INFORMATION REGARDING ENVIRONMENTAL AUDIT REPORTS

August 2007

VICTORIA'S AUDIT SYSTEM

An environmental audit system has operated in Victoria since 1989. The *Environment Protection Act 1970* (the Act) provides for the appointment by the Environment Protection Authority (EPA Victoria) of environmental auditors and the conduct of independent, high quality and rigorous environmental audits.

An environmental audit is an assessment of the condition of the environment, or the nature and extent of harm (or risk of harm) posed by an industrial process or activity, waste, substance or noise. Environmental audit reports are prepared by EPA-appointed environmental auditors who are highly qualified and skilled individuals.

Under the Act, the function of an environmental auditor is to conduct environmental audits and prepare environmental audit reports. Where an environmental audit is conducted to determine the condition of a site or its suitability for certain uses, an environmental auditor may issue either a certificate or statement of environmental audit.

A certificate indicates that the auditor is of the opinion that the site is suitable for any beneficial use defined in the Act, whilst a statement indicates that there is some restriction on the use of the site.

Any individual or organisation may engage appointed environmental auditors, who generally operate within the environmental consulting sector, to undertake environmental audits. The EPA administers the environmental audit system and ensures its ongoing integrity by assessing auditor applications and ensuring audits are independent and conducted with regard to guidelines issued by EPA.

AUDIT FILES STRUCTURE

Environmental audit reports are stored digitally by EPA in three parts: the audit report (part A), report appendices (part B) and, where applicable, the certificate or statement of environmental audit and an executive summary (part C). A report may be in colour and black-and-white formats. Generally, only black-and-white documents are text searchable.

Report executive summaries, findings and recommendations should be read and relied upon only in the context of the document as a whole, including any appendices and, where applicable, any certificate or statement of environmental audit.

AUDIT REPORT CURRENCY

Audit reports are based on the conditions encountered and information reviewed at the time of preparation and do not represent any changes that may have occurred since the date of completion. As it is not possible for an audit to present all data that could be of interest to all readers, consideration should be made to any appendices or referenced documentation for further information.

When information regarding the condition of a site changes from that at the time an audit report is issued, or where an administrative or computation error is identified, environmental audit reports, certificates and statements may be withdrawn or amended by an environmental auditor. Users are advised to check EPA's website to ensure the currency of the audit document.

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FURTHER INFORMATION

For more information on Victoria's environmental audit system, visit EPA's website or contact EPA's Environmental Audit Unit.

Web: www.epa.vic.gov.au/envaudit

Email: environmental.audit@epa.vic.gov.au

Nolan Consulting Pty Ltd

Section 53V Audit of Landfill Operation
Hyland Highway, Loy Yang
Service Order Reference No. 8006077
Appendices

Latrobe City Council

December 2019

A165-01

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List of appendices

Appendix A

EPA Licence 25565, last amended on 17 August 2018

ENVIRONMENT PROTECTION ACT 1970
SECTION 20

LICENCE

LATROBE CITY COUNCIL

Holder of

Licence:	**25565**
Issued:	04/06/2009
Last Amended:	17/08/2018
ABN:	92 472 314 133
Registered Address:	141 COMMERCIAL RD MORWELL VIC 3840
Premises Address:	64 HYLAND HIGHWAY LOY YANG VIC 3844
Scheduled Categories:	A05 Landfills
Description:	The licence holder operates a landfill. This licence allows for putrescible waste, solid inert waste, asbestos of domestic origin, and shredded tyres to be deposited to land and for asbestos of a domestic origin to be stored temporarily on site. Part of the premises is north of the landfill (see Schedule 1A) which is considered to be a transfer centre for storing of asbestos before going into landfill.

....
STEPHEN ADAMTHWAITE
Team Leader
Development Assessments
Delegate of the Environment Protection Authority

Issued under the *Environment Protection Act 1970*, Section 20

PREAMBLE

Licences

Who we are: The Environment Protection Authority ("EPA") is an independent statutory authority established under the *Environment Protection Act 1970* ("the Act"). Our purpose is to protect and improve our environment by preventing harm to the environment and human health.

Why we issue licences: EPA is responsible for preventing or controlling pollution (including noise) and improving the quality of the environment. This responsibility includes regulating activities that may present a danger to the environment. One of the tools available to EPA is the licensing of certain scheduled premises that may present a risk to the environment.

Section 20 of the Act requires the occupier of a "scheduled premises" to obtain an EPA licence to discharge, handle, treat or dispose of waste to the environment. These premises are defined in the *Environment Protection (Scheduled Premises and Exemptions) Regulations 2017* ("the Regulations").

When we issue licences: EPA will issue a licence when satisfied that an applicant has put in place measures to protect the environment. Licences allow activities to occur and set performance outcomes based on a site's environmental risk. EPA can amend, suspend or revoke a licence in response to changes in standards, site activities or licence holder performance. Licence holders must submit an annual performance statement and pay an annual fee to EPA. All licences and performance statements are publicly available.

Licence information and obligations

Interpretation: For the purposes of this licence "You" means the licence holder identified on the first page of this licence at the "premises" identified on the first page and represented in Schedule 1.
Unless the contrary intention appears, words or terms used in the conditions of your licence have the same meaning as in the Act, including any regulations or policies made pursuant to the Act."

Compliance:
You must comply at all times with the Act and all policies and regulations administered by EPA. Strict penalties apply for non-compliance with any part of your licence or making a false claim on your annual performance statement.

Your licence is subject to conditions. These conditions give rise to a number of duties and obligations on you as the licence holder. Some of these are general in nature, while others require you to do (or not to do) specific things. The duties and obligations imposed by these conditions do not derogate from each other in any way, nor do they affect any other duties or obligations which you are required by law to comply with. You must fulfil all of the duties and perform all of the obligations set out in this licence or otherwise required by law. Certain conditions on your licence may require you to seek a further approval from EPA. Such approvals can be sought via written application to approvals.applications@epa.vic.gov.au. Approvals are only given in writing from the lead assessing officer.

Landfill levy: Landfills must, in accordance with the method and frequency specified in section 50SB of the Act, calculate the amount of landfill levy payable, prepare a landfill levy statement, and submit to EPA both the statement and fee payable.

Review of decisions: If you object to any of the licence conditions, you may have the decision reviewed by applying in writing to the Registrar, Planning and Environment Division, Victorian Civil and Administrative Tribunal ("VCAT"), 7th Floor, 55 King Street, Melbourne within 21 days of the date of issue. An application fee may be applicable when lodging an appeal with VCAT. Contact VCAT on (03) 9628 9777 for further details on fees associated with an appeal. A copy of the appeal should also be forwarded to the Manager, Development Assessments Unit, Environment Protection Authority, GPO Box 4395, Melbourne, 3001, within 7 days of lodgement of the appeal.

Interested (third) parties may also appeal against the licence within 21 days of the date of issue. The Tribunal will notify you if such appeals are received. If an appeal is lodged, this licence will not come into effect.

Licence structure

Structure: Your licence has multiple parts:

- Environmental performance conditions - setting out the performance outcomes you must meet;
- Schedule 1A - locality plan of your premises, delineating the premises boundary;
- Schedule 1B - plan of premises (provided by you).

Some types of licences also contain Schedule 1C - final landfill contour plans and/or Schedule 2 - tables specifying wastes that may be accepted at the premises and the associated treatment applied to them.

CONDITIONS

General Conditions

LI_G1	You must ensure that waste is not discharged, emitted or deposited beyond the boundaries of the premises except in accordance with this licence or under the Act.
LI_G2	You must immediately notify EPA of non-compliance with any condition of this licence by calling 1300 EPA VIC (1300 372 842), sending an email to contact@epa.vic.gov.au, or using the EPA Interaction Portal.
LI_G3	By 30 September each year you must submit an annual performance statement to EPA for the previous financial year in accordance with the Annual Performance Statement Guidelines (EPA Publication 1320.3, released June 2011).
LI_G4	Documents and monitoring records used for preparation of the annual performance statement must be retained at the premises for five years from the date of each statement, and be able to be immediately produced upon request by an officer of the Authority.
LI_G6	You must provide EPA with a financial assurance determined by the EPA, and maintain such assurance (including any part of such assurance) so that it can be claimed on, utilised or realised as and when required.

Amenity Conditions

LI_A1	You must ensure that odours offensive to the senses of human beings are not discharged, emitted or released beyond the boundaries of the premises.
LI_A2	You must ensure that there are no emissions of noise and/or vibrations from the premises which are detrimental to either of the following: a) the environment in the area around the premises; and b) the wellbeing of persons and/or their property in the area around the premises.
LI_A3	You must ensure that nuisance dust and/or nuisance airborne particles are not discharged or emitted beyond the boundaries of the premises, except as permitted by this licence.

Waste Acceptance Conditions

LI_WA1	You must ensure all of the following: a) only waste of a type shown in Schedule 2 of this licence is accepted at the premises; and b) if it is identified that any waste has been received at the premises that is of a type not shown in Schedule 2 in contravention of paragraph a) above, such waste must be placed in a designated and sign-posted temporary storage area and sent for disposal to a site licensed by EPA to receive such waste within 21 days of the date it was received.

LI_WA1.5 You must not accept any waste for storage pending any licenced operation except asbestos waste of domestic origin stored in a single 12m3 sized consolidation bin at the site marked, 'Hyland Highway Landfill Part B (Site of Asbestos Bin)' in Schedule 1B, and managed according to the following: (A) At all times storage does not exceed a single consolidation bin with a locked lid or locked behind doors or gates with access only allowed to those appropriately trained in asbestos management; (B) all packages placed in the consolidation bin are appropriately packaged in accordance with the requirements of EPA publication No: IWRG611.1 "Asbestos transport and disposal"; (C) the consolidation bin is lined with plastic in accordance with requirements of EPA publication No:IWRG611.1 "Asbestos transport and disposal"; (D) The waste stored within the consolidation bin must be disposed of as soon as reasonably practicable and, no longer than 3 months from when the first package was placed in the bin; (E) The tabulated quantity and date of asbestos waste received at the consolidation site and the tabulated quantity and date of asbestos waste collected from the consolidation site for final disposal at a licenced facility must be kept for a period of at least 2 years; (F) transport and disposal of the waste from the consolidation site must be in accordance with regulations; EPA Industrial Waste Resource Guidelines, 2009; EPA Publication IWRG611.1 "Asbestos transport and disposal"; and all applicable EPA publications (as amended from time to time); (G) EPA must be notified immediately of any incident or spill of wastes and; (H) Spill Management Plan ("SMP") for transportation of the waste to and from the consolidation site and a SMP for the consolidation site to avoid and safely manage spills must be developed.

Waste Management Conditions

LI_WM3 You must ensure that litter originating from the premises is not present beyond the boundaries of the premises.

LI_WM4 You must ensure that waste does not burn at the premises.

Landfill Conditions

LI_L1 You must develop and put into place a monitoring program that accords with Section A of the Landfill Licensing Guidelines, (EPA Publication 1323.3, released September 2016). The program must evaluate the risks to the environment associated with the operation of the landfill and the steps which can be taken to manage such risks and enable both you and EPA to determine changes in the condition of the environment or impacts to environmental quality as a result of activities at the premises. The monitoring program must be verified by a person who has been appointed as an environmental auditor under the Environment Protection Act 1970 and it must do all of the following:

a) contain an assessment of the risks to the environment arising from the waste that has been deposited at the premises and of the current landfill operation prepared in accordance with the Landfill Licensing Guidelines, (EPA Publication 1323.3, released September 2016) or another method approved by EPA in writing;
b) describe the environmental monitoring of landfill gas, leachate, groundwater, land, air, odour, noise, dust and surface water which will be undertaken to respond to the risks identified in the risk assessment in paragraph a) above;
c) contain trigger levels and contingency actions to prevent further pollution when exceeded;
d) specify the frequency for completing environmental audits of the landfill operation; and
e) be appropriate and adapted to the characteristics of the landfill, including the landfill design, the volume of waste received, the age and planned future lifespan of the landfill and the surrounding environment.

LI_L2	You must engage a person who has been appointed as an environmental auditor under the Environment Protection Act 1970 to conduct and submit to EPA environmental audits of the risk of harm actually or potentially arising from landfill operation under Section 53V of the Act at the frequency specified in the monitoring program.
LI_L3	You must ensure that surface water is segregated from active landfill cells.
LI_L4	Waters contaminated by leachate must not be discharged beyond the boundaries of the premises.
LI_L4.1	You must extract leachate from cell(s) 3 and 4 such that the depth of leachate above the lowest point of the drainage layer does not exceed 300mm.
LI_L5	You must take all practicable measures to prevent emissions of landfill gas from exceeding the action levels specified in Table 6.4 of Best Practice Environmental Management, Siting, Design, Operation and Rehabilitation of Landfills (EPA Publication 788.3, released August 2015).
LI_L6	All waste in the cell(s) listed in Schedule 2 apart from at the active tipping face must be covered at all times.
LI_L7	By the end of each day's operations waste must be covered in one of these ways: a) with a layer of soil at least 0.15 metres thick if the waste is only solid inert waste; b) with a layer of soil at least 0.30 metres thick for all other wastes; or c) using alternative cover approved by EPA in writing.
LI_L7.1	You must cover waste asbestos immediately upon deposition in one of these ways: a) with a layer of waste (not including waste asbestos) at least 1 metre thick or a layer of soil at least 0.3 metres thick; or b) using alternative cover approved by EPA in writing.
LI_L8	You must: a) limit the area of the tipping face of each cell to 900m2; b) only operate one tipping face at any time unless a second tipping face is required for short term operational reasons; and c) ensure the active tipping face is mechanically stable as per Section 7.6 of the Best Practice Environmental Management, Siting, Design, Operation and Rehabilitation of Landfills (EPA Publication 788.3, released August 2015).
LI_L9	You must ensure all of the following: a) Waste that is accepted for disposal at the premises is only placed into cell(s) listed in Schedule 2; and b) Waste for disposal is not placed outside of the perimeter of any cell(s) listed in Schedule 2.
LI_L10	You must ensure that waste that has been previously deposited is not recovered and reprocessed except in accordance with written approval from EPA.
LI_L11	You must ensure that waste is not stockpiled at the premises prior to deposit in a cell except in accordance with written approval from EPA.

LI_L12 You must ensure that an independent annual survey is conducted by a licensed surveyor, or other method approved by EPA in writing, by the end of June each year for each landfill cell at the premises and submitted to EPA with your annual performance statement. The survey must:

a) confirm the volume and mass of air space consumed since the last survey; and
b) verify that the top of the waste deposited in cells is in compliance with the EPA approved pre-settlement contour plan.

LI_L13 You must manage each landfill cell so that the surface contour prior to settlement conforms to the surface profile grades in Section 8.1.5 of the Best Practice Environmental Management, Siting, Design, Operation and Rehabilitation of Landfills (EPA Publication 788.3, released August 2015) or otherwise as approved by EPA in writing and so that the top of waste prior to settlement is not higher at any point than the pre-settlement top of waste approved contour plan shown in Schedule 1C.

LI_L15 You must take measures to prevent hotspots in the waste mass at the landfill site.

LI_L16 You must report hotspots within the waste mass to EPA within 24 hours of detection.

LI_L17 You must manage hotspots within the waste mass in accordance with the Landfill Licensing Guidelines (EPA Publication 1323.3, released September 2016).

LI_L18 You must:

a) notify EPA of your intention to commence construction of a new landfill cell at the premises by written notice in accordance with Appendix 7 of the Landfill Licensing Guidelines (EPA Publication 1323.3, released September 2016); and
b) not start constructing a new cell without written EPA approval.

LI_L19 Prior to commencing construction of a new landfill cell you must submit the following material to EPA so that it may consider whether or not to grant approval for the construction of the new cell:

a) detailed designs of the landfill cell meaning plans, technical specifications and a construction quality assurance plan which comply with Section 6 and Appendices D, E and F of the Best Practice Environmental Management, Siting, Design, Operation and Rehabilitation of Landfills (EPA Publication 788.3, released August 2015);
b) an assessment report of the of the detailed designs prepared by a person who has been appointed as an environmental auditor under the Environment Protection Act 1970 in accordance with Appendix 14 of the Landfill Licensing Guidelines (EPA Publication 1323.3, released September 2016); and
c) a completed and signed auditor declaration in the format shown in Appendix 15 of the Landfill Licensing Guidelines (EPA Publication 1323.3, released September 2016).

LI_L20 Upon approval by EPA to construct each new landfill cell, you must engage a person who has been appointed as an environmental auditor under the Environment Protection Act 1970 to conduct an environmental audit and submit an environmental audit report to EPA. The environmental audit report must:

a) verify that the construction of the new landfill cell is in accordance with EPA approved designs;
b) assess any potential risks associated with the construction or use of the new landfill cell; and
c) be prepared in accordance with Section 53V of the Environment Protection Act 1970.

LI_L21 You must not commence filling of any new landfill cell with waste without the written approval of EPA.

LI_L22	You must implement a rehabilitation plan for the landfill. The plan must: a) be revised after each cell is full, if necessary; b) meet the requirements of Section 8 of Best Practice Environmental Management, Siting, Design, Operation and Rehabilitation of Landfills (EPA Publication 788.3, released August 2015); c) set timeframes for placement of final capping of all completed cells, calculated from the date that the cell became full; and d) set timeframes for the progressive capture and treatment of landfill gas and leachate from each completed cell.
LI_L23	You must place intermediate cover on all cells within one month of the date that the cell became full. The intermediate cover must comprise a minimum of 500 mm of compacted clay or compacted clay rich soil or alternative cover approved by EPA in writing.
LI_L24	In circumstances where the deposit of waste in a cell is likely to cease for a period of three months or more, you must place intermediate cover on the cell within one month of the date that waste was last placed in the cell. The intermediate cover must comprise a minimum of 500 mm of compacted clay or compacted clay rich soil or alternative cover approved by EPA in writing.
LI_L25	Prior to commencing construction of each new section of landfill cap you must submit the following to EPA for approval: a) detailed designs of the landfill cap, meaning plans, technical specifications and a construction quality assurance plan which comply with Section 8 and Appendices D, E and F of the Best Practice Environmental Management, Siting, Design, Operation and Rehabilitation of Landfills (EPA Publication 788.3, released August 2015); b) an assessment report of the detailed designs of the cap prepared by a person who has been appointed as an environmental auditor under the Environment Protection Act 1970 in accordance with Appendix 14 of the Landfill Licensing Guidelines (EPA Publication 1323.3, released September 2016); and c) a completed and signed auditor declaration in the format shown in Appendix 15 of the Landfill Licensing Guidelines (EPA Publication 1323.3, released September 2016).
LI_L26	Upon approval by EPA to construct each new landfill cap you must engage a person who has been appointed as an environmental auditor under the Environment Protection Act 1970 to conduct and submit an environmental audit report to EPA. The environmental audit report must: a) verify that the construction of the cap is in accordance with EPA approved designs; b) assess any potential risks associated with the construction; and c) be prepared in accordance with Section 53V of the Environment Protection Act 1970.
LI_L27	You must complete final capping of cells within 2 years of the date that cell became full, in compliance with the approved rehabilitation plan.
LI_L28	You must provide EPA with at least 6 month’s notice of your intention to cease accepting waste at the premises.

Air Conditions

Licence does not have any discharge to air conditions.

Water Conditions

LI_DW1	You must ensure that surface water discharged from the premises is not contaminated with waste.

Land Conditions

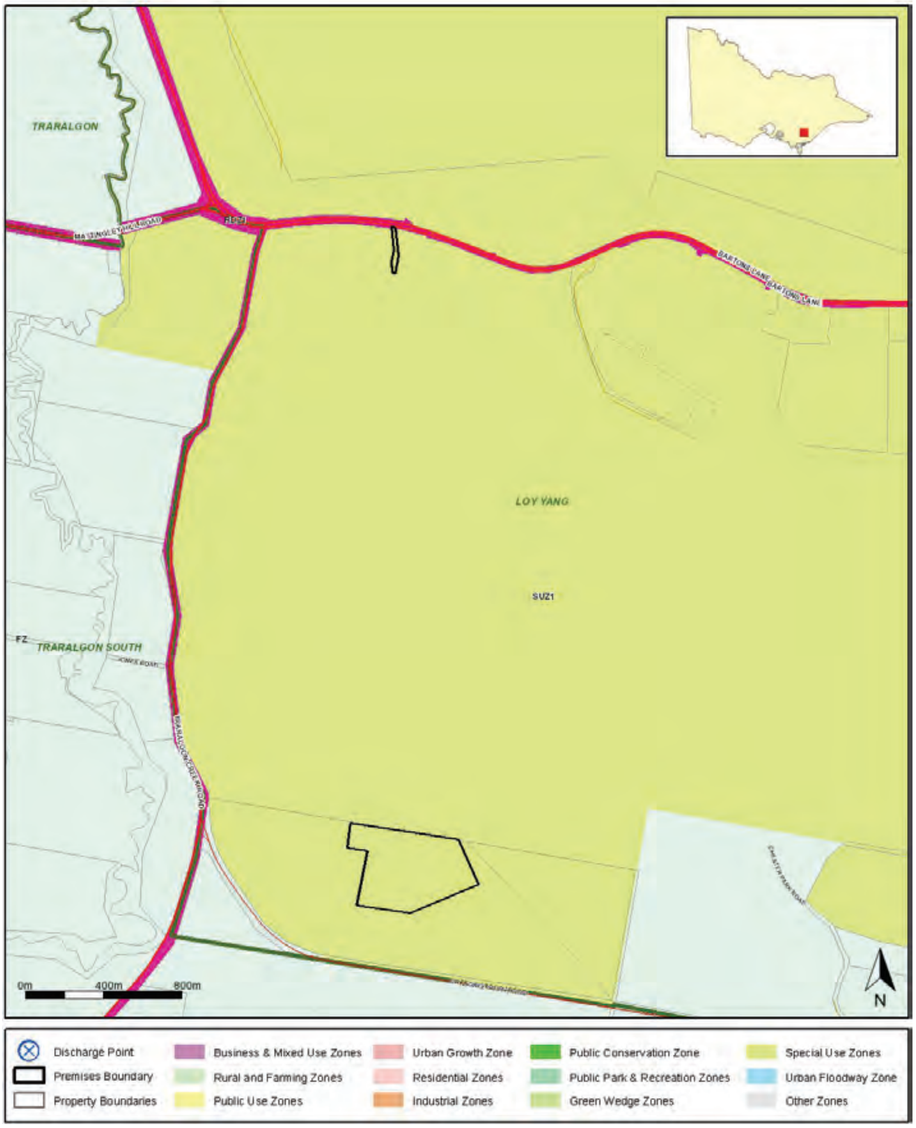
LI_DL1.2 You must ensure that the activities carried on at the premises do not do either of the following:

a) cause detriment to any beneficial use which may be made of the land on the premises outside of the boundary of any landfill cells; and
b) pollute land on the premises contrary to section 45 of the Environment Protection Act 1970.

LI_DL1.3 You must ensure that the activities carried on at the premises do not do either of the following:

a) cause detriment to any beneficial use which may be made of groundwater both within and beyond the boundary of the premises.
b) pollute groundwater both within and beyond the boundary of the premises contrary to section 39 of the Environment Protection Act 1970.

SCHEDULE 1A - LOCALITY PLAN



Licence:	25565
Company Name:	LATROBE CITY COUNCIL
ABN:	92 472 314 133
Premises Address:	64 Hyland Highway, LOY YANG VIC 3844
Issued:	04/06/2009
Last Amended:	17/08/2018

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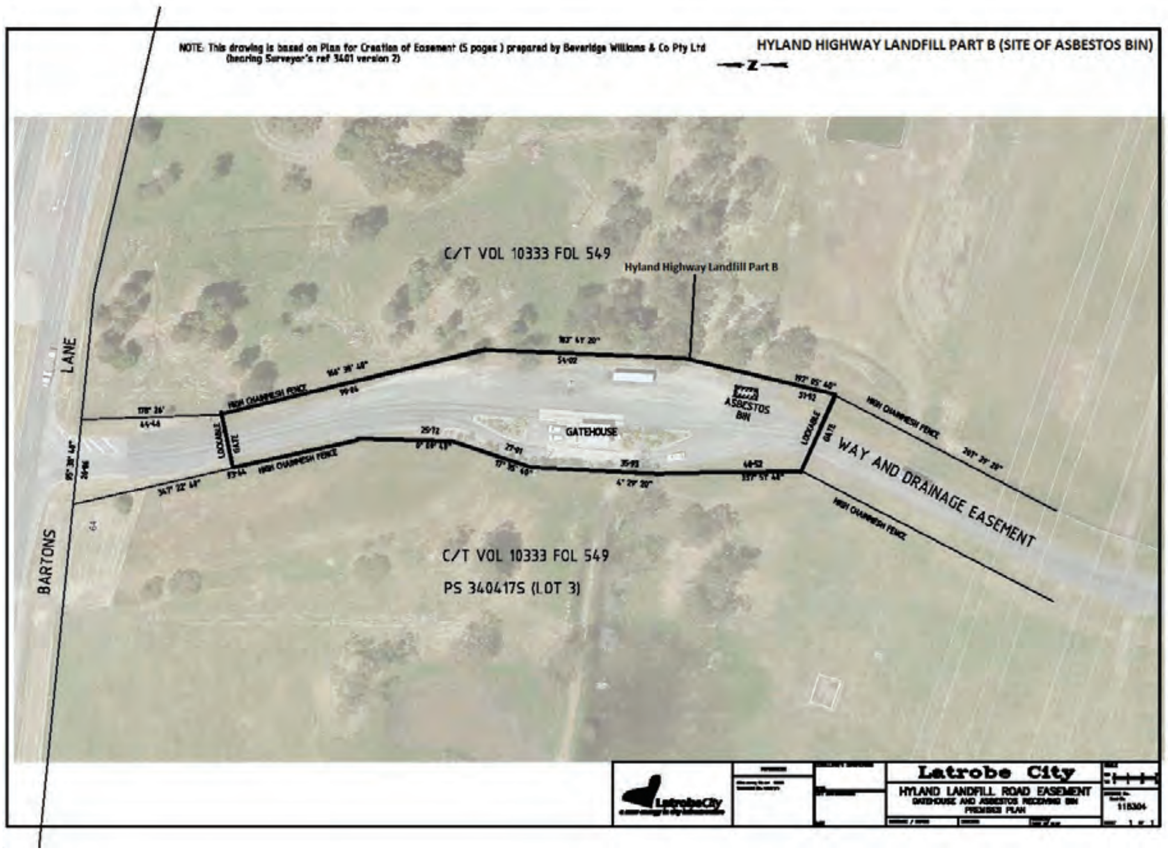
SCHEDULE 1B - PREMISES PLAN



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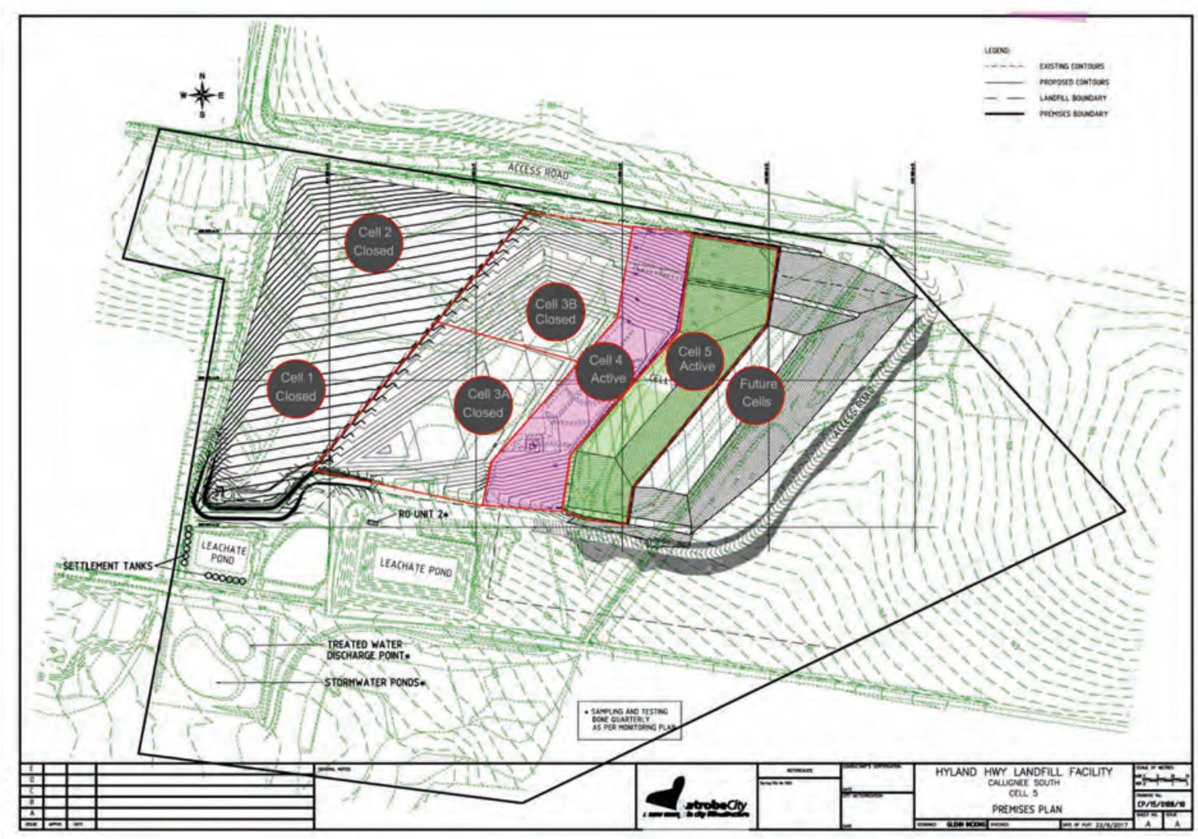

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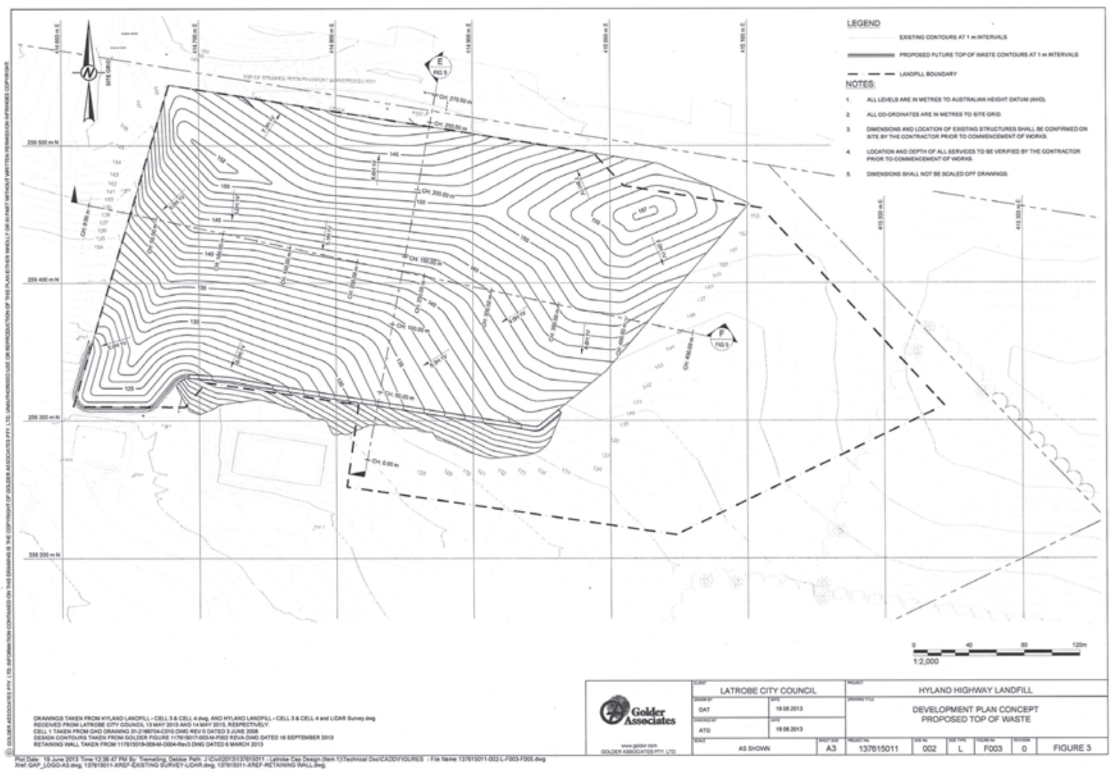
SCHEDULE 1C - CONTOUR PLAN



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SCHEDULE 2 - WASTE ACCEPTANCE TABLES

Disposal to Landfill - General Waste

Landfill Cell	Waste Type
CELL 4	Asbestos waste of domestic origin
	Putrescible waste
	Solid inert waste
	Tyres shredded into pieces < 250 mm
CELL 5	Asbestos waste of domestic origin
	Putrescible waste
	Solid inert waste
	Tyres shredded into pieces < 250 mm

Appendix B

Site photographs (7 October 2019)

Photograph 1: Southern cell 5 with cover stockpile (looking WSW)

Photograph 2: Cell 5 north-north-west of tippling face with litter net and Cell 4 intermediate cover on batter (looking WNW)

Photograph 3: Cell 5 north with daily cover, litter nets within Cell and in north-west corner and waste through cap (looking north-east)

Photograph 4: Cell 5 with litter nets within cell and in north-west corner and waste through cap and staining on geotextile (looking NNE)

Photograph 5: Cell 5 tipping area (looking west)

Photograph 6: Cell 5 tipping area to left with LFG extraction well in background (looking west)

Photograph 7: Cell 5 South-west corner with gravel on side liner, leachate level monitoring point and leachate inspection line – adjacent Cell 4 (looking south)

Photograph 8: Cell 5 South-west corner with gravel on side liner, leachate level monitoring point and leachate inspection line – adjacent Cell 4 (looking south)

Photograph 9: Above cell 5 tipping face with stripped back cover and LFG well (looking south-west)

Photograph 10: Cell 4 batter with new LFG manifold in rear (from Cell 5 looking north-west)

Photograph 11: Cell 5 (with firefighting line with sprinklers (looking ENE)

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Photograph 13: Leachate Pond 2 with 9 of 10 aerators working (looking SW)

Photograph 14: covered Cell 4 leachate riser (looking NNW)

Photograph 15: Leachate Pond 2 near freeboard with fire-fighting pipeline C (looking south)

Photograph 16: Leachate Pond 1 used for high flows (looking west)

Photograph 17: Cell 1-2 cap stormwater chute overflow towards Stormwater Pond 1 (looking south)

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Photograph 19: BH2 locked and labelled (looking south)

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Photograph 26: North-east of Cell 5 - Strong wind from WSW

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Figure 29: Flare on Cell 1 with limited vegetation strike in some areas (looking east)

Appendix C

PLC (2017) *“Landfill Gas Risk Assessment Hyland Highway Landfill, Loy Yang”*

Landfill Gas Risk Assessment

Hyland Highway Landfill, Loy Yang

Prepared for:
Latrobe City Council
141 Commercial Rd
Morwell Vic 3840

February 2017

LATROBE CITY COUNCIL

HYLAND HIGHWAY LANDFILL - LFGRA

Authored and Reviewed by:

Role	Name
Author:	Kathy Mac Innes - Principal Environmental Consultant | Hydrogeologist
Editorial and Technical Review:	Deane Ellwood - Director

Revision History

Revision	Date Issued	Document Status
01	January 2017	Draft
02	February 2017	Final

Prepared by:
PLC Consulting Pty Ltd

ABN:80 605 049 054

ACN: 605 049 054

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GLOSSARY

TERM	DEFINITION
AGO	Australian Greenhouse Office
AHD	Australian Height Datum
BPEM	*Best Practice Environmental Management Siting, Design, Operation and Rehabilitation of Landfills* (EPA Publication 788)
CCL	Compacted Clay Liner
DEDJTR	Department of Economic Development, Jobs, Transport and Resources
DELWP	Department of Environment, Land, Water and Planning
EPA	Environment Protection Authority
GCL	Geosynthetic Clay Liner
HA	Hydrogeological Assessment
HDPE	High Density Ploy Ethylene
LFG	Landfill Gas
LFGRA	Landfill Gas Risk Assessment
LLDPE	Linear Low Density Poly Ethylene
PLC	PLC Consulting Pty Ltd
RO	Reverse Osmosis
SEC	State Electricity Corporation
tpa	Tonnes per annum

1 Introduction

PLC Consulting Pty Ltd (PLC) was engaged by the Latrobe City Council (Council) to prepare a Landfill Gas Risk Assessment (LFGRA) for the Hyland Highway Landfill (the Site) located approximately 9.5 km south of Traralgon on the southern edge of the Loy Yang coal mine and power station (**Figure 1**). The Site is owned by Council and is located on the southern edge of the Latrobe Valley in the foothills of the Strzelecki Ranges.

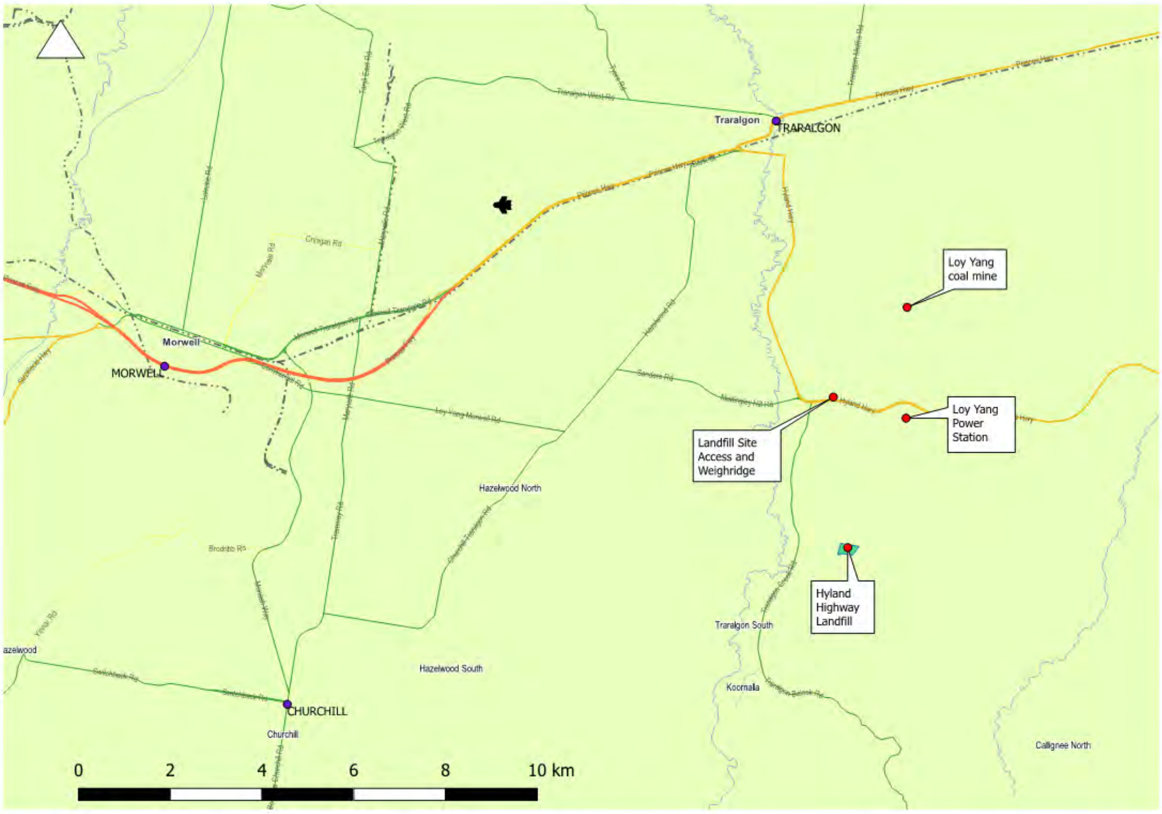


Figure 1 Location of Hyland Highway Landfill

The Site is owned by Council and is situated on the Loy Yang Mine lease. The site office and weighbridge are located near the entrance of the site just off Hyland Highway which is the main access road to the Loy Yang mine and power station. The actual landfill is approximately 4km south of the entrance, south of the mine's overburden dump.

The LFGRA has been prepared in accordance with Appendix 2 of EPA's Publication entitled *Landfill Licensing* (EPA Publication 1323.3).

1.1 Description

The landfill started receiving waste in May 2009 and initially received approximately 23,000 tpa of municipal waste and 24,000 tpa of Industrial waste. Cells 1 and 2 were filled concurrently. Cell 3 was divided into Cell 3A and Cell 3B. Filling is currently occurring into Cell 4. Cells 1 and 2 have a double composite liner consisting from bottom to top:

- 1m thick compacted clay layer (CCL);
- Textured High Density Poly Ethylene (HDPE) geomembrane;
- Geosynthetic drainage grid;
- Geosynthetic Clay Liner (GCL);
- Geotextile;
- Aggregate drainage layer; and

- Geotextile.

Most of Cells 1 and 2 (except the eastern batter) have had a final cap installed. The cap profile is as follows;

- 200 mm topsoil layer;
- 700 mm sub-soil;
- 300 mm drainage layer;
- cushion geotextile;
- flexible Linear Low Density Polyethylene (LLDPE) geomembrane liner;
- geosynthetic clay liner (GCL); and
- 300 mm soil cover over waste.

Cell 3 has a single composite liner consisting from bottom to top of:

- 1m thick CCL;
- GCL;
- HDPE geomembrane;
- Cushion Geotextile;
- Aggregate drainage layer; and
- Filter Geotextile.

The Cell 4 basal liner has the following profile from bottom to top:

- 0.5m CCL;
- 2 x GCL;
- HDPE geomembrane;
- Cushion Geotextile;
- Aggregate drainage layer; and
- Filter Geotextile.

The sidewall of Cell 4 has the following profile:

- HDPE;
- GCL; and
- 1m Clay.

A perched watertable was identified during the construction of Cell 3B so a groundwater (seepage) collection system was installed.

Leachate from the collection system is pumped to two leachate ponds located on the southern side of Cell 3A. Leachate is treated by reverse osmosis (RO) and the treated water is released to the primary stormwater dam. Brine from the RO plant is discharged to the lined leachate pond,

A landfill gas extraction system has been installed over the final capped area which is operated by Run Energy. Landfill gas is disposed via a flare located near the education centre. The collection system consists of a horizontal passive collection system beneath the cap and a vertical well extraction system.

Leachate and LFG management systems are described in detail by Nolan 2015. A plan of the site layout is presented in **Figure 2**.

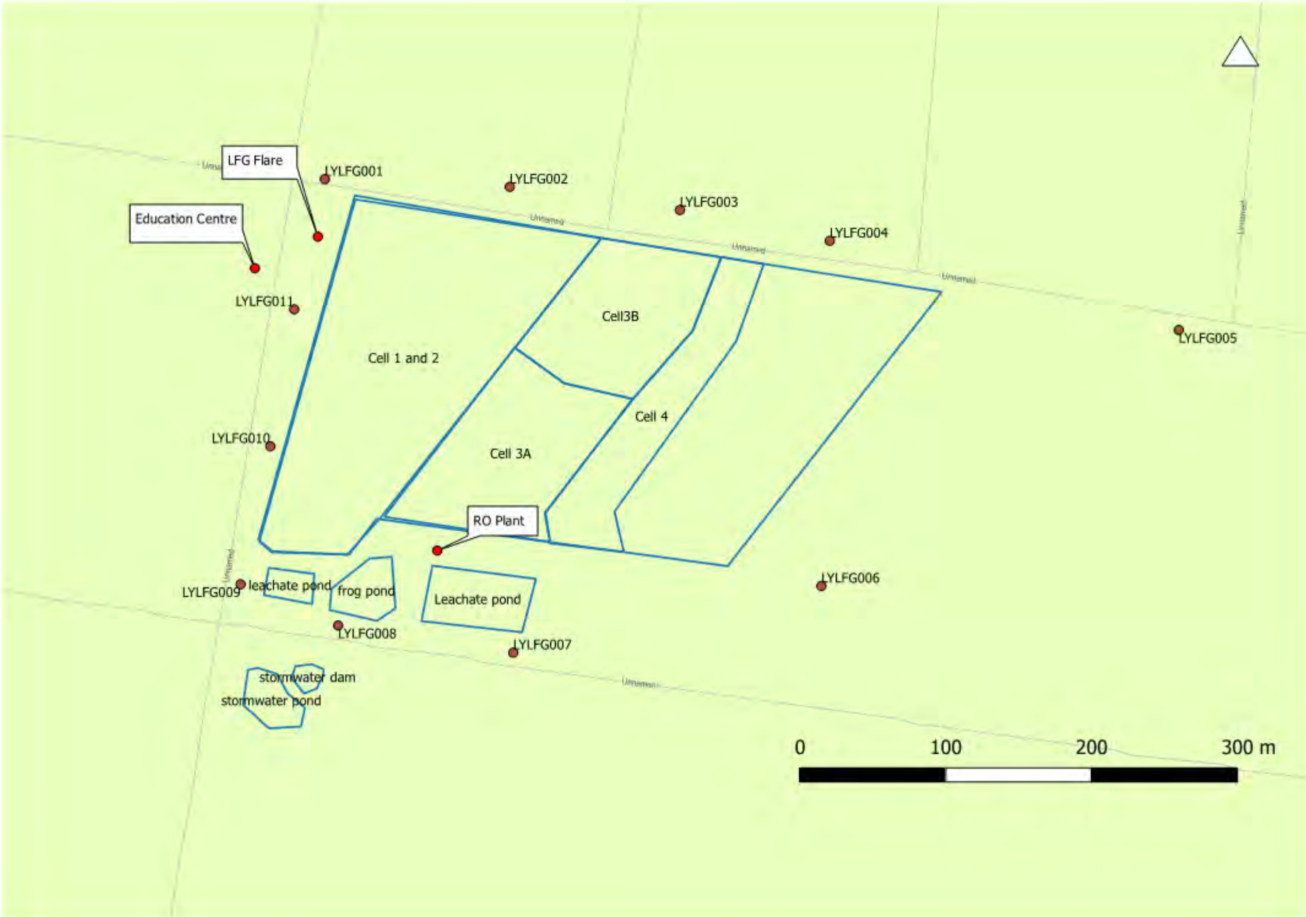


Figure 2 Site Plan

1.2 Objective

The LFGRA is performed in order to assess whether migration of Landfill Gas (LFG) from the landfill presents an unacceptable risk to human health and the environment. The results of the LFGRA are considered in developing the LFG monitoring program and other potential management requirements.

The objective of the risk assessment is to determine if the landfill gas management and monitoring at the landfill site is sufficient to:

- Mitigate any risks identified to receptors;
- Where the management and monitoring of landfill gas is not sufficient to enable the completion of a representative landfill gas risk assessment, make recommendations to enable a representative landfill gas risk assessment to be undertaken; and
- Where the management and monitoring of landfill gas is not sufficient to mitigate risks identified to receptors, to recommend what action needs to be taken.

1.3 Background

The Hyland Highway Landfill opened in 2009 and is therefore relatively young in Victorian landfill terms. All cells have composite liners and has operating gas and leachate extraction systems. The landfill gas extraction system is operated by Run Energy.

1.4 Previous work

A hydrogeological assessment (HA) was prepared by GHD (2007) as part of the Works Approval Application for the site. The HA has not been recently updated.

A monitoring program was prepared for the site by Hyder in 2011. This was verified by the site's Auditor John Nolan in December 2011. No gas monitoring was proposed for the site at that time based on the following justification.

> *Given the best practice landfill cell (base and side) lining systems, the relatively short waste deposition period (since June 2009), and the sparse nature and significant buffer distances to the nearest sensitive receptors (nearest residential premises >1 km), no landfill gas monitoring or infrastructure is proposed for the site at this stage.*
>
> *LCC shall undertake preliminary gas monitoring and periodic site inspections when the landfill cap is completed for Cell1/2, and actions will be taken to achieve greenhouse gas off-setting.*

A revised monitoring program was prepared in the 2014 Audit undertaken by John Nolan. Monitoring data collected under this program has been provided to PLC by Council. Monitoring commenced in October 2014 and has been undertaken by Run Energy.

The most recent Operations Audit was undertaken by John Nolan in 2015. The monitoring program was updated as part of this process. All elements are required to be monitored quarterly. The current landfill gas monitoring requirements are as follows:

Table 1 Current monitoring requirements

Element	Parameter	Unit[1]	Description
Landfill Gas (subsurface)	Quality	Various	Field: Atmospheric pressure, relative pressure, peak CH_4, CO_2, O_2, and stabilised CH_4, CO_2, O_2, CO, and H_2S, flow (L/s), and comments.
	Condition	Descriptive	Qualitative description of the condition of the bore and headworks (e.g. damage, disturbance).
Landfill Gas (interim and final cap)	Quality	Various	Field: Atmospheric pressure, relative pressure, peak CH_4.
	Condition	Descriptive	Qualitative description of the condition of the cap (cracks, odour, status of vegetation, leachate).
Landfill Gas (buildings and service pits)	Quality	Various	Field: Atmospheric pressure, relative pressure, peak CH_4, CO_2, O_2.
	Condition	Descriptive	Qualitative description of the condition of the buildings and service pits (including possible LFG access points, cracks and odour).

(1) SI units preferred

Source: Nolan 2015.

The Auditor's conclusions relating to LFG included:

- No high risks have been identified.

- The following are considered to be medium risks:
  - Direct emissions from Cell 3 while filling impacting on plant operators;
  - Lateral LFG migration to service pits and Education Centre impacting on the health of workers and visitors;

The following conclusions and recommendations were made by the Auditor following a review of the available monitoring data:

- *The methane concentrations at all eleven on-site LFG monitoring bores have been consistently below the EPA (2015c) BPEM action level of 1.0%v/v since monitoring commenced in October 2014 with the exception of one exceedance at one bore located 300 m to the east of the operating cell and two exceedances from monitoring bore LYLFG007 located south of Leachate Pond No. 2.*
- *The CO_2 concentrations was above the EPA (2015c) BPEM action level of 1.5% v/v above background at most LFG monitoring bores in October 2014. By April 2015 there were no exceedances as the background concentration had increased and the monitored concentrations at most bores had decreased. Unfortunately this monitoring event occurred in a rising atmospheric pressure environment.*
- *Further monitoring is required to assess the background CO_2 concentration range and the impact of the LFG management system.*
- *A methane survey of the Cell 1/2 (west) final cap was undertaken by Run Energy on 10th July 2015 after the LFG management system had been installed. Of the 2,188 sampling points the methane concentration was below the 100 ppm action level except for 34 points mainly located in the north-east area near the eastern edge of the cap.*
- *No monitoring within buildings or services was undertaken over the audited period.*

1.5 Assessment Framework

The risk assessment framework will be based on a qualitative assessment of likelihood and consequence. These are then used to determine a numeric value for the level of risk for each potential hazard. Only hazards with complete pathways are considered. The assessment matrix is as proposed in the UK guideline (LTFGN03, 2004).

The assessment framework is presented in **Figure 3.**

Likelihood	Consequence					
	Minor	Noticeable	Significant	Severe	Major	Catastrophic
Extremely unlikely	1	2	3	4	5	6
Very unlikely	2	4	6	8	10	12
Unlikely	3	6	9	12	15	18
Somewhat unlikely	4	8	12	16	20	24
Fairly probable	5	10	15	20	25	30
Probable	6	12	18	24	30	36

Magnitude of risk	
Insignificant	6 or less
Acceptable	8 to 12
Unacceptable	15 or more

Figure 3 Assessment Framework

The criteria for the assessment of likelihood and consequence are as follows:

	Likelihood	Range
1	Extremely unlikely	Incident occurs less than once in a million years
2	Very Unlikely	Incident occurs between once per million and once every 10,000 years
3	Unlikely	Incident occurs between once per 10,000 years and once every 100 years
4	Somewhat unlikely	Incident occurs between once per hundred years and once every 10 years
5	Fairly probable	Incident occurs between once per 10 years and once per year
6	Probable	Incident occurs at least once per year

	Consequence	Definition
1	Minor	Nuisance on site only (no off-site effects). No outside complaint.
2	Noticeable	Noticeable nuisance off-site e.g. discernable odours. Minor breach of permitted emission limits, but no environmental harm. One or two complaints from the public
3	Significant	Severe and sustained nuisance, e.g. strong offensive odours Major breach of permitted emissions limits with possibility of prosecution. Numerous public complaints
4	Severe	Hospital treatment required Public warning and off-site emergency plan invoked
5	Major	Evacuation of local populace, Temporary disabling and hospitalisation. Serious toxic effect on beneficial or protected species. Widespread but not persistent damage to land
6	Catastrophic	Major airborne release with serious off-site effects. Site shutdown

Figure 4 Evaluation Criteria

2 Site Background Information

2.1 Topography

The site slopes to the southwest from approximately 152 mAHD to 119 mAHD. The topography of the site and surrounding area is shown in **Figure 5**. The site is relatively high in the landscape between two east-west trending ridgelines.

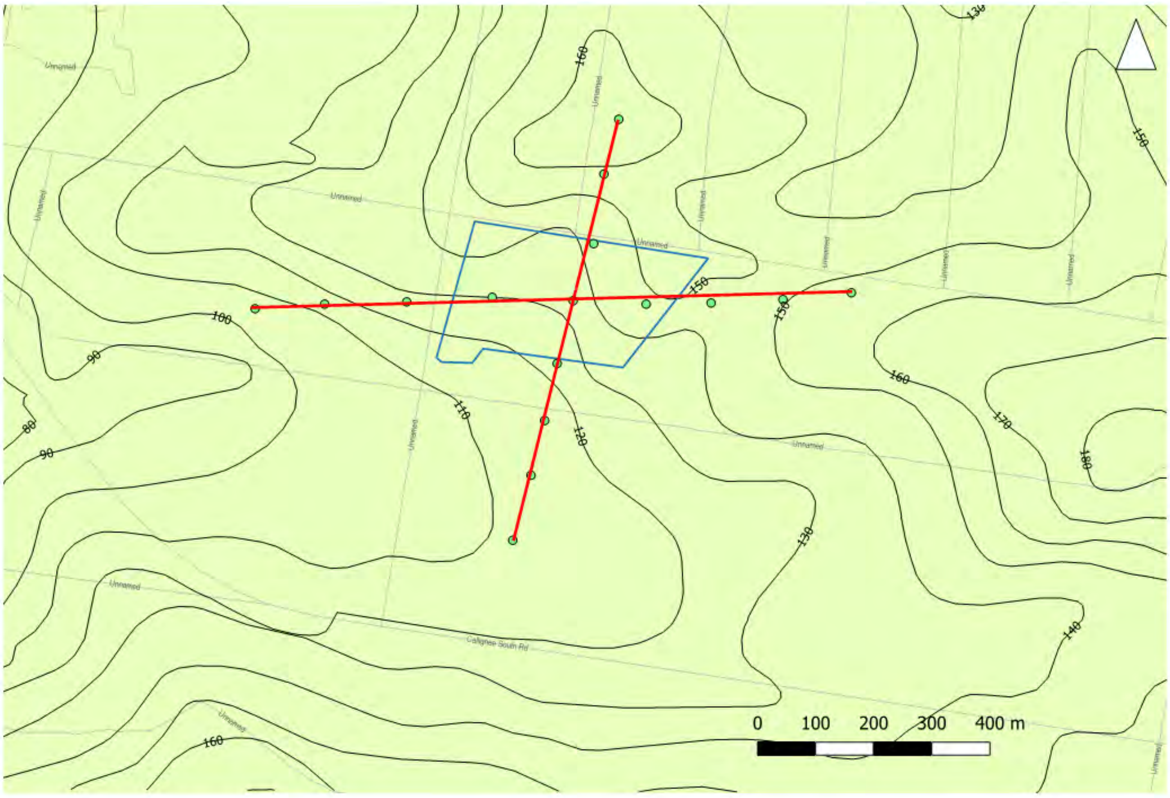
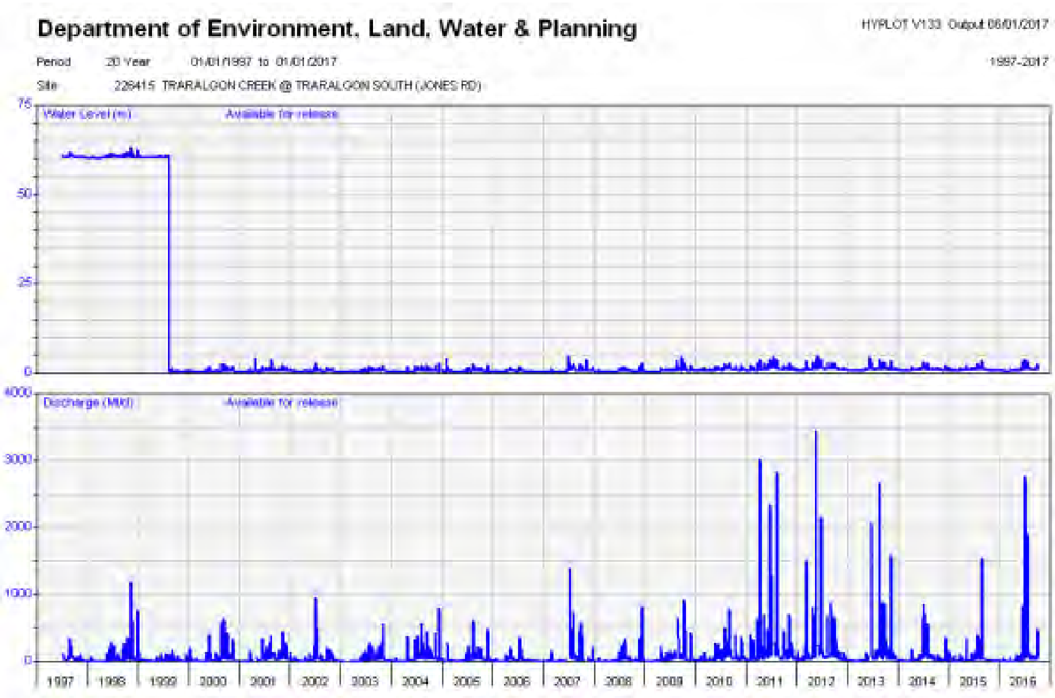


Figure 5 Topography

2.2 Surface water

Traralgon Creek is located approximately 1 km west of the Site. Traralgon Creek flows northwards through Traralgon joining the Latrobe River north of the township. Ultimately this finds its way to the Gippsland Lakes. A hydrographic station monitored by the Department of Environment, Land, Water and Planning (DELWP) is located approximately 1.5 km northwest of the Site. A hydrograph is shown in **Figure 6**. The hydrograph shows the creek is flowing most of the year.



Source: http://data.water.vic.gov.au/monitoring.htm

Figure 6 Traralgon Creek Hydrograph

Runoff from the site outside the landfill area drains to the south to the primary stormwater dam south of the leachate ponds. The secondary stormwater dam receives overflow from the primary stormwater dam. Overflows from the secondary stormwater dam drain into a minor watercourse which drains into Traralgon Creek.

2.3 Surrounding Land Use

The site was previously used for forestry. The surrounding land on all sides is currently used for plantation forestry. The overburden dump of the Loy Lang mine is approximately 500m north of the landfill.

The nearest residence is approximately 1.2 km southwest of the landfill.

2.4 Geology

The Site is on the southern edge of the Latrobe Valley which is part of the Gippsland Basin. The Gippsland Basin is bounded to the north by Palaeozoic basement which forms the Great Dividing Range. The Strzelecki Ranges form the southern margin of the Latrobe Valley and these are comprised of fault blocks of Lower Cretaceous aged metasediments.

The geological sequence beneath the landfill consists of from youngest to oldest:

- Upper Tertiary (uTa) Haunted Hills Formation;
- Middle Tertiary (mTa) brown coal deposits of the Latrobe Valley Coal Measures including:
  - Morwell Formation
  - Traralgon Formation
- Middle Tertiary (mTa) Older Volcanics (Thorpdale Volcanics) which depending on location may be absent. It is understood that the youngest flows may be interbedded in to the lower sequences of the Latrobe Valley Coal Measures
- Early Tertiary (eTa) Childers Formation
- Lower Cretaceous Strzelecki Group (bedrock)

The Older Volcanics and Childers Formation are thought to be absent at this location.

The geology from the 1:250,000 mapsheet is shown in **Figure 7**. The outcropping unit is the Tertiary aged Haunted Hills Gravel. Alluvium overlies the Haunted Hills Gravel along the Traralgon Creek.

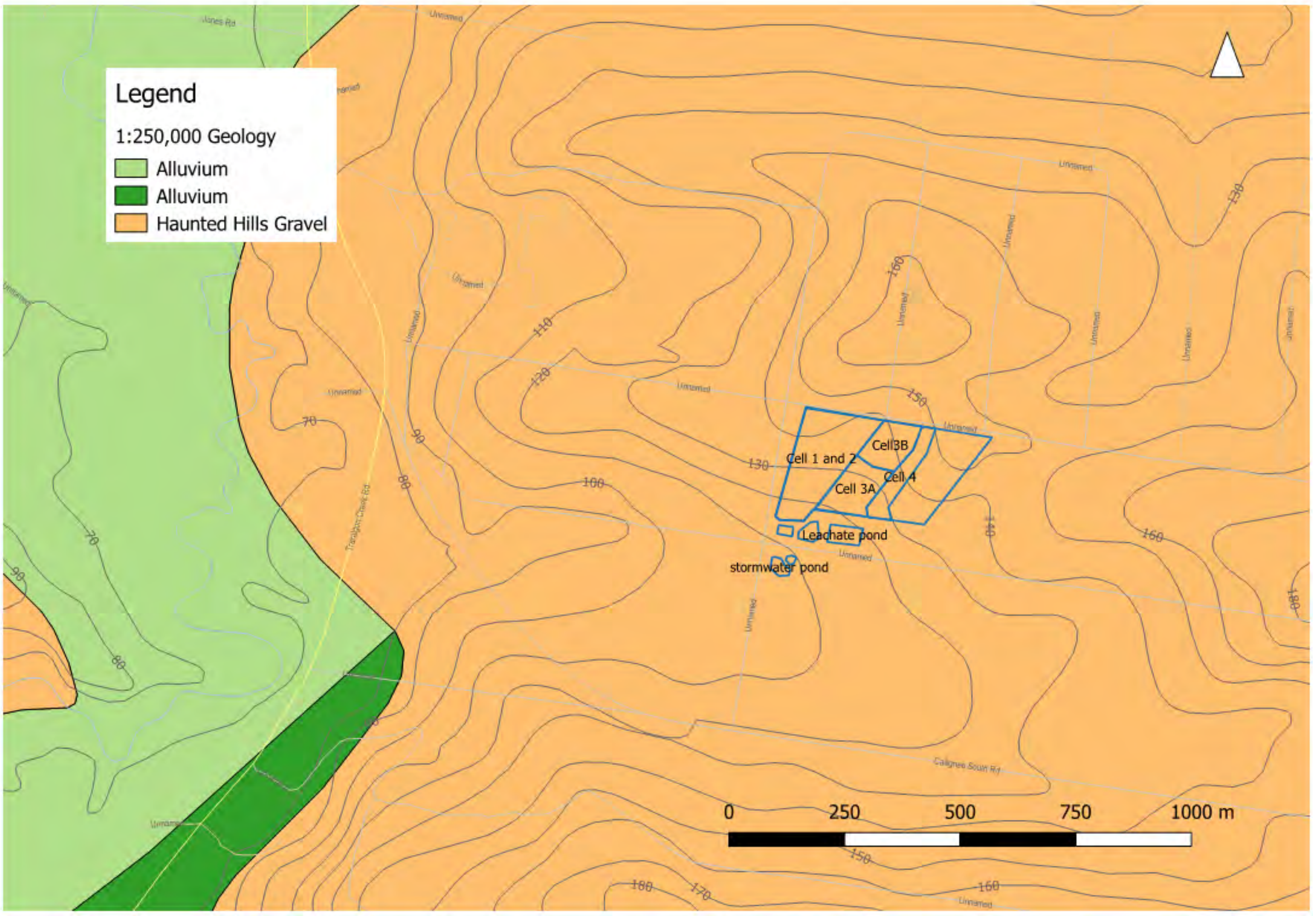


Figure 7 Geology (1:250,000)

The Haunted Hills Formation consists of fluvial sediments including gravels, sands and clays. The Haunted Hills Formation varies in thickness from 14m in the southwest thickening to over 30m in the north and east.

There are two formations of the Latrobe Valley Coal Measures present. The Morwell Formation is a ligneous clay containing thin coal and sand beds. This formation thickens from 7.5m in the southwest to over 30 m in the north. The top of the Traralgon Formation is marked by the T1 Coal Seam which varies from 23m thick in the south to 59m in the north. There is some evidence of faulting in this unit. Below the T1 Coal Seam the Traralgon Formation consists of a thick sequence of interbedded sands, clays and coals.

The Latrobe Coal Measures have been extensively modelled culminating in the development of the Latrobe Valley Coal Model for the Department of Primary Industry (now the Department of Economic Development, Jobs, Transport and Resources (DEDJTR)). Outputs from this process were used to produce cross sections to illustrate the relationships between the geological units. The location of the cross sections is shown in **Figure 5**. South to North and West to East Cross sections are shown in **Figures 8 and 9** respectively.

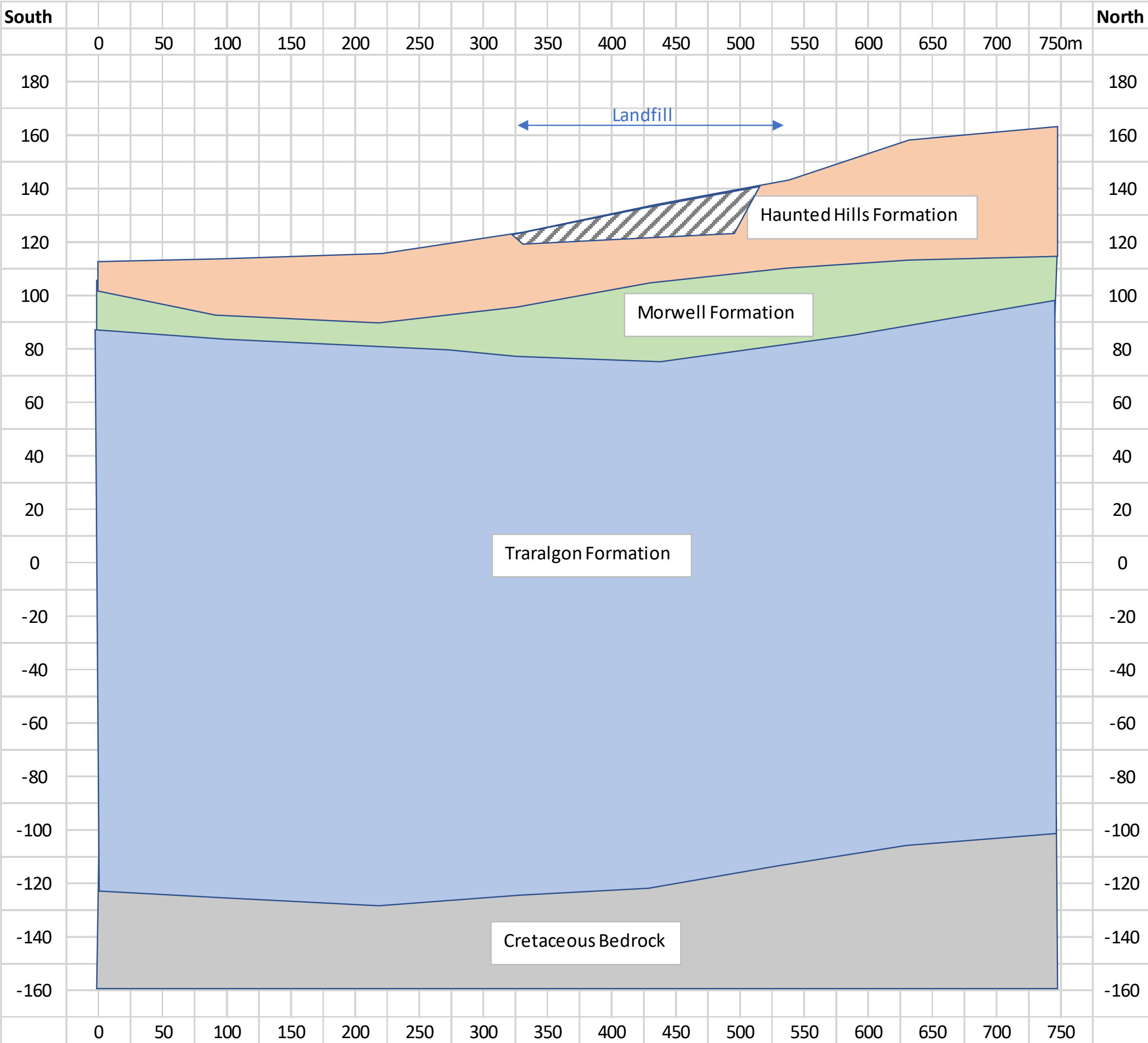


Figure 8 South to North Cross section

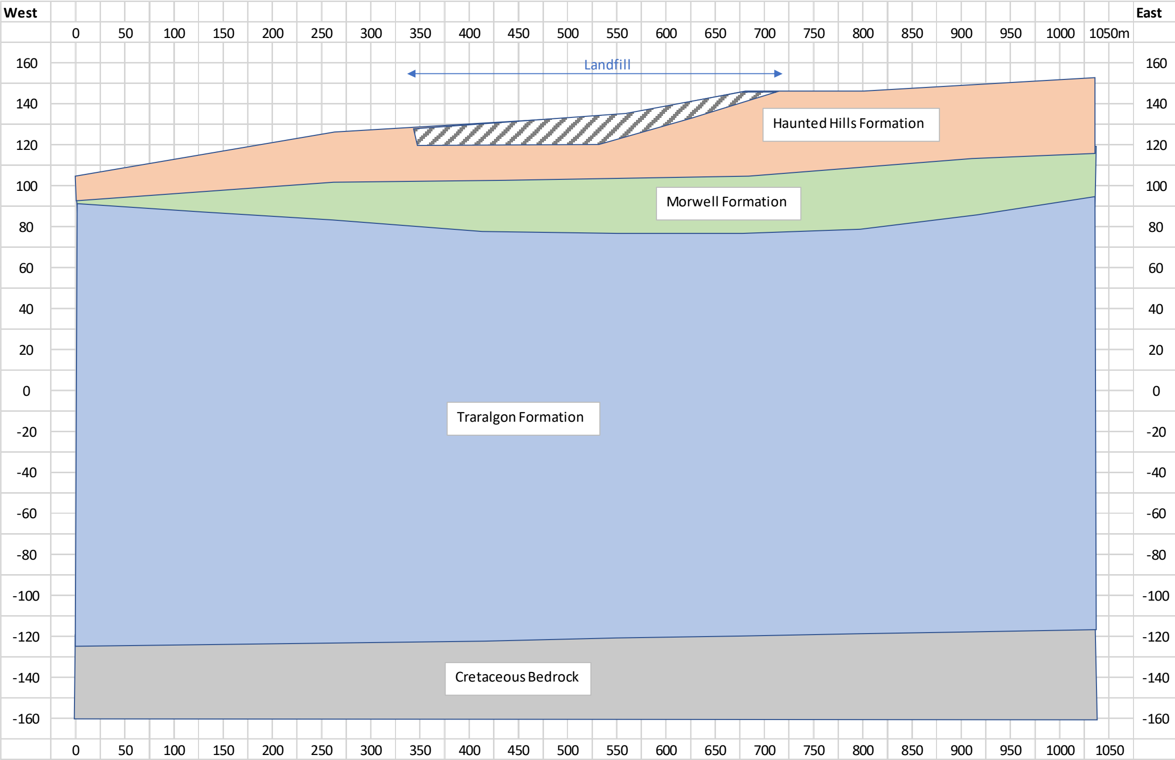


Figure 9 West to East Cross section

2.5 Hydrogeology

The site is close to a major open cut mine (Loy Yang). Dewatering to extract the coal has significantly altered the hydrogeological regime at this site. The Hydrogeological Assessment prepared by GHD (2007) presented a map of potentiometric levels in the T1 and T2 aquifers in 1960 prior to major mining activity in the area. The historic levels in the vicinity of the site are estimated to have been approximately 50mAHD. The base of the landfill at its lowest point is about 119 mAHD, well above the undisturbed groundwater level.

There are five groundwater monitoring bores at the site. Current groundwater levels at the site are now between 55 and 45 mAHD with groundwater flow towards the mine. The presence of perched groundwater in the upper formations was observed in the north-west corner of the Cell 3B northern batter during construction (Nolan 2015: section 3.5). A groundwater interception system was subsequently installed.

2.6 LFG Monitoring Data

2.6.1 Monitoring network

Twelve LFG monitoring bores, LYLFG001 to LYLFG012, were installed between 13th and 15th October 2014. The drilling and bore installation was supervised by Run Energy.

The spacing of bores exceeds the recommended spacing in the BPEM. This is justified by the following considerations:

- The strata above the watertable is generally low permeability (silty sand, sandstone, sandy clay and clayey sand). There are however some thin sandy zones; and
- There is no development within 250 m.

The logs of the bores have not been provided but Nolan (2016) reports that the bores are 50mm diameter casing perforated from 1.5m to total depth, with bentonite seal at least 1m from the ground surface and that each is fitted with a top and end cap. Run Energy have advised the bores are all fitted with a tri-cap which provides a seal.

Nolan (2016) reports that the depth of the bores generally reflects the depth to the base of the waste and the depth to the floor of the leachate ponds. The monitoring bore network is summarised in **Table 2** with the bore locations shown on **Figure 8**.

Table 2 Location of LFG monitoring bores

Bore ID	Location (on-site or off-site)	Status
LYLFG001	NW of Cell 2	Active
LYLFG002	North of Cell 2	Active
LYLFG003	North of Cell 3	Active
LYLFG004	North of Cell 4	Active
LYLFG005	NE of the future cells	Active
LYLFG006	SE of future cells	Active
LYLFG007	South of Leachate Pond No. 2	Active
LYLFG008	South of Cell 3 & Leachate Ponds	Active
LYLFG009	SW of Cell 1/2	Active
LYLFG010	West of Cell 1/2	Active
LYLFG011	West of Cell 1/2	Active
LYLFG012	Background, west of site	Active

The locations of the LFG monitoring bores LYLFG001 to LYLFG012 are presented in **Figure 8**. The background monitoring bore LYLFG012 is within the road reserve on Traralgon Creek Road, approximately 900 m west of Cell 1/2.

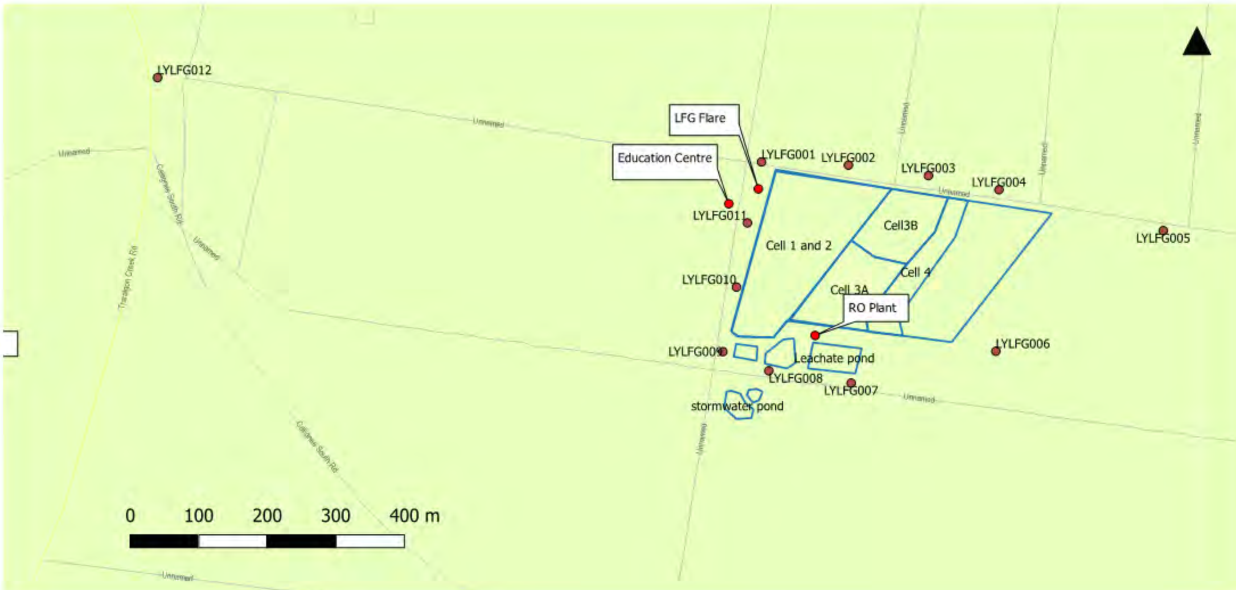


Figure 10 LFG Monitoring bore locations

Collated monitoring data is presented in **Appendix B**.

2.6.2 Subsurface Geology

LFG bore monitoring data is tabulated in **Appendix B**. EPA Action Levels for subsurface geology at the site boundary are 1%v/vCH_4 or 1.5% v/v CO_2 above background. Key points from this dataset include:

- Methane was detected in four monitoring bores (LYLFG001 LYLFG002, LYLFG008 and LYLFG011) but all were below the EPA Action Levels except LYLFG007;
- Methane concentrations up to 8.8 %v/vCH_4 have been reported in LYLFG007 (4/5 exceeded 1%v/v CH_4);
- Carbon Dioxide concentrations:
  - All readings bar 1 exceeded 0%v/vCO_2;
  - CO_2 concentrations were up to 11.3%v/vCO_2 in the background bore LYLFG012;
- Oxygen concentrations were correspondingly depleted

These concentrations for methane and carbon dioxide are plotted in **Figures 11 and 12** respectively.

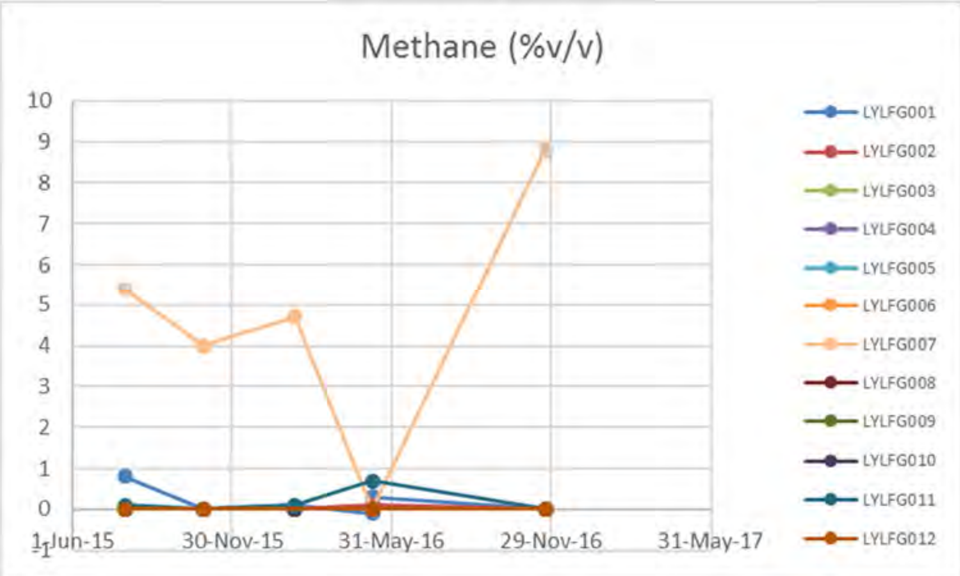


Figure 11 Methane concentrations in perimeter bores.

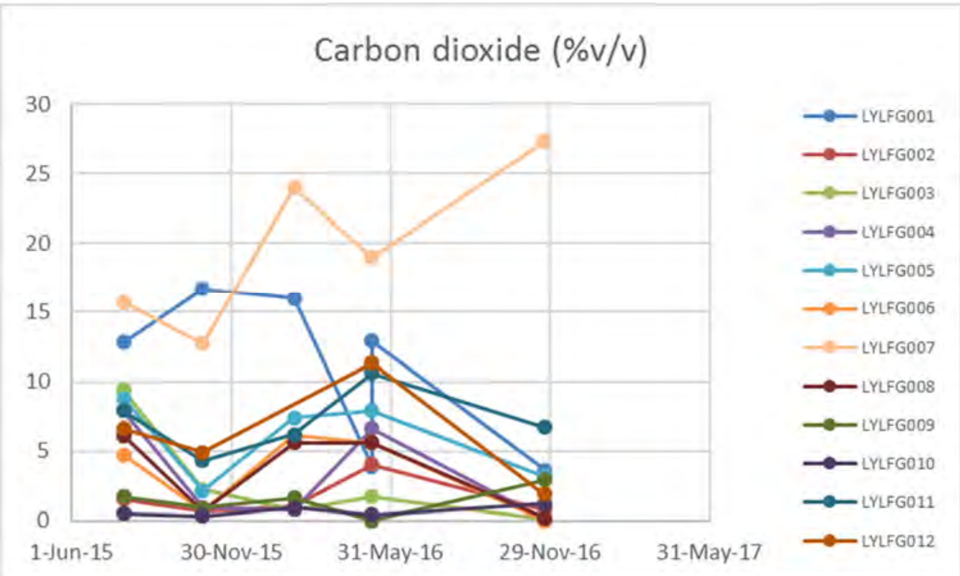


Figure 12 Carbon dioxide concentrations in perimeter bores

Bore LYLFG012 is considered to be the background bore. The bore has been monitored on four occasions to November 2016 and reported concentrations of CO_2 varied between 1.9 % v/v CO_2 and 11.3 % v/v CO_2.. These readings are comparable to concentrations reported in other LFG monitoring bores around the site. Bore LYLFG012 is considered to be sufficiently distant from the landfill to be impacted by LFG from the landfill (particularly considering the local geology is predominantly sandy). The source of CO_2 is therefore unrelated to the landfill. Given that the readings from LYLFG012 are generally similar to those at other monitoring locations it is considered that these are also from a non-landfill source.

2.6.3 Landfill Surface

The following monitoring information was provided by Council:

- November 2014 - Spreadsheet of results[1] (results >10ppm presented):
  - 31 readings exceeded EPA final cap criterion out of 2,922 readings.
- July 2015 – memorandum from Run Energy presenting report on surface emissions survey:
  - Survey undertaken over final cap areas only;
  - 32 readings exceeded EPA final cap criterion out of 2,922 readings.
- December 2016 - Survey map prepared by Monarc:
  - Number of locations: 124;
  - No readings exceeded the EPA criterion for final caps of 100ppm; and
  - 5 readings exceeded 100 ppm in the intermediate capped area but were within the EPA intermediate cap criterion.

Note 1: The bore coordinates appear to relate to a site datum so the location of the exceedances cannot be determined precisely.

2.6.4 Buildings and Structures

Buildings and structures have been monitored on 4 occasions during 2016. Methane concentrations exceeding the limit of reporting were recorded in 3 of the 4 monitoring events. The maximum concentration was 7ppm reported at location LYLS011 (actual location not documented).

2.6.5 Service pits

Pits and services have been monitored on 4 occasions during 2016. Methane concentrations exceeding the limit of reporting were recorded on one occasion (9/5/2016). The maximum concentration was 7ppm reported at location LYLSP007 which is the stormwater pipe on slab at front of building).

2.6.6 Discussion

The landfill and surrounding area overlies a major coal seam. Methane, Carbon dioxide and carbon monoxide are also present within coal measure strata (BSI 2015)

It is a well known fact that coal, particularly if it has been dewatered, will offgas methane. This fact underpins the coal-seam gas industry. Methane, in the presence of oxygen will be broken down to carbon dioxide by soil microbes. It is therefore not surprising that the background geology at the site contains elevated carbon dioxide and smaller amounts of methane.

The background bore LYLFG012 is located approximately half a kilometre from the site. The origin of the carbon dioxide in this bore is highly unlikely to originate from the landfill and therefore reflects background conditions.

Therefore it cannot be concluded that presence of methane or carbon dioxide in the monitoring bores indicates a landfill source. Rather their presence is more likely to be from the underlying coal.

3 Conceptual Model

3.1 Nature of the waste and source of landfill gas

The following landfill gas sources of potential impacts have been identified:

- Waste in the landfill area; and
- Leachate in the leachate pond.

The site is licensed to accept:

- Asbestos waste of domestic origin;
- Putrescible waste;
- Solid Inert Waste;
- Tyres shredded into pieces < 250 mm.

Landfill gas is generated from the degradation of organic materials in the waste. The major constituents are methane (CH_4 and CO_2) which in fresh landfill gas are present at concentrations between 40% and 60% by volume (v/v).

Another source of the major constituents of landfill gas is also relevant to this study. The coal in the natural geological formations produce CH_4 and CO_2 (and other minor trace gases). Absence of a continuous natural barrier such as a clay horizon means there is nothing to prevent upwards migration of methane from the coal units. This is therefore another source of typical landfill gas constituents. The monitoring equipment that is currently being used is not able to differentiate between CH_4 and CO_2 from the coal and that from the landfill (or other landfill related sources).

3.2 Environmental Setting and Receptors

The environmental setting is described in **Section 2**. The sensitive receptors for landfill gas for the Hyland Highway Landfill are shown in **Figure 13**.

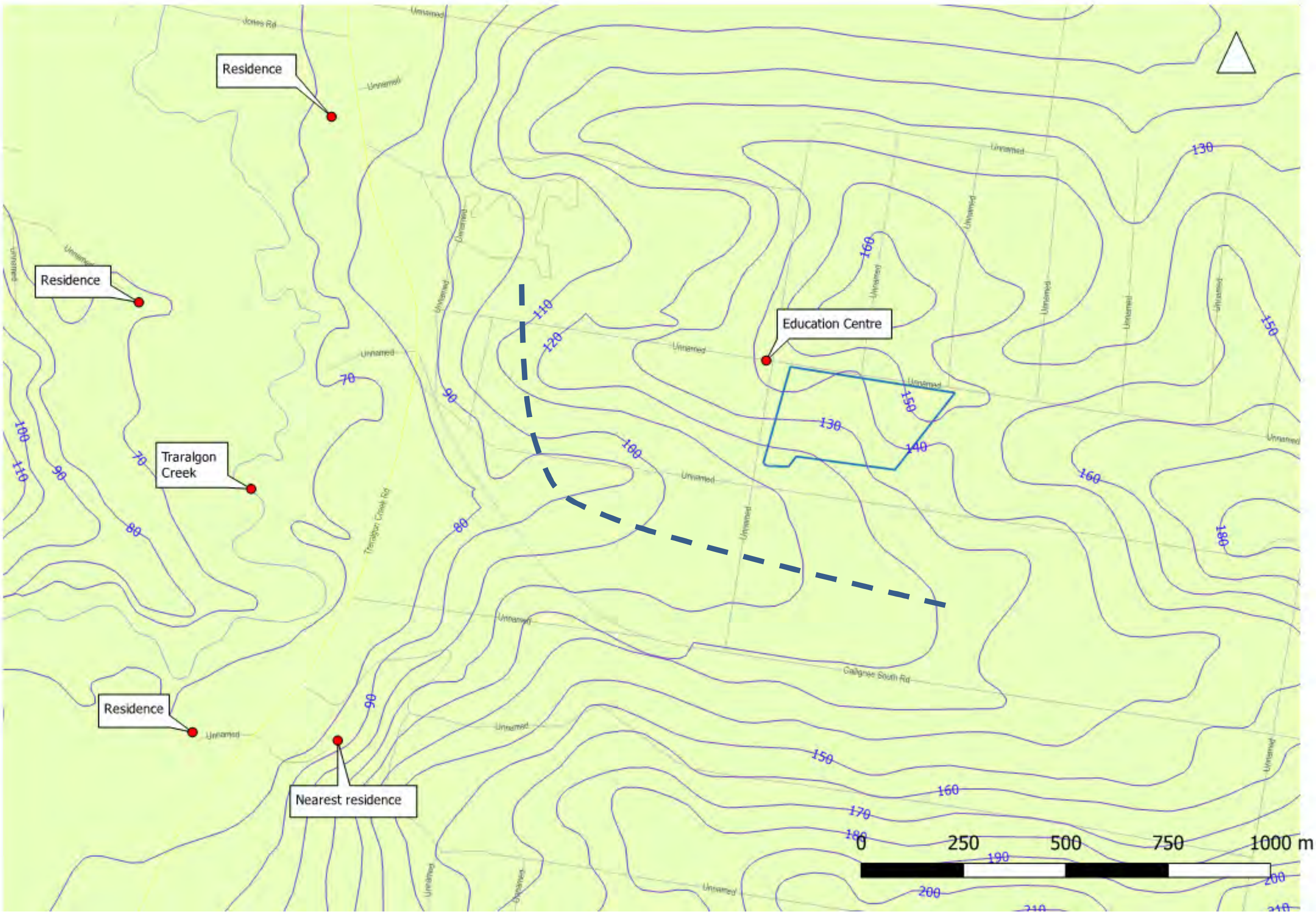


Figure 13 Sensitive Receptors

3.3 Environmental Benchmarks

The Environmental Benchmarks for the air environment as specified in Table 6.4 of the Landfill BPEM (EPA Publication 788.3) are:

Table 3 Environmental Benchmarks

Location	Parameter	Action Level and unit
Landfill surface final cap	Methane concentration in air*	100 ppm
Within 50mm of penetrations through the final cap	Methane concentration in air**	200 ppm
Landfill surface intermediate cover areas* **	Methane concentration in air*	200 ppm
Within 50mm of penetrations through the intermediate cover	Methane concentration in air**	1000ppm
Biofilters	Methane flux	1.0g/m^2/hr
Subsurface geology at the landfill boundary	Methane and Carbon dioxide concentrations	1% v/v CH_4 or 1.5% CO_2 above background

Subsurface service on and adjacent to the landfill site	Methane concentration	10,000 ppm
Buildings/structures on and adjacent to the landfill site	Methane concentration in air	5,000 ppm
Landfill gas flares	Methane and Volatile Organic Compounds	98% Destruction efficiency

* Point of measurement is 50mm above the landfill surface

** Point of measurement is 50mm from the point of discharge

*** Intermediate cover areas are those that do not have an engineered landfill cap and are bit scheduled to receive waste during the next three months

3.4 Landfill Gas Collection and Treatment Systems

A landfill gas extraction system has been installed and is operated by Run Energy. The system consists of 14 vertical gas extraction bores connected to two manifolds constructed through the final capped areas of Cells 1 and 2. Extracted LFG is piped to an on-site flare. The extraction network is shown in **Figure 14**.

Figure 14 LFG Extraction system

3.5 Pathways

Away from the waste mass the pressure that represents the driving mechanism for LFG migration from the landfill source dissipates and migration will be limited to diffusion and flow caused by fluctuations in atmospheric pressure, water levels and oxygen consumption.

Potential transport pathways for LFG generated in the waste include:

- LFG emissions through cap;
- LFG emissions through intermediate cap;
- LFG migration in subsurface geology;

- LFG migration through services; and
- Leakage from gas extraction system.

Potential transport for CH4 and CO2 from the underlying coal include:

- LFG migration in subsurface geology; and
- LFG migration through services.

A Source-Pathway-Receptor diagram contained on **Figure 15**Error! Reference source not found. illustrates the possible pathways for landfill gas movement at the site. Blue pathways are complete for this site, and red pathways are incomplete, meaning site specific considerations dictate the potential impacts will not occur. A discussion of these is presented in **Section 4**.

A summary of the Landfill Gas Conceptual Model is presented in **Figure 16**.

Hazard Identification for Landfills - Sources, Pathways and Receptors

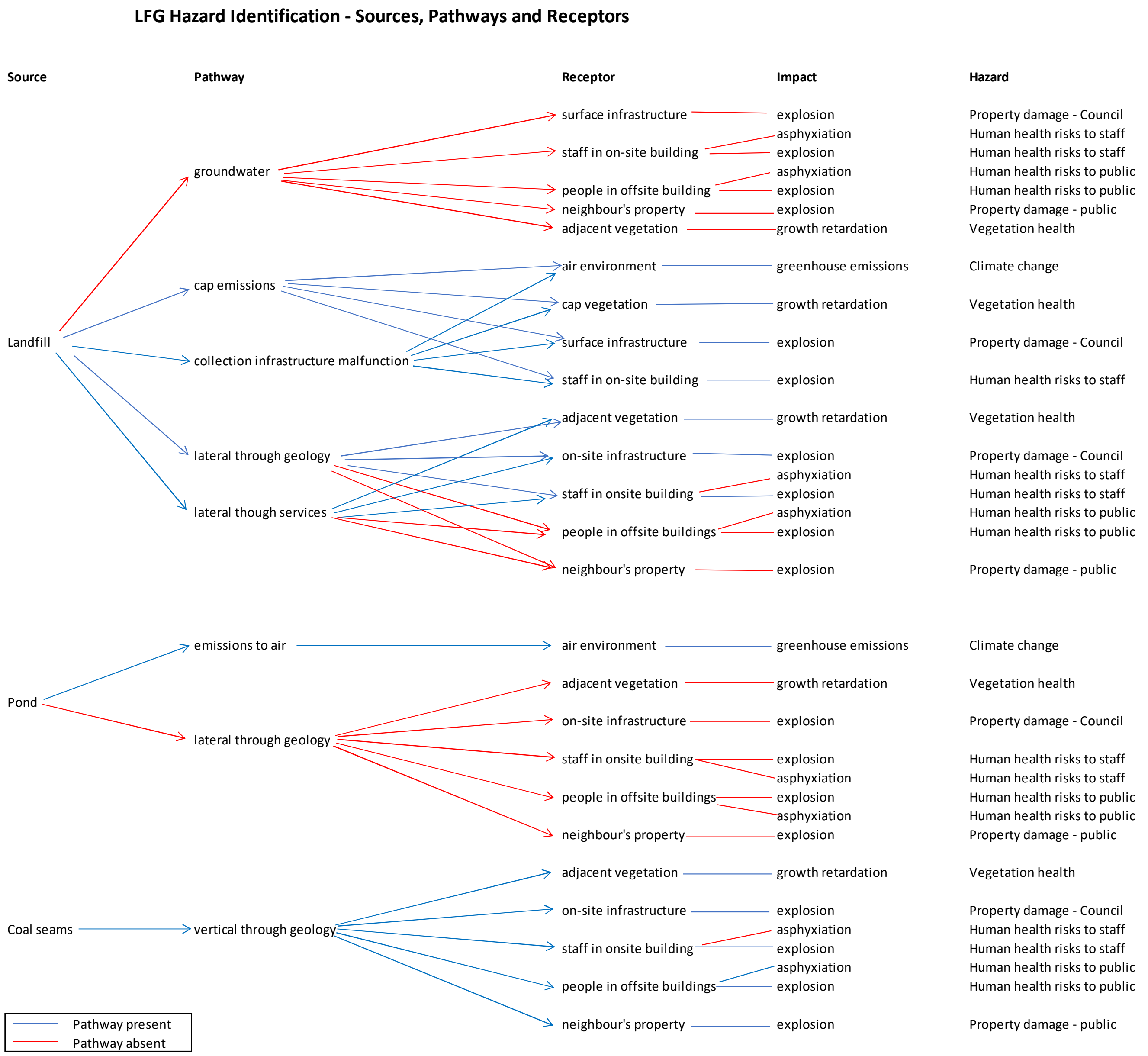
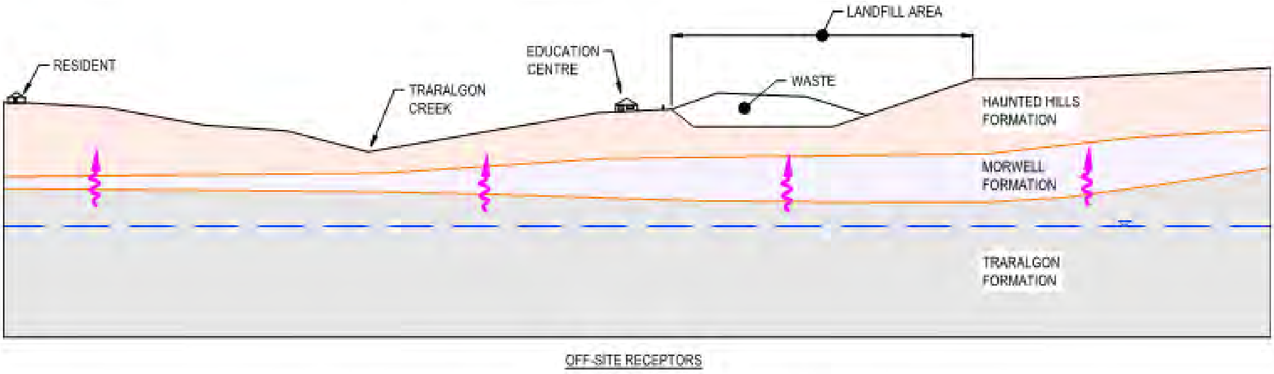


Figure 15 Source Pathway Receptor Diagram



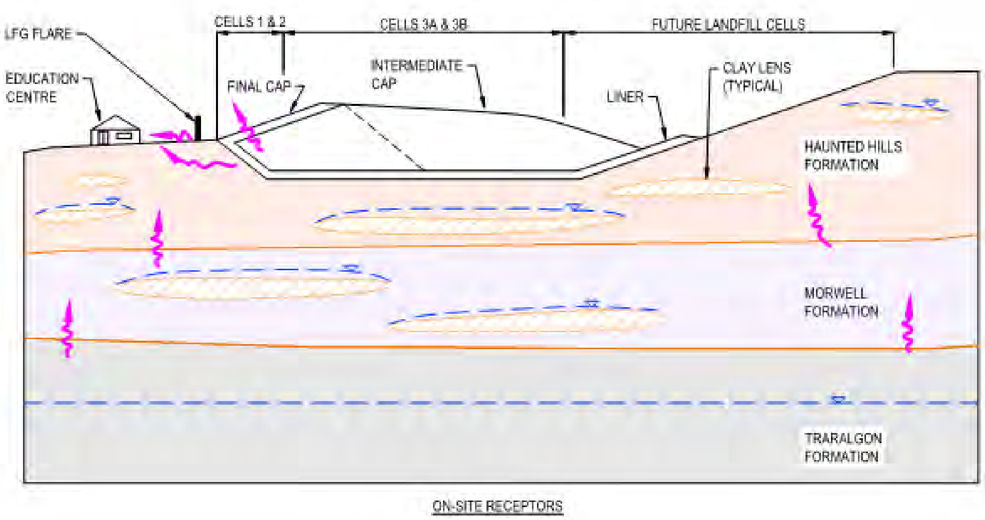


Figure 16 LFG Conceptual Model

4 Hazard Identification and Risk Screening

4.1 Source of risk

4.1.1 Waste in Landfill

Putrescible wastes and solid inert wastes both have the potential to generate landfill gas. LFG is a natural byproduct of the decomposition of organic material in anaerobic (without oxygen) conditions. LFG contains roughly 50 to 55 percent methane and 45 to 50 percent carbon dioxide, with less than 1 percent non-methane organic compounds and trace amounts of inorganic compounds.

Methane is explosive between concentrations of 5 and 15%v/v. Above 15%v/v methane is not explosive because there is insufficient oxygen present to sustain combustion, however where methane is present at concentrations above 15%v/v there are usually areas at the perimeter where methane concentrations are within the explosive range.

Carbon dioxide and methane are both asphyxiants as they preferentially displace oxygen in the air. Oxygen concentrations only need to decrease by a few % to create conditions which are potentially hazardous to human health.

Hydrogen sulphide and carbon monoxide are the trace gases which typically also create hazards. Hydrogen sulphide is toxic at very low concentrations and is particularly hazardous because after small exposure the characteristic rotten egg smell is no longer detectable to the nose. Carbon monoxide strongly binds to haemoglobin reducing the oxygen carrying capacity. Carbon monoxide is a product of combustion and is therefore used as an indicator of current or historic fires. Hydrogen sulphide and carbon monoxide are monitored at the ppm concentration range.

Fugitive Landfill Gas Migrating via Groundwater

The most recent Audit report did not find any evidence of landfill leachate presence in groundwater so all pathways from this are incomplete.

LFG emissions through cap

Cells 1 and 2 have a final cap over part of the cells. The cap covering the remainder of Cells 1 and 2 and part of Cell 3 is currently being constructed. The remainder of the filled area has intermediate cover or daily cover over the waste. Methane generated in the waste that is not collected by the extraction system rises to the surface because it is less dense than air.

The capping layers host methanotrophic bacteria that effectively convert the majority of the methane to carbon dioxide. While the same volume of carbon is released the greenhouse impact is greatly reduced since methane has 25 times greater global warming potential than carbon dioxide. Therefore while some emissions will still occur the impact of this has been minimised.

LFG Collection Infrastructure Malfunction

Gas collection infrastructure consists of a network of gas collection bores installed into the final capped portions of Cells 1 and 2.

While Run Energy undertakes regular checks on the system and makes the necessary adjustments to maximise methane extraction there is still the potential for malfunction of the extraction system. If this were to occur then methane pressures within the waste would build up driving advective flow. Given that the landfill cells are all lined then the direction of the majority of the advective flow will be laterally to intermediate and daily covered cells.

If the malfunction was in the form of a pipe leakage then there is the potential for gas to accumulate through overland flow, however given the density differences between methane and air it would be expected that the LFG would disperse rapidly.

Lateral through Geology

The Haunted Hills Formation consists of a succession of cross-bedded and lenticular gravels, sands and clays deposited in a fluviatile environment. The more permeable units provide pathways for migration of gas in the subsurface. This is usually driven by a pressure gradient within the waste which gradually dissipates with distance from the source. Other drivers such as diffusion are minor in comparison to pressure drivers.

All landfill cells are lined at Hyland Highway, and those with a final cap have a LFG extraction system and consequently the pressure gradient that would drive advective flow is likely to be minimal.

Lateral through Services

Subsurface services are usually installed by constructing a trench, placing the service within this then backfilling the trench. Typically the trench backfill has a greater permeability than the surrounding geology and therefore acts as a preferential pathway for gas migration. In the case of the Haunted Hills Formation the permeabilities are likely to be similar and therefore flow will dissipate into the surrounding geology, minimising the distance the gas will travel.

4.1.2 Leachate Pond

Emissions to air

Dissolved methane in leachate can volatilise when the leachate is discharged to the leachate pond. This discharge is released to the atmosphere. Volumes released by this method are small and are not able to be monitored. It is included for completeness but is not considered to pose a major risk.

Lateral through geology

Methane can also volatilise from a leachate plume from a leaking pond which would then have similar pathways to subsurface geology described above. There is no evidence of leakage from the pond and so it is considered the pond liner is intact and therefore these pathways are incomplete.

4.1.3 Natural Geology

Vertically through geology

The coal-rich Morwell and Traralgon Formations underlie the landfill and the surrounding area. Coal formations release CH_4 which can be oxidised to CO_2. The driver for migration is not advective flow so movement is driven by diffusion and other natural drivers such as barometric pumping. The lower flow rates increase the likelihood microbial action will be able to manage the CH_4, however the byproduct of their activity (the CO_2) will remain.

4.2 Receptors

4.3 Environmental Receptors

Air environment

The major constituents of landfill gas are greenhouse gases which are generally considered responsible for inducing climate change. Methane is particularly potent being 25 times more damaging than the carbon dioxide baseline. The air environment includes soil gas and above ground areas.

The air environment can be impacted from

- LFG cap emissions

- Volatilisation of methane from pond

Cap vegetation

The final cap is newly established and is currently sparsely vegetated. LFG can retard plant growth, or even kill plants. The cap vegetation can potentially be impacted by cap emissions.

Adjacent vegetation

Similarly vegetation near the site can be impacted by:

- Lateral migration through the geology; and/or
- Vertical migration from the coal seams

4.4 Onsite Receptors

Surface Infrastructure

Surface infrastructure at the site consists of:

- LFG extraction system and flare;
- RO plant;
- Tanks; and
- Education Centre

The nature of the hazard posed to surface infrastructure is explosion. For an explosion to occur methane needs to accumulate to explosive concentrations and there needs to be an ignition source.

On-site infrastructure can be impacted by LFG emissions from:

- Cap emissions;
- Collection infrastructure malfunction;
- Lateral migration through the geology;
- Lateral migration along services; and
- Vertical migration from the coal seams.

On-site staff and visitors

On-site staff can potentially be exposed to two hazards, explosion and asphyxiation. Whilst explosion sounds like a major risk in reality there are rarely areas where gas can accumulate sufficient volumes that would cause an explosion big enough to injure people. The areas where gas tends to accumulate in buildings are in small confined areas like cupboards under sinks. The explosion from a volume of methane in such an area would be unlikely to damage the building, although it could be expected to give someone a fright.

Asphyxiation hazards occur in poorly ventilated areas below ground level such as cellars. As there are no cellars or basements there are no asphyxiation hazards on-site.

Hazards to on-site staff and visitors could potentially arise from:

- Cap emissions;
- Collection infrastructure malfunction;
- Lateral migration through the geology;
- Lateral migration along services; and
- Vertical migration from the coal seams.

4.5 Offsite Receptors

Neighbouring property

The nearest houses are located over a kilometre from the site along the Traralgon Creek Valley. They are all lower in the landscape than the landfill, and since methane rises (in the absence of strong advective flow) it is considered that the methane pathway from the landfill to these houses is incomplete. There is also a valley between the receptors and the landfill which would preclude lateral CO_2 migration. Therefore the only potential source of CH_4 and CO_2 at these locations is the underlying coal seams.

Off-site human receptors

People within adjacent residences are not considered to be at risk from LFG the landfill for the reasons discussed above. There is potential for people to be impacted if working within excavations or service pits adjacent to the site. It is understood there are no offsite service pits, so there is no pathway.

5 Basic Quantitative Risk Assessment

5.1 Expected volumes and duration of LFG generation

There have been a number of estimates of the volume of LFG that the site will produce. These were described by Nolan (2014) and are summarised below.

GHD (2007) used the Australian Greenhouse Office (AGO) workbook to estimate gas generation based on 43,000 tonnes of waste being deposited. GHD concluded the landfill is likely to generate about 2,494 tonne/yr CH_4 and about 52,391 tonne/yr of CO_2 equivalent (CO_2-e).

GHD (2007) also used the US EPAs landfill gas model to estimate methane emissions. The model predicted an emission rate of 21 m^3/hr in the first year and 60 m^3/hr after three years of operation. Over a 200 year emission period it was estimate the maximum CH_4 production rate would be 250 m^3/hr in the 18^{th} year.

Nolan (2015) reported that as at 30 June 2015 Council estimated the remaining landfill life to be 8.3 years.

5.2 Risk Assessment

The framework for undertaking the risk assessment is presented in **Figures 3 and 4**. The risk matrix contained in **Appendix C** presents a summary of the relevant considerations for each pathway and evaluates the relative magnitude of the risk. Additional control measures which reduce the risk are also presented together with a further assessment of residual risk for relevant hazards. Control measures include:

- Cell liners;
- LFG Extraction system;
- Monitoring and maintenance inspections;
- Enhancement of cap vegetation to increase methane oxidation; and
- Progressive capping.

All pathways contained in the Source-Pathway-Receptor diagram are presented in the Risk Matrix. For completeness pathways associated with emissions from the coal seam have been included. These are in no way related to landfill operations but because they are a significant contributor of chemicals which are normally considered to constitute LFG these have also been included.

The assessment shows:

- Of the 99 potential pathways from landfill operations identified only 15 are complete pathways;
- No risks were assessed as being Unacceptable (Risk score 15 or greater); and
- The highest risk (Risk score of 9) was assessed for the following risks:
  - Fugitive Landfill gas migrating vertically through cap exploding and destroying surface infrastructure
  - Fugitive Landfill gas migrating vertically through cap, accumulating in onsite buildings exploding and causing harm to people
  - Leaking LFG collection infrastructure causing explosion damaging surface infrastructure
  - Leaking LFG collection infrastructure causing explosion causing harm to people
  - Fugitive Landfill gas migrating laterally through geology, accumulating in onsite buildings, exploding causing property damage
  - Fugitive Landfill gas migrating laterally through geology, accumulating in onsite buildings, exploding injuring staff

- The level of risk for each of these was assessed as being ‘Acceptable’, and with the control measures proposed the level of risk for most reduced to ‘Insignificant’
- Those risks related to the gas extraction infrastructure are under the control of the contractor. Council needs to ensure the contractor continues to undertake regular monitoring of the equipment to ensure the risks remain ‘Acceptable’.

6 Conclusions and Recommendations

This LFGRA has been undertaken in accordance with Appendix 2 of EPA Publication 1323.3 which identifies EPA's preferred method of undertaking LFGRA's. The UK risk assessment matrix is EPA's preferred framework for the qualitative assessments.

The Hyland Highway Landfill is unusual from most other operating landfills in that it overlies a major coal seam. The major constituents of LFG are methane and carbon dioxide. Naturally occurring methane is also produced from coal, particularly when it has been dewatered.

Methane being lighter than air will tend to rise through permeable soil horizons where bacteria in the soil break this down to carbon dioxide.

It is considered that the methane and carbon dioxide concentrations reported in the monitoring data are more likely to be derived from the underlying coal than from landfill operations.

The LFGRA assessment shows:

- Of the 99 potential pathways from landfill operations identified only 15 are complete pathways;
- No risks were assessed as being Unacceptable (Risk score 15 or greater); and
- The highest risk (Risk score of 9) was assessed for the following risks:
  - Fugitive Landfill gas migrating vertically through cap exploding and destroying surface infrastructure
  - Fugitive Landfill gas migrating vertically through cap, accumulating in onsite buildings exploding and causing harm to people
  - Leaking LFG collection infrastructure causing explosion damaging surface infrastructure
  - Leaking LFG collection infrastructure causing explosion causing harm to people
  - Fugitive Landfill gas migrating laterally through geology, accumulating in onsite buildings, exploding causing property damage
  - Fugitive Landfill gas migrating laterally through geology, accumulating in onsite buildings, exploding injuring staff
- The level of risk for each of these was assessed as being 'Acceptable', and with the control measures proposed the level of risk for most reduced to 'Insignificant'
- Those risks related to the gas extraction infrastructure are under the control of the contractor. Council needs to ensure the contractor continues to undertake regular monitoring of the equipment to ensure the risks remain 'Acceptable'.

The highest risks ranked higher mainly because of the seriousness of the consequence. While the magnitude of any explosions is unlikely to be small - the ramifications are more likely to be political than physical – the occurrence cannot be considered to have a consequence level below 'Significant'. The level of all risks was assessed as being either 'Acceptable' or 'Insignificant".

LFG concentrations are very dependent on the prevailing meteorological conditions and results need to be interpreted within this context. Monitoring is required to be undertaken in accordance with EPA Publication 1416 *Draft Landfill Gas Fugitive Emissions Monitoring Guidelines* which lists the following meteorological and environmental conditions be recorded:

- Vegetation;
- Atmospheric pressure;
- Rainfall;
- Frost and snow; and
- Wind.

It is recommended that barometric pressure data (hourly readings) be downloaded from the Bureau of Meteorology website for the nearest weather station for the three days before and during monitoring. Monitoring should be undertaken during periods of falling or stable atmospheric pressure.

The following recommendations are made regarding LFG at the Hyland Highway Landfill:

- The site plan and locations of key features such as monitoring bores be converted to a publicly recognised datum (not an SEC site grid);
- Monitoring datasets include more comprehensive environmental and meteorological data;
- Peak and stabilised readings for LFG monitoring bores be recorded;
- Purge times for bore sampling be recorded; and
- Details of monitoring equipment and equipment calibration be recorded.

7 References

BSI 2015. *Code of Practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings*. BS 8485:2015.

EPA Victoria 2016. *Landfill Licensing*. EPA Publication 1323.3.

EPA Victoria 2011. *Draft Landfill Gas Fugitive Emissions Monitoring Guidelines*. EPA Publication 1416.

EPA Victoria 2015. *Best Practice Environmental Management Siting, Design, Operation and Rehabilitation of Landfills*. EPA Publication 788.3, August 2015.

GHD 2007. *Proposed Landfill Site Callignee Hydrogeological Assessment*. JN31/19890/06/7916.

GHD 2007. *Report for Proposed Callignee South Road Landfill, Documentation Supporting Works Approval Application* (January 2007) Cited by Nolan 2014.

Hyder 2011. *Risk Assessment and Environmental Monitoring Program 2011*, Hyland Highway Landfill. Rep No AA003889-05A.

Nolan Consulting Pty Ltd 2015. *Section 53V Audit of Landfill Operation Highland Highway, Loy Yang*. Service Order Reference No 8004739. Audit no 69028-8.

Nolan Consulting Pty Ltd 2014. *Section 53V Audit of Landfill Operation Highland Highway, Loy Yang*. Service Order Reference No 8004188. Audit no 69028-5.

8 Limitations

This report was prepared for the sole use of the Latrobe City Council and should not be relied upon by any other person. None of PLC Consulting Pty Ltd or any of its related entities, employees or directors (each a **PLC Person**) owes a duty of care (whether in contract, tort, statute or otherwise) to any third party with respect to or in connection with this report and no PLC Person accepts any liability for any loss or damage suffered or costs incurred arising out of or in connection with the use this report by any third party.

The report has been prepared with the objectives and scope of work outlined in the proposal. The work was carried out in accordance with the terms and conditions of Latrobe City Council's purchase order.

The conclusions and recommendations provided in this report are based on available information and it is possible that different conclusions and recommendations could be made should new information become available, or with changing site conditions over time.

The report will not be updated if anything occurs after the date of this report and PLC Consulting Pty Ltd will not be obliged to inform any person of any matter arising or coming to its attention after that date.

APPENDIX A – EPA Licence

ENVIRONMENT PROTECTION ACT 1970
SECTION 20

LICENCE

LATROBE CITY COUNCIL

Holder of

Licence:	**25565**
Issued:	04/06/2009
Last Amended:	22/03/2016
ABN:	92 472 314 133
Registered Address:	141 COMMERCIAL RD MORWELL VIC 3840
Premises Address:	64 HYLAND HIGHWAY LOY YANG VIC 3844
Scheduled Categories:	A05 Landfills
Description:	The licence holder operates a landfill. This licence allows for putrescible waste, solid inert waste, asbestos of domestic origin, and shredded tyres to be deposited to land and for asbestos of a domestic origin to be stored temporarily on site.

Heather Hawkins

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HEATHER HAWKINS
Team Leader
Development Assessments
Delegate of the Environment Protection Authority

Issued under the *Environment Protection Act 1970*, Section 20

PREAMBLE

Licences

Who we are: The Environment Protection Authority ("EPA") is an independent statutory authority established under the *Environment Protection Act 1970* ("the Act"). Our purpose is to protect and improve our environment by preventing harm to the environment and human health.

Why we issue licences: EPA is responsible for preventing or controlling pollution (including noise) and improving the quality of the environment. This responsibility includes regulating activities that may present a danger to the environment. One of the tools available to EPA is the licensing of certain scheduled premises that may present a risk to the environment.

Section 20 of the Act requires the occupier of a "scheduled premises" to obtain an EPA licence to discharge, handle, treat or dispose of waste to the environment. These premises are defined in the *Environment Protection (Scheduled Premises and Exemptions) Regulations 2007* ("the Regulations").

When we issue licences: EPA will issue a licence when satisfied that an applicant has put in place measures to protect the environment. Licences allow activities to occur and set performance outcomes based on a site's environmental risk. EPA can amend, suspend or revoke a licence in response to changes in standards, site activities or licence holder performance. Licence holders must submit an annual performance statement and pay an annual fee to EPA. All licences and performance statements are publicly available.

Licence information and obligations

For the purposes of this licence "You" means the licence holder identified on the first page of this licence at the "premises" identified on the first page and represented in Schedule 1.

If you object to any of the licence conditions, you may have the decision reviewed by applying in writing to the Registrar, Planning and Environment Division, Victorian Civil and Administrative Tribunal ("VCAT"), 7th Floor, 55 King Street, Melbourne within 21 days of the date of issue. An application fee may be applicable when lodging an appeal with VCAT. Contact VCAT on (03) 9628 9777 for further details on fees associated with an appeal. A copy of the appeal should also be forwarded to the Manager, Development Assessments Unit, Environment Protection Authority, GPO Box 4395, Melbourne, 3001, within 7 days of lodgement of the appeal.

Interested (third) parties may also appeal against the licence within 21 days of the date of issue. The Tribunal will notify you if such appeals are received. If an appeal is lodged, this licence will not come into effect.

Compliance: You must comply at all times with the Act and all policies and regulations administered by EPA. Strict penalties apply for non-compliance with any part of your licence or making a false claim on your annual performance statement.

Licence structure

Structure: Your licence has multiple parts:

- Environmental performance conditions - setting out the performance outcomes you must meet;
- Schedule 1A - locality plan of your premises;
- Schedule 1B - plan of premises (provided by you).

Some types of licences also contain Schedule 1C - final landfill contour plans and/or Schedule 2 - tables specifying wastes that may be accepted at the premises and the associated treatment applied to them.

CONDITIONS

General Conditions

LI_G1	Waste from the premises must not be discharged to the environment except in accordance with this licence.
LI_G2	You must immediately notify EPA of non-compliance with any condition of this licence.
LI_G3	By 30 September each year you must submit an annual performance statement to EPA for the previous financial year in accordance with the Annual Performance Statement Guidelines (EPA Publication 1320).
LI_G4	Documents and monitoring records used for preparation of the annual performance statement must be retained at the premises for seven years from the date of each statement.
LI_G6	You must maintain a financial assurance calculated in accordance with the EPA method.
LI_G7	In accordance with the method and frequency specified in section 50SB of the Act you must (a) calculate the amount of landfill levy payable, (b) prepare a landfill levy statement and (c) submit to EPA both the statement and fee payable.

Amenity Conditions

LI_A1	Offensive odours must not be discharged beyond the boundaries of the premises.
LI_A2	Unacceptable noise (including vibration) must not be emitted beyond the boundaries of the premises.
LI_A4	Nuisance airborne particles must not be discharged beyond the boundaries of the premises.

Waste Acceptance Conditions

LI_WA1	Only wastes listed in Schedule 2 may be accepted at the premises.
LI_WA1.5	You must not accept any waste for storage pending any licenced operation except asbestos waste of domestic origin stored in a single 12m3 sized consolidation bin at the site marked, ‘Hyland Highway Landfill Part B (Site of Asbestos Bin)’ in Schedule 1B, and managed according to the following: (A) At all times storage does not exceed a single consolidation bin with a locked lid or locked behind doors or gates with access only allowed to those appropriately trained in asbestos management; (B) all packages placed in the consolidation bin are appropriately packaged in accordance with the requirements of EPA publication No: IWRG611.1 “Asbestos transport and disposal”; (C) the consolidation bin is lined with plastic in accordance with requirements of EPA publication No:IWRG611.1 “Asbestos transport and disposal”; (D) The waste stored within the consolidation bin must be disposed of as soon as reasonably practicable and, no longer than 3 months from when the first package was placed in the bin; (E) The tabulated quantity and date of asbestos waste received at the consolidation site and the tabulated quantity and date of asbestos waste collected from the consolidation site for final disposal at a licenced facility must be kept for a period of at least 2 years; (F) transport and disposal of the waste from the consolidation site must be in accordance with regulations; EPA Industrial Waste Resource Guidelines, 2009; EPA Publication IWRG611.1 "Asbestos transport and disposal”; and all applicable EPA publications (as amended from time to time); (G) EPA must be notified immediately of any incident or spill of wastes and; (H) Spill Management Plan (“SMP”) for transportation of the waste to and from the consolidation site and a SMP for the consolidation site to avoid and safely manage spills must be developed.

LI_WA2 Wastes accepted at the premises may only be treated or disposed of in accordance with Schedule 2.

Waste Management Conditions

LI_WM3 You must ensure that litter is not deposited beyond the boundaries of the premises.

Landfill Conditions

LI_L1	You must implement a monitoring program, verified by an environmental auditor appointed pursuant to the Act, which enables both you and EPA to determine compliance with this licence.
LI_L2	You must engage an environmental auditor appointed pursuant to the Act to conduct the environmental audits at the frequency specified in the verified monitoring program.
LI_L3	By the end of each day's operations waste must be covered with a layer of soil at least 0.30 metres thick or using another method of cover approved by EPA.
LI_L4	Waters contaminated by leachate must not be discharged beyond the boundaries of the premises.
LI_L4.1	You must extract leachate from cells listed in Schedule 2 such that the depth of leachate above the lowest point of the drainage layer does not exceed 300 millimetres.
LI_L5	You must prevent emissions of landfill gas from exceeding the investigation levels specified in Best Practice Environmental Management, Siting, Design, Operation and Rehabilitation of Landfills (EPA Publication 788).
LI_L6	You must progressively rehabilitate landfill cells in accordance with Best Practice Environmental Management, Siting, Design, Operation and Rehabilitation of Landfills (EPA Publication 788).
LI_L7	You must not start constructing a new cell without written EPA approval.
LI_L8.1	You must ensure that an independent annual survey, including contour plans with at least 1 metre intervals, is conducted in June each year and provided to EPA with the annual performance statement for each landfill cell to determine the volume of air space consumed
LI_L9.1	You must manage each landfill cell so that its final contour prior to settlement is not higher at any point than the pre-settlement contour plan shown in Schedule 1.

Air Conditions

Licence does not have any discharge to air conditions.

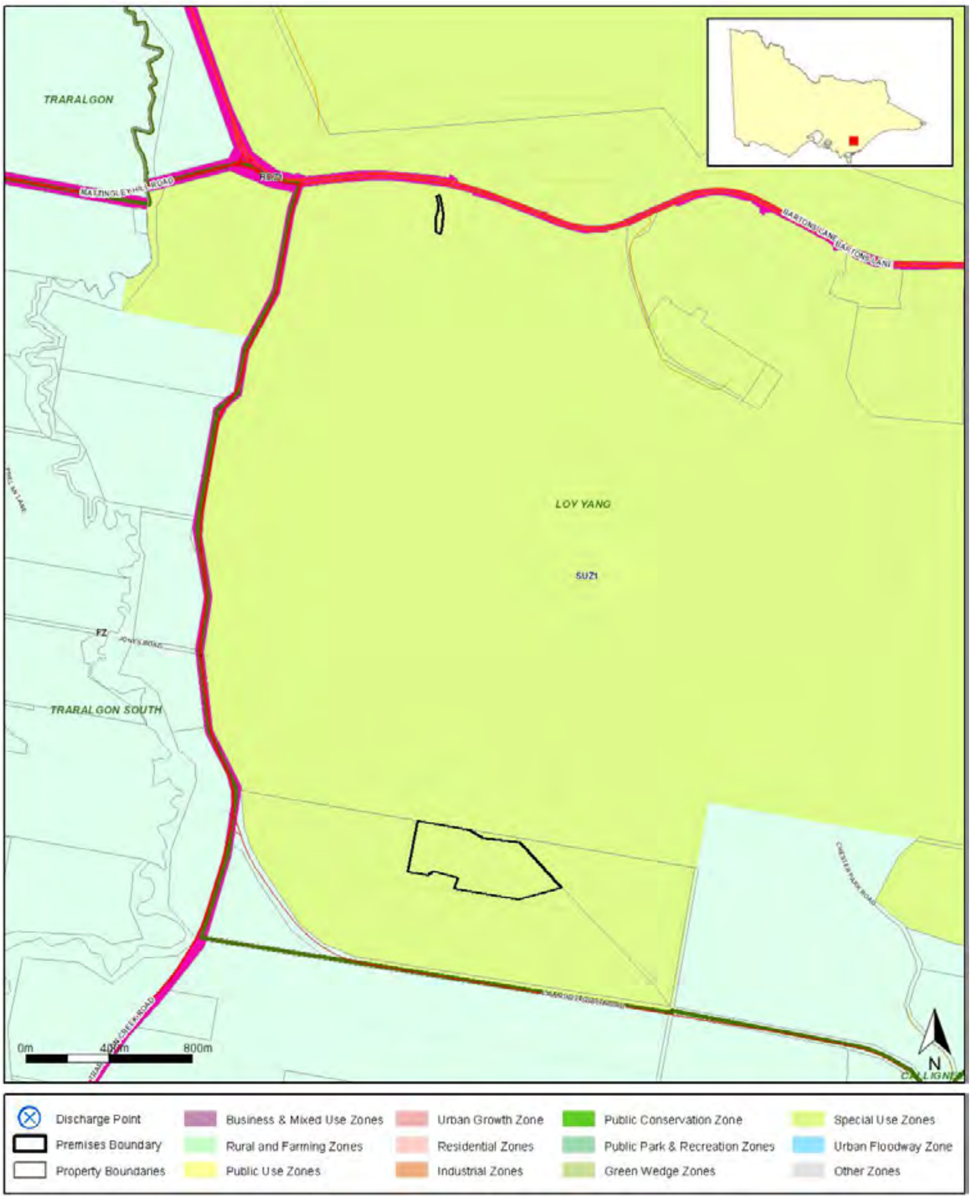
Water Conditions

LI_DW1 Stormwater discharged from the premises must not be contaminated with waste.

Land Conditions

LI_DL1 You must not contaminate land or groundwater.

SCHEDULE 1A - LOCALITY PLAN



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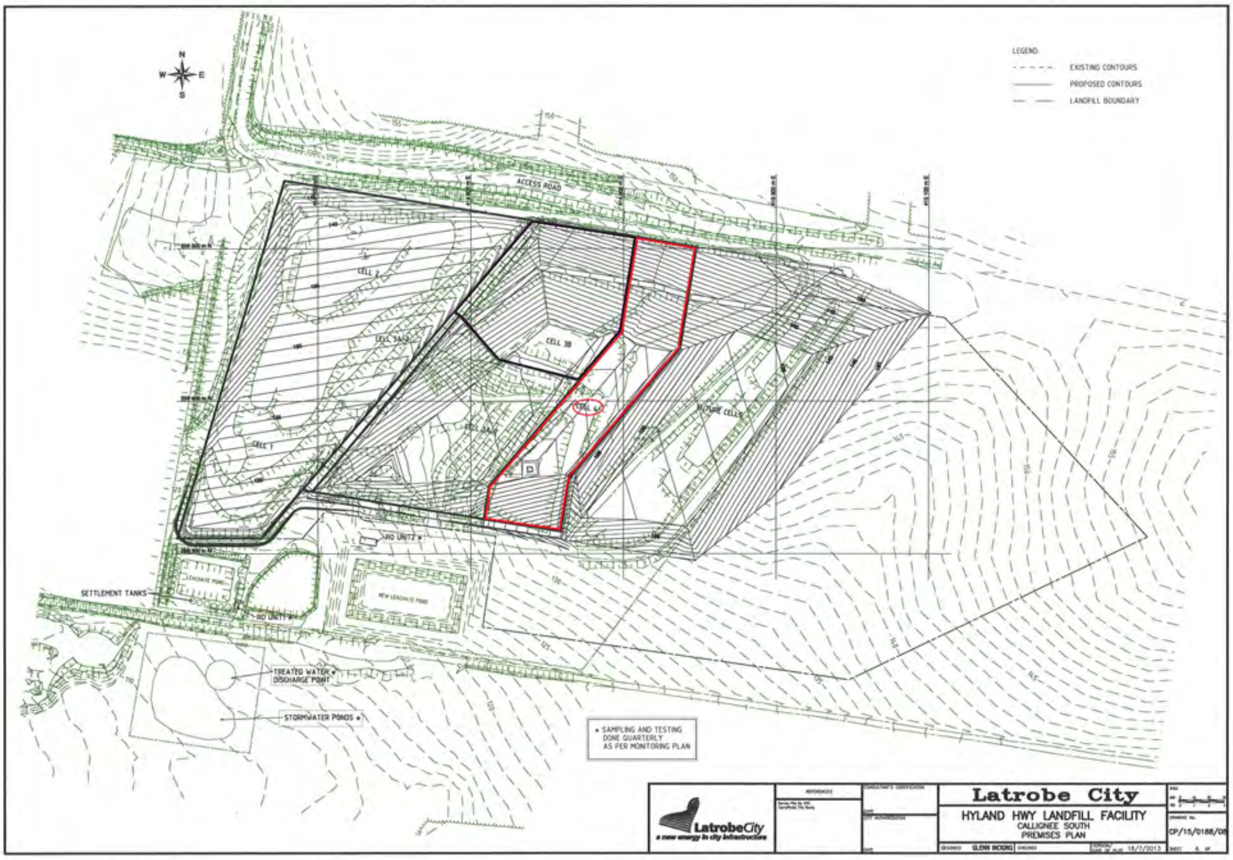
Company Name:	LATROBE CITY COUNCIL
ABN:	92 472 314 133
Premises Address:	64 Hyland Highway, LOY YANG VIC 3844
Issued:	04/06/2009
Last Amended:	22/03/2016

Before relying on the information in this map, users should carefully evaluate its accuracy, currency, completeness and relevance for their purposes, and should obtain any appropriate professional advice relevant to their particular circumstances.

SCHEDULE 1B - PREMISES PLAN



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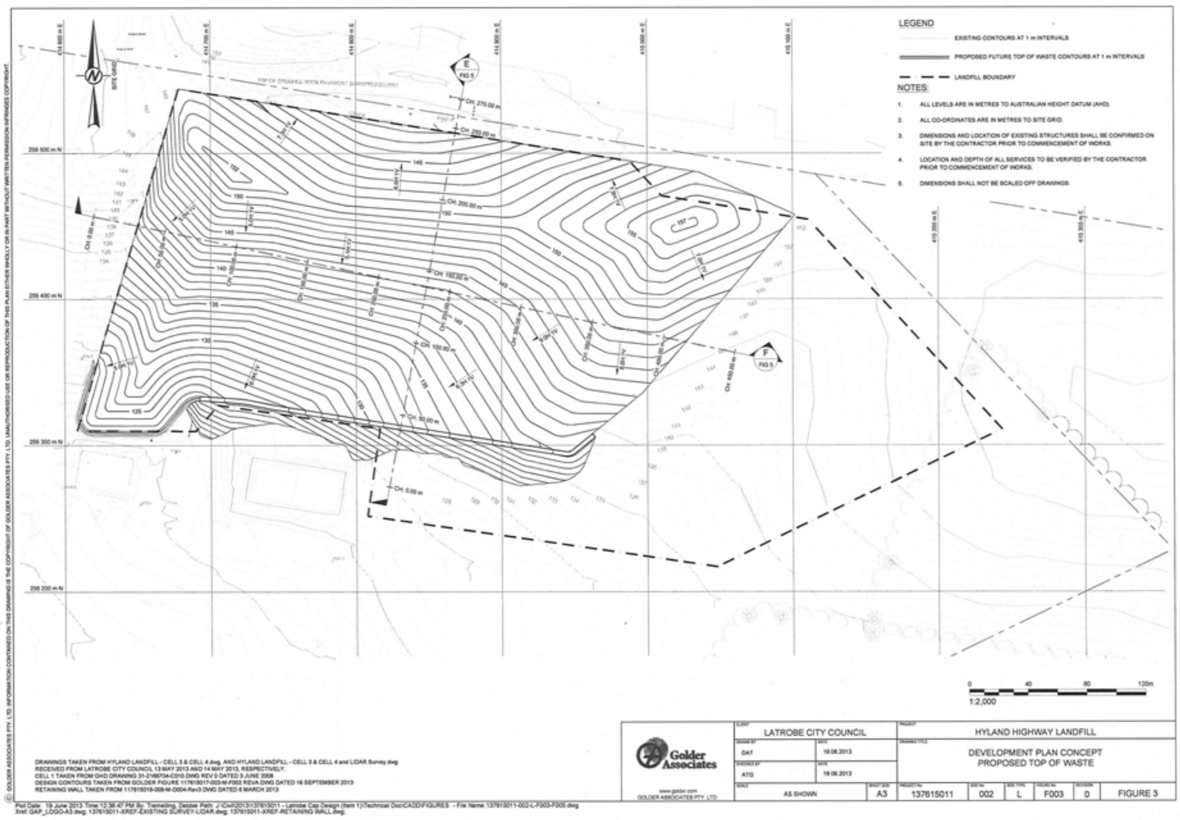
SCHEDULE 1C - CONTOUR PLAN



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SCHEDULE 2 - WASTE ACCEPTANCE TABLES

Disposal to Landfill - General Waste

Landfill Cell	Waste Type
CELL 3B	Asbestos waste of domestic origin
	Putrescible waste
	Solid inert waste
	Tyres shredded into pieces < 250 mm
CELL 4	Asbestos waste of domestic origin
	Putrescible waste
	Solid inert waste
	Tyres shredded into pieces < 250 mm
Cell 2	Asbestos waste of domestic origin
	Putrescible waste
	Solid inert waste
	Tyres shredded into pieces < 250 mm
Cell 3A-1	Asbestos waste of domestic origin
	Putrescible waste
	Solid inert waste
	Tyres shredded into pieces < 250 mm

APPENDIX B – LFG Monitoring data

Bore	Date Time	Methane	Carbon Dioxide	Oxygen	Balance Gas	Pressure	Atmospheric Pressure	Flow	Depth to Liquid	Depth-to-Base	Comments
LYLFG001	30-Jul-15	0.8	12.8	5.4	81	3.66	1003.8	4.2	9.99	9.99	OK
LYLFG001	28-Oct-15	0	16.7	5.3	78	1.38	1005.3	2.2	10	10	OK
LYLFG001	10-Feb-16	0.1	16	4.9	79	0	999.1	1.3	10	10	OK
LYLFG001	9-May-16	-0.10	3.88	15.13	81.09	0.00	982.43	6.48	23.22	23.22	OK - Sample Complete
LYLFG001	9-May-16	0.3	12.9	5.8	81	0	980.5	-0.4	10	10	OK - Sample Complete
LYLFG001	23-Nov-16	0	3.6	17	79.4	-0.02	997.7	0		10.05	OK - Sample Complete
LYLFG002	30-Jul-15	0	1.5	19.6	78.9	4.24	1002.9	4.3	9.06	9.06	OK
LYLFG002	28-Oct-15	0	0.7	19.8	79.5	1.27	1005.6	2.4	9	9	OK
LYLFG002	10-Feb-16	0	1	19.8	79.2	0.32	1000.3	0.8	9.1	9.1	OK
LYLFG002	9-May-16	0.1	4	14.5	81.4	0	981.8	2.8	9.1	9.1	OK - Sample Complete
LYLFG002	23-Nov-16	0	0.8	20	79.2	0.53	998.9	0		9.08	OK - Sample Complete
LYLFG003	30-Jul-15	0	9.4	10.2	80.4	7.62	1003.5	6.6	28.04	28.2	OK
LYLFG003	28-Oct-15	0	2.2	17.1	80.7	1.68	1005.6	2.9	27.6	28.2	OK
LYLFG003	10-Feb-16	0	0.8	20.1	79.1	1.31	1000.6	2.2	25.7	28.2	OK
LYLFG003	9-May-16	0	1.7	17	81.3	0	982.8	6.7	28.2	28.2	OK - Sample Complete
LYLFG003	23-Nov-16	0	0.1	21.4	78.5	0.4	998.9	-0.1		28.22	OK - Sample Complete
LYLFG004	30-Jul-15	0	7.9	12.1	80	6.71	1002.7	6.3	28.16	28.16	OK
LYLFG004	28-Oct-15	0	0.9	19.2	79.9	1.73	1006.3	2.7	28.2	28.2	OK
LYLFG004	10-Feb-16	0	0.8	19.4	79.8	0.98	1000.3	0.8	15.6	28.2	OK
LYLFG004	9-May-16	0	6.6	11.8	81.6	0	981.8	5.5	28.2	28.2	OK - Sample Complete
LYLFG004	23-Nov-16	0	0.1	21.5	78.4	0.4	997.7	-0.1		28.21	OK - Sample Complete
LYLFG005	30-Jul-15	0	8.8	12.3	78.9	6.5	1001.6	6	26.01	26.01	OK
LYLFG005	28-Oct-15	0	2.1	18	79.9	2.05	1005.3	3	26	26	OK
LYLFG005	10-Feb-16	0	7.4	13.3	79.3	0.69	1000.2	1.5	26	26	OK
LYLFG005	9-May-16	0	7.9	11.5	80.6	0	981	6.1	26	26	OK - Sample Complete
LYLFG005	23-Nov-16	0	3.2	19.3	77.5	0.55	997.7	0		26.05	OK - Sample Complete
LYLFG006	30-Jul-15	0	4.7	15.6	79.7	7.29	1003.8	6.6	1898	1898	OK
LYLFG006	28-Oct-15	0	0.7	19.1	80.2	-1.91	1004.8	3	18.9	19	OK
LYLFG006	10-Feb-16	0	6.1	13.4	80.5	0	1001.5	2.4	19	19	OK
LYLFG006	9-May-16	0	5.6	12.5	81.9	0	983	7.3	19	19	OK - Sample Complete
LYLFG006	23-Nov-16	0	0	21.9	78.1	0.29	999.5	0		19	OK - Sample Complete
LYLFG007	30-Jul-15	5.4	15.7	5.3	73.6	2.35	1005.2	2.6	6.02	6.02	OK
LYLFG007	28-Oct-15	4	12.7	9.4	73.9	0.03	1008.5	0.7	6	6.1	OK
LYLFG007	10-Feb-16	4.7	24	2.2	69.1	-0.05	1002.8	0.5	6	6	OK
LYLFG007	9-May-16	0	19	3	78	0	983.3	1.8	6	6	OK - Sample Complete
LYLFG007	23-Nov-16	8.8	27.3	0.4	63.5	-0.26	1001.5	-0.3		6.04	OK - Sample Complete
LYLFG008	30-Jul-15	0	6.1	13.4	80.5	8.81	1005.2	7.3	14.01	14.04	OK
LYLFG008	28-Oct-15	0	0.7	20	79.3	1.91	1008.2	3	14	14.1	OK
LYLFG008	10-Feb-16	0	5.6	14.2	80.2	1.83	1004	2.8	13.9	14	OK
LYLFG008	9-May-16	0	5.6	12	82.4	0	985.5	8.9	14	14	OK - Sample Complete
LYLFG008	23-Nov-16	0	0.2	21.7	78.1	-0.07	1002.6	-0.4		14.06	OK - Sample Complete
LYLFG009	30-Jul-15	0	1.7	19.5	78.8	0.09	1005.1	0.3	6.04	6.04	OK
LYLFG009	28-Oct-15	0	0.9	19.4	79.7	-0.03	1008.8	0	6	6	OK
LYLFG009	10-Feb-16	0	1.6	19.4	79	-0.01	1003.9	0.1	6	6	OK
LYLFG009	9-May-16	0	0	19.7	80.3	0	985.3	-0.4	9	9	OK - Sample Complete
LYLFG009	23-Nov-16	0	2.9	19	78.1	-0.03	1002.5	-0.1		6.05	OK - Sample Complete
LYLFG010	30-Jul-15	0	0.5	20.2	79.3	0.15	1003.8	0	5.98	5.98	OK
LYLFG010	28-Oct-15	0	0.3	20.2	79.5	-0.1	1007.6	0	6	6	OK
LYLFG010	10-Feb-16	0	0.9	19.8	79.3	0	1002.6	0	6	6	OK
LYLFG010	9-May-16	0	0.4	18.8	80.8	0	983	-0.4	6	6	OK - Sample Complete
LYLFG010	23-Nov-16	0	1.2	20.8	78	-0.03	1000.5	-0.2		5.98	OK - Sample Complete
LYLFG011	30-Jul-15	0.1	7.9	9.8	82.2	6.03	1004	5.9	11.04	11.04	OK
LYLFG011	28-Oct-15	0	4.3	17.1	78.6	2.14	1005.3	3.6	11.1	11.1	OK
LYLFG011	10-Feb-16	0.1	6.2	13.9	79.8	0	1000.2	2.5	11	11	OK
LYLFG011	9-May-16	0.7	10.6	7.2	81.5	0	980.7	6.7	11	11	OK - Sample Complete
LYLFG011	23-Nov-16	0	6.7	14	79.3	0.43	999.1	-0.1		11.05	OK - Sample Complete
LYLFG012	30-Jul-15	0	6.6	13.9	79.5	0.38	1007.6	0.9	16.06	16.06	OK
LYLFG012	28-Oct-15	0	4.9	16.4	78.7	-0.06	1010.8	0.5	16	16	OK
LYLFG012	9-May-16	0	11.3	7.3	81.4	0	987.5	0.2	16	16	OK - Sample Complete
LYLFG012	23-Nov-16	0	1.9	18.6	79.5	0.02	1004.9	-0.4		16.08	OK - Sample Complete

* Datasets modelled. Features are representations only. Features represented may be absent or different, or features may not be represented in modelling.

Legend

Cell 1 & 2 Methane (CH4) monitoring results (ppm)

- 0 - 100
- 100 - 1,000
- 1,000 - 10,000

Cell 3A & 3B Methane (CH4) monitoring results (ppm)

- 0 - 200
- 200 - 1,000
- 1,000 - 10,000
- Wind speed reading <10kph
- Wind speed reading >10kph
- Cells
- 25m x 25m Grid
- Elevation - 10m

Key Map

0 12.5 25 50
Meters

monarc ENVIRONMENTAL

LaTrobe City Council
Hyland Highway Landfill
Map source: Monarc
Author: Justin Pegg
Date: 21/12/2016

N

Hyland Highway Landfill
Methane Monitoring - 20 December 2016

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994

A3

Figure 1

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Memorandum

To	Latrobe City Council
CC	Dean Wilson Angelo Grixti
From	Ian Greig
Date	15 July 2015
Subject	Surface Emissions Survey Hyland Highway Landfill

The following memo is a report on the surface emission survey completed at the Hyland Highway Landfill

If you have any queries please do not hesitate to contact.

Thanks,

Ian Greig

Ian Greig
Group Technical Manager

Table of Contents

1 INTRODUCTION

- Run Energy undertook a landfill cap fugitive emission survey on the Hyland Highway Landfill.
- Survey was complete from 10th of July 2015

1.1 Scope of Survey

- The emissions survey was completed on following areas of the landfill:
  - Walkover of completed landfill cell area
  - Check of penetrations through the final cap (wells and manifolds)
  - Check of Rental flare

2 Methodology

2.1 Guidelines Used

- Survey was completed in accordance with the "*Draft Landfill Gas Fugitive Emissions Monitoring Guidelines (Vic EPA Publication 1416 Sept 2011)*"
- Results were analysed in accordance with table 6.4 which outlines landfill surface gas action levels from "*Best Practice Environmental Management – Siting, Design, Operation and Rehabilitation of Landfills' (EPA Victoria, Publication 788.2, October 2014) ('EPA publication 788.2')*"

Table 6.4: Landfill gas action levels

Location	Parameter(s)	Action level and unit
Landfill surface final cap	Methane concentration in air*	100 ppm
Within 50mm of penetrations through the final cap	Methane concentration in air**	100 ppm
Landfill surface intermediate cover areas***	Methane concentration in air*	200 ppm
Within 50mm of penetrations through the intermediate cover	Methane concentration in air**	1000 ppm

* Point of measurement is 50mm above the landfill surface.

** Point of measurement is 50mm from the point of discharge.

*** Intermediate cover areas are those that do not have an engineered landfill cap and are not scheduled to receive waste during the next three months.

2.2 Instrument Used

- Emissions were measured using a Crowcon Gastec MK 5 with built in GPS, Flame Ionisation Detector (FID) - detection capability from 1 to 9,999ppm of methane (Serial Number – GT000000359
- Refer Appendix A for calibration certificate
- The FID was bump tested prior to commencement against calibration gas
- The unit was 'autozero' to clean air prior to sampling starting

2.3 Methodology Overview

- Performed by sweeping end of FID wand within 50mm of the ground surface.
- Samples were taken continuously (where possible) on a 25m grid across the cell
- Survey was taken at walking pace
- Wind speed was measured regularly (minimum twice per grid line) at a height of approximately 50mm from surface and found to be within specified requirements.
- Locations were referenced on GPS and map (see Appendix C) produce to show actual coverage as well as coordinates.

3 Results

3.1 Sampling Completed

Date of Sampling	Sampling Location
10th Jul 2015	• 2,922 samples were taken over the landfill site.
10th Jul 2015	• Walkover of completed landfill cell area • Check of penetrations through final cap (Wells and Manifolds) • Check of flare

3.2 Weather Conditions

Metric	Condition
Rain	No rain 48 hours prior to SEM, 1.6 mm after emissions monitoring was completed
Wind speed	Wind speed below acceptable limits 5.3 km
Temperature	Temperature ranged from 2.0 to 9.0 ^{0}C
Atmospheric Pressure	Refer to Appendix B

3.3 Survey Data Summary

Methane Level Sample Range	Total Samples	Comment
0 ppm	2,188	No actions required
1 ppm to 100ppm	702	No actions required
101 ppm to 200 ppm	9	Actions required
201 ppm to 1,000 ppm	14	Actions required
1,001 ppm to 9,998 ppm	9	Actions required
9,999+ ppm	0	
Total	**2,922**	

Note.

1. *Absolute value is used. Absolute PPM reading (before autozero is deducted)*

- Monitoring data is collected into a csv file and included as a separate csv file

3.4 Landfill Gas Action Levels

- Hyland Highway Landfill is an active landfill. However, the cell monitored is completed with final capping.
- Surface emission methane levels in accordance to landfill gas action levels (outlined Section 2.1 of this report) are summarised as follows:

Location	Parameter(s)	Action level and unit	Total Samples
Landfill cap surface final cap	Methane concentration in air*	>100 ppm	32 locations highlighted **3.6 Map: Landfill Gas Action Levels > 100ppm**
Within 50 mm of penetrations through the final cap	Methane concentration in air**	>100 ppm	None No penetrations were observed
Landfill surface intermediate cover areas	Methane concentration in air*	>200 ppm	None Surveyed area was final cap
Within 50 mm of penetrations through the intermediate cover	Methane concentration in air**	>1000 ppm	None Surveyed area was final cap

'*Point of measurement is 50mm above the landfill surface.
**Point of measurement is 50mm from the point of discharge.
***Intermediate cover areas are those that do not have an engineered landfill cap and are not scheduled to receive waste during the next three months.'.

3.5 Map: Surface Emission Data

1	All readings on map. *Note. the most up-to-date map image on Google Earth is from 22 Jan 2014*

3.6 Map: Landfill Gas Action Levels > 100ppm

1	Above image includes only methane levels >100ppm

4 Conclusion

- The survey was completed on the cell with final capping at Hyland Highway Landfill
- In accordance EPA guidelines the action level for landfill surface final cover > 100ppm methane
- Small sections of final cap had readings exceeding the action limit thus require further action – these locations are found in the "Map: Landfill Gas Action Levels > 100 ppm" and listed in Appendix C

Appendix A – Calibration Certificate

K.D. FISHER & CO. PTY LTD SERVICE CENTRE

HEAD OFFICE: 18 Benjamin Street, St Marys, Adelaide, S.A. 5042
A.B.N. 27 007 879 647 Ph: 08 8277 3288 Fax: 08 8276 4024 Website: www.kdfisher.com.au

CALIBRATION CERTIFICATE
Gas Detection Equipment

Customer: Run Energy Pty Limited
Unit 8, 20 Duerdin Street
Clayton
Victoria 3168

Calibration Date: 13/05/2015
KDF Reference No.: R1505032
Model: Gas-Tec Mk V
Serial No.: GT0000000359
Customer ID:

INSPECTION REPORT OF ACCESSORIES

The equipment was calibrated in accordance with AS/NZS 60079.29.2:2008 and the manufacturer's instructions.

Service details: Replaced MEMS flow sensor. Replaced hydrophobic filters. Calibrated to specifications.

Gas cylinders used for calibration

Cylinder #: 457641
Analysis: 84.7ppm (+/- 2.4ppm) Methane
Certificate Date: 12/07/2011

Cylinder #: 390366
Analysis: 839ppm (+/- 20ppm) Methane
Certificate Date: 12/07/2011

Cylinder #: 428441
Analysis: 8700ppm (+/- 200ppm) Methane
Certificate Date: 12/07/2011

Installation Date: 29/10/2013
Calibrated, inspected and tested by:

Next Service Date: 13/11/2015

Jeff Harvey - Service Technician

Appendix B – Weather Conditions

- Temperature and Rain fall for month of July 2015

10/07/2015 Latrobe Valley, Vic - Daily Weather Observations

Australian Government
Bureau of Meteorology

Latrobe Valley, Victoria
July 2015 Daily Weather Observations

Most observations from Latrobe Valley Airport, evaporation from Blue Rock Reservoir and sunshine from East Sale Airport.

		Temps		Rain	Evap	Sun	Max wind gust			9 am						3 pm					
Date	Day	Min	Max				Dir	Spd	Time	Temp	RH	Cld	Dir	Spd	MSLP	Temp	RH	Cld	Dir	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	8th		km/h	hPa	°C	%	8th		km/h	hPa
1	We	6.9	13.9	0	0.4		NW	61	23:18	9.8	99	8	W	11	1027.2	12.8	63	7	WNW	28	1022.8
2	Th	7.3	10.9	6.2	2.2		WSW	80	10:21	7.3	99	8	WNW	28	1017.7	8.5	89	4	WSW	22	1023.0
3	Fr	3.8	10.5	5.6	1.6		WNW	30	14:07	6.1	100	8	WSW	11	1028.2	9.2	86	8	WNW	22	1025.3
4	Sa	5.6	10.0	0			WNW	39	11:14	8.9	81	8	W	11	1021.2	9.7	90	8	W	19	1020.2
5	Su	4.3	15.4	0.2			W	33	12:41	8.0	100	6	NE	7	1019.8	14.4	67	5	WNW	22	1017.0
6	Mo	4.5	10.8	0	0.4		WSW	19	18:24	7.3	100	8		Calm	1015.8	10.3	97	7	WSW	11	1014.6
7	Tu	7.3	11.6	2.6	0.4		NE	22	14:33	8.3	100	8		Calm	1023.2	9.9	100	7	NNE	13	1023.8
8	We	3.7	13.3	1.0	1.2		NE	20	13:56	4.5	100	8	NE	9	1028.3	11.9	80		NE	15	1026.5
9	Th	0.3	12.3	0	0.3		WNW	9	04:39	3.7	100	7	ENE	2	1028.5	11.5	96	8	NNE	7	1024.7
10	Fr	2.0		1.6	0.2					6.4	100	8	SSE	7	1017.8						
Statistics for the first 10 days of July 2015																					
Mean		4.6	12.1		0.8					7.0	97	7		8	1022.8	10.9	85	6		17	1022.0
Lowest		0.3	10.0	0	0.2					3.7	81	6		Calm	1015.8	8.5	63	4	NNE	7	1014.6
Highest		7.3	15.4	6.2	2.2		WSW	80		9.8	100	8	WNW	28	1028.5	14.4	100	8	WNW	28	1026.5
Total				17.2	6.7																

IDCJDW3042.201507 Prepared at 23:37 UTC on Thursday 9 July 2015

Source of data
Temperature, humidity, wind, pressure, cloud and rainfall observations are from Morwell (Latrobe Valley Airport) {station 085280}. Evaporation observations are from Willow Grove (Blue Rock Reservoir) {station 085283}.
Some cloud observations are from automated equipment; these are somewhat different to those made by a human observer and may not appear every day.
You should read the **important information** in these notes.

Other formats
To **print** this page, get the PDF version (one page, 45 kb).
To use this page in a **spreadsheet**, get the plain text version (4 kb).

Other times and other places
The **last 14 months** of Daily Weather Observations for Latrobe Valley, Victoria are also here on this web site:
Jul 15 Jun 15 May 15 Apr 15 Mar 15 Feb 15 Jan 15 Dec 14
Nov 14 Oct 14 Sep 14 Aug 14 Jul 14 Jun 14
Daily Weather Observations are also routinely prepared for hundreds of **other locations** in Victoria and across Australia. To get other months or places not on this web site, contact us.

Climate statistics
If you are after **long-term averages** relevant to Latrobe Valley, Victoria, look at the tables for Morwell (Latrobe Valley Airport), Yallourn, Yallourn SEC, Willow Grove (Blue Rock Reservoir) or East Sale Airport.
Maps and tables of average conditions for locations across Australia are also available.

More information
If you are using these pages, you are deemed to have understood the **important information** in these notes. They cover how the data are obtained, how they are processed, and what each column means.
If you have **any questions** about this product, or you want any other weather or climate information, please contact us.

Appendix C – Surface Emission Levels > 100 ppm

Serial No: GT0000000359									
Software Version: V1 i1.00 B27									
Date: 10/07/15									
Speed Units: km/h		5.3							
	Temp C	9							
Count	Time	Absolut	Relative	Latitude	Longitu	Height	SOG	COG	Mark
330	100317	102	102	3816.6765	14633.560	157.2	5.08		0
1086	101553	102	102	3816.6565	14633.528	158.8	1.59		0
289	100236	116	116	3816.6669	14633.560	156.1	3.88		0
2661	104208	120	120	3816.6735	14633.549	154.8	4.81		0
1075	101542	121	121	3816.6576	14633.526	158.3	0.48		0
1076	101543	128	128	3816.6581	14633.526	158.3	1.72		0
288	100235	156	156	3816.6664	14633.560	156.1	1.79		0
287	100234	172	172	3816.6662	14633.560	156.2	2.47		0
2665	104212	195	195	3816.6724	14633.553	155.1	4.73		0
2663	104210	215	215	3816.6729	14633.551	154.9	4.97		0
2662	104209	219	219	3816.6732	14633.550	154.8	4.68		0
2664	104211	265	265	3816.6726	14633.552	155	5.12		0
1079	101546	271	271	3816.6583	14633.527	158	0.25		0
1085	101552	275	275	3816.6568	14633.528	158.8	3.03		0
1080	101547	281	281	3816.6583	14633.527	158.1	0.29		0
1077	101544	293	293	3816.6581	14633.526	158	0.2		0
319	100306	314	314	3816.6803	14633.564	156.4	1.42		0
1078	101545	333	333	3816.6583	14633.527	158.1	1.44		0
1084	101551	412	412	3816.6573	14633.527	158.8	3.34		0
329	100316	421	421	3816.6773	14633.561	157.1	5.27		0
1083	101550	493	493	3816.6579	14633.527	158.6	1.62		0
1081	101548	522	522	3816.6582	14633.527	158.2	0.18		0
1082	101549	570	570	3816.6581	14633.527	158.6	0.55		0
320	100307	1311	1311	3816.6803	14633.563	156.5	0.48		0
328	100315	1357	1357	3816.6779	14633.562	157.1	5.12		0
327	100314	1564	1564	3816.6783	14633.562	157	4.56		0
326	100313	1576	1576	3816.6788	14633.563	156.9	4.31		0
324	100311	1661	1661	3816.6795	14633.563	156.6	1.22		1
323	100310	1681	1681	3816.6797	14633.563	156.7	0.79		0
325	100312	1702	1702	3816.6794	14633.563	156.7	0.99		0
321	100308	1902	1902	3816.6803	14633.563	156.6	0.22		0
322	100309	1985	1985	3816.6799	14633.563	156.7	0.61		0

Serial No: GT0000000359
Software Version: V1 i1.00 B27
Date: 12/11/14

Speed Units: km/h		6.2
Temp	c	12.4
Baro	mlb	1016

Count	Time	Absolute	Relative	Latitude	Longitude	Height	SOG	COG	Mark
0									
201	105632	14	14	3816.70035S	14633.55608E	148.8	4.18		0
202	105633	17	17	3816.70086S	14633.55557E	148.8	4.01		0
241	105712	19	19	3816.71844S	14633.53149E	145.8	4.21	226.83	0
242	105713	16	16	3816.71888S	14633.53076E	145.7	4.69		0
251	105722	13	13	3816.72278S	14633.52557E	144.9	3.01		0
252	105723	10	10	3816.72304S	14633.52515E	144.8	3.44	226.94	0
253	105724	18	18	3816.72322S	14633.52471E	144.6	2.66	227.19	0
295	105806	12	12	3816.74584S	14633.50165E	141.2	6.45		0
296	105807	22	22	3816.74641S	14633.50112E	141.1	4.47	212.85	0
297	105808	30	30	3816.74698S	14633.50076E	141	4.75	211.04	0
298	105809	52	52	3816.74750S	14633.50040E	140.9	4.51	209.75	0
301	105812	14	14	3816.74943S	14633.49935E	140.6	4.03	210.15	0
416	110007	11	11	3816.75604S	14633.50060E	129.8	3.16		0
417	110008	12	12	3816.75551S	14633.50062E	129.9	3.66	41.48	0
419	110010	12	12	3816.75420S	14633.50070E	129.9	4.38		0
420	110011	11	11	3816.75377S	14633.50027E	129.8	4.71	19.27	0
421	110012	12	12	3816.75328S	14633.49996E	130.2	4.84	6.74	0
422	110013	14	14	3816.75285S	14633.49941E	130.4	4.47	357.26	0
423	110014	14	14	3816.75245S	14633.49885E	130.7	3.95	349.1	0
555	110226	17	17	3816.71535S	14633.48922E	136.8	3.9	1.16	0
556	110227	31	31	3816.71480S	14633.48932E	137.2	4.95	2.47	0
557	110228	24	24	3816.71424S	14633.48950E	137.4	4.36	3.66	0
558	110229	23	23	3816.71375S	14633.48986E	137.7	5.36	5.27	0
647	110358	31	31	3816.70592S	14633.51270E	142.3	4.1	302.41	0
648	110359	39	39	3816.70563S	14633.51186E	142.3	4.07	301.9	0
649	110400	21	21	3816.70532S	14633.51096E	142.2	5.25	301.41	0
651	110402	10	10	3816.70466S	14633.50930E	142.2	4.58	299.36	0
680	110431	23	23	3816.69243S	14633.49632E	142.7	4.34	11.27	0
681	110432	26	26	3816.69218S	14633.49689E	142.8	2.84	13.27	0
682	110433	39	39	3816.69215S	14633.49748E	142.9	2.9		0
683	110434	18	18	3816.69262S	14633.49873E	142.2	5.97		0
684	110435	16	16	3816.69292S	14633.49966E	142.3	4.62	21.62	0
685	110436	21	21	3816.69322S	14633.50042E	142.3	4.44	27.33	0
686	110437	15	15	3816.69352S	14633.50095E	142.7	4.21	33.24	0
687	110438	14	14	3816.69382S	14633.50140E	143.1	2.96		0
688	110439	18	18	3816.69413S	14633.50190E	143.1	3.66	38.54	0
689	110440	16	16	3816.69433S	14633.50237E	143.4	4.07		0
690	110441	10	10	3816.69462S	14633.50302E	143.5	4.51	45.68	0
694	110445	12	12	3816.69560S	14633.50592E	144.1	4.07	72.62	0
695	110446	18	18	3816.69588S	14633.50664E	144.2	4.4	77.45	0
696	110447	15	15	3816.69615S	14633.50745E	144.1	3.9	82.79	0
697	110448	23	23	3816.69639S	14633.50829E	144.2	4.38	86.08	0
698	110449	35	35	3816.69658S	14633.50913E	144.4	4.19	89.38	0
699	110450	58	58	3816.69685S	14633.50989E	144.3	4.4	93.35	0
700	110451	63	63	3816.69718S	14633.51061E	144.3	4.53	95.61	0
701	110452	62	62	3816.69743S	14633.51147E	144.3	4.84	98.77	0
702	110453	30	30	3816.69780S	14633.51219E	144.1	4.6	100.82	0
703	110454	23	23	3816.69814S	14633.51302E	144.4	4.73	103.89	0
704	110455	13	13	3816.69841S	14633.51383E	144.5	4.55	105.36	0
705	110456	10	10	3816.69857S	14633.51471E	144.7	3.99	105.67	0
714	110505	10	10	3816.69986S	14633.52269E	146.9	4.1	102.11	0
741	110532	10	10	3816.69472S	14633.53510E	149.7	3.55	37.36	0
799	110630	11	11	3816.67836S	14633.51358E	149.8	5.36	31.54	0
803	110634	10	10	3816.67852S	14633.51668E	150.5	3.9	59.26	0
837	110708	10	10	3816.68357S	14633.54046E	153.4	3.44	108.8	0
839	110710	11	11	3816.68365S	14633.54169E	153.9	3.45		0
840	110711	11	11	3816.68360S	14633.54230E	154	1.62		0
841	110712	11	11	3816.68345S	14633.54297E	154.2	3.97		0
842	110713	10	10	3816.68328S	14633.54382E	154.2	4.64	102.88	0
850	110721	10	10	3816.68065S	14633.54514E	154.5	3.92	21.2	0
989	110940	10	10	3816.68091S	14633.56847E	153.7	3.9		0
1054	111045	13	13	3816.66023S	14633.58524E	150.8	4.36	236.98	0
1061	111052	11	11	3816.66438S	14633.58316E	151.8	4.58	210.24	0
1201	111312	12	12	3816.65248S	14633.54197E	157.9	3.64		0
1202	111313	10	10	3816.65245S	14633.54134E	157.8	3.27		0
1231	111342	11	11	3816.67011S	14633.53142E	157.1	5.05		0
1261	111412	10	10	3816.65206S	14633.53078E	155.7	3.9		0
1262	111413	10	10	3816.65151S	14633.53042E	155.8	3.58		0
1384	111615	11	11	3816.66685S	14633.50955E	154.8	4.12	315.87	0
1385	111616	12	12	3816.66583S	14633.50968E	154.9	4.68	321.33	0
1545	101345	24	24	3816.68617S	14633.49627E	154.7	4.97	194.1	0
1546	101346	55	55	3816.68686S	14633.49571E	155	5.1	194.29	0
1547	101347	60	60	3816.68769S	14633.49536E	155	5.05	194.59	0
1548	101348	23	23	3816.68857S	14633.49507E	155	5.25		0
1592	101432	10	10	3816.72001S	14633.48383E	149.7	0.48		0
1593	101433	11	11	3816.72012S	14633.48392E	149.5	1.31		0
1602	101442	23	23	3816.72351S	14633.48376E	148.8	1.23		0

1603	101443	41	41	3816.72350S	14633.48377E	148.8	0.18		0	
1604	101444	26	26	3816.72352S	14633.48381E	148.7	0.27		0	
1605	101445	22	22	3816.72352S	14633.48380E	148.6	0.18		0	
1617	101457	10	10	3816.72542S	14633.48278E	147.8	4.88	196.89	0	
1621	101501	18	18	3816.72808S	14633.48119E	147.8	4.71		0	
1622	101502	26	26	3816.72873S	14633.48085E	147.7	4.92	200.56	0	
1623	101503	28	28	3816.72933S	14633.48052E	147.5	4.56	200.83	0	
1624	101504	33	33	3816.72983S	14633.48026E	147.5	2.99		0	
1625	101505	65	65	3816.73029S	14633.48037E	147.3	1.31		0	
1626	101506	51	51	3816.73060S	14633.48048E	147.2	2.12		0	
1627	101507	24	24	3816.73099S	14633.48041E	147	5.19	199.16	0	
1628	101508	17	17	3816.73167S	14633.48032E	146.9	4.71		0	
1629	101509	27	27	3816.73227S	14633.47992E	146.8	4.93		0	
1630	101510	14	14	3816.73274S	14633.47955E	146.8	4.31	202.5	0	
1642	101522	15	15	3816.73958S	14633.47585E	145.3	4.42		0	
1643	101523	14	14	3816.73992S	14633.47536E	145.2	3.57		0	
1657	101537	12	12	3816.74838S	14633.47309E	143.3	5.53	198.46	0	
1658	101538	192	192	3816.74911S	14633.47284E	143.2	5.03	197.46	0	1
1659	101539	518	518	3816.74971S	14633.47255E	143	5.05	196.33	0	1
1660	101540	915	915	3816.75035S	14633.47223E	143	4.75		0	1
1661	101541	700	700	3816.75084S	14633.47199E	142.9	3.58		0	1
1662	101542	441	441	3816.75108S	14633.47190E	142.8	0.27		0	1
1663	101543	110	110	3816.75106S	14633.47191E	142.7	1.22		0	1
1664	101544	35	35	3816.75131S	14633.47220E	142.5	0.33		0	
1665	101545	15	15	3816.75158S	14633.47239E	142.2	0.61		0	
1667	101547	10	10	3816.75158S	14633.47249E	141.7	0.57		0	
1669	101549	10	10	3816.75147S	14633.47264E	141.2	1.07		0	
1670	101550	35	35	3816.75146S	14633.47286E	141	1.55		0	
1671	101551	122	122	3816.75114S	14633.47289E	140.6	2.16		0	1
1672	101552	253	253	3816.75060S	14633.47327E	140.2	2.73	223.79	0	1
1673	101553	309	309	3816.75011S	14633.47380E	140.2	2.68	289.21	0	1
1674	101554	330	330	3816.74976S	14633.47403E	140.1	1.16	297.73	0	1
1675	101555	531	531	3816.74964S	14633.47421E	139.9	0.2		0	1
1676	101556	120	120	3816.74960S	14633.47415E	139.5	0.18		0	1
1677	101557	27	27	3816.74955S	14633.47416E	139.4	0.25		0	
1678	101558	14	14	3816.74955S	14633.47420E	139.2	1.22		0	
1679	101559	19	19	3816.74957S	14633.47417E	138.9	1.36		0	
1680	101600	43	43	3816.74961S	14633.47419E	138.7	0.18		0	
1681	101601	52	52	3816.74960S	14633.47424E	138.6	0.35		0	
1682	101602	78	78	3816.74943S	14633.47434E	138.3	2.05	307.84	0	
1683	101603	101	101	3816.74905S	14633.47450E	138	2.66	316.27	0	1
1684	101604	81	81	3816.74881S	14633.47467E	137.6	0.92		0	
1685	101605	171	171	3816.74895S	14633.47500E	137.2	3.03		0	1
1686	101606	525	525	3816.74911S	14633.47505E	137.4	1.16		0	1
1687	101607	1000	1000	3816.74923S	14633.47469E	137.4	1.75		0	1
1688	101608	915	915	3816.74949S	14633.47438E	137.4	2.73		0	1
1689	101609	805	805	3816.74985S	14633.47411E	137.3	2.79		0	1
1690	101610	277	277	3816.75032S	14633.47396E	137.2	3.6	305.07	0	1
1691	101611	217	217	3816.75077S	14633.47367E	137.3	4.31	299.04	0	1
1692	101612	215	215	3816.75147S	14633.47345E	137.2	5.25	273.39	0	1
1693	101613	70	70	3816.75223S	14633.47324E	137.1	5.73	241.02	0	
1694	101614	34	34	3816.75297S	14633.47296E	137.1	5.38	228.37	0	
1695	101615	20	20	3816.75366S	14633.47262E	137	5.3	224.84	0	
1704	101624	13	13	3816.75991S	14633.46918E	136.7	5.12	206	0	
1705	101625	16	16	3816.76058S	14633.46876E	137	4.71	205.81	0	
1706	101626	26	26	3816.76129S	14633.46848E	137	4.55		0	
1707	101627	51	51	3816.76200S	14633.46824E	137	4.75	205.18	0	
1708	101628	41	41	3816.76280S	14633.46809E	136.9	5.29	200.72	0	
1709	101629	11	11	3816.76367S	14633.46800E	136.7	6.66	197.49	0	
1714	101634	16	16	3816.76778S	14633.46934E	135.5	5.19	175.27	0	
1715	101635	46	46	3816.76835S	14633.47023E	135.2	5.38	161.49	0	
1716	101636	95	95	3816.76886S	14633.47106E	134.9	4.64	152.93	0	
1717	101637	107	107	3816.76931S	14633.47189E	134.6	5.1	147.13	0	1
1718	101638	79	79	3816.76967S	14633.47286E	134.4	5.21	142.38	0	
1719	101639	62	62	3816.76982S	14633.47387E	134.1	5.21	134.39	0	
1720	101640	66	66	3816.76992S	14633.47494E	134	6.53	129.54	0	
1721	101641	90	90	3816.77002S	14633.47595E	133.7	5.38	125.76	0	
1722	101642	150	150	3816.77017S	14633.47702E	133.5	5.88	122.64	0	1
1723	101643	105	105	3816.77021S	14633.47798E	133.3	5.03	114.71	0	1
1724	101644	85	85	3816.77034S	14633.47892E	133	4.62	112.56	0	
1725	101645	117	117	3816.77044S	14633.47981E	132.8	4.88	107.56	0	1
1726	101646	68	68	3816.77054S	14633.48080E	132.5	5.34	106.26	0	
1727	101647	37	37	3816.77057S	14633.48179E	132.3	5.01	104.45	0	
1728	101648	32	32	3816.77063S	14633.48276E	132.1	5.06	100.73	0	
1729	101649	40	40	3816.77063S	14633.48381E	132	6.3	98.99	0	
1730	101650	41	41	3816.77074S	14633.48487E	131.7	5.43	98.52	0	
1731	101651	66	66	3816.77082S	14633.48594E	131.6	5.4	97.15	0	
1732	101652	72	72	3816.77091S	14633.48700E	131.4	5.51	97.24	0	
1733	101653	117	117	3816.77101S	14633.48807E	131.2	6.4	96.52	0	1
1734	101654	116	116	3816.77102S	14633.48916E	131.1	5.73	94.73	0	1
1735	101655	79	79	3816.77105S	14633.49025E	131	6.53	94.27	0	
1736	101656	138	138	3816.77111S	14633.49130E	130.8	5.3	94.12	0	1
1737	101657	107	107	3816.77115S	14633.49233E	130.7	5.4	93.77	0	1
1738	101658	62	62	3816.77113S	14633.49339E	130.7	5.32	92.13	0	
1739	101659	43	43	3816.77106S	14633.49445E	130.6	5.45	88.78	0	

1740	101700	83	83	3816.77100S	14633.49555E	130.5	6.3	88.5	0	
1741	101701	162	162	3816.77099S	14633.49668E	130.4	6.67	88.87	0	1
1742	101702	143	143	3816.77093S	14633.49778E	130.3	5.51	87.75	0	1
1743	101703	48	48	3816.77079S	14633.49886E	130.3	6.8	86.25	0	
1744	101704	18	18	3816.77066S	14633.49994E	130.3	5.51	85.82	0	
1746	101706	19	19	3816.77037S	14633.50204E	130.4	5.4	85.05	0	
1747	101707	44	44	3816.77011S	14633.50304E	130.3	6.29	81.78	0	
1748	101708	55	55	3816.76993S	14633.50405E	130.2	5.73	80.03	0	
1749	101709	47	47	3816.76958S	14633.50504E	130.1	6.16	78.58	0	
1750	101710	37	37	3816.76921S	14633.50593E	130	5.3	76.02	0	
1751	101711	15	15	3816.76856S	14633.50673E	130.1	6.82	69.51	0	
1752	101712	11	11	3816.76793S	14633.50753E	130	6.62	66.21	0	
1807	101807	10	10	3816.76139S	14633.55949E	127.9	4.92	86.47	0	
1808	101808	10	10	3816.76096S	14633.56031E	128.1	4.9	83.33	0	
1809	101809	11	11	3816.76067S	14633.56115E	128.2	5.05	82.34	0	
1810	101810	10	10	3816.76044S	14633.56218E	128.3	5.49	82.41	0	
1812	101812	11	11	3816.75999S	14633.56414E	128.6	5.4	83.87	0	
1817	101817	19	19	3816.76010S	14633.56961E	128.3	5.51	88.33	0	
1818	101818	15	15	3816.76021S	14633.57066E	128.5	5.93	90.31	0	
1819	101819	12	12	3816.76035S	14633.57164E	128.6	5.18	91.08	0	
1820	101820	18	18	3816.76041S	14633.57259E	128.7	5.12	91.3	0	
1821	101821	14	14	3816.76036S	14633.57355E	128.8	5.06	89.97	0	

Buildings and Structures Monitoring

		CH4 (ppm)			
ID	Description	10/2/2016	9/5/2016	16/8/2016	23/11/2016
LYLST001	Kitchen Sink Cupboard, Education Centre	0	0	8	0
LYLST002	Bench Storage seats, Education Centre	0	0	6	0
LYLST003a	Main Room, Education Centre	0	1	8	0
LYLST003b		0	3	6	0
LYLST003c		0	3	6	0
LYLST004	Stage area, Education Centre	0	2	5	0
LYLST005	Office, Education Centre	0	2	4	0
LYLST006	Bathroom sink, Education Centre	0	5	4	0
LYLST007	Bathroom sink, Education Centre	0	2	4	0
LYLST008	Storeroom, Education Centre	0	1	2	2
LYLST009		0	5	5	0
LYLST010		0	5	5	0
LYLST011		0	7	5	0

Service pits / external services

		CH4 (ppm)			
ID	Description	10/2/2016	9/5/2016	16/8/2016	23/11/2016
LYLSP001	Main power box and cables on eastern side of building	0	1	0	0
LYLSP002	Hot water service pipe work on eastern side of building	0	3	0	0
LYLSP003	D pipe western side of building underneath	0	6	0	0
LYLSP004	Sewer pipe, western side of building, underneath	0	5	0	0
LYLSP005	Sewer breather, western side of building	0	6	0	0
LYLSP006	Storm water pipe on slab at front of building	0	6	0	0
LYLSP007	Storm water pipe on slab at front of building	0	7	0	0
LYLSP008	Downpipe, north side of building	0	6	0	0
LYLSP009	stormwater pit at entrance to compound	0	3	0	0

APPENDIX C – Risk Matrix

						Before control measures					After control measures				
Risk description	**Source**	**Pathway**	**Impact**	**Receptor**	**Site specific considerations**	**Likelihood**	**Consequence**	**Risk**	**Acceptability assessment**	**Control measures**	**Likelihood**	**Consequence**	**Risk**	**Acceptability assessment**	**Actions**
Fugitive Landfill gas migrating via the groundwater, volatilising, accumulating in on-site buildings, exploding and causing harm to people	Landfill	volatilisation from groundwater	Explosion	Surface Infrastructure	**No evidence of leachate impacts in groundwater**										
Fugitive Landfill gas migrating via the groundwater, volatilising, accumulating in on-site buildings, exploding and causing harm to people	Landfill	volatilisation from groundwater	Explosion in on-site building	On-site staff and visitors	**No evidence of leachate impacts in groundwater**										
Fugitive Landfill gas migrating via the groundwater,volatilising, accumulating in on-site buildings, causing axphyxiation	Landfill	volatilisation from groundwater	Asphyxiation in on-site buildings	On-site staff and visitors	**No evidence of leachate impacts in groundwater, no cellars**										
Fugitive Landfill gas migrating via the groundwater, volatilising , accumulating in offsite buildings, causing asphyxiation	Landfill	volatilisation from groundwater	Asphyxiation in off-site buildings	Neighbours and workmen	**No evidence of leachate impacts in groundwater**										
Fugitive Landfill gas migrating via the groundwater, volatilising , accumulating in offsite buildings, exploding	Landfill	volatilisation from groundwater	Explosion off-site	Neighbours and workmen	**No evidence of leachate impacts in groundwater**										
Fugitive Landfill gas migrating via the groundwater, volatilising , accumulating in offsite buildings, exploding	Landfill	volatilisation from groundwater	Explosion Off-site	Surface Infrastructure	**No evidence of leachate impacts in groundwater**										
Fugitive Landfill gas migrating via the groundwater, volatilising and harming adjacent vegetation	Landfill	volatilisation from groundwater	Vegetation impacts	Adjacent vegetation	**No evidence of leachate impacts in groundwater**										
Fugitive Landfill gas migrating vertically through cap causing greenhouse emissions	Landfill	Through capping	Greenhouse emissions	Air environment	EPA approved cap being progressively installed, gas extraction system reduces landfill pressures	Fairly probable	Minor	5	Insignificant	Enhancement of cap vegetation to increase methane oxidation, progressive capping	Fairly probab	Minor	5	Insignificant	Include cap emissions survey in Monitoring program
Fugitive Landfill gas migrating vertically through cap impacting cap vegetation	Landfill	Through capping	Vegetation impacts	Cap vegetation	Cap vegetation yet to establish	Fairly probable	Minor	5	Insignificant	Enhancement of cap vegetation to increase methane oxidation, progressive capping	Somewhat u	Minor	4	Insignificant	Monitor visually during routine site inspections
Fugitive Landfill gas migrating vertically through cap exploding and destroying surface infrastructure	Landfill	Through capping	Explosion	Surface infrastructure	multiple infrastructure items near perimeter of cells, open aspect, gas extraction system reduces pressure in the landfill	Unlikely	Significant	9	Acceptable	Enhancement of cap vegetation to increase methane oxidation, progressive capping	Extremely unlikely	Significant	3	Insignificant	Include cap emissions survey and service pits in Monitoring program
Fugitive Landfill gas migrating vertically through cap, accumulating in onsite buildings exploding and causing harm to people	Landfill	Through capping	Explosion	On-site staff and visitors	Education Centre is the only infrastructure people can enter, building is on stumps and not indirect contact with the ground, open aspect. Gas extraction system reduces landfill pressures	Unlikely	Significant	9	Acceptable	Enhancement of cap vegetation to increase methane oxidation, progressive capping	Extremely unlikely	Significant	3	Insignificant	Include cap emissions survey and buildings and structures in Monitoring program
Leaking LFG collection infrastructure causing greenhouse emissions	Landfill	Collection infrastructure malfunction	Greenhouse emissions	Air environment	Regular inspections by Run Energy	Somewhat unlikely	Minor	4	Insignificant						
Leaking LFG collection infrastructure damaging cap vegetation	Landfill	Collection infrastructure malfunction	Vegetation impacts	Cap vegetation	Cap vegetation yet to establish, regular inspections by Run Energy	Somewhat unlikely	Minor	4	Insignificant						
Leaking LFG collection infrastructure causing explosion damaging surface infrastructure	Landfill	Collection infrastructure malfunction	Explosion	Surface infrastructure	multiple infrastructure items near perimeter of cells, open aspect, high in the landscape, regular inspections by Run Energy	Unlikely	Significant	9	Acceptable						Run Energy Inspections to continue with reporting to Council
Leaking LFG collection infrastructure causing explosion causing harm to people	Landfill	Collection infrastructure malfunction	Explosion	On-site staff and visitors	Education Centre is the only infrastructure people can enter, building is on stumps and well ventilated, open aspect, regular inspections by Run Energy	Unlikely	Significant	9	Acceptable						Run Energy Inspections to continue with reporting to Council
Fugitive Landfill gas migrating laterally through geology impacting adjacent vegetation	Landfill	Through geology	Vegetation impacts	Adjacent vegetation	All cells are lined, extraction system manages gas pressures. Geology is permeable so gas will not travel far laterally. Forestry areas are adjacent, some recently logged	Extremely unlikely	Noticeable	2	Insignificant						Include perimeter LFG monitoring bores in Monitoring Program, Monitor visually during routine site inspections

						Before control measures					After control measures				
Risk description	**Source**	**Pathway**	**Impact**	**Receptor**	**Site specific considerations**	**Likelihood**	**Consequence**	**Risk**	**Acceptability assessment**	**Control measures**	**Likelihood**	**Consequence**	**Risk**	**Acceptability assessment**	**Actions**
Fugitive Landfill gas migrating laterally through geology, accumulating in onsite buildings, exploding causing property damage	Landfill	Through geology	Explosion on-site	Surface infrastructure	All cells are lined, extraction system manages gas pressures.	Unlikely	Significant	9	Acceptable	Enhance understanding by implementing monitoring program	Extremely unlikely	Significant	3	Insignificant	Include buildings and structures in Monitoring Program
Fugitive Landfill gas migrating laterally through geology, accumulating in onsite buildings, causing asphyxiation	Landfill	Through geology	Asphyxiation in on-site buildings	On-site staff and visitors	**No cellars in on-site buildings**										
Fugitive Landfill gas migrating laterally through geology, accumulating in onsite buildings, exploding injuring staff	Landfill	Through geology	Explosion in on-site building	On-site staff and visitors	Low gas generation rates, low permeability of upper portions of the natural formations	Unlikely	Significant	9	Acceptable	Enhance understanding by implementing monitoring program	Extremely unlikely	Significant	3	Insignificant	Include buildings and structures in Monitoring Program
Fugitive Landfill gas migrating laterally through geology, accumulating in offsite buildings, causing asphyxiation	Landfill	Through geology	Asphyxiation off site	Neighbours and workmen	**No pathway to neighbour's buildings**										
Fugitive Landfill gas migrating laterally through geology, accumulating in offsite buildings, exploding injuring staff	Landfill	Through geology	Explosion off-site	Neighbours and workmen	**No pathway to neighbour's buildings**										
Fugitive Landfill gas migrating laterally through geology, accumulating in offsite buildings, exploding causing property damage	Landfill	Through geology	Explosion in off-site buildings	Property damage	**No pathway to neighbour's buildings**										
Fugitive Landfill gas migrating laterally through services, impacting adjacent vegetation	Landfill	Through services	vegetation impacts	Adjacent vegetation	All cells are lined, extraction system manages gas pressures. Geology is permeable so gas will not travel far laterally. Forestry areas are adjacent, some recently logged	Extremely unlikely	Minor	1	Acceptable	Enhance understanding by implementing monitoring program	Fairly probab	Minor	5	Insignificant	Include LFG monitoring in services in the Periodic Monitoring Program, monitor visually during routine site inspections
Fugitive Landfill gas migrating laterally through services, accumulating in on-site buildings, exploding harming property	Landfill	Through services	Explosion on-site	Surface infrastructure	All cells are lined, extraction system manages gas pressures. Geology is permeable so gas will not travel far laterally.	Very Unlikely	Significant	6	Insignificant						Include buildings and structures in Monitoring Program
Fugitive Landfill gas migrating laterally through services, accumulating in on-site buildings, causing asphyxiation	Landfill	Through services	Asphyxiation in on-site buildings	On-site staff and visitors	**No cellars in buildings on-site**										
Fugitive Landfill gas migrating laterally through services, accumulating in on-site buildings, exploding harming people	Landfill	Through services	Explosion in on-site building	On-site staff and visitors	All cells are lined, extraction system manages gas pressures. Geology is permeable so gas will not travel far laterally.	Extremely unlikely	Significant	3	Insignificant						Include service pits in Monitoring Program
Fugitive Landfill gas migrating laterally through services, accumulating in off-site buildings, causing asphyxiation	Landfill	Through services	Asphyxiation off site	Neighbours and workmen	**No pathway to neighbour's buildings**										
Fugitive Landfill gas migrating laterally through services, accumulating in off-site buildings, exploding harming people	Landfill	Through services	Explosion off-site	Neighbours and workmen	**No pathway to neighbour's buildings**										
Fugitive Landfill gas migrating laterally through services, accumulating in off-site buildings, exploding harming property	Landfill	Through services	Explosion in off-site buildings	Property damage	**No pathway to neighbour's buildings**										
Release of methane from dissolved methane in the leachate in the pond	Pond	Emissions to air	Greenhouse emissions	Air Environment	Pond is aerated	Very Unlikely	Minor	2	Insignificant						
Methane volatilising from leachate leaking from pond impacting vegetation	Pond	Lateral through geology	Vegetation impacts	Adjacent vegetation	**Pond is lined, no indication of leakage**										
Methane volatilising from leachate leaking from pond, accumulating in infrastructure and exploding damaging on-site infrastructure	Pond	Lateral through geology	Explosion	Surface Infrastructure	**Pond is lined, no indication of leakage**										
Methane volatilising from leachate leaking from pond, accumulating in infrastructure and exploding injuring staff/visitors	Pond	Lateral through geology	Explosion	On-site staff and visitors	**Pond is lined, no indication of leakage**										
Methane volatilising from leachate leaking from pond, accumulating in infrastructure causing asphyxiation hazard to onsite staff and visitors	Pond	Lateral through geology	Asphyxiation	On-site staff and visitors	**No cellars**										
Methane volatilising from leachate leaking from pond, accumulating in infrastructure and exploding, injuring neighbours or workmen	Pond	Lateral through geology	Explosion	Neighbours and workmen	**No pathway to neighbour's buildings**										
Methane volatilising from leachate leaking from pond, accumulating in infrastructure causing asphyxiation hazard to neighbours or workmen	Pond	Lateral through geology	Asphyxiation	Neighbours and workmen	**No pathway to neighbour's buildings**										

						Before control measures					After control measures				
Risk description	Source	Pathway	Impact	Receptor	Site specific considerations	Likelihood	Consequence	Risk	Acceptability assessment	Control measures	Likelihood	Consequence	Risk	Acceptability assessment	Actions
Methane volatilising from leachate leaking from pond, accumulating in infrastructure and exploding damaging offsite infrastructure	Pond	Lateral through geology	Explosion in off-site buildings	Property damage	**No pathway to neighbour's buildings**										
Methane volatilising from coal seam, migrating upwards to impact vegetation	Coal seams	Vertical through geology	Vegetation impacts	Adjacent vegetation	Majority of methane will oxidise to CO_2 by soil microbes	Extremely unlikely	Minor	1	Insignificant						
Methane volatilising from coal seam, migrating upwards, accumulating in infrastructure and exploding damaging on-site infrastructure	Coal seams	Vertical through geology	Explosion	Surface Infrastructure	Majority of methane will oxidise to CO_2 by soil microbesEducation centre is on stumps with good ventilation	Extremely unlikely	Minor	1	Insignificant						
Methane volatilising from coal seam, migrating upwards, accumulating in infrastructure and exploding injuring staff or visitors	Coal seams	Vertical through geology	Explosion	On-site staff and visitors	Majority of methane will oxidise to CO_2 by soil microbes	Extremely unlikely	Minor	1	Insignificant						
Methane volatilising from coal seam, migrating upwards, accumulating in infrastructure causing asphyxiation hazard to staff or visitors	Coal seams	Vertical through geology	Asphyxiation	On-site staff and visitors	Majority of methane will oxidise to CO_2 by soil microbes	Extremely unlikely	Minor	1	Insignificant						
Methane volatilising from coal seam, migrating upwards, accumulating in infrastructure and exploding injuring neighbours or workmen	Coal seams	Vertical through geology	Explosion	Neighbours and workmen	Majority of methane will oxidise to CO_2 by soil microbes	Extremely unlikely	Minor	1	Insignificant						
Methane volatilising from coal seam, migrating upwards causing asphyxiation hazard to neighbours or workmen	Coal seams	Vertical through geology	Asphyxiation	Neighbours and workmen	Majority of methane will oxidise to CO_2 by soil microbes	Extremely unlikely	Minor	1	Insignificant						
Methane volatilising from coal seam, migrating upwards, accumulating in infrastructure and exploding damagin neighbours property	Coal seams	Vertical through geology	Explosion in off-site buildings	Property damage	Majority of methane will oxidise to CO_2 by soil microbes	Extremely unlikely	Minor	1	Insignificant						

Appendix D

Ground Consulting (2019) "*Annual Environmental Monitoring Report - Hyland Highway Landfill*" for 2018/19

ABN 8976 837 6280

ANNUAL ENVIRONMENTAL MONITORING REPORT

HYLAND HIGHWAY LANDFILL
64 HYLAND HIGHWAY
LOY YANG, VICTORIA, 3844

Prepared for:
ALS ON BEHALF OF LATROBE CITY COUNCIL

Prepared by:
GROUND CONSULTING PTY. LTD.

Date:
23 SEPTEMBER 2019

Project/Report Number:
V2101_002_003_HYLAND

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Author:	Craig Barker
Name of Client:	ALS
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Technical Limitations, Uncertainties and Assumptions - This document is issued, subject to the technical limitations, uncertainties and assumptions as described in **Section 8.**

Confidentiality – This report was prepared for Latrobe City Council, ALS and the incumbent S53V Landfill Operations Environmental Auditor, and may contain confidential information. If you receive this report in error, please contact Ground Consulting for collection of this document.

By
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Craig Barker
Ground Consulting Pty. Ltd.
Principal Geo-Environmental Engineer

EXECUTIVE SUMMARY

Ground Consulting Pty Ltd (Ground Consulting) were engaged by ALS to prepare an Annual Environmental Monitoring Report (AMR) on the ongoing: groundwater, surface water, leachate, and landfill gas (LFG) monitoring at the Hyland Highway Landfill ('site') owned and operated by Latrobe City Council (Council). This AMR has been prepared, based on the assessment of data collected and provided to Ground Consulting by ALS, for the monitoring period: August 2018 to May 2019.

Three events of groundwater, surface water, leachate, and LFG monitoring were conducted during the 2018/2019 monitoring period. Monitoring events were generally required to be undertaken on a quarterly basis. However, only three events of monitoring were conducted, due to the delay in Contract award. The three events of monitoring are referred to as the: "November 2018", "February 2019", and "May 2019" events.

Based on the findings of the monitoring program, an indicative assessment of compliance against the specifications in Tender No. 488 issued by Council has been provided. It is expected that this assessment will be retained by Council, as a key supporting information for the 2018/2019 Annual Performance Statement (APS), with the final compliance to be determined by Council in conjunction with the incumbent Environmental Auditor (Landfill Operations) and EPA.

The findings of the compliance assessment are summarised below:

- **Monitoring Frequencies and Dates:** The requirement for certain quarterly testing of various groundwater, surface water, leachate, and LFG parameters at the site were not fully complied with, given the delayed awarding of the Contract to ALS. Council awarded the contract to ALS in mid-November 2018, which meant the planned August 2018 testing was not conducted. The remainder of the monitoring field schedule was generally conducted to plan:
    - Groundwater monitoring well BH05, across the sampling events, was the only monitoring well which could be successfully sampled. BH05 was successfully sampled in February 2019, and June 2019. The May 2019 groundwater monitoring event was unsuccessful, due to limited sample volumes, where an additional sampling attempt was conducted in June 2019; and
    - Other on-site groundwater monitoring wells were either noted in the field as 'dry' or 'blocked' across monitoring events.

- **Monitoring Parameters:** All the parameters defined in the Council Tender document were measured, as far as practically possible across the monitoring events;

- **Sampling Methods**: Sampling methods used for: groundwater, surface water, leachate and LFG sampling were generally conducted (where possible) in accordance to methods specified in the Tender document. EPA (2000) Publication 669 and EPA (2009) IWRG 701 were generally followed, to conduct groundwater and leachate sampling. Similarly, EPA (2009) IWRG701 was followed to sample surface water. LFG sampling was undertaken in accordance with the LFG monitoring equipment details and procedures as provided in Table 5 and Table 6 of the Council Tender document;

- **Quality Assurance / Quality Certification Compliance**: QA/QC compliance requirements were generally adhered to; and

- **Reporting**: ALS is not fully compliant on reporting requirements. The Council Tender requires that a factual report be submitted to Council following each monitoring event. ALS has not provided the November 2018 factual report to Council. This AMR complies with the relevant requirements of the Council Tender.

Key monitoring results across the monitoring period: August 2018 to May 2019 are summarised below:

Groundwater

All bores except BH05, were either dry or blocked, leading to limited available monitoring of groundwater across all 2018-2019 monitoring events. Since, there is only one set of groundwater monitoring bore data, it is not possible to create contour interpretations for standing groundwater levels and matched / inferred groundwater flow direction for the upper aquifer system for the site. The limited amount of groundwater data makes it difficult to perform any analysis for trends and potential impacts to the upper groundwater system from landfill leachate.

- Groundwater levels for monitoring well BH05 have remained relatively consistent across time. The most recent monitoring period (i.e., the two events at November 2018 and February 2019) gave similar reduced water levels when compared to the data back to May 2016 (i.e., a SWL ranging between 52.62 m AHD to 53.24 m AHD);
- Dissolved iron levels at BH05 during the first two monitoring events exceeded the Primary Contact Recreation (PCR) beneficial use Investigation Level (IL);
- All other recorded dissolved chemical concentrations of potential concern from well BH05 were observed to be below relevant ILs; and
- Groundwater from BH05 was observed to be acidic, with depleted DO levels. These observations are similar to that shown from earlier monitoring at this well.

The most recent set of groundwater sampling results from monitoring well BH05 does not suggest any noticeable leachate impact from the landfill.

It is recommended that the blocked groundwater monitoring wells at the site be either repaired and cleaned-out/redeveloped, or instead replaced and made suitable for future groundwater monitoring events.

Surface Water and Reverse Osmosis Treated Wastewater

Dissolved iron concentrations at Traralgon Creek upstream and downstream both were observed to exceed the selected ILs for PCR and Irrigation groundwater beneficial use. Other dissolved potential chemicals of concern as analysed were all observed to be within acceptable levels when compared to ILs.

Dissolved ammonia concentration in SW01 and SW02 exceeded ILs for PCR during the November 2018 and May 2019 monitoring events respectively.

The level of laboratory reporting for dissolved BTEX (the laboratory report level) needs to be suitably lowered for future laboratory analysis, such that matrix interference affects are appropriately addressed. On the current data-set, it is difficult to ascertain whether the concentrations of dissolved benzene in the two stormwater ponds (SW01 and SW02) exceeded ILs.

The surface water testing results for the period were noted to differ significantly from the previous year of monitoring results, as conducted by Monarc Environmental. The 2017-2018 results (Monarc Environmental) showed ANZECC and NHMRC IL’s (as nominated by Monarc Environmental) were exceeded for dissolved chloride, magnesium, phosphorus, ammonia, and nitrate at various water testing locations. The same ILs were also exceeded for RO permeate, across the 2017-2018 testing conducted by Monarc Environmental.

Leachate Waters

Monitoring and testing across landfill leachate waters indicated:

- Dissolved hydrocarbon concentrations exceeded the majority of nominated ILs (related to groundwater beneficial use) in all the leachate waters (Leachate Ponds and Leachate Sumps);
- Dissolved sodium and chloride concentrations exceeded nominated ILs for PCR, both the leachate ponds and leachate sumps;
- Dissolved sulphate concentrations indicate IL exceedance for PCR in Leachate Ponds 1 and 2;
- TDS levels exceeded the Livestock IL for all leachate waters;
- Dissolved iron and manganese concentrations were above the Irrigation and PCR IL’s;

- Both leachate ponds (LP01 and LP02) and Leachate Sumps (LS01 and LS02) exceeded nitrate (as N) ILs for ANZECC (2000) – 95% Freshwater Protection, ANZECC (2000) – Irrigation (LTV),and PCR across the 2018-2019 monitoring period except LP01 in November 2018 monitoring; and
- Dissolved iron and manganese were also above the ADWG 2011 health (potable water) and ANZECC 2000 – 95% Freshwater Protection standards across all site leachate ponds and sumps.

The above observed results are noted to be different from the previous year's monitoring work.

Dissolved hydrocarbons were recorded only in LP01, from the March 2018 monitoring event (by Monarc Environmental, 2018).

It is recommended that sampling and testing for dissolved hydrocarbons be continued with the monitoring and testing across all leachate waters at the site.

LFG Observations

A number of exceedances of methane were observed across the three LFG surface emission monitoring events that were conducted at the site across the monitoting period:

- A total of 16 leaks/exceedances for methane were observed across the first monitoring event (November 2018);
- There were only five exceedances noted across the final two surface emission monitoring events;
- The majority of these observed exceedances to the Landfill Best Practice Environmental Measures ('BPEM') Publication 788.3 Action Levels were either associated with montoring close to pipe penetartions through the cap, or a result of localised cap wash-outs that will need to be rectified by Council.

For LFG bore monitoring (subsurface investigations) across the monitoring period, the following was observed:

- For sampling on 29 November 2018, no methane was detected across any of the 12 LFG bores; and relatively moderate exceedance only to the carbon dioxide Action Level of 1.5 % (i.e., no background carbon dioxide allowance was conservatively assumed for the site) were noted for LFG bores: LFG02 (2.4 % CO_2), LFG03 (2.3 % CO_2) and LFG09 (2 % CO_2). Matched bore flow rates at these LFG bores ranged up to 0.3 L/Hr (i.e., a relatively low borehole flow rate);
- For sampling on 20 February 2019, all LFG bores were able to be tested across this monitoring event, where no methane was detected from any of the 12 LFG bores. Notable exceedance of the carbon dioxide Action Level was noted for LFG bore 01 (15.1 %), with other minor exceedance only at bores LFG10 (1.7 %) and LFG12 (1.7 %). Gas flow rate at LFG01 was at 0.7 L/hr, where for the other two bores LFG10 and LFG12, flow rates were between 0.3 to 0.4 L/hr; and
- For sampling on 15 May 2019, all LFG bores were able to be tested across the monitoring event, where no methane was detected from any of the 12 LFG bores. Notable exceedance of the carbon dioxide Action Level was noted for LFG bore 01 (10 %), with no other exceedances. Gas flow rate at LFG01 was at 0.8 L/hr.

LFG monitoring should continue to be undertaken at the site, to allow for the assessment of:

- The LFG collection and abatement system;
- The typical composition for off-gas being produced;
- The estimated generation rates for LFG from remnant waste; and
- Checks for the potential migration of LFG from the containment cells.

GROUND CONSULTING PTY. LTD.

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TABLES (within text)

FIGURES

APPENDICES

LIST OF ACRONYMS

Acronym	Definition
ADWG	Australian Drinking Water Guidelines
AHD	Australian Height Datum
ALS	Australian Laboratory Services
AMR	Annual Environmental Monitoring Report
ANZECC	Australian and New Zealand Environment and Conservation Council
ANZECC/ARMCANZ	Australian and New Zealand Environment and Conservation Council/ Agriculture and Resource Management Council of Australia and New Zealand
APS	Annual Performance Statement
AS/NZS	Australian/New Zealand Standard
BTEX	Benzene, toluene, ethyl benzene, xylenes
CCME	Canadian Council of Ministers for the Environment
COC	Chain of Custody
Council	Latrobe City Council
CSM	Conceptual Site Model
DO	Dissolved Oxygen
EPA	Environment Protection Authority (Victoria)
EQL	Equivalent Quantification Level
IBE	Ionic Balance Equation
IWRG	Industrial Waste Resource Guidelines
km	Kilometre
LFG	Landfill gas
LSIO	Land Subject to Inundation Overlay
meq/L	Miliequivalents per Litre
NATA	National Association of Testing Authorities
NEPC	National Environmental Protection Council
NEPM	National Environment Protection Measure. Typically referred to is the 'Site Contamination NEPM' issued by the National Environment Protection Council
NHMRC & NRMMC	National Health & Medical Research Council and Natural Resource Management Ministerial Council, Canberra, Australia
PCR	Primary Contact Recreation
ppm	Parts per million
QA/QC	Quality Assurance / Quality Control
RPD	Relative Percentage Difference
SECV	State Electricity Commission of Victoria
SEM	Surface Gas Emissions Monitoring
SEPP	State Environment Protection Policy
SEPP PMCL	State Environment Protection Policy (Prevention and Management of Contaminated Land)
SEPP Waters	State Environment Protection Policy (Waters)
SRO	State Resource Overlay
TDS	Total Dissolved Solids
US EPA	United States Environment Protection Agency
VVG	Visualising Victoria's Groundwater
WDE	Water Dependent Ecosystems
WHO	World Health Organisation

1 INTRODUCTION

1.1 General/Background

Ground Consulting Pty. Ltd. (Ground Consulting) were engaged by ALS, to prepare an Annual Environmental Monitoring Report (AMR) on behalf of Latrobe City Council (Council), for the Hyland Highway Landfill, at 64 Hyland Highway, Loy Yang, Victoria (the 'site').

Ground Consulting was approached by ALS to prepare the AMR in accordance with Council's Tender document: LCC-488. Environmental monitoring data (waters, groundwaters, leachate, and landfill gas (LFG)) were collected from the site between November 2018 and June 2019. The data was assessed, analysed and reported, generally conforming to the Tender document requirements. This AMR will form part of the 2018/2019 Annual Performance Statement (APS) to be prepared by Council for the site.

A locality plan is included as **Figure 1** and more detailed definition of the site is shown within **Figure 2**.

1.2 Purpose of Annual Environmental Monitoring Report

The purpose of the AMR is to:

- Satisfy the requirements of the Council's Tender document: LCC-488 and related amendment. The Tender documentation is attached in **Appendix A**;
- Assist Council in reporting to EPA Victoria, in regard to their 2018/2019 APS; and
- Assist the incumbent Section 53V Environmental Auditor (Landfill Operations) in reviewing site environmental data.

EPA Landfill Licence: 25565, last amended 17 August 2018, is provided in **Appendix B**.

1.3 Project Objectives

Project objectives were:

- Review the collected (2018/2019) environmental monitoring data and screen results against applicable Investigation Levels (ILs), interpret the monitoring results and review Quality Assurance/Quality Certification (QA/QC) results;
- Review selected and available historical data available to identify potential trends;
- Assess for compliance across the conditions of the Landfill Licence; and
- Assess the impacts of the landfill's operation on the surrounding environment, such as groundwater, surface water, land and atmosphere and LFGs.

1.4 Scope of Works

The scope of work comprised:

- Collection of groundwater, surface water, landfill leachate, and LFG samples at the locations and frequencies defined within Section 2 of Tender LCC-488;
- Conduct a matched QA/AC program for groundwater, leachate and surface water, containing the required components, as mentioned in Section 3 of Tender LCC-488; and
- Prepare an AMR, fulfilling the general requirements provided in Section 4 of Tender LCC-488.

Based on the above scope of works, the fieldwork undertaken by ALS is summarised in **Table 1.1**.

Table 1.1: Fieldwork Conducted by ALS for Annual Environmental Monitoring

<table>
<tr><th>Parameter</th><th>Suggested Monitoring Dates
(first week of the month)</th><th>Dates Monitored</th></tr>
<tr><td>Groundwater Level</td><td rowspan="4">Quarterly on:
• August 2018;
• November 2018;
• February 2019; and
• May 2019.</td><td rowspan="4">GW, leachate and surface water levels monitored on:
• 28 and 29 November 2018;
• 19 and 28 February 2019;
• 16 May 2019; and
• 13 June 2019.
LFG monitored on:
• 29 and 30 November 2018;
• 20 February 2019; and
• 15 May 2019.</td></tr>
<tr><td>Leachate Level</td></tr>
<tr><td>Surface water Level</td></tr>
<tr><td>LFG (subsurface) quality</td></tr>
<tr><td>Groundwater Quality</td><td rowspan="4">Bi-annually on:
• November 2018; and
• May 2019.</td><td rowspan="4">GW, leachate, and surface water quality monitored on:
• 28 November 2018; and
• 16 May 2019.
LFG (buildings and subsurface services) measured on:
• 15 May 2019</td></tr>
<tr><td>Leachate Quality</td></tr>
<tr><td>Surface Water Quality</td></tr>
<tr><td>LFG (building, structures, and subsurface services)</td></tr>
</table>

2 SITE CHARACTERISATION

2.1 Site Description

2.1.1 General Details

General site information is provided in **Table 2.1**.

Table 2.1 – Site Description

Site Information	Description
Site Address	64 Hyland Highway, Loy Yang, Victoria, 3844.
Site Area	The total site area is approximately 220,000 m^2 (based on the area as defined by the landfill Licence). • The landfill area is estimated at 12.8 Ha; • The actual landfill cell footprint is estimated at 8.2 Ha.
Current Site Use	Hyland Highway Landfill.
Historical Site Use	Blue Gum Plantation.
Current Zoning	Surrounding land use • North: Special Use Zone (SUZ1); • South: Farming Zone (FZ); • East: FZ; and • West: FZ. On the south-west side of the site, across Cochranes Road, is a Rural Living Zone (RLZ6). A Land Subject to Inundation Overlay (LSIO) and State Resource Overlay (SRO) are in the vicinity of the site, however those overlays do not directly affect the site. Planning Property Reports for the site are presented in **Appendix C**.
Environmental Audit Overlay	None
Nearest Surface water receptor	Traralgon Creek (located approximately 1.1 km from the western boundary of the site).
Groundwater Segment	Segment A1 (refer to Section 4.1).

2.1.2 Waste Cell Details & Other Infrastructure Aspects

Locations for the various landfill waste cells are shown on **Figure 3.**

Table 2.2 – Waste Cell & Other Landfill Infrastructure Details

Waste Cell or Item	Description
1 & 2	• Closed two landfill waste cells, which were completed as a single combined cell of total approximate plan area 2.8 Ha; • Waste placement ceased July 2012; and • Final capping placed in 2014. Base Liner: 1.0 m thick compacted clay liner (CCL), HDPE geomembrane, geosynthetic drainage grid, geosynthetic clay liner (GCL) and 0.3 m thick drainage aggregate blanket. Capping: Council indicate, there is an active LFG removal system servicing these cells

Waste Cell or Item	Description
	Leachate Collection: Primary collection via a drainage blanket, converging to the south-east corner low point and flowing to Leachate Pond No. 1 (LP01) under gravity. Secondary leachate collection via a geosynthetic drainage grid, via a collector drain along the east edge of Cells 1 and 2, which grades to the same south-east low point. It is understood that there is currently, no ability to directly measure leachate levels within Cells 1 and 2.
3A & 3B	Cell 3A • Closed waste cell. Waste was initially placed from mid-2012; and • Area of approximately 1.2 Ha. Cell 3B • Closed waste cell. Waste was initially placed from mid-2013; and • Area of approximately 1.2 Ha. Base Liner: 1.0 m thick CCL, 1.5 mm thick HDPE geomembrane, geosynthetic drainage grid, GCL and 0.3 m thick drainage aggregate blanket. Capping: Cells 3A and 3B are understood to have a combination of final and interim capping at this stage: • Part of Cell 3 (approximately 1.0 Ha is capped). Cell 3 was split as Cells '3A' & '3B' to renew the Landfill Licence when the part of a Cell 3 was completed.; and • For the purpose of landfill capping, the entire cell is consider as 'Cell 3'. Perched Groundwater Control: North-west slope of Cell 3B (seepage water collection). Leachate Collection: Primary collection via drainage blanket, converging to south-west corner low point. Leachate is pumped-off, via a collector sump to Leachate Pond No. 2 (LP02). There is the ability to monitor leachate level from this sump.
4	• Active waste cell. • Area of approximately 1.2 Ha. Base liner: 0.5 m thick CCL, two geosynthetic clay liners, 1.5 mm HDPE geomembrane, a cushion geotextile, 0.3 m aggregate drainage layer and a filter geotextile. Leachate Collection: There is a leachate collection sump along the southern boundary of this cell. Leachate is pumped-off to LP02.
5	• Active waste cell. • Area of approximately 1.3 Ha. • Cell design equivalent to Cell 4. Leachate is pumped-off to LP02.via Cell 4 sump.
Future Cells Area	Future trapezoidal plan area of approximately 1.5 Ha, to the east side of the existing waste cells.
Leachate Pond No. 1	• Lined pond with a design capacity of approximately 1.2 ML; and • Excess leachate from Leachate Pond No. 1 used to be periodically directed to LP02 (as required); and • This Leachate Pond is understood from Council to not be used anymore.
Leachate Pond No. 2	• Lined pond has a design capacity of approximately 8.4 ML; and • Pond construction occurred in 2012.
Reverse Osmosis (RO) Treatment Plant	• The RO Plant has a fluid treatment capacity of 100 kL /day; • Updated RO infrastructure is located next to LP02; • Brine from the RO treatment is returned to LP02; • Treated permeate is discharged to the Primary Stormwater Pond; and • Between July 2013 to December 2013, the RO Plant discharged an average of 17.1 kL / day of permeate to the Primary Stormwater Pond. • The RO Plant is no longer in use.

Waste Cell or Item	Description
Primary Stormwater Pond	• Located to the south-west of LP01; and • This is a Primary (sediment removal) Pond, where water then overflows, across a weir to the Secondary Stormwater Pond.
Secondary Stormwater Pond	• Located to the south-west of LP01; and • Storage capacity for water is understood to be 4 ML.

2.2 Site Environmental Setting

2.2.1 Topography

According to the latest Environmental Audit Report prepared by Nolan Consulting (2017), an east-west trending ridgeline is located on the northern boundary of the site. The northern and southern boundary of the site are at an elevation of approximately 152 m Australian Height Datum (AHD) and 119 m AHD respectively.

2.2.2 Regional Geology

A search of the regional geology from published reports, suggest that the site lies in the Gippsland Basin and comprises of unconsolidated Quaternary and Tertiary sediments, of both marine and non-marine origin. The regional stratigraphy consists of the following aquifer units summarised below:

Haunted Hills formation: The Haunted Hills Formation are relatively thin units, extensive across the plains of the Gippsland Basin. The formation can range in thickness from 5 m to 100 m. The aquifers of this formation are generally within 30 m of the land surface and are either unconfined or semi-confined. It is of Upper Tertiary (Pliocene) age. (Australian Government, Bioregional Assessments; Nolan Consulting, 2017).

Morwell Formation: The Morwell Formation consists of ligneous clay, thin coals and sands. The formation thickens from 7.5 m in the south-west to the north and across the top of the site to over 30 m. This formation is of Mid-Tertiary age. (Nolan Consulting, 2017).

Traralgon Formation: The top of this formation is the ‘T1 Coal seam’. The T1 coal seam varies in thickness from 23 m in the south of the site, to 59 m to the north at State Electricity Commission Victoria (SECV) exploration bore LY481 (Nolan Consulting, 2017). The formation consists of coarser-grained sandstones and conglomerates at the base, coals and shales in the middle, and sandstones, shales, and minor coals near the top (Australian Stratigraphic Units Database).

Lower Cretaceous: This is the bedrock beneath the site, comprising of mudstones, sandstones, conglomerates, minor coals, and volcanic rocks (Nolan Consulting, 2017).

2.2.3 Regional Hydrogeology

The site lies in the vicinity of Loy Yang Coal Mine and coal-powered electrical power plants: Loy Yang A and Loy Yang B. The hydrogeology of the area has been impacted by these facilities and has been under investigation since the 1950s. Hydrogeological investigation of the area generally started with the drilling of coal exploration bores. These exploration bores intersected the Morwell Formation, T1 Coals, and the Traralgon Formation aquifer (Nolan Consulting, 2017).

The lower aquifer system has experienced significant stress since the commissioning of the open-cut coal mines. A review of available reports and articles suggest groundwater flow has altered significantly since the 1960s, due to the dewatering operations at the Loy Yang and Morwell open-cut mines (Australian Government, Bioregional Assessments). Groundwater flow in the lower aquifer system is now interpreted generally radially, towards these mines. Extraction of groundwater for oil and gas exploration purposes exceeds the Annual regional recharge, which has caused a 1 m to 1.5 m decline in groundwater levels per year since the 1960s (Australian Government, Bioregional Assessments).

A search of the VVG data-base developed by the University of Ballarat (http://www.vvg.org.au, 2019) identified 62 Water Monitoring Information System (WMIS) bores within a 1 km radius of the site. The depth of the bores ranged from 3 m below ground surface level (bgs) - (bores: 314278 and 314279) to 337 m (bore 314738). The majority of these bores are, however, less than 200 m bgs in depth. The groundwater database search results are presented in **Appendix D**.

2.2.4 Nearby Surface Water Bodies

The closest significant surface water body to the site is the Traralgon Creek approximately 1.1 km from the western boundary of the site. Traralgon Creek flows in the northerly direction, eventually discharging into the Latrobe River. Shingle Creek lies approximately 2.5 km south-west of the site and discharges into Traralgon Creek, roughly 400 m downstream.

3 METHODOLOGY

3.1 Investigation Guidelines

The following regulatory guidelines and standards were generally referred to when conducting site sampling and monitoring:

- EPA Publication 668 – Hydrogeological Assessment (Groundwater Quality) Guidelines, September 2006;
- EPA Publication 669 - Groundwater Sampling Guidelines, April 2000;
- EPA Publication IWRG701- Sampling and Analysis of Waste Water, Soils and Wastes, June 2009;
- EPA Victoria Publication. 788.3. Best Practice Environmental Management. Siting, Design, Operation and Rehabilitation of Landfills, August 2015;
- Australian/New Zealand Standard: Water Quality – Sampling – Part 11: Guidance on Sampling of Groundwaters, AS/NZS 5667.11-1998;
- EPA Victoria Publication 1684, Landfill Gas Fugitive Emissions Monitoring Guidelines, February 2018; and
- EPA Publication 1490.1, Closed Landfill Guidelines, January 2018.

3.2 Water Sampling Methodology

Groundwater sampling was conducted in accordance with EPA Publication 669 – Groundwater Sampling Guidelines, 2000 and ALS Internal Procedure EN/67.11 **(**refer to **Appendix E-1)**. If conditions arose, where groundwater samples were not able to be filtered in the field, sample filtering was conducted as soon as the samples arrived in the laboratory.

Low flow sampling (i.e., 'Micro-purge' or a similar sampling device) was conducted to collect groundwater samples as preferred by Council. If site conditions did not allow for suitable low-flow sampling, samples were then typically collected using disposable hand bailers or 12-Volt battery powered, electrical submersible down-well pumps (i.e.,'bilge or whale pumps'). Sampling locations are presented within **Figure 3**.

Surface water sampling were typically conducted using an extension pole and a water sampling vessel. The typical sampling protocol followed is presented in **Appendix E-2**.

All field-testing devices were checked for acceptable measurements against control standards each day of sampling. The QA/QC sections of this Report (**Section 3.4** and **Appendix I**) detail the procedures implemented and observed quality checking results.

Samples were sent to a National Association of Testing Authorities (NATA) accredited laboratory for analysis accompanied by Field Analysis Request Forms[1].

Monitoring results are provided within a tabulated format within **Appendix F-1.**

3.3 LFG Emission Monitoring Methodology

LFG monitoring was generally conducted as per EPA Guideline 1684 - Landfill Gas Fugitive Emissions Monitoring Guidelines and compared to the Actions Levels as set out within EPA Publication 788.3 - Siting, Design, Operation, and Rehabilitation of Landfills. Each monitoring event was carefully planned, by monitoring the weather forecast for a suitable site sampling 'window' when meteorological

[1] ALS Analysis Request forms are used instead of Chain of Custody (CoC) forms.

parameters were optimal for gas sampling. The surface gas emission monitoring methodology is presented in **Appendix E-3.**

- The site has a network of 12 installed LFG monitoring bores: LFG 01 to LFG 12. The LFG bores were monitored using GA5000 extractive LFG analyser; and
- A site/landfill cell cap walkover, buildings, structures, services and other areas were monitored with a 'LaserOne' low-concentration methane detector.

Both monitoring instruments (the GA5000 extractive LFG analyser and the LaserOne methane detector) met the performance specifications listed in the EPA Guidelines 1684 and are also understood to be preferred by Council for landfill monitoring use.

Monitoring results are provided in **Appendix F-2 to F-4**. Any observed exceedances as taken from Table 6.4, Section 6.7 of EPA Publication 788.3 were understood to have been reported to Council by ALS, within a period of 24 hours from the field monitoring observation.

The LFG emissions monitoring points are presented in figures in the Quarterly Surface Emissions Monitoring Reports provided by ALS (**Appendix F-2 to F-4**).

3.4 Quality Assurance / Quality Control

A QA/QC plan was implemented during site water quality monitoring. QA/QC checks are performed to ensure the reliability of results. The QA/QC plan included:

- Collection of field blanks;
- Sample trip blanks;
- Sampling equipment rinsate blanks; and
- 'Duplicate' and 'triplicate' or 'blind' sample check replicates (intra and inter-laboratory) samples.

With the above QA/QC Plan, field conditions sometimes restricted the implementation of the full QA/QC plan. The QA/QC plan is discussed in more detail in **Section 6** of this AMR.

LFG monitoring did not require QA/QC implementation (except in association with measurement device calibration). However, every effort was made by ALS, to ensure the reliability and validity of collected site data. Every instrument used was calibrated to standards in general accordance with Sections 4.1 and 4.2 of EPA Publication 1684.

3.5 Investigation Levels

3.5.1 Investigation Levels – Waters

The analytical results for groundwater and leachate were compared against the following Investigation Levels (ILs):

- ***Australian and New Zealand Guidelines for Fresh and Marine Water Quality, October 2000 (ANZECC 2000):***
    - o Protection for Freshwater Species (95%);
    - o Water Quality for Irrigation;
    - o Livestock Drinking Water Quality; and
    - o Primary Contact Recreation.
- ***National Water Quality Management Strategy, Australian Drinking Water Guidelines 6 (ADWG 2011 with related updates).***

Analytical results along with the adopted ILs are tabulated in **Appendix F-1**.

3.5.2 Investigation Levels – LFG

LFG assessment criteria were developed, based on Table 6.4 of EPA Guideline 788.3, which provides LFG ‘Action Levels’ at various locations and exposure situations across the landfill. Values of 1.0 % (volume to volume, ‘v/v’) methane and 1.5 % v/v carbon dioxide above assumed carbon dioxide background levels were the adopted Action Levels for subsurface geology and the landfill site boundary (i.e., perimeter LFG monitoring bores installed outside the waste mass, close to the site boundary).

Similarly, methane action levels adopted for landfill cover areas, subsurface services and buildings and structures are as summarised in **Table 3.1.**

Table 3.1: LFG Methane Action Levels

Location	Action level (ppm_v)
Landfill surface final cap.	100
Within 50 mm of penetration through the final cap.	100
Landfill surface intermediate cover areas	200
50 mm from penetrations in the intermediate cover	1000
Subsurface services on and adjacent to the landfill site	10,000
Buildings/structures on and adjacent to the landfill site	5,000

Note: These Action Levels are derived from EPA Publication 788.3 – ‘Landfill BPEM’, Table 6.4.

4 BASIS OF ASSESSMENT

4.1 Beneficial Uses of Groundwater

4.1.1 Regulatory Framework

SEPP-Waters - (ref. 4) applies to the management of groundwater contamination issues in Victoria. The goal of the policy is:

> "*to provide a framework to protect and improve the quality of Victoria's waters having regard to the principles of environment protection set out in the Environment Protection Act 1970 (the Act).*"

Key policy objectives relevant to the pollution of groundwater as defined in SEPP-Waters are:

- Achieve the level of environmental quality required to protect the beneficial uses of waters (which includes groundwaters);
- Ensure that pollution to waters from both diffuse and point sources is managed in an integrated way, to deliver the best outcome for the community as a whole; and
- Protect and improve environmental quality through consistent, equitable and proportionate regulatory decisions that focus on outcomes and use the best available information.

SEPP-Waters seeks to achieve these objectives by establishing:

- Relevant beneficial uses and environmental quality objectives for groundwaters;
- Obligations to protect beneficial uses and improve groundwater quality; and
- Rules for decision-making by protection agencies, to protect beneficial uses and improve groundwater quality.

Definitions of relevant beneficial uses of groundwater to be protected are primarily based on background salinity (or total dissolved solids (TDS)). EPA/The Authority (as defined by *the Act*) may determine that certain beneficial uses based around representative TDS range, do not apply if any of the following situations apply:

- There is insufficient aquifer yield to sustain the beneficial use;
- The application of groundwater, such as for irrigation, may be a risk to beneficial uses of land, or the broader environment due to the soil properties;
- The beneficial use specified in the definition of water dependent ecosystems and species relates to stygofauna and troglofauna; and
- The background level of an environmental quality indicator would not provide for the protection of the beneficial use.

Groundwater is considered polluted, where the objectives for environmental quality indicators of a beneficial use are exceeded. Where groundwater has been polluted, it must be cleaned up such that the protection of beneficial uses is restored, or if this is not possible, groundwater must be cleaned up to the extent practicable.

4.1.2 Relevant Groundwater Segment

There is limited field data to confirm the relevant groundwater segment for the site. TDS measurement from groundwater monitoring well location BH05, between November 2018 and June 2019 ranged from 140 mg/L to 160 mg/L.

The published Groundwater Resource Report for the site, suggests groundwater salinity of less than 500 mg/L in the Upper Mid-Tertiary, Lower Mid-Tertiary, and Lower Tertiary Aquifers (i.e., depth of 28 m bgs to 286 m bgs). These aquifers are more likely to be extracted for human and industrial use. This is confirmed by the VVG bore search results, which identified 62 groundwater bores in the vicinity of the site with the majority of the bores being installed at depths less than 200 m bgs.

The above consideration suggests *"Segment A1"* groundwater quality as defined by SEPP-Waters is the applicable segment. The Groundwater Resource Report for the site is attached as **Appendix D**.

4.1.3 Protected Beneficial Uses

The protected beneficial uses for *Segment A1* groundwater (refer to **Table 4.1** below) are:

- Water Dependent Ecosystems and Species: 'WDE' (at the point of groundwater flux discharge to the closest relevant surface water body) – 'Central Foothills and Coastal Plains' applies;
- Potable water supply (Desirable);
- Potable Mineral Water Supply (this is considered not to be applicable for the site situation);
- Agriculture and Irrigation (Irrigation);
- Agriculture and Irrigation (Stock Watering);
- Industrial and Commercial Water;
- Water-based Recreation (Primary Contact Recreation: 'PCR' (e.g., bathing, swimming));
- Traditional Owner Cultural Values;
- Cultural and Spiritual Values;
- Buildings and Structures; and
- Geothermal Properties.

Table 4.1 – Protected Beneficial Uses of Groundwater

Beneficial Use	Segment (TDS)						
	A1 (0 – 600)	A2 (601 – 1,200)	B (1,201 – 3,100)	C (3,101 – 5,400)	D (5,401 – 7,100)	E (7,101 – 10,000)	F (>10,001)
Water Dependent Ecosystems & Species	✓	✓	✓	✓	✓	✓	✓
Potable Water							
Desirable	✓						
Acceptable		✓					
Potable Mineral Water[2]	✓	✓	✓	✓			
Agriculture & Irrigation (Irrigation)	✓	✓	✓				
Agriculture & Irrigation (Stock Watering)	✓	✓	✓	✓	✓	✓	
Industrial & Commercial Water Use	✓	✓	✓	✓	✓		
Water-based Recreation PCR (e.g., Bathing, Swimming)	✓	✓	✓	✓	✓	✓	✓
Traditional Owner Cultural Values	✓	✓	✓	✓	✓	✓	✓
Cultural & Spiritual Values	✓	✓	✓	✓	✓	✓	✓
Buildings & Structures	✓	✓	✓	✓	✓	✓	✓
Geothermal Properties	✓	✓	✓	✓	✓	✓	✓

Table Note:
1. Dark shaded boxes indicate relevant segment and beneficial uses for this site.
2. The site is not located in an area required to be protected for a potable mineral water supply according to the Victorian Mineral Water Committee Web-site.

4.1.4 Groundwater Quality Objectives

In accordance with SEPP-Waters, groundwater quality objectives for beneficial uses are planned to be primarily sourced from the Australian Water Quality Guidelines for Fresh and Marine Waters, published by the Australian and New Zealand Environment and Conservation COUNCIL (ANZECC, 1992 (ref. 9) and 2000 (ref. 10)).

Matched ILs to relevant beneficial groundwater uses are summarised in **Table 4.2**.

Table 4.2 - Basis for Assessment of Groundwater

Beneficial Use	Indicators	Objectives/Relevant Guidelines
Water Dependent Ecosystems & Species	Those specified in SEPP-Waters[2,3]. Use of 95% trigger values for freshwater apply – (Table 3.4.1 – ANZECC/ARMCANZ (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality.	Those applicable under SEPP-Waters for receiving water: *'Central Foothills & Coastal Plains'.* The use of 95% trigger values for freshwater apply – (Table 3.4.1 – ANZECC/ARMCANZ (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality. This trigger value selection covers a slightly to moderately modified environment.
Potable water - Desirable	Those specified in SEPP-Waters[1,2]	ANZECC, 1992 guidance has been superseded by ANZECC/ARMCANZ, 2000. These guidelines have been referenced in the first instance and as follows: 1. ANZECC/ARMANZ, 2000. Drinking Water; 2. NHMRC, 2004 Australian Drinking Water Guidelines – Health and Aesthetics; and 3. USEPA, April 2019. Regional Screening Levels – Tap Water.
Irrigation	Water quality that is suitable for agricultural activities such as stock watering & irrigation, as well as a range of other uses, such as the irrigation of domestic gardens, commercial agriculture, parks and golf courses.	ANZECC/ARMCANZ, 2000 – Primary Industries Guidelines – Water Quality of Irrigation and General Use.
Stock Watering		ANZECC/ARMCANZ, 2000, these guidelines have been referenced in the first instance, followed by a hierarchy of guidance as listed below: • ANZECC/ARMCANZ, 2000 – Primary Industries – Livestock Drinking Water Quality; and • NHMRC, 2004 – Australian Drinking Water Guidelines.
Industrial & Commercial Water Use	Water quality that is suitable for industrial & commercial use.	ANZECC (1992) Australian Water Quality Guidelines for Fresh and Marine Waters – Chapter 6.
Water-based Recreation (PCR)	Water quality that is suitable for Primary Contact Recreation (PCR), (e.g., swimming, diving, water skiing, caving and spas), Secondary Contact Recreation (e.g., boating & fishing) and for aesthetic enjoyment.	ANZECC/ARMCANZ, 2000, this guidance has been referenced in the first instance, together with the following drinking water guidelines: • ANZECC/ARMCANZ, 2000 – Guidelines for Recreational Water and Aesthetics; • NEHF, 2008 – Guidelines for Managing Risks in Recreational Water; • NHMRC, 2004/2011 - Australian Drinking Water Guidelines – Health & Aesthetics; • US EPA, April 2019 – Regional Screening Levels; and • WHO, 2008 – Guidelines for Drinking Water Quality
Traditional Owners Cultural Values	Water quality that protects the cultural values of Traditional Owners, having recognised primary responsibility for protecting the values of water	Current default based around WDE protection & water-based recreation (PCR).

[2] EPA Victoria guidance has included advice that ANZECC/ARMCANZ (2000) – or other references may be used if considered to represent 'better science'.

[3] An errata slip issued for ANZECC (2000), dated June 2005, notes that nitrate trigger levels should be deleted and noted to be 'under review'. Calculations presented in National Institute of Water and Atmospheric Research Pty. Ltd. (2002): Memorandum, Nitrate Guideline Values in ANZECC (2000) suggest that ANZECC (2000) significantly underestimated nitrate criteria and suggests nitrate (as N) values of 4.1 mg/L (for 99%), 7.2 mg/L (95%), 8.7 mg/L (90%) and 12 mg/L (80%) respectively.

	for cultural needs, to ensure that Traditional Owner cultural practices can continue. Values may include traditional aquaculture, fishing, harvesting, cultivation of freshwater and marine foods, fish, grasses, medicines & filtration of water holes.	
Cultural & Spiritual Values	Water quality that is suitable for cultural and spiritual needs & ensures that cultural, spiritual & ceremonial practices can continue. These include the cultural values held by communities (e.g. baptisms, water-based festivals and cultural celebrations).	Current default based around WDE protection & water-based recreation (PCR).
Buildings and Structures	• pH. • Sulphate.	Introduced contaminants shall not cause groundwater to become corrosive to structures and building materials. Specific guidelines for buildings and structures are not available. Australian Standard (AS 2159-2009) – Piling – Design and Installation, has been referenced for assessing the impact of groundwater on building and structures. Corrosive, acidic, caustic or aggressive effects of groundwater indicators such as: pH, sulphate, chloride and oxidation-reduction potential need to be considered where shallow groundwater is present.
Geothermal Properties	Water quality that will not affect the natural thermal capacity (i.e., temperature).	Current default set to that matched to Buildings & Structures, plus aesthetic guidance for humans considered (covered through water-based recreation (PCR)).

4.2 Beneficial Uses of Surface Water

Traralgon Creek is the only surface water body in the vicinity of the site, which is located approximately 1.1 km from the western site boundary. Traralgon Creek flows northwards, eventually discharging into the Latrobe River.

Based on the site’s location and Figure 1 of SEPP-Waters, the applicable segment: ‘Central Foothills and Coastal Plains’ has been adopted for the case of a freshwater exposure setting (**Table 4.3**), which works to providing 95 % protection of freshwater ecosystems.

Table 4.3 – Protected Beneficial Uses of Surface Water (Inland Waters)

Beneficial Uses	***Water***	***Aquatic Reserves***	***Rivers & Streams***						***Wetlands***
	Segment	*Aquatic Reserves*	*Highlands*	*Uplands-A*	*Uplands-A*	*Central Foothills & Coastal Plains*	*Urban*	*Murray & Western Plains*	*Lakes & Swamps*
Water Dependent Ecosystems and Species that are:	*Largely unmodified*	✓	✓	✓	✓				
	Slightly to moderately modified					✓		✓	✓
	Highly modified						✓		
Human Consumption After Appropriate Treatment		*Where water is sourced for supply in accordance with the special water supply catchments* ***area*** *set out in Schedule 5 of the* ***Catchment and Land Protection Act 1994*** *or the* ***Safe Drinking Water Act 2003****.*							
Agriculture & Irrigation			✓	✓	✓	✓	✓	✓	✓
Human Consumption of Aquatic Foods		✓	✓	✓	✓	✓	✓	✓	✓
Aquaculture		✓*Where the environmental quality is suitable and an aquaculture licence has been approved in accordance with the* ***Fisheries Act 1995****.*							
Industrial & Commercial Use				✓	✓	✓	✓	✓	
*Water-based Recreation (**Primary Contact** Recreation (e.g., swimming, water skiing))*		✓*	✓	✓	✓	✓	✓	✓	✓
*Water-based Recreation (**Aesthetic Enjoyment**)*		✓*	✓	✓	✓	✓	✓	✓	✓
*Water-based Recreation (**Secondary Contact** Recreation (e.g., swimming, water skiing))*		✓*	✓	✓	✓	✓	✓	✓	✓
Traditional Owner Cultural Values		✓	✓	✓	✓	✓	✓	✓	✓
Cultural & Spiritual Values		✓	✓	✓	✓	✓	✓	✓	✓
Navigation & Shipping									

Note:
1. Dark shaded boxes with ticks indicate relevant considerations for this site.
2. If a segment is marked with a tick that is asterisked, there is an exclusion identified in Table 5 (see Clause 1(4) of that Schedule 3 – SEPP-Waters).

5. MONITORING RESULTS

5.1 Consolidated Annual Monitoring Results

Results of all field and laboratory results have been tabulated and presented as Appendices, as follows:

- Groundwater, surface waters and leachate analytical results – **Appendix F-1**;
- Surface water field parameter results, compared against available trigger values provided within SEPP – Waters, refer to **Appendix F-1**; and
- LFG surface emission monitoring results and reports – **Appendix F-2** to **Appendix F-4**.

5.2 Compliance with Fieldwork Program

The environmental monitoring conducted by ALS has been evaluated for compliance against specifications provided in Tender No. LCC-488 and its addendum. **Tables 5.1** and **5.2** provide a summary of compliance of these monitoring activities by segment and location.

Overall, the Monitoring Program was found to be partially compliant with the requirements of Council Tender No. 488. Sampling events that were not compliant with the original requirements of the Monitoring Program were generally a result of field sampling locations being 'dry'. August 2018 monitoring, as required by the Council Tender wasn't conducted, due to a delay in the Contract Award. ALS were granted the Contract only in mid-November 2018, instead of July 2018 (reference has been made to the e-mail communication to Ground Consulting from ALS, dated 19 August 2019 in support of this situation).

Table 5.1: Monitoring Compliance by Segment and Location - Waters

Investigation Date & Location	Nov 2018	Feb 2019	May 2019	June 2019	Compliance Comment
Groundwater Bores					
BH01	Well dry	✓	Well dry	Well dry	Not enough water to sample in BH01.
BH02	Well dry	Well dry	Well dry	Well dry	No samples due to wells being dry.
BH03	Well full of silt	Well dry	**Well blocked at 49 m bgs**	Well dry	No samples due to wells being dry or blocked.
BH04	Well dry	Well dry	Well dry	Well dry	No samples due to wells being dry.
BH05	✓[2]	✓	**Not sampled**	✓	Samples collected. Was also able to collect field duplicates.
Perched Groundwater					
Cell 3B Groundwater Interception System	Well blocked	Well blocked	Well blocked	Well blocked	Well filled with rubble during all monitoring events

Surface Water and RO Permeate					
Stormwater Pond 1	✓	✓	✓	x	Turbid, light brown in colour, during Nov and Feb. events, full to spilling, turbid, creamy colour during May sampling.
Stormwater Pond 2	✓	✓	✓	x	Very turbid. Green tinge during Feb sampling.
Traralgon Creek (U/S)	✓	✓	✓	x	Slightly turbid during Nov sampling, stagnant in Feb, low flow during May sampling.
Traralgon Creek (D/S)	✓	✓	✓	x	Stagnant and oily during Feb sampling, no flow light well on the surface in May.
RO Permeate	✓	x	x	x	RO Plant was not operational during Feb and May sampling events.
Leachate					
Leachate Pond 1	✓	✓	✓	x	Dark brown in colour, dirty and strong odour during February sampling.
Leachate Pond 2	✓	✓	✓	x	Slight odour during November and May sampling.
Leachate Sump (Cell 1)	✓	✓	✓	x	Strong odour during February sampling, leachate odour in May.
Leachate Sump (Cell 2)	✓	✓	✓	x	No odour during November, strong odour during February and May sampling events.

Table Notes:
1. RO = Reverse Osmosis.
2. Standing groundwater depth at BH05 was not recorded by ALS on 28 November 2018.

Table 5.2: Monitoring Compliance by Segment and Location – LFG

Investigation Date	Nov 2018	Feb 2019	May 2019	Compliance
Methane Emissions				
Landfill Cap Walkover	✓	✓	✓	Total of 16 exceedances recorded during Nov 2018 walkover. Five leaks/ exceedances recorded in February 2019 and five leaks recorded in May 2019.
LFG (buildings, structures, and subsurface service)	x	x	x	Minor non-compliance. Council Tender LCC-488 required a low concentration methane detector with detection limit to 1 ppm. However, ALS used methane detector, with a detection limit of 2 ppm.

5.3 Fluids Monitoring

5.3.1 Groundwater Levels & Water Quality

General

The groundwater monitoring network at the site consists of five groundwater monitoring bores as presented in **Figure 3.** Locations: BH01, BH02, and BH04 are inferred to be located up-gradient at the site, while location BH03 is interpreted to be perched within the T1 coal seam and may not be hydraulically connected to the regional water table beneath the landfill (Monarc Environmental, 2018). Location BH05 is inferred to be located hydraulically down-gradient at the site (Monarc Environmental, 2018).

Groundwater Levels

Of the five bores installed for groundwater monitoring, only location BH05 was able to be sampled during the 2018-2019 monitoring period, where the other bores were either monitored as ‘dry’, or were noted as fully silted-up (refer to **Table 5.1**).

Table 5.3: Groundwater Bores – Standing Water Level Monitoring Summary

Investigation Date & Test Location	Estimated Original Bore Depth (m bTOC)[4]	Observed Base Level of Well in Field (m TOC)	Observed SWL in Field (m TOC)	Comment/Observations
28 November 2018				
BH01	69.23	68.4	-	Monitoring well observed by ALS as ‘dry’.
BH02	74.35	74.6	-	Monitoring well observed by ALS as ‘dry’.
BH03	69.70	SILTED	-	Not monitored or sampled.
BH04	20.70	20.7	-	Monitoring well observed by ALS as ‘dry’.

[4] Nolan Consulting, 2015: Hyland Highway Landfill 53V Audit of Landfill Operations Table 5-1.

Investigation Date & Test Location	Estimated Original Bore Depth (m bTOC)[4]	Observed Base Level of Well in Field (m TOC)	Observed SWL in Field (m TOC)	Comment/Observations
28 November 2018				
BH05	101.0	102.2	89.14	This well was water sampled with a HydraSleeve sampling device, set at water sampling depth = 91 m from well top-of-casing (TOC) level.
19 February 2019				
BH01	69.23	68.05	66.68	
BH02	74.35	74.35	-	Monitoring well observed by ALS as 'dry'.
BH03	69.70	50.2	-	Monitoring well observed by ALS as 'dry'. Well was 'dry', damaged/blocked.
BH04	20.70	20.65	-	Monitoring well observed by ALS as 'dry'.
BH05	101.0	100.75	89.76	
28 February 2019				
BH05	101.0	100.75	89.67	Ground level to well TOC = -0.27 m.
16 May 2019				
BH01	69.23	NA	NA	No monitoring conducted.
BH02	74.35	NA	NA	No monitoring conducted.
BH03	69.70	NA	NA	No monitoring conducted.
BH04	20.70	NA	NA	No monitoring conducted.
BH05	101.0	NA	NA	No monitoring conducted.
13 June 2019				
BH01	69.23	67.85	-	Monitoring well observed by ALS as 'dry'.
BH02	74.35	74.36	-	Monitoring well observed by ALS as 'dry'.
BH03	69.70	-	-	Monitoring well blocked at 49 m from well TOC.
BH04	20.70	20.49	-	Monitoring well observed by ALS as 'dry'.
BH05	101.0	100.75	89.79	Groundwater well sampled using a down-hole sampling pump.

Table Notes:
- 'SILTED' = the bore was silted-up.
- 'NA' = not assessed by ALS.
- 'm TOC' = recorded standing water level taken from well top of casing.
- '-' = no reading could be taken.

Locations BH01 to BH04 were either low on water standing level in the well, or completely 'dry' to prevent any suitable groundwater samples to be collected. BH05 was unable to be sampled on May 2019, prompting another round of groundwater sampling at this location on 13 June 2019.

During the June 2019 monitoring event, wells BH01, BH02, and BH04 were observed as dry. BH03 was blocked at a dipped depth of 49 m from well TOC. BH05 was the only well that could be accurately level gauged and sampled, using a downhole sampling pump.

The standing water level (SWL) hydrograph for groundwater monitoring well BH05 (refer to **Appendix J**) shows a similar level range for gauged SWL across the recent monitoring period (two events of November 2018 and February 2019) when compared to data back to May 2016 (SWL ranging between 52.62 m AHD to 53.24 m AHD).

Groundwater Quality Results

Table 5.4: Groundwater Bores – Field Quality Results Summary

Investigation Date & Test Location	Temp. (ºC)	E.C. (µS/cm)	pH	Redox (mV)	D.O. (mg/L)	Comment/Observations
28 November 2018						
BH01	-	-	-	-	-	Well reported by ALS as ‘dry’.
BH02	-	-	-	-	-	Well reported by ALS as ‘dry’. Level interface probe stopped at 74.6 m from well TOC.
BH03	-	-	-	-	-	Well full of silt.
BH04	-	-	-	-	-	Well reported by ALS as ‘dry’. Level interface probe stopped to 20.7 m from below well TOC.
BH05	15.9	274.4	5.35	20.6	3.78	Clear water, some debris present in the sample. No odour.
28 February 2019[5]						
BH01	-	-	-	-	-	Well reported by ALS as ‘dry’ during 19 February 2019 sampling.
BH02	-	-	-	-	-	Well reported by ALS as ‘dry’ during 19 February 2019 sampling.
BH03	-	-	-	-	-	Well blocked at 50.2 m from well TOC during 19 February 2019 sampling event.
BH04	-	-	-	-	-	Well reported by ALS as ‘dry’ during 19 February 2019 sampling event.
BH05	18.4	297.5	3.78	62.7	1.52	Water orange, turbid and silt-laden, slow well recharge.
13 June 2019						
BH01	-	-	-	-	-	Well reported by ALS as ‘dry’.
BH02	-	-	-	-	-	Well reported by ALS as ‘dry’.
BH03	-	-	-	-	-	Well blocked at 49 m from well TOC level.

[5] ALS conducted a round of sampling event in 19 February 2019. Insufficient water samples only could be collected during this event, prompting another round of sampling on 28 February 2019, where only well BH05 could be sampled.

Investigation Date & Test Location	Temp. (ºC)	E.C. (µS/cm)	pH	Redox (mV)	D.O. (mg/L)	Comment/Observations
BH04	-	-	-	-	-	Well reported by ALS as 'dry'.
BH05	15.8	322	4.21	-64.9	0.17	Sample light brown in color and turbid, silt laden.

The limited amount of available groundwater sampling data makes it difficult to perform any comprehensive analysis across groundwater quality trends and potential chemical impacts to groundwater. For groundwater monitoring well BH05, which was the only location where suitable samples could be drawn from:

- Analysis show a gradual decrease in Dissolved Oxygen (DO) levels between November 2018 (3.78 mg/L) and June 2019 monitoring (0.17 mg/L);
- TDS levels remained relatively low and constant across the three available groundwater monitoring events through the period;
- Total alkalinity (reported as $CaCO_3$) has decreased from 23 mg/L in November 2018, to 7 mg/L in May 2019;
- Slight increases in chloride and sulphate concentrations were observed;
- Total dissolved organic carbon was observed to range between 2.6 mg/L to 11 mg/L, suggesting some potential impact from waste leachate;
- No significant dissolved ammonia or nitrate impacts were observed to groundwater;
- Dissolved iron concentrations across the first two groundwater monitoring events exceeded the applicable beneficial use IL for Primary Contact Recreation. Across the three sampling events, dissolved iron ranged from 0.06 mg/L to 1.90 mg/L.

Tri-linear Piper diagram and ionic balance bar charts were constructed for the available groundwater samples, to graphically represent the major cation and anion relationships (refer to **Appendix I-2**). The plots show the low salinity groundwater from groundwater monitoring well BH05 is dominated by sodium chloride ions.

5.3.2 Perched Groundwater

The Waste Cell 3B Groundwater Interception System was filled with rubble during the entire monitoring period, where no water samples could be therefore collected. Hence, no laboratory analysis on collected perched water samples was performed.

5.3.3 Surface Water and RO Permeate

Surface water monitoring was conducted from two stormwater ponds (SW01 and SW02), Traralgon Creek at locations upstream and downstream of the site, and the RO treatment unit (permeate on-site):

- Sampling for laboratory chemical analysis was conducted during the November 2018 and May 2019 monitoring events; and
- The RO unit was not operational during 2019 monitoring (i.e., it could only be sampled during the November 2018 monitoring event).

Monitoring data was analysed and compared to available ILs, including the ANZECC (2000) Guidelines. ADWG (2015), and SEPP-Waters (2018).

- Dissolved iron concentrations from Traralgon Creek upstream and downstream samples exceeded ILs for PCR and irrigation during the May 2019 monitoring event (concentrations ranged between 0.28 mg/L to 0.93 mg/L for ferrous iron). These levels are similar to what was encountered in the groundwater at BH05. The dissolved iron concentration in the creek upstream sample (November 2018 monitoring event, result of 0.28 mg/L) slightly exceeded the ferrous iron IL for irrigation (0.2 mg/L);
- Creek TDS values ranged between 110 mg/L to 140 mg/L across the upstream and downstream water samples;
- Dissolved oxygen levels in the creek were at similar level ranges both upstream (7.4 mg/L to 11 mg/L) and downstream (5.8 mg/L to 6.5 mg/L);
- Dissolved ammonia concentration in SW01 and SW02 exceeded ILs for PCR during the November 2018 and May 2019 monitoring events respectively; and
- Dissolved total organic carbon concentrations for both upstream and downstream surface water samples were of similar concentrations (ranging between 4.4 mg/L to 5.3 mg/L);

Tri-linear Piper diagram and ionic balance bar charts were constructed for the surface waters to graphically represent the major cation and anion relationships (refer to **Appendix I-2**).

- Assessment of the bar chart plots suggests that cations:sodium, magnesium and calcium are dominant for both upstream and downstream creek waters, where the sodium amount is approximately twice that for calcium and magnesium; and
- Assessment of the bar chart plots for the creek waters shows that chloride is the more dominant iron, followed by bicarbonate (where the chloride amount is roughly twice that for bicarbonate).

For the stormwater pond samples (from Locations 1 and 2):

- Across the two sampling periods, TDS ranged between 170 mg/L to 300 mg/L;
- Dissolved oxygen (from the field) levels in the groundwater ranged from 7.3 mg/L to 7.6 mg/L;
- Dissolved total organic carbon concentrations ranged between 8.4 mg/L to 14 mg/L; and
- Across the two sampling periods of 28 November 2018 and 16 May 2019, similar results were evident when looking at water ion balance. For cations, sodium, magnesium and calcium were the diominant ions (as for the creek water samples). For anions, chloride was generally the dominant ion, by bicarbonate also contributed notably. Dissolved sulphate was also present within the stormwater pond samples, where it was less dominant in the nearby creek waters.

For the RO permeate:

- TDS was proven as being very low at only 10 mg/L. Examination of ion bar chart plots shows this treated water, is dominated by sodium ions and carbonate/bicarbonate ions;
- The water was effectively at neutral pH level (7.2);
- All dissolved metals/metalloids were suitably very low.

5.3.4 Leachate Waters

<u>General</u>

Leachate monitoring were conducted at five locations across the site. The five monitoring locations are:

- Leachate Pond 1 (LP01);
- Leachate Pond 2 (LP02);

- Leachate Sump 1 (LS01) in Cell 3;
- Leachate Sump 2 (LS02) at Cell 4; and
- The groundwater interception system installed on Cell 3 (monitored for leachate).

Installation of a proposed leachate monitoring bore at Cell 1 (LB01) was planned, if monitored leachate flow exceeded 5L/Ha/day over the leachate capture zone (Nolan Consulting, 2014 and Nolan Consulting, 2015). Council received an exemption from EPA for the required installation of LB01, as the estimated monitored leachate flow remained below 5L/Ha/day (Nolan Consulting, 2017). There are currently no leachate monitoring bores in the waste cells present at the site.

Landfill conditions LI_L4.1 of Landfill Licence 25565 states *"You must extract leachate from cell(s) 3 and 4 such that the depth of leachate above the lowest point does not exceed 300 mm"*. Cell 3 and Cell 4 leachate collection systems have been installed. The sump pump is designed to cut in before the leachate level reaches 300 mm above the lowest point of the drainage layer. As of 7 August 2017, Council had installed a telemetry-based flow and level monitoring system for the leachate sump servicing Cell 4, while installation was in progress for Cell 3 (Nolan Consulting, 2017). Collected leachate from Cell 3 and Cell 4 is pumped to Leachate Pond LP02.

Council had obtained a licence condition exemption from EPA, requiring the depth of leachate in Cell 1 and 2 to be less than 300 mm above lowest point in the drainage layer (Nolan Consulting, 2017).

Leachate Level Monitoring

Leachate levels were not monitored by ALS during the entire 2018-1019 monitoring events (for the reasons as stated above).

Leachate Field Quality Monitoring

All leachate quality parameters per Council Tender LCC-488 were monitored during the Annual monitoring events. The summary of field quality results from each monitoring points at the site is summarised in **Table 5.5**.

Table 5.5: Leachate Monitoring Points – Field Quality Results Summary

Investigation Date & Test Location	Temp. (ºC)	E.C. (µS/cm)	pH	Redox (mV)	D.O. (mg/L)	Comment/Observations
28 November 2018						
LP01	20.5	2635	8.72	43	11.08	Green in colour, turbid and no odour.
LP02	20.1	12960	8.06	50.6	6.64	Black in colour, slightly turbid and no odour.
LS01-Cell 3	23.0	18563	7.29	17.1	1.40	Light brown in colour, slightly turbid, no odour.
LS02- Cell 4	19.7	7029	6.93	-76.4	1.14	Black in colour, slightly turbid, and no odour.
19 February 2019						
LP01	18.4	3962	9.21	90.6	6.5	Dark brown with strong odour.
LP02	20.8	13292	7.87	91.0	3.07	
LS01- Cell 3	19.4	18121	6.71	-78.5	1.4	Dark brown, non-turbid, strong odour.

Investigation Date & Test Location	Temp. (ºC)	E.C. (µS/cm)	pH	Redox (mV)	D.O. (mg/L)	Comment/Observations
LS02- Cell 4	23.1	11523	6.37	-141.4	0.42	Dark brown, non-turbid, strong odour.
16 May 2019						
LP01	11.6	5945	9.74	-21.7	10.57	1 m from pond being full, green colour and no odour.
LP02	13.4	14851	8.51	-25.9	6.09	1 m from full, dark brown/green in colour, and leachate odor
LS01- Cell 3	18.3	22190	7.36	-59.1	1.26	Dark brown with leachate odor
LS02- Cell 4	18.9	13773	7.21	-231.2	0.39	Brown with leachate odor

Key leachate results across the monitoring period were:

- TDS levels in all leachate monitoring points exceeded the ANZECC (2000) - Livestock IL;
- Similarly, concentrations of dissolved: chloride, sulphate, sodium, and iron in all leachate monitoring points exceeded the ILs for ANZECC (2000) Primary Contact Recreation;
- Dissolved iron levels generally exceeded the IL for Irrigation;
- Both leachate ponds (LP01 and LP02) and Leachate Sumps (LS01 and LS02) exceeded nitrate (as N) ILs for ANZECC (2000) – Water Dependent Ecosystem 95% FW, ANZECC 2000) – Irrigation (LTV),and PCR across the 2018-2019 monitoring period except LP01 in November 2018 monitoring;
- Dissolved manganese in Leachate Pond 2 exceeded ADWG (2015) - Human Health criteria (potable water IL); and
- Historical data has suggested elevated levels of dissolved benzene and toluene in LP01, which exceeded livestock and drinking water ILs (Monarc Environmental, 2018). During ALS's monitoring (2018-2019), the available levels of laboratory analytical reporting for dissolved BTEX compounds in waters had to be increased, due to matrix interference effects. Therefore, some of the dissolved BTEX results are considered to not be reliable for analysis (observed concentration levels less than 10 µg/L). Dissolved BTEX concentrations in LS01 and LS02 exceeded the ILs for PCR.

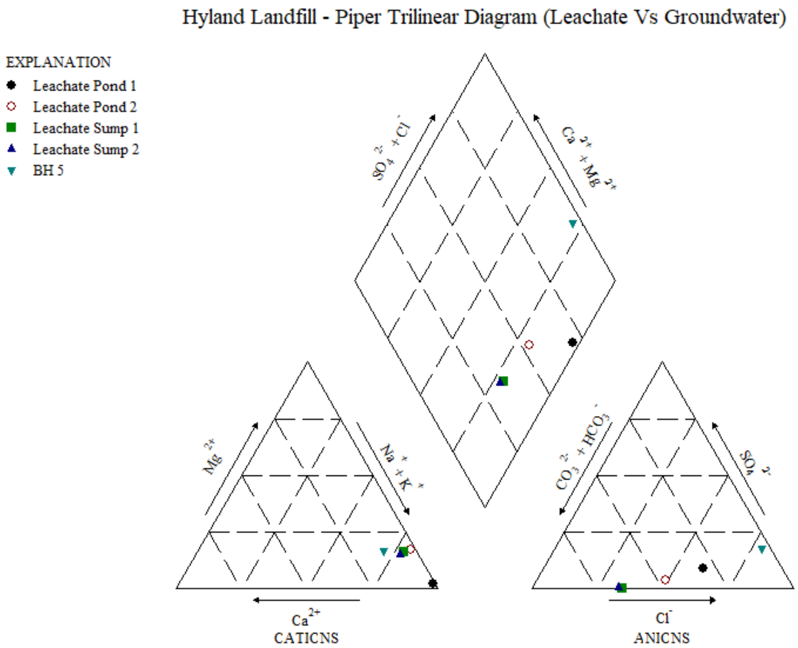
Tri-linear Piper diagram and ionic balance bar charts were constructed for the leachate waters, to graphically show major cation and anion relationships (refer to **Appendix I-2**).

A comparison of the plots across leachate waters when compared to available groundwater and surface water samples indicates significantly different water chemistries. This suggests that leachate from the landfill is not significantly impacting the underlying groundwater.

- The observed water quality (leachate) plots for the two leachate ponds: LP01 and LP02 (13 June 2019) are seen to be similar to that indicated from the earlier Monarc Environmental, 2018 Report. These waters are dominated by sodium on the cation side, with lessor contributions from potassium amd magnesium. On the anion side the waters are dominated by chloride and bicarbonate; and

- The Piper tri-linear plot also shows that ion chemistry is different for the groundwater sample taken from monitoring location BH05 (i.e., it is not showing signs of any significant landfill leachate impact).

Inset Figure A - Piper Trilinear Plots for Waters - Hyland Highway Landfill (13 June 2019)



5.4 LFG Emissions Monitoring

LFG emissions monitoring across the site was conducted across three rounds:

- 29 November 2018;
- 20 February 2019; and
- 15 May 2019.

The results of these sampling events are presented in **Appendix F-2 to Appendix F-4**. Each of these LFG monitoring events are summarised in the sections below.

5.4.1 November 2018

The first round of LFG monitoring was conducted on 29 November 2018. A site walkover, testing of buildings and services, subsurface services, and testing across the 12 x LFG monitoring bores were conducted:

- Atmospheric conditions at the time of testing were calm and overcast, where the ground was observed to be dry;
- No rainfall had occurred in the area between 27 November 2018 and 30 November 2018 (Morwell (Latrobe Weather Station: # 085280)); and
- It was observed that LFG monitoring was conducted near the top of a rising atmospheric air pressure response (i.e., at Mean Sea Level Pressure (MSLP) of 1011 mbar (at the Latrobe Weather Station)).

Surface Emission Monitoring Results

A Landfill Education Centre, located approximately 50 m from the site is a potential receptor of LFG migration and impact, hence, every underground service entering and leaving this building was checked:

- The landfill cap was generally clear, with minimal observed vegetation growth across it;
- Sections of intermediate landfill capping proved to be difficult to traverse and monitor for surface LFG emissions, due to excessive disposal of garbage creating a trip hazard.

Surface emission monitoring across the landfill, indicated a total of 16 more significant methane emissions/exceedances:

- A total of eight exceedances were recorded across what ALS termed as 'intermediate' waste cells (marked by ALS as 'blue' data points within their report). Concentrations across these eight points ranged from 220 ppm to 6,000 ppm methane in air. This area is closer to the active waste tipping face. Most of the higher observed results from this data set came from monitoring for methane in air close to pipe penetrations of various types through the landfill cap. Ground Consulting makes the observation, when considering the Landfill BPEM 788.3, for an interim cap, when monitoring close (i.e. within 50 mm) to a pipe penetration for a methane emission at near ground surface, that an Action Level of 1,000 ppm should apply. This means that only two location out of these eight surface emission readings exceeded the applicable suggested Action Level; and
- A total of eight exceedances were recorded across what ALS termed as 'final' (capped) waste cells (marked as 'red' data points by ALS in their report). These concentrations across the eight points ranged from 150 ppm to 8,000 ppm. Ground Consulting makes the observation, when considering the Landfill BPEM 788.3, for a final landfill cap, when monitoring close (i.e. within 50 mm) to a pipe penetration for a methane emission at near ground surface, that an Action Level of 100 ppm should apply.

<u>Subsurface Services Monitoring Results</u>

The results of monitoring for methane ingress in air to identified subsurface service areas is shown in **Table 5.6**

Table 5.6 : Summary of Subsurface Service Monitoring (November 2018)

Location Description	Methane Result (ppm)[6]	Comment
Main power box and cables. Eastern side of building.	2.2	-
Drain pipe. West side under building.	2.2	-
Sewer breather. Western side of building.	2.2	-
Stormwater pipe in to tank.	2.2	-
Downpipe. North side of building.	2.2	-
Stormwater pit. Side of road opposite compound entrance.	2.2	-

There are no other available monitoring results of the same testing locations shown in **Table 5.6** by landfill gas analyser (i.e., independent equipment checks for methane, carbon dioxide, oxygen and other key landfill gases).

[6] ALS used a methane detector with a detection limit of 2 ppm, which is strictly, not compliant with the Council Tender LCC-488 (required a detection limit of 1 ppm $_{v/v}$).

Key LFG Bore Monitoring Results (Subsurface)

- LFG monitoring bores: LFG 01, LFG 07, and LFG 08 were observed to have initially loose bore caps, which were tightened before LFG testing on these bores on the day of sampling;
- LFG 07 was also observed to have standing water within the bore's uPVC screen, with cracked concrete also observed around its base at the ground surface interface;
- No methane was detected across any of the 12 LFG bores; and
- Relatively moderate exceedance to the carbon dioxide Action Level of 1.5 % (i.e., no background carbon dioxide allowance was conservatively assumed for the site) were only noted for LFG bores: LFG02 (2.4 % CO_2), LFG03 (2.3 % CO_2) and LFG09 (2 % CO_2). Matched bore flow rates at these particular LFG bores ranged up to 0.3 L/Hr (i.e., a relatively low borehole flow rate).

Table 5.7 : Summary of LFG Bore Monitoring Results (November 2018)

LFG	Depth to base of gravel pack (m)	CH_4 %(v/v)	CO_2 %(v/v)	O_2 %(v/v)	Flow (L/hr)	H_2S (ppm)	CO (ppm)	Balance (%)	Diff Pressure (mbar)
1	NA	0	0.1	20.7	0	0	0	79.3	-0.17
2	8	0	2.4	18.5	0.1	0	0	79.1	0.6
3	26	0	2.3	19.4	0.3	0	0	78.3	1.47
4	26	0	1	20.4	-0.1	0	0	78.6	1.29
5	24	0	1.3	20.1	0.3	0	-	78.6	1.55
6	17	0	0.7	20.7	-0.4	0	0	79.2	-1.86
7	4	0	0.2	23	-0.2	1	-	75.9	1.55
8	12	0	0.2	19.6	0.1	1	-	80.1	0.14
9	4	0	2	17.5	0	2	-	80.6	-0.03
10	4	0	1.2	18.3	-0.1	1	-	80.5	0.05
11	9	0	1.0	19.7	-0.2	0	0	79.4	-1.2
12	14	0	0.7	19.5	0.3	0	0	79.8	-0.02

Note:
Shading denotes exceedance to Landfill BPEM Action Level.

5.4.2 February 2019

This second round of SEM was conducted on 20 February 2019. A site walkover emissions study was completed and LFG monitoring bores were tested during this monitoring event.

- The weather was fine, calm and still, where surface soil was dry;
- LFG bore cap conditions were similar to November 2018 Monitoring Event;
- Excessive rubbish was encountered near LP02 and LFG bore 05;
- LFG bore 02 was observed to have a broken well 'monument', whilst LFG bore 07 was still observed to have cracked concrete near its base, at the ground surface;

- All LFG bores were able to be tested across this monitoring event, where no methane was detected from any of the 12 LFG bores; and
- Notable exceedance of the carbon dioxide Action Level of 1.5 % v/v was noted for LFG bore 01 (15.1 %), with other minor exceedance only at bores LFG10 (1.7 %) and LFG12 (1.7 %).

Surface emission monitoring across the landfill walkover, indicated a total of five more significant methane emissions/exceedances. Of these five LFG emissions:

- Two exceedances were observed by ALS across the final capped waste cells (methane in air values of 120 ppm and 1,124 ppm). These methane leaks were observed to have occurred due to waste cover 'wash-outs' (i.e., waste soil cover erosion); and
- Three exceedances were observed across the intermediate/interim covered waste cells (methane in air values of 112 ppm to 1,246 ppm). These leaks were also observed to have occurred due to waste cover 'wash-outs'.

Table 5.8 : Summary of LFG Bore Monitoring Results (February 2019)

LFG	Depth to base of gravel pack (m)	CH_4 %(v/v)	CO_2 %(v/v)	O_2 %(v/v)	Flow (L/hr)	H_2S (ppm)	CO (ppm)	Balance (%)	Diff Pressure (mbar)
1	NA	0	15.1	6.4	0.7	1	1	78.5	-0.45
2	8	0	0.1	20.4	0.6	1	0	79.5	-0.10
3	26	0	0.1	20.4	0	1	0	79.5	-1.9
4	26	0	0.2	20.3	0.3	1	0	79.5	-0.83
5	24	0	1.0	19.9	0.1	1	0	79.1	-1.38
6	17	0	0.1	20.5	0	10	0	79.4	-1.88
7	4	0	0.2	22.7	0.5	1	1	77.2	-0.10
8	12	0	0.2	20.4	-0.2	1	0	79.4	-1.84
9	4	0	1.2	19.6	0.4	1	1	79.2	0.16
10	4	0	1.7	19.2	0.4	1	1	79.1	0.14
11	9	0	0.7	20.1	0.2	0	0	79.2	-0.72
12	14	0	1.7	19.1	0.3	1	0	79.2	-0.14

Note:
Shading denotes exceedance to Landfill BPEM Action Level.

5.4.3 May 2019

This was the final round of LFG monitoring conducted for the site on 15 May 2019. A site walkover, testing of LFG bores and testing of buildings and services (the Recreation Centre) was conducted.

- The weather was overcast with dry ground conditions;
- The landfill cap was generally clear, with minimal vegetation growth, creating easy conditions for the walkover survey traverses;
- Some parts of the intermediate landfill coverings proved difficult to surface monitor, due to the presence of excessive rubbish creating a trip hazard;

- All LFG bores were able to be monitored. Similar observations for bores: LFG 02 and LFG 07 were observed, as for the previous February 2019 monitoring event; and
- The carbon dioxide Action Level was exceeded in LFG 01 (10 %). A similar observation for LFG 01 was recorded previously, during the February 2019 monitoring event.

Surface emission monitoring across the landfill walkover, indicated a total of five noted methane emissions/exceedances. Of the five LFG emissions as detected from surface monitoring:

- Two exceedances were in the final capped waste cells; and
- Three exceedances were observed across the intermediate/interim covered waste cells.

Again, these observed methane in air exceedances near the cap surface, were either associated with capping erosion wash-outs of pipe penetrations.

Table 5.9 : Summary of Subsurface Service Monitoring (May 2019)

Location Description	Methane Result (ppm)	Comment
Main power box and cables. Eastern side of building	2.1	-
Drain pipe. West side under building	2.1	-
Sewer breather. Western side of building	2.1	-
Stormwater pipe in to tank	2.1	-
Stormwater pit. Side of road opposite compound entrance	2.1	-

There are no other available monitoring results of the same testing locations shown in **Table 5.9** by landfill gas analyser (i.e., independent equipment checks for methane, carbon dioxide, oxygen and other key landfill gases).

Table 5.10 : Summary of LFG Bore Monitoring Results (May 2019)

LFG	Depth to base of gravel pack (m)	CH_4 %(v/v)	CO_2 %(v/v)	O_2 %(v/v)	Flow (L/hr)	H_2S (ppm)	CO (ppm)	Balance (%)	Diff Pressure (mbar)
1	NA	0	10	9.1	0.8	1	0	80.9	0.02
2	8	0	0.1	19.9	0.6	2	0	80	-0.02
3	26	0	1.0	19.3	0.2	2	0	79.7	0.07
4	26	0	0.2	20.1	0.1	2	0	79.8	0.07
5	24	0	0.4	20.1	0.1	1	0	79.5	-1.62
6	17	0	1.1	19.6	0	1	0	79.3	-2.19
7	4	0	0.2	20.5	0.5	1	0	79.4	-0.07
8	12	0	0.2	20.5	0.6	1	0	79.3	-4.05
9	4	0	0.7	20.1	0.5	1	0	79.2	0.07
10	4	0	1.4	19.2	0.5	1	0	79.4	0.12
11	9	0	0.7	20.2	0.3	1	0	79.1	-0.53

LFG	Depth to base of gravel pack (m)	CH_4 %(v/v)	CO_2 %(v/v)	O_2 %(v/v)	Flow (L/hr)	H_2S (ppm)	CO (ppm)	Balance (%)	Diff Pressure (mbar)
12	14	0	1.1	19.8	0.5	1	0	79.2	0.00

Note:
Shading denotes exceedance to Landfill BPEM Action Level.

6. QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC)

The quality of collected data sets should be analysed, to determine if observed trends in parameters tested, are the results of changes in chemical or physio-chemical characteristics of the media samples being tested, or if the changes are likely to be due to the errors in either field sampling or follow-up laboratory methodology.

Ground Consulting conducted a review of the QA/QC program as implemented by ALS across the monitoring events. A summary review of the QA/QC procedures is presented below.

6.1 Field QA/QC Procedures

QA/QC samples were collected where possible:

- During the first monitoring event of 28 November 2019, it was planned to collect field duplicate and triplicates from groundwater monitoring bore location BH03. However, BH03 was filled with silt, where no suitable groundwater sample could be collected. Only location BH05 could be sampled using the HydraSleeve groundwater sampling method[7]. As a result, insufficient groundwater volume could be collected for corresponding field duplicate and triplicate water samples. No rinsate samples were taken by ALS, as no well sampling pump was used with this sampling;
- Groundwater monitoring bore BH05 was also the only bore that could be sampled during the February 2019 monitoring event. There was not enough water volume to collect matched field QA/QC samples at this location; and
- Samples were collected from groundwater monitoring bore BH05 during the June 2019 monitoring event. All bores except BH05 were observed to be either dry or blocked. A primary field water sample, along with the matched field duplicate and triplicate was collected from BH05.

6.1.1 Field Duplicate Laboratory Analysis

Primary samples were submitted for analysis to the ALS laboratory, which is a NATA accredited laboratory. As mentioned in the above section, only BH05 could be sampled for field water duplicates and triplicates, owing to the above-discussed field constraints. Suitable QA/QC checks could be performed only on water samples from the June 2019 monitoring event.

The duplicate analyses are compared using the Relative Percent Difference (RPD) method. The RPD is calculated based on the following formula:

$$RPD = \frac{Result\ No.1 - Result\ No.2}{Mean\ Result}\ X\ 100$$

RPD results of 50 % or lower are generally considered acceptable for dissolved organic contaminants, whereas RPDs of less than 30 % are generally considered acceptable for inorganic contaminants. There was no formal Environmental Monitoring Plan for the site, which set out suitable up-front RPD limits for the field QA/QC checks.

Ground Consulting conducted QA/QC checks on the analyses performed by ALS for the completed monitoring events. The results of QA/QC checks are presented within **Appendix I-1.**

RPDs for duplicate samples for BH05 from the June 2019 monitoring event, ranged from 7 % for dissolved manganese, to 11 % for bicarbonate in water (all observed RPDs were within acceptable limits).

[7] Refer to web-site of supplier: https://www.hydrasleeve.com/

The QA/QC program implemented by the two ALS laboratories (both primary and secondary), included the preparation of laboratory blanks, laboratory duplicates and spiked samples.

It is noted that normally as an 'Industry' sound practice, with triplicate testing checks of soils/waters, etc., an alternate testing laboratory is normally chosen, where the alternate accredited testing laboratory is not commercially linked with the primary testing laboratory. With the situation for this report, two separate, but commercially-linked testing laboratories were used across both testing regimes (both holding separate NATA accreditation matched to each testing facility).

All QA/QC samples which were analysed, reported readings below the Equivalent Quantification Limit (EQL) for every chemical analyte tested. This suggests to a point, that the QA/QC procedures as implemented by ALS on the field and in the laboratory were suitable.

6.1.2 Ionic Balance Error Calculations

The accuracy of major dissolved ion concentrations is determined by comparing the sum of major cations (Ca^{+2}, Mg^{+2}, K^{+}, and Na^{+}) and major anions (Cl^{-}, HCO_3^{-}, SO_4^{-}, and CO_3^{2-}). It is expected that the sum of major cations and anions in milliequivalents per litre (meq/L) should be approximately equal. An ionic balance error (IBE) is calculated as:

$$\boldsymbol{IBE}\ (\%) = \frac{\sum(\boldsymbol{cations}) - \sum(\boldsymbol{anions})}{\sum(\boldsymbol{cations}) + \sum(\boldsymbol{anions})}\ \boldsymbol{X\ 100}$$

In general, error less than 5% are considered acceptable for groundwater and 15% is considered acceptable for leachate and surface water.

The Ionic Balance plots constructed for various groundwater and surface water sample points are presented in **Appendix I-2** and **Appendix H.**

The results of ionic balance plots and corresponding IBEs for groundwater, leachate, and surface water samples is summarised below:

- An IBE of -10.5% and -7.6% (slightly higher than the generally accepted value of 5% for groundwater) were calculated for groundwater sampled during February 2019, and June 2019 monitoring events respectively from monitoring point BH05. IBE for BH05 groundwater sample from November 2018 was within the acceptable limit (-1.1%);
- Ion balance calculations performed for leachate samples from November 2018 monitoring event show IBEs generally above acceptable limits; and
- Ion balance calculations were performed for leachate samples taken during May 2019 monitoring event. IBEs calculated for all samples were within the acceptable limit. IBEs for LP01, LP02, LS01, and LS02 were 12.9%, 14.6%, -8.3% and -10.9% respectively.

Ionic Balance plots provide completely different ionic signals for groundwater, surface water, and leachate samples, suggesting no intereference of leachate into groundwater and surface water.

6.1.3 Chain of Custody Forms

Chain of Custody (CoC) forms used by ALS do not fully comply with Council's QA/QC compliance requirement. Analysis Request Forms are used by ALS, which do not include the name of the person/s receiving the samples, as well as the times and dates that the field samples were received.

6.1.4 Evidence of Field Sampling Equipment Calibration

ALS have provided in their various interim reports suitable supporting evidence that a robust and appropriate series of equipment checks and calibrations was conducted across their various items of sampling equipment.

7. SUMMARY CONCLUSIONS & RECOMMENDATIONS

7.1 Groundwater

All bores except BH05, were either dry or blocked, leading to limited available monitoring of groundwater across all 2018-2019 monitoring events. Since, there is only one set of groundwater monitoring bore data, it is not possible to create contour interpretations for standing groundwater levels and matched / inferred groundwater flow direction for the upper aquifer system for the site.

The limited amount of groundwater data makes it difficult to perform a comprehensive analysis for trends and potential impacts to the upper groundwater system from landfill leachate.

- Groundwater levels for monitoring well BH05 have remained relatively consistent across time. The most recent monitoring period (i.e., the two events at November 2018 and February 2019) gave similar reduced water levels when compared to the data back to May 2016 (i.e., a SWL ranging between 52.62 m AHD to 53.24 m AHD);
- Dissolved iron levels at BH05 during the first two monitoring events exceeded the PCR beneficial use IL;
- All other recorded dissolved chemical concentrations of potential concern from groundwater well BH05 were observed to be below the relevant ILs; and
- Groundwater from BH05 was observed to be acidic, with depleted DO levels. These observations are similar to that shown from earlier monitoring at this well.

The most recent set of groundwater sampling results from monitoring well BH05 does not suggest any noticeable leachate impact from the landfill.

It is recommended that the blocked groundwater monitoring wells at the site be either repaired and cleaned-out/redeveloped, or instead replaced and made suitable for future groundwater monitoring events. This will help to provide for improved conclusions to be made regarding on-site groundwater condition and likely landfill leachate impacts.

It is also recommended that all chemical analytes and physio-chemical testing currently being monitored / tested for, are continued into the future across the available monitoring points.

7.2 Surface Water and Treated Wastewater

Dissolved iron concentrations at Traralgon Creek upstream and downstream both were observed to exceed the selected ILs for PCR and irrigation. Other dissolved potential chemicals of concern as analysed were all observed to be within acceptable levels when compared to ILs.

The level of laboratory reporting for dissolved BTEX (the laboratory report level) needs to be suitably lowered for future laboratory analysis, such that matrix interference affects are suitably addressed. On the current data-set, it is difficult to ascertain whether the concentrations of dissolved benzene in the two stormwater ponds (SW01 and SW02) exceeded ILs.

The surface water testing results for the period were noted to differ significantly from the previous year of monitoring results, as conducted by Monarc Environmental. The 2017-2018 results (Monarc Environmental) showed ANZECC and NHMRC IL's (as nominated by Monarc Environmental) were exceeded for dissolved chloride, magnesium, phosphorus, ammonia, and nitrate at various water testing locations. The same ILs were also exceeded for RO permeate, across the 2017-2018 testing conducted by Monarc Environmental.

7.3 Leachate Waters

Monitoring and testing across landfill leachate waters indicated:

- Dissolved hydrocarbon concentrations exceeded the majority of nominated ILs in all the leachate waters (Leachate Ponds and Leachate Sumps);
- Dissolved sodium and chloride concentrations exceeded nominated ILs for PCR, both the leachate ponds and leachate sumps;
- Dissolved sulphate concentrations indicate IL exceedance for PCR in Leachate Ponds 1 and 2;
- TDS levels exceeded the Livestock IL for all leachate waters;
- Both leachate ponds (LP01 and LP02) and Leachate Sumps (LS01 and LS02) exceeded nitrate (as N) ILs for ANZECC (2000) – Water Dependent Ecosystem 95% FW, ANZECC 2000) – Irrigation (LTV),and PCR across the 2018-2019 monitoring period except LP01 in November 2018 monitoring;
- Dissolved iron and manganese concentrations were above the Irrigation and PCR IL's; and
- Dissolved iron and manganese were also above the ADWG 2011 health (potable water) and ANZECC 2000 – 95% freshwater standards across all site leachate ponds and sumps.

The above observed results are noted to be different from the previous year's monitoring work.

- Dissolved hydrocarbons were recorded only in LP01, from the March 2018 monitoring event (by Monarc Environmental, 2018).

It is recommended that sampling and testing for dissolved hydrocarbons be continued with the monitoring and testing across all leachate waters at the site.

7.4 LFG Observations

A number of exceedances of methane were observed across the three LFG surface emission monitoring events at the site:

- A total of 16 leaks/exceedances for methane were observed across the first monitoring event; and
- There were only five exceedances noted across the final two monitoring events.

LFG monitoring equipment used to monitor methane concentrations in buildings, service trenches, and pits monitoring did not comply with the Council's requirement of 1 ppm detection limit. However, the results show methane gas concentrations at the detection limit (2 ppm) of the instrument used which is significantly lower than the action level (5000 ppm[8]).

LFG monitoring should continue to be undertaken at the site, to allow for the assessment of:

- The LFG collection and abatement system;
- The typical composition for off-gas being produced;
- The estimated generation rates for LFG from remnant waste; and
- Checks for the potential migration of LFG from the containment cells.

[8] Table 6.4 of EPA (2015b) Landfill BPEM: Action levels for Building/Structures on and adjacent to the landfill site.

8 LIMITATIONS & UNCERTAINTY

Ground Consulting has prepared this report for ALS, on behalf of Latrobe City Council (Council).

This document was prepared to meet the objectives outlined in our proposal. Adverse field conditions have resulted in the collection of limited sets of site data for the monitoring period. Additional site sampling and information may improve the confidence, or yield different results, due to a range of factors, such as the variable or heterogeneous nature of environmental contaminants in the subsurface. Extreme care should be taken, and no warranty is provided, in the application of any costs or contingent liabilities derived using the data or conclusions within this AMR.

The assessment has been undertaken and performed in a professional manner consistent with the skill and care exercised by reputable consultants under similar circumstances. No other warranty is provided.

Ground Consulting has relied on verbal information and documentation provided by the client (ALS) and third parties for the preparation of this report. Ground Consulting did not attempt to independently verify the accuracy and completeness of the information provided. The conclusions made in this AMR are based solely on the information as provided to Ground Consulting by the client and, Ground Consulting assumes no responsibility for any information that was inaccurate, incomplete, or misinterpreted.

It is well known that site conditions, including contaminant extent and concentrations are likely to vary with time. The information provided in this report and corresponding analysis and conclusions made are only accurate as the date of issue. It is likely that further investigation will be necessary if this report is used after a considerable delay.

The Report is intended for use and reliance by ALS, Council and the incumbent Section 53V Environmental Auditor (Landfill Operations) associated with the site. The scope of work performed as part of this AMR may not be appropriate to satisfy the needs of any other person. Any other person’s use of, or reliance on, the findings, conclusions, recommendations or any other material presented herein, is at that person’s sole risk.

9 REFERENCES

Legislation and Subordinate Legislation

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Figures

LEGEND

- Landfill Premises Boundary
- Surface Water Monitoring Point
  (DS)= Downstream
  (US)= Upstream

0 1 2 3 4 5

SCALE (Approximate) (km)

N

SITE	64 Hyland Highway, Loy Yang, VIC
TITLE	General Site Location - Hyland Landfill - Figure 1

DRAWN / CHECKED	M.Nelson / C. Barker
DATE	30-08-2019
SCALE	As Shown
DRAWING NAME	V2021- ALS Latrobe Council - Fig 1

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LEGEND

- Landfill Premises Boundary

0 200 400 600 800 1000

SCALE (Approximate) (m)

N

SITE	64 Hyland Highway, Loy Yang, VIC
TITLE	Site Location - Hyland Landfill - Figure 2

DRAWN / CHECKED	M.Nelson / C. Barker
DATE	30-08-2019
SCALE	As Shown
DRAWING NAME	V2021- ALS Latrobe Council- Fig 2

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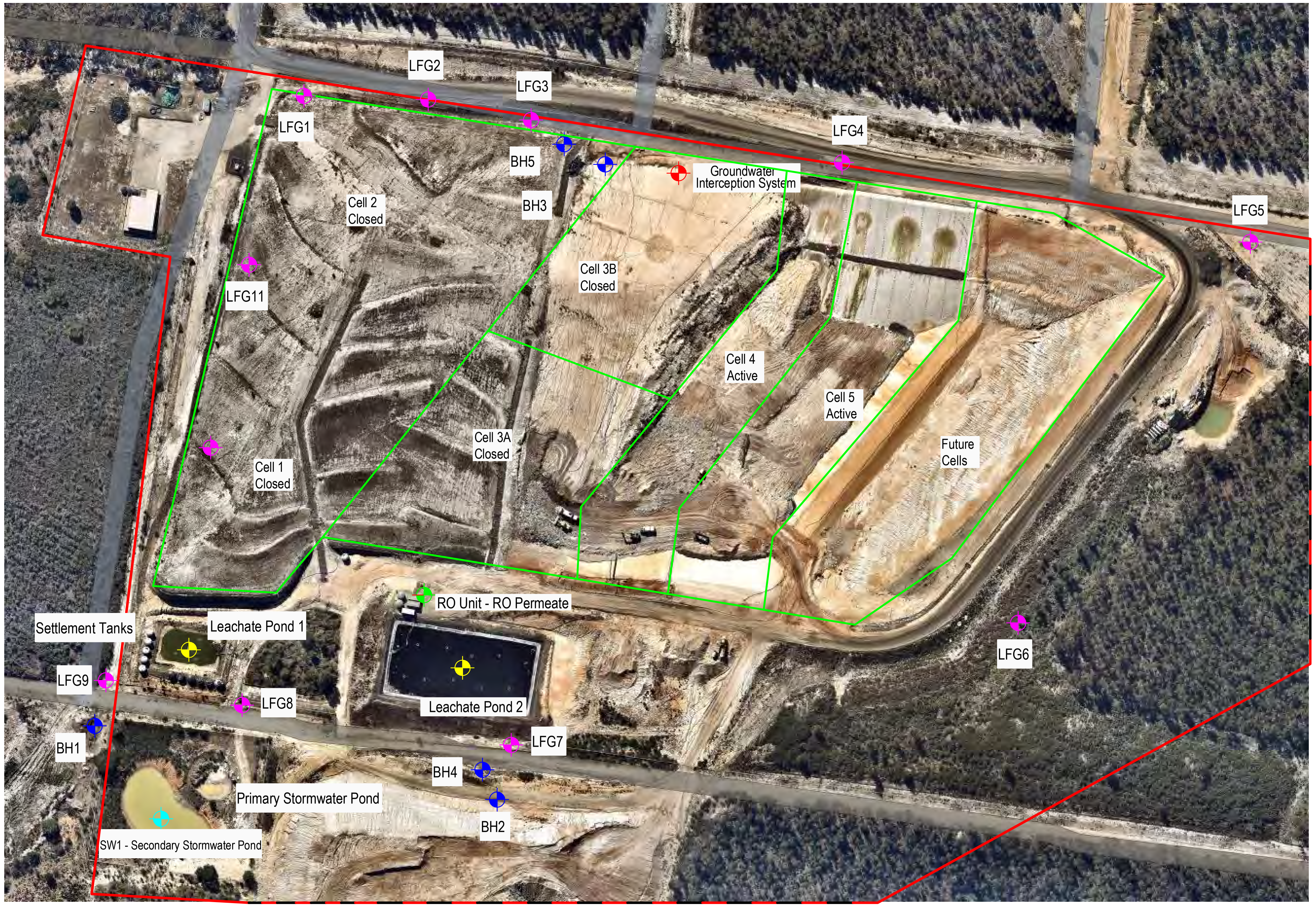
LEGEND

- Landfill Premises Boundary
- Groundwater Monitoring Point
- Surface Water Monitoring Point
- Reverse Osmosis Permeate Point
- Leachate Pond Monitoring Point
- Groundwater Interception System Monitoring Point
- Landfill Gas Bore Monitoring Point



0 50 100 150 200 250

SCALE (Approximate) (m)

N

SITE	64 Hyland Highway, Loy Yang, VIC
TITLE	Site Monitoring Locations - Hyland Landfill - Figure 3

DRAWN / CHECKED	M.Nelson / C. Barker
DATE	30-08-2019
SCALE	As Shown
DRAWING NAME	V2021- ALS Latrobe Council - Fig 3

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Appendices

Appendix A
COUNCIL Tender LCC-488 and Addendum

REQUEST FOR TENDER NO: LCC-488

LANDFILL MONITORING AND REPORTING

A <u>mandatory</u> site meeting is scheduled to start at 10am on Friday, 15 June 2018 at the Education Centre at the Hyland Highway Landfill followed by site visits to the Morwell Landfill and Moe Landfill

TENDERS CLOSE:	**<u>2:00 pm on Thursday, 28 June 2018</u>**
PHONE CONTACT:	Katie Garlick, Procurement Administration Officer Corporate Headquarters, telephone (03) 5128 5714

TABLE OF CONTENTS

This request for tender is divided into the following sections:

LATROBE CITY COUNCIL

LANDFILL MONITORING AND REPORTING

REQUEST FOR TENDER NO: LCC-488

TENDER INFORMATION AND CONDITIONS OF TENDERING

LATROBE CITY COUNCIL

REQUEST FOR TENDER NO: LCC-488

1. NATURE OF CONTRACT

1.1 FORM OF CONTRACT

Latrobe City Council is seeking tenders for the performance of work under an agreement (which in the remainder of this document is referred to as "**the Contract**").

The Contract comprises two parts: Water monitoring (groundwater, leachate and surface water) and Landfill gas monitoring. Tenderers can bid for one or both parts. Council has the option to engage two contractors to perform each individual part or one contractor to perform both parts. The contractor for Water monitoring shall compile the interim and annual reports. In the event of Landfill gas monitoring performed by a separate contractor the monitoring data will be provided to the contractor preparing annual reports to incorporate in the annual report.

1.2 WORK TO BE PERFORMED

The works / services to be provided under the Contract are:

1) Sampling and testing of:
    a) Groundwater, leachate at Hyland Highway, Morwell and Moe Landfills;
    b) Treated water produced from leachate treatment plant at Hyland Highway Landfill;
    c) Stormwater ponds at Hyland Highway Landfill; and
    d) Surface water in Traralgon Creek at two nominated locations.
2) Prepare Interim reports for every monitoring event; Hyland Highway, Morwell and Moe Landfills; and
3) Annual Monitoring Reports for Hyland Highway, Moe and Morwell Landfills;
4) Monitoring of landfill gas bores at Moe, Morwell and Hyland Highway Landfills;
5) Landfill gas surface emissions monitoring at Hyland Highway Landfill.

Tenderers should ensure that they read the Contract fully to ascertain the nature of the work to be performed and the terms on which it is to be performed, as the agreement will be evidenced solely by the Contract.

1.3 LOCATION OF WORKS

The works / services under the Contract are to be performed at:

1) Hyland Highway Landfill, Loy Yang;
2) Morwell Landfill, Maryvale Road, Morwell;
3) Moe Landfill Haunted Hills Road, Newborough; and
4) Johns Road and Downies Lane, Traralgon South (creek water sampling points).

1.4 TENDERERS TO VISIT SITES

A **mandatory** site meeting is scheduled to start at 10am on Friday, 15 June 2018 at the Education Centre at the Hyland Highway Landfill followed by site visits to the Morwell Landfill and Moe Landfill.

Please note that to submit a tender response a company representative is required to attend the site meeting and visits.

Tenderers should register for the site visit by contacting the contact officer before 5pm on Tuesday, 12 June 2018.

Tenderers are advised and expected to visit the Municipality before submitting a tender, and to ascertain for themselves the actual extent and nature of the work to be done, as the Latrobe City Council will not entertain any claim whatsoever on account of a failure to do so.

1.5 CONTACT OFFICER

Only enquiries regarding the tender process can be directed to the officer of Latrobe City Council as follows:

Katie Garlick, Procurement Administration Officer, telephone: (03) 5128 5714

Any other enquires must be submitted via the e-tendering portal.

Latrobe City Council may restrict the period during which it will accept questions, requests for further information or for clarification.

1.6 ENQUIRIES

All questions, requests for further information or for clarification are to be submitted via the e-tendering portal no later than 3 business days prior to the tender closing.

Latrobe City Council restricts all questions and enquiries to the respondent and its representatives. Enquiries through potential sub-contractors and suppliers must be directed through the respondent.

Latrobe City Council may restrict the period during which it will accept questions, requests for further information or for clarification.

2. SUBMISSION OF TENDERS

2.1 TENDER FORM

The Tender Form Schedules attached to the Tender Form and other information or documents listed in the Tender Form are to be completed and will constitute the tender.

2.2 FORM OF TENDER SUBMISSIONS

Electronic tender lodgement via Latrobe City Council's e-tendering portal www.latrobe.vic.gov.au/tenders is to be utilised by tenderers to lodge submissions no later than the closing time and date.

Tender Closing Time and Date: **2:00 pm, Thursday, 28 June 2018**

COUNCIL DOES NOT ACCEPT HARDCOPY SUBMISSIONS

3. ADDENDA

Addenda to the tender documents may be issued prior to the closing of tenders for the purposes of clarifying the documents or to reflect modifications in the specification or to the contract terms. If a tenderer is in doubt as to the true meaning of any part of the tender documents, the tenderer should notify the Contact Officer and obtain clarification of the tender documents that will be made only by formal addendum to the tender documents. Latrobe City Council will not be responsible for any erroneous interpretation. Each addendum issued will be distributed to each person or organisation to whom or which a set of tender documents has been issued.

All addenda issued will become part of the Tender Documents and ultimately form part of the Contract. As part of their submission, tenderers are required to list the addenda that they received during the tender period and acknowledge that their tender has been prepared having regard to those addenda.

4. ACCEPTANCE OF TENDERS

4.1 LATROBE CITY COUNCIL NOT BOUND TO ACCEPT TENDER

Latrobe City Council is not bound to accept the lowest or any tender.

4.2 LATE TENDERS

Latrobe City Council will not accept late Tenders; however the exception being where it can be substantiated that there was a Latrobe City Council related system failure or interruption to the e-Tendering portal, in the case of submission of an electronic tender.

4.3 LATROBE CITY COUNCIL PROPERTY

Tenders, once submitted become the property of the Latrobe City Council. Tenderers license the Latrobe City Council to reproduce the whole or any part thereof, of the tender for the purposes of evaluation.

4.4 NEGOTIATION

Latrobe City Council may accept or reject any tender, or negotiate with any tenderer regarding the terms of any tender submitted.

4.5 STATUS OF TENDER

Each tender constitutes an offer by the tenderer to the Latrobe City Council to provide the services required under, or otherwise to satisfy the requirements of the Specification on the Terms and Conditions of the proposed contract (subject to the Statement of Compliance). Latrobe City Council reserves the right to accept a tender in part or in whole.

4.6 NON-CONFORMING TENDERS

Any tenderer failing to comply with and / or containing provisions contrary to the tender documents will be considered non-conforming and may be rejected at the discretion of the Latrobe City Council.

Latrobe City Council reserves all rights to consider and accept non-conforming tenders, or to reject them.

4.7 WITHDRAWAL OF TENDERS

No tender must be withdrawn prior to the expiration of sixty (60) days following the date of the closing of tenders unless the Latrobe City Council will agree to such withdrawal in writing.

4.8 TENDERS BY FACSIMILE OR EMAIL

Tenders submitted by facsimile or email will not be accepted.

5. ADDITIONAL INFORMATION AND DOCUMENTATION

5.1 QUESTIONNAIRE AND SUPPORTING DOCUMENTATION

Tenderers are required to complete the questionnaire contained in the Tender Form and submit it as part of their tender. They should also supply any information or documents specified in the Tender Form.

5.2 INFORMATION FOR EVALUATION

Tenderers may submit any further information considered relevant to their tender. Latrobe City Council may require a tenderer to submit additional information concerning its tender or to personally discuss its tender before any tender is accepted.

Should a tenderer fail to:

- submit the additional information so required by; or
- attend personally to discuss its tender at,

the date and time stipulated by the Latrobe City Council, its tender may not be further considered.

5.3 RECTIFICATION OF ERRORS AND OMISSIONS

Latrobe City Council reserves the right to:

- check tenders for errors and omissions;
- by agreement with a tenderer, amend a tender price or rate submitted by a tenderer to remedy the effect of any errors or omissions in the calculation of the tender price or rate; and
- by agreement with a tenderer, otherwise amend the tender of the tenderer to remedy the effect of any errors or omissions.

6. NOTIFICATION OF TENDERERS

6.1 NOTIFICATION OF SUCCESSFUL TENDERER

The successful tenderer will be notified in writing of the acceptance of their tender.

The notification of the acceptance of the tender will create a Contract between the parties which includes the Tender Submission.

The successful tenderer must execute and return to the Latrobe City Council the formal agreement in the form of the Contract, including any documentation as requested, within seven (7) days of its receipt from the Latrobe City Council.

6.2 NOTIFICATION OF UNSUCCESSFUL TENDERERS

All tenderers will be notified of the Latrobe City Council's decision relating to the acceptance or otherwise of tenders.

Latrobe City Council is not obliged to give reasons for its decision and no negotiations or correspondence concerning the decision will be entered into. Latrobe City Council's written notification will be final.

7. PROBITY OF TENDER PROCESS

7.1 STATUTORY DECLARATION

A Statutory Declaration included in the Tender Form must be made by a person authorised to make such a declaration on behalf of the tenderer and submitted with its tender.

7.2 IMPROPER ASSISTANCE

Tenderers must not approach, or request any other person to approach, any Councillors or members of staff of the Latrobe City Council individually to solicit support for their tenders or otherwise seek to influence the outcome of the tender process. The tender of any tenderer who seeks to canvass a Councillor or staff member individually will not be considered.

Enquiries relating to clarification of the tender documents are appropriate and acceptable and such enquiries should only be directed to the named Contact Person or their nominated representative.

8. DISCLOSURE

Latrobe City Council will not disclose tender contents and tender information except:

a) as required by law;

b) for the purposes of investigation by the Australian Competition and Consumer Commission (ACCC) or any similar Government authority;

c) to external consultants and advisors engaged by the Latrobe City Council to assist with the tendering process; and

d) general information from tenderers required to be disclosed by Government policy.

Tenders will be treated as confidential.

9. WORKCOVER COSTS

Any tenderer who submits a tender and who does not provide evidence of WorkCover may have a cost added to their tender price, to cover the WorkCover liability that the Latrobe City Council will incur in these cases.

10. GOODS AND SERVICES TAX (GST)

Tenderers are to price the goods or services, exclusive of GST, that is, the price is not to include GST. Should the supply of any goods or services under the Contract be subject to GST, the amount of the GST is to be shown separately on a complying tax invoice.

11. PREPARATION AND PRESENTATION OF TENDER AT OWN RISK

Latrobe City Council may or may not proceed with this Contract. A decision upon whether the Latrobe City Council will proceed with this Contract will not be known until tenders are received. If the Latrobe City Council decides to proceed with this Contract or one similar, the Latrobe City Council will make a formal Contract with the successful tenderer/s. Prior to the actual drafting of the final agreement or Contract, the Latrobe City Council is unable to make any commitment to you as a tenderer.

12. TENDERERS DECISION TO PARTICIPATE

Latrobe City Council will not be responsible for, nor pay for any expense or loss that may be incurred by the tenderers in the preparation of their tender.

13. NO COLLATERAL CONTRACT

The submission of a tender by a tenderer will not give rise to any contract governing, or in any way concerning, the tender process, or any aspect of the tender process, for the Contract. Latrobe City Council expressly disclaims any intention to enter into any such contract.

14. ANTI-COMPETITIVE CONDUCT

Tenderers and their respective officers, employees, agents and advisors must not engage in any collusion, anti-competitive conduct or any similar conduct with any other tenderer or any other person in relation to the preparation, content or lodging of their tender.

15. BENEFIT TO THE REGIONAL ECONOMY

Latrobe City Council's is committed to buying from local businesses where purchases can be justified against Value for Money, while remaining compliant with the *Competition and Consumer Act 2010* and other fair trading legislation requirements.

Wherever practicable, Council will fully examine the benefits available through purchasing goods, services or works from suppliers/contractors within Latrobe City.

Council will also seek from prospective tenderers what economic contribution they will make to the Latrobe City region. A weighting percentage will be assigned to this selection criteria.

16. AUSTRALIAN / NEW ZEALAND (ANZ) CONTENT

Latrobe City Council is committed to maximising the Australian industry content in this Contract. Tenderers are encouraged to explore the feasibility of including equipment of ANZ origin and to use the expert services of ICN Victoria. Information regarding the ICN is contained on the page at the end of this section.

17. OH&S MANAGEMENT SYSTEM

Tenderers are required to demonstrate to the Latrobe City Council that they have an appropriate OH&S management system which includes:

- A documented OH&S Policy;
- Legislative requirements compliance;
- Job safety analysis / risk assessment / safe work method statements;

- Relevant formal and informal safe work systems and procedures for managing OH&S risks;
- Relevant training and induction details including construction induction training;
- Communication schedules;
- Accident and emergency procedures; and
- Any other OH&S requirements specified by the Council

Tenderers must respond to all questions contained in the questionnaire in Tender Form Schedule 5. The completed questionnaire must be included with their tender submission.

18. EVALUATION CRITERIA

Latrobe City Council's standard evaluation criteria consist of:

Gateway Criteria - The following criteria must be met to proceed to evaluation stage:
- OH&S Policies & Procedures – Must provide:
  - Completed copy of OH&S Management System Questionnaire (Schedule 5);
  - Copy of OH&S Policy;
  - Copy of OH&S Management System; and
  - Evidence of any formal certification (i.e. AS4801)
- Insurances – As stipulated in tender specification
- Special Requirements – As stipulated in the tender specification
- Tender Briefing / Site Visit – As stipulated in the tender document

Evaluation Criteria - required for all tenders and all tenders will be evaluated in accordance with them:
- Price
- Benefit to Regional Economy
- OH&S Practices
- Previous Relevant Experience and Performance
- Capacity

Buy Local Statement

Local Industry Objective

The Latrobe City Council, where practical, will give substantial consideration to contracts or purchases of goods, machinery or material manufactured in Australia or New Zealand (ANZ), or services that have a high level of local value-added content.

Requirement on Council, Subcontractors or Suppliers

To facilitate this objective, the Latrobe City Council is working closely with the Industry Capability Network (Victoria) Limited, (ICN Victoria) to enable ICN Victoria to assist council, its subcontractors and suppliers to identify ANZ sources of supply for goods and services.

ICN Victoria and Latrobe City Council support and encourage 'Buy Local' procurement and will assist subcontractors and suppliers with this endeavour.

ICN Victoria Service

ICN Victoria can be engaged to assist prospective Tenderers maximise the 'Local Content' in their Tender. ICN Victoria can provide assistance with sourcing capable and competent local trades, manufactured goods and services, including those suppliers and subcontractors located in the Latrobe and surrounding council regions.

Further Information

ICN (Gippsland):	Colin Young
Mobile:	0438 753 428
Email:	cyoung@icnvic.org.au
Web:	www.icnvic.org.au
ICN Gateway Portal:	www.gateway.icn.org.au

LATROBE CITY COUNCIL

LANDFILL MONITORING AND REPORTING

REQUEST FOR TENDER NO: LCC-488

SERVICES GENERAL CONDITIONS

TABLE OF CONTENTS

1. INTRODUCTORY CLAUSES

1.1 DEFINITIONS

In this Contract, the following terms have the meanings indicated, unless inconsistent with the context:

"**the Annexure**" means the Annexure to these Services General Conditions;

"**the Council**" means the party specified as such in the Annexure;

"**City Mark**" means the name and each and every trademark (whether registered or not) of, or used by, the Latrobe City Council from time to time during the Contract Term;

"**the Commencement Date**" means the date specified as such in the Annexure;

"**Confidential Information**" means all information and materials, in any form, not lawfully in the public domain, in the possession of or under the control of the Contractor or to which the Contractor gains access at any time (including the period preceding the execution of this Contract);

"**this Contract**" means the contract evidenced by the Contract Documents;

"**the Contract Documents**" means the documents specified as such in the Annexure;

"**Contract Material**" means all material in any form at all that is, pursuant to this Contract, produced by or provided to the Contractor (including material provided by or to an employee, agent or subcontractor of the Contractor;

"**the Contractor**" means the party specified as such in the Annexure;

"**the Contractor's Plant**" means all or any of the vehicles, plant, implements, appliances and equipment used by the Contractor for carrying out its obligations under this Contract, whether or not owned by the Contractor;

"**the Contractor's Representative**" has the meaning ascribed to it by clause 2.4;

"**the Contract Term**" has the meaning ascribed to it by clause 2.2;

"**the Initial Contract Term**" means the period specified as such in the Annexure;

"**Information Privacy Principles**" means the Information Privacy Principles under the *Privacy and Data Protection Act* 2014 and any other applicable Code of Practice.

"**Municipal District**" means the Municipal District of the Latrobe City Council;

"**OH&S**" means occupational health and safety;

"**OH&S Management System**" has the meaning ascribed to it by clause 7.3;

"**Party's Representative**" means:

1.1.1 the Supervisor in respect of the Latrobe City Council; and

1.1.2 the Contractor's Representative in respect of the Contractor;

"**Personal Information**" means information or an opinion (including information or an opinion forming part of a database), that is recorded in any form and whether true or not, about an individual whose identity is apparent, or can reasonably be ascertained, from the information or opinion;

"**Public Holiday**" means a public holiday, within the meaning of the *Public Holidays Act* 1983, applying in the Municipal District;

"**the Services**" means:

1.1.3 the performance of work;

1.1.4 the supply of materials; and

1.1.5 all other things required to be done,

under this Contract by the Contractor as indicated in the Contract Documents and includes any matters reasonably to be inferred from the Contract Documents or trade usage; and

"**the Supervisor**", also referred to as "**the Superintendent**" means:

1.1.6 the person specified as such in the Annexure; or

1.1.7 any other person nominated in writing by the Latrobe City Council,

and includes any person:

1.1.8 to whom powers, duties or functions have been delegated by a person referred to in clause 1.1.6 or clause 1.1.7;

1.1.9 the authority of whom the Contractor has been notified; and

1.1.10 in respect of whom no notice of the revocation of his or her authority has been given to the Contractor.

1.2 CONSTRUCTION OF TERMS

In this Contract, unless inconsistent with the context:

1.2.1 headings and underlinings are for convenience only and do not affect interpretation;

1.2.2 words expressed in the singular include the plural and vice versa;

1.2.3 a reference to a gender includes a reference to each other gender;

1.2.4 where a term is assigned a particular meaning, other grammatical forms of that term have a corresponding meaning;

1.2.5 a reference to a person includes a reference to a firm, corporation or other corporate body and vice versa; and

1.2.6 a reference to any Act, regulation, proclamation, planning scheme, local law or by-law includes all Acts, regulations, proclamations, planning schemes, local laws or by-laws amending, consolidating or replacing same;

1.2.7 a reference to an Act includes all regulations, proclamations, planning schemes, local laws and by-laws made under that Act;

1.2.8 a reference to a party in a document includes that party and its successors, permitted assigns, receivers, receivers and managers, liquidators and legal personal representatives; and

1.2.9 a reference to any document includes a reference to that document as amended, rectified or replaced from time to time and to any document so amending, rectifying or replacing the document.

1.3 INTERPRETATION

1.3.1 Amendment

This Contract may be amended only by a written instrument duly executed by the parties.

1.3.2 Precedence

Should the Contract Documents contain any discrepancy or inconsistency, then, for the purpose of removing the discrepancy or resolving the inconsistency, the documents will take precedence in the order in which they are listed in the Annexure.

If the discrepancy is not removed or the inconsistency is not resolved by this method, the Supervisor must make a determination removing the discrepancy or resolving the inconsistency.

No determination by the Supervisor under this clause will be construed as giving rise to a variation under clause 4.1.

1.3.3 Whole Understanding

This Contract constitutes the whole understanding between the parties and embodies all terms and conditions under which the Services are to be performed by the Contractor. All previous negotiations and understandings between the parties on this subject matter will cease to have effect from the date of this Contract.

1.3.4 Governing Law

The law of the State of Victoria governs this Contract and any legal proceedings under this Contract.

1.3.5 Counting of Days

Where under any provision of this Contract, any notice is to be given, any payment is to be made or anything else is to be done:

1.3.5.1 in a stated period of days, the stated number of days excludes Saturdays, Sundays and public holidays. Any period of days is deemed to be consecutive if interrupted only by days which are not to be taken into account under this clause; and

1.3.5.2 on a Saturday, Sunday or Public Holiday. The notice may be given, the payment made or anything else done on the next day which is not a Saturday, Sunday or Public Holiday.

1.3.6 Several and Joint Liability

If the Contractor consists of two or more parties, this Contract binds each of them severally and jointly.

1.3.7 No Waiver

No:

1.3.7.1 time or other indulgence granted by the Latrobe City Council to the Contractor;

1.3.7.2 variation of the terms and conditions of this Contract; or

1.3.7.3 judgment or order obtained by the Contractor against the Latrobe City Council,

will in any way amount to a waiver of any of the rights or remedies of the Latrobe City Council in relation to the terms of this Contract.

1.3.8 No Restriction of the Latrobe City Council's Powers

This Contract does not fetter or restrict the powers or discretions of the Latrobe City Council in relation to any powers or obligations it has under any Act, regulation or local law that may apply to the Services, the Contractor or the Municipal District.

1.3.9 The Supervisor

The Supervisor (also referred to as the Superintendent) must exercise any powers or functions conferred, and perform any duties imposed, on the Supervisor under clauses 1.3.2, 4.2, 5.3.1 and 5.3.2 reasonably and independently of the parties. Except as expressly provided in this clause or elsewhere in this Contract, the Supervisor may exercise other powers conferred, and perform any other duties imposed or functions conferred, on the Supervisor in the Latrobe City Council's interests.

1.4 NOTICES

1.4.1 Method of Giving Notices

A notice required or permitted to be given by one party to another under this Contract must be in writing, addressed to the party to receive it and:

1.4.1.1 handed to that Party's Representative;

1.4.1.2 delivered to that party's address;

1.4.1.3 sent by pre-paid mail to that party's address; or

1.4.1.4 transmitted by facsimile to that party's facsimile number.

1.4.2 Time of Receipt

A notice given to a party in accordance with clause 1.4.1 must be treated as having been duly given and received:

1.4.2.1 if handed to the Party's Representative, immediately;

1.4.2.2 if delivered to a party's address, on the day of delivery;

1.4.2.3 if sent by pre-paid mail, on the third day after posting; or

1.4.2.4 if transmitted by facsimile to a party's facsimile number and a correct and complete transmission report is received, on the day of transmission.

1.4.3 Address and Facsimile Numbers of Parties

For the purpose of clauses 1.4.1 and 1.4.2, an address or facsimile number of party is the address or facsimile number stated in the Annexure, unless notice of a new address or facsimile number has been given to the other party.

2. THE SERVICES

2.1 WORK TO BE PERFORMED

The Contractor must perform the Services during the Contract Term in accordance with the Contract Documents.

As part of Latrobe City Council's Emergency Management Response and Recovery planning arrangements you may be requested to provide your services to assist Council and Emergency Agencies under this Contract as the rates negotiated by both parties.

2.2 CONTRACT TERM

2.2.1 Extent of Contract Term

The Contract Term is the Initial Contract Term and any period for which the operation of the Contract is extended under clause 2.2.2, if any.

2.2.2 Extension of Contract Term

Latrobe City Council may, at its option, extend the operation of this Contract beyond the Initial Contract Term for a period not longer than the period stated in the Annexure from the expiration of the Initial Contract Term, if it gives notice of its intention to extend this Contract at least that period specified in the Annexure prior to the end of the Initial Contract Term.

2.2.3 Survival of Rights and Obligations

The rights and obligations of the parties under clauses 2.8, 2.9, 2.11, 5.3, 7, 8.6 and 9 will survive the termination or expiry of this Contract.

2.3 FEES

The Contractor must pay all fees, charges and costs incurred in its performance of the Services, except as expressly stated otherwise in the Annexure.

2.4 CONTRACTOR'S REPRESENTATIVE

The Contractor must appoint a competent person to be responsible for the day to day performance of the Services and the supervision of all persons employed or engaged in carrying out the Services ("the Contractor's Representative").

The Contractor must notify the Supervisor of the name of the Contractor's Representative prior to the Commencement Date and must notify the Supervisor immediately should a new Contractor's Representative be appointed.

2.5 STATUTORY REQUIREMENTS

The Contractor must:

2.5.1 obey; and

2.5.2 ensure that its employees, subcontractors and agents obey,

any Acts, regulations, local laws and by-laws in any way applicable to the performance of the Services or this Contract.

2.6 THE MEDIA

The Contractor must:

2.6.1 not either itself or through its employees, agents or subcontractors make any statement to the media on behalf of the Latrobe City Council or in relation to the performance of the Services;

2.6.2 refer all enquiries from the media relating to the performance of the Services to the Supervisor; and

2.6.3 notify the Supervisor immediately of any event arising in the course of performing the Services which may receive media attention.

2.7 CONFLICTS OF INTEREST

2.7.1 The Contractor must immediately make a full disclosure in writing to the Latrobe City Council of the existence, nature and extent of any actual or potential conflict of interest that the Contractor, or any of its employees, agents and subcontractors, may have between the Contractor's obligations under this Contract and the interests of:

2.7.1.1 the Contractor, its employees, agents or subcontractor;

2.7.1.2 an associate of the Contractor, its employees, agents or subcontractors;

2.7.1.3 a company in which the Contractor, its employees, agents or subcontractors are involved, whether as an officer, shareholder, employee or otherwise; or

2.7.1.4 any other person with whom or which the Contractor or its employees, agents or subcontractors have a financial or business association, whether directly or indirectly.

2.7.2 If the Contractor fails to comply with its obligations under clause 2.7.1, the Latrobe City Council may immediately terminate this Contract. If this Contract is terminated under this clause, clauses 5.2 and 5.3 will operate, to the extent that they are applicable, as if the termination had been made by the Latrobe City Council under clause 5.1.

2.8 USE OF LATROBE CITY COUNCIL'S NAME OR LOGO

The Contractor must not use the Latrobe City Council's name or logo without the prior written consent of the Supervisor, which may be given subject to such conditions as the Supervisor considers appropriate.

2.9 CONFIDENTIALITY

All persons including Tenderers and Contractors must:

2.9.1 keep confidential;

2.9.2 maintain proper and secure custody of; and

2.9.3 not use or reproduce in any form,

the Confidential Information without the written consent of the Supervisor, or as required by law.

Immediately upon the Supervisor's request the Contractor must:

2.9.4 deliver to the Latrobe City Council all confidential information in its possession that is capable of being delivered; and

2.9.5 delete, erase or otherwise destroy all confidential information contained in computer memory, magnetic, optical, laser, electronic or other media in its possession or control which is not capable of delivery to the Latrobe City Council.

2.10 INTELLECTUAL PROPERTY

2.10.1 Subject to this clause, the property and copyright in all Contract Material will vest in the Latrobe City Council. The Contractor must ensure that any person, including employees, agents and subcontractors, engaged by it in the provision of the Services agrees to assign to the Latrobe City Council all the property and copyright in the Contract Material.

2.10.2 Subject to this clause, the Contractor acknowledges that the Latrobe City Council has property and copyright in any discoveries, inventions, patents, designs or other rights arising out of or in performance of this Contract.

2.10.3 Notwithstanding subclauses 2.10.1 and 2.10.2 nothing in this Contract affects or in any way alters the Contractor's ownership of or rights to any pre-existing intellectual property.

2.10.4 Except to the extent that the Contract Material contains the Contractor's rights arising from subclause 2.10.3, the Contractor will not use, reproduce or publish, other than for the Latrobe City Council, the Contract Material, without the prior written consent of the Supervisor.

2.10.5 The Contractor, in performing the Services, must use its best endeavours not to breach the intellectual property rights of any third party.

2.11 INFORMATION PRIVACY

2.11.1 The Contractor must, in respect of Personal Information held in connection with this Contract:

2.11.1.1 comply with the Information Privacy Principles with respect to any act done, or practice engaged in, by the Contractor, its employees and agents including, without limitation, using Personal Information only for the purposes of fulfilling the Contractor's obligations under this Contract and not disclosing Personal Information without the Supervisor's written authority except for the purpose of fulfilling the Contractor's obligations under this Contract;

2.11.1.2 immediately notify the Supervisor where it becomes aware of a breach of clause 2.11.1.1 by the Contractor, its employees or agents; and

2.11.1.3 indemnify and keep indemnified and hold harmless the Latrobe City Council and its Councillors and all members of Latrobe City Council staff against any liability incurred or loss or damage suffered by the Latrobe City Council or its Councillors or members of staff arising out of or in connection with a breach of clause 2.11.1.1 by the Contractor, its employees or agents.

2.11.2 If, during the Contract Term, the Latrobe City Council gives notice to the Contractor that it proposes to audit, either directly or through its auditors, the Contractor's information handling practices, the Contractor must provide all reasonable assistance to the party conducting such an audit.

3. PAYMENTS

3.1 OBLIGATION TO PAY

If the Contractor complies with its obligations under this Contract, the Latrobe City Council must make the payment or payments specified in the Annexure on the basis stated in the Annexure.

The Contractor will be eligible for an increase in accordance with CPI (Melbourne all Groups) at the commencement of each extension period of this Contract and subject to satisfactory performance review.

At this time, should the Contractor incur costs above the CPI increase, the Contractor may submit to the Supervisor, in writing for consideration, a detailed report of these cost increases for an increase in their rate above CPI.

3.2 GOODS AND SERVICES TAX

In this clause 3.2,

"**adjustment**" has the meaning set out in section 195-1 of *A New Tax System (Goods and Services Tax) Act* 1999;

"**adjustment note**" has the meaning set out in section 195-1 of *A New Tax System (Goods and Services Tax) Act* 1999;

"**GST**" means a Goods and Services Tax, Value Added Tax, Consumption Tax or tax of similar effect, whether authorised by *A New Tax System (Goods and Services Tax) Act* 1999 or otherwise;

"**taxable supply**" has the meaning set out in section 195-1 of *A New Tax System (Goods and Services Tax) Act* 1999; and

"**taxable income**" has the meaning set out in section 195-1 of *A New Tax System (Goods and Services Tax) Act* 1999.

To the extent that the performance of the Services constitutes a taxable supply:

3.2.1 if the payment or payments described in clause 3.1 has or have been described as exclusive of GST, the payment or payments will be increased by the applicable amount of GST (GST Amount) which will be calculated by multiplying the amount upon which GST is payable by the prevailing rate of GST;

3.2.2 the Contractor must provide to the Latrobe City Council, a valid tax invoice at or prior to the time of payment of any GST Amount; and

3.2.3 if any adjustment occurs in relation to the taxable supply, the Contractor must issue an adjustment note to the Latrobe City Council within seven (7) days of becoming aware of the adjustment and any payment necessary to give effect to such adjustment must be made within seven (7) days after the date of receipt of the adjustment note.

4. VARIATIONS

4.1 DIRECTION OF VARIATIONS

During the Contract Term, the Supervisor may direct the Contractor to:

4.1.1 alter the extent of the Services;

4.1.2 alter the character, quality or mode of performance of the Services; or

4.1.3 carry out any work of a character similar to the Services.

4.2 VALUATION OF VARIATIONS

The value, if any, of any variation must be added to or subtracted from any payment to the Contractor under clause 3. The value of each variation will be determined by the Supervisor by applying:

4.2.1 any relevant rates or prices contained in the Contract Documents which are expressly stated to be provided for the purposes, or partly for the purposes, of this clause; or

4.2.2 reasonable rates or prices if there are no relevant rates or prices contained in the Contract Documents which are expressly stated to be provided for the purposes, or partly for the purposes, of this clause. If the variation involves a decrease in the Services or the omission of part of the Services, the Supervisor must make a reasonable allowance for the Contractor's profit and overheads.

5. DEFAULTS AND TERMINATION

5.1 DEFAULT BY CONTRACTOR

If the Contractor defaults in the performance or observance of any obligation it has under this Contract, the Supervisor may, without limiting any other rights that the Latrobe City Council may have, give notice to the Contractor to show cause why the powers contained in this clause should not be exercised.

Such notice must:

5.1.1 not be unreasonably given;

5.1.2 state that it is a notice under this clause; and

5.1.3 specify the default, on the part of the Contractor upon which it is based.

If, within seven (7) days after receipt of the notice, the Contractor fails to show, to the satisfaction of the Supervisor, that the default will be rectified and this Contract will be satisfactorily completed in accordance with its terms, the Latrobe City Council, without prejudice to any other rights that it may have under this Contract or at common law against the Contractor, may:

5.1.4 suspend payment under this Contract; or

5.1.5 terminate this Contract.

5.2 CONTRACTOR'S RIGHT TO TERMINATE

If, within fourteen (14) days of any period for payment stated in the Annexure, the Latrobe City Council has failed to pay to the Contractor any amount due under clause 3 (other than an amount being the subject of a dispute or difference under this Contract), the Contractor may by notice to the Latrobe City Council either suspend the Services or terminate this Contract.

5.3 PAYMENTS ON TERMINATION

5.3.1 Limit of Payments

If this Contract is terminated under clauses 5.1 or 5.2, or otherwise, the Latrobe City Council is liable to make payments to the Contractor only in respect of any portion of the Services which have been properly performed and not paid for at the date of termination, as determined by the Supervisor.

5.3.2 Payment for Losses and Expenses

If this Contract is terminated by the Latrobe City Council under clause 5.1, or otherwise, the Contractor must, within 14 days, pay to the Latrobe City Council the amount of the loss and expenses incurred by the Latrobe City Council by reason of or arising from the termination, as determined by the Supervisor.

5.3.3 Latrobe City Council May Retain Moneys

Latrobe City Council may retain the moneys payable to the Contractor under clause 5.3.1 until any amount payable by the Contractor to the Latrobe City Council under clause 5.3.2 has been determined by the Supervisor and paid by the Contractor.

5.4 INSOLVENCY OF CONTRACTOR

If the Contractor:

5.4.1 being a person:

- 5.4.1.1 becomes bankrupt or files or is served with a petition in bankruptcy;
- 5.4.1.2 is served with a bankruptcy notice;
- 5.4.1.3 makes an assignment for the benefit of his or her creditors;
- 5.4.1.4 becomes bound as a debtor by any scheme of arrangement;

5.4.1.5 executes as a debtor any deed of assignment or deed of arrangement; or

5.4.1.6 has a mortgagee or other creditor take possession of any of his or her assets; or

5.4.2. being a partnership:

5.4.2.1 is dissolved;

5.4.2.2 any of the partners becomes bankrupt, or files, or is served with, a petition in bankruptcy;

5.4.2.3 any of the partners is served with a bankruptcy notice;

5.4.2.4 any of the partners makes an assignment for the benefit of his or her creditors;

5.4.2.5 any of the partners becomes bound by any scheme of arrangement;

5.4.2.6 any of the partners executes, as a debtor, any deed of assignment or deed of arrangement; or

5.4.2.7 any of the partners has a mortgagee or other creditor take possession of any of his or her assets; or

5.4.3 being a company or other body corporate:

5.4.3.1 takes, or has taken or instituted against it, any action or proceeding, whether voluntary or compulsory, having as its object the winding-up of the company or other body corporate;

5.4.3.2 an administrator is appointed, or steps are taken for the appointment of an administrator, under Part 5.3A of the Corporations Law in respect of it;

5.4.3.3 enters into a composition or other arrangement with its creditors, other than a voluntary winding-up by members for the purpose of reconstruction or amalgamation;

5.4.3.4 has a mortgagee or other creditor take possession of any of its assets;

5.4.3.5 a receiver or receiver and manager is appointed, or steps are taken for the appointment of a receiver or receiver and manager, in respect of it; or

5.4.3.6 in the case of an incorporated association, takes or institutes, or has taken or instituted against it, any action or proceeding having as its object the cancellation of the incorporation of the incorporated association,

the Latrobe City Council may terminate this Contract immediately and clause 5.3 will, to the extent that it is applicable, operate as if the termination had been made by the Latrobe City Council under clause 5.1.

6. SUBCONTRACTING AND ASSIGNMENT

6.1 SUBCONTRACTING

6.1.1 General

The Contractor must not subcontract the whole or any portion of its rights and obligations under this Contract, except with the prior written consent of the Supervisor, which may be given subject to such conditions as the Supervisor considers appropriate. Except in so far as any consent given by the Supervisor under this clause expressly provides otherwise, no subcontractors will have any rights under this Contract against the Latrobe City Council or be entitled to receive any payments under this Contract from the Latrobe City Council.

6.1.2 Contractor still to be Liable

Unless otherwise agreed in writing by the Supervisor, no subcontracting of any rights or obligations of the Contractor under this Contract will relieve the Contractor from any liability under this Contract or at law in respect of the performance or purported performance of this Contract and the Contractor will be responsible for the acts and omissions of any subcontractor's employees and agents, as if they were the acts or omissions of the Contractor.

6.2 ASSIGNMENT

6.2.1 General

The Contractor must not assign the whole or any of its rights under this Contract, except with the prior written consent of the Supervisor, which may be given subject to such conditions as the Supervisor considers appropriate. Except in so far as any consent given by the Supervisor under this clause expressly provides otherwise, no assignees will have any rights under this Contract against the Latrobe City Council or be entitled to receive any payments under this Contract from the Latrobe City Council.

6.2.2 Change in Beneficial Ownership

For the purpose of this clause, an assignment of this Contract includes any change in the beneficial ownership of the share capital of the Contractor, if it is a company, which alters the effective control of the Contractor.

7. OCCUPATIONAL HEALTH AND SAFETY ACT

7.1 GENERAL OCCUPATIONAL HEALTH AND SAFETY REQUIREMENTS

Latrobe City Council is obliged to provide and maintain, so far as is practicable, a working environment for its employees and members of the public that is safe and without risk to health.

The Contractor must itself, and must ensure that any subcontractors of the Contractor, at all times identify and take all necessary precautions for the health and safety of all persons, including the Contractor's employees and subcontractors, staff of the Latrobe City Council and members of the public, who may be affected by the performance of the Services.

The Contractor must inform itself of all OH&S policies, procedures or measures implemented or adopted by the Latrobe City Council. The Contractor must comply with all such policies, procedures or measures.

The Contractor must immediately comply with any and all directions by the Supervisor relating to OH&S.

7.2 LEGISLATIVE COMPLIANCE

The Contractor must:

7.2.1 comply with; and

7.2.2 ensure that its employees, subcontractors and agents comply with,

any Acts, regulations, local laws, codes of practice and Australian Standards which are in any way applicable to OH&S and the performance of the Services. This provision includes the *Charter of Human Rights and Responsibilities Act* 2006.

The Contractor must also ensure plant and equipment is appropriately licensed or registered and maintained / inspected on a regular basis.

7.3 CONTRACTOR OH&S MANAGEMENT SYSTEM

Prior to the commencement of the Contract, the Contractor must provide evidence of any current independent accreditation or certification of its OH&S Management System, for example, SafetyMAP or AS 4801.

Otherwise the Contractor must establish and implement an OH&S management system which ensures compliance with all duties of an employer under the *Occupational Health and Safety Act* 2004 ("the OH&S Management System") for the work to be undertaken on behalf or for Council.

The OH&S Management System must be:

7.3.1 submitted to the Supervisor for approval prior to the Commencement Date; and

7.3.2 updated during each year of the Contract Term, and such updated OH&S Management System submitted to the Supervisor for approval prior to each anniversary of the Commencement Date.

The Contractor must notify the Latrobe City Council and the Victorian WorkCover Authority of accidents and dangerous occurrences in accordance with the requirements of applicable legislation, including the Occupational Health and Safety Regulations 2007.

Prior to the Commencement Date, the Contractor must submit for approval by the Supervisor a Risk Assessment. The Risk Assessment must include a comprehensive safety analysis of the Contract and the risk control methods to be employed by the Contractor.

The Contractor is also required to demonstrate to the Latrobe City Council that they have an appropriate OH&S Management System which includes as a minimum:

- A documented OH&S Policy
- Legislative requirements compliance

- Job safety analysis / risk assessment
- Relevant formal and informal safe work systems and procedures for managing OH&S risks
- Relevant training and induction details
- Communication schedules
- Accident and emergency procedures.
- Any other OH&S requirements specified by the Council

The Contractor must make any amendments to the OH&S Management System, or any update of the OH&S Management System, submitted for the approval of the Supervisor, which the Supervisor may direct.

The Contractor must implement the OH&S Management System or updated OH&S Management System, as the case may be, throughout the Contract Term.

The Contractor must, when requested by the Supervisor, provide evidence of the Contractor's ongoing implementation of the OH&S Management System.

The Contractor will, as though it or he were the employer within the meaning of the *Occupational Health and Safety Act* 2004, carry out all duties and responsibilities of an employer in relation to its or his employees (as defined in Section 5 and 21 of the said Act).

8. INSURANCE AND INDEMNITY

8.1 WORKERS' COMPENSATION

The Contractor must:

8.1.1 itself effect; and

8.1.2 ensure that each of its subcontractors effects,

a WorkCover policy of insurance complying with the provisions of the *Workplace Injury Rehabilitation & Compensation Act* 2013 in respect of all of its employees.

8.2 PUBLIC LIABILITY INSURANCE

The Contractor must, at all times during the Contract Term, be the holder of a current public liability policy of insurance ("the Public Liability Policy") in respect of the activities specified in the Period Contract Specification – Services Schedule 1, providing coverage for an amount per event of at least that stated in the Annexure.

The Public Liability Policy must be effected with a known and reputable insurance provider. The Public Liability Policy must extend to cover the Latrobe City Council in respect to claims for personal injury or property damage arising out of the negligence of the Contractor.

8.3 PROFESSIONAL INDEMNITY INSURANCE

The Contractor must, at all times during the Contract Term, be the holder of a current professional indemnity policy of insurance ("the Professional Indemnity Policy") in respect of the activities specified in the Period Contract Specification – Services Schedule 1 providing coverage for an amount per event of at least that stated in the Annexure.

The Professional Indemnity Policy must be effected with a known and reputable insurance provider. The Professional Indemnity Policy must extend to cover the Latrobe City Council in respect to claims for a breach of Professional Duty arising out of the negligence of the Contractor.

8.4 PROVISION OF EVIDENCE

8.4.1 Proof of Payment

The Contractor must produce to the Supervisor policies of insurance and receipts evidencing that the premiums for the insurances referred to in clauses 8.1, 8.2 and 8.3 have been paid not less than fourteen (14) days before the Commencement Date.

8.4.2 Certificates of Currency

The Contractor must provide the Latrobe City Council with certificates of currency in respect of the insurances referred to in clauses 8.1, 8.2 and 8.3 within two (2) days of a request by the Supervisor.

8.5 FAILURE TO INSURE

If the Contractor fails to comply with its obligations under clauses 8.1, 8.2, 8.3 or 8.4, the Latrobe City Council may immediately terminate this Contract.

If this Contract is terminated under this clause, clause 5.3 will, to the extent that it is applicable, operate as if the termination had been made by the Latrobe City Council under clause 5.1.

8.6 INDEMNITY

The Contractor must indemnify the Latrobe City Council and its Councillors and members of staff from and against all actions, claims, losses, damages, penalties or demands or costs (including, without limitation, all indirect losses, consequential losses and legal costs on a full indemnity basis) consequent upon, occasioned by or arising from its performance or purported performance of its obligations under this Contract, including, without limitation, any acts or omissions of the Contractor's subcontractors, agents and employees.

9. SECURITY

Upon the execution of this Contract, the Contractor must deliver to the Supervisor any Security Deposit payable to Latrobe City Council for the sum stated in the Annexure ("the Security Deposit").

If the Contractor fails to carry out and complete its obligations under this Contract, Latrobe City Council may have recourse to the Security Deposit in respect of any moneys for which the Contractor may be liable to Latrobe City Council under this Contract or otherwise.

10. AUSTRALIAN / NEW ZEALAND (ANZ) CONTENT

Section 186(6) of the *Local Government Act* 1989 requires that wherever practical, a Council must give effective and substantial preference to contracts for the purchase of goods, machinery or material manufactured or produced in Australia or New Zealand.

11. DISPUTE RESOLUTION

11.1 NOTICE OF DISPUTE

In the event of any dispute or difference arising between the Latrobe City Council and the Contractor, either during the period of this Contract or after the determination, abandonment or breach of this Contract, as to any matter or thing connected with this Contract or arising under this Contract, then the Latrobe City Council or the Contractor may give to the other party notice of the dispute or difference.

Such notice:

11.1.1 will not be unreasonably given; and

11.1.2 will signify that it is a notice under this clause; and

11.1.3 will give sufficient details of the dispute or difference as to enable the party receiving the notice to ascertain the nature of the dispute or difference alleged.

11.2 ALTERNATIVE DISPUTE RESOLUTION

Within fourteen (14) days of the receipt of any notice of dispute under clause 11.1 by either party, a representative of each party will meet to discuss ways of resolving the dispute or difference. The representatives may resolve the dispute or difference themselves or refer the dispute or difference to any form of alternative dispute resolution procedure on which they agree. The representatives must be authorised by the parties to resolve the dispute or difference on their behalf should this prove to be practicable.

11.3 REFERRAL TO ARBITRATION

Unless a dispute or difference of which notice has been given under clause 11.1 is previously settled, either party may, not less than twenty-eight (28) days after the notice of dispute or difference was given, that dispute shall be and is referred to arbitration. The arbitrator shall be agreed between the parties within fourteen (14) days from the date of the receipt of the notice referring the dispute to arbitration by the Contractor or the Council as the case may be, or, failing agreement, shall be nominated by the person stated in the Annexure.

11.4 NO OBLIGATION TO REFER

This clause will not in any way require the Latrobe City Council or the Contractor to refer to arbitration any dispute or difference or in any way act as a bar to the bringing of legal proceedings by the Latrobe City Council or the Contractor, except that no dispute or difference will be the subject of legal proceedings from the time it is referred to arbitration under clause 11.3 to the end of any subsequent arbitration.

11.5 WORK TO CONTINUE

If it be reasonably possible, work under the Contract will continue during arbitration or legal proceedings, and no payment due or payable by the Latrobe City Council, that is not in dispute, will be withheld on account of the arbitration or legal proceedings, unless so authorised by the Contractor or by this Contract.

11.6 COMMERCIAL ARBITRATION ACT

Except where inconsistent with this Contract, any arbitration under this clause will be conducted in accordance with the *Commercial Arbitration Act* 1984.

ANNEXURE

The Commencement Date is (clause 1.1):
Date specified in the Latrobe City Council's Letter of Acceptance

The Contract Documents are (clause 1.1):
- Formal Instrument of Agreement
- Letter of Acceptance
- Services General Conditions
- Period Contract Specification – Services
- Attachment 1
- Tender Submission Document

The Council is (clause 1.1):
Latrobe City Council

The Supervisor is (clause 1.1):
Coordinator Landfill Services or nominated representative

The Council's address is (clause 1.4.3):
141 Commercial Road, Morwell or postal address PO Box 264, Morwell 3840

The Council's facsimile number is (clause 1.4.3):
(03) 5128 5672

The Contractor is (clause 1.1):

The Contractor's address is (clause 1.4.3):
or postal address

The Contractor's facsimile number is (clause 1.4.3):

The Initial Contract Term is (clause 1.1):
Two (2) years

The maximum period for which the Contract may be extended is (clause 2.2.2):
Three (3) by Two (2) year periods

The period prior to the Initial Contract Term by which notice of an extension must be given is (clause 2.2.2):
One (1) month

Fees, charges and costs for which the Contractor is not to be responsible (clause 2.3):
The Contractor is solely responsible for paying all fees and charges and costs associated with the services except for those as specified in Specification

The payments to be made to the Contractor are (clause 3):
Payments made for services as requested and accepted as complying with the Specification

The basis of payments to the Contractor is (clause 3):
Within 30 days of receipt of correctly rendered invoice, subject to the services having been satisfactorily carried out. Invoices must not be given to the Latrobe City Council more than once per month. Each invoice must be in the form of a tax invoice (within the meaning ascribed to that term by the *A New Tax System (Goods and Services Tax) Act* 1999 *(Cth)*).

The minimum amount of coverage under the Public Liability Policy is (clause 8.2):
$10,000,000

The minimum amount of coverage under the Professional Indemnity Policy is (clause 8.3):
Not Applicable

The amount of the security deposit is (clause 9):
Not applicable

The person to nominate an arbitrator is (clause 11.3):
The President of the Victorian Chapter of the Institute of Arbitrators (or a nominee)

LATROBE CITY COUNCIL

LANDFILL MONITORING AND REPORTING

REQUEST FOR TENDER NO: LCC-488

PERIOD CONTRACT SPECIFICATION - SERVICES

TABLE OF CONTENTS

1. DEFINITIONS

In this Specification, the following terms have the meanings indicated, unless inconsistent with the context:

"**Services**" means this Period Contract Specification – Services; and

"**Specified Services**" means the work described in the Period Contract Specification – Services Schedule 1.

2. OBLIGATION TO PROVIDE SERVICES

2.1 CONTRACTOR'S OBLIGATION

The Contractor must provide Specified Services in accordance with this Specification during the Contract Term when directed to do so by the Supervisor.

2.2 NO OBLIGATION ON THE LATROBE CITY COUNCIL

Latrobe City Council is under no obligation to obtain:

2.2.1 any or all of the Specified Services from the Contractor; or

2.2.2 the Specified Services exclusively from the Contractor.

3. QUALITY

It is a term of the essence of this Contract that all Specified Services supplied by the Contractor to the Latrobe City Council must:

3.1 be in the form described; and

3.2 conform to all other criteria specified, in the Period Contract Specification – Services Schedule 1.

4. LOCATION

The Specified Services must be provided at any site within the Municipal District directed by the Supervisor, unless a specific location at which the Specified Services are to be provided is stated in the Period Contract Specification – Services Schedule 1. Latrobe City Council must ensure that the Contractor has any access to the site reasonably necessary to enable the Specified Services to be provided.

5. DOCUMENTS

Latrobe City Council must, prior to any date on which the Contractor has been directed to commence providing the Specified Services, supply to the Contractor any plans, drawings, specifications or other documents ("the Documents") reasonably necessary to enable the Specified Services to be provided and which are not otherwise to be supplied by the Contractor. The Documents must be returned to the Latrobe City Council by the Contractor at the conclusion of the provision of any Specified Services or on demand by the Supervisor.

6. REJECTION OF SERVICES

6.1 SUPERVISOR'S DETERMINATION

The Supervisor may determine if work performed by the Contractor complies with the requirements of this Specification.

6.2 ACCEPTANCE OR REJECTION OF WORK

If the Supervisor determines that any work does not comply with this Specification under clause 6.1, the Supervisor may accept or reject the work.

6.3 RECTIFICATION OF FAULTS

The Contractor must immediately remedy any faults in work that has been rejected by the Supervisor under clause 6.1 if directed to do so by the Supervisor.

6.4 ACCEPTANCE OF WORK

Any acceptance of work by the Supervisor under clause 6.2 will only relieve the Contractor from the obligation to remedy faults in the work concerned. It will not relieve the Contractor from any other obligations under this Contract or negate any express or implied warranty or condition in respect of the work.

6.5 QUALITY OF WORK

If any work which does not comply with this Specification is accepted by the Supervisor under clause 6.2, there shall be a deemed variation or the same as that specified in the Period Contract Specification – Services Schedule 1.

If the quality of the work is inferior as determined by the Supervisor an amount reflecting the difference in the value between the work performed and the Specified Services described in the Period Contract Specification – Services Schedule 1 must be deducted from any payments to the Contractor. Alternatively the Contractor must pay the amount on demand to the Latrobe City Council if payment has already been made for the work concerned.

If the quality of the work is the same or is superior, no additional amount shall be payable by the Latrobe City Council to the Contractor in respect of the work concerned unless otherwise agreed by the Latrobe City Council.

6.6 COMPENSATION

The Contractor must pay to the Latrobe City Council, on demand, the amount of any loss or damage caused to the Latrobe City Council, or for which the Latrobe City Council may become liable, due to any work not being in accordance with any of the requirements of this Specification. The Supervisor must determine the amount of any loss, damage or liability incurred by the Latrobe City Council for the purposes of this clause.

6.7 SUPERVISOR'S OBLIGATION

The Supervisor must exercise any powers conferred on the Supervisor, including the power to make a determination on any issue, under clauses 6.1, 6.5 and 6.6 reasonably and independently of the parties.

7. PAYMENTS

7.1 RATES

Latrobe City Council must pay the Contractor at the rates specified in Tender Form Schedule 1A & 1B for the Specified Services provided.

7.2. INVOICES

The Contractor must issue a complying tax invoice to the Latrobe City Council, itemised to the satisfaction of the Supervisor, each month for all amounts payable to the Contractor under clause 7.1 in the preceding calendar month. All invoices from the Contractor are to include the contract name, contract number, name of requestor, location of works, the quoted price and quotation number where applicable. In the instance of small maintenance work the number of hours, the hourly rate and the plant and materials used should be included on the invoice.

A debt arising for any goods or services supplied under this Contract, and upon which a GST liability arises, will not be recognised until the Contractor provides a complying tax invoice, in accordance with GST regulations and as described within this section.

Latrobe City Council will pay the Contractor at the rates specified in Tender Form Schedule 1A & 1B for the goods or services provided, plus any applicable GST, following the receipt of a complying tax invoice.

8. INTELLECTUAL PROPERTY

The Contractor agrees to indemnify, keep indemnified and hold harmless the Latrobe City Council from and against any action, claims, losses, damages, penalties, demands or costs (including, without limitation, all indirect losses, consequential losses and legal costs on a full indemnity basis) arising from actual or alleged infringements in the provision of the Specified Services of any rights in respect of letters patent, trademarks, copyright, design, confidential information or the like whether granted by the Commonwealth of Australia, a foreign State or the common law.

9. CONFIDENTIALITY

All persons including Tenderers and Contractors must not release any document or article or divulge any information gained in the course of the contract to the media or any person without the prior written approval of the Latrobe City Council.

10. CONTRACT PERFORMANCE REVIEW

During the course of the Contract, and upon its completion, the performance of the Contractor will be reviewed. This assessment will be used to determine the eligibility of the Contractor for future works with the Latrobe City Council.

Latrobe City Council reserves the right to decide overall performance. The Contractor will be entitled to participate and upon request, have access to the review results.

11. TERMS AND CONDITIONS

The Contract terms and conditions override the purchase order terms and conditions, where a conflict arises the Contract terms and conditions take precedence.

LATROBE CITY COUNCIL

PERIOD CONTRACT SPECIFICATION – SERVICES SCHEDULE 1

REQUEST FOR TENDER NO: LCC-488

1. WATER MONITORING (GROUNDWATER, LEACHATE AND SURFACE WATER)

1.1. Monitoring Locations

The water monitoring locations are within or near to the following landfills. A plan showing monitoring locations of each landfill site is attached.

a) Hyland Highway Landfill, Loy Yang;

b) Morwell Landfill, Maryvale Road, Morwell; and

c) Moe Landfill, Haunted Hills Road, Newborough.

2. MONITORING FREQUENCIES

Testing shall be carried out at the frequencies given in the Testing Schedule in Table 1. If there would be an increased number of sampling and testing due to the change of testing frequency or addition of new monitoring infrastructure as required by the environmental auditor or EPA, payments will be made in accordance with the agreed rate per test.

2.1. Monitoring frequency, parameters to be monitored and timing of samples:

Table 1: Monitoring Frequencies

Landfill	Element	Parameter[1]	Frequency
Morwell	Groundwater, leachate, surface water	Level/Quality	every 6 months
	Landfill gas (subsurface)	Quality	Quarterly
		Flow	Quarterly
		Condition	Quarterly
	Landfill gas (buildings and structures and subsurface service)	Quality	Biannually
		Flow Level	Biannually
	Landfill Gas (surface methane emission monitoring)	Quality	Quarterly

[1] The details of Parameters to be monitored are given in Table 3

Landfill	Element	Parameter[1]	Frequency
Moe	Groundwater, leachate, surface water	Level/Quality	every 6 months
	Landfill gas (subsurface)	Quality	Quarterly
		Flow	Quarterly
		Condition	Quarterly
	Landfill gas (buildings and structures and subsurface service)	Quality	Biannually
		Flow Level	Biannually
	Landfill Gas (surface methane emission monitoring)	Quality	Quarterly
Hyland Highway	Groundwater	Level	Quarterly
		Quality	Biannually
		Condition	Each visit and following report of damage
	Leachate	Level	Quarterly
		Quality	Biannually
		Condition	Each visit and following report of damage
	Surface water	Level	Quarterly
		Quality	Biannually
		Condition	Each visit
	Landfill gas (subsurface)	Quality	Quarterly
		Flow	Quarterly
		Condition	Quarterly
	Landfill gas (buildings and structures and subsurface service)	Quality	Biannually
		Flow Level	Biannually
	Landfill Gas (surface methane emission monitoring)	Quality	Quarterly

Table 2: Testing Times

Landfill	Parameter	Suggested testing dates (first week of the month)			
Morwell	Groundwater quality, leachate quality, surface water quality,)		November		May
	Landfill gas (subsurface), Landfill gas (buildings and structures and subsurface service)	August	November	February	May

Landfill	Parameter	Suggested testing dates (first week of the month)			
Moe	Groundwater quality, leachate quality, surface water quality,)		November		May
	Landfill gas (subsurface), Landfill gas (buildings and structures and subsurface service)	August	November	February	May
Hyland Highway	Groundwater level, leachate level, surface water level, landfill gas (subsurface) quality	August	November	February	May
	Groundwater quality, leachate quality, surface water quality, Landfill gas (buildings and structures and subsurface service)	August		February	

Parameters to be monitored as part of the program are shown in the Table 3.

Table 3: Parameters to be monitored

Element	Parameter	Unit[1]	Description
Groundwater	Level	m (in AHD/RL)[2]	Calculated as top of casing (ToC) level less standing water level (SWL) depth below (ToC). Depth to base of bore below top of casing. Casing 'stick up'.
	Quality	various	*Field:* Temperature, Electrical Conductivity, pH, Oxidation – Reduction Potential, Dissolved Oxygen, physical appearance.
			Laboratory: pH, Total Dissolved Solids (TDS), Ammonia (as N), Nitrate (as N), Bicarbonate (HCO3), Chloride, Sulphate, Sodium, Potassium, Calcium, Magnesium, Total Organic Carbon (TOC), Total Phosphate, Total Recoverable Hydrocarbons (TRH) – 2013 NEPM fractions, and BTEXs. Total Iron (filtered) and Manganese (filtered).
	Purged Volume	L	Metered volumes from bores in monitoring network
	Condition	Descriptive	Qualitative description of the condition of the bore and headworks (e.g. damage, disturbance).

Element	Parameter	Unit[1]	Description
Leachate (bores)	Level	m (in AHD/RL)[2]	Depth below top of leachate bore Bore 'stick up' (if elevation of bore altered)
	Quality	various	*Field:* Temperature, Electrical Conductivity, pH, Oxidation-Reduction Potential, Dissolved Oxygen, physical appearance
			Laboratory: pH, Total Dissolve Solids (TDS), Ammonia (as N), Nitrate (as N), Bicarbonate (HCO_3), Chloride, Sulphate, Sodium, Pottasium, Calcium, Magnesium, Total Iron (filtered), Manganese (filtered), Total Organic Carbon (TOC), Total Phosphate, Total Recoverable Hydrocarbons (TPH) -2013 NEPM fractions, and BTEX.
	Condition	Descriptive	Qualitative description of the conditions of the bore and headworks (e.g. damage, disturbance)
Leachate Pond	Level	m (in AHD/RL)[2] if possible	Depth of sampling location
	Quality	various	*Field:* Temperature, Electrical Conductivity, pH, Oxidation-Reduction Potential, Dissolved Oxygen, physical appearance
			Laboratory: pH, Total Dissolve Solids (TDS), Ammonia (as N), Nitrate (as N), Bicarbonate (HCO_3), Chloride, Sulphate, Sodium, Pottasium, Calcium, Magnesium, Total Iron (filtered), Manganese (filtered), Total Organic Carbon (TOC), Total Phosphate, Total Recoverable Hydrocarbons (TRH) -2013 NEPM fractions, and BTEX.
	Condition	Descriptive	Turbidity, colour, odour of pond, estimate free board

Element	Parameter	Unit[1]	Description
Stormwater Pond	Level	m (in AHD/RL)[2] if possible	Depth of sampling location
	Quality	various	*Field:* Temperature, Electrical Conductivity, pH, Oxidation-Reduction Potential, Dissolved Oxygen, physical appearance
			Laboratory: pH, Total Dissolve Solids (TDS), Ammonia (as N), Nitrate (as N), Bicarbonate (HCO_3), Chloride, Sulphate, Sodium, Potassium, Calcium, Magnesium, Total Iron (filtered), Manganese (filtered), Total Organic Carbon (TOC), Total Phosphate, Total Recoverable Hydrocarbons (TPH) -2013 NEPM fractions, and BTEX.
	Condition	Descriptive	Turbidity, colour, odour of pond, estimate free board
Surface water	Level	m (in AHD/RL)[2] if possible	Depth of sampling location
	Quality	various	*Field:* Temperature, Electrical Conductivity, pH, Oxidation-Reduction Potential, Dissolved Oxygen, physical appearance
			Laboratory: pH, Total Dissolve Solids (TDS), Ammonia (as N), Nitrate (as N), Bicarbonate (HCO_3), Chloride, Sulphate, Sodium, Potassium, Calcium, Magnesium, Total Iron (filtered), Manganese (filtered), Total Organic Carbon (TOC), Total Phosphate, Total Recoverable Hydrocarbons (TPH) -2013 NEPM fractions, and BTEX.
	Condition	Descriptive	Turbidity, colour, odour
Landfill Gas (subsurface)	Quality	Various	*Field:* Atmospheric pressure, relative pressure, peak CH_4, CO_2, O_2 and stabilised CH_4, CO_2, O_2, CO, and H_2S, flow (L/s), and comments.
	Condition	Descriptive	Qualitative description of the condition of the bore and headworks (e.g. damage, disturbance).
Landfill Gas (interim and final cap)	Quality	Various	*Field:* Atmospheric pressure, relative pressure, peak CH_4.
	Condition	Descriptive	Qualitative description of the condition of the cap (cracks, odour, status of vegetation, leachate).

Element	Parameter	Unit[1]	Description
Landfill Gas (buildings and service pits)	Quality	Various	*Field:* Atmospheric pressure, relative pressure, peak CH_4, CO_2, O_2.
	Condition	Descriptive	Qualitative description of the condition of the buildings and service pits (including possible LFG access points, cracks and odour).

(1) SI units preferred
(2) AHD – Australian Height Datum, RL – Reduced level

2.2. Sampling Methods

2.2.1. Groundwater, Leachate and Surface Water

Sampling methods to be applied to the groundwater, leachate and surface water monitoring are summarised in Table 4.

Table 4: Sampling Methods

Element	Method	Comment
Groundwater and leachate	EPA (2000) Groundwater Sampling Guidelines, Publication No. 699. EPA (2009), Sampling and Analysis of Water, Wastewaters, Soils and Wastes, IWRG701.	Low flow sampling method preferred. Levels to be gauged prior to sampling disturbance.
Surface Water	EPA (2009), Sampling and Analysis of Water, Wastewaters, Soils and Wastes, IWRG701.	Levels to be gauged or estimated prior to sampling. Physical characteristics of the water body to be noted.

The following additional notes are made:

- Collection of the following QA/QC samples:
  - field blank;
  - equipment/rinsate blank;
  - blind replicates (inter and intra-laboratory);
- In selecting the appropriate sampling method, and undertaking sampling tasks, all appropriate Occupational Health, Safety and Environmental requirements shall be considered.

2.2.2. Landfill Gas

LFG sampling should be undertaken in accordance with the EPA (2011b),"*Draft Landfill Gas Fugitive Emissions Monitoring Guidelines"*. Sampling procedures should be modified as required to conform to changes between the draft and the final guidelines.

Table 5 below provides the required details of the LFG monitoring equipment.

Table 5: Landfill Gas monitoring equipment details

Item	Details
LFG bore monitoring	An extractive LFG gas analyser as per Table 4-1 of EPA (2011b). The meter shall be calibrated to monitor methane (CH_4), carbon dioxide (CO_2), oxygen (O_2) – calibration certificates to be provided by from rental company and included in the annual monitoring report. The meter shall be equipped and calibrated to measure gas flow rate or an alternative instrument to measure flow will suffice.
Final and interim cap	A low concentration methane detector with a detection limit to 1 ppm as per Table 4-2 of EPA (2011b). The meter shall be calibrated.
Subsurface services	An extractive LFG gas analyser as per Table 4-1 of EPA (2011b) to monitor peak and stabilised methane (CH_4 and carbon dioxide (CO_2) concentration and minimum oxygen (O_2) concentration. The meter shall be calibrated. A low concentration methane detector with a detection limit to 1 ppm as per Table 4-2 of EPA (2011b) to monitor methane. The meter shall be calibrated.
Buildings, service trenches and pits monitoring	As per subsurface services.
Pressure gauge	A pressure measure device (i.e. manometer, bi-directional gauge or equivalent) is required to gauge relative bore / probe pressure prior to and following sampling of the bore. The pressure gauge should allow for relatively low pressures (e.g. as low as Pascals rather than mbar or hectapascals).

Specific LFG monitoring procedures to be applied are listed In Table 6

Table 6: LFG Monitoring Procedure

General	Monitoring shall (to the extent practicable) be conducted during falling and/or low atmospheric pressure. LFG monitoring equipment shall be operated in accordance with manufacturer's instructions as well as EPA (2011b) "Draft Landfill Gas Fugitive Emissions Monitoring Guidelines, Publ. No. 1416.
LFG bores	The following LFG monitoring procedure shall be followed at bores: 1. Run meter in ambient air and record ambient air readings until stabilisation. 2. Record bore pressure reading using a manometer (or equivalent). If reading above 1 mm H_2O, then also take a pressure reading at conclusion of monitoring. 3. Record gas flow rate and relative pressure. Ensure the unit has been "zeroed" prior to taking these readings. 4. Purge LFG probes for a minimum period of one minute and bores for a minimum period of three minutes. Record CH_4, CO_2, O_2 concentrations (to 0.5% or lower) on a minimum of six occasions during each bore purge. 5. If concentrations are fluctuating, continue running pump and recording concentrations at 1 minute intervals until stable. 6. At completion of monitoring at each bore / probe, purge the meter in open air until ambient readings are achieved.
Landfill cap surface (interim and final)	Monitor on a 25 m square grid over the interim and final cap. Diversions off the grid pattern to target and monitor any cracks, odours, stressed vegetation, or infrastructure potentially penetrating the cap (e.g. bores, posts) is allowed. Monitoring should where practical take place following low and falling atmospheric pressure with wind speeds less than 10 km/hr and not after any high rainfall events(i.e. the cap should not be saturated) Monitoring device should have extendable probe with the specifications recommended in the EPA (2011b). The operator should stand still for several seconds and record readings at ground surface. Locations (GPS co-ordinates) and concentrations of elevated methane and carbon dioxide should be recorded along with wind speed and direction.
Subsurface services	As per Section 8 of EPA (2011b).
Buildings, service trenches and pits monitoring	As per Section 9 of EPA (2011b).

3. QA/QC COMPLIANCE REQUIREMENT

- Groundwater sampling shall be undertaken in accordance with *EPA (2000) Groundwater Sampling Guidelines;*
- Sampling to be undertaken by qualified experienced personnel;
- All equipment used shall be calibrated prior to use;
- All field records and calibrations should be recorded on field data sheets;
- Monitoring bores should be gauged for level prior to purging /sampling;
- Monitoring bores should be purged until field parameters (electrical conductivity, pH and temperature) stabilise;
- Bore sampling should be conducted using a low flow downhole Submersible Pump. Pumping should continue until chemical equilibrium is reached in accordance with the EPA Publication 669 requirements. This method required that only small volumes of water typically at a pumping rate of between 0.1 L/min to 0.5 L/min.
- QA/QC samples should be collected in accordance with the minimum requirements of the relevant sampling guidelines for each sampling episode.

  These should include:

  - blind replicates (inter and intralaboratory);and
  - calculation of Relative Percent Differences (RPD).

  Data validation checks should also be undertaken.
- Sampling equipment should be decontaminated and rinsed with deionised water between bores;
- Samples should be filtered and preserved while on-site and in transit to the laboratory;
- Each sample designated for analysis should be recorded on a Chain-of-Custody form which details:
  - name of the person transferring the samples;
  - name of person receiving the samples, e.g. laboratory staff;
  - time and date the samples were taken;
  - time and date the samples were received; and
  - analytes to be determined.
- Laboratory specified sample holding times should be adhered to.
- Laboratory analysis should be undertaken by a National Association of Testing Authority (NATA) accredited laboratory. Laboratory analytical limits of reporting (LOR) shall be such that they meet or better the trigger levels used to assess impacts under the SEPP (Groundwaters of Victoria) for groundwater samples and SEPP (Waters of Victoria) for surface water samples.

4. REPORTING

4.1. Quarterly Report

Following each monitoring event a factual report should be submitted to Council. This report should include a summary of test results, noting any exceedances of action levels or trigger values and any damages to monitoring infrastructure.

4.2. Annual Report

At the end of each financial year an annual monitoring report for Hyland Highway Landfill shall be prepared for the completed financial year. The report shall include the following:

A high level overview of the monitoring program scope and data analyses performed methods using tabulations:

- A declaration that the monitoring program was completely in accordance with the verified monitoring program and explains any non-conformances, including names of persons responsible for each component of the monitoring program;
- Identification of any changes to the monitoring points;
- A tabulated checklist of all bores at the site noting compliance with the monitoring specification for each monitoring event, i.e. stating that the bore was sampled or otherwise noting the reasons for non-compliance;
- New field and laboratory groundwater, surface water, leachate, and LFG data should be added to a database holding and enabling efficient reporting of all monitoring records and data;
- A listing of all equipment used, by make and model and evidence of any calibration;
- Plans showing the locations of all monitoring locations (i.e. bores, pits, indoor locations) and general site features;
- For water sampling:
    - Tabulated field parameters and laboratory analytical data, including graphical presentation of trends for key parameters (i.e. including but not limited to ammonia, nitrate, TDS, reduced water level, methane concentrations);
    - NATA-stamped laboratory certificates for all results;
    - Signed chain of custody and laboratory sample receipt records;
    - Trend analysis of groundwater reduced level, ammonia, nitrate, and TDS; and
    - Exceedance of beneficial use criteria.
- Equipment calibration certificates;
- Originals of the groundwater, leachate, and surface water field record sheets (hand written and soiled is acceptable);

- Data interpretation, including consideration of assumptions and uncertainties;
- Interpolated watertable surface contour plan overlain on the base of waste level, the data to be used should be last monitoring event prior to 30 June;
- Conclusions, including re-evaluation of the risk posed, operational controls and other management strategies, and monitoring effort;
- Recommended changes to the monitoring program;
- An electronic recording device (CD-ROM or USB memory stick) containing the annual data set as well as a copy of the entire updated database over the full historical monitoring period; and
- The Annual report should be submitted as an **unlocked PDF file**.

LATROBE CITY COUNCIL

LANDFILL MONITORING AND REPORTING

REQUEST FOR TENDER NO: LCC-488

TENDER FORM AND TENDER FORM SCHEDULES

TENDER INFORMATION AND CONDITIONS OF TENDERING

FORM OF TENDER SUBMISSIONS

Electronic tender lodgement via Latrobe City Council's e-tendering portal www.latrobe.vic.gov.au/tenders is to be utilised by tenderers to lodge submissions no later than the closing time and date.

COUNCIL DOES NOT ACCEPT HARDCOPY SUBMISSIONS

LATROBE CITY COUNCIL

TENDER FORM

REQUEST FOR TENDER NO: LCC-488

PLEASE USE BLOCK LETTERS

Business Name of company or firm submitting Tender - **Include full trading as business name (if applicable)**	....
	....
Address of Tenderer:	....
	....
Postal Address of Tenderer: *(if different from above address)*	....
	....
GST Registration Number:	....

hereby tenders to perform the works / services for:

LANDFILL MONITORING AND REPORTING

in accordance with the following documents:

⇒ **Tender Information and Conditions of Tendering**
⇒ **Services General Conditions**
⇒ **Period Contract Specification – Services**
⇒ **Tender Form**
⇒ **Tender Form Schedules 1, 2, 3, 4, 5 and 6**
⇒ **Attachment 1**

For the rates as detailed in the Tender Form Schedule 1A & 1B spreadsheet

NOTE: Tenderers are to price the goods or services exclusive of GST, that is, the price is not to include a GST. Should the supply of any goods or services under the Contract be subject to GST, the amount of the GST is to be shown separately on a complying tax invoice.

If the Tenderer is a firm, the full names of the individual members of the firm must be stated here:	....
	....
Name of person submitting tender:	....
Position of person submitting tender:	....
Signature of person submitting tender:	....

DATED this **..........** day of **............................** 2018 *(insert date)*

LATROBE CITY COUNCIL

TENDER FORM SCHEDULE 1A & 1B

REQUEST FOR TENDER NO: LCC-488

PRICING SCHEDULE

Please price the separate Excel spreadsheet file and submit in Excel format.

NOTE: All above prices are to be exclusive of GST.

LATROBE CITY COUNCIL

TENDER FORM SCHEDULE 2

STATEMENT BY TENDERER IN SUPPORT OF REQUEST FOR TENDER NO: LCC-488

1. GENERAL

This Tender is submitted and Contract Claims, if successful will be submitted in the name of:

____

Company Address: ____

____

Registered Address of Tenderer: ____

____

Phone No.: ____________________ Fax No.: ____________________

Email Address: ____

2. INDIVIDUALS **(Tick where appropriate)**

(a) This Tender is submitted by an individual trading under own name ☐

OR

(b) By an individual trading under a name registered under the *Business Names Act* 1962 ☐

Australian Business Number (ABN): ____________________

Registered Business Name: ____________________

Trading as: ____________________

3. PARTNERS

(a) This Tender is submitted by Partners ☐

Name: (i) ____________________

(ii) ____________________

(iii) ____________________

(b) The partners trade under their individual names ☐

OR

(c) Under a name registered under the *Business Names Act* 1962 ☐

Australian Business Number (ABN): ______________________________

Registered Business Name: ______________________________

Trading as: ______________________________

(d) Authorisation is based under:

(i) All partners signing ☐

(ii) Other arrangements as follows:

____

____

____

Signed: ______________________ **Date:** _____ /_____ / _____

4. COMPANIES

(a) This Tender is submitted by a company registered under the Companies Act of Australia ☐

(b) Australian Company Number (ACN): ______________________________

OR / AND

Australian Business Number (ABN): ______________________________

(c) The persons authorised under the Articles of Association of the Company to sign documents are: ☐

Name: ____________________ Position: ____________________

Name: ____________________ Position: ____________________

Name: ____________________ Position: ____________________

Name: ____________________ Position: ____________________

(d) Authorisation is based under:

(i) All named persons signing ☐

(ii) Other arrangements as follows:

____

____

____

Signed: ______________________ **Date:** _____ /_____ / _____

5. CONFORMING TENDER

This Tender is submitted in conformance with all the said documents of the above-mentioned contract:

Signed: ______________________________ **Date:** _____ /_____ / _____

OR

The following details are provided for the extent to which this tender does not conform with the above-mentioned contract:

____

____

____

____

____

____

____

____

N.B. 1. If space inadequate, please attach additional sheets.
2. Additional sheets are / are not attached.

Signed: ______________________________ **Date:** _____ /_____ / _____

LATROBE CITY COUNCIL

TENDER FORM SCHEDULE 3

REQUEST FOR TENDER NO: LCC-488

STATUTORY DECLARATION

I, ____

of, ____

do solemnly and sincerely declare that:

1. DEFINITIONS

In this Statutory Declaration:

"**Bidders**" means any tenderers for the Contract and includes the Tenderer;

"**the Contract**" means the Contract that the tender to which this Statutory Declaration is annexed pertains;

"**Industry Association**" means any organisation of which Bidders are members;

"**the Tenderer**" means (insert below: name of company, other body, corporate, firm or individual)

____; and

"**Tender Price**" means the amount indicated by a Bidder as the lowest amount for which that Bidder is prepared to perform the Contract.

2. * INTRODUCTION

I am the Tenderer and make this declaration on my own behalf. ☐

OR

2. * INTRODUCTION

2.1 I hold the position of (insert Managing Director or other title)

____ of the Tenderer and am duly authorised by the Tenderer to make this declaration on its behalf.

2.2 I make this declaration on behalf of the Tenderer and on behalf of myself.

(* Delete or strikethrough alternative which is not applicable)

3. NO KNOWLEDGE OF TENDER PRICES

Prior to the Tenderer submitting its tender for the Contract, neither the Tenderer, nor any of its employees or agents, had knowledge of the Tender Price or proposed Tender Price of any other Bidder who submitted, or of any person, company, other body corporate or firm that proposed to submit, a tender for the Contract.

4. DISCLOSURE OF TENDER PRICE

Prior to the close of tenders for the Contract, neither the Tenderer, nor any of its employees or agents, disclosed the Tenderer's Tender Price to:

4.1 any other Bidder who submitted a tender for the Contract;

4.2 any person, company, other body corporate or firm proposing to submit a tender for the Contract; or

4.3 any person or organisation connected or associated with a Bidder, person, company, other body corporate or firm of a kind referred to in clauses 4.1 or 4.2.

5. PROVISION OF INFORMATION

Neither the Tenderer, nor any of its employees or agents, has provided information to:

5.1 any other Bidder who has submitted a tender for the Contract;

5.2 any person, company, other body corporate or firm proposing to submit a tender for the Contract; or

5.3 any other person, company, other body corporate or firm for the purpose of assisting in the preparation of a tender for the Contract.

6. GENUINE COMPETITION

The Tenderer is genuinely competing for the Contract.

7. INDUSTRY ASSOCIATION AGREEMENTS

Neither the Tenderer, nor any of its employees or agents, has entered into any contract, agreement, arrangement or understanding, other than as disclosed to the Council in the Tenderer's tender, that the successful Bidder for the Contract will pay any money to, or provide any other benefit or other financial advantage to, an Industry Association in respect of the Contract.

8. UNSUCCESSFUL TENDERERS' FEES

Neither the Tenderer, nor any of its employees or agents, has entered into any contract, agreement, arrangement or understanding that the successful Bidder for the Contract will pay any money to, or provide any other benefit or other financial advantage to, any other Bidder who unsuccessfully tendered for the Contract.

9. QUALIFICATIONS TO TENDERS

Neither the Tenderer, nor any of its employees or agents, has entered into any contract, agreement, arrangement or understanding that Bidders for the Contract would include an identical or similar condition or qualification in their tenders for the Contract.

I acknowledge that this declaration is true and correct and I make it in the belief that a person making a false declaration is liable to the penalties of perjury.

DECLARED at ....)

.... in the State of Victoria)

on this .... day of .... 2018)

Signed: ....

Before Me * :

Signature: ____________________________________

Full Name: ____________________________________

Address: ____________________________________

Qualification: ____________________________________

* (See below for a list of people who are authorised to witness Statutory Declarations)

These persons are authorised to witness statutory declarations under Section 107A of the Evidence Act:

- A Justice of the Peace or a Bail Justice
- A Notary Public
- A barrister and solicitor of the Supreme Court
- A clerk to a barrister and solicitor of the Supreme Court
- The Prothonotary or a Deputy Prothonotary of the Supreme Court
- The Registrar or a Deputy Registrar of the County Court
- The Principal Registrar of the Magistrates' Court
- The Registrar or a Deputy Registrar of the Magistrates' Court
- The Registrar of Probates or an Assistant Registrar of Probates
- The Associate to a Judge of the Supreme Court or of the County Court
- The Secretary of a Master of the Supreme Court or of the County Court
- A person registered as a Patent Attorney under Part XV of the Patents Act 1952 of the Commonwealth
- A member of the Police Force
- The Sheriff or a Deputy Sheriff
- A member or former member of either House of the Parliament of Victoria
- A member or former member of either House of the Parliament of the Commonwealth
- A councillor of a municipality
- A senior officer of a Council as defined in the Local Government Act 1989
- A registered medical practitioner within the meaning of the Medical Practice Act 1994
- A dentist
- A veterinary surgeon
- A pharmacist
- A principal in the teaching service
- The manager of a bank
- A member of the Institute of Chartered Accountants in Australia or the Australian Society of Accountants or the National Institute of Accountants
- The secretary of a building society
- A minister of religion authorised to celebrate marriages
- A person who holds an office in the public service or in a statutory authority that is prescribed as an office to which this section applies
- A fellow of the Institute of Legal Executives (Victoria)

LATROBE CITY COUNCIL

TENDER FORM SCHEDULE 4

REQUEST FOR TENDER NO: LCC-488

INFORMATION TO BE SUPPLIED BY TENDERER

Tenderers are required to submit such information as is necessary to enable the Council to assess their ability to carry out the works. This questionnaire has been prepared to assist tenderers in supplying this information.

1. Tenderer's Name: ____

2. How many years has the Tenderer been in business under its present business name?

   ____

3. In what other types of business has the Tenderer a financial interest?

   ____

   ____

4. How many years experience has the Tenderer had in the type of work it would be required to perform under the Contract?

   ____

5. List current works of a similar type that the Tenderer is undertaking. (Note: All contact persons listed below, or any persons contacted by Latrobe City Council in relation to work performed by the tenderer, may be treated as referees).

Description of Work	Annual Value	When Started and Expiry Date	Location of Work	Client Company, Contact Person and Telephone Number

6. List works of a similar type that the Tenderer has done in the past three years. (Note: All contact persons listed below, or any persons contacted by Latrobe City Council in relation to work performed by the tenderer, may be treated as referees.)

Description of Work	Value	Dates	Location of Work	Client Company, Contact Person and Telephone Number

7. What is the experience of the principal individuals of the Tenderer in the type of work it would be required to perform under the Contract?

Name and Position	Location and Description of Work and for Whom Work Performed	In what capacity

8. State the number of personnel and equipment (if applicable) that the Tenderer intends to employ on performing the Contract.

Personnel: ____

____

____

____

Equipment: ____

____

____

____

9. Location of Office (if applicable) the Tenderer intends to use for the Contract.

____

10. Give details of the Tenderer's financial ability to carry out the work.

____

____

11. List banks or other financial institution from which references may be obtained.

____

____

12. List names and telephone numbers of professional referees.

Name	**Position**	**Organisation**	**Telephone**

13. Insurance Details

13.1. Provide details of WorkCover insurance or a attach letter of exemption, whichever is applicable

Insurance Provider: ____

WorkCover Employer No: ______________________ Expiry date: _______________

13.2 Provide details of Public Liability and Professional Indemnity insurance

Public Liability

Insurance Provider: ____

Policy No: ___________________________________ Expiry date: _______________

Sum Insured: ____

Professional Indemnity

Insurance Provider: ____

Policy No: ___________________________________ Expiry date: _______________

Limit of Indemnity: ____

14. Benefit to Regional Economy

14.1 Principle place of business or registered office address:

____

14.2 Does your business have an office or depot within Latrobe City? Please provide details and location:

____

14.3 Will your business source goods and services for this contract from within Latrobe City?

YES / **NO** *(please circle)* If yes, please provide details: ____________________

____

14.4 Does your company sponsor any community or sporting groups from within Latrobe City? If so, please list:

YES / **NO** *(please circle)* If yes, please provide details: ____________________

____

14.5 Does your company employ trainees / apprentices / people with disabilities from within Latrobe City?

YES / **NO** *(please circle)* If yes, how many in the last financial year? ________

15. Community Engagement

Does your product / service have the potential to have an impact on the community?

If so, please outline how you will communicate and engage with key stakeholders and relevant community members:

____

____

16. Other information from Contractor (Tenderers are invited to submit other relevant information in support of their Tender. Tenderers are expected to clarify in writing their interpretation of the Specification where there may be an ambiguity).

____

____

____

LATROBE CITY COUNCIL

TENDER FORM SCHEDULE 5

REQUEST FOR TENDER NO: LCC-488

OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT SYSTEM QUESTIONNAIRE

This questionnaire forms part of Latrobe City Council's tender evaluation process and is to be completed by tenderers and submitted with their tender offer. The objective of the questionnaire is to provide an overview of the status of the tenderers OH&S management system. Tenderers will be required to verify their responses noted in their questionnaire by providing evidence of their ability and capacity in relevant matters.

		Yes	No
1	**OH&S Policy and Management**		
1.1	Is there a written company OH&S policy? *If Yes, provide a copy of policy.* *Comments:*	☐	☐
1.2	Does the company have an OH&S Management System certified by a recognised independent authority (eg: SafetyMAP)? *If Yes, provide details:*	☐	☐
1.3	Is there a company OH&S Management System manual or plan? *If Yes, provide a copy of contents page(s).* *Comments:*	☐	☐
1.4	Are Occupational Health and Safety responsibilities clearly identified for all levels of staff? *If Yes, provide details:*	☐	☐
2	**Safe Work Practices and Procedures**		
2.1	Has the company prepared safe operating procedures or specific safety instructions relevant to its operations? *If Yes, provide a summary listing of procedures or instructions:*	☐	☐
2.2	Does the company have any permit to work systems? *If Yes, provide a summary listing or permits.*	☐	☐
2.3	Is there a documented incident investigation procedure? *If Yes, provide a copy of a standard incident report form.* *Comments:*	☐	☐
2.4	Are there procedures for maintaining, inspecting and assessing the hazards of plant operated / owned by the company? *If Yes, provide details:*	☐	☐

		Yes	No
2.5	Are there procedures for storing and handling hazardous substances? *If Yes, provide details:*	☐	☐
2.6	Are there procedures for identifying, assessing and controlling risks associated with manual handling? *If Yes, provide details:*	☐	☐

3 OHS Training

3.1 Describe how Occupational Health and Safety training is conducted in your company:

....

....

		Yes	No
3.2	Is a record maintained of all training and induction programs undertaken for employees in your company? *If Yes, provide examples of safety training records.* *Comments:*	☐	☐

4 Health and Safety Workplace Inspection

		Yes	No
4.1	Are regular Occupational Health and Safety inspections at work-sites undertaken? *If Yes, provide details:*	☐	☐
4.2	Is standard workplace inspection checklists used to conduct Occupational Health and Safety inspections? *If Yes, provide details or examples:*	☐	☐
4.3	Is there a procedure by which employees can report hazards at workplaces? *If Yes, provide details:*	☐	☐

5 Health and Safety Consultation

		Yes	No
5.1	Is there a workplace OH&S committee? *If Yes, provide details:*	☐	☐
5.2	Are employees involved in decision making over OH&S matters? *If Yes, provide details:*	☐	☐
5.3	Are there employee-elected Occupational Health and Safety representatives? *Comments:*	☐	☐

6 OH&S Performance Monitoring

		Yes	No
6.1	Is there a system for recording and analysing Occupational Health and Safety performance statistics? *If Yes, provide details:*	☐	☐

	Yes	No
6.2 Are employees regularly provided with information on company Occupational Health and Safety performance? *If Yes, provide details:*	☐	☐
6.3 Has the company ever been convicted of an Occupational Health and Safety offence? *If Yes, provide details:*	☐	☐

7 Company References

7.1 Please provide the following information for the three (3) most recent contracts completed by the company:

	Contract 1	**Contract 2**	**Contract 3**
Contract Description:			
Client:			
Contact:			
Phone No.:			
Number of lost time injuries:			
Number of person days on contract:			
Total days lost due to injuries:			

Certification
The information provided in this questionnaire is an accurate summary of the company's Occupational Health and Safety management system.
Company Name: ______________________________
Name: ______________________________
Signed: ______________________________
Position: ______________________________
Contact Number: ____________________ Date: ________________

LATROBE CITY COUNCIL

TENDER FORM SCHEDULE 6

REQUEST FOR TENDER NO: LCC-488

RECEIPT OF ADDENDA

The tenderer is required to list the addenda that they received during the tender period and acknowledge that the tender has been prepared having regard to those addenda.

This Tender Form Schedule is only to be returned with the tender submission where addenda have been received by the Tenderer.

ADDENDUM NUMBER	BRIEF DESCRIPTION (eg. Specification Page No., Clause, Schedule No.)	DATE RECEIVED

This tender has been prepared having regard to the addenda listed above.

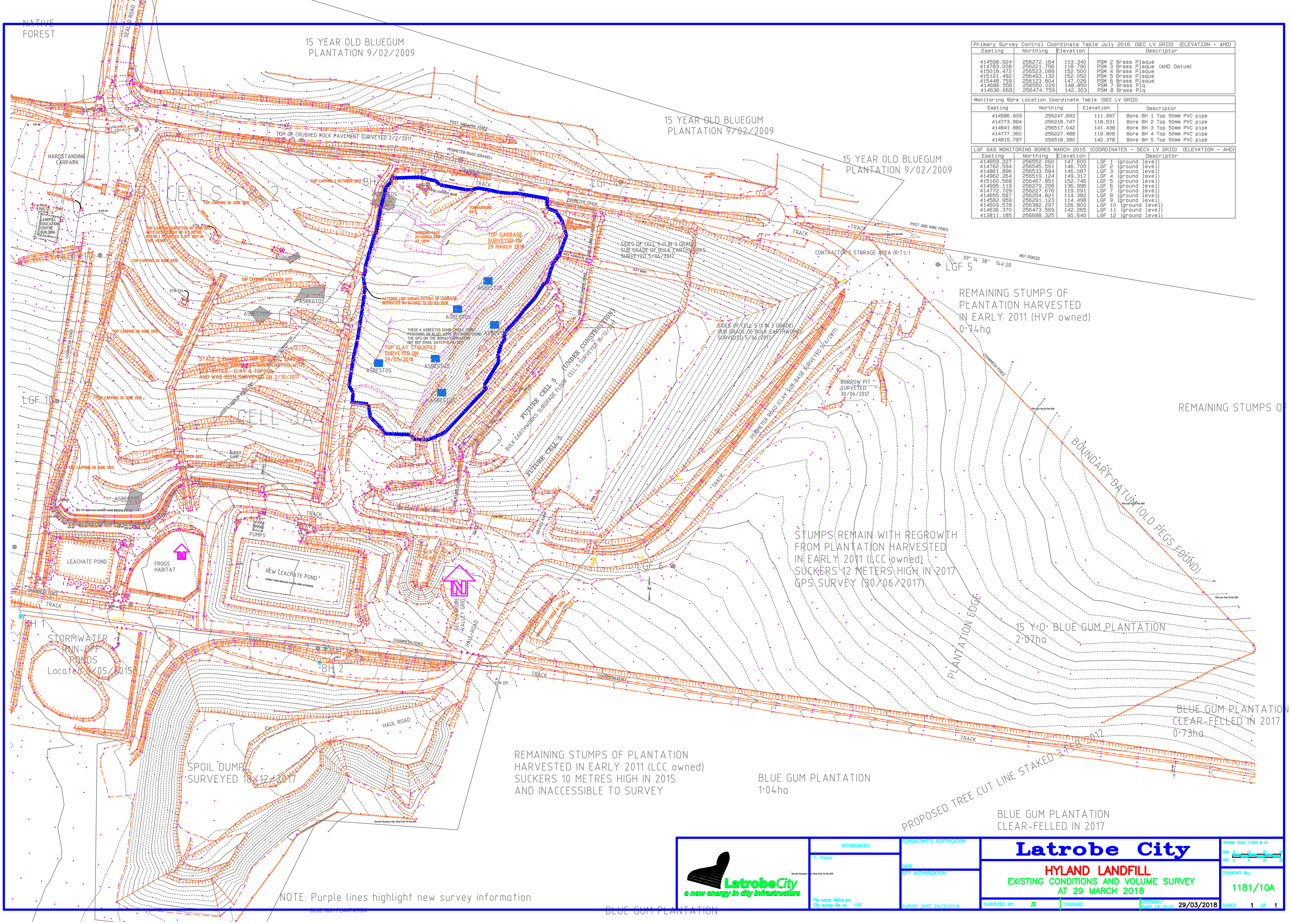
SIGNED: ____

NAME OF TENDERER: ______________________________________

DATE: ______________________

ATTACHMENT 1

Monitoring Locations Plans



Primary Survey Control Coordinate Table July 2016 (SEC LV GRID) (ELEVATION - AHD)			
Easting	Northing	Elevation	Descriptor
414598.924	256272.164	113.340	PSM 2 Brass Plaque
414783.008	256221.756	118.790	PSM 3 Brass Plaque (AHD Datum)
415018.472	256523.089	152.500	PSM 4 Brass Plaque
415121.492	256493.132	152.052	PSM 5 Brass Plaque
415448.759	256123.804	147.026	PSM 6 Brass Plaque
414686.556	256550.029	148.850	PSM 7 Brass Plq
414636.669	256474.759	142.303	PSM 8 Brass Plq

Monitoring Bore Location Coordinate Table (SEC LV GRID)			
Easting	Northing	Elevation	Descriptor
414586.909	256247.893	111.997	Bore BH 1 Top 50mm PVC pipe
414773.994	256218.747	118.531	Bore BH 2 Top 50mm PVC pipe
414841.880	256517.042	141.438	Bore BH 3 Top 50mm PVC pipe
414777.360	256227.488	119.808	Bore BH 4 Top 50mm PVC pipe
414815.797	256518.380	142.378	Bore BH 5 Top 50mm PVC pipe

LGF GAS MONITORING BORES MARCH 2015 (COORDINATES - SECV LV GRID) (ELEVATION - AHD)			
Easting	Northing	Elevation	Descriptor
414659.227	256552.060	147.600	LGF 1 (ground level)
414762.594	256545.591	146.705	LGF 2 (ground level)
414861.896	256533.584	146.087	LGF 3 (ground level)
414962.264	256519.124	149.317	LGF 4 (ground level)
415160.568	256467.851	152.746	LGF 5 (ground level)
414995.119	256279.206	136.996	LGF 6 (ground level)
414772.729	256227.676	119.091	LGF 7 (ground level)
414655.587	256254.821	114.382	LGF 8 (ground level)
414582.959	256291.123	114.498	LGF 9 (ground level)
414609.578	256382.297	126.800	LGF 10 (ground level)
414636.370	256473.569	142.265	LGF 11 (ground level)
413811.185	256688.325	90.640	LGF 12 (ground level)

LatrobeCity
a new energy in city infrastructure

REFERENCES
1. Xxxxx

File name: Metric.pro
City survey file no. 1181

CONSULTANT'S CERTIFICATION
DATE
CITY AUTHORIZATION
SURVEY DATE 29/3/2018

Latrobe City

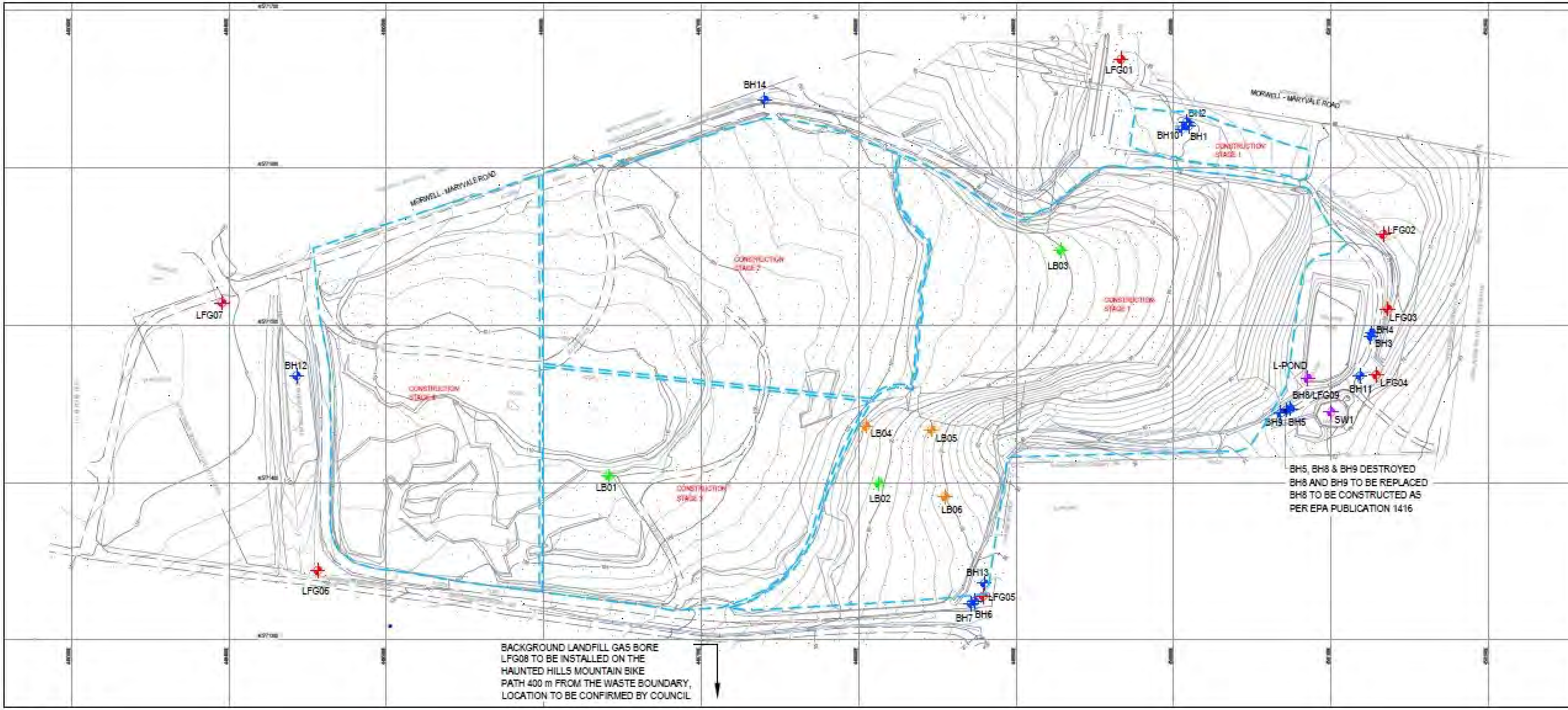
HYLAND LANDFILL
EXISTING CONDITIONS AND VOLUME SURVEY
AT 29 MARCH 2018

SURVEYED BY: JZ | CHECKED | VERSION/DATE OF PLOT 29/03/2018

ORIGINAL SCALE 1:2000 @ A3
HOR 0 10 20 30
VER 0 X 2X 3X

DRAWING No. 1181/10A

SHEET 1 OF 1



LEGEND:

70	EXISTING MAJOR CONTOUR	LB02	EXISTING LEACHATE MONITORING BORE
	EXISTING MINOR CONTOUR	LB05	EXISTING LEACHATE EXTRACTION BORE
	EXISTING FENCE	BH13	EXISTING GROUNDWATER MONITORING BORE
	EXISTING DRAIN	SW01	PROPOSED SURFACE WATER / LEACHATE POND SAMPLING LOCATION
	EXISTING TRACK	LFG02	PROPOSED LANDFILL GAS MONITORING BORE
	EXISTING BOUNDARY LINE		

N

0 25 50 75m

SCALE 1:2500 AT ORIGINAL SIZE

GHD

LATROBE CITY COUNCIL
MORWELL LANDFILL REHABILITATION
ENVIRONMENTAL MONITORING PROGRAM
EXISTING AND PROPOSED
MONITORING LOCATIONS

Job Number	31-32822
Revision	0
Date	DEC 2016

N

0 20 40 60m

SCALE 1:2000 AT ORIGINAL SIZE

GHD

LATROBE CITY COUNCIL
MOE LANDFILL REHABILITATION
ENVIRONMENTAL MONITORING PROGRAM
ENVIRONMENTAL MONITORING
LOCATION PLAN

Job Number	31-32155
Revision	A
Date	JUNE 2016

REQUEST FOR TENDER NO: LCC-488

LANDFILL MONITORING AND REPORTING

ADDENDUM 1

Please note that you are only eligible to submit a tender if you attended the mandatory site meeting that was held on 15 June 2018

TENDERS CLOSE: **2:00 pm on Thursday, 28 June 2018**

PHONE CONTACT: Katie Garlick, Procurement Administration Officer
Corporate Headquarters, telephone (03) 5128 5714

LATROBE CITY COUNCIL

ADDENDUM 1

REQUEST FOR TENDER NO: LCC-488

Please find an addendum to the above tender, containing revised:

- Period Contract Specification – Services Schedule 1;
- Attachments;
- Groundwater and Leachate Bore Monitoring Details; and
- Tender Form Schedule 1A and 1B (provided as separate excel file).

Tenderers are to ensure acknowledgement of this addendum on the Tender Form Schedule for Receipt of Addenda in their submission.

LATROBE CITY COUNCIL

PERIOD CONTRACT SPECIFICATION – SERVICES SCHEDULE 1

ADDENDUM 1

REQUEST FOR TENDER NO: LCC-488

1. WATER MONITORING (GROUNDWATER, LEACHATE AND SURFACE WATER)

1.1. Monitoring Locations

The water monitoring locations are within or near to the following landfills. A plan showing monitoring locations of each landfill site is attached.

a) Hyland Highway Landfill, Loy Yang;

b) Morwell Landfill, Maryvale Road, Morwell; and

c) Moe Landfill, Haunted Hills Road, Newborough.

2. MONITORING FREQUENCIES

Testing shall be carried out at the frequencies given in the Testing Schedule in Table 1. If there would be an increased number of sampling and testing due to the change of testing frequency or addition of new monitoring infrastructure as required by the environmental auditor or EPA, payments will be made in accordance with the agreed rate per test.

2.1. Monitoring frequency, parameters to be monitored and timing of samples:

Table 1: Monitoring Frequencies

Landfill	Element	Parameter[1]	Frequency
Morwell	Leachate (bores and pond)	Level/Quality	Quarterly
	Groundwater, surface water	Level/Quality	Bi-annually
	Landfill gas (subsurface, buildings and structures and underground services)	Methane, CO_2, CO, H_2S	Quarterly
	Landfill Gas (surface methane emission monitoring)	Methane(ppm) and Wind speed	Quarterly
Moe	Leachate (bores and pond)	Level/Quality	Quarterly
	Groundwater, surface water	Level/Quality	Bi-annually

[1] The details of Parameters to be monitored are given in Table 3

Landfill	Element	Parameter[1]	Frequency
	Landfill gas (subsurface, buildings and structures and underground services)	Methane, CO_2, CO, H_2S	Quarterly
	Landfill Gas (surface methane emission monitoring)	Methane(ppm) and Wind speed	Quarterly
Hyland Highway	Groundwater	Quality	Biannually
		Condition	Each visit and following report of damage
		Level	Quarterly
	Leachate	Quality	Biannually
		Condition	Each visit
		Level /Field testing	Quarterly
	Surface water	Quality	Biannually
		Condition	Each visit
		Level /Field testing	Quarterly
	RO Unit	Quality	Quarterly
		Level /Field testing	Quarterly
	Landfill Gas (subsurface)	Quality	Quarterly
	Landfill Gas (subsurface) Landfill Gas (surface)	Flow	Quarterly
		Condition	Quarterly
		Quality	Quarterly
	Landfill Gas (buildings and subsurface services)	Quality	Biannually[2]
	Landfill Gas (buildings and subsurface services)	Flow	Biannually[2]

Table 2: Testing Times

Landfill	Parameter	Suggested testing dates (first week of the month)			
Morwell	Groundwater, surface water		November		May
	Leachate (bores and pond), Landfill gas (subsurface, buildings and structures and underground services, and surface methane emission monitoring))	August	November	February	May

[2] May and November

Landfill	Parameter	Suggested testing dates (first week of the month)			
Moe	Groundwater, surface water		November		May
	Leachate (bores and pond), Landfill gas (subsurface, buildings and structures and underground services, and surface methane emission monitoring))	August	November	February	May
Hyland Highway	Groundwater level, leachate level, surface water level, landfill gas (subsurface) quality	August	November	February	May
	Groundwater quality, leachate quality, surface water quality, Landfill gas (buildings and structures and subsurface service)		November		May

Parameters to be monitored as part of the program are shown in the Table 3.

Table 3: Parameters to be monitored

Element	Parameter	Unit[1]	Description
Groundwater	Level	m (in AHD/RL)[2]	Calculated as top of casing (ToC) level less standing water level (SWL) depth below (ToC). Depth to base of bore below top of casing. Casing 'stick up'.
	Quality	various	*Field:* Temperature, Electrical Conductivity, pH, Oxidation – Reduction Potential, Dissolved Oxygen, physical appearance.
			Laboratory: pH, Total Dissolved Solids (TDS), Ammonia (as N), Nitrate (as N), Bicarbonate (HCO3), Chloride, Sulphate, Sodium, Potassium, Calcium, Magnesium, Total Organic Carbon (TOC), Total Phosphate, Total Recoverable Hydrocarbons (TRH) – 2013 NEPM fractions, and BTEXs. Total Iron (filtered) and Manganese (filtered).
	Purged Volume	L	Metered volumes from bores in monitoring network

Element	Parameter	Unit[1]	Description
	Condition	Descriptive	Qualitative description of the condition of the bore and headworks (e.g. damage, disturbance).
Leachate (bores)	Level	m (in AHD/RL)[2]	Depth below top of leachate bore Bore ‘stick up’ (if elevation of bore altered)
	Quality	various	*Field:* Temperature, Electrical Conductivity, pH, Oxidation-Reduction Potential, Dissolved Oxygen, physical appearance
			Laboratory: pH, Total Dissolve Solids (TDS), Ammonia (as N), Nitrate (as N), Bicarbonate (HCO_3), Chloride, Sulphate, Sodium, Pottasium, Calcium, Magnesium, Total Iron (filtered), Manganese (filtered), Total Organic Carbon (TOC), Total Phosphate, Total Recoverable Hydrocarbons (TPH) -2013 NEPM fractions, and BTEX.
	Condition	Descriptive	Qualitative description of the conditions of the bore and headworks (e.g. damage, disturbance)
Leachate Pond	Level	m (in AHD/RL)[2] if possible	Depth of sampling location
	Quality	various	*Field:* Temperature, Electrical Conductivity, pH, Oxidation-Reduction Potential, Dissolved Oxygen, physical appearance
			Laboratory: pH, Total Dissolve Solids (TDS), Ammonia (as N), Nitrate (as N), Bicarbonate (HCO_3), Chloride, Sulphate, Sodium, Pottasium, Calcium, Magnesium, Total Iron (filtered), Manganese (filtered), Total Organic Carbon (TOC), Total Phosphate, Total Recoverable Hydrocarbons (TRH) -2013 NEPM fractions, and BTEX.
	Condition	Descriptive	Turbidity, colour, odour of pond, estimate free board

Element	Parameter	Unit[1]	Description
Stormwater Pond	Level	m (in AHD/RL)[2] if possible	Depth of sampling location
	Quality	various	*Field:* Temperature, Electrical Conductivity, pH, Oxidation-Reduction Potential, Dissolved Oxygen, physical appearance
			Laboratory: pH, Total Dissolve Solids (TDS), Ammonia (as N), Nitrate (as N), Bicarbonate (HCO_3), Chloride, Sulphate, Sodium, Potassium, Calcium, Magnesium, Total Iron (filtered), Manganese (filtered), Total Organic Carbon (TOC), Total Phosphate, Total Recoverable Hydrocarbons (TPH) -2013 NEPM fractions, and BTEX.
	Condition	Descriptive	Turbidity, colour, odour of pond, estimate free board
Surface water	Level	m (in AHD/RL)[2] if possible	Depth of sampling location
	Quality	various	*Field:* Temperature, Electrical Conductivity, pH, Oxidation-Reduction Potential, Dissolved Oxygen, physical appearance
			Laboratory: pH, Total Dissolve Solids (TDS), Ammonia (as N), Nitrate (as N), Bicarbonate (HCO_3), Chloride, Sulphate, Sodium, Potassium, Calcium, Magnesium, Total Iron (filtered), Manganese (filtered), Total Organic Carbon (TOC), Total Phosphate, Total Recoverable Hydrocarbons (TPH) -2013 NEPM fractions, and BTEX.
	Condition	Descriptive	Turbidity, colour, odour
Landfill Gas (subsurface)	Quality	Various	*Field:* Atmospheric pressure, relative pressure, peak CH_4, CO_2, O_2 and stabilised CH_4, CO_2, O_2, CO, and H_2S, flow (L/s), and comments.
	Condition	Descriptive	Qualitative description of the condition of the bore and headworks (e.g. damage, disturbance).
Landfill Gas (interim and final cap)	Quality	Various	*Field:* Atmospheric pressure, relative pressure, peak CH_4.
	Condition	Descriptive	Qualitative description of the condition of the cap (cracks, odour, status of vegetation, leachate).

Element	Parameter	Unit[1]	Description
Landfill Gas (buildings and service pits)	Quality	Various	*Field:* Atmospheric pressure, relative pressure, peak CH_4, CO_2, O_2.
	Condition	Descriptive	Qualitative description of the condition of the buildings and service pits (including possible LFG access points, cracks and odour).

(1) SI units preferred
(2) AHD – Australian Height Datum, RL – Reduced level

2.2. Sampling Methods

2.2.1. Groundwater, Leachate and Surface Water

Sampling methods to be applied to the groundwater, leachate and surface water monitoring are summarised in Table 4.

Table 4: Sampling Methods

Element	Method	Comment
Groundwater and leachate	EPA (2000) Groundwater Sampling Guidelines, Publication No. 699. EPA (2009), Sampling and Analysis of Water, Wastewaters, Soils and Wastes, IWRG701.	Low flow sampling method preferred. Levels to be gauged prior to sampling disturbance.
Surface Water	EPA (2009), Sampling and Analysis of Water, Wastewaters, Soils and Wastes, IWRG701.	Levels to be gauged or estimated prior to sampling. Physical characteristics of the water body to be noted.

The following additional notes are made:

- Collection of the following QA/QC samples:
    - field blank;
    - equipment/rinsate blank;
    - blind replicates (inter and intra-laboratory);
- In selecting the appropriate sampling method, and undertaking sampling tasks, all appropriate Occupational Health, Safety and Environmental requirements shall be considered.

2.2.2. *Landfill Gas*

LFG sampling should be undertaken in accordance with the EPA (2011b),"*Draft Landfill Gas Fugitive Emissions Monitoring Guidelines"*. Sampling procedures should be modified as required to conform to changes between the draft and the final guidelines.

Table 5 below provides the required details of the LFG monitoring equipment.

Table 5: Landfill Gas monitoring equipment details

Item	Details
LFG bore monitoring	An extractive LFG gas analyser as per Table 4-1 of EPA (2011b). The meter shall be calibrated to monitor methane (CH_4), carbon dioxide (CO_2), oxygen (O_2) – calibration certificates to be provided by from rental company and included in the annual monitoring report. The meter shall be equipped and calibrated to measure gas flow rate or an alternative instrument to measure flow will suffice.
Final and interim cap	A low concentration methane detector with a detection limit to 1 ppm as per Table 4-2 of EPA (2011b). The meter shall be calibrated.
Subsurface services	An extractive LFG gas analyser as per Table 4-1 of EPA (2011b) to monitor peak and stabilised methane (CH_4 and carbon dioxide (CO_2) concentration and minimum oxygen (O_2) concentration. The meter shall be calibrated. A low concentration methane detector with a detection limit to 1 ppm as per Table 4-2 of EPA (2011b) to monitor methane. The meter shall be calibrated.
Buildings, service trenches and pits monitoring	As per subsurface services.
Pressure gauge	A pressure measure device (i.e. manometer, bi-directional gauge or equivalent) is required to gauge relative bore / probe pressure prior to and following sampling of the bore. The pressure gauge should allow for relatively low pressures (e.g. as low as Pascals rather than mbar or hectapascals).

Specific LFG monitoring procedures to be applied are listed In Table 6

Table 6: LFG Monitoring Procedure

General	Monitoring shall (to the extent practicable) be conducted during falling and/or low atmospheric pressure. LFG monitoring equipment shall be operated in accordance with manufacturer's instructions as well as EPA (2011b) "Draft Landfill Gas Fugitive Emissions Monitoring Guidelines, Publ. No. 1416.
LFG bores	The following LFG monitoring procedure shall be followed at bores: 1. Run meter in ambient air and record ambient air readings until stabilisation. 2. Record bore pressure reading using a manometer (or equivalent). If reading above 1 mm H_2O, then also take a pressure reading at conclusion of monitoring. 3. Record gas flow rate and relative pressure. Ensure the unit has been "zeroed" prior to taking these readings. 4. Purge LFG probes for a minimum period of one minute and bores for a minimum period of three minutes. Record CH_4, CO_2, O_2 concentrations (to 0.5% or lower) on a minimum of six occasions during each bore purge. 5. If concentrations are fluctuating, continue running pump and recording concentrations at 1 minute intervals until stable. 6. At completion of monitoring at each bore / probe, purge the meter in open air until ambient readings are achieved.
Landfill cap surface (interim and final)	Monitor on a 25 m square grid over the interim and final cap. Diversions off the grid pattern to target and monitor any cracks, odours, stressed vegetation, or infrastructure potentially penetrating the cap (e.g. bores, posts) is allowed. Monitoring should where practical take place following low and falling atmospheric pressure with wind speeds less than 10 km/hr and not after any high rainfall events(i.e. the cap should not be saturated) Monitoring device should have extendable probe with the specifications recommended in the EPA (2011b). The operator should stand still for several seconds and record readings at ground surface. Locations (GPS co-ordinates) and concentrations of elevated methane and carbon dioxide should be recorded along with wind speed and direction.
Subsurface services	As per Section 8 of EPA (2011b).
Buildings, service trenches and pits monitoring	As per Section 9 of EPA (2011b).

3. QA/QC COMPLIANCE REQUIREMENT

- Groundwater sampling shall be undertaken in accordance with *EPA (2000) Groundwater Sampling Guidelines;*
- Sampling to be undertaken by qualified experienced personnel;
- All equipment used shall be calibrated prior to use;
- All field records and calibrations should be recorded on field data sheets;
- Monitoring bores should be gauged for level prior to purging /sampling;
- Monitoring bores should be purged until field parameters (electrical conductivity, pH and temperature) stabilise;
- Bore sampling should be conducted using a low flow downhole Submersible Pump. Pumping should continue until chemical equilibrium is reached in accordance with the EPA Publication 669 requirements. This method required that only small volumes of water typically at a pumping rate of between 0.1 L/min to 0.5 L/min.
- QA/QC samples should be collected in accordance with the minimum requirements of the relevant sampling guidelines for each sampling episode.

  These should include:

  - blind replicates (inter and intralaboratory);and
  - calculation of Relative Percent Differences (RPD).

  Data validation checks should also be undertaken.
- Sampling equipment should be decontaminated and rinsed with deionised water between bores;
- Samples should be filtered and preserved while on-site and in transit to the laboratory;
- Each sample designated for analysis should be recorded on a Chain-of-Custody form which details:
  - name of the person transferring the samples;
  - name of person receiving the samples, e.g. laboratory staff;
  - time and date the samples were taken;
  - time and date the samples were received; and
  - analytes to be determined.
- Laboratory specified sample holding times should be adhered to.
- Laboratory analysis should be undertaken by a National Association of Testing Authority (NATA) accredited laboratory. Laboratory analytical limits of reporting (LOR) shall be such that they meet or better the trigger levels used to assess impacts under the SEPP (Groundwaters of Victoria) for groundwater samples and SEPP (Waters of Victoria) for surface water samples.

4. REPORTING

4.1. Quarterly Report

Following each monitoring event a factual report should be submitted to Council. This report should include a summary of test results, noting any exceedances of action levels or trigger values and any damages to monitoring infrastructure.

4.2. Annual Report

At the end of each financial year an annual monitoring report for Hyland Highway Landfill shall be prepared for the completed financial year. The report shall include the following:

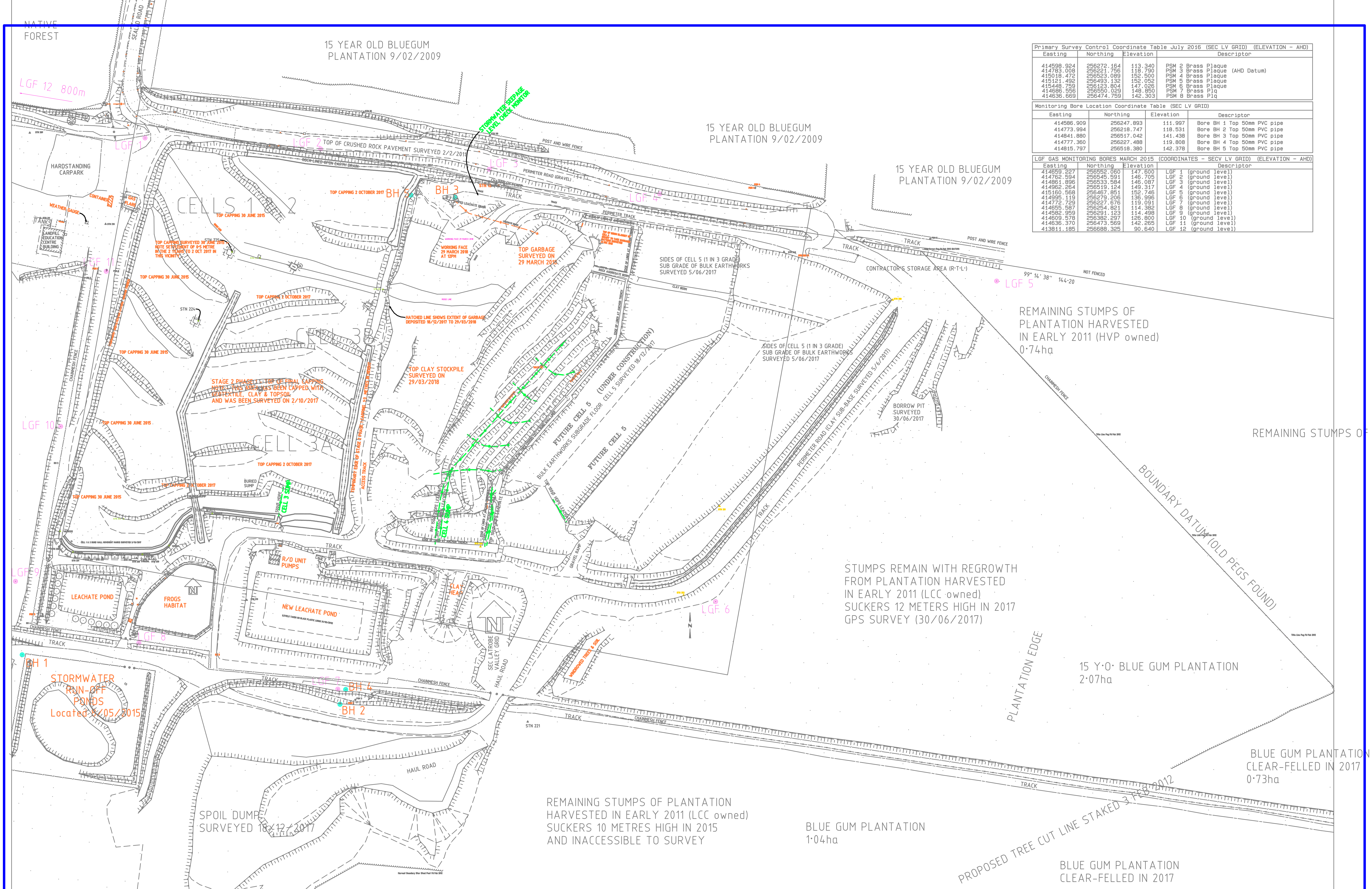
A high level overview of the monitoring program scope and data analyses performed methods using tabulations:

- A declaration that the monitoring program was completely in accordance with the verified monitoring program and explains any non-conformances, including names of persons responsible for each component of the monitoring program;
- Identification of any changes to the monitoring points;
- A tabulated checklist of all bores at the site noting compliance with the monitoring specification for each monitoring event, i.e. stating that the bore was sampled or otherwise noting the reasons for non-compliance;
- New field and laboratory groundwater, surface water, leachate, and LFG data should be added to a database holding and enabling efficient reporting of all monitoring records and data;
- A listing of all equipment used, by make and model and evidence of any calibration;
- Plans showing the locations of all monitoring locations (i.e. bores, pits, indoor locations) and general site features;
- For water sampling:
    - Tabulated field parameters and laboratory analytical data, including graphical presentation of trends for key parameters (i.e. including but not limited to ammonia, nitrate, TDS, reduced water level, methane concentrations);
    - NATA-stamped laboratory certificates for all results;
    - Signed chain of custody and laboratory sample receipt records;
    - Trend analysis of groundwater reduced level, ammonia, nitrate, and TDS; and
    - Exceedance of beneficial use criteria.
- Equipment calibration certificates;
- Originals of the groundwater, leachate, and surface water field record sheets (hand written and soiled is acceptable);

- Data interpretation, including consideration of assumptions and uncertainties;
- Interpolated watertable surface contour plan overlain on the base of waste level, the data to be used should be last monitoring event prior to 30 June;
- Conclusions, including re-evaluation of the risk posed, operational controls and other management strategies, and monitoring effort;
- Recommended changes to the monitoring program;
- An electronic recording device (CD-ROM or USB memory stick) containing the annual data set as well as a copy of the entire updated database over the full historical monitoring period; and
- The Annual report should be submitted as an **unlocked PDF file**.

ATTACHMENT 1

Monitoring Locations Plans and Groundwater and Leachate Bore Monitoring Details



Primary Survey Control Coordinate Table July 2016 (SEC LV GRID) (ELEVATION – AHD)

Easting	Northing	Elevation	Descriptor
414598.924	256272.164	113.340	PSM 2 Brass Plaque
414783.008	256221.756	118.790	PSM 3 Brass Plaque (AHD Datum)
415018.472	256523.089	152.500	PSM 4 Brass Plaque
415121.492	256493.132	152.052	PSM 5 Brass Plaque
415448.759	256123.804	147.026	PSM 6 Brass Plaque
414686.556	256550.029	148.850	PSM 7 Brass Plq
414636.669	256474.759	142.303	PSM 8 Brass Plq

Monitoring Bore Location Coordinate Table (SEC LV GRID)

Easting	Northing	Elevation	Descriptor
414586.909	256247.893	111.997	Bore BH 1 Top 50mm PVC pipe
414773.994	256218.747	118.531	Bore BH 2 Top 50mm PVC pipe
414841.880	256517.042	141.438	Bore BH 3 Top 50mm PVC pipe
414777.360	256227.488	119.808	Bore BH 4 Top 50mm PVC pipe
414815.797	256518.380	142.378	Bore BH 5 Top 50mm PVC pipe

LGF GAS MONITORING BORES MARCH 2015 (COORDINATES – SECV LV GRID) (ELEVATION – AHD)

Easting	Northing	Elevation	Descriptor
414659.227	256552.060	147.600	LGF 1 (ground level)
414762.594	256545.591	146.705	LGF 2 (ground level)
414861.896	256533.584	146.087	LGF 3 (ground level)
414962.264	256519.124	149.317	LGF 4 (ground level)
415160.568	256467.851	152.746	LGF 5 (ground level)
414995.119	256279.206	136.996	LGF 6 (ground level)
414772.729	256227.676	119.091	LGF 7 (ground level)
414655.587	256254.821	114.382	LGF 8 (ground level)
414582.959	256291.123	114.498	LGF 9 (ground level)
414609.578	256382.297	126.800	LGF 10 (ground level)
414636.370	256473.569	142.265	LGF 11 (ground level)
413811.185	256688.325	90.640	LGF 12 (ground level)

LatrobeCity
a new energy in city infrastructure

REFERENCES
1. Xxxxx

File name: Metric.pro
City survey file no. 1182

CONSULTANT'S CERTIFICATION
DATE
CITY AUTHORIZATION
SURVEY DATE 13/06/2018

Latrobe City

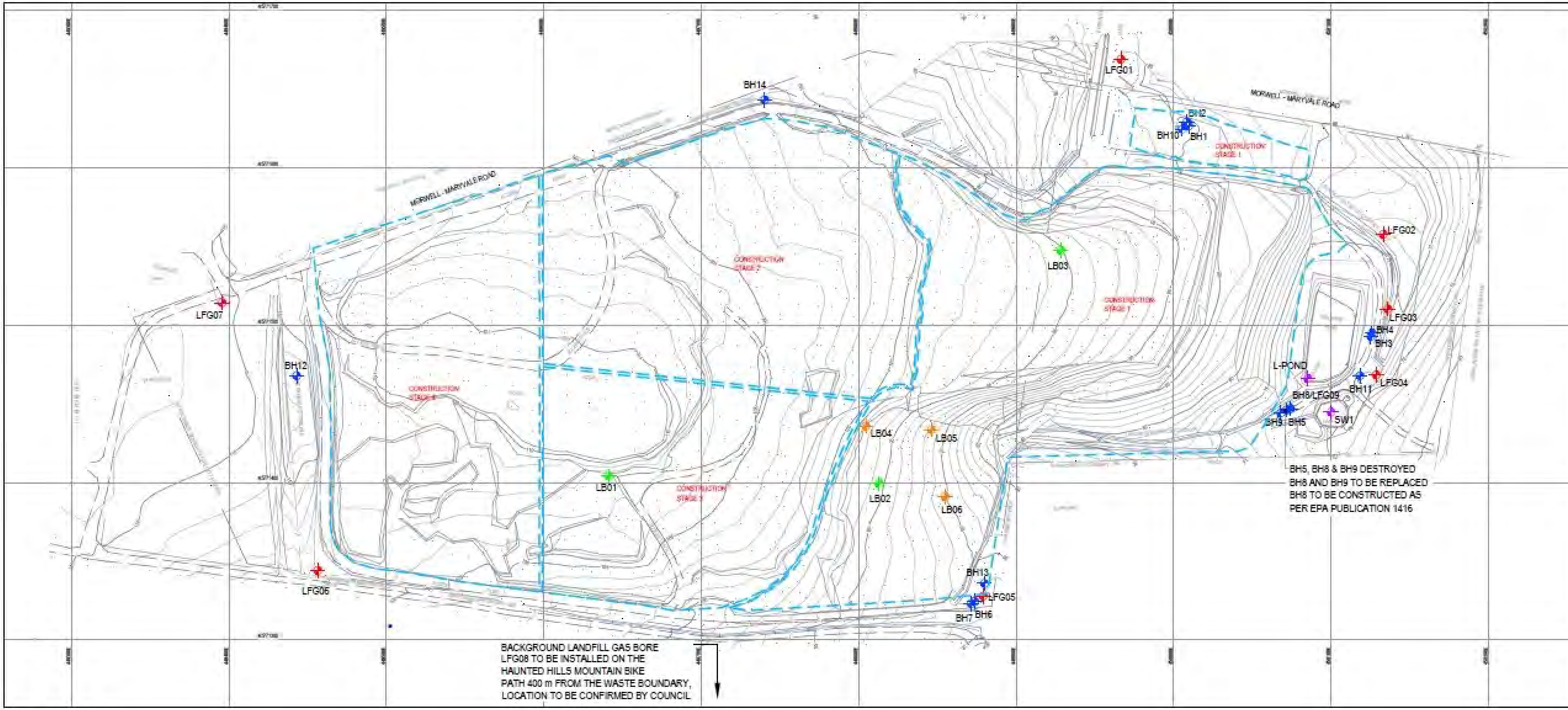
HYLAND LANDFILL
MONITORING STATION LOCATIONS
AT 13 JUNE 2018

SURVEYED BY: JZ | CHECKED | VERSION/DATE OF PLOT 13/06/2018

ORIGINAL SCALE 1:2000 @ A3
HOR 0 10 20 30
VER 0 X 2X 3X

DRAWING No. 1182/02A

SHEET 1 OF 1



LEGEND:

70	EXISTING MAJOR CONTOUR	LB02	EXISTING LEACHATE MONITORING BORE
	EXISTING MINOR CONTOUR	LB05	EXISTING LEACHATE EXTRACTION BORE
	EXISTING FENCE	BH13	EXISTING GROUNDWATER MONITORING BORE
	EXISTING DRAIN	SW01	PROPOSED SURFACE WATER / LEACHATE POND SAMPLING LOCATION
	EXISTING TRACK	LFG02	PROPOSED LANDFILL GAS MONITORING BORE
	EXISTING BOUNDARY LINE		

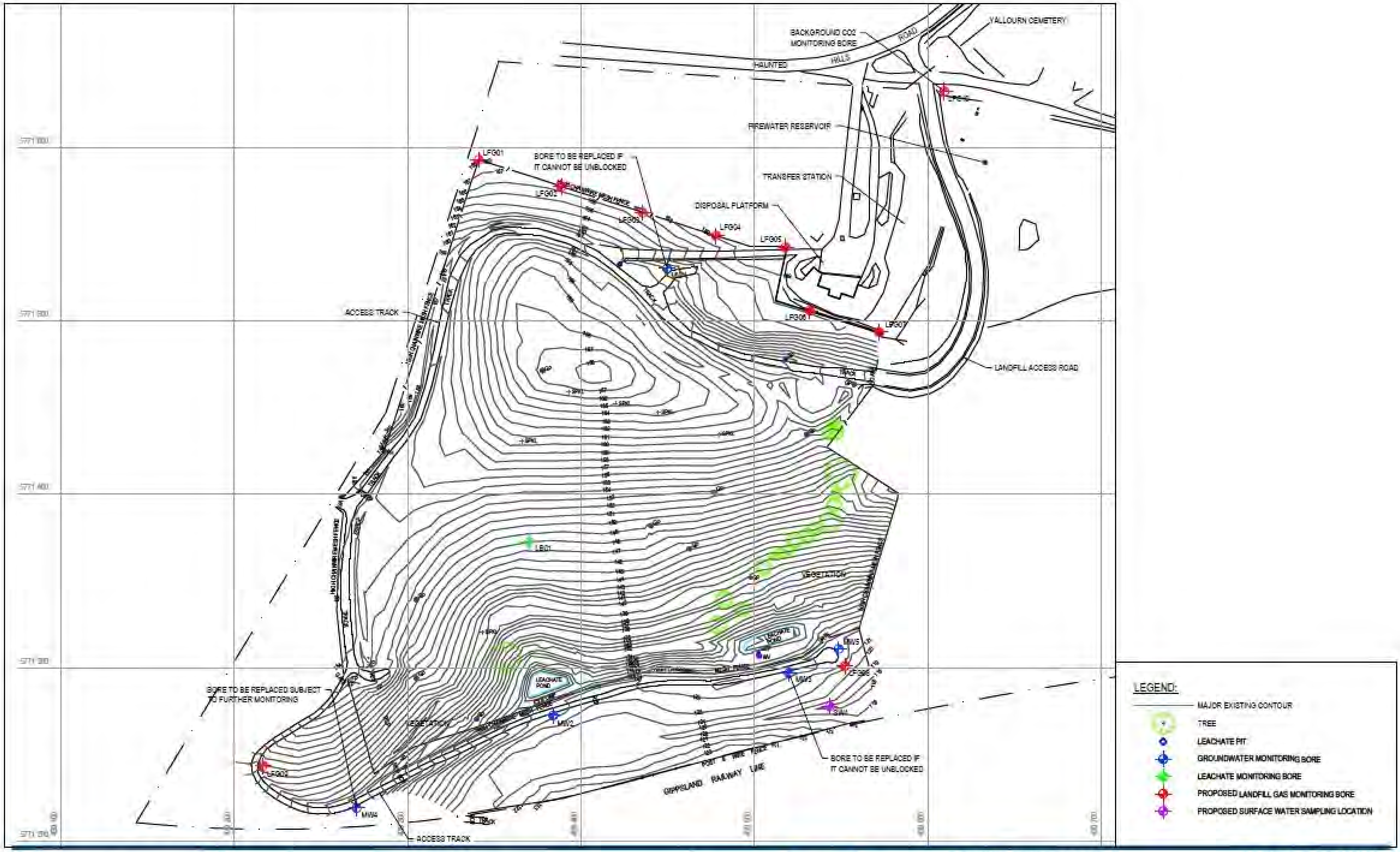
N

0 25 50 75m
SCALE 1:2500 AT ORIGINAL SIZE

GHD

LATROBE CITY COUNCIL
MORWELL LANDFILL REHABILITATION
ENVIRONMENTAL MONITORING PROGRAM
EXISTING AND PROPOSED
MONITORING LOCATIONS

Job Number	31-32822
Revision	0
Date	DEC 2016



GHD

LATROBE CITY COUNCIL
MOE LANDFILL REHABILITATION
ENVIRONMENTAL MONITORING PROGRAM

ENVIRONMENTAL MONITORING LOCATION PLAN

Job Number	31-32155
Revision	A
Date	JUNE 2016

Groundwater bore depths and Screen Intervals

Hyland Highway Landfill

Bore no.	Depth (bgl)	Screen Intervals
BH1	69.20 m	47.00 -66.00 m
BH2	74.40 m	59.00-72.00 m
BH3	69.70 m	49.00-69.00 m
BH4	20.70 m	17.00-20.70 m
BH5	101.50 m	93.00-99.00 m

Groundwater and Leachate Bore Monitoring Details – Moe Landfill

Bore	MGA coordinates		RL (m AHD)[1]	Screen (m bgl)[2]	Screen Formation	Depth (m AHD)	Standing Water / Leachate Level (m AHD)	Location
	Easting	Northing						
MW1	439449.59	5771530.13	163.3	122.1 – 131.1	Haunted Hills	122.1	130.6	Northern part of the site, south of internal access road
MW2	439383.90	5771272.54	123.2	112.2 – 115.2	Haunted Hills	112.2	119.0	Southern part of the site, south of internal access road
MW3	439519.81	5771297.11	123.2	115 - 118	Haunted Hills	115.0	117.2	South eastern corner of the site, south of internal access road
MW4	439270.60	5771219.23	136.8	123.3 – 129.3	Haunted Hills	123.3	123.8	South western corner of the site, south of internal access road
MW5	439548.56	5771310.91	123.5	111.4 – 118.9	Haunted Hills	111.4	119.6	South eastern corner of the site
LB01	439370.15	5771372.73	149	131 - 137		131	133.3	Central part of the site

Groundwater and Leachate Bore Monitoring Details – Morwell Landfill

Bore	MGA coordinates		Elevation TOC (m AHD)1	Screen (m bgl)2	Screen Formation	Depth (m AHD)	Standing Water / Leachate Level, May 2016 (m AHD)	Location	Up or down hydraulic gradient from site	Condition
	Easting	Northing								
BH1	450009.648	5771626.388	86.500	79.833 – 82.133	Haunted Hills Formation	79.833	80.090	Northeast (former asbestos dump)	Up	Active
BH2	450008.483	5771629.059	86.463	61.543 – 67.543	Haunted Hills Formation	61.543	Dry	Northeast (former asbestos dump)	Up	Active
BH3	450125.276	5771492.720	74.061	67.64 – 70.14	Haunted Hills Formation	67.64	Dry	East (east of leachate pond)	Down	Active
BH4	450126.009	5771494.779	74.174	47.74 - 54.24	Haunted Hills Formation	47.74	Dry	East (east of leachate pond)	Down	Active
BH5	450071.985	5771446.125	73.404	66.746 – 68.746	Haunted Hills Formation	66.746	Destroyed	East (south of leachate pond)	Down	Destroyed
BH6	449873.604	5771324.438	91.836	85.232 – 87.432	Haunted Hills Formation	85.232	85.896	East (south of leachate pond)	Down	Active
BH7	449871.400	5771323.058	91.837	56.033 – 63.033	Haunted Hills Formation	56.033	55.057	South (southeast corner Stage 4)	Down	Active
BH8	450074.307	5771446.924	73.267	66.387 – 68.887	Haunted Hills Formation	66.387	Destroyed	East (south of leachate pond)	Down	Destroyed
BH9	450068.086	5771444.118	73.395	41.534 – 50.534	Haunted Hills Formation	41.534	Destroyed	East (south of leachate pond)	Down	Destroyed
BH10	450005.566	5771624.509	86.567	44.623 – 56.623	Haunted Hills Formation	44.623	46.767	Northeast (former asbestos dump)	Up	Active
BH11	450118.291	5771467.79	72.985	29.922 – 41.922	Haunted Hills Formation / Latrobe Valley Coal Measure	29.922	39.865	East (east of leachate pond)	Down	Active
BH12	449442.955	5771506.018	110.069	58.207 – 70.207	Haunted Hills Formation / Latrobe Valley Coal Measure	58.207	59.029	West	Up	Active
BH13	449994.436	5771511.218	91.004	35.004 – 41.004	Latrobe Valley Coal Measure	35.004	47.670	South (southeast corner Stage 4)	Down	Active
BH14	449842.194	5771820.495	103.259	38.377 – 50.377	Latrobe Valley Coal Measure	38.377	49.740	North	Up	Active
LB01	449759.60	5771589.428	108.083	95.528 – 106.528	Waste	95.528	Dry	Central south (Stage 2)	In waste	Active
LB02	449931.42	5771584.053	96.105	83.699 – 94.399	Waste	83.699	94.20	Southeast (Stage 4)	In waste	Active
LB03	450047.34	5771731.576	95.709	86.685 – 94.185	Waste	86.685	Dry	Northeast (Former Quarry)	In waste	Active
LB04	449804.543	5771435.847	99.133	94.633 – 95.633	Waste	92.633	Not monitored	Southeast (Stage 4)	In waste	Active
LB05	449846.063	5771433.554	93.361	84.861 – 87.861	Waste	82.861	Not monitored	Southeast (Stage 4)	In waste	Active
LB06	449854.789	5771391.054	91.767	83.767 – 86.767	Waste	81.767	Not monitored	Southeast (Stage 4)	In waste	Active

Appendix B
EPA Landfill Licence

ENVIRONMENT PROTECTION ACT 1970
SECTION 20

LICENCE

LATROBE CITY COUNCIL

Holder of

Licence:	**25565**
Issued:	04/06/2009
Last Amended:	17/08/2018
ABN:	92 472 314 133
Registered Address:	141 COMMERCIAL RD MORWELL VIC 3840
Premises Address:	64 HYLAND HIGHWAY LOY YANG VIC 3844
Scheduled Categories:	A05 Landfills
Description:	The licence holder operates a landfill. This licence allows for putrescible waste, solid inert waste, asbestos of domestic origin, and shredded tyres to be deposited to land and for asbestos of a domestic origin to be stored temporarily on site. Part of the premises is north of the landfill (see Schedule 1A) which is considered to be a transfer centre for storing of asbestos before going into landfill.

....

STEPHEN ADAMTHWAITE
Team Leader
Development Assessments
Delegate of the Environment Protection Authority

Issued under the *Environment Protection Act 1970*, Section 20

PREAMBLE

Licences

Who we are: The Environment Protection Authority ("EPA") is an independent statutory authority established under the *Environment Protection Act 1970* ("the Act"). Our purpose is to protect and improve our environment by preventing harm to the environment and human health.

Why we issue licences: EPA is responsible for preventing or controlling pollution (including noise) and improving the quality of the environment. This responsibility includes regulating activities that may present a danger to the environment. One of the tools available to EPA is the licensing of certain scheduled premises that may present a risk to the environment.

Section 20 of the Act requires the occupier of a "scheduled premises" to obtain an EPA licence to discharge, handle, treat or dispose of waste to the environment. These premises are defined in the *Environment Protection (Scheduled Premises and Exemptions) Regulations 2017* ("the Regulations").

When we issue licences: EPA will issue a licence when satisfied that an applicant has put in place measures to protect the environment. Licences allow activities to occur and set performance outcomes based on a site's environmental risk. EPA can amend, suspend or revoke a licence in response to changes in standards, site activities or licence holder performance. Licence holders must submit an annual performance statement and pay an annual fee to EPA. All licences and performance statements are publicly available.

Licence information and obligations

Interpretation: For the purposes of this licence "You" means the licence holder identified on the first page of this licence at the "premises" identified on the first page and represented in Schedule 1.
Unless the contrary intention appears, words or terms used in the conditions of your licence have the same meaning as in the Act, including any regulations or policies made pursuant to the Act."

Compliance:
You must comply at all times with the Act and all policies and regulations administered by EPA. Strict penalties apply for non-compliance with any part of your licence or making a false claim on your annual performance statement.

Your licence is subject to conditions. These conditions give rise to a number of duties and obligations on you as the licence holder. Some of these are general in nature, while others require you to do (or not to do) specific things. The duties and obligations imposed by these conditions do not derogate from each other in any way, nor do they affect any other duties or obligations which you are required by law to comply with. You must fulfil all of the duties and perform all of the obligations set out in this licence or otherwise required by law. Certain conditions on your licence may require you to seek a further approval from EPA. Such approvals can be sought via written application to approvals.applications@epa.vic.gov.au. Approvals are only given in writing from the lead assessing officer.

Landfill levy: Landfills must, in accordance with the method and frequency specified in section 50SB of the Act, calculate the amount of landfill levy payable, prepare a landfill levy statement, and submit to EPA both the statement and fee payable.

Review of decisions: If you object to any of the licence conditions, you may have the decision reviewed by applying in writing to the Registrar, Planning and Environment Division, Victorian Civil and Administrative Tribunal ("VCAT"), 7th Floor, 55 King Street, Melbourne within 21 days of the date of issue. An application fee may be applicable when lodging an appeal with VCAT. Contact VCAT on (03) 9628 9777 for further details on fees associated with an appeal. A copy of the appeal should also be forwarded to the Manager, Development Assessments Unit, Environment Protection Authority, GPO Box 4395, Melbourne, 3001, within 7 days of lodgement of the appeal.

Interested (third) parties may also appeal against the licence within 21 days of the date of issue. The Tribunal will notify you if such appeals are received. If an appeal is lodged, this licence will not come into effect.

Licence structure

Structure: Your licence has multiple parts:

- Environmental performance conditions - setting out the performance outcomes you must meet;
- Schedule 1A - locality plan of your premises, delineating the premises boundary;
- Schedule 1B - plan of premises (provided by you).

Some types of licences also contain Schedule 1C - final landfill contour plans and/or Schedule 2 - tables specifying wastes that may be accepted at the premises and the associated treatment applied to them.

CONDITIONS

General Conditions

LI_G1 You must ensure that waste is not discharged, emitted or deposited beyond the boundaries of the premises except in accordance with this licence or under the Act.

LI_G2 You must immediately notify EPA of non-compliance with any condition of this licence by calling 1300 EPA VIC (1300 372 842), sending an email to contact@epa.vic.gov.au, or using the EPA Interaction Portal.

LI_G3 By 30 September each year you must submit an annual performance statement to EPA for the previous financial year in accordance with the Annual Performance Statement Guidelines (EPA Publication 1320.3, released June 2011).

LI_G4 Documents and monitoring records used for preparation of the annual performance statement must be retained at the premises for five years from the date of each statement, and be able to be immediately produced upon request by an officer of the Authority.

LI_G6 You must provide EPA with a financial assurance determined by the EPA, and maintain such assurance (including any part of such assurance) so that it can be claimed on, utilised or realised as and when required.

Amenity Conditions

LI_A1 You must ensure that odours offensive to the senses of human beings are not discharged, emitted or released beyond the boundaries of the premises.

LI_A2 You must ensure that there are no emissions of noise and/or vibrations from the premises which are detrimental to either of the following:

a) the environment in the area around the premises; and
b) the wellbeing of persons and/or their property in the area around the premises.

LI_A3 You must ensure that nuisance dust and/or nuisance airborne particles are not discharged or emitted beyond the boundaries of the premises, except as permitted by this licence.

Waste Acceptance Conditions

LI_WA1 You must ensure all of the following:

a) only waste of a type shown in Schedule 2 of this licence is accepted at the premises; and
b) if it is identified that any waste has been received at the premises that is of a type not shown in Schedule 2 in contravention of paragraph a) above, such waste must be placed in a designated and sign-posted temporary storage area and sent for disposal to a site licensed by EPA to receive such waste within 21 days of the date it was received.

LI_WA1.5 You must not accept any waste for storage pending any licenced operation except asbestos waste of domestic origin stored in a single 12m3 sized consolidation bin at the site marked, 'Hyland Highway Landfill Part B (Site of Asbestos Bin)' in Schedule 1B, and managed according to the following: (A) At all times storage does not exceed a single consolidation bin with a locked lid or locked behind doors or gates with access only allowed to those appropriately trained in asbestos management; (B) all packages placed in the consolidation bin are appropriately packaged in accordance with the requirements of EPA publication No: IWRG611.1 "Asbestos transport and disposal"; (C) the consolidation bin is lined with plastic in accordance with requirements of EPA publication No:IWRG611.1 "Asbestos transport and disposal"; (D) The waste stored within the consolidation bin must be disposed of as soon as reasonably practicable and, no longer than 3 months from when the first package was placed in the bin; (E) The tabulated quantity and date of asbestos waste received at the consolidation site and the tabulated quantity and date of asbestos waste collected from the consolidation site for final disposal at a licenced facility must be kept for a period of at least 2 years; (F) transport and disposal of the waste from the consolidation site must be in accordance with regulations; EPA Industrial Waste Resource Guidelines, 2009; EPA Publication IWRG611.1 "Asbestos transport and disposal"; and all applicable EPA publications (as amended from time to time); (G) EPA must be notified immediately of any incident or spill of wastes and; (H) Spill Management Plan ("SMP") for transportation of the waste to and from the consolidation site and a SMP for the consolidation site to avoid and safely manage spills must be developed.

Waste Management Conditions

LI_WM3 You must ensure that litter originating from the premises is not present beyond the boundaries of the premises.

LI_WM4 You must ensure that waste does not burn at the premises.

Landfill Conditions

LI_L1 You must develop and put into place a monitoring program that accords with Section A of the Landfill Licensing Guidelines, (EPA Publication 1323.3, released September 2016). The program must evaluate the risks to the environment associated with the operation of the landfill and the steps which can be taken to manage such risks and enable both you and EPA to determine changes in the condition of the environment or impacts to environmental quality as a result of activities at the premises. The monitoring program must be verified by a person who has been appointed as an environmental auditor under the Environment Protection Act 1970 and it must do all of the following:

a) contain an assessment of the risks to the environment arising from the waste that has been deposited at the premises and of the current landfill operation prepared in accordance with the Landfill Licensing Guidelines, (EPA Publication 1323.3, released September 2016) or another method approved by EPA in writing;
b) describe the environmental monitoring of landfill gas, leachate, groundwater, land, air, odour, noise, dust and surface water which will be undertaken to respond to the risks identified in the risk assessment in paragraph a) above;
c) contain trigger levels and contingency actions to prevent further pollution when exceeded;
d) specify the frequency for completing environmental audits of the landfill operation; and
e) be appropriate and adapted to the characteristics of the landfill, including the landfill design, the volume of waste received, the age and planned future lifespan of the landfill and the surrounding environment.

LI_L2	You must engage a person who has been appointed as an environmental auditor under the Environment Protection Act 1970 to conduct and submit to EPA environmental audits of the risk of harm actually or potentially arising from landfill operation under Section 53V of the Act at the frequency specified in the monitoring program.
LI_L3	You must ensure that surface water is segregated from active landfill cells.
LI_L4	Waters contaminated by leachate must not be discharged beyond the boundaries of the premises.
LI_L4.1	You must extract leachate from cell(s) 3 and 4 such that the depth of leachate above the lowest point of the drainage layer does not exceed 300mm.
LI_L5	You must take all practicable measures to prevent emissions of landfill gas from exceeding the action levels specified in Table 6.4 of Best Practice Environmental Management, Siting, Design, Operation and Rehabilitation of Landfills (EPA Publication 788.3, released August 2015).
LI_L6	All waste in the cell(s) listed in Schedule 2 apart from at the active tipping face must be covered at all times.
LI_L7	By the end of each day's operations waste must be covered in one of these ways: a) with a layer of soil at least 0.15 metres thick if the waste is only solid inert waste; b) with a layer of soil at least 0.30 metres thick for all other wastes; or c) using alternative cover approved by EPA in writing.
LI_L7.1	You must cover waste asbestos immediately upon deposition in one of these ways: a) with a layer of waste (not including waste asbestos) at least 1 metre thick or a layer of soil at least 0.3 metres thick; or b) using alternative cover approved by EPA in writing.
LI_L8	You must: a) limit the area of the tipping face of each cell to 900m2; b) only operate one tipping face at any time unless a second tipping face is required for short term operational reasons; and c) ensure the active tipping face is mechanically stable as per Section 7.6 of the Best Practice Environmental Management, Siting, Design, Operation and Rehabilitation of Landfills (EPA Publication 788.3, released August 2015).
LI_L9	You must ensure all of the following: a) Waste that is accepted for disposal at the premises is only placed into cell(s) listed in Schedule 2; and b) Waste for disposal is not placed outside of the perimeter of any cell(s) listed in Schedule 2.
LI_L10	You must ensure that waste that has been previously deposited is not recovered and reprocessed except in accordance with written approval from EPA.
LI_L11	You must ensure that waste is not stockpiled at the premises prior to deposit in a cell except in accordance with written approval from EPA.

LI_L12 You must ensure that an independent annual survey is conducted by a licensed surveyor, or other method approved by EPA in writing, by the end of June each year for each landfill cell at the premises and submitted to EPA with your annual performance statement. The survey must:

a) confirm the volume and mass of air space consumed since the last survey; and
b) verify that the top of the waste deposited in cells is in compliance with the EPA approved pre-settlement contour plan.

LI_L13 You must manage each landfill cell so that the surface contour prior to settlement conforms to the surface profile grades in Section 8.1.5 of the Best Practice Environmental Management, Siting, Design, Operation and Rehabilitation of Landfills (EPA Publication 788.3, released August 2015) or otherwise as approved by EPA in writing and so that the top of waste prior to settlement is not higher at any point than the pre-settlement top of waste approved contour plan shown in Schedule 1C.

LI_L15 You must take measures to prevent hotspots in the waste mass at the landfill site.

LI_L16 You must report hotspots within the waste mass to EPA within 24 hours of detection.

LI_L17 You must manage hotspots within the waste mass in accordance with the Landfill Licensing Guidelines (EPA Publication 1323.3, released September 2016).

LI_L18 You must:

a) notify EPA of your intention to commence construction of a new landfill cell at the premises by written notice in accordance with Appendix 7 of the Landfill Licensing Guidelines (EPA Publication 1323.3, released September 2016); and
b) not start constructing a new cell without written EPA approval.

LI_L19 Prior to commencing construction of a new landfill cell you must submit the following material to EPA so that it may consider whether or not to grant approval for the construction of the new cell:

a) detailed designs of the landfill cell meaning plans, technical specifications and a construction quality assurance plan which comply with Section 6 and Appendices D, E and F of the Best Practice Environmental Management, Siting, Design, Operation and Rehabilitation of Landfills (EPA Publication 788.3, released August 2015);
b) an assessment report of the of the detailed designs prepared by a person who has been appointed as an environmental auditor under the Environment Protection Act 1970 in accordance with Appendix 14 of the Landfill Licensing Guidelines (EPA Publication 1323.3, released September 2016); and
c) a completed and signed auditor declaration in the format shown in Appendix 15 of the Landfill Licensing Guidelines (EPA Publication 1323.3, released September 2016).

LI_L20 Upon approval by EPA to construct each new landfill cell, you must engage a person who has been appointed as an environmental auditor under the Environment Protection Act 1970 to conduct an environmental audit and submit an environmental audit report to EPA. The environmental audit report must:

a) verify that the construction of the new landfill cell is in accordance with EPA approved designs;
b) assess any potential risks associated with the construction or use of the new landfill cell; and
c) be prepared in accordance with Section 53V of the Environment Protection Act 1970.

LI_L21 You must not commence filling of any new landfill cell with waste without the written approval of EPA.

LI_L22	You must implement a rehabilitation plan for the landfill. The plan must: a) be revised after each cell is full, if necessary; b) meet the requirements of Section 8 of Best Practice Environmental Management, Siting, Design, Operation and Rehabilitation of Landfills (EPA Publication 788.3, released August 2015); c) set timeframes for placement of final capping of all completed cells, calculated from the date that the cell became full; and d) set timeframes for the progressive capture and treatment of landfill gas and leachate from each completed cell.
LI_L23	You must place intermediate cover on all cells within one month of the date that the cell became full. The intermediate cover must comprise a minimum of 500 mm of compacted clay or compacted clay rich soil or alternative cover approved by EPA in writing.
LI_L24	In circumstances where the deposit of waste in a cell is likely to cease for a period of three months or more, you must place intermediate cover on the cell within one month of the date that waste was last placed in the cell. The intermediate cover must comprise a minimum of 500 mm of compacted clay or compacted clay rich soil or alternative cover approved by EPA in writing.
LI_L25	Prior to commencing construction of each new section of landfill cap you must submit the following to EPA for approval: a) detailed designs of the landfill cap, meaning plans, technical specifications and a construction quality assurance plan which comply with Section 8 and Appendices D, E and F of the Best Practice Environmental Management, Siting, Design, Operation and Rehabilitation of Landfills (EPA Publication 788.3, released August 2015); b) an assessment report of the detailed designs of the cap prepared by a person who has been appointed as an environmental auditor under the Environment Protection Act 1970 in accordance with Appendix 14 of the Landfill Licensing Guidelines (EPA Publication 1323.3, released September 2016); and c) a completed and signed auditor declaration in the format shown in Appendix 15 of the Landfill Licensing Guidelines (EPA Publication 1323.3, released September 2016).
LI_L26	Upon approval by EPA to construct each new landfill cap you must engage a person who has been appointed as an environmental auditor under the Environment Protection Act 1970 to conduct and submit an environmental audit report to EPA. The environmental audit report must: a) verify that the construction of the cap is in accordance with EPA approved designs; b) assess any potential risks associated with the construction; and c) be prepared in accordance with Section 53V of the Environment Protection Act 1970.
LI_L27	You must complete final capping of cells within 2 years of the date that cell became full, in compliance with the approved rehabilitation plan.
LI_L28	You must provide EPA with at least 6 month's notice of your intention to cease accepting waste at the premises.

Air Conditions

Licence does not have any discharge to air conditions.

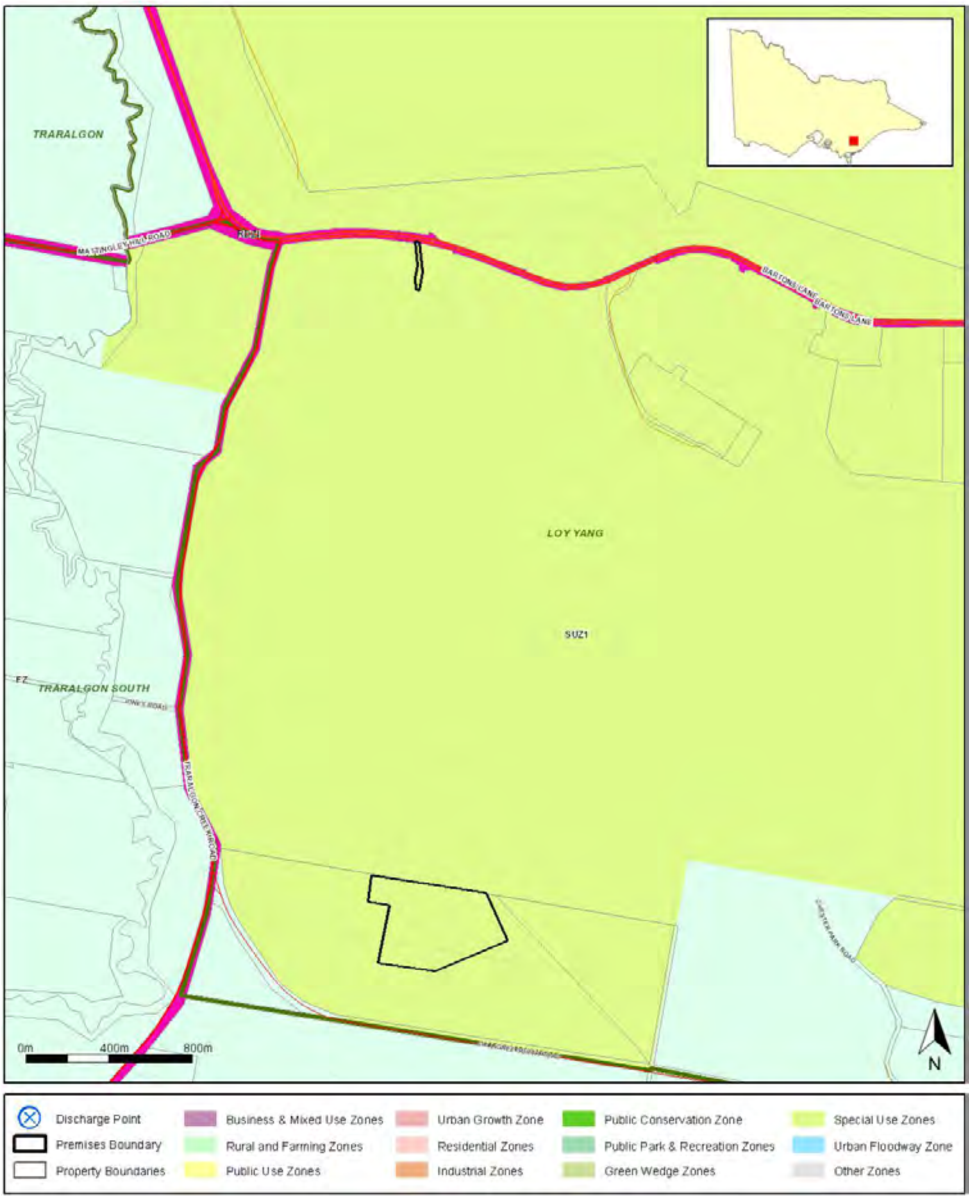
Water Conditions

LI_DW1	You must ensure that surface water discharged from the premises is not contaminated with waste.

Land Conditions

LI_DL1.2	You must ensure that the activities carried on at the premises do not do either of the following: a) cause detriment to any beneficial use which may be made of the land on the premises outside of the boundary of any landfill cells; and b) pollute land on the premises contrary to section 45 of the Environment Protection Act 1970.
LI_DL1.3	You must ensure that the activities carried on at the premises do not do either of the following: a) cause detriment to any beneficial use which may be made of groundwater both within and beyond the boundary of the premises. b) pollute groundwater both within and beyond the boundary of the premises contrary to section 39 of the Environment Protection Act 1970.

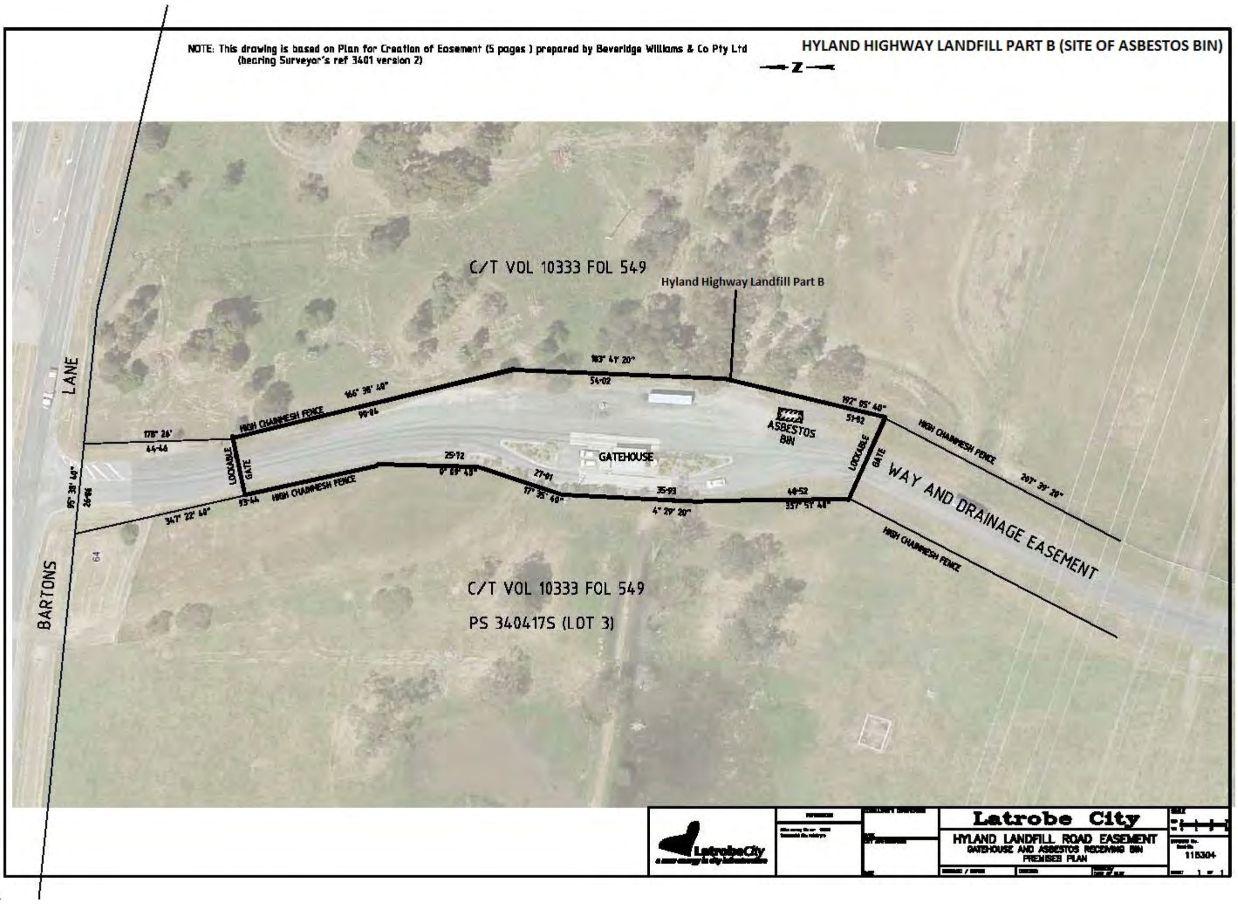
SCHEDULE 1A - LOCALITY PLAN



Licence:	25565
Company Name:	LATROBE CITY COUNCIL
ABN:	92 472 314 133
Premises Address:	64 Hyland Highway, LOY YANG VIC 3844
Issued:	04/06/2009
Last Amended:	17/08/2018

Before relying on the information in this map, users should carefully evaluate its accuracy, currency, completeness and relevance for their purposes, and should obtain any appropriate professional advice relevant to their particular circumstances.

SCHEDULE 1B - PREMISES PLAN



Licence:	25565
Company Name:	LATROBE CITY COUNCIL
ABN:	92 472 314 133
Premises Address:	64 Hyland Highway, LOY YANG VIC 3844
Issued:	04/06/2009
Last Amended:	17/08/2018

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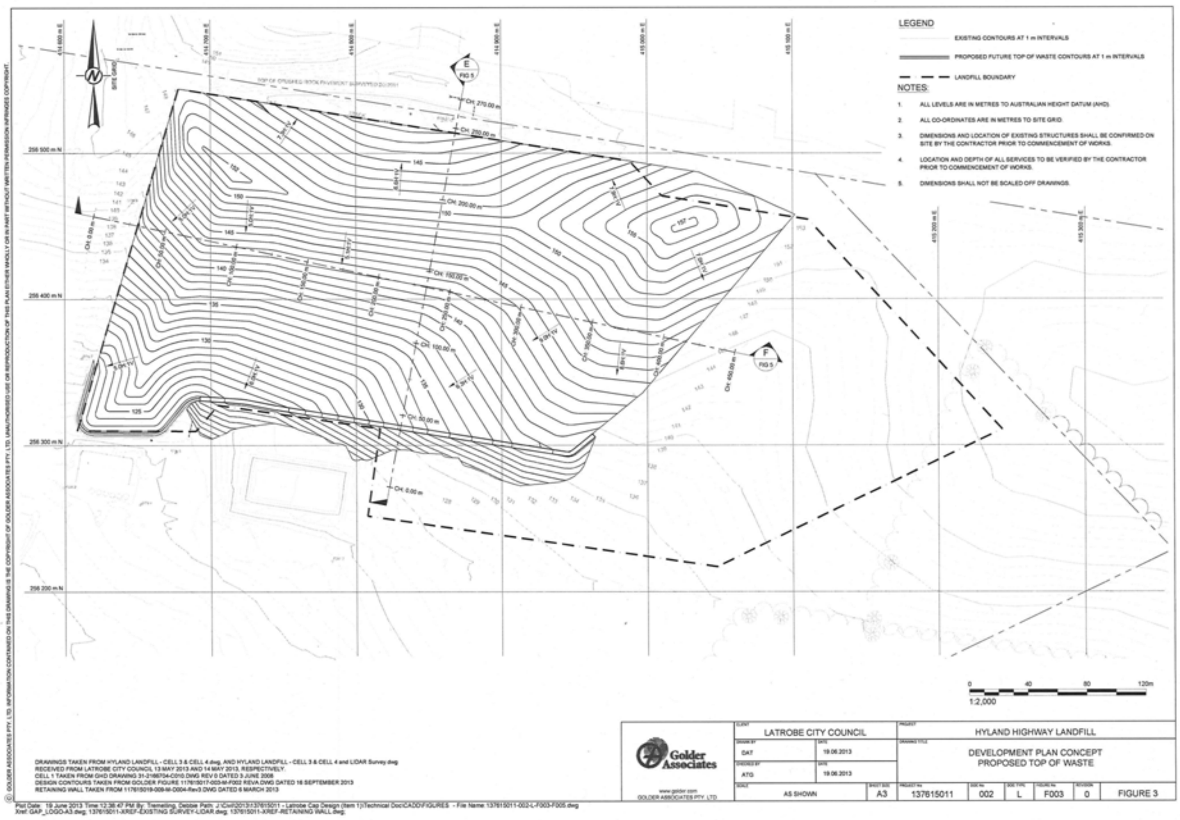
Issued:	04/06/2009
Last Amended:	17/08/2018

Before relying on the information in this map, users should carefully evaluate its accuracy, currency, completeness and relevance for their purposes, and should obtain any appropriate professional advice relevant to their particular circumstances.

SCHEDULE 1C - CONTOUR PLAN



Licence:	25565
Company Name:	LATROBE CITY COUNCIL
ABN:	92 472 314 133
Premises Address:	64 Hyland Highway, LOY YANG VIC 3844
Issued:	04/06/2009
Last Amended:	17/08/2018

Before relying on the information in this map, users should carefully evaluate its accuracy, currency, completeness and relevance for their purposes, and should obtain any appropriate professional advice relevant to their particular circumstances.

SCHEDULE 2 - WASTE ACCEPTANCE TABLES

Disposal to Landfill - General Waste

Landfill Cell	Waste Type
CELL 4	Asbestos waste of domestic origin
	Putrescible waste
	Solid inert waste
	Tyres shredded into pieces < 250 mm
CELL 5	Asbestos waste of domestic origin
	Putrescible waste
	Solid inert waste
	Tyres shredded into pieces < 250 mm

Appendix C
Planning Property Report

PLANNING PROPERTY REPORT

From www.planning.vic.gov.au on 15 August 2019 10:48 AM

PROPERTY DETAILS

Address:	**64 BARTONS LANE LOY YANG 3844**	
Lot and Plan Number:	**Lot RES1 PS601792**	
Standard Parcel Identifier (SPI):	**RES1\PS601792**	
Local Government Area (Council):	**LATROBE**	www.latrobe.vic.gov.au
Council Property Number:	**49564**	
Planning Scheme:	**Latrobe**	planning-schemes.delwp.vic.gov.au/schemes/latrobe
Directory Reference:	**VicRoads 98 B6**	

UTILITIES

Rural Water Corporation:	**Southern Rural Water**
Urban Water Corporation:	**Gippsland Water**
Melbourne Water:	**outside drainage boundary**
Power Distributor:	**AUSNET**

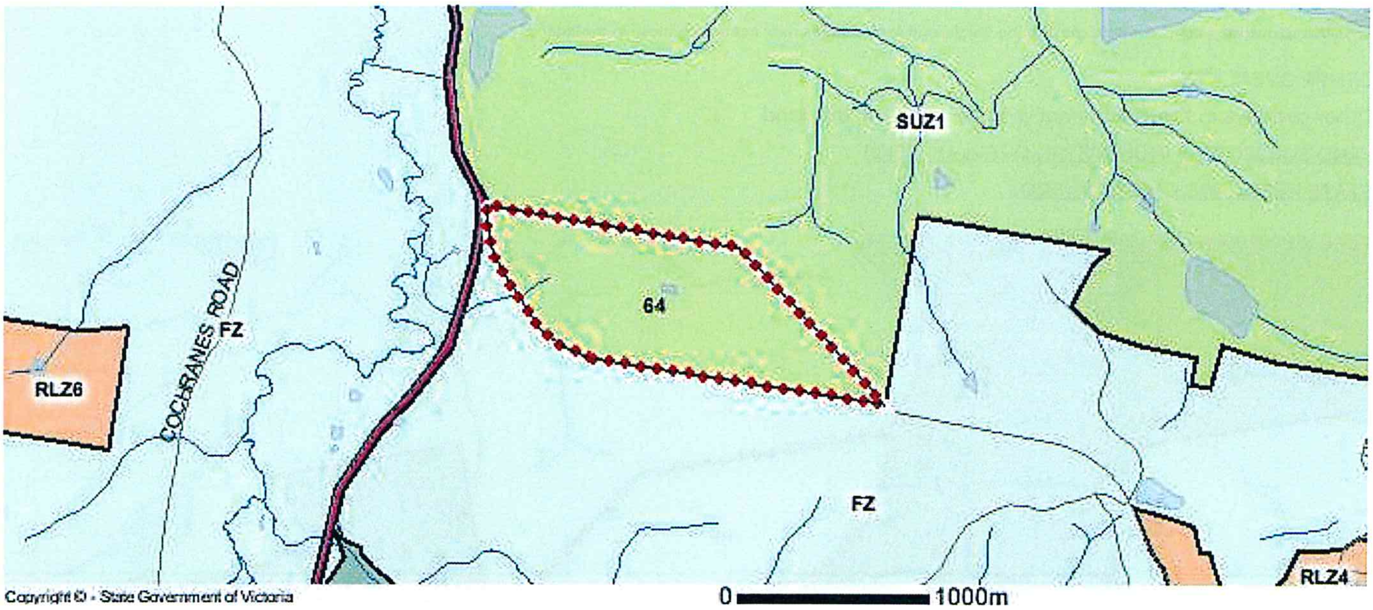
STATE ELECTORATES

Legislative Council:	**EASTERN VICTORIA**
Legislative Assembly:	**MORWELL**

Planning Zones

SPECIAL USE ZONE (SUZ)

SPECIAL USE ZONE - SCHEDULE 1 (SUZ1)



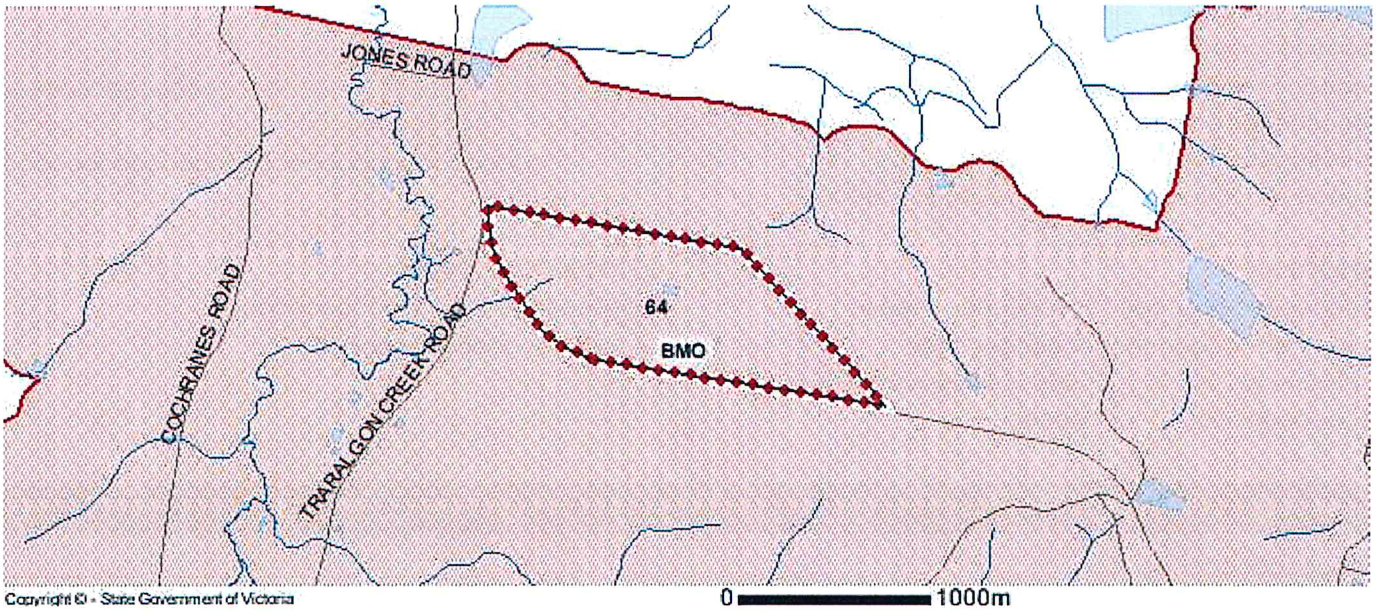
FZ - Farming	PPRZ - Public Park & Recreation	RDZ1 - Road - Category 1
RLZ - Rural Living	SUZ - Special Use	

Note: labels for zones may appear outside the actual zone - please compare the labels with the legend.

Notwithstanding this disclaimer, a vendor may rely on the information in this report for the purpose of a statement that land is in a bushfire prone area as required by section 32C (b) of the Sale of Land 1962 (Vic).

Planning Overlay

BUSHFIRE MANAGEMENT OVERLAY (BMO)



BMO - Bushfire Management

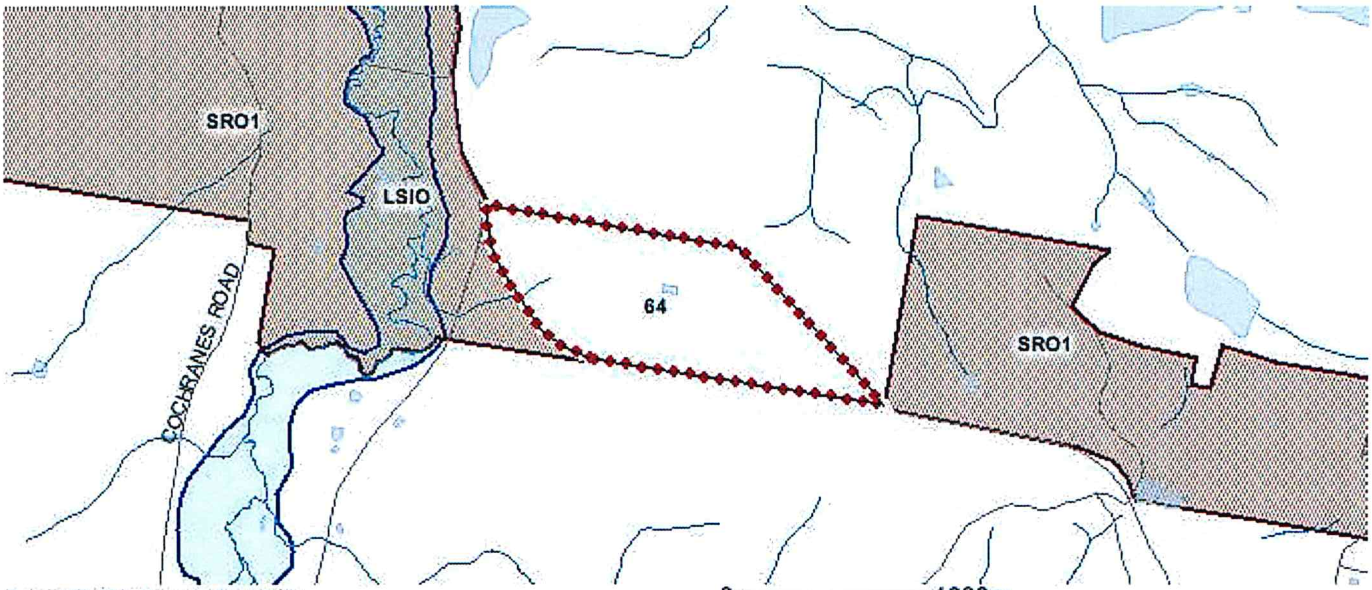
Note: due to overlaps, some overlays may not be visible, and some colours may not match those in the legend.

OTHER OVERLAYS

Other overlays in the vicinity not directly affecting this land

LAND SUBJECT TO INUNDATION OVERLAY (LSIO)

STATE RESOURCE OVERLAY (SRO)



LSIO - Land Subject to Inundation

SRO - State Resource

Note: due to overlaps, some overlays may not be visible, and some colours may not match those in the legend.

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PLANNING PROPERTY REPORT

VICTORIA State Government | Environment, Land, Water and Planning

Further Planning Information

Planning scheme data last updated on 14 August 2019.

A **planning scheme** sets out policies and requirements for the use, development and protection of land.
This report provides information about the zone and overlay provisions that apply to the selected land.
Information about the State and local policy, particular, general and operational provisions of the local planning scheme that may affect the use of this land can be obtained by contacting the local council or by visiting https://www.planning.vic.gov.au

This report is NOT a **Planning Certificate** issued pursuant to Section 199 of the *Planning and Environment Act 1987.*
It does not include information about exhibited planning scheme amendments, or zonings that may abut the land.
To obtain a Planning Certificate go to Titles and Property Certificates at Landata - https://www.landata.vic.gov.au

For details of surrounding properties, use this service to get the Reports for properties of interest.

To view planning zones, overlay and heritage information in an interactive format visit http://mapshare.maps.vic.gov.au/vicplan

For other information about planning in Victoria visit https://www.planning.vic.gov.au

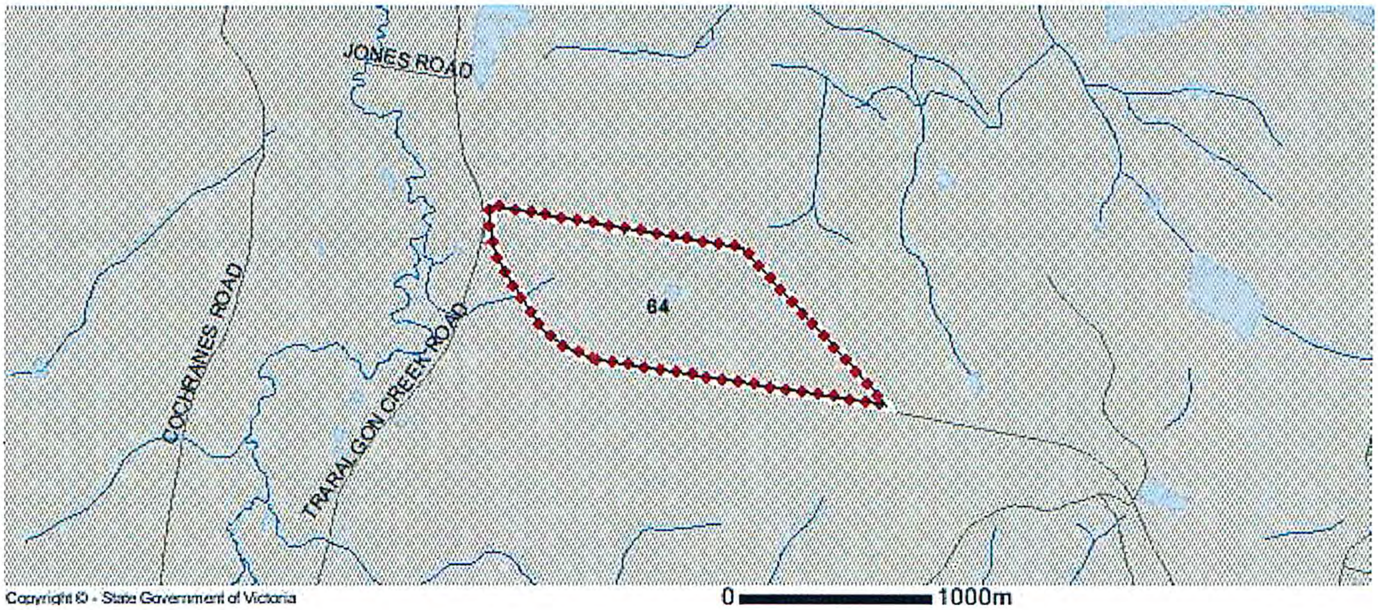
Notwithstanding this disclaimer, a vendor may rely on the information in this report for the purpose of a statement that land is in a bushfire prone area as required by section 32C (b) of the Sale of Land 1962 (Vic).

PLANNING PROPERTY REPORT

VICTORIA State Government | Environment, Land, Water and Planning

Designated Bushfire Prone Area

This property is in a designated bushfire prone area.
Special bushfire construction requirements apply. Planning provisions may apply.



 0 ▬ 1000m

Designated Bushfire Prone Area

Designated bushfire prone areas as determined by the Minister for Planning are in effect from 8 September 2011 and amended from time to time.

The Building Regulations 2018 through application of the Building Code of Australia, apply bushfire protection standards for building works in designated bushfire prone areas.

Designated bushfire prone areas maps can be viewed on VicPlan at http://mapshare.maps.vic.gov.au/vicplan or at the relevant local council.

Note: prior to 8 September 2011, the whole of Victoria was designated as bushfire prone area for the purposes of the building control system.

Further information about the building control system and building in bushfire prone areas can be found on the Victorian Building Authority website www.vba.vic.gov.au

Copies of the Building Act and Building Regulations are available from www.legislation.vic.gov.au

For Planning Scheme Provisions in bushfire areas visit https://www.planning.vic.gov.au

Notwithstanding this disclaimer, a vendor may rely on the information in this report for the purpose of a statement that land is in a bushfire prone area as required by section 32C (b) of the Sale of Land 1962 (Vic).

Appendix D
Groundwater Database Search and Groundwater Resource Report

Groundwater Database Search (Monitoring Wells around Hyland Highway Landfill)

Bore ID	Parish	Parish No	Longitude (GDA94)	Latitude (GDA94)	Easting (MGA)	Northing (MGA)	Map zone	Elevation (digitised)	Constructed date	Constructed depth
312644	LOY YANG	3020	146.572824	-38.266944	462631.4	5764480	55	110.16	12/31/1918 0:00	20.4
312645	LOY YANG	3020	146.575392	-38.269594	462857.4	5764187	55	115.65	12/31/1918 0:00	17.7
312660	LOY YANG	3020	146.575888	-38.266874	462899.4	5764489	55	117.13	12/31/1921 0:00	67.1
312797	LOY YANG	3020	146.550761	-38.27262	460704.4	5763841	55	113.92	8/13/1947 0:00	100.6
312798	LOY YANG	3020	146.568501	-38.274886	462257.4	5763597	55	134.06	2/27/1948 0:00	152.4
312799	LOY YANG	3020	146.54794	-38.286885	460465.4	5762257	55	146.48	9/12/1947 0:00	61
312954	LOY YANG	3020	146.549699	-38.276167	460613.4	5763447	55	99.46	11/12/1958 0:00	150.3
312957	LOY YANG	3020	146.551937	-38.265424	460803.4	5764640	55	96.91	5/29/1959 0:00	143.9
312989	LOY YANG	3020	146.551207	-38.268963	460741.4	5764247	55	90.61	5/27/1959 0:00	140.2
313000	LOY YANG	3020	146.547403	-38.264839	460406.4	5764703	55	71.16	4/18/1960 0:00	206.3
313005	LOY YANG	3020	146.565563	-38.267143	461996.4	5764455	55	100.06	9/30/1959 0:00	189.6
313006	LOY YANG	3020	146.570041	-38.267772	462388.4	5764387	55	100.96	11/5/1959 0:00	194.5
313007	LOY YANG	3020	146.564787	-38.270763	461930.4	5764053	55	112.43	11/20/1959 0:00	175.3
313008	LOY YANG	3020	146.564046	-38.274275	461867.4	5763663	55	147.51	11/27/1959 0:00	123.1
313009	LOY YANG	3020	146.569391	-38.271348	462333.4	5763990	55	115.23	5/27/1963 0:00	150.3
313014	LOY YANG	3020	146.565929	-38.265288	462027.4	5764661	55	100.21	5/23/1960 0:00	86.9
313015	LOY YANG	3020	146.563305	-38.277868	461804.4	5763264	55	150.21	1/16/1960 0:00	136.6
313016	LOY YANG	3020	146.55805	-38.28094	461346.4	5762921	55	109.18	11/14/1962 0:00	108.8
313017	LOY YANG	3020	146.553835	-38.278463	460976.4	5763194	55	108.44	12/14/1959 0:00	147.5
313030	LOY YANG	3020	146.554188	-38.276761	461006.4	5763383	55	127.49	11/12/1958 0:00	143.3
313031	LOY YANG	3020	146.554988	-38.273177	461074.4	5763781	55	127.15	12/6/1958 0:00	120.4
313032	LOY YANG	3020	146.55573	-38.269575	461137.4	5764181	55	103.95	4/30/1959 0:00	146
313033	LOY YANG	3020	146.556495	-38.265964	461202.4	5764582	55	113.51	4/28/1959 0:00	100
313038	LOY YANG	3020	146.548979	-38.279751	460552.4	5763049	55	77.74	12/8/1958 0:00	102.1
313040	LOY YANG	3020	146.56104	-38.266594	461600.4	5764514	55	107.6	5/5/1959 0:00	111.6
313041	LOY YANG	3020	146.560264	-38.270169	461534.4	5764117	55	110	5/15/1959 0:00	139
313042	LOY YANG	3020	146.559534	-38.273735	461472.4	5763721	55	146.63	1/28/1959 0:00	113.7
313043	LOY YANG	3020	146.558769	-38.277328	461407.4	5763322	55	147.54	1/27/1959 0:00	125.6
313049	LOY YANG	3020	146.574565	-38.268338	462784.4	5764326	55	110.93	2/2/1960 0:00	196.6
313050	LOY YANG	3020	146.579191	-38.268941	463189.4	5764261	55	122.95	3/23/1960 0:00	150.3
313107	LOY YANG	3020	146.577732	-38.276119	463065.4	5763464	55	148.52	6/5/1961 0:00	189
313155	LOY YANG	3020	146.575397	-38.264764	462855.4	5764723	55	116.77	10/11/1962 0:00	184.7
313156	LOY YANG	3020	146.576531	-38.272194	462958.4	5763899	55	127.43	10/30/1962 0:00	196
313160	LOY YANG	3020	146.576249	-38.283269	462939.4	5762670	55	175.34	11/30/1962 0:00	106.7
313161	LOY YANG	3020	146.567225	-38.282037	462149.4	5762803	55	142.3	11/20/1962 0:00	106.7
313163	LOY YANG	3020	146.580035	-38.265375	463261.4	5764657	55	119.87	2/4/1963 0:00	173.7
313811	LOY YANG	3020	146.56852	-38.267893	462255.4	5764373	55	100.6	4/28/1977 0:00	0.8
313812	LOY YANG	3020	146.568785	-38.267434	462278.4	5764424	55	100.06	4/28/1977 0:00	3.1
313813	LOY YANG	3020	146.568936	-38.267137	462291.4	5764457	55	100.06	4/28/1977 0:00	3.1
313843	LOY YANG	3020	146.571256	-38.265253	462493.4	5764667	55	110.22	9/21/1977 0:00	8
313849	LOY YANG	3020	146.578879	-38.265497	463160.4	5764643	55	119.84	9/22/1977 0:00	8
313890	LOY YANG	3020	146.578974	-38.265011	463168.4	5764697	55	119.59	10/19/1977 0:00	24.6
314198	LOY YANG	3020	146.54738	-38.268408	460406.4	5764307	55	75.78	5/23/1979 0:00	10
314199	LOY YANG	3020	146.547367	-38.266921	460404.4	5764472	55	74.67	5/30/1979 0:00	10
314200	LOY YANG	3020	146.547449	-38.27021	460413.4	5764107	55	76.52	5/29/1979 0:00	10
314201	LOY YANG	3020	146.54915	-38.268712	460561.4	5764274	55	79.74	5/24/1979 0:00	10
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314203	LOY YANG	3020	146.550174	-38.26767	460650.4	5764390	55	80.22	5/24/1979 0:00	10
314204	LOY YANG	3020	146.550739	-38.266907	460699.4	5764475	55	82.98	5/25/1979 0:00	10
314205	LOY YANG	3020	146.551343	-38.269054	460753.4	5764237	55	92.06	6/1/1979 0:00	6
314206	LOY YANG	3020	146.55337	-38.268467	460930.4	5764303	55	90.36	5/31/1979 0:00	6.4
314207	LOY YANG	3020	146.555771	-38.268449	461140.4	5764306	55	106.75	6/1/1979 0:00	6
314208	LOY YANG	3020	146.558286	-38.268539	461360.4	5764297	55	104.33	6/1/1979 0:00	6.4
314209	LOY YANG	3020	146.559999	-38.268771	461510.4	5764272	55	103.7	5/23/1979 0:00	20
314278	LOY YANG	3020	146.578747	-38.270616	463151.4	5764075	55	123.96	11/28/1979 0:00	3
314279	LOY YANG	3020	146.579627	-38.27262	463229.4	5763853	55	130.22	11/28/1979 0:00	3
314736	LOY YANG	3020	146.549033	-38.278499	460556.4	5763188	55	85.69	6/5/1985 0:00	80
314737	LOY YANG	3020	146.571654	-38.281098	462536.4	5762909	55	182.67	4/1/1985 0:00	320
314738	LOY YANG	3020	146.571764	-38.2664	462538.4	5764540	55	110	3/3/1985 0:00	337
314850	LOY YANG	3020	146.549021	-38.278481	460555.4	5763190	55	85.69	6/21/1985 0:00	226
WRK989481	LOY YANG	3020	146.558096	-38.280228	461350	5763000	55	109.83	7/2/2009 0:00	75
WRK989482			146.558096	-38.280228	461350	5763000	55	109.83	2/4/2009 0:00	72.6

Groundwater Resource Report

Groundwater catchment: Central Gippsland **VICGRID94 Easting: 2636918 Northing: 2357135**

Depth to water table: 10 - 20m **Water table salinity (mg/L): 501 - 1000**

Groundwater layers (Aquifers and Aquitards)	Depth below surface (m)	Groundwater salinity (mg/L)
UTQA Upper Tertiary / Quaternary Aquifer layered clay, sands and silt	0 - 28	1001 - 3500
UMTA Upper Mid-Tertiary Aquifer limestone (fractured rock), sand, gravel, clay, minor coal	28 - 45	< 500
LMTA Lower Mid-Tertiary Aquifer sand, gravel, limestone (fractured rock), minor clay, occasional coal	45 - 82	< 500
LTA Lower Tertiary Aquifer sand, gravel, clay and silt, minor coal	82 - 286	< 500
BSE Mesozoic and Palaeozoic Bedrock (basement) sedimentary (fractured rock): Sandstone, siltstone, mudstone, shale. Igneous (fractured rock): includes volcanics, granites, granodiorites.	286 - 486	1001 - 3500

Groundwater management unit (GMU)	Depth below surface (m)	PCV (ML/yr)
ROSEDALE GMA	50 - 150	22,372
STRATFORD GMA	> 150	27,645

For further information about this report contact:

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VICTORIA State Government | Environment, Land, Water and Planning

How to read this report

Introduction

Groundwater is part of the water cycle. When rain or snow falls on land, some of it evaporates, some flows to streams and rivers, and some seeps into the soil. Some of the water in the soil is used by plants but some continues to move down through the soil and rock until all the pores and cracks are full of water. This is known as the water table and this water is called groundwater.

Groundwater is a finite resource that, like surface water, is allocated under the Water Act (1989). A Bore Construction Licence is required to drill for groundwater including for domestic and stock purposes. Taking and using groundwater for commercial or irrigation purposes requires an additional licence.

Purpose of this report

This report has been prepared to provide potential groundwater users with basic information about groundwater beneath their property. This includes the different geological layers, the depths of the layers and the salinity of groundwater in the layers. Information on the groundwater management units (GMU) and any associated caps on the volume that can be licensed (the PCV) are also provided.

Definitions and context

Term	Description
Groundwater Catchment	An identified area of the State within which groundwater resources are connected.
Easting / Northing	The VICGRID 94 coordinates of the spot that was selected on the interactive map.
Groundwater Salinity	Indicates the possible concentration of salts within the groundwater. The salt content indicates the possible uses of the water (see the Beneficial Use Table below). Fertilisers and other contaminants can also enter groundwater and affect its use. It is up to you to make sure that the groundwater you use is suitable for your purpose.
Aquifer	An aquifer is a layer of soil or rock which stores usable volumes of groundwater. Aquifers are generally limestones, gravels and sands, as well as some fractured rocks where the cracks in the rock are open and connected (some basalts, sandstones and limestones). How much water can be pumped from an aquifer depends on how much water is stored in pores and cracks, how well connected the pores and cracks are, and how thick the layer is. It is more likely that volumes of water for irrigation and urban water supply will come from gravels, sands, limestones and basalts that are at least 30 metres thick. Low volumes of water for domestic and stock use are likely from any aquifer greater than 10 metres thick. The advice above is a guide only, as the amount of water available can be highly variable. Actual pumping volumes can only be determined from drilling, appropriate construction and testing of a bore.
Aquitard	An aquitard is a layer of rock or soil that does not allow water to move through it easily, limiting its capacity to supply water. Aquitards are generally silts, clays and fractured rocks (where there are few cracks in the rock or the cracks are poorly connected).
Groundwater Management Unit (GMU)	A collective term for groundwater management areas (GMAs) and water supply protection areas (WSPAs). GMAs and WSPAs are defined areas and depths below the surface where rules for groundwater use may apply. WSPAs often have caps on groundwater use and plans describing how the resource is managed. GMAs usually have caps on groundwater use and may have local plans and rules. All other areas are managed directly through the Water Act (1989). Always check with your local Rural Water Corporation to be sure that the information on the GMU is correct for your specific location.
Permissible Consumptive Volume (PCV)	A cap that is set under the Water Act (1989) declaring the total volume of groundwater that may be taken from the area. Once the PCV is reached, no additional extraction can be licensed for use within the area unless traded from another groundwater licence holder.
Depth to Water Table	This is an indication of the depth at which groundwater might first be encountered when drilling a bore. The depth can vary from year to year, and from place to place and may vary significantly from that indicated in this report.

Beneficial Use Table

Salinity range (mg/L TDS)	Beneficial use as described by State Environment Protection Policy (Groundwaters of Victoria) s160							
	Potable water - preferred	Potable water - acceptable	Potable mineral water	Irrigation	Stock water	Industry	Ecosystem protection	Buildings and structures
<500	✓	✓	✓	✓	✓	✓	✓	✓
501-1000		✓	✓	✓	✓	✓	✓	✓
1001-3500			✓	✓	✓	✓	✓	✓
3501-13000					✓	✓	✓	✓
13001+						✓	✓	✓

Accessibility

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Appendix E
ALS Sampling Procedures

Appendix E-1
Sampling of Groundwaters

QUALITY WORK INSTRUCTION

SAMPLING OF GROUNDWATERS

DOCUMENT NUMBER: QWI-EN/67.11

Copy Number:

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AMENDMENT HISTORY

Amend. No.	Date	Description of Amendment	Author / Editor	Approved by
0	22/08/14	Draft version to send to NATA	K Moulding	Draft
1	04/09/14	Draft amended due to NATA response	D Darby	K Moulding
2	14/11/14	Various syntax amendments to sections 1.0 through 7.0 to aid readability. Addition of more definitions	G Davies / M Monds	K Moulding
3	11/02/15	Added ref to Qld DEHP, "Monitoring and Sampling Manual 2009"	K Moulding	K Moulding
4	12/10/16	Updated to template V8; added Env FWI number; added ALS Env doc references; added 'Sampling using bailer; plus other changes to ensure covers all sites	K Moulding / D Darby / M Monds	K Moulding
5	16/01/17	Update of referring section	D Darby	K.Moulding
6	04/04/17	Updated scope to include samples collected. Addition to Ground water monitoring procedure	D Darby / M Monds	D Darby
7	22/01/18	Added the requirement that equipment must be decontaminated if collecting microbiological samples and no use of Decon 90 when sampling for PFAS. Formatting changed throughout document. Safety requirements updated to be in line with EN67 Master Procedure. Removed reference FWI-EN/001 as this is no longer use.	D Darby	K. Moulding

1. SCOPE

Water samples are collected for microbiological and chemical testing. This procedure is provided to give guidance in collection, handling and monitoring of groundwater quality and is based on the following:

- VIC EPA Publication IWRG701, "A Guide To The Sampling And Analysis Of Waters, Wastewaters, Soils, And Wastes"
- VIC EPA Publication 669, "Groundwater Sampling Guidelines"
- AS/NZS 5667.11:1998 "Water Quality – Sampling Part 11: Guidance on Sampling of Groundwaters
- Qld DEHP, "Monitoring and Sampling Manual 2009"

2. REFERENCED DOCUMENTS

ENFM (67) Series	National Bottle Prep Laboratory Bottle Order Form & Packing Slip
FDFM (006b)	Groundwater Sampler Checks Calibration
FDFM (007)	Groundwater Field Sheet
FDFM (007b)	Groundwater Sampling Field Sheet for low flow purge
WFM (030)	Sample Container Filling Instructions
FDFM (56)	Groundwater Gauging Record
QWI-EN/01	Laboratory Equipment Calibration and Qualification
QWI-EN/11	Bottle Preparation and Supply Procedure
QWI-EN/12	Bottle Freighting Procedure
QWI-EN/EA075FD	Redox Potential - Field Measurement
HSE-AU-GRP-PRO-02-05	Preparing and Using JSEA AU
	JSEA/SWMS appropriate for the task or site

3. DEFINITIONS

For the purposes of this procedure, the following definitions and abbreviations apply:

3.1 **Aquifer:** Water-bearing formation (bed or stratum) of permeable rock, sand or gravel capable of yielding significant quantities of water.

3.2 **Consolidated Aquifer:** an aquifer comprising material which is compact due to cementation or compression.

3.3 **Groundwater;** water which is being held in, and can usually be recovered from, or via, an underground formation.

3.4 **Well or borehole**: a hole sunk into the ground for abstraction of water or for observation purposes. A well is generally larger in diameter than a borehole and dug rather than drilled. A borehole is often used for monitoring purposes only and may be lined with suitable casing and screened at appropriate depths. Wells and boreholes may be constructed from a range of different materials including; PVC, polyethylene, cast iron or mild steel pipes with or without cementous grouting support. Internal pipe diameters can vary from small (less than 32 mm) to common (approximately 50 mm) to large (in excess of 150 mm). The common operational depths can vary from 2 metres to approximately 40 metres but some bores can greater than 100 metres to capture the very deep aquifers. Refer to Appendix 1 for diagram.

3.5 **Spring**: Groundwater emerging naturally through the surface of the land.

3.6 **Pore water**: Water that fills the pores or cavities within a body of rock or soil.

3.7 **Casing**; A solid tube used as a temporary or permanent lining for a well or borehole in order to prevent the ingress of solid aquifer material into the borehole or to ensure that groundwater only enters borehole at specific depths via a screen.

3.8 **Screen**; A type of lining tube, with apertures, designed to permit the flow of water into a well while preventing the entry of aquifer or filter pack material.

3.9 **Sampling devices/ Purging Equipment**: Devices may include petrol driven pumps, bailers or electric submersible pumps. Determining which device to use will depend on client requirements, water table depth, piezometer pipe diameter, ease of water extraction (and bore recharge capacity), and accessibility of the piezometer. The field technician will choose the most appropriate sampling device to suit the conditions and clients' requirements.

3.10 **Bailer**: The bailer is generally cylindrical in design and smaller in diameter than the internal diameter of the bore. It has a ball valve or similar device that will allow groundwater to flow up through the bottom of the bailer when lowered into the bore whilst retaining the water in the bailer when it is withdrawn from the bore.

3.11 **Medium to High Flow Sampling Pumping (MHFSP):** Submersible pumps are capable of extracting up to approximately 15 litres of water per minute and is recommended when the required bore information is unavailable. Generally, three bore volumes will need to be extracted depending on the stabilisation of chemical parameters of the groundwater.

3.12 **Low Flow Purging Pumping (LFPP):** This technique allows a pump to be placed at the location where the aquifer is passing through the bore (known as the screen). This technique reduces the amount of purging required as the pump is located in the screen. The pump will collect between 50 – 250 mL of sample per minute. The bore information must be cited to complete this type of sampling.

3.13 **Bore Information:** Information relating to the bore and its construction is contained within the Bore Construction report. Critical information including the bore identification number, bore location, bore depth and screen interval may be necessary to the sampling operation and should be cited if required prior to the sampling process. If sampling is required in accordance with Vic EPA Guidelines or is NATA accredited the bore information <u>must</u> be cited. If the bore information is not available, evidence must sought from the client.

3.14 **SWL:** Standing Water Level is defined as the natural level of water within a borehole and is determined as the height water rises up the hole. It is measured as the distance from the top of the hole to the surface of the water. If the client requires water table depth or SWL then it must be determined prior to any other sampling operation. It is surveyed to a reference point which is typically the top of the casing of a borehole [TOC].

3.15 **DIW:** Deionised Water

3.16 **Depth check device:** Different Equipment can be used to measure depths in the bore. E.g., drawdown meter / fox whistle, tape measure or interface probe/dip meter. When using the fox whistle, interface probe/dip meter when it is lowered into the bore and hits the water interface a whistle/audible sound is heard. A measure is recorded on the field sheet which represents the water level relative to the top of the bore to the nearest cm.

3.17 **JSEA** – Job Safety Environmental Analysis

3.18 **SWMS** – Safe Work Method Statement

3.19 **Cooling Aid** – A container that keeps that sample chilled, examples are refrigerated eskies or eskies cooled with freezer bricks or other cooling items.

3.20 **PFAS** - Per and poly-fluorinated Alkyl Substances

4. PURPOSE / PRINCIPLE

4.1 The most significant activity in groundwater monitoring is obtaining a representative sample of groundwater and not stagnant water in the bore. Drilling techniques during borehole construction, human interference and possible surface water intrusion can contaminate bores. When bores are drilled, drilling methods may employ drilling muds, oils, grease and bentonite to facilitate easy drilling. Curious children or vandals are liable to drop materials into unsecured bores, surface water runoff may fill bore pipes, and casing surrounds, ultimately, floating over the target aquifer water.

4.2 Typical applications of this procedure include; the extraction of groundwater from bores for the assessment of water quality with regard to corrosion of subterranean structures, agricultural or industrial use, livestock consumption and pollution, monitoring.

4.3 If historical data is accessible – bores should be sampled in order of contamination from least to the most contaminated.

5. SAFETY/ENVIRONMENT

When taking any samples, safety considerations are of the utmost importance. **Safety of the sampler is to be considered before taking any sample.** If a sampling technique or a sampling site is deemed to be unsafe for any reason sampling **must not take place**.

5.1 Before undertaking any sampling a Job Safety Environmental Analysis (JSEA) or a Safe Work Method Statement (SWMS) must be approved by the appropriate staff member as indicated on the appropriate form [JSEA form 05-02.01]. The JSEA must be read, understood and signed by the sampler before commencing sampling. Refer to ALS-HSE-AU-GRP-PRO-02-05.

5.2 If all requirements of the SWMS or JSEA cannot be met, then the job should not be undertaken. Contact your supervisor immediately if you have any concerns about completing the task. Also contact the site supervisor and/or client contact to advice of any safety hazards or concerns.

5.3 Whilst performing any sampling operations Staff must ensure that they are compliant to all site safety requirements including pre-field checks and toolbox meetings, inductions, accreditations and tickets, the use of appropriate safety personal protective equipment (PPE) and the use of the correct and serviceable equipment (the right tool for the job).

5.4 Personal Protective Equipment (PPE)

Staff following and conducting this procedure must wear the appropriate safety personal protective equipment (PPE) at all times.

The following items must be used when sampling:

5.4.1. Approved safety glasses. (Tinted safety glasses permitted in bright conditions)

5.4.2. Steel-capped boots.

5.4.3. Long pants Cotton Drill

5.4.4. High Visibility Long Sleeved Cotton Drill Shirt or a long Sleeved Cotton Drill Shirt and a High Visibility Cotton Vest.

5.5 Staff must also wear additional PPE as required or as directed by a local authority, the client or as indicated via signage. The supervisor must ensure staff are wearing / using the correct PPE. Examples of additional PPE are included in the table below.

PPE	TO BE USED
Riggers Gloves or Disposable gloves	As required
Full Face Shield	When handling potentially hazardous samples
Head Protection	As required or when stipulated on MANDATORY safety signage
Hearing protection	As required or when stipulated on MANDATORY safety signage
Sun protection and insect repellent	When working outdoors
Apron or disposable full body suit	When handling hazardous samples

5.6 Avoid unnecessary damage to surrounding flora and fauna by keeping to recognised tracks. The client is responsible for providing and maintaining safe access tracks to ALL sample points prior to the commencement of any monitoring. A JSEA/SWMS is to be completed, in the presence of the client when required, prior to the commencement of any monitoring.

6. PRELIMINARY PROCEDURES

Before leaving the workplace to carry out sampling ensure that:

6.1 Correct and sufficient sample bottles are available;

6.2 Sufficient sample labels are available;

6.3 The sampling devices are maintained and functional;

6.4 Priming water is available, as required;

6.5 Field quality control requirements are fulfilled;

6.6 Other equipment that may be needed is packed.

It is better to have equipment in the vehicle and not use it than to not have it at all.

Safety. *Ensure that the mobile phone is functional. Inform at least one person of your proposed destination and your estimated time of return to the laboratory.*

7. SAMPLING APPARATUS/MATERIALS/CHECKLIST

7.1 Purging Equipment (Options)

7.1.1. Bailer:

7.1.2. Medium to High Flow Sampling Pump (MHFSP):

7.1.3. Low Flow Purging Pump (LFPP) (including bladder and spares):

General note: Although more practical for sampling of deeper bores, contamination of water may result from intimate contact with a pumps internal mechanism. Gas extraction due to temperature and pressure variations during use can cause shifts in the ground waters chemical equilibrium.

7.2 **Calibrated Field Meters** and Calibration Documentation.

7.3 **Tools**. Examples kept in the vehicle are: Star Picket Driver, hammer, stilton's, assorted screwdrivers, electrical tape, spanners, shovel, brush hook, and pruning shears.

7.4 **Documents**: including Groundwater Field sheet (ENFM (58) / FDFM (007)), site history (if available), Bore Information (if available), Chain of Custody or similar document and Bottle List and Filling Instructions (e.g. WFM (030)), and calibration sheet such as FDFM (006).

7.5 **Sample containers** as per ENFM (67) series or WFM (030)

7.6 **Flow through cell and Sample Containers** (for measuring bore volume in MHFSP).

7.7 Depth check device (e.g. drawdown meter / bore fox whistle, interface probe). (If NATA accredited check against ref)

7.8 Tape Measure or similar device capable of measuring to 1 cm: (can be used to assist in pump placement) (If NATA accredited check against ref)

7.9 Priming/ cleaning water. If using petrol pump carry a minimum of 2 L of clean priming tap water for the petrol pump. Ensure adequate supplies of clean water are on-board for cleaning of bailers or submersible pumps.

7.10 Decontamination Solutions

7.10.1. Reagent grade water (e.g. for rinsates)

7.10.2. Decon-90 (do not use if sampling for PFAS/PFOS)

7.10.3. 70 % Ethanol

7.11 **Cooling Aid - Esky** (Electric refrigerated or Cool Box with Ice/bricks)

7.12 **Other optional equipment:** Plastic buckets (minimum 3) Ground sheets, Sampling platform (or similar device to stabilise entry of pump and lines into bore), and battery.

7.13 **Waste container (for low flow purging)**

8. STABILISATION AND OTHER CRITERIA RECOMMENDED

Parameters	pH	DO (mg/L)	EC
Stabilisation Criteria	± 0.1 *	± 10 % (above 0.5)**	± 3 %
Calibrations ***	On use #	Membrane - on use, LDO - Monthly	Annual or on use if required
Checks	On Use	Monthly	On use

* *Deviation from EPA 669 as field equipment can only report pH to 0.1 units as per NATA requirements.*

** *3 readings below 0.5 mg/L is considered stabilised (Reference EQASOP-GW/001)*

*** *See EN67.2 Calibration and Check of Field Equipment for calibration requirements and forms*

\# *Weekly where historical data has shown over time that the stability of pH meter calibration lasts a week.*

9. GROUNDWATER SAMPLING PROCEDURE - GENERAL

The VIC EPA Publication 669 "Groundwater Sampling Guidelines" should be referred to, if required.

9.1 Samplers

Groundwater sampling requires special expertise and should be undertaken by, or in consultation with, appropriately qualified and experienced personnel. Careful consideration and understanding is required of:

- Australian / New Zealand Standard AN/NZS 5567.1:1998
- EPA Victoria Publication 669, "Groundwater Sampling Guidelines"
- Qld DEHP, "Monitoring and Sampling Manual 2009"

Samplers are reminded to minimise influence from surface or other sources of potential contamination.

9.2 Ensure all quality controls (section 14) have been taken into consideration as per clients' request. For example field blanks, duplicates, trip blanks and field rinsates.

9.3 Complete all required documentation on field sheets, e.g. FSFM(000/01), FDFM(007) or FDFM (007b) prior to conducting sampling.

9.4 Lay out a ground sheet or similar set up to ensure equipment is protected from contamination at bore site

9.5 Complete field equipment calibrations/checks on appropriate form e.g. FSFM(000/01), FDFM(006), prior to sampling (refer to section above and if more information required see document EN67.02).

9.6 Clean sampling equipment with phosphorus free detergent (e.g. Decon-90) or ethanol wash (if collecting bacteriological samples) and rinse with DIW prior to placing into groundwater (bore) well to reduce potential contamination.

Note: do not use Decon if sampling for PFAS/PFOS

9.7 Upon arrival at sampling location, complete initial inspection of sampling location and accessibility (if unfamiliar with location). Including bore seal/condition and clear bore identification if available. Record any abnormalities on field sheet. Where required - check all bores for standing water level prior to conducting any sampling to display purging effect on aquifer. It can be recorded on FDFM (56).

9.8 Before measuring the depth of the bore you need to know where the measurement should be taken from before any purging or sampling is completed;

9.8.1. From the ground

9.8.2. From the bore casing or

9.8.3. From the standpipe.

9.9 The bore depth must be verified (as in the case of suspected tampering or collapse etc.), the depth check device is lowered into the bore until the tape slackens, an audible alarm sounds or a light indicator illuminates, indicating the bottom of the bore. A measurement is ALWAYS recorded on the field sheet to the nearest centimetre or graduation on the depth check device.

9.10 Commence completing appropriate sampling field sheet recording date, time, bore ID, standing water level (SWL) to a surveyed reference point, as specified by the client, which is typically top of casing (TOC), depth (to TOC), screened interval (if low flow purging)

9.11 Any other observation such as interferences with locks, or caps or odours emanating from the bore should be recorded on the field sheet.

9.12 Place pump or bailer in bore and purge as per requirements for method of sampling being undertaken (i.e. low flow or medium-high flow or hand bailing).

9.13 The height measurements taken relative to the top of the bore casing can be assessed against a common datum reference such as the Australian Height Datum (AHD) that would have been determined when the bore was commissioned, if required.

Note: Depth of Water (distance from bottom of bore to the top of the water) is not to be confused with Standing Water Level (distance from the top of bore to the top of the water).

9.14 If following Low Flow Pump Purging Procedure see Section 10 or if following other methods see Section 11.

10. LOW FLOW PUMP PURGING (LFPP) PROCEDURE

10.1 If any portion of the screen is dewatered on arrival record on the field sheet.

10.2 A sampling platform or similar device can be used to (as seen in Appendix 1, Figure 2) lower pump into bore. Pump intake is to be set at the midpoint of the screened interval using a tape measure for placement. Care should be taken to lower pump slowly ensuring minimal disturbance to the water column.

10.3 Record pump placement, water level and time prior to sampling. Set drawdown meter to alarm when probe is dewatered, generally 100mm beneath water surface will suffice. Set pump rate and commence sampling ensuring flow is directed through flow cell and is collected for later disposal after leaving flow cell.

10.4 Insert/screw water quality meter into flow cell. Once water reaches the probe commence recording stabilisation parameters every two minutes as per criteria listed in section 7.

***NOTE** Water level can be recorded every two minutes however if drawdown meter is placed just above the bottom of the screen ongoing measurements are not required.*

10.5 In principal, a bore will draw down to a point of hydraulic equilibrium where the recharge rate matches the purge rate, it is not unusual if bore draws down initially. The bore must not be completely dewatered. If bore does not appear to stabilise during sampling and is potentially in danger of dewatering, it is recommended to collect a sample without stabilisation and clearly note it on field sheet, the client must be notified and approval provided to complete testing.

10.6 If the screen is de watered – the sample must not be taken until the screen has re-charged preferably after 24 hours. However, in extraordinary circumstances where the client has approved it, the samples can be taken.

10.7 When the water first flows through the cell – record the initial chemical parameters. Continue to monitor the pH, EC and DO and record it on the field sheet as required.

10.8 It is recommended to allow at least 20 minutes of purging prior to starting the stabilisation criteria process. Once three consecutive readings are taken each two minutes apart within the stabilisation criteria mentioned in section 8 the sample can be collected. Record water level, disconnect flow cell and fill sample containers ensuring nothing comes into contact with the inside of the bottle or lid with the exception of the sample itself. Fill as per WFM (030).

10.9 Take final measurements of temperature, redox (if required) and other field parameters as requested/required. To measure redox follow procedure in EA075FD. Record results, time and date of sampling on the field sheet e.g. FDFM(007).

10.10 Label sample bottles with laboratory numbers and / or field numbers including any preservation details.

10.11 At the completion of filling sample containers, measure and record water level and time. Be sure to comment on the sample itself, i.e. colour and odour.

10.12 To complete a rinsate blank, fill pressure chamber case and bladder with deionised water and collect a sample.

10.13 Replace plastic bladder in sampling pump with a new bladder (bladders can be re used (they must be de contaminated as per section 13) if site history can show there is no effect on rinsate blanks).

10.14 If samples require filtering, this should be completed in the field. If this is not possible, then it must be indicated on the paper work provided to the laboratory and completed as soon as possible after arrival at the laboratory.

10.15 Samples must be stored on ice/bricks or refrigerated esky ready for transport to the laboratory.

10.16 Complete decontamination process as per Section 13.

10.17 Field sheet (including calibration sheets where possible) completed by the sampler must be submitted with samples and chain-of-custody sheets to the laboratory for processing.

11. MEDIUM TO HIGH LEVEL PUMPING

11.1 A minimum of one bore volume of water is removed and discarded to waste. Continue to remove groundwater and at least at quarter bore volumes,

11.2 An initial sample is taken and retained in an appropriate container. Rinse probes with sample and immediately measure the pH, Dissolved Oxygen (DO) and Electrical Conductivity (EC) and record on the field sheet.

11.3 Keep removing groundwater and at least every quarter bore volume, check the EC and Dissolved Oxygen and compared to the initial EC to mark any changes in water quality. Sampling can commence when the results have met the above stabilisation criteria (section 8) in three consecutive readings. It is considered highly likely the bore now is providing actual aquifer groundwater and not surface water. Each groundwater bore is different and the use of prior testing results can assist in the determination of the ability to start sample collection.

11.4 A sample stock should then be taken in a large container, such as a plastic beaker. Once the container is full and allowing no more than 5 min. settling time, sub-samples should be taken. One portion may be filtered through a laboratory washed glass fibre filter with a nominal pore size of 1.2 µm or less if truly soluble analytes are required. A third portion may be bottled directly as sub-sampled.

11.5 Measure the temperature, redox (if required) and other field parameters as requested/required. To measure redox follow procedure in EA075FD similar. Record results, time and date of sampling on the field sheet e.g. FDFM (007).

11.6 Label sample bottles with laboratory numbers and / or field numbers including any preservation details.

11.7 Fill all appropriate containers as described in

11.8 WFM (030) or EN08 and store as stated in section 7 of procedure EN67, unless otherwise specified (e.g. Acidification of samples for metals and ammonia). Rinse all unpreserved sample bottles with the groundwater prior to filling.

11.9 If samples require filtering, this should be completed in the field. If this is not possible, then it must be indicated on the paper work provided to the laboratory and completed as soon as possible after arrival at the laboratory.

11.10 Samples must be stored on ice or in a refrigerated esky ready for transport to the laboratory.

11.11 Once sampling has been completed – decontamination of all equipment that were in contact with the groundwater should be completed. See decontamination section below.

Note: If a sample cannot be collected from the bore during the sampling process above it may be necessary to leave and return to the site after a few to several hours (where practical) when the bore is recharged with groundwater (if at all). Otherwise it will be reported as "dry" or "insufficient volume".

11.12 Field sheet (including calibration sheets where possible) completed by the sampler must be submitted with samples and chain-of-custody sheets to the laboratory for processing.

12. SAMPLING USING A BAILER

12.1 Different size bailers are available depending upon piezometer pipe diameter size, choose a bailer that will provide maximum sample volume per bail.

12.2 Clean the bailer and buckets thoroughly and then rinse thoroughly with reagent grade water. If sampling for PFAS do not use Decon 90 as a decontamination solution

12.3 Attach the cord to the bailer via a suitable connector and lower it slowly down the piezometer until it is below water level.

Do not allow the bailer to rapidly hit the water and sink to the bottom as this can stir up unwanted sediment.

12.4 Raise the bailer and tip out the contents being careful that it is not reintroduced to the bore. Repeat the process until the bore has been flushed sufficiently

12.5 An initial sample is taken and retained in an appropriate container e.g. bucket. Rinse probes with sample and immediately measure the pH, temperature, Dissolved Oxygen (DO) and Electrical Conductivity (EC) and record on the back of the field sheet under site ID. Repeat process emptying contents of bailer into subsequent buckets until 3 successive stable pH & EC readings are obtained.

12.6 Keep removing groundwater and check the pH, EC and Dissolved Oxygen (if required) and compare to the prior readings to mark any changes in water quality. Sampling can commence when the results have met the stabilisation criteria (refer section 8) in three consecutive readings. It is considered highly likely the bore now is providing actual aquifer groundwater and not surface water. Each groundwater bore is different and the use of prior testing results can assist in the determination of the ability to start sample collection.

12.7 A composite sample should then be taken by mixing the 3 stabilised sub samples in one large container, such as a plastic bucket. Once the container is full and allowing no more than 5 min. settling time, final field parameters e.g. pH, EC, temperature & Dissolved Oxygen (DO) readings should be taken and recorded on the front of the field sheet, sub sampling can then be done. One portion may be filtered through a laboratory washed glass fibre filter with a nominal pore size of 1.2 µm or less if truly soluble analytes are required. A third portion may be bottled directly as sub-sampled.

12.8 To measure redox follow procedure in EA075FD or similar. Record results, time and date of sampling on the field sheet e.g. FDFM (007.

12.9 If the samples require field filtration then this is achieved through the use of disposable syringes and 0.45 µm membrane filters.

12.10 Samples must be stored on ice/ice bricks (refer 7.11) or in a refrigerated esky ready for transport to the laboratory.

12.11 Any damage or other problems noted during the sampling operation should be noted on the field sheets as comments and reported ASAP to client.

13. DECONTAMINATION

13.1 If sampling for PFAS do not use Decon 90 as a decontamination solution.

13.2 As a minimum, rinse all sampling equipment including bailers/pumps, receptacles, flow cell, sampling tube, interface probe, filtration equipment and probes in a phosphorus free solution and then flush with deionised water prior to use in the next bore.

13.3 Decontamination may vary from job to job depending on the nature of the groundwater and the reason for sampling. In general all equipment and devices that have come into contact with groundwater will need to be decontaminated.

13.4 If the site is visibly affected (e.g. soil or clay particles) the sampling equipment must be decontaminated with a phosphorus free detergent, e.g. Decon-90.

13.5 If bacteriological samples are to be taken then decontamination must involve an alcohol or similar wash to ensure sterile conditions of the equipment used.

14. QUALITY CONTROL (QC)

QC involves specific activities to assure the quality of samples, including the collection of information that identifies any error due to possible sources of cross contamination and inconsistencies in sampling, and provides checks on the analytical techniques used. The following Quality Controls can be requested by the client:

14.1 **Duplicates** - Two for every 20 real samples.

14.2 **Rinsate Blanks** – As required.

14.3 **Field Blanks** - One per trip.

14.4 **Trip Blanks** - One per trip.

14.5 **Quality Control Blanks** are measured throughout the sampling, as specified in the appropriate procedure, and should include any filtration or preservatives as appropriate.

15. CALCULATION OF BORE VOLUME

There are two calculations used in the calculation of bore volumes. The Victorian EPA calculation (15.1) must be considered when the low flow purging technique is completed. The second calculation (15.2) can only be used when there is no bore information available for that site. The calculation in 15.2, is an in-house modified version of the EPA Calculation (15.1). If the calculation for 15.2 is used, it must be specified on the test report that the bore volume is approximate.

15.1 Victorian EPA Guidelines Calculation of Bore Volume (Pub 669)

Bore Volume = casing volume + filter pack volume

$$= \pi h_1 d_2^2/4 + n(\pi h_1 d_1^2/4 - \pi h_2 d_2^2/4)$$

Where: $\pi = 3.14$

n = porosity (0.3 for most filter pack material)

h_1 = height of water column

d_1= diameter of annulus

h_2 = length of filter pack

d_2 = diameter of casing

15.2 Historical Calculation of Approximate Bore Volume (mod version of EPA 669)

Calculate the approximate holding volume of the bore from the internal diameter of the casing (mm) and the depth of water in the bore (m) as follows;

$$\textbf{Bore Volume (litres)} = \frac{\textbf{3.142 x (Diameter)}^{2}\textbf{ x Depth of Water (m)}}{\textbf{4,000 (mm)}}$$

Where:

Bore Volume	*is in litres*
Internal Diameter	*is in mm*
Depth of Water	*is in metres*

This does not take into consideration the water outside the casing.

16. REPORTING GROUNDWATER DATA AS PER VIC EPA GUIDELINES

The following information is required in reports that are required to be in accordance with Victorian EPA Compliance Reporting:

16.1 Type of purging completed: Low flow purging or Medium/High Flow purging.

16.2 Sampling equipment details – in general comment section is okay.

16.3 Bore information (bore identification number, bore location, bore depth and screen interval. Screen interval is only for low flow purging.

16.4 Bore volumes removed (for medium and high flow purging only).

16.5 Pump location in bore (low flow purging only)

16.6 If the sample was field filtered – general comment okay and if required state which ones weren't field filtered.

16.7 Has the bore construction report been cited/checked (low flow purging only)

16.8 Dissolved oxygen results should not be reported when the samples are collected using a bailer. (This is not an EPA requirement – but best practice)

Note: All data should be checked and approved by an approved signatory for groundwater sampling.

17. REFERENCES

17.1 EPA Publication 669, Groundwater Sampling Guidelines, EPA Victoria

17.2 EPA Publication IWRG701 Sampling and analysis of waters, wastewaters, soils and wastes, EPA Victoria

17.3 AS/NZS 5667.11 Water quality – Sampling Part 11: Guidance on sampling of groundwaters

17.4 Qld DEHP, "Monitoring and Sampling Manual 2009"

17.5 EQASOP-GW 001, Low Stress (low flow) Purging and Sampling Procedure for the Collection of Groundwater Samples From Monitoring Wells, USEPA, 2010

18. APPENDICES

Appendix 1 Cross sectional view of a groundwater monitoring bore

Appendix 2 Platform Setup for Low Flow Purging Groundwater Sampling

Figure 1: Groundwater monitoring bore

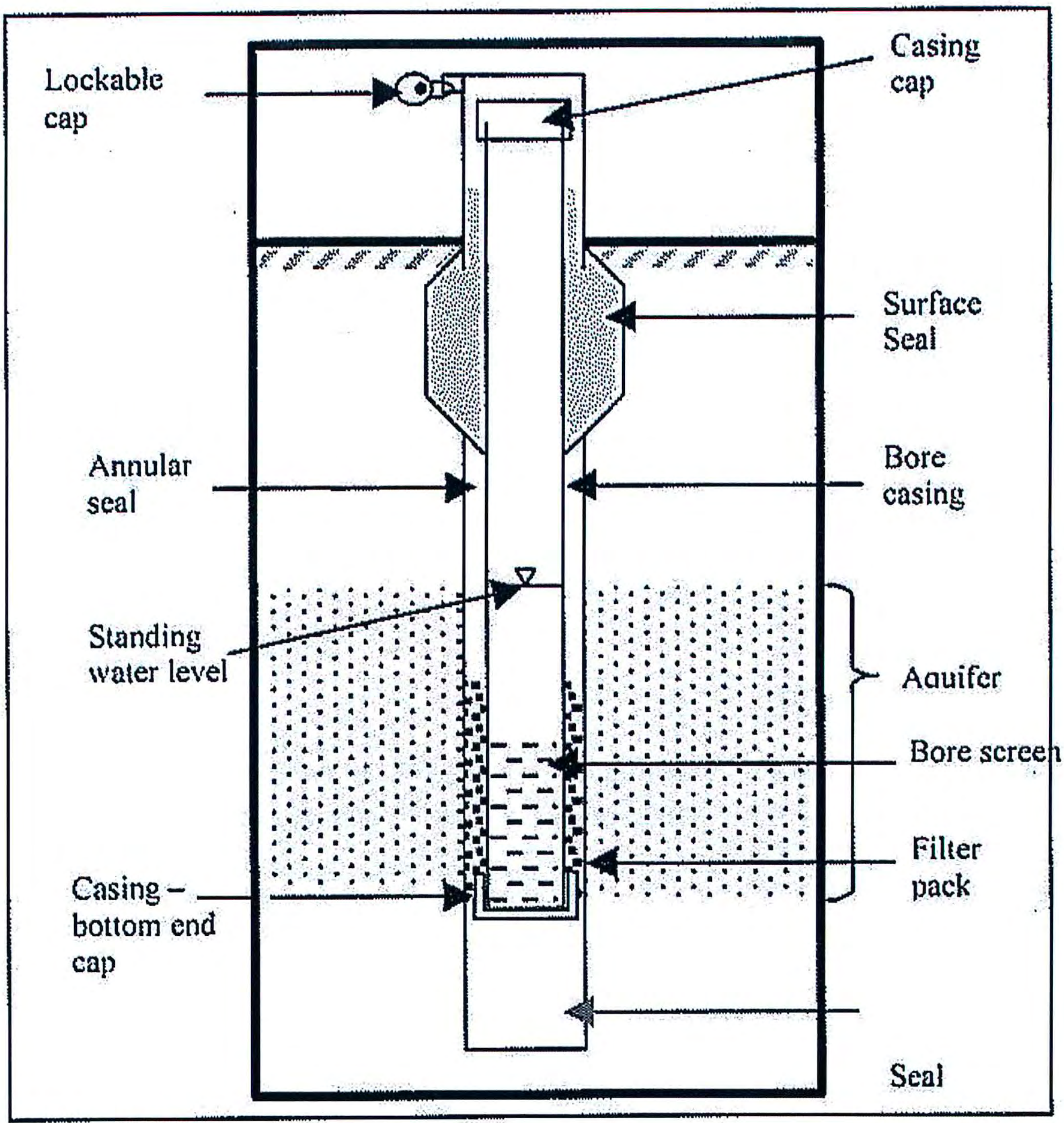
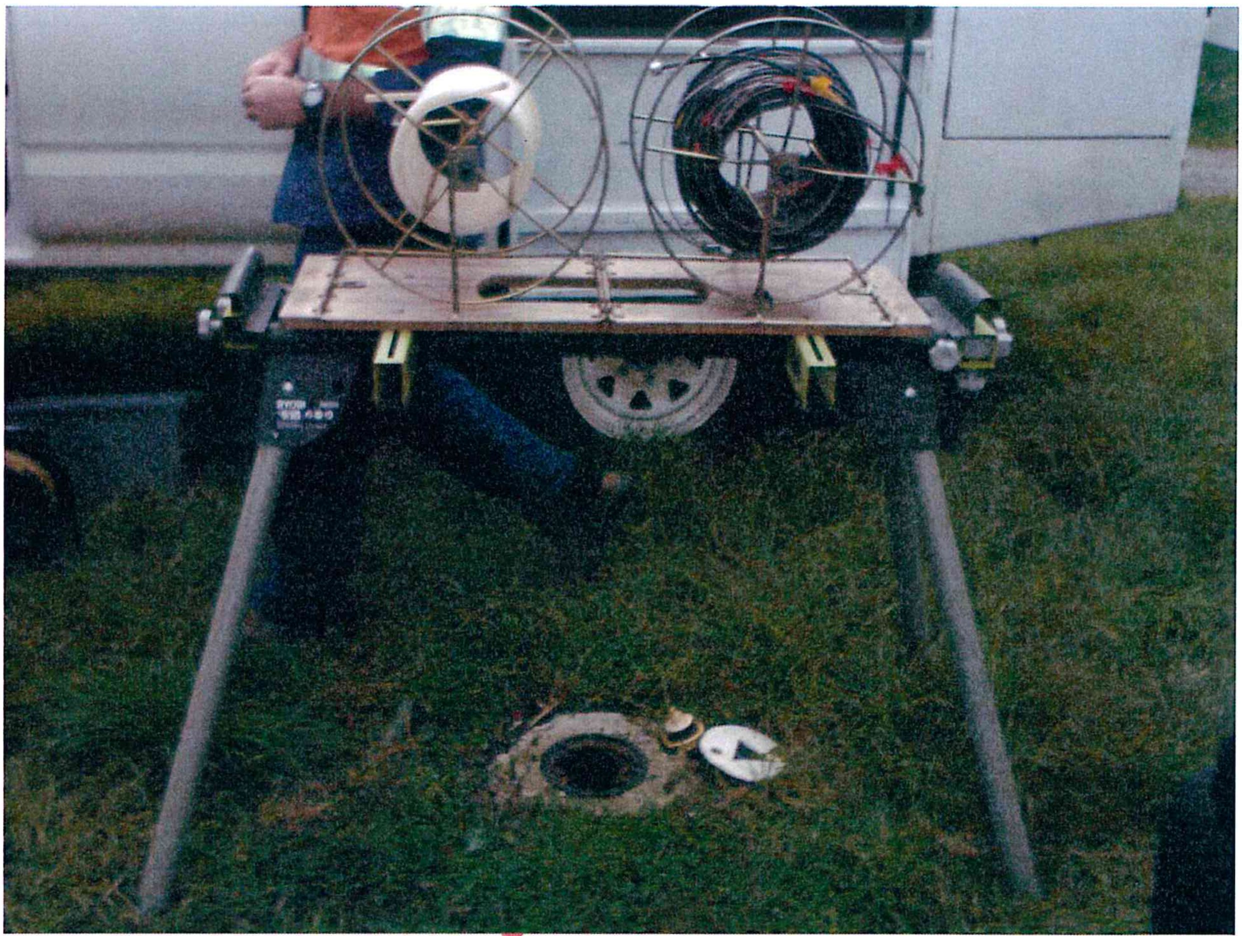


Figure 2 - Platform Setup for Low Flow Purging Groundwater Sampling (07/08/14)



Appendix E-2
Sampling of Surface Waters

QUALITY WORK INSTRUCTION

SAMPLING FROM RIVERS AND STREAMS

DOCUMENT NUMBER: **QWI-EN/67.06**

Copy Number:

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AMENDMENT HISTORY

Amend. No.	Date	Description of Amendment	Author / Editor	Approved by
0	10/12/14	Split from EN67	K.Moulding	K.Moulding
1	31/07/17	Added comment in scope relating to what samples are collected as per NATA Scoresby Biological Audit. MM addition of information from EN67.MUD. Updated references	D.Darby / M.Monds	D.Darby
2	15/01/18	Format fixed	L Cai	L Cai

1. SCOPE

This document describes the sampling of surface waters such as rivers and streams. Water samples are collected for microbiological, biological and chemical testing. It is based on:

1.1 AS/NZS 5667 Part 6: Guidance on sampling of rivers and streams

1.2 The Queensland Department of Environment and Resource Management ‗Monitoring and Sampling Manual, 2009'

1.3 IWRG701 (2009) VIC EPA Sampling and Analysis of Waters, Wastewaters, Soils and Wastes.

2. REFERENCED DOCUMENTS

Refer to QWI-EN/67.

3. SAFETY

3.1 When taking any samples, safety considerations are of the utmost importance. **Safety of the sampler is to be considered before taking any sample**. If a sampling technique or a sampling site is deemed to be unsafe for any reason sampling **must not take place**.

3.2 Before undertaking any sampling the applicable JSEA should be read,understood and signed. Refer to HSE-AU-GRP-FRM-02-05.01 for a blank copy.

3.3 Staff following and conducting this procedure must wear the appropriate safety personal protective equipment (PPE).

4. GENERAL CONSIDERATIONS FOR SAMPLING

4.1 Refer to QWI-EN/67 for full list of considerations.

4.2 Many sample bottles supplied by ALS contain preservative so container labels be read and preserved containers should NOT be rinsed prior to sampling.

4.3 Where a natural / plain container, without preservative, is used it should be rinsed with the sample water before filling.

4.4 If several types of samples are to be taken from the same point, the microbiological sample should be taken first.

4.5 When collecting a microbiological sample, unscrew lid and hold in fingers until sample is collected, i.e. do not put lid down. As the inside of the bottle is sterile, be careful not to touch inside of bottle or lid. Fill to 3cm from the top of the bottle or to the red dot.

4.6 When sampling potable water as well do not store any other water samples (e.g. from rivers, creeks, recycled water or wastewater) in the esky or fridge used for reticulated waters. Place in an alternative esky.

4.7 Transport of samples should be between 2 – 8 degrees (AS2031).

4.8 To ensure representative results a sampling point should be chosen where the constituents of interest are distributed homogeneously throughout the water body.

4.9 Surface layers containing floating material or films should be avoided as the results will be biased, unless these are particularly required for analysis.

4.10 Avoid disturbing sediment that may contaminate the sample when sampling shallow waters;

4.11 For DO and BOD samples, which are affected by changes in gaseous content, the sample should NOT be agitated and should be filled to zero headspace.

4.12 Fill the container with enough sample to rinse it (if no preservative), cap and shake. Empty the rinse water away from the immediate site of sampling – downstream if possible.

5. SAMPLING SURFACE WATERS

5.1 Collection of Samples

When collecting samples from a River or Stream always stand and look upstream. Rivers and streams in Australia can flood quite quickly due to extensive rain in another geography region.

5.1.1. Reasonable access in all weather is important and it is essential for routine sites which are frequently sampled. Check relevant Safe Work Method Statement (SWMS) or JSEA for the coverage of all hazards.

5.1.2. Complete checks and calibration of all field equipment as required (QWI-EN/67.02)

5.1.3. Assess sampling site to determine if Personal Floatation Device (PFD) needs to be worn.

5.1.4. Sampler should ensure the location of the sampling site is correct.

5.1.5. The preferred method of collecting a sample is with a container attached to a sampling stick. Where this is not possible it is acceptable to use a clean bucket (do not use a bucket that was used for another purpose – e.g. plaster bucket).

5.1.6. Immerse sample container neck downward, below the surface. Turn the bottle until the neck points slightly upward and the mouth is directed towards the current. If there is no current, as is the case of a reservoir, create a current artificially by pushing bottle forward horizontally in a direction away from the hand. Take the sample with container opening facing upstream, so that the water will flow into container without potential contamination from the stick or sampler. Rinse container at least twice, unless the container has preservative in it. The sample should be taken between 10 cm and 30 cm below surface away from the edge where applicable (if possible mid stream; and an area of high turbulence should be chosen, avoiding stagnant water).

5.1.7. If sampling from a low flowing or a shallow water body, as practically as possible try not to disturb the bottom of water body. If this is not possible, to collect a sample of water without disturbing the bottom - use a syringe or other device with an extended inlet tube and pierce through the surface layer (if required) take sample 30 mm below the surface.

5.1.8. To collect a sample of the actual surface layer, the container should be held horizontally in the water, half submerged.

5.1.9. Fill the samples as per form WFM (030).

5.1.10. Where impractical or for safety reasons a sample cannot be collected directly from the bank, sampling from a bucket may be adopted.

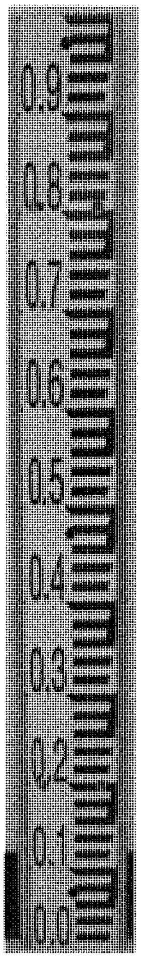
5.1.11. If the sampler has to stand in the water, the container must enter the water upstream of the sampler to avoid contamination.

5.1.12. Once sample has been taken, have a separate bottle to analyse the field data using field equipment, do not use this water for laboratory samples.

5.1.13. Sampler should rinse field equipment at least two times with sample water before analysing the sample water. Follow steps in instruction manual for use.

5.1.14. Note: Sampling from unsafe sites such as unstable banks, should be avoided if possible. If this is unavoidable, the operation should be conducted by a team using appropriate precautions. Sampling from bridges should be used when appropriate.

5.2 Reading Staff gauges



5.2.1. Staff gauges are used to give a quick and easy measurement of the water level, accurate to the nearest mm.

5.2.2. Each gauge is 1 metre long, marked in metric units and is numbered at intervals of 10 centimetres (1 decimetre). The number on the left hand side identifies the range of the gauge. The range generally will be as follows: 0-1m, 1-2m, 2-3m, 3-4m etc, and will be spaced up the bank of the river

5.2.3. The face of the gauge is white, the numbers are black and increments are alternating black and white. Each black or white section on the gauge represents 10mm. From there it is a matter of sighting to millimetre accuracy within the 10mm range. Always read the gauge from the bottom up.

5.2.4. When reading a staff gauge, be aware of the following:

5.2.5. The meniscus of the water must also be allowed for when taking a reading. A meniscus is generally 3 mm. To get an accurate reading, get as close to water level as is practicable and safe, and read to the bottom of the meniscus.

5.2.6. Fluctuation caused by currents and wind can give in-accurate readings. To get an accurate reading in this circumstance, watch gauge for a period of time and determine the mean reading.

In some cases, there will be a bow wave across the gauge due to high water velocities. To account for this, you will need to determine where the water level would be if no bow wave existed. The easiest way is to look at the upstream water level before the bow wave comes into effect, and draw an imaginary horizontal line across the gauge and take that reading

6. <u>REFERENCES</u>

6.1 AS NZS 5667.6 Part 6: Guidance on sampling of rivers and streams

6.2 AS2031 Water quality- Sampling for microbiological analysis

6.3 ISO 5667.3 Guidance on the preservation and handling of water samples.

Appendix E-3
Surface Gas Emissions Monitoring Methodology

QUALITY WORK INSTRUCTION

MONITORING OF LANDFILL GAS FUGITIVE EMISSIONS

DOCUMENT NUMBER: EN66.3

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AMENDMENT HISTORY

Amend. No.	Date	Description of Amendment	Author / Editor	Approved by
0	05/03/2019	Issue A	A van-Prooyen	A van-Prooyen
1	29/05/2019	Updated from draft version, updated method code and included hyperlinks	D.Darby/ A van-Prooyen	A van-Prooyen

1. SCOPE

Landfill Gas is produced during the anaerobic phases of microbial degradation of the landfilled waste. Landfill gas monitoring bores are installed off the boundaries of landfill sites with the aim of intercepting any gas escaping laterally from the site and identifying its location. This procedure defines how to collect the gas samples.

2. REFERENCED DOCUMENTS

FDFM057	Gas Bores Field Sheet
FDFM058	Subsurface Services Monitoring Field Sheet
FDFM059	Buildings and Structures Field Sheet
FDFM060	Landfill Cap Walkover Field Sheet

3. DEFINITIONS

For the purposes of this method the following definitions and abbreviations apply:

3.1 LFG = Landfill Gas

3.2 EPA 1416 = EPA Victoria, Publication1416 Draft Landfill Gas Fugitive Emissions Monitoring Guidelines 2011.

3.3 EPA 1684 = EPA Victoria, Publication 1684 Landfill gas fugitive emissions monitoring guideline 2018.

4. PURPOSE / PRINCIPLE

4.1 This procedure in conjunction with referenced documents is a guideline for the monitoring gas migration via bores, over landfill caps, buildings and service pits.

5. INTERFERENCES

Meteorological and Environmental Conditions

5.1 Bores, Buildings & Subsurface Services: **Atmospheric pressure** – rapid alterations (increasing or decreasing) over short time periods immediately before or during monitoring can decrease of increase landfill gas emissions from site. If possible sampling should be planned for times of stable or falling barometric pressure.

5.2 Surface / Cap Monitoring: Rainfall, Frost, High Temp/Dry Weather, Wind Atmospheric Pressure & Excessive Vegetation. Any surface emissions monitoring that includes the final cover, penetrations through the final cover or an intermediate cover should NOT be conducted under any of the following conditions:

- if atmospheric pressure at the landfill site is rising sharply or is much higher than the average for the geographical area of the landfill
- during frost conditions

- in areas where water is standing or ponding
- if wind speed is greater than 10km/h at 50mm above the ground
- within 2 days of heavy rainfall
- during any other meteorological or environmental conditions that may significantly affect the representativeness of the data obtained.

If at times any of the above conditions are unavoidable it should be noted on the field sheet that these issues may have affected the data obtained. See Appendix A of EPA 1684 for detailed conditions.

Weather data for the site on the days of monitoring and 48 hours preceding should be downloaded from the closest Bureau of Meteorology weather station. If an onsite weather station is available this data should be used. Surface wind is measured with a portable anemometer.

5.3 <<Instrument Carryover>>

Instruments should be purged after each sub sample. Remove the tubing and probe and leave the pump turned on away from the service and other sources of gas or contaminants until any residual gas present within the instruments has been purged. Background checks should also be done prior to each sample with results recorded on the field sheet. The prevailing background concentrations are generally as follows:

Analyte or Analyte Group	Concentration	Instrument
CH_4 - methane	<0.1%	Extractive LFG analyser
CH_4 - methane	0.0ppm	Low-concentration methane detector
CO_2 - Carbon dioxide	<0.1%	Extractive LFG analyser
O_2	21%	Extractive LFG analyser
N – nitrogen (balance)	79%	Extractive LFG analyser

6. APPARATUS

6.1 Extractive landfill gas analyser eg Geotech GA2000, GA5000, GEM5000 that meet the minimum performance specifications listed in EPA 1684 Table 2.

6.2 Low concentration methane detector eg Inspectra Laser, Laserone or Flame Ionisation Detector (FID) that meet the minimum performance specifications listed in EPA 1684 Table 2.

6.3 Other equipment to carry includes: GPS, measuring wheel, marker flags, marker paint, marker tape, hand held wind speed meter (anemometer).

7. SAFETY

7.1 Staff following and conducting this procedure must wear the appropriate safety personal protective equipment (PPE). The supervisor must ensure staff are wearing / using the correct PPE as per the task JSEA.

8. SAMPLING, SAMPLE STORAGE AND HOLDING TIME

8.1 The EPA Victoria, Publication 1684 Landfill Gas Fugitive Emissions Monitoring Guidelines 2018, the Landfill BPEM section 6.7 and the equipment manuals should be read and carried by the field technician.

8.2 Prior to arrival at the site, monitoring personnel should complete a brief desktop review of the locations to be monitored, to develop an understanding of the number and types of bores, services and buildings to be monitored and the likely time required to complete the monitoring. In the case of the walkover survey, this should provide an understanding of the number and location of transects to be monitored, and confirm the size of the area, the likely time required to complete the monitoring and the location of any known or likely point sources of emission or penetrations through the final cover layers.

8.3 Historical data should be sought and reviewed. Regular assessment of results whilst monitoring is good practice and will allow the operator to identify any emmisions or unsafe working conditions, table 6.4 in section 6.7 of the Landfill BPEM contains landfill gas action levels to be reported to the contract manager and/or the client within 24 hours.

9. LFG BORE MONITORING

9.1 Locate and identify the bore by its description, record all prestart information on (Gas Bores Field Sheet) eg time, date, site ID, weather conditions etc.

9.2 Visually inspect the bore and without breaking the gastight seal, note any issues or deficiencies that may prevent representative data being obtained (such as LFG odours, unsealed bores, screened sections of pipework above ground level, failed bentonite seal, open gas tap loose cap, locked or unsecure etc).

9.3 Turn on extractive LFG analyser and perform background checks and record atmospheric pressure.

9.4 Turn pump off, zero the pressure sensor with sample tube disconnected (shielded from any wind) and connect the sample tube to the white port and the bore and record the relative pressure.

9.5 Next check the flow, disconnect tube from the white port and connect to the blue port, the flow is averaged over 1 minute, record reading and follow prompts to continue ie disconnect from blue and connect to white port.

9.6 Turn pump on and run the pump until required peak, stabilised and minimum concentrations are obtained. If stabilisation is not reached within 3 minutes record the readings and the rate of change in concentration (average over 30 seconds) and note as non-stabilised final readings.

9.7 If very high LFG concentrations are recorded (>30%v/v CH_4, and or >30% v/v CO_2), then monitoring of the bore should continue beyond 3 minutes to gauge the persistence of the levels detected. Also record a flow reading in this case.

9.8 Refer to EPA 1684 section 6 for detailed guidelines.

10. SUBSURFACE SERVICES

10.1 Due to the diverse nature of subsurface services (eg utility and stormwater pits), it is not possible to provide a universal, step-by-step field monitoring procedure for all locations. The following steps may need to be modified, depending on the exact nature of the service. Factors that may influence the method of monitoring, and that may be useful to record, include:

- dimensions of the subsurface service
- sealing of the subsurface service
- accessibility of the subsurface service
- any known landfill gas dissipation measures
- weight of access panels or covers into subsurface services
- locking mechanisms on access panels or covers (if applicable).

10.2 Locate and identify the service, record all prestart information on (Subsurface Services Monitoring Field Sheet) eg time, date, site description, ID, location or GPS coordinates, weather conditions etc.

10.3 Visually inspect the location and note any issues or deficiencies with the location that may prevent representative landfill gas monitoring data being obtained (this might include landfill gas odours, unsealed service or inaccessible service).

10.4 With the instrument turned on insert into the subsurface service. This should be done in a way that minimises the ingress of air to the subsurface service. Example methods include inserting probe through small holes in access panels or slightly lifting the access panel just far enough to allow the probe to be inserted. Attempt to monitor the lateral and vertical profile of the Turn on the low concentration methane detector perform background checks and record (target background methane is ~ 2.0ppm

10.5 cavity where possible.

10.6 Record the highest concentration of methane and approximate observed stable reading if unstable record the range between its fluctuating. If a stable range is not reached within 3 minutes record the direction and rate of change in concentration and note as non-stablilised readings.

10.7 When monitoring has been completed the instrument should be purged and monitoring personnel should note the finish time and any issues that may have prevented representative data being obtained.

10.8 Refer to EPA 1684 section 7 for detailed guidelines.

11. BUILDINGS AND STRUCTURES

11.1 Monitoring is performed with the low concentration methane detector. Due to the diverse nature of buildings, it is not possible to provide a universal, step-by-step field monitoring procedure for all possible locations. Factors that may influence the method of monitoring, and are not limited to but may be useful to record are listed on the (Buildings and Structures Field Sheet). Monitoring locations may include but are not limited to the following: • around service ingress points, such as pipework

- inside electricity meter/fuse box
- inside cabinets within bathrooms, kitchens, laundries and other rooms
- around cracks and penetrations through floors
- along skirting boards and joins between floors and walls
- within floor voids (underneath floors)
- within wall cavities (access permitting)
- within any other identified confined spaces or possible entry points for landfill gas.

11.2 Turn on the low concentration methane detector perform background checks and record (target background methane is ~ 2.0ppm

11.3 Starting in the middle of each room with the probe at head height, monitor the ambient concentration of methane present then proceed to inspect the building and monitor each identified location with the instruments running continuously. Monitor each location holding the probe as close as possible to any potential landfill gas sources. Record the type and location of each area monitored on the the (Buildings and Structures Field Sheet) (for example, bathroom cabinet or roof void). Inspect the area and record observations (such as holes in floor for services pipes that may act as pathways for migration of landfill gas).

11.4 Methane is lighter than air and may accumulate in elevated positions. If methane is found to be entering the building/structure monitor the surrounding elevated areas.

11.5 Record the highest concentration of methane found in any location of each room.

11.6 Once monitoring of the inside of the building/structure has been completed, monitor the outside of the building around airbricks, vents, services entries, manhole covers, drain covers, shallow excavations and cracks or gaps in any hardstanding/concrete etc.

11.7 When monitoring has been completed, monitoring personnel should note the finish time and any issues that may have prevented representative data being obtained.

12. LANDFILL SURFACE MONITORING (WALKOVER)

12.1 The purpose of this method (commonly known as a walkover survey) is to identify defects in the cap and landfill infrastructure, such as gas wells and leachate sumps, that are allowing fugitive emissions of landfill gas. The fugitive emissions are assessed by monitoring methane present in air above the cap surface. The pre event review will see a map of the site with transects drawn at 25 m intervals for intermediate caps and 50 m intervals for final caps at right angles to each other crossing in a grid pattern. Each transect should start and finish approximately 5m beyond the waste boundary. The map should also identify any known defects or gas penetrations through the cap.

12.2 Record all prestart information on the (Landfill Cap Walkover Field Sheet) eg time, date, site description weather conditions. The low concentration methane analyser is used for this task. Surface emissions should be monitored continuously at a height approximately 50 mm above the ground along the transects spaced at 25 m or 50 m intervals across the surface of the landfill. Record wind speed every 15 minutes at 50mm above ground using a hand held anemometer.

12.3 Monitor at normal walking speed along the transects parallel with a landfill boundary if possible, then again along the other set at the right angle. If any points of possible emmisions are observed eg: gas odours, bubbling through ponded water or penetrations through the cap divert form the transect to record emmissions again at 50mm above and on all sides of the defect. Any newly identified points of interest should be marked, photographed and GPS location recorded against the results, these may include but are not limited to:

• Landfill edges and side slopes – these should be particularly focused upon as lower compaction rates occur at the landfill edge, the waste is therefore less resistant to gas movement.

• anchor trenches

• surface cracking, fissures and/or depressions

• stressed vegetation

• interfaces between intermediate cover or final cap on adjoining cells

• gas wells and monitoring points

• junctions in gas collection pipework

• sumps, towers, risers and other monitoring points

• liquid discharge infrastructure (leachate recirculation or condensate discharges)

12.4 Upon completion, note the finish time and any identified issues that may have prevented representative data being obtained.

12.5 Monitoring results exceeding the landfill gas action levels in Table 6.4 of BPEM must be reported contract manager and/or the client within 24 hours.

13. QUALITY CONTROL

13.1 Calibration of equipment, check with appropriate gases prior to use.

14. REFERENCES

EPA Victoria, Publication1416 Draft Landfill Gas Fugitive Emissions Monitoring Guidelines 2011.

EPA Victoria, Publication 788.3 Siting, Design, Operation and Rehabilitation of Landfills, BPEM 2015

EPA Victoria, Publication 1684 Landfill Gas Fugitive Emissions Monitoring Guideline 2018.

15. APPENDICES

Appendix 1 Table 6.4 of BPEM

Table 6.4 of BPEM

Table 6.4: Landfill gas action levels

Location	Parameter(s)	Action level and unit
Landfill surface final cap	Methane concentration in air*	100 ppm
Within 50mm of penetrations through the final cap	Methane concentration in air**	100 ppm
Landfill surface intermediate cover areas***	Methane concentration in air*	200 ppm
Within 50mm of penetrations through the intermediate cover	Methane concentration in air**	1000 ppm
Biofilters	Methane flux	$1.0g/m^2/hr$
Subsurface geology at the landfill boundary	Methane and Carbon Dioxide concentrations	1% v/v Methane or 1.5% v/v Carbon Dioxide above background
Subsurface services on and adjacent to the landfill site	Methane concentration	10,000 ppm
Building/structures on and adjacent to the landfill site	Methane concentration in air	5000 ppm
Landfill gas flares	Methane and Volatile Organic Compounds	98% Destruction efficiency

* Point of measurement is 50mm above the landfill surface.

** Point of measurement is 50mm from the point of discharge.

*** Intermediate cover areas are those that do not have an engineered landfill cap and are not scheduled to receive waste during the next three months.

Appendix F
Monitoring Results

Appendix F-1
Groundwater, Surface Water, and Leachate Monitoring Results

Method_Name	ChemName	Units	EQL	ADWG 2015 Health	ANZECC 2000 - Irrigation (LTV)	ANZECC 2000 - Livestock	ANZECC 2000 FW 95%	Primary Contact Recreation
Dissolved Oxygen (Field)	Dissolved Oxygen	mg/L	0.5					
Electrical Conductivity (Field)	EC (field)	uS/cm	10					
BTEXN via Purge & Trap GC-MS	Benzene	µg/L	1	**1**		1	950	1
	Toluene	µg/L	1	**800**		800	180	25
	Ethylbenzene	µg/L	1	**300**		300	80	3
	Xylene (m & p)	µg/L	2	**600**		600	200	20
	Xylene (o)	µg/L	1	**600**		600	350	20
	Xylene Total	µg/L	2	**600**		600		20
	Total BTEX	µg/L	2					
MS Soluble Metals - Low Level	Iron (Filtered)	mg/L	0.01		*0.2*			0.3
	Manganese (Filtered)	mg/L	0.001	**0.5**	*0.2*		1.9	0.1
Nutrients	Ammonia as N	mg N/L	0.1				0.75	0.41
	Nitrate as N	mg N/L	0.01		*1.13*		0.16	113
	Reactive P	mg P/L	0.01		*0.0004*			
OES Metals	Calcium	mg/L	0.1			1000		
	Magnesium	mg/L	0.1					
	Potassium	mg/L	0.1					
	Sodium	mg/L	0.1					180
pH (Field)	pH sediment, 0.01M calcium chloride extract, units	Units						
Redox Potential (Field)	Redox Potential (Field)	mV						
Standing Water Level (AHD)	Standing Water Level compared to AHD (m) (Field)	M						
TDS at 180°C +/- 5°C	TDS	mg/L	5			|2000		
TOC (SFA)	TOC	mg/L	0.5					
Total Recoverable Hydrocarbons	C10-C14	µg/L	100					
	C15-C28	µg/L	100					
	C29-C36	µg/L	100					
	C10-C16	µg/L	100					
	C16-C34	µg/L	100					
	C34-C40	µg/L	100					
	C10-C40 (Sum of total)	µg/L	100					
Total Recoverable Hydrocarbons & F1	C6-C9	µg/L	100					
	C6-C10	µg/L	100					
	C6-C10 (F1 minus BTEX)	µg/L	100					
TPH by Headspace	C6-C9	µg/L	500					
Total Recoverable Hydrocarbons F2	C10-C16 (F2 minus Naphthalene)	µg/L	100					
Alkalinity	Bicarbonate Alkalinity as CaCO3	mg CaCO3/L	2					
	Alkalinity (Carbonate as CaCO3)	mg/L	2					
	Alkalinity (Hydroxide) as CaCO3	mg/L	2					
	Alkalinity (total) as CaCO3	mg/L	2					
Cl DA	Chloride	mg/L	1					250
SO4 DA	Sulphate	mg/L	1	**500**		1000		250

Field_ID	BH5	BH5	BH5	DUP DUPLICATE	FIELD BLANK	LEACHATE POND 1	LEACHATE POND 1	LEACHATE POND 2	LEACHATE POND 2	LEACHATE SUMP 1 - Cell 3	LEACHATE SUMP 1 - Cell 3	LEACHATE SUMP 2 - Cell 4
LocCode	BH5	BH5	BH5	BH5		LEACHATE POND 1	LEACHATE POND 1	LEACHATE POND 2	LEACHATE POND 2	SUMP 1 Cell 3	SUMP 1 Cell 3	SUMP 2 Cell 4
Sampled_Date-Time	11/28/2018	2/28/2019	6/13/2019	6/13/2019	2/28/2019	11/28/2018	5/16/2019	11/28/2018	5/16/2019	11/28/2018	5/16/2019	11/28/2018
Dissolved Oxygen	3.8	1.5	<0.5	-	-	11.1	10.6	6.6	6.1	1.4	1.3	1.1
EC (field)	270	300	320	-	-	2600	5900	13,000	15,000	19,000	22,000	7000
Benzene	<1	<1	<1	<1	<1	<1	**<10**	<1	**<10**	<1	**10**	<1
Toluene	<1	<1	<1	<1	<1	<1	<10	<1	<10	<1	<10	110
Ethylbenzene	<1	<1	<1	<1	<1	<1	<10	<1	<10	<1	31	60
Xylene (m & p)	<2	<2	<2	<2	<2	<2	<20	<2	<20	<2	69	140
Xylene (o)	<1	<1	<1	<1	<1	<1	<10	<1	<10	32	37	77
Xylene Total	<2	<2	<2	<2	<2	<2	<20	<2	<20	32	110	220
Total BTEX	<2	<2	<2	<2	<2	<2	<20	<2	<20	32	150	390
Iron (Filtered)	*0.92*	*1.9*	0.06	0.06	<0.01	0.02	*0.21*	*0.46*	*0.48*	*7.2*	*3.2*	*2*
Manganese (Filtered)	0.041	0.049	0.043	0.04	<0.001	<0.001	0.007	***0.55***	***0.55***	*0.34*	*0.47*	***0.71***
Ammonia as N	0.2	0.4	0.2	0.18	<0.1	0.5	0.8	***30***	***53***	*1400*	*1000*	***460***
Nitrate as N	0.02	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	***37***	***15***	*<0.2*	*<0.2*	***<0.2***
Reactive P	<0.01	0.01	<0.01	0.01	<0.01	<0.01	0.03	***4.3***	***39***	*5.7*	*53*	***3.9***
Calcium	8.3	4.1	5.2	5.2	<0.1	34	15	130	75	170	190	210
Magnesium	3	4.1	4.6	4.6	<0.1	28	19	460	500	270	360	89
Potassium	1.2	0.8	0.9	0.9	<0.1	170	460	740	1400	800	690	270
Sodium	32	37	39	39	<0.1	420	1600	2300	3600	1900	3000	480
pH sediment, 0.01M calcium chloride extract, units	5.4	3.8	4.2	-	-	8.7	9.7	8.1	8.5	7.3	7.4	6.9
Redox Potential (Field)	-20.6	62.7	-64.9	-	-	43	-21.7	50.6	-25.9	17.1	-59.1	-76.4
Standing Water Level compared to AHD (m) (Field)	-	90	90	-	-	-	-	-	-	-	-	-
TDS	160	140	140	140	<5	1600	4100	7800	8400	7100	8400	2800
TOC	5.6	11	2.6	2.6	<0.5	70	260	330	330	710	640	270
C10-C14	<100	<100	<100	<100	<100	<200	<200	100	100	1100	1000	1000
C15-C28	<100	<100	<100	<100	<100	<200	<200	500	500	1800	2100	1100
C29-C36	<100	<100	<100	<100	<100	<200	<200	<100	<100	400	400	300
C10-C16	<100	<100	<100	<100	<100	<200	<200	200	200	1300	1300	1100
C16-C34	<100	<100	<100	<100	<100	<200	400	500	500	1800	2100	1100
C34-C40	<100	<100	<100	<100	<100	<200	<200	<100	<100	200	<100	100
C10-C40 (Sum of total)	<100	<100	<100	<100	<100	<200	400	700	700	3300	3400	2300
C6-C9	<100	<100	<100	<100	<100	-	-	-	-	-	-	-
C6-C10	<100	<100	<100	<100	<100	-	-	-	-	-	-	-
C6-C10 (F1 minus BTEX)	<100	<100	<100	<100	<100	-	-	-	-	-	-	-
C6-C9 (TPH by Headspace)	-	-	-	-	-	<500	<500	<500	<500	<500	800	1000
C10-C16 (F2 minus Naphthalene)	<100	<100	<100	<100	<100	<200	-	200	-	1300	-	1100
Bicarbonate Alkalinity as CaCO3	-	7	9	10	<2	-	590	-	3900	-	7200	-
Alkalinity (Carbonate as CaCO3)	<2	<2	<2	<2	<2	50	380	<2	260	<2	<2	<2
Alkalinity (Hydroxide) as CaCO3	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Alkalinity (total) as CaCO3	21	7	9	10	<2	410	960	3800	4100	7400	7200	3000
Chloride	63	71	78	77	<1	500	1400	2500	3100	2400	2700	610
Sulphate	17	19	24	24	<1	250	270	340	300	<50	<100	<20

Method_Name	ChemName	Units	EQL	ADWG 2015 Health	ANZECC 2000 - Irrigation (LTV)	ANZECC 2000 - Livestock	ANZECC 2000 FW 95%	Primary Contact Recreation	LEACHATE SUMP 2 - Cell 4	RINSATE RINSATE	RINSATE	RO PERMEATE	STORMWATER POND 1	STORMWATER POND 1	STORMWATER POND 2	STORMWATER POND 2	TRARALGON CREEK DOWNSTREAM	TRARALGON CREEK DS
								LocCode	SUMP 2 Cell 4			RO PERMEATE	STORMWATER POND 1	STORMWATER POND 1	STORMWATER POND 2	STORMWATER POND 2	TRARALGON CREEK DS	TRARALGON CREEK DS
								Sampled_Date-Time	5/16/2019	6/13/2019	2/28/2019	11/28/2018	11/28/2018	5/16/2019	11/28/2018	5/16/2019	11/28/2018	5/16/2019
Dissolved Oxygen (Field)	Dissolved Oxygen	mg/L	0.5						<0.5	-	-	3	7.6	7.3	2.4	9.2	5.8	6.5
Electrical Conductivity (Field)	EC (field)	uS/cm	10						14,000	-	-	16	310	320	420	390	230	310
BTEXN via Purge & Trap GC-MS	Benzene	µg/L	1	**1**		1	950	1	**<10**	<1	<1	<1	<1	**<10**	<1	**<10**	<1	<1
	Toluene	µg/L	1	**800**		800	180	25	13	<1	<1	<1	<1	<10	<1	<10	<1	<1
	Ethylbenzene	µg/L	1	**300**		300	80	3	46	<1	<1	<1	<1	<10	<1	<10	<1	<1
	Xylene (m & p)	µg/L	2	**600**		600	200	20	150	<2	<2	<2	<2	<20	<2	<20	<2	<2
	Xylene (o)	µg/L	1	**600**		600	350	20	71	<1	<1	<1	<1	<10	<1	<10	<1	<1
	Xylene Total	µg/L	2	**600**		600		20	220	<2	<2	<2	<2	<20	<2	<20	<2	<2
	Total BTEX	µg/L	2						280	<2	<2	<2	<2	<20	<2	<20	<2	<2
MS Soluble Metals - Low Level	Iron (Filtered)	mg/L	0.01		*0.2*			0.3	*0.75*	<0.01	<0.01	<0.01	0.05	0.02	0.05	0.01	0.19	*0.64*
	Manganese (Filtered)	mg/L	0.001	**0.5**	*0.2*		1.9	0.1	*0.44*	<0.001	<0.001	<0.001	0.003	0.004	0.081	<0.001	0.033	0.052
Nutrients	Ammonia as N	mg N/L	0.1				0.75	0.41	*510*	-	-	0.1	0.3	0.5	0.7	0.1	<0.1	<0.1
	Nitrate as N	mg N/L	0.01		*1.13*		0.16	113	*<0.1*	-	-	0.57	0.08	0.08	<0.01	0.04	0.09	<0.01
	Reactive P	mg P/L	0.01		*0.0004*				*5*	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
OES Metals	Calcium	mg/L	0.1			1000			140	<0.1	<0.1	<0.1	17	28	36	28	8.8	12
	Magnesium	mg/L	0.1						190	<0.1	<0.1	<0.1	6.5	7.7	7.7	9.4	5.4	7
	Potassium	mg/L	0.1						610	<0.1	<0.1	0.5	5.9	5.7	6.6	7.2	1.4	1.8
	Sodium	mg/L	0.1					180	1500	<0.1	<0.1	2.1	25	23	27	35	23	29
pH (Field)	pH sediment, 0.01M calcium chloride extract, units	Units							7.2	-	-	7.3	8	8	8.1	8	7.1	7
Redox Potential (Field)	Redox Potential (Field)	mV							-231.2	-	-	39.8	48	-17.6	43.2	-9.8	56.9	15.3
Standing Water Level (AHD)	Standing Water Level compared to AHD (m) (Field)	M							-	-	-	-	-	-	-	-	-	-
TDS at 180°C +/- 5°C	TDS	mg/L	5			|2000			5700	<5	<5	10	170	300	270	200	110	140
TOC (SFA)	TOC	mg/L	0.5						350	<0.5	<0.5	1	8.4	8.9	14	9	4.7	5.3
Total Recoverable Hydrocarbons	C10-C14	µg/L	100						700	<100	<100	<100	<100	<100	<100	<100	<100	<100
	C15-C28	µg/L	100						1300	<100	<100	<100	<100	<100	<100	<100	<100	<100
	C29-C36	µg/L	100						300	<100	<100	<100	<100	<100	<100	<100	<100	<100
	C10-C16	µg/L	100						800	<100	<100	<100	<100	<100	<100	<100	<100	<100
	C16-C34	µg/L	100						1300	<100	<100	<100	<100	<100	<100	<100	<100	<100
	C34-C40	µg/L	100						<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
	C10-C40 (Sum of total)	µg/L	100						2100	<100	<100	<100	<100	<100	<100	<100	<100	<100
Total Recoverable Hydrocarbons & F1	C6-C9	µg/L	100						-	<100	<100	-	<100	-	<100	-	<100	<100
	C6-C10	µg/L	100						-	<100	<100	-	<100	-	<100	-	<100	<100
	C6-C10 (F1 minus BTEX)	µg/L	100						-	<100	<100	-	<100	-	<100	-	<100	<100
TPH by Headspace	C6-C9	µg/L	500						800	-	-	<500	-	<500	-	<500	-	-
Total Recoverable Hydrocarbons F2	C10-C16 (F2 minus Naphthalene)	µg/L	100						-	<100	<100	<100	<100	-	<100	-	<100	<100
Alkalinity	Bicarbonate Alkalinity as CaCO3	mg CaCO3/L	2						4300	<2	<2	-	-	61	-	92	-	46
	Alkalinity (Carbonate as CaCO3)	mg/L	2						<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
	Alkalinity (Hydroxide) as CaCO3	mg/L	2						<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
	Alkalinity (total) as CaCO3	mg/L	2						4300	<2	<2	5	70	61	100	92	52	46
Cl DA	Chloride	mg/L	1					250	1500	<1	<1	1	43	40	47	56	39	67
SO4 DA	Sulphate	mg/L	1	**500**		1000		250	<50	<1	<1	<1	21	41	35	22	<2	14

								Field_ID	TRARALGON CREEK UPSTREAM	TRARALGON CREEK US	TRIP BLANK	TRIP BLANK
								LocCode	TRARALGON CREEK US	TRARALGON CREEK US		
								Sampled_Date-Time	11/28/2018	5/16/2019	11/28/2018	2/28/2019
				ADWG 2015 Health	ANZECC 2000 - Irrigation (LTV)	ANZECC 2000 - Livestock	ANZECC 2000 FW 95%	Primary Contact Recreation				
Method_Name	**ChemName**	**Units**	**EQL**									
Dissolved Oxygen (Field)	Dissolved Oxygen	mg/L	0.5						7.4	11	-	-
Electrical Conductivity (Field)	EC (field)	uS/cm	10						230	300	-	-
BTEXN via Purge & Trap GC-MS	Benzene	µg/L	1	**1**		1	950	1	<1	<1	<1	<1
	Toluene	µg/L	1	**800**		800	180	25	<1	<1	<1	<1
	Ethylbenzene	µg/L	1	**300**		300	80	3	<1	<1	<1	<1
	Xylene (m & p)	µg/L	2	**600**		600	200	20	<2	<2	<2	<2
	Xylene (o)	µg/L	1	**600**		600	350	20	<1	<1	<1	<1
	Xylene Total	µg/L	2	**600**		600		20	<2	<2	<2	<2
	Total BTEX	µg/L	2						<2	<2	<2	<2
MS Soluble Metals - Low Level	Iron (Filtered)	mg/L	0.01		*0.2*			0.3	*0.28*	*0.93*	<0.01	<0.01
	Manganese (Filtered)	mg/L	0.001	**0.5**	*0.2*		1.9	0.1	0.05	0.051	<0.001	<0.001
Nutrients	Ammonia as N	mg N/L	0.1				0.75	0.41	<0.1	<0.1	<0.1	<0.1
	Nitrate as N	mg N/L	0.01		*1.13*		0.16	113	0.04	0.05	<0.01	<0.01
	Reactive P	mg P/L	0.01		*0.0004*				<0.01	0.02	<0.01	<0.01
OES Metals	Calcium	mg/L	0.1			1000			9.1	14	<0.1	<0.1
	Magnesium	mg/L	0.1						5.5	7.5	<0.1	<0.1
	Potassium	mg/L	0.1						1.4	1.6	<0.1	<0.1
	Sodium	mg/L	0.1					180	23	28	<0.1	<0.1
pH (Field)	pH sediment, 0.01M calcium chloride extract, units	Units							7.6	6.9	-	-
Redox Potential (Field)	Redox Potential (Field)	mV							50.1	25.1	-	-
Standing Water Level (AHD)	Standing Water Level compared to AHD (m) (Field)	M							-	-	-	-
TDS at 180°C +/- 5°C	TDS	mg/L	5			|2000			110	140	<5	<5
TOC (SFA)	TOC	mg/L	0.5						4.4	4.7	<0.5	<0.5
Total Recoverable Hydrocarbons	C10-C14	µg/L	100						<100	<100	<100	<100
	C15-C28	µg/L	100						<100	<100	<100	<100
	C29-C36	µg/L	100						<100	<100	<100	<100
	C10-C16	µg/L	100						<100	<100	<100	<100
	C16-C34	µg/L	100						<100	<100	<100	<100
	C34-C40	µg/L	100						<100	<100	<100	<100
	C10-C40 (Sum of total)	µg/L	100						<100	<100	<100	<100
Total Recoverable Hydrocarbons & F1	C6-C9	µg/L	100						<100	<100	<100	<100
	C6-C10	µg/L	100						<100	<100	<100	<100
	C6-C10 (F1 minus BTEX)	µg/L	100						<100	<100	<100	<100
TPH by Headspace	C6-C9	µg/L	500						-	-	-	-
Total Recoverable Hydrocarbons F2	C10-C16 (F2 minus Naphthalene)	µg/L	100						<100	<100	<100	<100
Alkalinity	Bicarbonate Alkalinity as CaCO3	mg CaCO3/L	2						-	53	-	<2
	Alkalinity (Carbonate as CaCO3)	mg/L	2						<2	<2	<2	<2
	Alkalinity (Hydroxide) as CaCO3	mg/L	2						<2	<2	<2	<2
	Alkalinity (total) as CaCO3	mg/L	2						54	53	<2	<2
Cl DA	Chloride	mg/L	1					250	40	64	<1	<1
SO4 DA	Sulphate	mg/L	1	**500**		1000		250	<2	<10	<1	<1

Appendix F-2
Surface Gas Emissions Monitoring November 2018

Latrobe City Council

Hyland Highway Landfill Site

Landfill Gas Report – November 2018

ALS Water

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Contents

1. Introduction

The Hyland Highway landfill is located at 64 Hyland Highway in Loy Yang, Victoria. The site has 12 landfill gas monitoring bores: LGF01-LGF12. The closed landfill cap is approximately 200m x 150m and the intermediate cap is 200 x 75m and the general perimeter is fully fenced. The transfer station is adjacent to the landfill and is operational. There is an education centre west of the closed cap. It is approximately 12.5 x 13.5 m and it and all its services were checked

Monitoring results are provided in the form of field sheets see Appendix 4. Exceedances as per table 6.4 in section 6.7 of the EPA Victoria, Publication 788.3 Siting, Design, Operation and Rehabilitation of Landfills, BPEM 2015 are reported to the client within 24 hours and are tabulated in this report with photos of marked areas of concern in Appendix 1.

1.1 Monitoring Procedures and Guidelines

All monitoring is conducted as per EPA Victoria, Publication 1684 Landfill gas fugitive emissions monitoring guideline 2018. The ALS in house method also references the EPA Victoria, Publication 788.3 Siting, Design, Operation and Rehabilitation of Landfills, BPEM 2015.

The cap walkover, buildings, structures, services and other areas were monitored with a LaserOne low concentration methane detector. The subsurface geology (gas bores) were monitored using a GA5000 extractive landfill gas analyser. Both instruments meet the minimum performance specifications listed in EPA 1684 Table 2. Calibration certificates for the equipment available at Appendix 3.

2. Site Summary report

The general site conditions for Hyland are good. The cap is clear with very little vegetation growing on final and intermediate cap, both in suitable condition for walkover monitoring. Parts of the intermediate cap were difficult to monitor with rubbish on and coming out of ground a trip hazard. All 12 bores were unlocked. LFG01, LFG07 & LFG08 has loose caps upon inspection, they were tightened prior to testing. All 12 bores were able to be tested. LFG02 has a broken monument and LFG07 is filled with water and has cracked concrete at its base. Apart from this all other bores were in good condition with no damage to casings, monuments or ground to report. The weather conditions were calm and overcast and the ground was dry.

The Recreation Centre is approximately 50m west of the capped landfill. It is a 12.5x13.5 solid permanent building with a main room, kitchen, office, store room, bathrooms and showers. All services entering and leaving the building are checked including water gas and power, and drains. Cupboards, oven, storage style bench seats and the ceiling cavity are identified likely accumulation points and are checked. Outside services include power and water entry points, a stormwater pit, drains, sewer outlet and vent, downpipes and stormwater in and out of rainwater storage tanks. A shipping container in the carpark is also checked.

Walkover Map

Methane gas exceedances

LFG02		LFG03
		
LFG07 		LFG12 

Leak 30.11.18 1249 6000ppm		Leak 30.11.18 0947 1200ppm
		
Leak 30.11.18 1255 350ppm		Leak 30.11.18 1322 450ppm
		

Appendix 1 – Detected Leaks

FINAL CELLS				
905	8000	146 33.587	38 16.676	Black pipe riser at base
947	1200	146 33.555	38 16.760	Water/power outlet, rocky surr
1043	800	146 33.513	38 16.713	Hard dry ground, little vegetation
1102	150	146 33.565	38 16.680	High point, hard ground, pipes and pit, rock surrounding pipes
1121	500	146 33.597	38 16.687	High point, tall steel pipe, leaks detected at base
1135	8000	146 33.546	38 16.726	Small pipe sth side hard surface, minimal vegetation
1143	6000	146 33.570	38 16.730	Short large pipe Sth side midway down hill
1153	450	146 33.518	38 16.758	Low point Sth battar, S/W grate with pipe inside
INTERMEDIATE CELLS				
1249	6000	146 33.630	38 16.656	Groundwater interception pipe
1255	350	146 33.669	38 16.666	edge of road adjacent to cell
1322	450	146 33.599	38 16.693	Western flank, deep crack near tall steel pipe
1330	220	146 33.612	38 16.662	Nth flank, deep crack adjacent to plastic pipe
1339	1000	146 33.602	38 16.730	Sth flank, low down, soft soil
1407	384	146 33.600	38 16.696	Sth flank near top, cracks
1441	244	146 33.665	38 16.693	Lower cell left side small crack
1455	224	146 33.666	38 16.700	Lower cell midway soft dirt

Bore ID	Start time	Air pressure (mb)	Relative pressure (mb)	Peak CH_4 (% v/v)	Peak CO_2 (% v/v)	Min. O_2 (% v/v)	Stabilised CH_4 (% v/v)	Stabilised CO_2 (% v/v)	Stabilised O_2 (% v/v)	H2S ppm	Balance	Aspiration time min/sec*	Flow l/hr	Comments
Date	30/11/2018													
LFG9	1130	999	-0.03	0	2	17.5	0	2	17.5	2	80.6	3m	0	H2S read 1ppm at background check
LFG7	1205	999	0.05	1	23	0.2	1	23	0.2	1	75.9	3m	-0.2	H2S read 0ppm at background check
LFG3	1430	993	1.47	0	2.3	19.4	0	2.3	19.4	0	78.3	2m	0.3	
LFG2	1500	989	0.6	0	2.4	18.5	0	2.4	18.5	0	79.1	3m	0.1	

Appendix 2 – Weather Data

LaTrobe Weather Data

Date/Time EDT	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm	
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts				
30/09:30am	17.4	16.4	11	66	3.5	ESE	7	13	4	7	1011.9	1011.9	0	
30/09:00am	16.3	16.6	12.1	76	2.3	SSW	2	7	1	4	1012.2	1012.2	0	
30/08:38am	14.6	13.8	11.6	82	1.6	SW	7	11	4	6	1012.4	1012.4	0	
30/08:30am	14.3	14.1	11.8	85	1.3	SW	4	7	2	4	1012.4	1012.4	0	
30/08:00am	13.1	12.2	11.5	90	0.9	WSW	7	9	4	5	1012.4	1012.4	0	
30/07:31am	12.1	12.4	10.8	92	0.7	CALM	0	0	0	0	1012	1012	0	
30/07:30am	12.1	12.4	10.8	92	0.7	CALM	0	0	0	0	1012	1012	0	
30/07:12am	11.1	11.1	9.9	92	0.6	CALM	0	0	0	0	1011.9	1011.9	0	
30/07:00am	10.8	10.4	9.7	93	0.6	ESE	2	7	1	4	1012	1012	0	
30/06:35am	9.7	9.4	8.6	93	0.5	CALM	0	0	0	0	1012.3	1012.3	0	
30/06:30am	9.3	8.9	8.2	93	0.5	CALM	0	0	0	0	1012.2	1012.2	0	
30/06:13am	8.5	7.9	7.4	93	0.5	CALM	0	0	0	0	1012.1	1012.1	0	
30/06:00am	8.2	7.5	7.1	93	0.5	CALM	0	0	0	0	1012.2	1012.2	0	
30/05:36am	7.2	6.3	6	92	0.5	CALM	0	0	0	0	1011.9	1011.9	0	
30/05:30am	8.3	7.6	7.1	92	0.6	CALM	0	0	0	0	1011.9	1011.9	0	
30/05:00am	8.2	7.5	7	92	0.6	CALM	0	0	0	0	1011.6	1011.6	0	
30/04:31am	7.8	6.2	6.4	91	0.6	WSW	4	6	2	3	1011.7	1011.7	0	
30/04:30am	7.7	6.1	6.3	91	0.6	WSW	4	6	2	3	1011.7	1011.7	0	
30/04:12am	7.7	6.9	6.3	91	0.6	CALM	0	7	0	4	1011.7	1011.7	0	
30/04:00am	8.2	7.5	6.8	91	0.7	CALM	0	0	0	0	1011.7	1011.7	0	
30/03:30am	9.7	9.3	8.3	91	0.7	CALM	0	0	0	0	1011.6	1011.6	0	
30/03:00am	9.5	9	7.9	90	0.8	CALM	0	0	0	0	1011.9	1011.9	0	
30/02:30am	10.1	9.8	8.5	90	0.8	CALM	0	0	0	0	1012.3	1012.3	0	
30/02:00am	10.9	10	9.2	89	0.8	ENE	4	6	2	3	1012.4	1012.4	0	
30/01:30am	11.4	10.2	9.7	89	0.9	E	6	7	3	4	1012.8	1012.8	0	
30/01:00am	11.4	10.2	9.5	88	1	ENE	6	7	3	4	1013.4	1013.3	0	
30/12:30am	11.3	9.8	9	86	1.1	N	7	9	4	5	1013.7	1013.6	0	
30/12:00am	12.6	11.3	10	84	1.3	E	7	11	4	6	1013.9	1013.8	0	

Date/Time EDT	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
29/11:30pm	13.2	11.6	10.2	82	1.6	E	9	13	5	7	1014	1013.9	0
29/11:00pm	13.5	12.2	10.1	80	1.8	E	7	11	4	6	1014.3	1014.2	0
29/10:30pm	13.9	12.3	10.1	78	2	ENE	9	13	5	7	1014.3	1014.2	0
29/10:00pm	14.4	12.3	9.8	74	2.4	ENE	11	15	6	8	1014.2	1014.1	0
29/09:30pm	15.1	12.7	10.1	72	2.6	ENE	13	19	7	10	1014.1	1014	0
29/09:00pm	15.6	13.2	9.9	69	3	ENE	13	20	7	11	1013.7	1013.6	0
29/08:30pm	16.4	14.1	10.3	67	3.2	E	13	19	7	10	1013.5	1013.4	0
29/08:00pm	17.2	15.3	10.6	65	3.5	E	11	19	6	10	1013.3	1013.2	0
29/07:30pm	17.9	15.7	10.8	63	3.8	ESE	13	20	7	11	1012.7	1012.7	0
29/07:00pm	18.9	16.3	10.7	59	4.4	ESE	15	22	8	12	1012.7	1012.7	0
29/06:30pm	19.4	16.2	10.1	55	5	E	17	22	9	12	1012.5	1012.5	0
29/06:00pm	21	18.8	10.8	52	5.6	ESE	13	20	7	11	1012.2	1012.2	0
29/05:30pm	21.2	19.2	11.5	54	5.4	ESE	13	19	7	10	1012.2	1012.2	0
29/05:00pm	21.2	19.1	11	52	5.6	ESE	13	19	7	10	1012.3	1012.3	0
29/04:30pm	20.4	17.7	11.6	57	4.9	ESE	17	24	9	13	1012.4	1012.4	0
29/04:00pm	21.5	19.8	11.2	52	5.7	ESE	11	15	6	8	1012.5	1012.5	0
29/03:30pm	20.4	18.2	10.8	54	5.3	E	13	19	7	10	1012.7	1012.7	0
29/03:00pm	19.9	18.6	11.4	58	4.7	SE	9	15	5	8	1013	1013	0
29/02:30pm	19.9	18.2	11.1	57	4.8	SSE	11	13	6	7	1013.1	1013.1	0
29/02:00pm	20.4	19.6	11.1	55	5.1	NE	6	13	3	7	1013.5	1013.4	0
29/01:30pm	21.1	20	12	56	5.1	SW	9	15	5	8	1013.6	1013.5	0
29/01:00pm	19.5	17.7	12	62	4.2	SSW	13	19	7	10	1013.8	1013.7	0
29/12:30pm	19.5	18.4	10.5	56	4.9	SSW	7	13	4	7	1013.9	1013.8	0
29/12:00pm	19	17	10.3	57	4.7	SSW	11	17	6	9	1014.1	1014	0
29/11:30am	19.9	18.7	9.5	51	5.5	NW	6	11	3	6	1014.2	1014.1	0
29/11:00am	19.6	18.6	10.3	55	5	W	6	9	3	5	1014.2	1014.1	0
29/10:30am	18	17.3	9.9	59	4.3	NE	4	7	2	4	1014.3	1014.2	0
29/10:00am	17.6	17.6	11.2	66	3.5	NE	2	7	1	4	1014.6	1014.5	0
29/09:30am	16.4	16.1	11.6	73	2.6	NW	4	7	2	4	1014.6	1014.5	0
29/09:00am	15.5	16	11.5	77	2.2	CALM	0	4	0	2	1014.9	1014.8	0
29/08:30am	14.5	13	11.8	84	1.5	SW	11	13	6	7	1014.6	1014.5	0
29/08:00am	13.8	12.2	11.7	87	1.1	SW	11	15	6	8	1014.3	1014.2	0
29/07:30am	12.8	12.1	11.4	91	0.7	WSW	6	7	3	4	1014.3	1014.2	0
29/07:00am	12.2	10.8	10.8	91	0.7	SW	9	13	5	7	1014.2	1014.1	0
29/06:30am	11.6	11.4	10.3	92	0.7	SW	2	7	1	4	1014.1	1014	0
29/06:00am	11.4	11.5	10.1	92	0.7	CALM	0	0	0	0	1013.9	1013.8	0
29/05:30am	11.4	11.5	10	91	0.7	CALM	0	0	0	0	1013.8	1013.7	0
29/05:00am	11.5	11.6	10.1	91	0.7	CALM	0	0	0	0	1013.7	1013.6	0
29/04:30am	11.2	11.2	9.8	91	0.7	CALM	0	0	0	0	1013.7	1013.6	0
29/04:19am	11.1	11.1	9.7	91	0.7	CALM	0	0	0	0	1013.7	1013.6	0
29/04:00am	11	10.9	9.6	91	0.7	CALM	0	0	0	0	1013.5	1013.4	0
29/03:59am	11	10.9	9.6	91	0.7	CALM	0	0	0	0	1013.5	1013.4	0
29/03:30am	10.7	10.5	9.1	90	0.8	CALM	0	0	0	0	1013.6	1013.5	0
29/03:00am	10.8	10.3	9.2	90	0.8	S	2	7	1	4	1013.3	1013.2	0
29/02:30am	10.8	10.6	9.1	89	0.8	CALM	0	0	0	0	1013.5	1013.4	0
29/02:00am	11.6	11.6	9.7	88	1	CALM	0	0	0	0	1013.3	1013.2	0
29/01:30am	11.9	12	10	88	1	CALM	0	0	0	0	1013.5	1013.4	0
29/01:00am	12.4	12.5	10.3	87	1.1	CALM	0	7	0	4	1013.7	1013.6	0
29/12:30am	12.4	12.5	10	85	1.2	CALM	0	0	0	0	1013.9	1013.8	0
29/12:00am	12.6	12.7	10.1	85	1.3	CALM	0	0	0	0	1013.9	1013.8	0

Date/Time EDT	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
28/11:30pm	13	13	9.8	81	1.6	CALM	0	0	0	0	1013.9	1013.8	0
28/11:00pm	13.1	13.1	9.9	81	1.6	CALM	0	0	0	0	1013.9	1013.8	0
28/10:30pm	12.9	12.9	9.7	81	1.6	CALM	0	6	0	3	1013.7	1013.6	0
28/10:00pm	14.1	12.9	9.7	75	2.3	SE	6	7	3	4	1013.3	1013.2	0
28/09:30pm	13.9	12.7	9.7	76	2.2	W	6	9	3	5	1013.1	1013.1	0
28/09:00pm	15.2	13.9	9.3	68	3	SE	6	9	3	5	1012.6	1012.6	0
28/08:30pm	16.1	14.3	9.5	65	3.4	SSE	9	13	5	7	1012.3	1012.3	0
28/08:00pm	17.3	15.5	9.5	60	4.1	SE	9	13	5	7	1012.1	1012.1	0
28/07:30pm	18	15.7	9.1	56	4.7	SE	11	17	6	9	1011.7	1011.7	0
28/07:00pm	19.1	16.3	10.1	56	4.8	ESE	15	22	8	12	1011.3	1011.3	0
28/06:30pm	19.6	17.2	10	54	5.2	ESE	13	19	7	10	1010.8	1010.8	0
28/06:00pm	19.4	16.7	9	51	5.5	SSE	13	20	7	11	1010.7	1010.7	0
28/05:30pm	19.6	16.2	9.2	51	5.5	SSE	17	26	9	14	1010.5	1010.5	0
28/05:00pm	20	17.5	9.6	51	5.6	SE	13	19	7	10	1010.7	1010.7	0
28/04:30pm	20.8	17.5	9.7	49	6	SSE	17	24	9	13	1010.5	1010.5	0
28/04:00pm	20.1	17.4	9.1	49	5.8	SSE	13	26	7	14	1010.4	1010.4	0
28/03:30pm	20.4	17.6	9.9	51	5.6	SSE	15	24	8	13	1010.3	1010.3	0
28/03:00pm	21	17.7	9.6	48	6.1	SSE	17	24	9	13	1010.2	1010.2	0
28/02:30pm	20.3	17.4	9.8	51	5.6	SE	15	24	8	13	1010.1	1010.1	0
28/02:00pm	21.3	18.5	9.9	48	6.2	SSE	15	22	8	12	1010	1010	0
28/01:30pm	20.3	17.9	10.1	52	5.5	SE	13	19	7	10	1010.1	1010.1	0
28/01:00pm	19.2	16.5	10.2	56	4.8	SSE	15	24	8	13	1010.2	1010.2	0
28/12:30pm	19.7	16.3	9	50	5.6	ESE	17	24	9	13	1009.9	1009.9	0
28/12:00pm	20.1	17.9	10.8	55	5.1	SE	13	20	7	11	1009.7	1009.7	0
28/11:30am	19.8	17.7	11	57	4.8	SE	13	20	7	11	1009.6	1009.6	0
28/11:00am	19	16.7	10.3	57	4.7	SE	13	26	7	14	1009.5	1009.5	0
28/10:30am	18.6	16.4	10.7	60	4.3	SE	13	20	7	11	1009.2	1009.2	0
28/10:00am	18.5	16.5	11.6	64	3.8	ESE	13	20	7	11	1009	1009	0
28/09:30am	17.9	16.3	11.5	66	3.5	ESE	11	17	6	9	1009.3	1009.3	0
28/09:00am	16.8	15.5	11.1	69	3.1	ESE	9	17	5	9	1009.3	1009.3	0
28/08:30am	16.5	15.3	11.6	73	2.7	ESE	9	17	5	9	1009.2	1009.2	0
28/08:00am	15.8	14.7	12	78	2.1	E	9	15	5	8	1008.9	1008.9	0
28/07:30am	15.5	14.9	12.3	81	1.8	ENE	7	13	4	7	1008.7	1008.6	0
28/07:00am	15.3	14.8	12.6	84	1.5	E	7	11	4	6	1008.5	1008.4	0
28/06:30am	14.4	13.4	12.3	87	1.1	E	9	11	5	6	1008.2	1008.1	0
28/06:00am	13.8	12.8	12.4	91	0.8	SE	9	13	5	7	1007.9	1007.8	0
28/05:30am	12.5	12.1	11.1	91	0.7	E	4	11	2	6	1007.6	1007.5	0
28/05:00am	11.9	10.6	10.1	89	0.9	NE	7	9	4	5	1007.2	1007.1	0
28/04:30am	13.3	12.4	11.4	88	1	E	7	11	4	6	1007	1006.9	0
28/04:00am	13.2	12.3	11.4	89	1	E	7	9	4	5	1006.7	1006.6	0
28/03:30am	13.6	12.4	11.7	88	1	E	9	15	5	8	1006.7	1006.6	0
28/03:00am	13.7	12.6	11.8	88	1	ESE	9	13	5	7	1006.7	1006.6	0
28/02:30am	13.8	12.7	11.8	88	1.1	ESE	9	13	5	7	1006.8	1006.7	0
28/02:00am	13.9	12.8	11.8	87	1.1	E	9	13	5	7	1006.9	1006.8	0
28/01:30am	14.1	13	12	87	1.1	E	9	15	5	8	1007	1006.9	0
28/01:00am	14.5	13.5	12.2	86	1.3	E	9	17	5	9	1007.3	1007.2	0
28/12:30am	14.4	13	12.1	86	1.2	E	11	17	6	9	1007.6	1007.5	0
28/12:00am	14.5	13.1	12.2	86	1.3	E	11	15	6	8	1007.6	1007.5	0

Date/Time EDT	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
27/11:30pm	14.5	12.7	12.2	86	1.3	E	13	17	7	9	1007.5	1007.4	0
27/11:00pm	14.6	12.7	11.9	84	1.5	E	13	19	7	10	1007.7	1007.6	0
27/10:30pm	14.7	13.2	11.8	83	1.6	E	11	17	6	9	1007.7	1007.6	0
27/10:00pm	14.9	13.3	11.7	81	1.7	E	11	19	6	10	1007.6	1007.5	0
27/09:30pm	15.2	12.8	11.4	78	2	E	15	22	8	12	1007.4	1007.3	0
27/09:00pm	15.9	13.1	11.5	75	2.4	E	17	26	9	14	1007.1	1007	0
27/08:30pm	16.4	13.6	11.3	72	2.8	E	17	24	9	13	1007	1006.9	0
27/08:00pm	17	14.1	11.1	68	3.2	E	17	24	9	13	1006.7	1006.6	0
27/07:30pm	17.7	14.4	11	65	3.6	E	19	30	10	16	1006.2	1006.1	0
27/07:00pm	18.7	15.5	11.3	62	4.1	E	19	28	10	15	1005.6	1005.5	0
27/06:30pm	19.1	15.9	11.2	60	4.3	E	19	28	10	15	1005.2	1005.1	0
27/06:00pm	19.9	16.7	11.4	58	4.7	E	19	26	10	14	1004.8	1004.7	0
27/05:30pm	20.5	17.4	11.7	57	4.9	ESE	19	30	10	16	1004.5	1004.4	0
27/05:00pm	21.1	18.1	12.5	58	4.9	E	20	33	11	18	1004.6	1004.5	0
27/04:30pm	22	19.6	12.8	56	5.3	E	17	28	9	15	1004.5	1004.4	0
27/04:00pm	21.4	18.5	12.8	58	4.9	E	20	35	11	19	1004.6	1004.5	0
27/03:30pm	22	19.6	12.5	54	5.4	E	17	26	9	14	1004.7	1004.6	0
27/03:00pm	21.4	19.5	13.1	59	4.8	E	15	26	8	14	1005.1	1005	0
27/02:30pm	21.9	19.8	13.5	59	4.9	ENE	17	24	9	13	1005.2	1005.1	0
27/02:00pm	21	18.7	11.9	56	5.1	E	15	24	8	13	1005.3	1005.2	0
27/01:30pm	22.6	20.5	13.7	57	5.2	NE	17	24	9	13	1005.4	1005.3	0
27/01:00pm	20.7	18.1	12.1	58	4.8	ENE	17	24	9	13	1005.7	1005.6	0
27/12:30pm	19.7	17.1	12	61	4.3	NE	17	22	9	12	1006	1005.9	0
27/12:00pm	19.8	17.5	11.6	59	4.6	E	15	22	8	12	1006.2	1006.1	0
27/11:30am	19.6	17.9	12.4	63	4	ENE	13	19	7	10	1006.5	1006.4	0
27/11:00am	19	16.6	12.5	66	3.7	ENE	17	24	9	13	1006.6	1006.5	0
27/10:30am	18.6	17.1	13	70	3.2	ENE	13	20	7	11	1006.6	1006.5	0
27/10:00am	17.2	15.6	12.7	75	2.5	NNE	13	17	7	9	1006.8	1006.7	0

Appendix 3 – Equipment Certificates

CERTIFICATION OF CALIBRATION

Date Of Calibration: 13-Feb-2018 **Certificate Number:** G505264_2/20056

4533

ISSUED BY: GEOTECHNICAL INSTRUMENTS (UK) LTD

Customer: **Thermo Fisher Scientific Australia Pty L**

5 Caribbean Drive PO Box 9092 Scoresby
VIC 3179 AUSTRALIA

Description: Gas Analyser

Model: GA5000

Serial Number: G505264

UKAS Accredited results:

Methane (CH_4)		
Certified Gas (%)	**Instrument Reading (%)**	**Uncertainty (%)**
5.0	4.9	0.41
15.0	14.9	0.64
50.0	49.2	0.94

Carbon Dioxide (CO_2)		
Certified Gas (%)	**Instrument Reading (%)**	**Uncertainty (%)**
5.0	4.8	0.43
15.0	14.6	0.70
50.0	49.7	1.1

Oxygen (O_2)		
Certified Gas (%)	**Instrument Reading (%)**	**Uncertainty (%)**
21.1	21.1	0.31

All concentrations are molar.

CH_4, CO_2 readings recorded at : 31.0 °C ± 1.5 °C

O2 reading recorded at : 22.3 °C ± 1.5 °C

Barometric Pressure : 0990 mbar ± 3 mbar

Method of Test : The analyser is calibrated in a temperature controlled chamber using a series of reference gases, in compliance with procedure LP004.

Geotechnical Instruments (UK) Ltd
Sovereign House, Queensway, Leamington Spa, Warwickshire, CV31 3JR
geotechuk.com service@geotech.co.uk +44 (0)1926 338111

CERTIFICATION OF CALIBRATION

Date Of Calibration: 13-Feb-2018 **Certificate Number:** G505264_2/20056

UKAS CALIBRATION 4533

Geotech

ISSUED BY: GEOTECHNICAL INSTRUMENTS (UK) LTD

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

Calibrations marked 'Non-UKAS Accredited results' on this certificate have been included for completeness.

Non-UKAS Accredited results:

Barometer (mbar)	
Reference	**Instrument Reading**
990	991

Additional Gas Cells		
Gas	**Certified Gas (ppm)**	**Instrument Reading (ppm)**
CO	496	507.7
H_2S	52.1	52.2

Internal Flow	
Applied (l/hr)	**Instrument Reading (l/hr)**
5	5.0
10	9.9

Approved by Signatory

Dawn Hemings

Laboratory Inspection

Geotechnical Instruments (UK) Ltd
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Calibration certificate number 42269

Instrument LaserOne

Serial number Huberg 17018.16

Description of the calibration procedure

UNI IEC ISO 14253-1: 2013 defines that the maximum permissible error limits are greater of the measurement uncertainty, calibration of the instrument is performed by measuring the response of the detection sensor compared to known concentrations. When the detected error is less than the maximum permissible error limits of the measuring equipment (as specified in its datasheet), the calibration is compliant.

Check of the instrument between 0 ÷ 10000 ppm CH4

Full scale (ppm)	**Gas concentration** (ppm)	**Response1** (ppm)	**Response2** (ppm)	**Response3** (ppm)	**Average response** (ppm)	**Max error** (ppm)	**Max error** (% F.s.)
1000	0	0	0	0	0,00	0,00	0,00
1000	100	98	99	99	98,67	2,00	0,20
1000	1000	998	998	1000	998,67	2,00	0,20

Uncertainty	0,20	%
Max % error	0,20	% Fs

Check of the instrument between 0 ÷ 100 % vol CH4

Full scale (%vol)	**Gas concentration** (%vol)	**Response1** (%vol)	**Response2** (%vol)	**Response3** (%vol)	**Average response** (%vol)	**Max error** (%vol)	**Max error** (% F.s.)
10	0	0	0	0	0,00	0,00	0,00
10	2,2	2,1	2,1	2,2	2,20	0,00	0,00
100	100	99	99	99	99,33	1,00	1,00

Uncertainty	1,00	%
Max % error	1,00	% Fs

Ambient condition by calibration

Temperature : 21 °C
Pressure : 1013 mBar
U.R. : 42 %

HUBERG

Date of creation: 18.04.2007 - VeMa
Last modification: 18.04.2007 - VeMa

SGS IQNet
Certificato UNI-EN-ISO 9001

Report number 38806

Instrument **LaserOne** Serial no. Huberg **17018.16**

With this document we certify that the following work has been carried out:

Kit Antiwater filter (10 pcs)
Cleaning pump
Calibration
System check

Repair result POSITIVE

Date of next control 22/1/2019

Repair date 22/1/2018

Responsible for repair Meli Thomas

Signature

HUBERG KG-Huber Günther & C. • Gas and Water Safety Systems • Via Copernico 18
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www.huberg.com • Register of commerce BZ, tax and VAT no. 01279940215

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RENTALS

Equipment Report – Laser One Gas Detector

This Inspectra Analyser has been performance checked as follows:

Calibration PID	Actual Value	Reading	Pass?	Lot #
Zero – fresh air	0.0 ppm	0.5 ppm	☑	825490
Span – Methane	100 ppm	100.0 ppm	☑	150963
Operations Check				

☑ Performance Check (pump, lamp, sensor & battery voltage check)

☑ Battery Charged ☑ Filters Check

☐ Electrical Safety Tag attached (AS/NZS 3760) Tag No:............................ Valid to:................................

Date: 21/2/18 Checked by: ADRIK

Signed: [signature]

Please check that the following items are received and that all items are cleaned and decontaminated before return. A minimum $30 cleaning / service / repair charge may be applied to any unclean or damaged items. Items not returned will be billed for at the full replacement cost.

Sent	Returned	Item
☑	☐	Laser One Operational Check, plus Battery Voltage @ 100% V
☑	☐	Telescopic Rod and Suction Cup
☑	☐	Flexi probe (black)
☑	☐	Hand Held probe (steel)
☑	☐	Spare water trap filter(s) 0.45um Qty 2
☑	☐	Brass filter (suction cup)
☑	☐	GPS Antenna
☑	☐	Carry strap
☑	☐	Instruction Manual
☑	☐	Cigarette filters
☑	☐	Charger 240v to 12v 500mA
☑	☐	Carry case
☐	☐	Check to confirm electrical safety (tag must be valid)
☐	☐	

Processors Signature/ Initials [signature]

Quote Reference	CM009292	Condition on return
Customer Ref	TBA	
Equipment ID	Laser1 – 1	
Equipment serial no.		
Return Date	/ /	
Return Time		

"We do more than give you great equipment... We give you great solutions!"

Phone: (Free Call) 1300 735 295	Environmental Assessment Technologies		Fax: (Free Call) 1800 675 123	
Melbourne Branch, 5 Caribbean Drive, Scoresby 3179 Email: RentalsEnviroVIC@thermofisher.com	Sydney Branch Level 1, 4 Talavera Road, North Ryde 2113 Email: RentalsEnviroNSW@thermofisher.com	Adelaide Branch 33 King St, Norwood, South Australia 5067 Email: RentalsEnviroSA@thermofisher.com	Brisbane Branch Unit 2/5 Ross St Newstead 4006 Email: RentalsEnviroQLD@thermofisher.com	Perth Branch 121 Beringarra Ave Malaga WA 6090 Email: RentalsEnviroWA@thermofisher.com

Appendix 4 – Field Sheets

BUILDINGS / STRUCTURES MONITORING FIELD SHEET

Client: Latrobe City Council	**Site/Project:** Hyland Hwy Landfill	**Date:** 29.11.18 T= 1500
Sampler: Andrew vP.	**Equipment ID:** Lasercone 17018.16	**Last calibration date:** 22.1.18
Initial air pressure (mb): 1013 ☐ Rising ☐ Falling	Weather conditions: Overcast, calm. Ground conditions: N/A.	

Description & use of Structure: **Education Centre**	GPS: **38°16'40.03"S 146°33'27.96"E**

Location & proximity to landfill site: **Approximately 50m West of the landfill**

Approximate dimensions and construction material, sealed/unsealed? **12.5x13.5m Sealed, plastered, suspension ceiling.**

Note any activities and the presence of chemicals such as: smoking, painting, presence of hydrocarbons, fuels, exhaust fumes, household cleaning products etc: **Store room houses solvents and various cleaning products** ✓

Any known landfill gas dissipation or management measures (for example, gas membranes or voids beneath the building/structure): **Unknown. Mostly open undeneath, built on stumps**

Identify locations of penetrations or entry paths for any landfill gas to enter the building/structure (e.g. around service ingress points such as pipework, cracks in floor, around the skirting board etc.): **Kitchen (water in & out, gas, power). Bathroom, shower, toilets, sinks** ✓

Identify locations of likely accumulation points for any landfill gas that may enter the building / structure (for example, attics or cupboards): **Ceiling cavity, kitchen cupboards, inside benchseats,** ✓

Note accessibility of the various areas within the building/structure, including underfloor voids, wall cavities, roof cavities etc: **lift a loose ceiling tile to check in cavity** ✓

Around service ingress points, such as pipework: **Yes check** ✓

Inside electricity meter/fuse box: **Yes check** ✓

Inside cabinets within bathrooms, kitchens, laundries and other rooms: **Yes check** ✓

Around cracks and penetrations through floors: **Yes check** ✓

Along skirting boards and joins between floors and walls: **Yes check** ✓

Description of monitoring point location	**CH_4 maximum(ppm)**	**Comment**
All.	2.2	

Air check: Low Conc-CH_4(~ 2.0ppm) ☑ Comments: 2.2 **Time Finished:** 1520

SUBSURFACE SERVICES MONITORING FIELD SHEET

Client: Latrobe City Council	**Site/Project:** Hyland Hwy Landfill	**Date:** 29.11.18
Sampler: AvP	**Equipment ID:** Laserone S/N: 17018.16	**Last calibration date:** 22.1.18
Initial air pressure (mb): 1013 ☐ Rising ☑ Falling	**Weather conditions:** overcast, calm. **Ground conditions:** Dry.	

* rate of change in concentration when unstabilised readings were taken (rapidly or slowly increasing or decreasing)

** fluctuation (± % v/v) of direction and rate of change in concentration (± % v/v per 10 seconds)

Description and location of service: Main power box and cables. Eastern side of building

GPS: 38°16'40.18"S 146°33'28.13"E

Observations: Odour, Condition, Dimensions, Access

Start time	CH4 Maximum from low concentration CH4 detector (ppm)	CH4 Stabilised range (ppm)		Unstable Range (ppm)(post 3 minutes instability)		* rate of change	Comments/Observations potential disruption to representative data:
1430	2.2	—	—	—		—	NIL

Air check: Low Conc-CH4(~ 2.0ppm) ☑ Comments: 2.2 **Time Finished:** 1450

Description and location of service: Hot water service pipe work. Eastern side of building.

GPS: 38°16'40.26"S 146°33'28.10"E

Observations: Odour, Condition, Dimensions, Access

Start time	CH4 Maximum from low concentration CH4 detector (ppm)	CH4 Stabilised range (ppm)		Unstable Range (ppm)(post 3 minutes instability)		* rate of change	Comments/Observations potential disruption to representative data:
1430	2.2						NIL

Air check: Low Conc-CH4(~ 2.0ppm) ☑ Comments: **Time Finished:** 1450

SUBSURFACE SERVICES MONITORING FIELD SHEET

Client: Latrobe City Council	**Site/Project:** Hyland Hwy Landfill		**Date:** 29.11.18
Sampler: AVP	**Equipment ID:** Laserone S/N: 17018.16		**Last calibration date:** 22.1.18
Initial air pressure (mb): 1013 ☐ Rising ☑ Falling	**Weather conditions:** overcast, calm. **Ground conditions:** Dry.		

* rate of change in concentration when unstabilised readings were taken (rapidly or slowly increasing or decreasing)

** fluctuation (± % v/v) of direction and rate of change in concentration (± % v/v per 10 seconds)

Description and location of service: Drain pipe. West side under building | GPS: 38°16'40.31"S 146°33'27.50"E

Observations: Odour, Condition, Dimensions, Access

Start time	CH4 Maximum from low concentration CH4 detector (ppm)	CH4 Stabilised range (ppm)		Unstable Range (ppm)(post 3 minutes instability)		* rate of change	Comments/Observations potential disruption to representative data: NIL
1430	2.2						

Air check: Low Conc-CH4(~ 2.0ppm) ☑ Comments: **Time Finished:** 1450

Description and location of service: Sewer pipe. West side under building | GPS: 38°16'40.24"S 146°33'27.53"E

Observations: Odour, Condition, Dimensions, Access

Start time	CH4 Maximum from low concentration CH4 detector (ppm)	CH4 Stabilised range (ppm)		Unstable Range (ppm)(post 3 minutes instability)		* rate of change	Comments/Observations potential disruption to representative data: NIL
1430	2.2						

Air check: Low Conc-CH4(~ 2.0ppm) ☑ Comments: **Time Finished:** 1450

SUBSURFACE SERVICES MONITORING FIELD SHEET

Client: Latrobe City Council	**Site/Project:** Hyland Hwy Landfill	**Date:** 29.11.18
Sampler: AvP	**Equipment ID:** Laserone S/N: 17018.16	**Last calibration date:** 22.1.18
Initial air pressure (mb): 1013 ☐ Rising ☑ Falling	**Weather conditions:** overcast, calm **Ground conditions:** Dry.	

* rate of change in concentration when unstabilised readings were taken (rapidly or slowly increasing or decreasing)

** fluctuation (± % v/v) of direction and rate of change in concentration (± % v/v per 10 seconds)

Description and location of service: Sewer breather. Western side of building.

GPS: 38°16'40.20"S 146°33'27.55"E

Observations: Odour, Condition, Dimensions, Access

Start time	CH4 Maximum from low concentration CH4 detector (ppm)	CH4 Stabilised range (ppm)		Unstable Range (ppm)(post 3 minutes instability)		* rate of change	Comments/Observations potential disruption to representative data: NIL
1430	2.2						

Air check: Low Conc-CH4(~ 2.0ppm) ☑ Comments:

Time Finished: 1450

Description and location of service: Stormwater pipe. Tank overflow.

GPS: 38°16'40.15"S 146°33'27.42"E

Observations: Odour, Condition, Dimensions, Access

Start time	CH4 Maximum from low concentration CH4 detector (ppm)	CH4 Stabilised range (ppm)		Unstable Range (ppm)(post 3 minutes instability)		* rate of change	Comments/Observations potential disruption to representative data: NIL
1430	2.2						

Air check: Low Conc-CH4(~ 2.0ppm) ☑ Comments:

Time Finished: 1450

SUBSURFACE SERVICES MONITORING FIELD SHEET

Client: Latrobe City Council	**Site/Project:** Hyland Hwy Landfill	**Date:** 29.11.18
Sampler: AMP	**Equipment ID:** Laserone S/N: 17018.16	**Last calibration date:** 22.1.18
Initial air pressure (mb): 1013 ☐ Rising ☑ Falling	**Weather conditions:** overcast & calm **Ground conditions:** Dry.	

* rate of change in concentration when unstabilised readings were taken (rapidly or slowly increasing or decreasing)

** fluctuation (± % v/v) of direction and rate of change in concentration (± % v/v per 10 seconds)

Description and location of service: Stormwater pipe. Into tank — GPS: 38°16'40.04"S 146°33'27.48"E

Observations: Odour, Condition, Dimensions, Access

Start time	CH4 Maximum from low concentration CH4 detector (ppm)	CH4 Stabilised range (ppm)		Unstable Range (ppm)(post 3 minutes instability)		* rate of change	Comments/Observations potential disruption to representative data: NIL
1430	2.2						

Air check: Low Conc-CH4(~ 2.0ppm) ☑ Comments: — **Time Finished:** 1450

Description and location of service: Downpipe. North side of building — GPS: 38°16'40.03"S 146°33'27.96"E

Observations: Odour, Condition, Dimensions, Access

Start time	CH4 Maximum from low concentration CH4 detector (ppm)	CH4 Stabilised range (ppm)		Unstable Range (ppm)(post 3 minutes instability)		* rate of change	Comments/Observations potential disruption to representative data: NIL
1430	2.2						

Air check: Low Conc-CH4(~ 2.0ppm) ☑ Comments: — **Time Finished:** 1450.

SUBSURFACE SERVICES MONITORING FIELD SHEET

Client: Latrobe City Council	**Site/Project:** Hyland Hwy Landfill	**Date:** 29.11.18
Sampler: AvP	**Equipment ID:** Laserone S/N: 17018.16	**Last calibration date:** 22.1.18
Initial air pressure (mb): 1013 ☐ Rising ☑ Falling	**Weather conditions:** overcast + calm **Ground conditions:** Dry.	

* rate of change in concentration when unstabilised readings were taken (rapidly or slowly increasing or decreasing)

** fluctuation (± % v/v) of direction and rate of change in concentration (± % v/v per 10 seconds)

Description and location of service: Stormwater pit. Side of road opposite compound entrance

GPS: 38°16'38.37"S 146°33'30.60"E

Observations: Odour, Condition, Dimensions, Access

Start time	CH4 Maximum from low concentration CH4 detector (ppm)	CH4 Stabilised range (ppm)		Unstable Range (ppm)(post 3 minutes instability)		* rate of change	Comments/Observations potential disruption to representative data: NIL
1430	2.2						

Air check: Low Conc-CH4(~ 2.0ppm) ☑ Comments:

Time Finished: 1450.

Description and location of service:

GPS:

Observations: Odour, Condition, Dimensions, Access

Start time	CH4 Maximum from low concentration CH4 detector (ppm)	CH4 Stabilised range (ppm)		Unstable Range (ppm)(post 3 minutes instability)		* rate of change	Comments/Observations potential disruption to representative data:

Air check: Low Conc-CH4(~ 2.0ppm) ☐ Comments:

Time Finished:

GAS BORE MONITORING FIELD SHEET

Client:	Latrobe City Council	**Site/Project:**	Hyland Hwy Landfill	**Date:**	29.11.18
Sampler:	AvP	**Equipment ID:**	GA5000 S/N:G505264	**Last calibration date:**	13.2.18

Initial air pressure (mb): 1014
☐ Rising
☑ Falling

Weather conditions: Overcast, calm.

Ground conditions: Dry.

* aspiration time when stabilised readings were taken, add note if not stabilised

** fluctuation (± % v/v) of direction and rate of change in concentration (± % v/v per 10 seconds)

Bore ID	Start time	Air pressure (mb)	Relative pressure (mb)	Peak CH_4 (% v/v)	Stabilised CH_4 (% v/v)	Peak CO_2 (% v/v)	Stabilised CO_2 (% v/v)	Min. O_2 (% v/v)	Stabilised O_2 (% v/v)	H2S (ppm)	CO (ppm)	Balance	Flow l/hr	Aspiration time min/sec*	Fluctuation (± % v/v)**
LFG12	1130	1004	-0.02	0	0	0.7	0.7	19.5	19.5	0	–	79.8	0.3	3m	–
Comments: Sealed, good cond, Ants nesting.															
Air check: CH_4 (<0.1%) ☑	CO_2 (<0.1%) ☑	O_2 (21.0%) ☑	Comment												
LFG01	1330	997	-0.17	0	0	0.1	0.1	20.7 ~~19.5~~ AvP	20.7	0	–	79.3	0	3m	–
Comments: Cap loose upon arrival.															
Air check: CH_4 (<0.1%) ☑	CO_2 (<0.1%) ☑	O_2 (21.0%) ☑	Comment 1ppm H2S.												
LFG11	1010	99.8	-1.2	0	0	1.0	1.0	19.6	19.7	0	–	79.4	-0.2	4m	–
Comments: Sealed tight, Good condition.															
Air check: CH_4 (<0.1%) ☑	CO_2 (<0.1%) ☑	O_2 (21.0%) ☑	Comment												
LFG06	1350	999	-1.86	0	0	0	0	20.7	20.7	0	–	79.2	-0.4	4m	–
Comments: Capped tight, well sealed.															
Air check: CH_4 (<0.1%) ☑	CO_2 (<0.1%) ☑	O_2 (21.0%) ☑	Comment												

Comments/Observations:

Time Finished: 1400

GAS BORE MONITORING FIELD SHEET

Client:	Latrobe City Council	**Site/Project:**	Hyland Hwy Landfill	**Date:**	30.11.19
Sampler:	AuP	**Equipment ID:**	GA5000 S/N:G505264	**Last calibration date:**	13.2.18

Initial air pressure (mb): 1011
☐ Rising
☑ Falling

Weather conditions: Calm Sunny light wind

Ground conditions: Dry.

* aspiration time when stabilised readings were taken, add note if not stabilised
** fluctuation (± % v/v) of direction and rate of change in concentration (± % v/v per 10 seconds)

Bore ID	Start time	Air pressure (mb)	Relative pressure (mb)	Peak CH_4 (% v/v)	Stabilised CH_4 (% v/v)	Peak CO_2 (% v/v)	Stabilised CO_2 (% v/v)	Min. O_2 (% v/v)	Stabilised O_2 (% v/v)	H2S (ppm)	CO (ppm)	Balance	Flow l/hr	Aspiration time min/sec*	Fluctuation (± % v/v)**
LFG8	1110	999	0.14	0	0	0.2	0.2	19.6	19.6	1	–	80.1	0.1	3m	–
Comments:	Cap loose, tightened prior to sampling. otherwise good condition.														
Air check: CH_4 (<0.1%) ☑	CO_2 (<0.1%) ☑	O_2 (21.0%) ☑	Comment												
LFG9	1130	999	-0.03	0	0	2.0	2.0	17.5	17.5	2	–	80.6	0	3m	–
Comments:	Good seal. Ants														
Air check: CH_4 (<0.1%) ☑	CO_2 (<0.1%) ☑	O_2 (21.0%) ☑	Comment	1ppm H_2S											
LFG10	1145	999	0.05	0	0	1.3	1.2	18.3	18.3	1	–	80.5	-0.1	3m	–
Comments:	Capped, Sealed, good condition.														
Air check: CH_4 (<0.1%) ☑	CO_2 (<0.1%) ☑	O_2 (21.0%) ☑	Comment	1ppm H_2S											

Comments/Observations:

Time Finished: 1155

GAS BORE MONITORING FIELD SHEET

Client: Latrobe City Council	**Site/Project:** Hyland Hwy Landfill	**Date:** 30.11.18	
Sampler: AvP	**Equipment ID:** GA5000 S/N:G505264	**Last calibration date:** 13.2.18	

Initial air pressure (mb): 1010
- [ ] Rising
- [x] Falling

Weather conditions: Calm, Sunny, light winds.

Ground conditions: Dry.

* aspiration time when stabilised readings were taken, add note if not stabilised

** fluctuation (± % v/v) of direction and rate of change in concentration (± % v/v per 10 seconds)

Bore ID	Start time	Air pressure (mb)	Relative pressure (mb)	Peak CH_4 (% v/v)	Stabilised CH_4 (% v/v)	Peak CO_2 (% v/v)	Stabilised CO_2 (% v/v)	Min. O_2 (% v/v)	Stabilised O_2 (% v/v)	H2S (ppm)	CO (ppm)	Balance	Flow l/hr	Aspiration time min/sec*	Fluctuation (± % v/v)**
LFG4	1415	993	1.29	0	0	1.0	1.0	20.4	20.4	0	–	78.6	0.2	3m	–
Comments: Monument good condition, sealed, OK.															
Air check: CH_4 (<0.1%) ☑	CO_2 (<0.1%) ☑	O_2 (21.0%) ☑	Comment												
LFG3	1430	993	1.47	0	0	2.3	2.3	19.4	19.4	0	–	78.3	0.3	2m	–
Comments: well sealed, nesting ants pushing sand up.															
Air check: CH_4 (<0.1%) ☑	CO_2 (<0.1%) ☑	O_2 (21.0%) ☑	Comment												
LFG2	1500	989	0.6	0	0	2.4	2.4	18.5	18.5	0	–	79.1	0.1	3m	–
Comments: Monument damaged, bore sealed + OK.															
Air check: CH_4 (<0.1%) ☑	CO_2 (<0.1%) ☑	O_2 (21.0%) ☑	Comment												

Comments/Observations:

Time Finished: 1510

GAS BORE MONITORING FIELD SHEET

Client:	Latrobe City Council	**Site/Project:**	Hyland Hwy Landfill	**Date:**	30.11.18
Sampler:	AvP	**Equipment ID:**	GA5000 S/N:G505264	**Last calibration date:**	13.2.18

Initial air pressure (mb): 1011
- [ ] Rising
- [x] Falling

Weather conditions: Calm, Sunny, light winds.

Ground conditions: Dry.

* aspiration time when stabilised readings were taken, add note if not stabilised

** fluctuation (± % v/v) of direction and rate of change in concentration (± % v/v per 10 seconds)

Bore ID	Start time	Air pressure (mb)	Relative pressure (mb)	Peak CH_4 (% v/v)	Stabilised CH_4 (% v/v)	Peak CO_2 (% v/v)	Stabilised CO_2 (% v/v)	Min. O_2 (% v/v)	Stabilised O_2 (% v/v)	H2S (ppm)	CO (ppm)	Balance	Flow l/hr	Aspiration time min/sec*	Fluctuation (± % v/v)**
LFG7	1205	999	0.05	1.0	1.0	23.0	23.0	0.2	0.2	1	–	75.9	-0.2	3m	–
Comments: Cap loose, monument filled with water to TOC															
Air check: CH_4 (<0.1%) ☑	CO_2 (<0.1%) ☑	O_2 (21.0%) ☑	Comment 0ppm H2S.												
LFG5	1355	993	1.55	0	0	1.3	1.3	20.1	20.1	0	–	78.6	0.3	3m	–
Comments: Good cond, sealed.															
Air check: CH_4 (<0.1%) ☑	CO_2 (<0.1%) ☑	O_2 (21.0%) ☑	Comment												
Comments:															
Air check: CH_4 (<0.1%) ☐	CO_2 (<0.1%) ☐	O_2 (21.0%) ☐	Comment												

Comments/Observations:

Time Finished: 1410

LANDFILL CAP WALKOVER MONITORING FIELD SHEET

Client: Latrobe CC.	Site/Project: Hyland LF -	Date: 30.11.18.
Sampler: Julian Phillip	Equipment ID: Laserone S/N: ~~18239.17~~ AvP 17018.16	Last calibration date: 22.11.18 ~~17.11.2017~~ AvP
Initial air pressure (mb): 1012. ☐ Rising ☑ Falling	Weather conditions: Calm, overcast	
	Ground conditions: dry	

Comments/Observations identified that may prevent representative data? N/A.

Air check: Low Conc-CH4(~ 2.0ppm) ☑ Time Started : 8:30 Time Finished: 12:00

POINT ID	TIME	OBSERVATION/FEATURE	CH4 PPM	EASTING	NORTHING	Wind Speed (km/h)	Time
1	9:05	Black pipe. Base Leak.	↑8000	146° 33.587' E	38° 16.676' S.	9:00/4.2 9:15/4.4	
	9:40	Hard dry. Low vegetation. Sunny, mild.				9:30/3.2 9:40/2.5	9:30 9:40
2	9:47	Rocky outlet. Water/power. Base of the hill. Sth battar	Approx 1200	146° 33.555' E	S 38° 16.760'	2.5 km 1.4 km	9:47 10:11
3	10:43	~~Re~~ Hard dry landscape. Low vegetation	Approx 800	E 146° 33.513'	S 38° 16.813' ✓	2.1 km 1.8 km/h	10.27 10.43
4	11:02	High point. Hard gravel. Pipes + pit. Rock surrounding pipes	Approx 150	E 146 33.565	S 38° 16.680'	2.1 km/h 1.8 km	10.04 11:02
5	11:21	High point. Tall steel pipe. Square steel base with gaps leaking gas.	Approx 500	E 146 33.597	S 38° 16.687' ✓	5.0 km 2.8 km/h	11.10 11.21
6	11.35	Small pipe. Sth side Hard surface. Minimal low vegetation.	↑150-8000	E 146° 33.546	S 38° 16.726' ✓	1.0 km/h	11.35
7	11:43	Short fat pipe. Sth side Midway down the hill	↑6000	E 146 33.570'	S 38° 16.730	6.1 km/h	11:43
8	11:53	Low point. Drain grill with pipe inside. Sth battar	450	E 146° 33.578	S 38° 16.758 ✓	6.1 km/h	11:53

LANDFILL CAP WALKOVER MONITORING FIELD SHEET

Client: LaTrobe CC	Site/Project: Hyland LF		Date: 30.11.18
Sampler: Jillian Phillips	Equipment ID: Laserone S/N: 17018.16	Last calibration date: 22.1.18	
Initial air pressure (mb): 1010 ☐ Rising ☑ Falling	Weather conditions: Mild, Sunny, calm Low wind, Ground conditions: Silty sand		

Comments/Observations identified that may prevent representative data? N/A

Air check: Low Conc-CH4(~ 2.0ppm) ☑ Time Started : 1:00pm Time Finished: 1520

POINT ID	TIME	OBSERVATION/FEATURE	CH4 PPM	EASTING	NORTHING	Wind Speed (km/h)	Time
1	12:49	Pipe. Stormwater management drain.	1600	E 146° 33.630	S 38° 16.656	3.2 km/h	12:49
2	12:55	Edge of road. Off cell.	350	E 146° 33.669	S 38° 16.666'	8.6 km/h	12:55
		Eastern edge. Recording 15-40 ppm. Top cell. All the way along	15-40 ppm			4.6 km/h	1:11
3	1.18	Western flank of interim cell Deepwash out.	150	E 146° 33.599'	S 38° 16.699'	0.7 km/h	1.18
4	1:22	Western flank. Deep crack near tall steel pipe	450	E 146 33.599'	S 38 16.693'	8 km/hr	1:22
5	1:30	Northern flank. Deep crack. Adjacent to plastic pile	220	E 146 33.612	S 38° 16.662	3.9 km/h	1:30
6	1:39	Sth Flank. Low down Soft soil.	1000	E 146 33 602'	S 38° 16' 730'	3.6 km	1.39
7	1:46	Sth Flank. Low down. Soft soil.	154	E 146 33' 617	S 38° 16 737'	7.5 km	1.46
8	2:07	Sth Flank. Near the top. Cracks	384	E 146 33 600	S 38 16 696'	1.3 km/h	2:07
9	2:38	new cell. left side crack	128	E 146 33 644'	S 38 16 718'	7.5 km/h 2.8 km	2:18 2:38
10	2:41	Low cell. Left side small crack	244	E 146 33 665'	S 38 16 693'	5 km	2:41
11	2:51	Low cell Right side	174	E 146 33 671'	S 33 16 709'	6 km	2:51

P.T.O

LANDFILL CAP WALKOVER MONITORING FIELD SHEET

Client: Latrobe City Council	**Site/Project:** Hyland Hwy Landfill	**Date:** 30.11.18 – Continued.
Sampler:	**Equipment ID:** Laserone S/N: 17018.16	**Last calibration date:** 22.1.18
Initial air pressure (mb): ☐ Rising ☐ Falling	**Weather conditions:** **Ground conditions:**	

Comments/Observations identified that may prevent representative data?

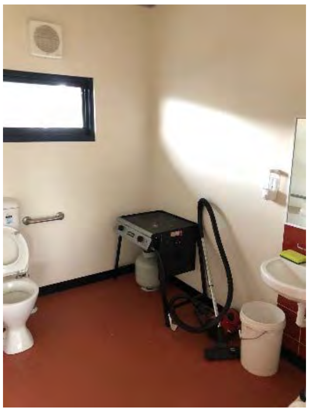
Air check: Low Conc-CH4(~ 2.0ppm) ☐ **Time Started :** 1455 **Time Finished:** 1520.

POINT ID	TIME	OBSERVATION/FEATURE	CH4 PPM	EASTING	SOUTHING	Wind Speed (km/h)	Time
12	1455	Lowcell, Midway, soft dirt	224	146°33.666	38°16.700	3.2	1455
13	1511	Bottom cell left flank.	179	146°33.680	38°16.710	3.6	1511

Appendix 5 – Buildings, Structures and Services Photos

Hyland Recreation Centre

Bathroom



Kitchen

Main room

Main room 2

Office

Shower

Store

Toilets

Shipping container

Hyland Sub Services and Buildings

Downpipe

Drain sewer breather

Hot water service

Power box

SW from tank

SW pit

SW2 from tank

Appendix F-3
Surface Gas Emissions Monitoring February 2019

Latrobe City Council
Hyland Highway Landfill Site
Landfill Gas Report – February 2019

ALS Water

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Contents

1. Introduction

The Hyland Highway landfill is located at 64 Hyland Highway in Loy Yang, Victoria. The site has 12 landfill gas monitoring bores: LGF01-LGF12. The closed landfill cap is approximately 200m x 150m and the intermediate cap is 200 x 75m and the general perimeter is fully fenced. The transfer station is adjacent to the landfill and is operational. There is an education centre west of the closed cap. It is approximately 12.5 x 13.5 m and it and all its services were checked

Monitoring results are provided in the form of field sheets see Appendix 4. Exceedances as per table 6.4 in section 6.7 of the EPA Victoria, Publication 788.3 Siting, Design, Operation and Rehabilitation of Landfills, BPEM 2015 are reported to the client within 24 hours and are tabulated in this report with photos of marked areas of concern in Appendix 1.

1.1 Monitoring Procedures and Guidelines

All monitoring is conducted as per EPA Victoria, Publication 1684 Landfill gas fugitive emissions monitoring guideline 2018. The ALS in house method also references the EPA Victoria, Publication 788.3 Siting, Design, Operation and Rehabilitation of Landfills, BPEM 2015.

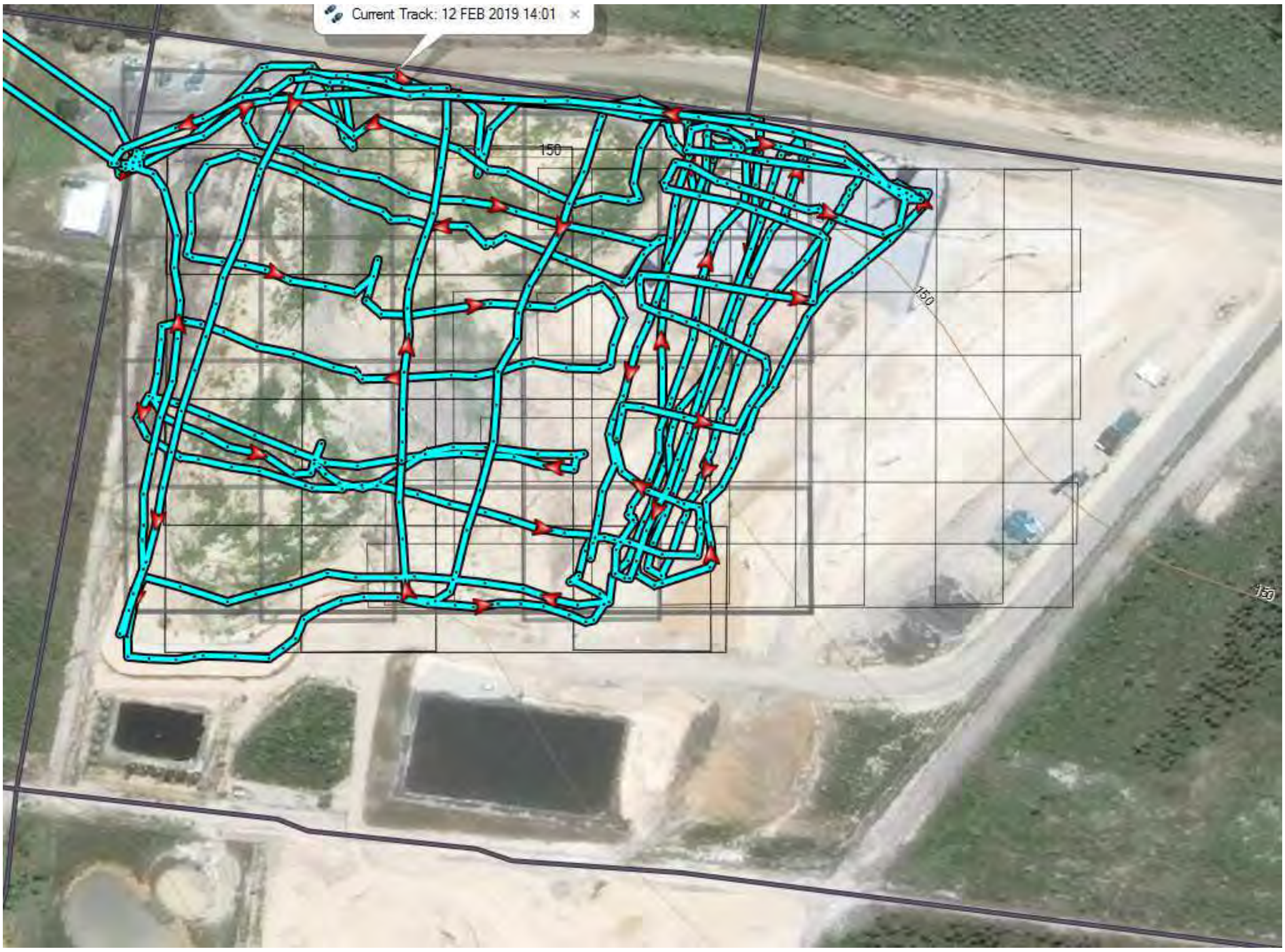
The cap walkover, buildings, structures, services and other areas were monitored with a LaserOne low concentration methane detector. The subsurface geology (gas bores) were monitored using a GA5000 extractive landfill gas analyser. Both instruments meet the minimum performance specifications listed in EPA 1684 Table 2. Calibration certificates for the equipment available at Appendix 3.

2. Site Summary report

The general site conditions for Hyland are good. The cap is clear with very little vegetation growing on final and intermediate cap, both in suitable condition for walkover monitoring. Parts of the intermediate cap were difficult to monitor with rubbish on and coming out of ground a trip hazard. Excessive rubbish was noted near leachate 2 and on fence near LFG05 (see photos). All 12 bores were sealed tightly and unlocked. All 12 bores were able to be tested. LFG02 has a broken monument and LFG07 has cracked concrete at its base (see photos). Apart from this all other bore were in good condition with no damage to casings, monuments or ground to report. The weather was fine, still and calm and the ground was dry.

Not due February: The Recreation Centre is approximately 50m west of the capped landfill. It is a 12.5x13.5 solid permanent building with a main room, kitchen, office, store room, bathrooms and showers. All services entering and leaving the building are checked including water gas and power, and drains. Cupboards, oven, storage style bench seats and the ceiling cavity are identified likely accumulation points and are checked. Outside services include power and water entry points, a stormwater pit, drains, sewer outlet and vent, downpipes and stormwater in and out of rainwater storage tanks. A shipping container in the carpark is also checked.

Walkover Map



Detected leaks

Hyland LFG02 broken monument

Hyland LFG07 cracked concrete

Hyland cap leak 1

Hyland cap leak 2

Hyland interim cap leak 3

Hyland interim cap leak 4

Hyland interim cap leak 5

Excessive rubbish near LFG05

Excessive rubbish near Leachate 2

Appendix 1 – Detected Leaks

SITE - Hyland				
TIME	CH4 PPM	Easting	Southing	Observation/Feature
FINAL CELLS				
807	120	146 33.626	38 16.661	Washout by BH03
914	1124	146 33.608	38 16.728	Washout. Edge of eastern battar
INTERMEDIATE CELLS				
1002	120	146 33.631	38 16.658	Washout. Northern edge
1023	112	146 33.681	38 16.729	Washout, eastern edge
1039	1246	146 33.598	38 16.739	Washout, southern edge

Appendix 2 – Weather Data

Latrobe weather 17-20.2.19

Date/Time EDT	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
20/04:00pm	22	15.6	8.5	42	7.1	W	32	44	17	24	1013.4	1013.2	0
20/03:30pm	22.2	15.5	8.3	41	7.3	W	33	43	18	23	1013.6	1013.4	0
20/03:00pm	20.9	15.4	9.2	47	6.2	W	28	41	15	22	1013.8	1013.6	0
20/02:30pm	21.1	16.1	9.4	47	6.3	W	26	39	14	21	1014.1	1013.9	0
20/02:00pm	20.7	14.7	8.7	46	6.3	W	30	41	16	22	1014	1013.8	0
20/01:30pm	20.4	13.8	7.7	44	6.6	W	32	44	17	24	1014.2	1014	0
20/01:00pm	19.9	14	7.3	44	6.4	W	28	39	15	21	1014.3	1014.1	0
20/12:30pm	20.5	14.5	7.2	42	6.8	W	28	37	15	20	1014.4	1014.2	0
20/12:00pm	19.9	14.3	7.3	44	6.4	WSW	26	33	14	18	1014.6	1014.4	0
20/11:30am	19.6	14.3	7	44	6.4	W	24	32	13	17	1014.7	1014.5	0
20/11:00am	18.3	13.5	7.4	49	5.5	W	22	32	12	17	1014.7	1014.5	0
20/10:30am	18.5	13.3	7.3	48	5.7	WNW	24	32	13	17	1014.7	1014.5	0
20/10:00am	17.3	13.4	8.7	57	4.4	W	19	26	10	14	1014.7	1014.5	0
20/09:30am	15.4	13.4	8.6	64	3.5	WSW	9	15	5	8	1015	1014.8	0
20/09:00am	13.7	12.2	8.3	70	2.7	SW	6	11	3	6	1014.8	1014.6	0
20/08:30am	12.5	10.8	8.4	76	2	SW	7	11	4	6	1014.7	1014.5	0
20/08:00am	11.5	10.3	8.2	80	1.6	SW	4	7	2	4	1014.5	1014.3	0
20/07:30am	10.8	10.3	8	83	1.4	CALM	0	0	0	0	1014.4	1014.2	0
20/07:00am	10.1	8.9	7.9	86	1.1	SSW	4	7	2	4	1014.4	1014.2	0
20/06:30am	9.1	7.3	7.1	87	0.9	S	6	9	3	5	1014.1	1013.9	0
20/06:00am	7.6	5.8	5.6	87	0.9	SSW	4	9	2	5	1014	1013.8	0
20/05:30am	8.3	6.6	5.9	85	1.1	S	4	7	2	4	1013.9	1013.7	0
20/05:00am	8.9	6.9	6.3	84	1.2	SSW	6	7	3	4	1013.8	1013.6	0
20/04:30am	8.5	6.9	6.3	86	1	S	4	7	2	4	1013.9	1013.7	0
20/04:00am	7.5	6.4	5.3	86	1	CALM	0	0	0	0	1013.9	1013.7	0
20/03:30am	7.5	6.4	5.1	85	1.1	CALM	0	0	0	0	1014	1013.8	0
20/03:00am	8	6.9	5.1	82	1.3	CALM	0	6	0	3	1014	1013.8	0
20/02:30am	9.7	8.1	6.4	80	1.5	SSW	4	7	2	4	1014.3	1014.1	0
20/02:00am	10.3	7.8	6.6	78	1.7	SW	9	11	5	6	1014.7	1014.5	0
20/01:30am	11.3	9.3	7.2	76	2	WSW	7	7	4	4	1014.7	1014.5	0
20/01:00am	11	9	7.1	77	1.9	WSW	7	9	4	5	1014.9	1014.7	0
20/12:30am	10.6	8.1	6.7	77	1.8	WSW	9	13	5	7	1014.9	1014.7	0
20/12:00am	11.1	8.3	7	76	2	WNW	11	13	6	7	1014.8	1014.6	0

Date/Time EDT	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
19/11:30pm	11.6	9.7	6.9	73	2.2	WNW	6	7	3	4	1014.8	1014.6	0
19/11:00pm	11.5	8.6	6.4	71	2.4	WNW	11	11	6	6	1014.8	1014.6	0
19/10:30pm	12.5	10.5	7	69	2.7	W	7	9	4	5	1014.8	1014.6	0
19/10:00pm	13.6	10.9	7.4	66	3	W	11	13	6	7	1014.7	1014.5	0
19/09:30pm	14.1	10.6	7.4	64	3.3	WSW	15	19	8	10	1014.5	1014.3	0
19/09:00pm	15.4	11.3	7.9	61	3.8	SW	19	26	10	14	1014	1013.8	0
19/08:30pm	16	10.5	7.7	58	4.2	SW	26	35	14	19	1013.6	1013.4	0
19/08:00pm	16.6	11.2	8.1	57	4.3	SW	26	33	14	18	1013.1	1013	0
19/07:30pm	17.6	12.6	8.2	54	4.8	SW	24	33	13	18	1012.6	1012.5	0
19/07:00pm	18.7	12.6	8.1	50	5.5	WSW	30	39	16	21	1012.3	1012.2	0
19/06:30pm	19.1	13.3	8.1	49	5.7	SW	28	41	15	22	1011.9	1011.8	0
19/06:00pm	19.7	14	8.4	48	5.9	SW	28	39	15	21	1011.9	1011.8	0
19/05:30pm	18.9	13	9.1	53	5.1	SW	30	39	16	21	1011.8	1011.7	0
19/05:00pm	19.3	14.1	8.9	51	5.5	SW	26	37	14	20	1011.6	1011.5	0
19/04:30pm	19.3	13	8.9	51	5.5	WSW	32	41	17	22	1011.4	1011.3	0
19/04:00pm	20.1	15	7.8	45	6.4	WSW	24	33	13	18	1011.2	1011.1	0
19/03:30pm	20.5	16	8.5	46	6.3	SW	22	32	12	17	1011.4	1011.3	0
19/03:00pm	18.9	12.4	9.1	53	5.2	SW	33	43	18	23	1011.6	1011.5	0
19/02:30pm	20.5	15	7.5	43	6.7	SW	26	32	14	17	1011.5	1011.4	0
19/02:00pm	21.5	16.2	6.6	38	7.6	W	24	32	13	17	1011.4	1011.3	0
19/01:30pm	20	15.6	7.4	44	6.5	NW	20	33	11	18	1011.3	1011.2	0
19/01:00pm	20.4	16.2	8.4	46	6.3	WNW	20	28	11	15	1011.6	1011.5	0
19/12:30pm	18.5	14.3	9.8	57	4.6	WNW	22	28	12	15	1012.1	1012	0
19/12:00pm	17	13.1	9.4	61	4	WNW	20	35	11	19	1012.1	1012	0
19/11:30am	17.3	13.3	9	58	4.3	WSW	20	26	11	14	1012.2	1012.1	0
19/11:00am	15.7	11.1	9.6	67	3.2	WSW	24	30	13	16	1012.3	1012.2	0
19/10:30am	16.7	12.3	9.1	61	3.9	SW	22	30	12	16	1011.9	1011.8	0
19/10:00am	17.1	13.5	10	63	3.8	WNW	19	30	10	16	1011.4	1011.3	0
19/09:30am	16.2	12.6	10.7	70	2.9	WNW	20	24	11	13	1011.5	1011.4	0
19/09:00am	15.5	11.6	10.9	74	2.5	WNW	22	28	12	15	1011.3	1011.2	0
19/08:30am	14.3	10.8	10.9	80	1.8	WNW	20	24	11	13	1011	1010.9	0
19/08:00am	14.7	12.7	11.5	81	1.7	W	13	17	7	9	1010.8	1010.7	0
19/07:30am	14	11.9	11.2	83	1.5	W	13	19	7	10	1010.6	1010.5	0
19/07:00am	13.5	11.4	11.2	86	1.2	W	13	19	7	10	1010.3	1010.2	0
19/06:30am	13.3	10.8	11	86	1.2	WNW	15	19	8	10	1010	1009.9	0
19/06:00am	13.1	10.1	10.5	84	1.4	WSW	17	20	9	11	1010	1009.9	0
19/05:30am	12.5	10.4	9.7	83	1.4	W	11	13	6	7	1009.7	1009.6	0
19/05:00am	11.1	9	8.1	82	1.5	SW	9	11	5	6	1009.7	1009.6	0
19/04:30am	11.8	9.7	8.1	78	1.8	SW	9	11	5	6	1009.6	1009.5	0
19/04:00am	12.4	11.3	8.5	77	1.9	S	4	9	2	5	1009.7	1009.6	0
19/03:30am	13.1	11.5	8.6	74	2.3	SSW	7	9	4	5	1009.6	1009.5	0
19/03:00am	13.6	11.4	8	69	2.8	W	9	11	5	6	1009.7	1009.6	0
19/02:30am	14.8	12	8.5	66	3.2	W	13	15	7	8	1009.9	1009.8	0
19/02:00am	15.8	12.2	8.5	62	3.7	WSW	17	20	9	11	1010	1009.9	0
19/01:30am	16.2	13.1	8.9	62	3.8	W	15	24	8	13	1010.1	1010	0
19/01:00am	16.3	13.2	9	62	3.8	W	15	20	8	11	1010.3	1010.2	0
19/12:30am	16.6	13.1	8.8	60	4	W	17	20	9	11	1010.4	1010.3	0
19/12:00am	16.7	13.1	8.4	58	4.2	W	17	20	9	11	1010.3	1010.2	0

Date/Time EDT	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind Dir	Wind Spd km/h	Wind Gust km/h	Wind Spd kts	Wind Gust kts	Press QNH hPa	Press MSL hPa	Rain since 9am mm
18/11:30pm	16.7	13.1	8.4	58	4.2	W	17	24	9	13	1010.3	1010.2	0
18/11:00pm	16.9	12.9	8.3	57	4.4	WSW	19	28	10	15	1010.3	1010.2	0
18/10:30pm	17	12.5	8.4	57	4.4	WSW	22	28	12	15	1010.3	1010.2	0
18/10:00pm	17	11.1	8.9	59	4.2	WSW	30	37	16	20	1010	1009.9	0
18/09:30pm	17.4	11.9	9.1	58	4.3	WSW	28	41	15	22	1009.6	1009.5	0
18/09:00pm	17.5	11.6	9.2	58	4.3	SW	30	41	16	22	1009.1	1009	0
18/08:30pm	17.5	11.5	10.1	62	3.9	SW	32	44	17	24	1008.4	1008.3	0
18/08:00pm	18	12.1	11.1	64	3.8	SW	33	41	18	22	1007.9	1007.8	0
18/07:30pm	18.7	11.8	11.5	63	4	WSW	39	52	21	28	1007.2	1007	0
18/07:00pm	19.2	12.2	11.3	60	4.3	SW	39	52	21	28	1006.6	1006.4	0
18/06:30pm	19.9	13.7	11.4	58	4.7	WSW	35	44	19	24	1006.3	1006.1	0
18/06:23pm	19.6	13.1	11.6	60	4.4	WSW	37	48	20	26	1006	1005.8	0
18/06:00pm	19.4	13.4	12.2	63	4	SW	35	50	19	27	1005.5	1005.3	0
18/05:30pm	21.6	15	12.5	56	5.2	SW	39	52	21	28	1004.8	1004.6	0
18/05:00pm	23	17.8	12.9	53	5.8	SW	32	44	17	24	1004.1	1003.9	0
18/04:30pm	24.7	19.4	14.2	52	6.2	SW	35	44	19	24	1003.8	1003.6	0
18/04:12pm	26.7	22.7	15.1	49	7	SW	30	41	16	22	1003.5	1003.3	0
18/04:00pm	28.3	26.7	13.8	41	8.7	W	15	22	8	12	1003.3	1003.1	0
18/03:30pm	27.7	26	14.7	45	7.9	W	17	26	9	14	1004	1003.8	0
18/03:00pm	25.6	22.7	14.1	49	6.9	WSW	22	30	12	16	1004.6	1004.4	0
18/02:30pm	25.3	22.5	14.4	50	6.5	W	22	32	12	17	1004.9	1004.7	0
18/02:00pm	25.6	22.8	14.4	50	6.7	WSW	22	32	12	17	1005.1	1004.9	0
18/01:30pm	24.2	21.6	14.9	56	5.6	WSW	22	28	12	15	1005.5	1005.3	0
18/01:00pm	23.3	19.9	14.8	59	5.1	W	26	33	14	18	1006.4	1006.2	0
18/12:30pm	23.8	20.3	14.5	56	5.5	W	26	33	14	18	1006.7	1006.5	0
18/12:00pm	24.4	19.6	14.5	54	5.9	W	33	44	18	24	1006.9	1006.7	0
18/11:32am	24.8	18.8	14.3	52	6.2	WNW	39	59	21	32	1006.8	1006.6	0
18/11:30am	24.7	19	14.2	52	6.2	WNW	37	50	20	27	1006.7	1006.5	0
18/11:26am	25.3	20.8	13.8	49	6.8	W	30	48	16	26	1006.5	1006.3	0
18/11:00am	27.5	24.2	12.7	40	8.7	W	22	32	12	17	1005.7	1005.5	0
18/10:30am	25.5	22.4	13.4	47	7.1	W	22	28	12	15	1005.6	1005.4	0
18/10:00am	24.6	22.8	13.2	49	6.7	WNW	15	24	8	13	1005.4	1005.2	0
18/09:30am	21.7	22.3	15.3	67	3.8	WSW	6	11	3	6	1005.2	1005	0
18/09:00am	19.3	20.7	15.4	78	2.3	SW	2	9	1	5	1005.4	1005.2	0
18/08:30am	18.6	19.4	14.9	79	2.2	WSW	4	7	2	4	1004.9	1004.7	0
18/08:00am	18	18.5	15.1	83	1.7	NNE	6	7	3	4	1004.6	1004.4	0
18/07:30am	16.7	17.1	13.6	82	1.8	S	4	9	2	5	1004.3	1004.1	0
18/07:00am	17	16.8	13.7	81	1.9	SSE	7	9	4	5	1004.7	1004.5	0
18/06:30am	17.2	18	13.7	80	2	S	2	9	1	5	1005	1004.8	0
18/06:00am	17.5	18.4	14	80	2	S	2	7	1	4	1005	1004.8	0
18/05:30am	17.5	17.8	14.4	82	1.8	SSW	6	7	3	4	1005.2	1005	0
18/05:00am	17.7	18.5	14.8	83	1.7	SW	4	7	2	4	1005.5	1005.3	0
18/04:30am	17.2	18.6	14.5	84	1.6	CALM	0	0	0	0	1005.5	1005.3	0
18/04:00am	17	18.4	14.3	84	1.6	CALM	0	0	0	0	1005.8	1005.6	0
18/03:30am	17.1	18.5	14.4	84	1.6	CALM	0	0	0	0	1006.1	1005.9	0
18/03:00am	17	18	14.3	84	1.6	N	2	7	1	4	1006.6	1006.4	0
18/02:30am	16.5	17.3	13.6	83	1.6	N	2	9	1	5	1006.9	1006.7	0
18/02:00am	17.7	18.9	13.8	78	2.2	CALM	0	0	0	0	1007.1	1006.9	0
18/01:30am	17.9	18	14.4	80	2	NE	7	9	4	5	1007.4	1007.2	0
18/01:00am	17.6	17.6	14.1	80	2	NNE	7	9	4	5	1007.8	1007.7	0
18/12:30am	18.6	18.6	13.7	73	2.8	ENE	6	9	3	5	1008.2	1008.1	0
18/12:00am	19.7	19.7	14.1	70	3.2	E	7	11	4	6	1008.5	1008.4	0

Date/Time EDT	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind Dir	Wind Spd km/h	Wind Gust km/h	Wind Spd kts	Wind Gust kts	Press QNH hPa	Press MSL hPa	Rain since 9am mm
17/11:30pm	19.7	19.7	14.3	71	3.1	E	7	13	4	7	1009	1008.9	0
17/11:00pm	20.1	19.8	14.5	70	3.3	E	9	13	5	7	1009.2	1009.1	0
17/10:30pm	20.2	20	14.6	70	3.3	E	9	17	5	9	1009.6	1009.5	0
17/10:00pm	20.6	20	14.5	68	3.6	E	11	17	6	9	1009.8	1009.7	0
17/09:30pm	21.1	20.3	15.2	69	3.5	ENE	13	19	7	10	1009.9	1009.8	0
17/09:00pm	21.3	20.6	15.4	69	3.5	ENE	13	19	7	10	1009.9	1009.8	0
17/08:30pm	21.7	19.9	15.5	68	3.7	NE	19	26	10	14	1009.7	1009.6	0
17/08:00pm	22.3	20.1	15.9	67	3.9	NE	22	28	12	15	1009.5	1009.4	0
17/07:30pm	23.3	21.7	16.1	64	4.4	NE	19	26	10	14	1009.4	1009.3	0
17/07:00pm	24.1	21.5	15.9	60	5	NE	24	33	13	18	1009.2	1009.1	0
17/06:30pm	28	26.7	9.8	32	10.2	SW	7	9	4	5	1009.1	1009	0
17/06:00pm	28.4	25.5	9.6	31	10.5	WSW	15	24	8	13	1009.2	1009.1	0
17/05:30pm	28.5	24.9	9.7	31	10.5	SW	19	24	10	13	1009.3	1009.2	0
17/05:00pm	28.6	24.6	10.3	32	10.4	SSW	22	33	12	18	1009.4	1009.3	0
17/04:30pm	29.3	24.2	7.8	26	11.7	W	24	32	13	17	1009.6	1009.5	0

Appendix 3 – Equipment Certificates

Calibration certificate number 46231

Instrument laserOne **Huberg serial number** 19121.18

Description of the calibration procedure

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

Check of the instrument between 0 ÷ 10000 ppm CH4

Full scale (ppm)	Gas concentration (ppm)	Response1 (ppm)	Response2 (ppm)	Response3 (ppm)	Average response (ppm)	Max error (ppm)	Max error (% F.s.)
1000	0	0	0	0	0,00	0,00	0,00
1000	100	101	100	98	99,00	2,00	0,20
1000	1000	1002	1000	998	1.000,00	2,00	0,20

Uncertainty	0,20	%
Max % error	0,20	% Fs

Check of the instrument between 0 ÷ 100 % vol CH4

Full scale (%vol)	Gas concentration (%vol)	Response 1 (%vol)	Response 2 (%vol)	Response 3 (%vol)	Average response (%vol)	Max error (%vol)	Max error (% F.s.)
10	0	0	0	0	0,00	0,00	0,00
10	2,2	2,2	2,3	2,2	2,00	0,10	1,00
100	100	99	99	100	99,00	1,00	1,00

Uncertainty	1,00	%
Max % error	1,00	% Fs

Environmental condition during calibration

Temperature	:	20 °C
Pressure	:	1012 mBar
U.R.	:	41 %

Calibration gas cylinders[1]

Gas	Serial number	Date of expire	GAS
Aria sintetica	047761	09/11/2023	AIR
100 PPM	AD0F9E6	14/06/2020	CH4
1000 PPM	ADT64C6	18/06/2020	CH4
1% vol	001231	10/06/2020	CH4
2,2 % VOL	080393	27/08/2021	CH4
100 % VOL	ADWR36L	09/11/2020	CH4

Calibration results : POSITIVE
Calibration date : 22/01/2019

Next scheduled calibration : 22/01/2020
Calibration supervisor : Stella Andrea

Andr Stell

[1] **The certificate of the gases could be downloaded at the following address http://www.huberg.com/certificati**

HUBERG SAS/KG - Huber Günther & C. • Sistemi di Sicurezza Gas e Acqua / Gas- und Wasser-Sicherheitssysteme
Sede/Sitz: Via Copernico 18/Kopernikusstr.18 • I-39100 Bolzano/Bozen (BZ) • http://www.huberg.com • E-Mail:huberg@huberg.com
Tel: +39 0471-936011 • Fax: +39 0471-205037 • N. Reg. imprese BZ, Cod. fisc. e Part. IVA. 01279940215

Service or Repair: GA5000

COMPANY	Ecowise Australia				
CONTACT	Andrew Van Prooyen				
SERIAL NO.	G505264	**CALL NO.**	SV1901240001	**RECEIVED**	24th Jan 2019

REQUEST/PROBLEM DESCRIPTION
Annual Calibration

This equipment has been calibrated to the manufacturer's specifications, using the standards shown below:

SENSOR	STANDARD	TRACEABILITY LOT NO.	PRE CALIBRATION READING	POST CALIBRATION READING
CH_4	0 %	785304	0.3 %	0 %
	60 %	808466	60.3%	60 %
CO_2	40 %	808466	39.3 %	40 %
O_2	0 %	785304	0.1%	0 %
	20.9 %	912744	21.2 %	20.9 %
CO	0 ppm	785304	0 ppm	0 ppm
	100 ppm	912744	100 ppm	100 ppm
H_2S	0 ppm	785304	4 ppm	0 ppm
	25 ppm	912744	22 ppm	25 ppm

- **Checked battery condition**
- **Checked for adequate flow and leak tested**
- **Checked internal filters**
- **Set next service due or gas check date**

COMMENTS/ADDITIONAL REPAIRS/SERVICES PERFORMED
Firmware V1.14.12. Pump checked OK Internal filters replaced Field calibration performed as per manufacturer's specifications. Manufacturer's service due 13th Feb 2021.

SERVICED BY	Minto Chandy	**COMPLETED**	25th Jan 2019
SIGNATURE	Minto Chandy		

Appendix 4 – Field Sheets

cap

LANDFILL CAP WALKOVER MONITORING FIELD SHEET

Client: Latrobe City Council	**Site/Project:** ~~Morwell~~ Landfill Hyland	**Date:** 20/02/19
Sampler: J. Phillip	**Equipment ID:** Laserone S/N: 19121.18	**Last calibration date:** ~~28/09/2018~~ 20/2 LB 22/1/19
Initial air pressure (mb): 1014.4 hPa ☑ Rising ☐ Falling	**Weather conditions:** Fine. Still. Calm. 1014.4 W C **Ground conditions:**	

Comments/Observations identified that may prevent representative data?

Air check: Low Conc-CH4(~ 2.0ppm) ☑ **Time Started :** **Time Finished:**

POINT ID	TIME	OBSERVATION/FEATURE	CH4 PPM	EASTING	NORTHING	Wind Speed (km/h)	Time
1	8.07am	Washout by BH03	120	146° 33.626'	38° 16.661	0.0	8.07
2	9.14	Washout. East edge of batter	1124	146° 33.608	38° 16.728	1.4	9.14
3	10:02	Washout North edge. Interim	120	146 33 631	38° 16.658	3.2	10.02
4	10:23	Washout. East edge. Interim	112	146° 33.681	38° 16.729	7.5km/h	10.23
5	10:39	Washout South edge. Interim	1246	146° 33.598	38° 16.739	3.6Km/h	10:39

GAS BORE MONITORING FIELD SHEET

Client:	Latrobe City Council	Site/Project:	Hyland Hwy Landfill	Date:	20/2/19

Sampler:	i. Bowlle	Equipment ID:	GA5000 S/N:G505264	Last calibration date:	24/1/19

Initial air pressure (mb):		Weather conditions:	cloudy, still
☑ Rising	1014.6 hPa		
☐ Falling		Ground conditions:	dry

* aspiration time when stabilised readings were taken, add note if not stabilised

** fluctuation (± % v/v) of direction and rate of change in concentration (± % v/v per 10 seconds)

Bore ID	Start time	Air pressure (mb)	Relative pressure (mb)	Peak CH_4 (% v/v)	Stabilised CH_4 (% v/v)	Peak CO_2 (% v/v)	Stabilised CO_2 (% v/v)	Min. O_2 (% v/v)	Stabilised O_2 (% v/v)	H2S (ppm)	CO (ppm)	Balance	Flow l/hr	Aspiration time min/sec*	Fluctuation (± % v/v)**
LGF01	820	998	-0.45 ~~-0.02~~	0.0	0.0	15.1	15.1	6.4	6.4	1	1	78.5	0.7	3	
Comments: unlocked, seal tight, background H_2S 1ppm															
Air check: CH_4 (<0.1%) ☑	CO_2 (<0.1%) ☑	O_2 (21.0%) ☑	Comment												
LGF02	845	998	-0.10 ~~-0.07~~	0.0	0.0	0.1	0.1	20.4	20.4	1	0	79.5	0.6	3	
Comments: unlocked, monument broken, seal tight, background H_2S 1ppm															
Air check: CH_4 (<0.1%) ☑	CO_2 (<0.1%) ☑	O_2 (21.0%) ☑	Comment												
LGF03	855	998	-1.96 ~~-0.02~~	0.0	0.0	0.1	0.1	20.4	20.4	1	0	79.5	0.0	3	
Comments: unlocked, seal tight, background H_2S 1ppm															
Air check: CH_4 (<0.1%) ☑	CO_2 (<0.1%) ☑	O_2 (21.0%) ☑	Comment												

Comments/Observations:

Time Finished: 900

GAS BORE MONITORING FIELD SHEET

Client:	Latrobe City Council	Site/Project:	Hyland Hwy Landfill	Date:	20/2/19

Sampler:	L.Bortolo	Equipment ID:	GA5000 S/N:G505264	Last calibration date:	24/1/19

Initial air pressure (mb):	Weather conditions: cloudy, still
☐ Rising	
☑ Falling 1014.6 hPa	Ground conditions: dry

* aspiration time when stabilised readings were taken, add note if not stabilised

** fluctuation (± % v/v) of direction and rate of change in concentration (± % v/v per 10 seconds)

Bore ID	Start time	Air pressure (mb)	Relative pressure (mb)	Peak CH_4 (% v/v)	Stabilised CH_4 (% v/v)	Peak CO_2 (% v/v)	Stabilised CO_2 (% v/v)	Min. O_2 (% v/v)	Stabilised O_2 (% v/v)	H2S (ppm)	CO (ppm)	Balance	Flow l/hr	Aspiration time min/sec*	Fluctuation (± % v/v)**
LGF04	910	998	~~0.02~~ -0.83	0.0	0.0	0.2	0.2	20.3	20.3	1	0	79.5	0.3	3	
Comments: seal tight, unlocked, dusty, background H_2S 1ppm															
Air check: CH_4 (<0.1%) ☑	CO_2 (<0.1%) ☑	O_2 (21.0%) ☑	Comment												
LGF05	925	998	-1.38	0.0	0.0	1.0	1.0	19.9	19.9	1	0	79.1	0.1	3	
Comments: seal tight, unlocked, background H_2S 1ppm															
Air check: CH_4 (<0.1%) ☑	CO_2 (<0.1%) ☑	O_2 (21.0%) ☑	Comment												
LGF06	940	998	-1.88	0.0	0.0	0.1	0.1	20.5	20.5	1	0	79.4	0.0	3	
Comments: seal tight, unlocked, background H_2S 1ppm															
Air check: CH_4 (<0.1%) ☑	CO_2 (<0.1%) ☑	O_2 (21.0%) ☑	Comment												

Comments/Observations:

Time Finished: 950

GAS BORE MONITORING FIELD SHEET

Client:	Latrobe City Council	Site/Project:	Hyland Hwy Landfill	Date:	20/2/19

Sampler:	L. Bartle	Equipment ID:	GA5000 S/N:G505264	Last calibration date:	24/1/19

Initial air pressure (mb):	Weather conditions: cloudy, still
☑ Rising 1014.9 hPa	
☐ Falling	Ground conditions: dry

* aspiration time when stabilised readings were taken, add note if not stabilised

** fluctuation (± % v/v) of direction and rate of change in concentration (± % v/v per 10 seconds)

Bore ID	Start time	Air pressure (mb)	Relative pressure (mb)	Peak CH_4 (% v/v)	Stabilised CH_4 (% v/v)	Peak CO_2 (% v/v)	Stabilised CO_2 (% v/v)	Min. O_2 (% v/v)	Stabilised O_2 (% v/v)	H2S (ppm)	CO (ppm)	Balance	Flow l/hr	Aspiration time min/sec*	Fluctuation (± % v/v)**
LGF07	955	998	-0.10	0.0	0.0	22.7	22.7	0.2	0.2	1	1	77.2	0.5	3	
Comments: seal tight unlocked, background H_2S 1ppm, concrete at bottom of monument broken															
Air check: CH_4 (<0.1%) ☑	CO_2 (<0.1%) ☑	O_2 (21.0%) ☑	Comment												
LGF08	1005	998	-1.84	0.0	0.0	0.2	0.2	20.4	20.4	1	0	79.4	-0.2	3	
Comments: seal tight, unlocked, background H_2S 1ppm															
Air check: CH_4 (<0.1%) ☑	CO_2 (<0.1%) ☑	O_2 (21.0%) ☑	Comment												
LGF09	1015	998	0.16	0.0	0.0	1.2	1.2	19.6	19.6	1	1	79.2	0.4		
Comments:															
Air check: CH_4 (<0.1%) ☑	CO_2 (<0.1%) ☒	O_2 (21.0%) ☑	Comment CO_2 0.2%												

Comments/Observations:

Time Finished: 1020

GAS BORE MONITORING FIELD SHEET

Client: Latrobe City Council	**Site/Project:** Hyland Hwy Landfill	**Date:** 20/2/19
Sampler: L Bowtell	**Equipment ID:** GA5000 S/N:G505264	**Last calibration date:** 24/1/19

Initial air pressure (mb):	**Weather conditions:** cloudy, still
[x] Rising 1014.8	
[ ] Falling	**Ground conditions:** dry

* aspiration time when stabilised readings were taken, add note if not stabilised

** fluctuation (± % v/v) of direction and rate of change in concentration (± % v/v per 10 seconds)

Bore ID	Start time	Air pressure (mb)	Relative pressure (mb)	Peak CH_4 (% v/v)	Stabilised CH_4 (% v/v)	Peak CO_2 (% v/v)	Stabilised CO_2 (% v/v)	Min. O_2 (% v/v)	Stabilised O_2 (% v/v)	H2S (ppm)	CO (ppm)	Balance	Flow l/hr	Aspiration time min/sec*	Fluctuation (± % v/v)**
LFG10	1025	998	0.14	0.0	0.0	1.7	1.7	19.2	19.2	1	1	79.1	0.4	3	
Comments: seal tight, unlocked, H_2S 1ppm background.															
Air check: CH_4 (<0.1%) ☑		CO_2 (<0.1%) ☑		O_2 (21.0%) ☑		Comment									
LFG11	1045	998	-0.72	0.0	0.0	0.7	0.7	20.1	20.1	0	0	79.2	0.2	3	
Comments: seal tight, unlocked, H_2S 1ppm background, redback spider living in monument															
Air check: CH_4 (<0.1%) ☑		CO_2 (<0.1%) ☑		O_2 (21.0%) ☑		Comment									
LFG12	1100	998	-0.14	0.0	0.0	1.7	1.7	19.1	19.1	1	0	79.2	0.3	3	
Comments: seal tight, unlocked															
Air check: CH_4 (<0.1%) ☑		CO_2 (<0.1%) ☑		O_2 (21.0%) ☑		Comment									

Comments/Observations:

Time Finished: 1115

Appendix F-4
Surface Gas Emissions Monitoring May 2019

Latrobe City Council

Hyland Highway Landfill Site

Landfill Gas Report – May 2019

ALS Water

RIGHT SOLUTIONS · RIGHT PARTNER
www.alsglobal.com

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Scoresby VIC 3179
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Contents

1. Introduction

The Hyland Highway landfill is located at 64 Hyland Highway in Loy Yang, Victoria. The site has 12 landfill gas monitoring bores: LGF01-LGF12. The closed landfill cap is approximately 200m x 150m and the intermediate cap is 200 x 75m and the general perimeter is fully fenced. The transfer station is adjacent to the landfill and is operational. There is an education centre west of the closed cap. It is approximately 12.5 x 13.5 m and it and all its services were checked

Monitoring results are provided in the form of field sheets see Appendix 4. Exceedances as per table 6.4 in section 6.7 of the EPA Victoria, Publication 788.3 Siting, Design, Operation and Rehabilitation of Landfills, BPEM 2015 are reported to the client within 24 hours and are tabulated in this report with photos of marked areas of concern in Appendix 1.

1.1 Monitoring Procedures and Guidelines

All monitoring is conducted as per EPA Victoria, Publication 1684 Landfill gas fugitive emissions monitoring guideline 2018. The ALS in house method also references the EPA Victoria, Publication 788.3 Siting, Design, Operation and Rehabilitation of Landfills, BPEM 2015.

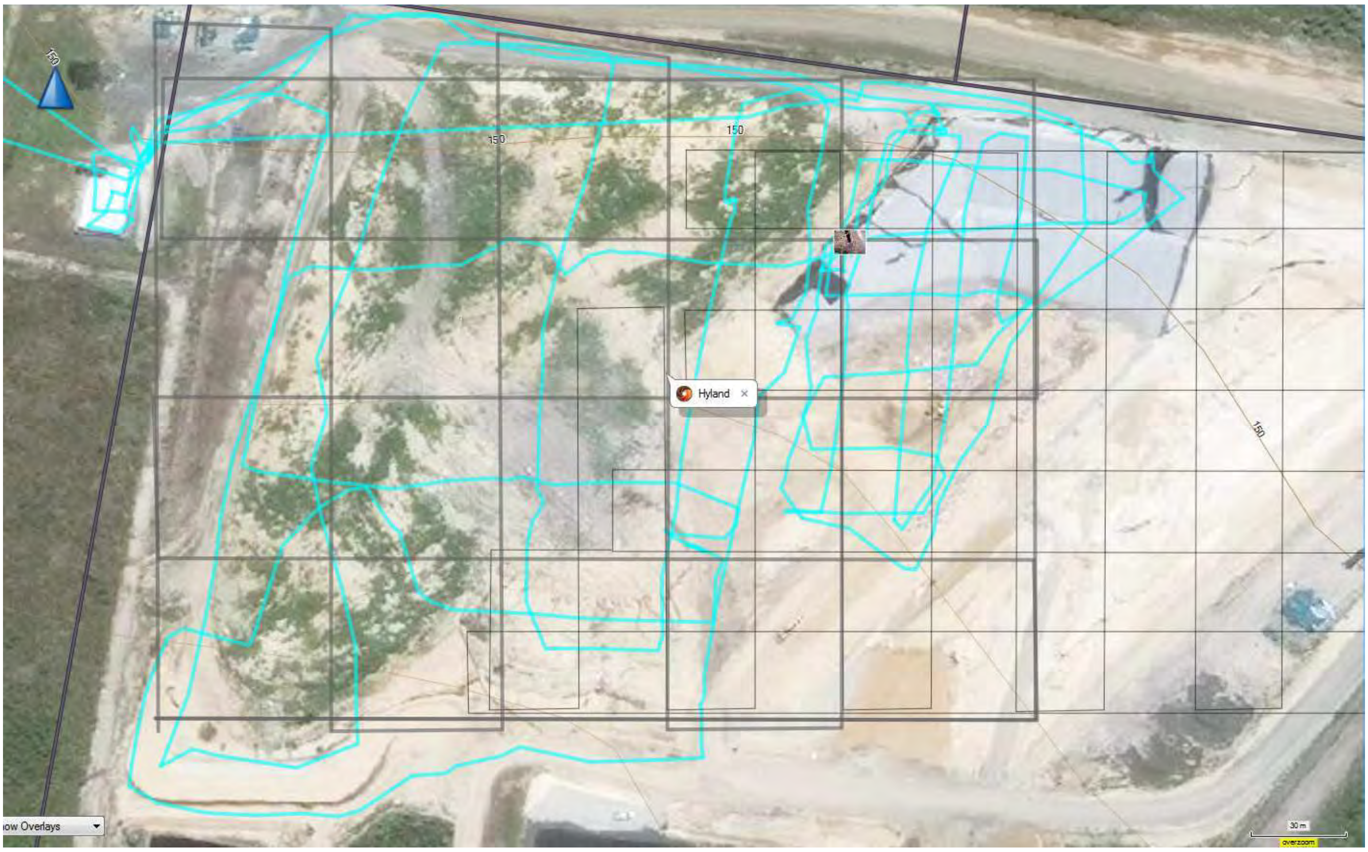
The cap walkover, buildings, structures, services and other areas were monitored with a LaserOne low concentration methane detector. The subsurface geology (gas bores) were monitored using a GA5000 extractive landfill gas analyser. Both instruments meet the minimum performance specifications listed in EPA 1684 Table 2. Calibration certificates for the equipment available at Appendix 3

2. Site Summary report

The general site conditions for Hyland are good. The cap is clear with very little vegetation growing on final and intermediate cap, both in suitable condition for walkover monitoring. Parts of the intermediate cap were difficult to monitor with rubbish on and coming out of ground a trip hazard. Excessive rubbish was noted near LFG06 (see photos). All 12 bores were sealed tightly and unlocked. All 12 bores were able to be tested. LFG02 has a broken monument and LFG07 has cracked concrete at its base. Apart from this all other bore were in good condition with no damage to casings, monuments or ground to report. The weather was overcast and the ground dry.

The Recreation Centre is approximately 50m west of the capped landfill. It is a 12.5x13.5 solid permanent building with a main room, kitchen, office, store room, bathrooms and showers. All services entering and leaving the building are checked including water gas and power, and drains. Cupboards, oven, storage style bench seats and the ceiling cavity are identified likely accumulation points and are checked. Outside services include power and water entry points, a stormwater pit, drains, sewer outlet and vent, downpipes and stormwater in and out of rainwater storage tanks. A shipping container in the carpark is also checked.

Walkover Map



Methane gas exceedances

Leak 1

Leak 2

Leak 3

Leak 4

Leak 5

Hyland cap

Excessive litter near LFG06

Appendix 1 – Detected Leaks

SITE - **Hyland**		15/05/2019		
TIME	CH4 PPM	Easting	Southing	Observation/Feature
840	120	146 33.37	38 16.39	Washout by BH03
852	6.2%v/v	146 33.36	38 16.40	Base of black pipe
905	324	146 33.571	38 16.728	Base of black pipe
923	9800	146 33.584	38 16.673	Hole at base of black pipe
953	120	146 33.667	38 16.666	Washout intermediate cap

Bore ID	Start time	Air pressure (mb)	Relative pressure (mb)	Peak CH_4 (% v/v)	Stabilised CH_4 (% v/v)	Peak CO_2 (% v/v)	Stabilised CO_2 (% v/v)	Min. O_2 (% v/v)	Stabilised O_2 (% v/v)	H2S ppm	Balance	Aspiration time min/sec*	Flow l/hr	Comments
Date	15/05/2019	Site - **Hyland**												
LFG01	1028	1014	0.02	0	0	10	10	9.1	9.1	1	80.9	3m	0.5	H2S read 1ppm at background check

Appendix 2 – Weather Data

Latrobe May11 - May17

Date/Time EST	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
17/08:30am	4.3	1.7	3.4	94	0.4	WSW	6	7	3	4	1028.3	1028.4	0
17/08:00am	3	0	2.1	94	0.4	SW	7	9	4	5	1028	1028.1	0
17/07:55am	2.7	0.2	1.8	94	0.4	WSW	4	7	2	4	1028	1028.1	0
17/07:39am	2.2	-0.3	1.3	94	0.3	WSW	4	6	2	3	1027.8	1027.9	0
17/07:30am	1.9	-1.1	1	94	0.3	WSW	6	7	3	4	1027.9	1028	0
17/07:26am	1.8	-1.2	0.9	94	0.3	WSW	6	9	3	5	1027.9	1028	0
17/07:13am	1.4	-1.6	0.5	94	0.3	WSW	6	7	3	4	1027.7	1027.8	0
17/07:00am	1.8	-1.4	0.9	94	0.3	WSW	7	9	4	5	1027.5	1027.6	0
17/06:30am	3	0.2	2.1	94	0.4	S	6	7	3	4	1027.1	1027.2	0
17/06:24am	3.1	0.7	2.2	94	0.4	S	4	7	2	4	1027.1	1027.2	0
17/06:00am	3.2	1.6	2.2	93	0.4	CALM	0	0	0	0	1027	1027.1	0
17/05:51am	3.2	1.6	2.2	93	0.4	CALM	0	0	0	0	1026.9	1027	0
17/05:30am	3.4	1.8	2.4	93	0.4	CALM	0	0	0	0	1026.9	1027	0
17/05:00am	3.1	1.4	2.1	93	0.4	CALM	0	0	0	0	1026.7	1026.8	0
17/04:43am	2.8	1.1	1.8	93	0.4	CALM	0	0	0	0	1026.5	1026.6	0
17/04:40am	2.7	1	1.7	93	0.4	CALM	0	0	0	0	1026.5	1026.6	0
17/04:30am	3	1.3	2	93	0.4	CALM	0	0	0	0	1026.5	1026.6	0
17/04:28am	3	1.3	2	93	0.4	CALM	0	0	0	0	1026.5	1026.6	0
17/04:00am	2.9	1.2	1.9	93	0.4	CALM	0	0	0	0	1026.4	1026.5	0
17/03:53am	2.7	1	1.7	93	0.4	CALM	0	0	0	0	1026.4	1026.5	0
17/03:45am	2.6	0.8	1.4	92	0.5	CALM	0	0	0	0	1026.4	1026.5	0
17/03:33am	3.2	1.5	2	92	0.5	CALM	0	0	0	0	1026.4	1026.5	0
17/03:30am	3.3	1.6	2.1	92	0.5	CALM	0	0	0	0	1026.4	1026.5	0
17/03:00am	3.8	2.3	2.8	93	0.4	CALM	0	0	0	0	1026.4	1026.5	0
17/02:30am	3.8	2.2	2.6	92	0.5	CALM	0	0	0	0	1026.5	1026.6	0
17/02:00am	4.7	3.3	3.5	92	0.5	CALM	0	0	0	0	1026.6	1026.7	0
17/01:30am	5	3.6	3.8	92	0.5	CALM	0	0	0	0	1026.7	1026.8	0
17/01:14am	4.2	2.7	2.9	91	0.5	CALM	0	0	0	0	1026.8	1026.9	0
17/01:00am	4	2.1	2.7	91	0.5	SW	2	6	1	3	1026.9	1027	0
17/12:30am	4.9	3.5	3.6	91	0.5	CALM	0	0	0	0	1027	1027.1	0
17/12:00am	5	3.6	3.5	90	0.6	CALM	0	0	0	0	1027.2	1027.3	0

Date/Time EST	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
16/11:30pm	5	3.2	3.5	90	0.6	SW	2	7	1	4	1027.4	1027.5	0
16/11:00pm	5.9	4.6	4.2	89	0.7	CALM	0	0	0	0	1027.4	1027.5	0
16/10:30pm	6.5	5.3	4.7	88	0.8	CALM	0	0	0	0	1027.6	1027.7	0
16/10:00pm	7.7	6.7	5.5	86	1	CALM	0	0	0	0	1027.6	1027.7	0
16/09:30pm	7.8	6.4	5.3	84	1.1	E	2	6	1	3	1027.7	1027.8	0
16/09:00pm	9	7	6.3	83	1.2	ESE	6	7	3	4	1027.7	1027.8	0
16/08:30pm	9.6	7.7	6.9	83	1.3	ESE	6	7	3	4	1027.5	1027.6	0
16/08:00pm	9.4	8.6	6.3	81	1.4	CALM	0	0	0	0	1027.6	1027.7	0
16/07:30pm	10.6	8.7	6.7	77	1.8	E	6	7	3	4	1027.3	1027.4	0
16/07:00pm	11.4	9.1	7.3	76	2	ESE	9	11	5	6	1027.1	1027.2	0
16/06:30pm	11	10.3	6.9	76	2	CALM	0	0	0	0	1026.8	1026.9	0
16/06:00pm	12.7	12.1	7.4	70	2.6	CALM	0	6	0	3	1026.5	1026.6	0
16/05:30pm	12.8	11.8	7.5	70	2.6	SW	2	7	1	4	1026.4	1026.5	0
16/05:00pm	13.5	10.5	7.5	67	2.9	WSW	13	15	7	8	1026.2	1026.3	0
16/04:30pm	15	12.7	7.3	60	3.8	SW	9	13	5	7	1026.2	1026.3	0
16/04:00pm	15.9	13.6	7.4	57	4.2	SSW	9	13	5	7	1026.2	1026.3	0
16/03:30pm	16.1	13.7	7.1	55	4.5	S	9	13	5	7	1026.2	1026.3	0
16/03:00pm	16.3	14.3	7.3	55	4.5	SW	7	13	4	7	1026.1	1026.2	0
16/02:30pm	16.1	13.3	7.1	55	4.5	SW	11	15	6	8	1026.1	1026.2	0
16/02:00pm	16.2	13	6.9	54	4.6	WSW	13	17	7	9	1026.3	1026.4	0
16/01:30pm	15.8	13.7	6.5	54	4.5	W	7	17	4	9	1026.6	1026.7	0
16/01:00pm	15.3	13.2	6.6	56	4.2	WSW	7	13	4	7	1027	1027.1	0
16/12:30pm	14.7	12.8	6.8	59	3.9	S	6	11	3	6	1027.3	1027.4	0
16/12:00pm	15.5	14.1	7.3	58	4	N	4	9	2	5	1027.8	1027.9	0
16/11:30am	14.6	12.6	6.9	60	3.8	WNW	7	9	4	5	1028.4	1028.5	0
16/11:00am	14.4	13.2	6.5	59	3.8	NW	2	7	1	4	1028.8	1028.9	0
16/10:30am	12.6	10.4	6.2	65	3	SSW	7	11	4	6	1029.1	1029.2	0
16/10:00am	12.8	11	7	68	2.8	WSW	6	9	3	5	1029.4	1029.5	0
16/09:30am	11.6	11.1	9.3	86	1.2	SW	2	7	1	4	1029.5	1029.6	0
16/09:00am	10.4	10.1	8.7	89	0.8	CALM	0	0	0	0	1029.8	1029.9	0
16/08:30am	9.6	8.4	8	90	0.8	W	4	7	2	4	1029.8	1029.9	0
16/08:00am	9.2	6.9	7.6	90	0.8	SW	9	9	5	5	1029.6	1029.7	0
16/07:30am	8.4	6.3	6.7	89	0.8	SW	7	9	4	5	1029.4	1029.5	0
16/07:00am	8.9	6.5	7	88	0.9	SW	9	9	5	5	1029.2	1029.3	0
16/06:30am	9.7	7	7.5	86	1	SW	11	13	6	7	1029	1029.1	0
16/06:00am	10	9.5	7.8	86	1.1	CALM	0	0	0	0	1029	1029.1	0
16/05:30am	9.9	9.4	7.8	87	1	CALM	0	6	0	3	1028.9	1029	0
16/05:00am	9.9	8.3	7.8	87	1	SSW	6	7	3	4	1028.9	1029	0
16/04:30am	10.1	8.3	8	87	1	SSW	7	9	4	5	1028.9	1029	0
16/04:00am	9.9	8.1	8	88	0.9	SSW	7	7	4	4	1028.8	1028.9	0
16/03:30am	10.1	8.5	8.2	88	0.9	SW	6	6	3	3	1028.9	1029	0
16/03:00am	10	9.6	8.4	90	0.8	CALM	0	0	0	0	1029.2	1029.3	0
16/02:30am	9.8	9.4	8.2	90	0.8	CALM	0	0	0	0	1029.4	1029.5	0
16/02:00am	9.6	8.4	8	90	0.8	W	4	6	2	3	1029.6	1029.7	0
16/01:30am	9.5	8.6	7.9	90	0.8	W	2	6	1	3	1029.7	1029.8	0
16/01:00am	9.5	7.9	7.8	89	0.8	WSW	6	7	3	4	1029.8	1029.9	0
16/12:30am	10.2	8.7	8.3	88	0.9	SSW	6	9	3	5	1029.9	1030	0
16/12:00am	10.6	9.2	8.7	88	0.9	SSW	6	7	3	4	1030.1	1030.2	0

Date/Time EST	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind Dir	Wind Spd km/h	Wind Gust km/h	Wind Spd kts	Wind Gust kts	Press QNH hPa	Press MSL hPa	Rain since 9am mm
15/11:30pm	10.8	9.7	8.4	85	1.2	S	4	7	2	4	1030.2	1030.3	0
15/11:00pm	11.5	10.8	8.7	83	1.4	SW	2	6	1	3	1030.2	1030.3	0
15/10:30pm	11.7	11.5	8.9	83	1.4	CALM	0	0	0	0	1030.4	1030.5	0
15/10:00pm	11.9	11.7	9.1	83	1.4	CALM	0	2	0	1	1030.7	1030.8	0
15/09:30pm	12	10.5	9.2	83	1.4	WSW	7	9	4	5	1030.8	1030.9	0
15/09:00pm	12.1	10.2	8.9	81	1.6	W	9	11	5	6	1030.8	1030.9	0
15/08:30pm	12.1	10.1	8.6	79	1.7	W	9	11	5	6	1030.8	1030.9	0
15/08:00pm	12.2	10.4	7.9	75	2.1	WSW	7	11	4	6	1030.7	1030.8	0
15/07:30pm	12.2	10	7.7	74	2.2	SW	9	13	5	7	1030.7	1030.8	0
15/07:00pm	12.3	10	7.6	73	2.3	SW	9	11	5	6	1030.5	1030.6	0
15/06:30pm	11.7	10	7.6	76	2	WSW	6	7	3	4	1030.3	1030.4	0
15/06:00pm	10.9	8.4	6.5	74	2.1	W	9	11	5	6	1030	1030.1	0
15/05:30pm	11.7	8.8	6.4	70	2.5	W	11	13	6	7	1029.9	1030	0
15/05:00pm	13.3	10.1	6.9	65	3.1	WSW	13	17	7	9	1029.7	1029.8	0
15/04:30pm	14	10.5	7.1	63	3.4	WSW	15	20	8	11	1029.7	1029.8	0
15/04:00pm	15	10.7	7.1	59	3.9	SW	19	28	10	15	1029.6	1029.7	0
15/03:30pm	15.6	11.3	6.9	56	4.3	WSW	19	28	10	15	1029.6	1029.7	0
15/03:00pm	16.1	11.2	6.8	54	4.5	W	22	30	12	16	1029.6	1029.7	0
15/02:30pm	15.3	10.9	7.6	60	3.8	W	20	24	11	13	1029.7	1029.8	0
15/02:00pm	15	10.2	7.3	60	3.8	W	22	28	12	15	1029.9	1030	0
15/01:30pm	15.1	10.9	8.3	64	3.4	W	20	28	11	15	1030	1030.1	0
15/01:00pm	15	10.7	7.8	62	3.6	W	20	26	11	14	1030	1030.1	0
15/12:30pm	15	10.3	7.8	62	3.6	W	22	30	12	16	1030.2	1030.3	0
15/12:00pm	15.2	10.8	7.3	59	3.9	W	20	26	11	14	1030.6	1030.7	0
15/11:30am	15.6	10.4	7.4	58	4.1	W	24	32	13	17	1030.9	1031	0
15/11:00am	15.6	10.6	7.9	60	3.8	WNW	24	30	13	16	1030.9	1031	0
15/10:30am	16	11.4	8	59	4	W	22	32	12	17	1031	1031.1	0
15/10:00am	14.6	11.5	10.2	75	2.3	W	17	22	9	12	1031	1031.1	0
15/09:30am	13.8	9.8	10.6	81	1.7	WNW	22	28	12	15	1031.1	1031.2	0
15/09:00am	13.7	10.4	10.9	83	1.5	WNW	19	22	10	12	1031.1	1031.2	0
15/08:30am	12.8	9.7	10.3	85	1.3	W	17	22	9	12	1031.1	1031.2	0
15/08:00am	12.4	9.2	10.1	86	1.2	WNW	17	20	9	11	1030.8	1030.9	0
15/07:30am	12.1	8.9	9.8	86	1.2	WNW	17	24	9	13	1030.5	1030.6	0
15/07:00am	11.8	9.3	9.7	87	1.1	W	13	17	7	9	1030.1	1030.2	0
15/06:30am	11.7	9.3	9.9	89	0.9	WSW	13	20	7	11	1029.9	1030	0
15/06:00am	11.4	8.9	9.7	89	0.9	WSW	13	15	7	8	1029.6	1029.7	0
15/05:30am	11.8	8.4	10.4	91	0.7	W	19	24	10	13	1029.4	1029.5	0
15/05:00am	11.5	8.8	10.2	92	0.7	WNW	15	19	8	10	1029.2	1029.3	0
15/04:30am	10.9	8	9.8	93	0.6	W	15	19	8	10	1029.2	1029.3	0
15/04:00am	10.3	8.4	9.1	92	0.6	WNW	9	13	5	7	1029.2	1029.3	0
15/03:30am	10.5	9	9.3	92	0.6	WNW	7	11	4	6	1029.3	1029.4	0
15/03:00am	10.8	8.3	9.6	92	0.6	W	13	15	7	8	1029.3	1029.4	0
15/02:30am	11.6	9.3	10.3	92	0.7	WSW	13	15	7	8	1029.5	1029.6	0
15/02:00am	10.8	9	9.4	91	0.7	W	9	11	5	6	1029.5	1029.6	0
15/01:30am	11.5	9.1	9.9	90	0.8	WNW	13	15	7	8	1029.5	1029.6	0
15/01:00am	12.2	10.3	10.6	90	0.8	W	11	15	6	8	1029.7	1029.8	0
15/12:30am	12.2	9.2	10.8	91	0.7	W	17	22	9	12	1029.7	1029.8	0
15/12:00am	11.7	8.6	10.3	91	0.7	WNW	17	20	9	11	1029.7	1029.8	0

Date/Time EST	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind Dir	Wind Spd km/h	Wind Gust km/h	Wind Spd kts	Wind Gust kts	Press QNH hPa	Press MSL hPa	Rain since 9am mm
14/11:30pm	11.3	8.4	9.7	90	0.8	WNW	15	17	8	9	1029.7	1029.8	0
14/11:00pm	11.7	8.8	9.6	87	1.1	WNW	15	17	8	9	1029.6	1029.7	0
14/10:30pm	12.4	9.2	10.1	86	1.2	W	17	20	9	11	1029.7	1029.8	0
14/10:00pm	12.6	9.4	10.1	85	1.3	WNW	17	19	9	10	1029.5	1029.6	0
14/09:30pm	12.7	9.9	9.9	83	1.4	WNW	15	19	8	10	1029.4	1029.5	0
14/09:00pm	13.1	10.3	9.9	81	1.6	WSW	15	17	8	9	1029.3	1029.4	0
14/08:30pm	14.3	11.7	10.7	79	1.9	WSW	15	17	8	9	1029.1	1029.2	0
14/08:00pm	14.2	11.3	11	81	1.7	WSW	17	19	9	10	1028.9	1029	0
14/07:30pm	14.4	10.9	11	80	1.8	SW	20	24	11	13	1028.7	1028.8	0
14/07:00pm	14.6	11.3	11	79	1.9	SW	19	26	10	14	1028.5	1028.6	0
14/06:30pm	15.3	12.3	9.4	68	3	WSW	15	24	8	13	1028.2	1028.3	0
14/06:00pm	15.6	13.2	8.8	64	3.5	WSW	11	15	6	8	1027.7	1027.8	0
14/05:30pm	15.9	13.1	8.6	62	3.7	W	13	17	7	9	1027.3	1027.4	0
14/05:00pm	16.2	12.6	8.4	60	3.9	W	17	20	9	11	1027.1	1027.2	0
14/04:30pm	16.4	12.8	8.4	59	4.1	W	17	26	9	14	1027	1027.1	0
14/04:00pm	16.5	12.3	8.2	58	4.2	W	20	32	11	17	1026.8	1026.9	0
14/03:30pm	16.7	12	7.9	56	4.5	W	22	32	12	17	1026.7	1026.8	0
14/03:00pm	17.9	12.1	7.9	52	5.1	W	28	37	15	20	1026.5	1026.6	0
14/02:30pm	18.7	12.9	8.1	50	5.5	W	28	37	15	20	1026.4	1026.5	0
14/02:00pm	18.5	11.8	7.3	48	5.6	W	32	43	17	23	1026.4	1026.5	0
14/01:30pm	18.3	12.1	7.7	50	5.4	W	30	43	16	23	1026.3	1026.4	0
14/01:00pm	17.8	12	8.1	53	4.9	W	28	37	15	20	1026.5	1026.6	0
14/12:30pm	17.5	10.8	8.1	54	4.8	W	33	43	18	23	1026.6	1026.7	0
14/12:00pm	17.1	10.9	8	55	4.6	W	30	39	16	21	1027.1	1027.2	0
14/11:30am	16.8	10.3	8	56	4.5	W	32	43	17	23	1027.3	1027.4	0
14/11:00am	16.4	11.4	7.9	57	4.3	W	24	35	13	19	1027.5	1027.6	0
14/10:30am	16.2	11.1	7.7	57	4.3	W	24	33	13	18	1027.6	1027.7	0
14/10:00am	15.8	11.4	7.6	58	4.1	W	20	30	11	16	1027.8	1027.9	0
14/09:30am	15.2	11.4	7.5	60	3.8	W	17	22	9	12	1027.8	1027.9	0
14/09:00am	14	12.3	8.2	68	2.9	W	7	15	4	8	1027.5	1027.6	0

Date/Time EST	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
14/12:00pm	17.1	10.9	8	55	4.6	W	30	39	16	21	1027.1	1027.2	0
14/11:30am	16.8	10.3	8	56	4.5	W	32	43	17	23	1027.3	1027.4	0
14/11:00am	16.4	11.4	7.9	57	4.3	W	24	35	13	19	1027.5	1027.6	0
14/10:30am	16.2	11.1	7.7	57	4.3	W	24	33	13	18	1027.6	1027.7	0
14/10:00am	15.8	11.4	7.6	58	4.1	W	20	30	11	16	1027.8	1027.9	0
14/09:30am	15.2	11.4	7.5	60	3.8	W	17	22	9	12	1027.8	1027.9	0
14/09:00am	14	12.3	8.2	68	2.9	W	7	15	4	8	1027.5	1027.6	0
14/08:30am	11.3	10.3	7.2	76	2	W	2	6	1	3	1027.3	1027.4	0
14/08:00am	10.6	9.9	6.9	78	1.7	CALM	0	2	0	1	1027.2	1027.3	0
14/07:30am	8.4	6.2	5.5	82	1.3	SE	6	9	3	5	1026.6	1026.7	0
14/07:00am	8.5	7.1	5.3	80	1.4	SSE	2	7	1	4	1026.4	1026.5	0
14/06:37am	8.9	7.1	5.3	78	1.6	SE	4	6	2	3	1026.1	1026.2	0
14/06:30am	9.1	7.7	5.3	77	1.7	S	2	6	1	3	1026	1026.1	0
14/06:27am	9.1	8	5.3	77	1.7	CALM	0	6	0	3	1026	1026.1	0
14/06:00am	9.8	6.4	5.8	76	1.8	NW	13	17	7	9	1025.6	1025.7	0
14/05:30am	10.1	6.7	5.9	75	1.9	NW	13	17	7	9	1025.4	1025.5	0
14/05:00am	10.1	7.1	5.9	75	1.9	NW	11	13	6	7	1025.5	1025.6	0
14/04:30am	11.1	7.3	5.8	70	2.5	NW	15	22	8	12	1025.3	1025.4	0
14/04:00am	11.2	6.7	5.9	70	2.5	WNW	19	22	10	12	1025.2	1025.3	0
14/03:30am	10.3	7.7	6.3	76	1.9	WNW	9	13	5	7	1025.3	1025.4	0
14/03:00am	8.7	7.3	5.3	79	1.5	ESE	2	7	1	4	1025.3	1025.4	0
14/02:30am	9	6.6	5.2	77	1.7	SSE	7	13	4	7	1025.3	1025.4	0
14/02:00am	9.1	6.8	5.7	79	1.5	SE	7	9	4	5	1025.4	1025.5	0
14/01:30am	9.6	6.5	5.4	75	1.9	WNW	11	15	6	8	1025.5	1025.6	0
14/01:00am	10.3	7	6.5	77	1.8	W	13	17	7	9	1025.8	1025.9	0
14/12:30am	10.5	6.8	6.5	76	1.9	W	15	20	8	11	1025.9	1026	0
14/12:00am	10.9	7	7	77	1.8	W	17	22	9	12	1025.7	1025.8	0

Date/Time EST	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
13/11:30pm	9.5	6.6	6.6	82	1.4	W	11	15	6	8	1025.8	1025.9	0
13/11:00pm	8.9	5.5	5.8	81	1.4	W	13	17	7	9	1026	1026.1	0
13/10:30pm	8.3	5.6	5.4	82	1.3	W	9	11	5	6	1026.1	1026.2	0
13/10:00pm	8.7	5.9	5.3	79	1.5	NW	9	9	5	5	1025.8	1025.9	0
13/09:30pm	9.6	6.9	5.4	75	1.9	NW	9	11	5	6	1025.6	1025.7	0
13/09:00pm	10.4	7.8	6.2	75	1.9	W	9	11	5	6	1025.5	1025.6	0
13/08:30pm	10.1	7.5	5.9	75	1.9	W	9	13	5	7	1025.3	1025.4	0
13/08:00pm	11.1	8.6	6.6	74	2.1	WSW	9	11	5	6	1025.2	1025.3	0
13/07:30pm	10.8	7.8	6	72	2.2	WSW	11	15	6	8	1025.1	1025.2	0
13/07:00pm	12.5	10.1	6.8	68	2.7	WSW	9	13	5	7	1024.7	1024.8	0
13/06:30pm	12.7	10.3	7	68	2.8	WSW	9	11	5	6	1024.5	1024.6	0
13/06:00pm	13.3	10.3	7.5	68	2.8	WSW	13	19	7	10	1024.3	1024.4	0
13/05:30pm	13.5	10.9	7.7	68	2.9	SW	11	17	6	9	1024	1024.1	0
13/05:00pm	15.2	11.4	7.7	61	3.7	WSW	17	20	9	11	1023.7	1023.8	0
13/04:30pm	16.4	12.2	8.1	58	4.2	WSW	20	24	11	13	1023.7	1023.8	0
13/04:00pm	17.1	12.5	8	55	4.6	WSW	22	28	12	15	1023.6	1023.6	0
13/03:30pm	17.6	13.4	8.2	54	4.8	WSW	20	26	11	14	1023.7	1023.8	0
13/03:00pm	18	13.9	8	52	5.1	WSW	19	28	10	15	1023.7	1023.8	0
13/02:30pm	17.9	13.2	7.9	52	5.1	WSW	22	32	12	17	1023.7	1023.8	0
13/02:00pm	18.3	13.7	8.3	52	5.1	WSW	22	30	12	16	1023.9	1024	0
13/01:30pm	18.2	13.7	8.5	53	5	W	22	32	12	17	1024.3	1024.4	0
13/01:00pm	17.9	13.2	7.9	52	5.1	W	22	32	12	17	1024.7	1024.8	0
13/12:30pm	16.9	12.6	7.8	55	4.6	WSW	20	32	11	17	1025	1025.1	0
13/12:00pm	17.7	13.5	8.3	54	4.8	W	20	28	11	15	1025.6	1025.7	0
13/11:30am	17.6	13.7	8.7	56	4.6	W	19	26	10	14	1026.2	1026.3	0
13/11:00am	16.9	12.8	8.6	58	4.2	WNW	20	26	11	14	1026.7	1026.8	0
13/10:30am	14.7	13.4	9.3	70	2.8	SW	6	9	3	5	1026.8	1026.9	0
13/10:00am	13	13.4	11.1	88	1	CALM	0	0	0	0	1027.1	1027.2	0
13/09:30am	13.1	13.7	12	93	0.6	CALM	0	0	0	0	1027.2	1027.3	0
13/09:00am	10.3	10.2	9.4	94	0.4	CALM	0	6	0	3	1027.4	1027.5	0
13/08:30am	8.3	7.7	7.4	94	0.4	CALM	0	6	0	3	1027.4	1027.5	0
13/08:00am	7	6.1	6.1	94	0.4	CALM	0	0	0	0	1027.2	1027.3	0
13/07:30am	6	4.9	5.1	94	0.4	CALM	0	0	0	0	1027	1027.1	0
13/07:00am	6	4.9	5.1	94	0.4	CALM	0	0	0	0	1026.8	1026.9	0
13/06:30am	6.2	4.8	5.3	94	0.4	ESE	2	6	1	3	1026.7	1026.8	0
13/06:00am	6.1	5	5.2	94	0.4	CALM	0	0	0	0	1026.5	1026.6	0
13/05:30am	5.9	4.8	5	94	0.4	CALM	0	0	0	0	1026.5	1026.6	0
13/05:00am	6.1	5	5.2	94	0.4	CALM	0	0	0	0	1026.5	1026.6	0
13/04:30am	5.9	4.8	5	94	0.4	CALM	0	0	0	0	1026.5	1026.6	0
13/04:00am	5.2	3.9	4.3	94	0.4	CALM	0	0	0	0	1026.5	1026.6	0
13/03:30am	5.5	4.3	4.5	93	0.4	CALM	0	0	0	0	1026.6	1026.7	0
13/03:00am	6.1	5	5.1	93	0.4	CALM	0	0	0	0	1026.9	1027	0
13/02:30am	6.2	5.1	5.2	93	0.4	CALM	0	0	0	0	1027.1	1027.2	0
13/02:00am	6.5	4.7	5.5	93	0.4	SW	4	7	2	4	1027.2	1027.3	0
13/01:30am	6.3	5.2	5.3	93	0.4	CALM	0	0	0	0	1027.2	1027.3	0
13/01:00am	6.8	5.8	5.7	93	0.5	CALM	0	0	0	0	1027.4	1027.5	0
13/12:30am	6.9	5.9	5.7	92	0.5	CALM	0	0	0	0	1027.4	1027.5	0
13/12:00am	7	4.7	5.8	92	0.5	NE	7	7	4	4	1027.5	1027.6	0

Date/Time EST	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
12/11:49pm	7.3	5.3	6.1	92	0.5	NE	6	7	3	4	1027.6	1027.7	0
12/11:36pm	7	4.9	5.8	92	0.5	NE	6	9	3	5	1027.7	1027.8	0
12/11:30pm	6.8	5	5.6	92	0.5	ENE	4	9	2	5	1027.7	1027.8	0
12/11:00pm	6.8	5.8	5.6	92	0.5	CALM	0	0	0	0	1027.7	1027.8	0
12/10:30pm	7.6	6.7	6.2	91	0.6	CALM	0	0	0	0	1027.8	1027.9	0
12/10:00pm	7.8	7	6.3	90	0.7	CALM	0	0	0	0	1027.9	1028	0
12/09:30pm	8.7	8.1	7.2	90	0.7	CALM	0	0	0	0	1027.9	1028	0
12/09:00pm	9.1	7.4	7.4	89	0.8	S	6	9	3	5	1028	1028.1	0
12/08:30pm	9.5	7.2	7.6	88	0.9	WNW	9	9	5	5	1027.9	1028	0
12/08:00pm	10.9	9.3	8.7	86	1.1	NW	7	7	4	4	1027.9	1028	0
12/07:30pm	11.2	10.1	8.6	84	1.3	NNW	4	7	2	4	1027.9	1028	0
12/07:00pm	11.4	11	8.4	82	1.5	CALM	0	0	0	0	1027.8	1027.9	0
12/06:30pm	11.7	9.6	8.4	80	1.6	W	9	11	5	6	1027.6	1027.7	0
12/06:00pm	12.6	10.2	8.7	77	1.9	W	11	13	6	7	1027.3	1027.4	0
12/05:30pm	14	10.2	9	72	2.5	W	19	24	10	13	1026.9	1027	0
12/05:00pm	14.5	11.1	9.1	70	2.7	W	17	22	9	12	1026.7	1026.8	0
12/04:30pm	14.9	11.5	9.3	69	2.9	W	17	22	9	12	1026.5	1026.6	0
12/04:00pm	15.3	11.3	9.2	67	3.1	W	20	30	11	16	1026.5	1026.6	0
12/03:30pm	15.4	10.7	9.1	66	3.2	W	24	30	13	16	1026.4	1026.5	0
12/03:00pm	15.6	10.6	9.5	67	3.1	WSW	26	39	14	21	1026.3	1026.4	0
12/02:30pm	15.8	11.6	9.7	67	3.2	W	22	30	12	16	1026.2	1026.3	0
12/02:00pm	15.4	10.7	9.3	67	3.1	W	24	33	13	18	1026.2	1026.3	0
12/01:30pm	15.1	10.3	9	67	3.1	W	24	32	13	17	1026.2	1026.3	0
12/01:00pm	14.9	9.3	8.8	67	3.1	W	28	35	15	19	1026.4	1026.5	0
12/12:30pm	15.2	10.7	10	71	2.7	WNW	24	33	13	18	1026.6	1026.7	0
12/12:00pm	15.7	10.2	9.1	65	3.4	WNW	28	35	15	19	1027	1027.1	0
12/11:30am	15.3	9.8	9.2	67	3.1	WNW	28	35	15	19	1027.1	1027.2	0
12/11:00am	14.7	10.8	9.5	71	2.7	WNW	20	28	11	15	1027.3	1027.4	0
12/10:30am	14.2	10.3	9.4	73	2.5	WNW	20	24	11	13	1027.5	1027.6	0
12/10:00am	13.6	9.9	9.5	76	2.1	WNW	19	24	10	13	1027.5	1027.6	0
12/09:30am	13	9.2	9.1	77	2	WNW	19	24	10	13	1027.5	1027.6	0
12/09:00am	12.8	8.8	8.9	77	1.9	WNW	20	24	11	13	1027.4	1027.5	0.6
12/08:30am	12.6	8.6	8.9	78	1.9	WNW	20	28	11	15	1027.1	1027.2	0.6
12/08:00am	12.5	8.6	8.6	77	1.9	WNW	19	24	10	13	1026.8	1026.9	0.6
12/07:30am	12.5	8	8.6	77	1.9	WNW	22	28	12	15	1026.6	1026.7	0.6
12/07:00am	12.5	8.3	8.4	76	2	WNW	20	28	11	15	1026.3	1026.4	0.6
12/06:30am	12.6	8.4	8.3	75	2.1	NW	20	26	11	14	1026	1026.1	0.6
12/06:00am	12.5	8.5	8.2	75	2.1	WNW	19	28	10	15	1025.8	1025.9	0.6
12/05:30am	12.4	8.9	8.7	78	1.8	NW	17	20	9	11	1025.6	1025.7	0.6
12/05:00am	12.4	8.5	8.7	78	1.8	WNW	19	22	10	12	1025.6	1025.7	0.6
12/04:30am	12.4	8.5	8.7	78	1.8	WNW	19	28	10	15	1025.5	1025.6	0.6
12/04:00am	12.5	8.1	8.8	78	1.8	NW	22	30	12	16	1025.3	1025.4	0.6
12/03:30am	12.6	7.1	9.1	79	1.8	NW	28	37	15	20	1024.9	1025	0.6
12/03:00am	12.5	7.8	9.1	80	1.7	WNW	24	32	13	17	1025.1	1025.2	0.6
12/02:45am	12.5	8.6	9.3	81	1.6	W	20	24	11	13	1025.3	1025.4	0.6
12/02:30am	12.5	8.8	9.5	82	1.5	W	19	26	10	14	1025.4	1025.5	0.6
12/02:13am	12.4	9.1	9.4	82	1.5	WSW	17	30	9	16	1025.4	1025.5	0.6
12/02:00am	12.6	8.7	9.6	82	1.5	W	20	28	11	15	1025.5	1025.6	0.6
12/01:30am	12.4	8.7	9.6	83	1.4	W	19	32	10	17	1025.6	1025.7	0.6
12/01:00am	12.2	8.5	9.6	84	1.3	W	19	26	10	14	1025.6	1025.7	0.6
12/12:30am	12.4	8.8	10	85	1.2	WSW	19	24	10	13	1025.9	1026	0.6
12/12:00am	12.4	8.7	10.1	86	1.2	W	20	30	11	16	1025.8	1025.9	0.6

Date/Time EST	Temp °C	App Temp °C	Dew Point °C	Rel Hum %	Delta-T °C	Wind					Press QNH hPa	Press MSL hPa	Rain since 9am mm
						Dir	Spd km/h	Gust km/h	Spd kts	Gust kts			
11/11:30pm	12.3	8.2	10.2	87	1.1	W	22	30	12	16	1025.8	1025.9	0.6
11/11:00pm	12.4	8.9	10.8	90	0.8	W	20	24	11	13	1025.9	1026	0.6
11/10:30pm	12.4	9.1	11	91	0.7	W	19	24	10	13	1026	1026.1	0.6
11/10:19pm	12.4	8.9	11	91	0.7	W	20	28	11	15	1026	1026.1	0.6
11/10:00pm	12.4	8.9	11	91	0.7	W	20	28	11	15	1026	1026.1	0.6
11/09:39pm	12.4	8.6	11	91	0.7	W	22	32	12	17	1025.9	1026	0.6
11/09:30pm	12.3	8.4	10.9	91	0.7	W	22	30	12	16	1025.9	1026	0.6
11/09:00pm	12.2	7.9	10.8	91	0.7	WNW	24	30	13	16	1025.8	1025.9	0.6
11/08:45pm	12.3	8.4	10.9	91	0.7	W	22	30	12	16	1025.7	1025.8	0.6
11/08:38pm	12.2	8.3	10.8	91	0.7	W	22	30	12	16	1025.7	1025.8	0.6
11/08:31pm	12.3	8.4	10.9	91	0.7	W	22	30	12	16	1025.7	1025.8	0.6
11/08:30pm	12.3	8.4	10.9	91	0.7	W	22	30	12	16	1025.7	1025.8	0.6
11/08:27pm	12.3	8.4	10.7	90	0.8	W	22	28	12	15	1025.8	1025.9	0.4
11/08:19pm	12.2	8.2	10.6	90	0.8	W	22	28	12	15	1025.7	1025.8	0.4
11/08:00pm	12.2	8.2	10.6	90	0.8	W	22	32	12	17	1025.5	1025.6	0.2
11/07:42pm	12.4	8.4	10.5	88	1	W	22	30	12	16	1025.5	1025.6	0.2
11/07:30pm	12.5	8.5	10.4	87	1.1	W	22	28	12	15	1025.4	1025.5	0.2
11/07:00pm	12.4	8	10.5	88	1	W	24	30	13	16	1025	1025.1	0.2
11/06:30pm	12.4	8.8	10.6	89	0.9	W	20	26	11	14	1024.8	1024.9	0.2
11/06:00pm	12.3	8.7	10.7	90	0.8	W	20	30	11	16	1024.6	1024.7	0.2
11/05:30pm	12.4	8.1	10.8	90	0.8	WNW	24	33	13	18	1024.4	1024.5	0.2
11/05:22pm	12.4	8.2	11	91	0.7	WNW	24	32	13	17	1024.2	1024.3	0.2
11/05:00pm	12.3	8	10.9	91	0.7	W	24	32	13	17	1024.1	1024.2	0.2
11/04:47pm	12.2	8.7	10.9	92	0.7	W	20	28	11	15	1024	1024.1	0.2
11/04:30pm	12.2	8.3	10.8	91	0.7	WNW	22	30	12	16	1023.9	1024	0.2
11/04:15pm	12.3	8	10.7	90	0.8	WNW	24	32	13	17	1023.9	1024	0
11/04:00pm	12.5	8.2	10.7	89	0.9	WNW	24	30	13	16	1023.8	1023.9	0
11/03:30pm	12.7	9.3	11.3	91	0.7	WNW	20	28	11	15	1023.6	1023.6	0
11/03:11pm	12.2	8.3	10.8	91	0.7	WNW	22	30	12	16	1023.6	1023.6	0
11/03:00pm	12.2	8.3	10.8	91	0.7	WNW	22	30	12	16	1023.6	1023.6	0
11/02:53pm	12.1	7.4	10.5	90	0.8	WNW	26	32	14	17	1023.6	1023.6	0
11/02:30pm	12.4	8.9	11	91	0.7	WNW	20	28	11	15	1023.3	1023.3	0
11/02:23pm	12.5	9.1	11.1	91	0.7	WNW	20	28	11	15	1023.4	1023.4	0
11/02:19pm	12.2	8.3	10.8	91	0.7	WNW	22	30	12	16	1023.5	1023.5	0
11/02:18pm	12.2	7.9	10.8	91	0.7	WNW	24	30	13	16	1023.5	1023.5	0
11/02:00pm	12.1	8.4	10.3	89	0.9	WNW	20	28	11	15	1023.5	1023.5	0
11/01:50pm	12.1	7.6	10	87	1.1	WNW	24	33	13	18	1023.3	1023.3	0
11/01:30pm	12.5	7.2	9.9	84	1.3	WNW	28	37	15	20	1023.3	1023.3	0
11/01:00pm	13.1	7.4	9.9	81	1.6	WNW	30	39	16	21	1023.3	1023.3	0
11/12:57pm	13.2	7.6	10	81	1.7	WNW	30	39	16	21	1023.3	1023.3	0
11/12:44pm	12.4	7	9.4	82	1.5	WNW	28	39	15	21	1023.3	1023.3	0
11/12:30pm	12.6	7.2	9.6	82	1.5	W	28	37	15	20	1023.3	1023.3	0

Appendix 3 – Equipment Certificates

Calibration certificate number 46231

Instrument laserOne **Huberg serial number** 19121.18

Description of the calibration procedure

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

Check of the instrument between 0 ÷ 10000 ppm CH4

Full scale (ppm)	Gas concentration (ppm)	Response1 (ppm)	Response2 (ppm)	Response3 (ppm)	Average response (ppm)	Max error (ppm)	Max error (% F.s.)
1000	0	0	0	0	0,00	0,00	0,00
1000	100	101	100	98	99,00	2,00	0,20
1000	1000	1002	1000	998	1.000,00	2,00	0,20

Uncertainty	0,20	%
Max % error	0,20	% Fs

Check of the instrument between 0 ÷ 100 % vol CH4

Full scale (%vol)	Gas concentration (%vol)	Response 1 (%vol)	Response 2 (%vol)	Response 3 (%vol)	Average response (%vol)	Max error (%vol)	Max error (% F.s.)
10	0	0	0	0	0,00	0,00	0,00
10	2,2	2,2	2,3	2,2	2,00	0,10	1,00
100	100	99	99	100	99,00	1,00	1,00

Uncertainty	1,00	%
Max % error	1,00	% Fs

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Sede/Sitz: Via Copernico 18/Kopernikusstr.18 • I-39100 Bolzano/Bozen (BZ) • http://www.huberg.com • E-Mail:huberg@huberg.com
Tel: +39 0471-936011 • Fax: +39 0471-205037 • N. Reg. imprese BZ, Cod. fisc. e Part. IVA. 01279940215

Environmental condition during calibration

Temperature	:	20 °C
Pressure	:	1012 mBar
U.R.	:	41 %

Calibration gas cylinders[1]

Gas	Serial number	Date of expire	GAS
Aria sintetica	047761	09/11/2023	AIR
100 PPM	AD0F9E6	14/06/2020	CH4
1000 PPM	ADT64C6	18/06/2020	CH4
1% vol	001231	10/06/2020	CH4
2,2 % VOL	080393	27/08/2021	CH4
100 % VOL	ADWR36L	09/11/2020	CH4

Calibration results	:	POSITIVE	Next scheduled calibration	:	22/01/2020
Calibration date	:	22/01/2019	Calibration supervisor	:	Stella Andrea

Andr Stell

[1] **The certificate of the gases could be downloaded at the following address http://www.huberg.com/certificati**

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SERVICE OR REPAIR: GA5000

COMPANY	Ecowise Australia				
CONTACT	Andrew Van Prooyen				
SERIAL NO.	G505264	**CALL NO.**	SV1901240001	**RECEIVED**	24th Jan 2019

REQUEST/PROBLEM DESCRIPTION
Annual Calibration

This equipment has been calibrated to the manufacturer's specifications, using the standards shown below:

SENSOR	STANDARD	TRACEABILITY LOT NO.	PRE CALIBRATION READING	POST CALIBRATION READING
CH_4	0 %	785304	0.3 %	0 %
	60 %	808466	60.3%	60 %
CO_2	40 %	808466	39.3 %	40 %
O_2	0 %	785304	0.1%	0 %
	20.9 %	912744	21.2 %	20.9 %
CO	0 ppm	785304	0 ppm	0 ppm
	100 ppm	912744	100 ppm	100 ppm
H_2S	0 ppm	785304	4 ppm	0 ppm
	25 ppm	912744	22 ppm	25 ppm

- **Checked battery condition**
- **Checked for adequate flow and leak tested**
- **Checked internal filters**
- **Set next service due or gas check date**

COMMENTS/ADDITIONAL REPAIRS/SERVICES PERFORMED
Firmware V1.14.12. Pump checked OK Internal filters replaced Field calibration performed as per manufacturer's specifications. Manufacturer's service due 13th Feb 2021.

SERVICED BY	Minto Chandy	**COMPLETED**	25th Jan 2019
SIGNATURE	Minto Chandy		

Appendix 4 – Field Sheets

BUILDINGS / STRUCTURES MONITORING FIELD SHEET

Client: Latrobe City Council	**Site/Project:** Hyland Hwy Landfill	**Date:** 15/5/19
Sampler: L. Bourke	**Equipment ID:** Laserone S/N: 19121.18	**Last calibration date:** ~~28/1/19~~ 22/1/19 16/5
Initial air pressure (mb): [x] Rising 1014 [ ] Falling	Weather conditions: dry, overcast Ground conditions: dry	

Description & use of Structure: **Education Centre**	GPS: **38°16'40.03"S 146°33'27.96"E**
Location & proximity to landfill site: **Approximately 50m West of the landfill**	
Approximate dimensions and construction material, sealed/unsealed? **12.5x13.5m Sealed, plastered, suspension ceiling.**	
Note any activities and the presence of chemicals such as: smoking, painting, presence of hydrocarbons, fuels, exhaust fumes, household cleaning products etc: **Store room houses solvents and various cleaning products** ✓	
Any known landfill gas dissipation or management measures (for example, gas membranes or voids beneath the building/structure): **Unknown. Mostly open undeneath, built on stumps** ✓	
Identify locations of penetrations or entry paths for any landfill gas to enter the building/structure (e.g. around service ingress points such as pipework, cracks in floor, around the skirting board etc.): **Kitchen (water in & out, gas, power). Bathroom, shower, toilets, sinks** ✓	
Identify locations of likely accumulation points for any landfill gas that may enter the building / structure (for example, attics or cupboards): **Ceiling cavity, kitchen cupboards, inside benchseats,** ✓	
Note accessibility of the various areas within the building/structure, including underfloor voids, wall cavities, roof cavities etc: **lift a loose ceiling tile to check in cavity** ✓	
Around service ingress points, such as pipework: **Yes check** ✓	
Inside electricity meter/fuse box: **Yes check** ✓	
Inside cabinets within bathrooms, kitchens, laundries and other rooms: **Yes check** ✓	
Around cracks and penetrations through floors: **Yes check** ✓	
Along skirting boards and joins between floors and walls: **Yes check** ✓	

Description of monitoring point location	**CH4 maximum(ppm)**	**Comment**
ALL	2.1	

Air check: Low Conc-CH4(~ 2.0ppm) [x] Comments: **Time Finished:** 1035

SUBSURFACE SERVICES MONITORING FIELD SHEET

Client: Latrobe City Council	**Site/Project:** Hyland Hwy Landfill	**Date:** 15/5/19
Sampler: L. Bordle	**Equipment ID:** Laserone S/N: 19121. 18	**Last calibration date:** ~~28/9/18~~ LB 16/5 22/1/19
Initial air pressure (mb): ☒ Rising ☐ Falling 1014	**Weather conditions:** overcast	
	Ground conditions: dry	

* rate of change in concentration when unstabilised readings were taken (rapidly or slowly increasing or decreasing)

** fluctuation (± % v/v) of direction and rate of change in concentration (± % v/v per 10 seconds)

Description and location of service:	Main power box and cables. Eastern side of building					GPS:	38°16'40.18"S 146°33'28.13"E
Observations: Odour, Condition, Dimensions, Access							
Start time	CH4 Maximum from low concentration CH4 detector (ppm)	CH4 Stabilised range (ppm)		Unstable Range (ppm)(post 3 minutes instability)		* rate of change	Comments/Observations potential disruption to representative data:
1000	2.1						NONE
Air check: Low Conc-CH4(~ 2.0ppm) ☒ Comments:						**Time Finished:**	1035

Description and location of service:	Hot water service pipe work. Eastern side of building.					GPS:	38°16'40.26"S 146°33'28.10"E
Observations: Odour, Condition, Dimensions, Access							
Start time	CH4 Maximum from low concentration CH4 detector (ppm)	CH4 Stabilised range (ppm)		Unstable Range (ppm)(post 3 minutes instability)		* rate of change	Comments/Observations potential disruption to representative data:
1000	2.1						NONE
Air check: Low Conc-CH4(~ 2.0ppm) ☒ Comments:						**Time Finished:**	1035

SUBSURFACE SERVICES MONITORING FIELD SHEET

Client: Latrobe City Council	**Site/Project:** Hyland Hwy Landfill		**Date:** 15/5/19
Sampler: L. Bordie	**Equipment ID:** Laserone S/N: 19121.18		**Last calibration date:** ~~28/9/18~~ 16/5 LB 22/1/19
Initial air pressure (mb): ☒ Rising ☐ Falling 1014	**Weather conditions:** overcast		
	Ground conditions: dry		

* rate of change in concentration when unstabilised readings were taken (rapidly or slowly increasing or decreasing)

** fluctuation (± % v/v) of direction and rate of change in concentration (± % v/v per 10 seconds)

Description and location of service:	Drain pipe. West side under building					GPS:	38°16'40.31"S 146°33'27.50"E
Observations: Odour, Condition, Dimensions, Access							
Start time	CH4 Maximum from low concentration CH4 detector (ppm)	CH4 Stabilised range (ppm)		Unstable Range (ppm)(post 3 minutes instability)		* rate of change	Comments/Observations potential disruption to representative data:
1000	2.1						NONE
Air check: Low Conc-CH4(~ 2.0ppm) ☒ Comments:						**Time Finished:**	1035

Description and location of service:	Sewer pipe. West side under building					GPS:	38°16'40.24"S 146°33'27.53"E
Observations: Odour, Condition, Dimensions, Access							
Start time	CH4 Maximum from low concentration CH4 detector (ppm)	CH4 Stabilised range (ppm)		Unstable Range (ppm)(post 3 minutes instability)		* rate of change	Comments/Observations potential disruption to representative data:
1000	2.1						NONE
Air check: Low Conc-CH4(~ 2.0ppm) ☒ Comments:						**Time Finished:**	1035

SUBSURFACE SERVICES MONITORING FIELD SHEET

Client: Latrobe City Council	**Site/Project:** Hyland Hwy Landfill		**Date:** 15/5/19
Sampler: L. Bordle	**Equipment ID:** Laserone S/N: 19121.18	**Last calibration date:** ~~28/9/18~~ 16/5 LB 22/1/19	
Initial air pressure (mb): ☒ Rising ☐ Falling 1014	**Weather conditions:** overcast		
	Ground conditions: dry		

* rate of change in concentration when unstabilised readings were taken (rapidly or slowly increasing or decreasing)

** fluctuation (± % v/v) of direction and rate of change in concentration (± % v/v per 10 seconds)

Description and location of service: Sewer breather. Western side of building. | GPS: 38°16'40.20"S 146°33'27.55"E

Observations: Odour, Condition, Dimensions, Access

Start time	CH4 Maximum from low concentration CH4 detector (ppm)	CH4 Stabilised range (ppm)		Unstable Range (ppm)(post 3 minutes instability)		* rate of change	Comments/Observations potential disruption to representative data:
1000	2.1						NONE

Air check: Low Conc-CH4(~ 2.0ppm) ☒ Comments: **Time Finished:** 1035

Description and location of service: Stormwater pipe. Tank overflow. | GPS: 38°16'40.15"S 146°33'27.42"E

Observations: Odour, Condition, Dimensions, Access

Start time	CH4 Maximum from low concentration CH4 detector (ppm)	CH4 Stabilised range (ppm)		Unstable Range (ppm)(post 3 minutes instability)		* rate of change	Comments/Observations potential disruption to representative data:
1000	2.1						NONE

Air check: Low Conc-CH4(~ 2.0ppm) ☒ Comments: **Time Finished:** 1035

SUBSURFACE SERVICES MONITORING FIELD SHEET

ALS

Client: Latrobe City Council		**Site/Project:** Hyland Hwy Landfill		**Date:** 15/5/19
Sampler: L. Boville	**Equipment ID:**	Laserone S/N: 19121.18		**Last calibration date:** ~~28/9/18~~ 16/5 LB 22/1/19
Initial air pressure (mb): [x] Rising [ ] Falling 1014		**Weather conditions:** overcast		
		Ground conditions: dry		

* rate of change in concentration when unstabilised readings were taken (rapidly or slowly increasing or decreasing)

** fluctuation (± % v/v) of direction and rate of change in concentration (± % v/v per 10 seconds)

Description and location of service: Stormwater pipe. Into tank — GPS: 38°16'40.04"S 146°33'27.48"E

Observations: Odour, Condition, Dimensions, Access

Start time	CH4 Maximum from low concentration CH4 detector (ppm)	CH4 Stabilised range (ppm)		Unstable Range (ppm)(post 3 minutes instability)		* rate of change	Comments/Observations potential disruption to representative data:
1000	2.1						NONE

Air check: Low Conc-CH4(~ 2.0ppm) [x] Comments: — **Time Finished:** 1035

Description and location of service: Downpipe. North side of building — GPS: 38°16'40.03"S 146°33'27.96"E

Observations: Odour, Condition, Dimensions, Access

Start time	CH4 Maximum from low concentration CH4 detector (ppm)	CH4 Stabilised range (ppm)		Unstable Range (ppm)(post 3 minutes instability)		* rate of change	Comments/Observations potential disruption to representative data:
1000	2.1						NONE

Air check: Low Conc-CH4(~ 2.0ppm) [x] Comments: — **Time Finished:** 1035

SUBSURFACE SERVICES MONITORING FIELD SHEET

Client: Latrobe City Council		**Site/Project:** Hyland Hwy Landfill		**Date:** 15/5/19	
Sampler: L. Bovill	**Equipment ID:** Laserone S/N: 19121.18		**Last calibration date:** ~~28/9/18~~ 16/5 LB 22/1/19		
Initial air pressure (mb): ☒ Rising ☐ Falling 1014		**Weather conditions:** overcast			
		Ground conditions: dry			

* rate of change in concentration when unstabilised readings were taken (rapidly or slowly increasing or decreasing)

** fluctuation (± % v/v) of direction and rate of change in concentration (± % v/v per 10 seconds)

Description and location of service:	Stormwater pit. Side of road opposite compound entrance						GPS: 38°16'38.37"S 146°33'30.60"E
Observations: Odour, Condition, Dimensions, Access							
Start time	CH4 Maximum from low concentration CH4 detector (ppm)	CH4 Stabilised range (ppm)		Unstable Range (ppm)(post 3 minutes instability)		* rate of change	Comments/Observations potential disruption to representative data: NONE
1000	2.1						
Air check: Low Conc-CH4(~ 2.0ppm) ☒ Comments:							**Time Finished:** 1035

Description and location of service:							GPS:
Observations: Odour, Condition, Dimensions, Access							
Start time	CH4 Maximum from low concentration CH4 detector (ppm)	CH4 Stabilised range (ppm)		Unstable Range (ppm)(post 3 minutes instability)		* rate of change	Comments/Observations potential disruption to representative data:
Air check: Low Conc-CH4(~ 2.0ppm) ☐ Comments:							**Time Finished:**

LANDFILL CAP WALKOVER MONITORING FIELD SHEET

ALS

Client: Latrobe City Council	**Site/Project:** Hyland Hwy Landfill		**Date:** 15/5/19
Sampler: L Boyle	**Equipment ID:** Laserone S/N: 19121.18	**Last calibration date:** ~~28/09/2018~~ 15/5 LB 22/1/19	
Initial air pressure (mb): 1014 ☒ Rising ☐ Falling	**Weather conditions:** overcast **Ground conditions:** dry		
Comments/Observations identified that may prevent representative data? no			
Air check: Low Conc-CH4(~ 2.0ppm) ☑	**Time Started :** 825	**Time Finished:** 1035	

POINT ID	TIME	OBSERVATION/FEATURE	CH4 PPM	EASTING	NORTHING	Wind Speed (km/h)	Time
1	840	Washout near borehole 3. Intermediate cap	120	146°33'37"	38°16'39"	2.2	850
2	852	Black pipe out of ground Intermediate cap-	6.2% vol.	146°~~33~~'36"	38°16'40"	3.0	855
3	905	Black pipe out of ground	324	146°33.571	38°16.728'	5.0	908
4	923	Black pipe out of ground	9800	146°33.584	38°16.673'	2.5	926
5	953	Washout, intemediate cap.	120	146°33.667	38°16.666	6.7	956

GAS BORE MONITORING FIELD SHEET

Client:	Latrobe City Council	**Site/Project:**	Hyland Hwy Landfill	**Date:**	14-5-19

Sampler:	C. Bowke,	**Equipment ID:**	GA5000 S/N:G505264	**Last calibration date:**	24/1/19

Initial air pressure (mb):	**Weather conditions:** Overcast, WSW, breeze, 15.7°C
☐ Rising 1014	
☑ Falling	**Ground conditions:** Light breeze,

* aspiration time when stabilised readings were taken, add note if not stabilised

** fluctuation (± % v/v) of direction and rate of change in concentration (± % v/v per 10 seconds)

Bore ID	Start time	Air pressure (mb)	Relative pressure (mb)	Peak CH_4 (% v/v)	Stabilised CH_4 (% v/v)	Peak CO_2 (% v/v)	Stabilised CO_2 (% v/v)	Min. O_2 (% v/v)	Stabilised O_2 (% v/v)	H2S (ppm)	CO (ppm)	Balance	Flow l/hr	Aspiration time min/sec*	Fluctuation (± % v/v)**
LFG01	1028	1014 ~~kPA~~	0.02	0.0	0.0	10.0	10.0	9.1	9.1	1	0	80.9	0.8	180	
Comments: Capped + Sealed. Unlocked.															
Air check: CH_4 (<0.1%) ☑	CO_2 (<0.1%) ☑	O_2 (21.0%) ☑	Comment												
LFG02	1037	1014	-0.02	0.0	0.0	0.7	0.1	19.9	19.9	2	0	80.0	0.6	180	
Comments: Capped, Sealed. Monument broken.															
Air check: CH_4 (<0.1%) ☑	CO_2 (<0.1%) ☑	O_2 (21.0%) ☑	Comment												
LFG03	1046	1014	0.07	0.0	0.0	1.0	1.0	19.3	19.3	2	0	79.7	0.2	180	
Comments: Capped, Sealed. Unlocked															
Air check: CH_4 (<0.1%) ☑	CO_2 (<0.1%) ☑	O_2 (21.0%) ☑	Comment												

Comments/Observations:

Time Finished:

GAS BORE MONITORING FIELD SHEET

Client: Latrobe City Council	Site/Project: Hyland Hwy Landfill	Date: 14-5-19

Sampler: L. Bourke,	Equipment ID: GA5000 S/N:G505264	Last calibration date: 24/1/19

Initial air pressure (mb): 1014	Weather conditions: Overcast, breeze, WNW, 16°C.
☐ Rising	
☑ Falling	Ground conditions: Light breeze,

* aspiration time when stabilised readings were taken, add note if not stabilised

** fluctuation (± % v/v) of direction and rate of change in concentration (± % v/v per 10 seconds)

Bore ID	Start time	Air pressure (mb)	Relative pressure (mb)	Peak CH_4 (% v/v)	Stabilised CH_4 (% v/v)	Peak CO_2 (% v/v)	Stabilised CO_2 (% v/v)	Min. O_2 (% v/v)	Stabilised O_2 (% v/v)	H2S (ppm)	CO (ppm)	Balance	Flow l/hr	Aspiration time min/sec*	Fluctuation (± % v/v)**
LFG04	1056	1014	0.07	0.0	0.0	0.2	0.1	20.1	20.1	2	0	79.8	0.1	180	
Comments: Capped, Sealed,															
Air check: CH_4 (<0.1%) ☑	CO_2 (<0.1%) ☑	O_2 (21.0%) ☑	Comment: 1ppm H2S background												
LFG05	1107	1014	-1.62	0.0	0.0	0.4	0.4	20.1	20.1	1	0	79.5	0.1	180	
Comments: Capped, Sealed.															
Air check: CH_4 (<0.1%) ☑	CO_2 (<0.1%) ☑	O_2 (21.0%) ☑	Comment: 1ppm H2S background.												
LFG06	1119	1014	-2.19	0.0	0.0	1.1	1.1	19.6	19.6	1	0	79.3	0.0	180	
Comments: Capped, Sealed, not Locked															
Air check: CH_4 (<0.1%) ☑	CO_2 (<0.1%) ☑	O_2 (21.0%) ☑	Comment												

Comments/Observations:

Time Finished:

GAS BORE MONITORING FIELD SHEET

Client:	Latrobe City Council	**Site/Project:**	Hyland Hwy Landfill	**Date:**	14-5-19.
Sampler:	L. Bowke,	**Equipment ID:**	GA5000 S/N:G505264	**Last calibration date:**	24/1/19

Initial air pressure (mb): 1014
☐ Rising
☑ Falling

Weather conditions: Overcast, breeze, W, 15.6°c

Ground conditions: breeze.

* aspiration time when stabilised readings were taken, add note if not stabilised
** fluctuation (± % v/v) of direction and rate of change in concentration (± % v/v per 10 seconds)

Bore ID	Start time	Air pressure (mb)	Relative pressure (mb)	Peak CH_4 (% v/v)	Stabilised CH_4 (% v/v)	Peak CO_2 (% v/v)	Stabilised CO_2 (% v/v)	Min. O_2 (% v/v)	Stabilised O_2 (% v/v)	H2S (ppm)	CO (ppm)	Balance	Flow l/hr	Aspiration time min/sec*	Fluctuation (± % v/v)**
LFG07	11^{30}	1014	-0.07	0.0	0.0	0.1	0.1	20.5	20.5	1	0	79.4	0.5	180	
Comments: Capped, Sealed, crack at base of monument.															
Air check: CH_4 (<0.1%) ☑	CO_2 (<0.1%) ☑	O_2 (21.0%) ☑	Comment 1 H2S background reading.												
LFG08	11^{42}	1014	-4.05	0.0	0.0	0.2	0.2	20.5	20.5	1	1	79.3	0.6	180	
Comments: Capped, Sealed, crack at base of monument.															
Air check: CH_4 (<0.1%) ☑	CO_2 (<0.1%) ☑	O_2 (21.0%) ☑	Comment												
LFG09	11^{50}		0.07	0.0	0.0	0.7	0.7	20.1	20.1	1	0	79.2	0.5	180	
Comments: Capped, Sealed,															
Air check: CH_4 (<0.1%) ☑	CO_2 (<0.1%) ☑	O_2 (21.0%) ☑	Comment 1 H2S background reading												

Comments/Observations:

Time Finished:

GAS BORE MONITORING FIELD SHEET

Client:	Latrobe City Council	Site/Project:	Hyland Hwy Landfill	Date:	14-5-19.

Sampler:		Equipment ID:	GA5000 S/N:G505264	Last calibration date:	24/1/19

Initial air pressure (mb):		Weather conditions:	Overcast,
☐ Rising	1014		
☑ Falling		Ground conditions:	Light breeze.

* aspiration time when stabilised readings were taken, add note if not stabilised

** fluctuation (± % v/v) of direction and rate of change in concentration (± % v/v per 10 seconds)

Bore ID	Start time	Air pressure (mb)	Relative pressure (mb)	Peak CH_4 (% v/v)	Stabilised CH_4 (% v/v)	Peak CO_2 (% v/v)	Stabilised CO_2 (% v/v)	Min. O_2 (% v/v)	Stabilised O_2 (% v/v)	H2S (ppm)	CO (ppm)	Balance	Flow l/hr	Aspiration time min/sec*	Fluctuation (± % v/v)**
LFG10	1157	1014	0.12	0.0	0.0	1.4	1.4	19.2	19.2	1	0	79.4	0.5	180	
Comments: Sealed, Capped,															
Air check: CH_4 (<0.1%) ☑	CO_2 (<0.1%) ☑	O_2 (21.0%) ☑	Comment												
LFG11	12[10]	1014	-0.53	0.0	0.0	1.0	0.7	19.9	20.2	1	0	79.1	0.3	180	
Comments: Sealed, Capped.															
Air check: CH_4 (<0.1%) ☑	CO_2 (<0.1%) ☑	O_2 (21.0%) ☑	Comment 1 H_2S background reading												
LFG12	12[21]	1014	0.00	0.0	0.0	1.0	1.10	19.8	19.8	1	0	79.2	0.5	180	
Comments: Sealed, Capped.															
Air check: CH_4 (<0.1%) ☑	CO_2 (<0.1%) ☑	O_2 (21.0%) ☑	Comment 1 H_2S background reading												

Comments/Observations:

Time Finished: 1230.

PE No: 19-21318

Water Resources Group - Analysis Request Form

Date Received	Program	Company
		LaTrobe City Council

Sampler : Leo Bourke Date Scheduled : Date Sampled: 16 / 5 / 19

Program Description : Sampled by ALS USING PROCEDURE EN67: YES or NO

Form : WEST

Sample No	Sample Name	Time	Site Details	SWL (m)	Field Temp	DO mg/L	pH Units	EC uS/cm	REDOX mv
6090010	STORMWATER POND 1	10:10	Fall to spilling turbid, creamy colour, cloudy no odour	-	11.4	~~7.4~~ 7.32	~~8.13~~ 7.98	324.8	~~20.5~~ -17.6
6090011	STORMWATER POND 2	10:25	Turbid, creamy cloudy ½ metre below full no odour		11.9	9.25	8.05	392.3	-9.8
6090012	TRARALGON CREEK US	8:15	Low flow clear to light brown odourless	-	10.9	11.02	6.90	302	25.1
6090013	TRARALGON CREEK DS	8:50	no flow, light oil on surface clear	-	11.1	6.52	7.05	306	15.3
6090014	RO PERMEATE								

P_150_MET_GRN (150mL green Band) **P_500_** (500mL plastic) **GA_100_HAA** (100mL Haloacetic acid) **G_40_THM** (40mL vial x 2) **GA_100_TOC** (100mL brown glass - white cap)
P_250 (250mL plastic) **P_250_MIC** (250mL plastic - red dot) **P_125** (125 mL plastic) **P_1L** (1 Litre plastic) **P_250_CHEM** (250 mL plastic) **P_250_NUTS** (250 mL plastic)

PE No:
19-21318

Water Resources Group - Analysis Request Form

Date Received	Program	Company
		LaTrobe City Council

Sampler : L. Bourke.

Date Scheduled :

Date Sampled: 16 / 5 / 19

Program Description :

Sampled by ALS USING PROCEDURE EN67: YES or NO

Form : WEST

Sample No	Sample Name	Time	Site Details	SWL (m)	Field Temp	DO mg/L	pH Units	EC uS/cm	REDOX mv
6090005	LEACHATE POND 1	950	- 1 metre from full - Green odour. - no odour.		11.6	10.57	9.74	5945	-21.7
6090006	LEACHATE POND 2	935	1 metre from full. - leachate odour - dark brown/green.		13.4 ~~18.9~~	6.09 ~~0.39~~	8.51 ~~7.21~~	~~14903~~ ~~13773~~ 14851	~~-32.9~~ ~~-231.2~~ -25.9
6090007	LEACHATE SUMP 1 - Cell 3	925	- dark brown - leachate odour.	-	18.3	1.26	7.36	22190	-59.1
6090008	LEACHATE SUMP 2 - Cell 4	915	leachate odour brown.		18.9	0.39	7.21	13773	-231.2
6090009	GW INTERCEPTION SYSTEM								

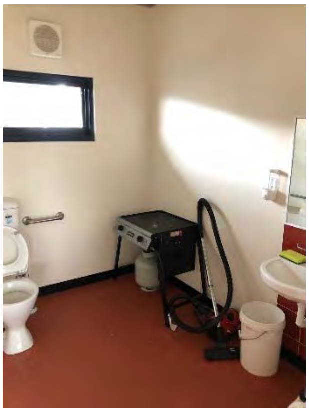
P_150_MET_GRN (150mL green Band) **P_500_** (500mL plastic) **GA_100_HAA** (100mL Haloacetic acid) **G_40_THM** (40mL vial x 2) **GA_100_TOC** (100mL brown glass - white cap)
P_250 (250mL plastic) **P_250_MIC** (250mL plastic - red dot) **P_125** (125 mL plastic) **P_1L** (1 Litre plastic) **P_250_CHEM** (250 mL plastic) **P_250_NUTS** (250 mL plastic)

Printed: 30/04/2019

Appendix 5 – Buildings, Structures, Services Photos

Hyland Recreation Centre

Bathroom



Kitchen

Main room

Main room 2

Office

Shower

Store

Toilets

Shipping container

Hyland Sub Services and Buildings

Downpipe

Drain sewer breather

Hot water service

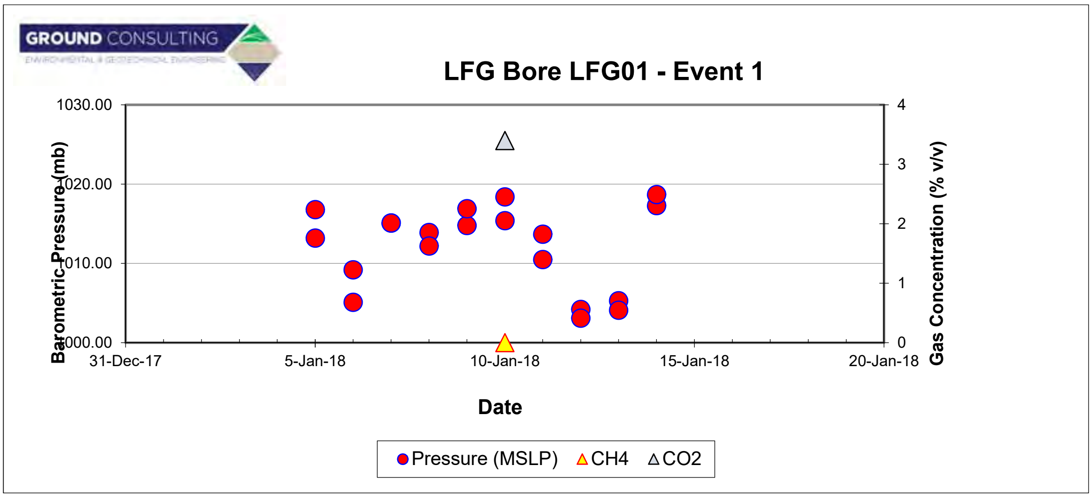
Power box

SW from tank

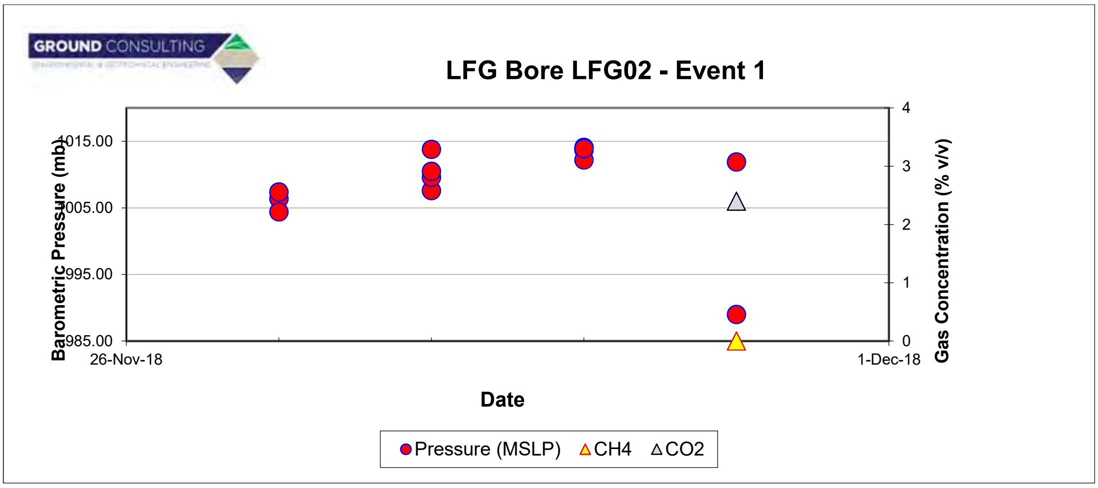
SW pit

SW2 from tank

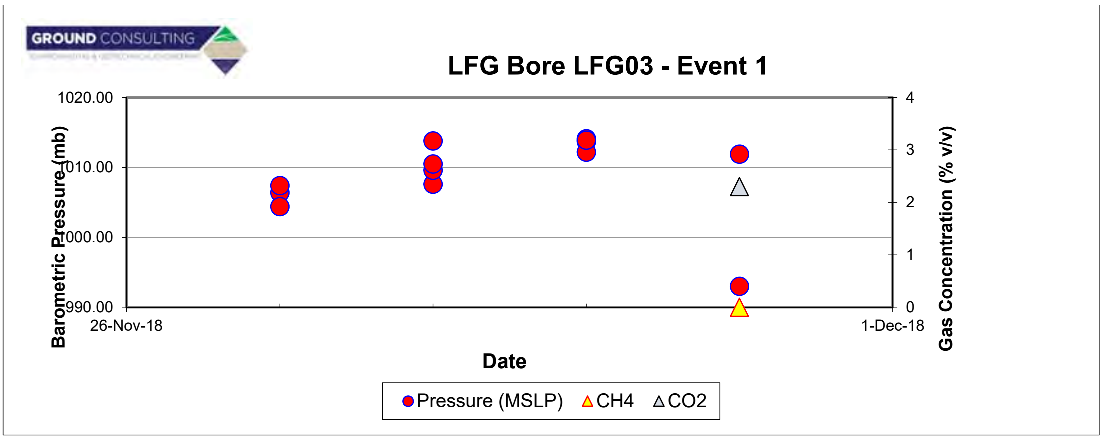
Appendix F-5
LFG Monitoring Plots



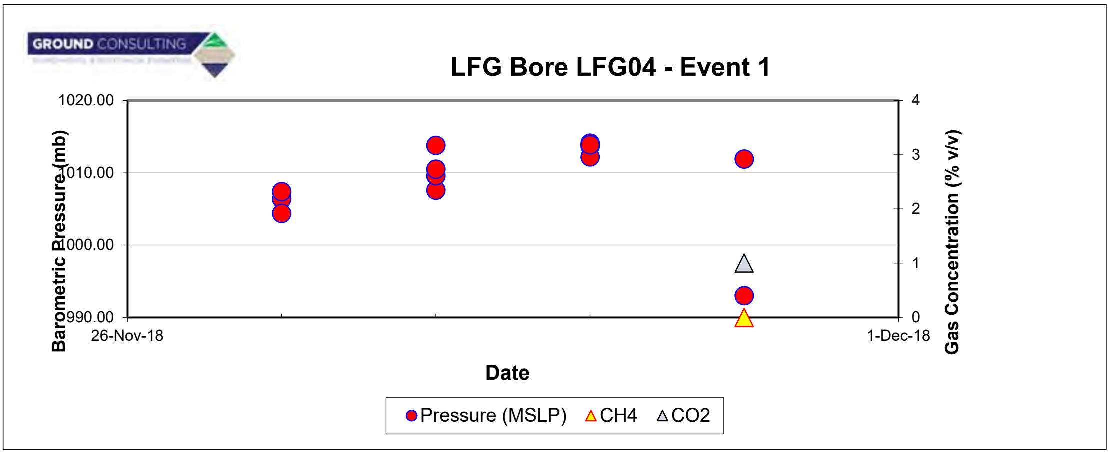
GROUND CONSULTING
LFG Bore LFG01 - Event 1
1030.00
1020.00
1010.00
1000.00
Barometric Pressure (mb)
4
3
2
1
0
Gas Concentration (% v/v)
31-Dec-17
5-Jan-18
10-Jan-18
15-Jan-18
20-Jan-18
Date
Pressure (MSLP)
CH4
CO2

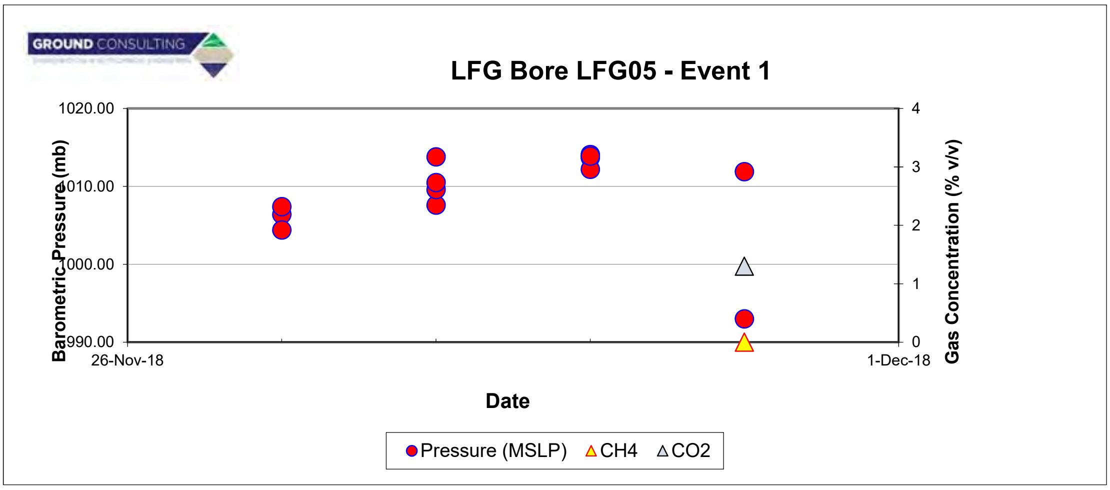


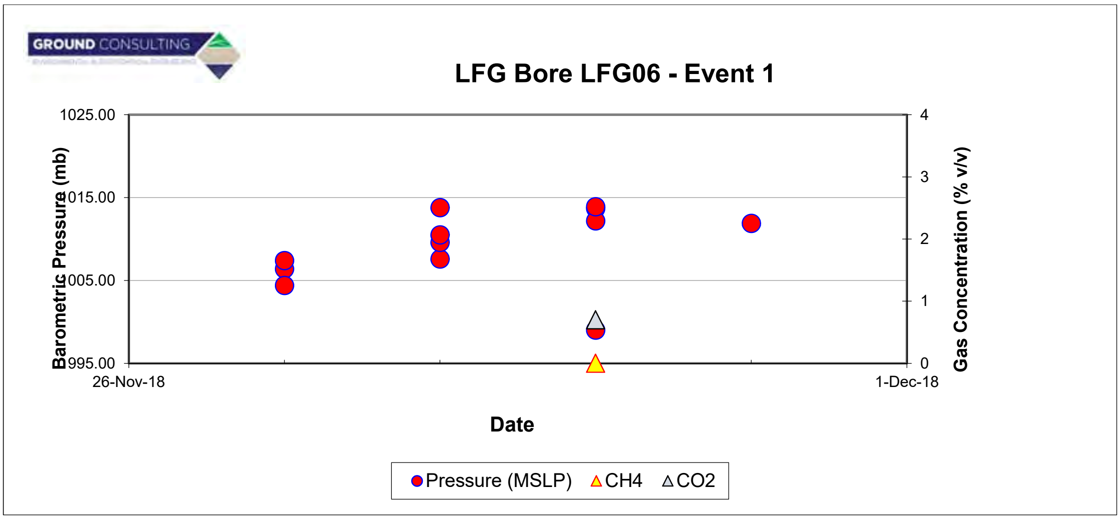
GROUND CONSULTING
LFG Bore LFG02 - Event 1
1015.00
1005.00
995.00
985.00
Barometric Pressure (mb)
4
3
2
1
0
Gas Concentration (% v/v)
26-Nov-18
1-Dec-18
Date
Pressure (MSLP)
CH4
CO2

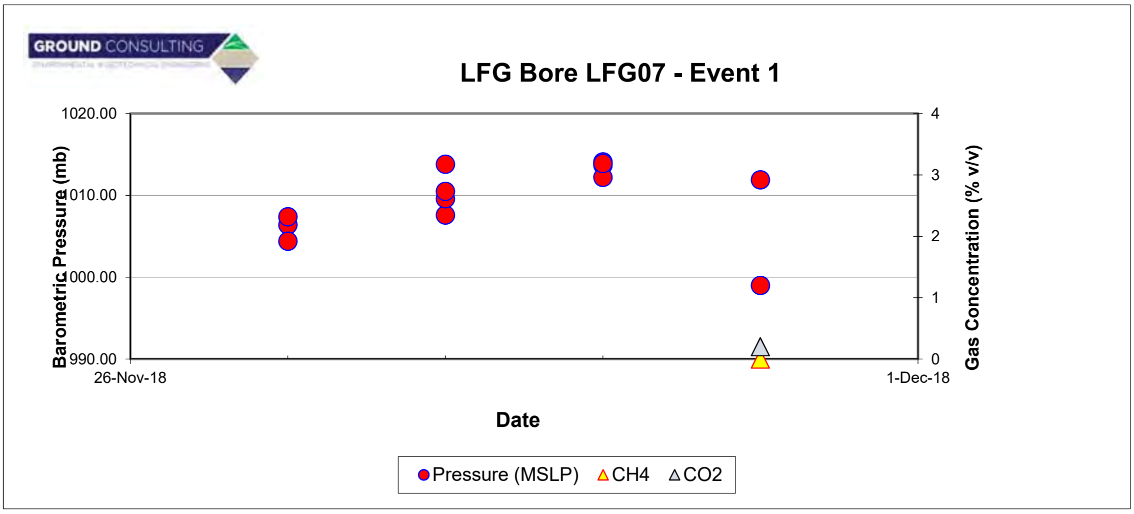


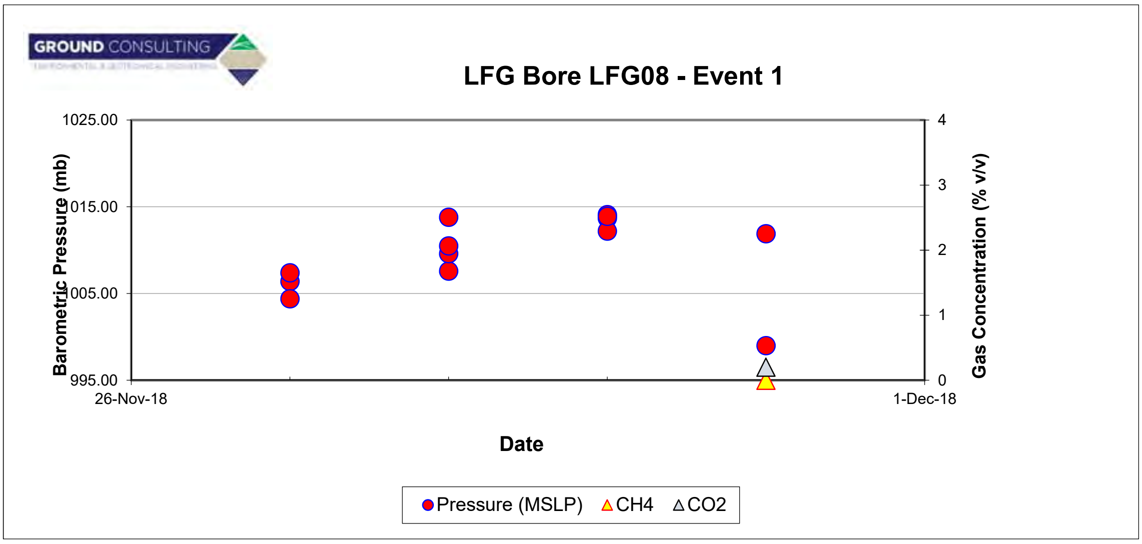
GROUND CONSULTING
LFG Bore LFG03 - Event 1
1020.00
1010.00
1000.00
990.00
Barometric Pressure (mb)
4
3
2
1
0
Gas Concentration (% v/v)
26-Nov-18
1-Dec-18
Date
Pressure (MSLP)
CH4
CO2

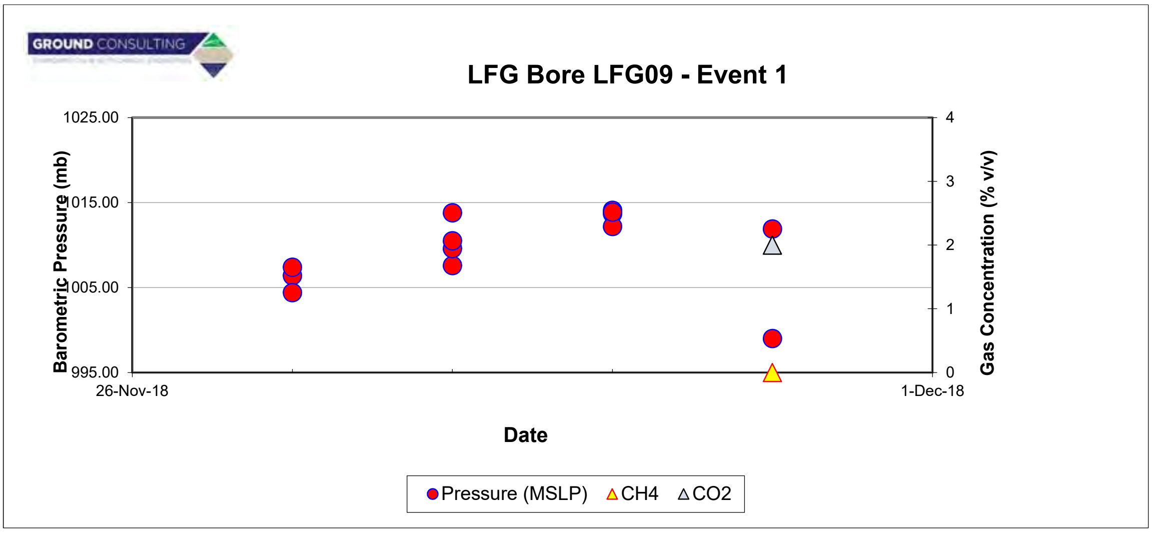

GROUND CONSULTING
LFG Bore LFG04 - Event 1
1020.00
1010.00
1000.00
990.00
4
3
2
1
0
26-Nov-18
1-Dec-18
Barometric Pressure (mb)
Gas Concentration (% v/v)
Date
Pressure (MSLP)
CH4
CO2

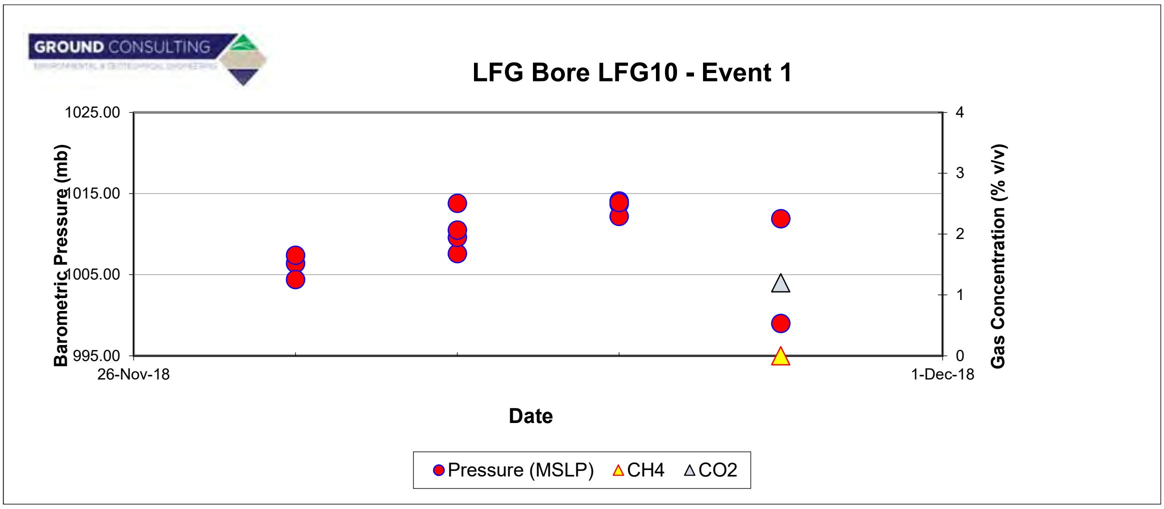

GROUND CONSULTING
LFG Bore LFG05 - Event 1
1020.00
1010.00
1000.00
990.00
4
3
2
1
0
26-Nov-18
1-Dec-18
Barometric Pressure (mb)
Gas Concentration (% v/v)
Date
Pressure (MSLP)
CH4
CO2


GROUND CONSULTING
LFG Bore LFG06 - Event 1
1025.00
1015.00
1005.00
995.00
4
3
2
1
0
26-Nov-18
1-Dec-18
Barometric Pressure (mb)
Gas Concentration (% v/v)
Date
Pressure (MSLP)
CH4
CO2

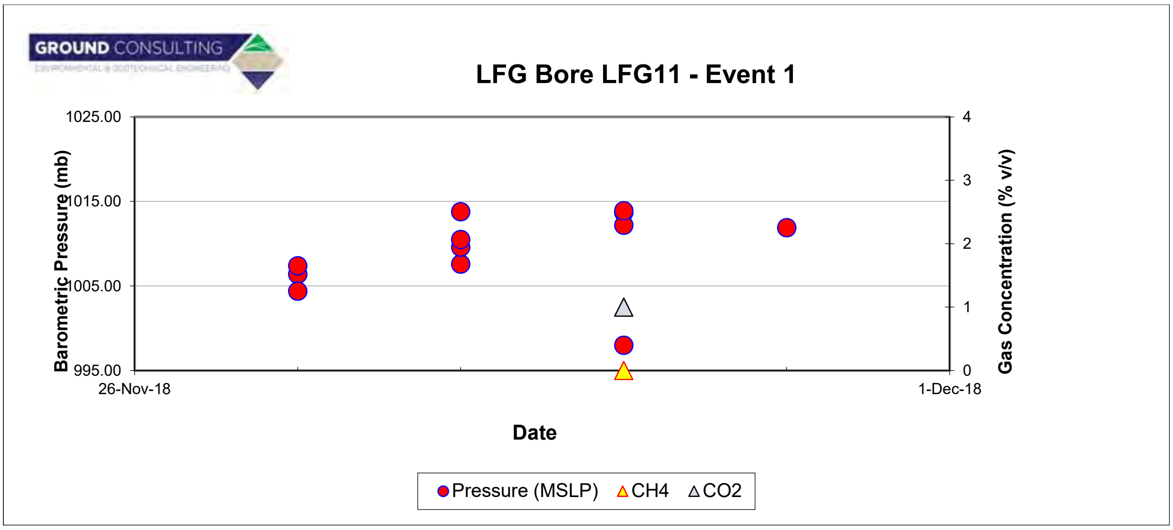

GROUND CONSULTING
LFG Bore LFG07 - Event 1
Barometric Pressure (mb)
Gas Concentration (% v/v)
1020.00
1010.00
1000.00
990.00
4
3
2
1
0
26-Nov-18
1-Dec-18
Date
Pressure (MSLP)
CH4
CO2


GROUND CONSULTING
LFG Bore LFG08 - Event 1
Barometric Pressure (mb)
Gas Concentration (% v/v)
1025.00
1015.00
1005.00
995.00
4
3
2
1
0
26-Nov-18
1-Dec-18
Date
Pressure (MSLP)
CH4
CO2

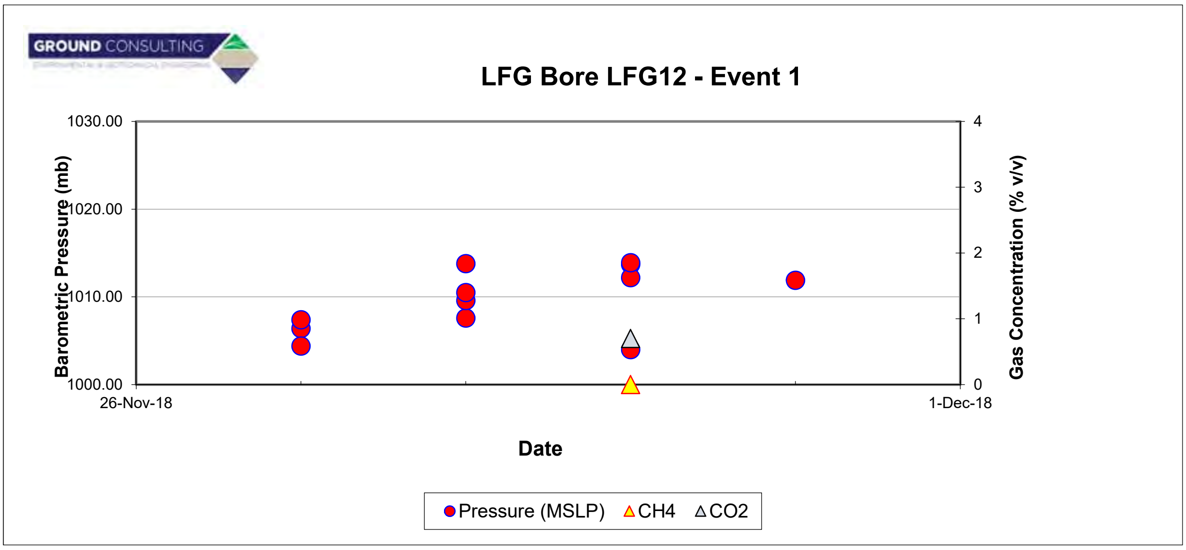

GROUND CONSULTING
LFG Bore LFG09 - Event 1
Barometric Pressure (mb)
Gas Concentration (% v/v)
1025.00
1015.00
1005.00
995.00
4
3
2
1
0
26-Nov-18
1-Dec-18
Date
Pressure (MSLP)
CH4
CO2



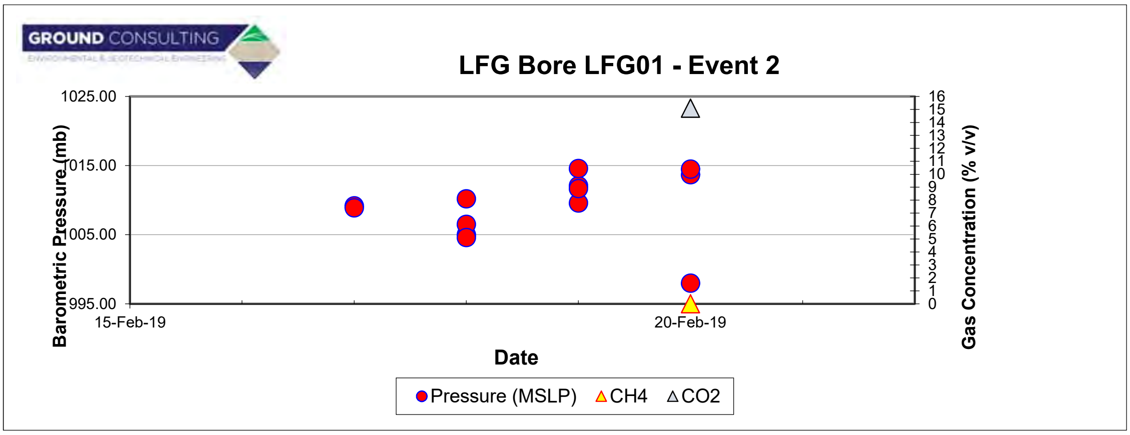
LFG Bore LFG10 - Event 1
Barometric Pressure (mb)
1025.00
1015.00
1005.00
995.00
Gas Concentration (% v/v)
4
3
2
1
0
26-Nov-18
1-Dec-18
Date
Pressure (MSLP)
CH4
CO2



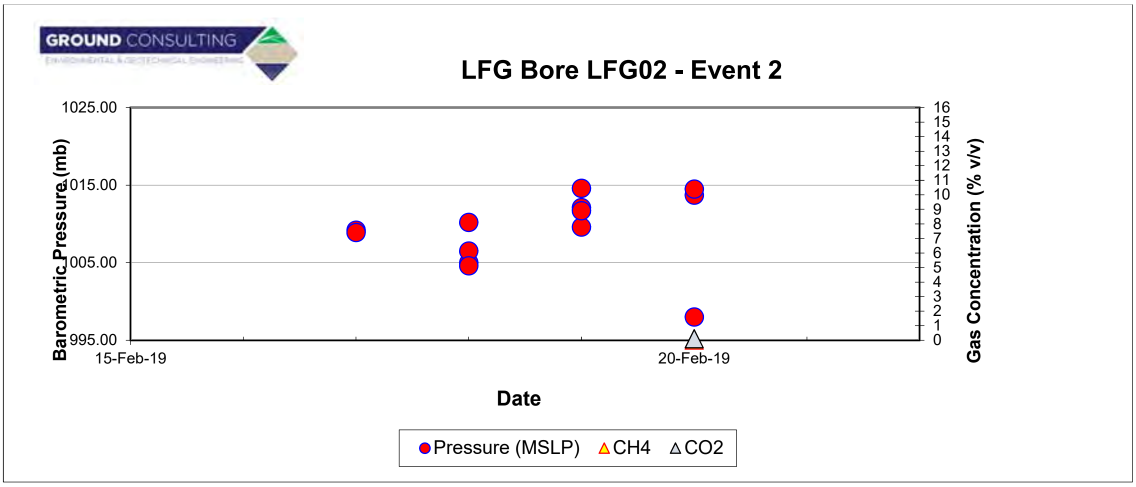
LFG Bore LFG11 - Event 1
Barometric Pressure (mb)
1025.00
1015.00
1005.00
995.00
Gas Concentration (% v/v)
4
3
2
1
0
26-Nov-18
1-Dec-18
Date
Pressure (MSLP)
CH4
CO2



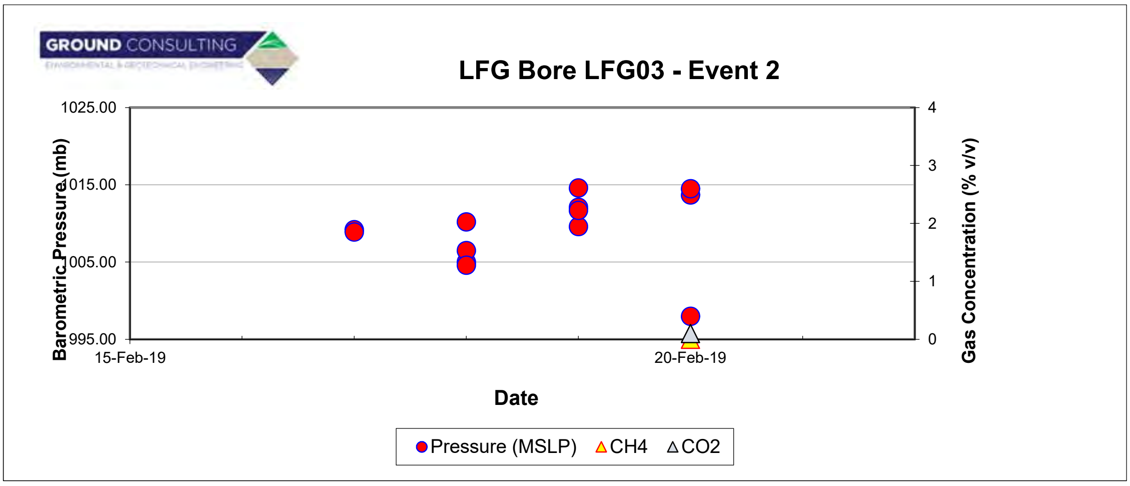
LFG Bore LFG12 - Event 1
Barometric Pressure (mb)
1030.00
1020.00
1010.00
1000.00
Gas Concentration (% v/v)
4
3
2
1
0
26-Nov-18
1-Dec-18
Date
Pressure (MSLP)
CH4
CO2



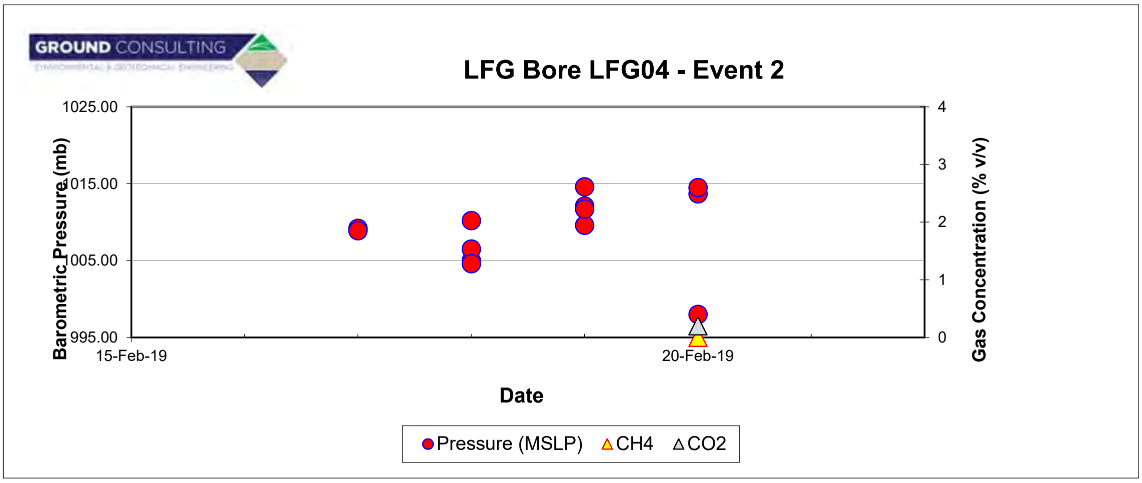
GROUND CONSULTING
LFG Bore LFG01 - Event 2
1025.00
1015.00
1005.00
995.00
Barometric Pressure (mb)
15-Feb-19
20-Feb-19
Date
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
Gas Concentration (% v/v)
Pressure (MSLP)
CH4
CO2



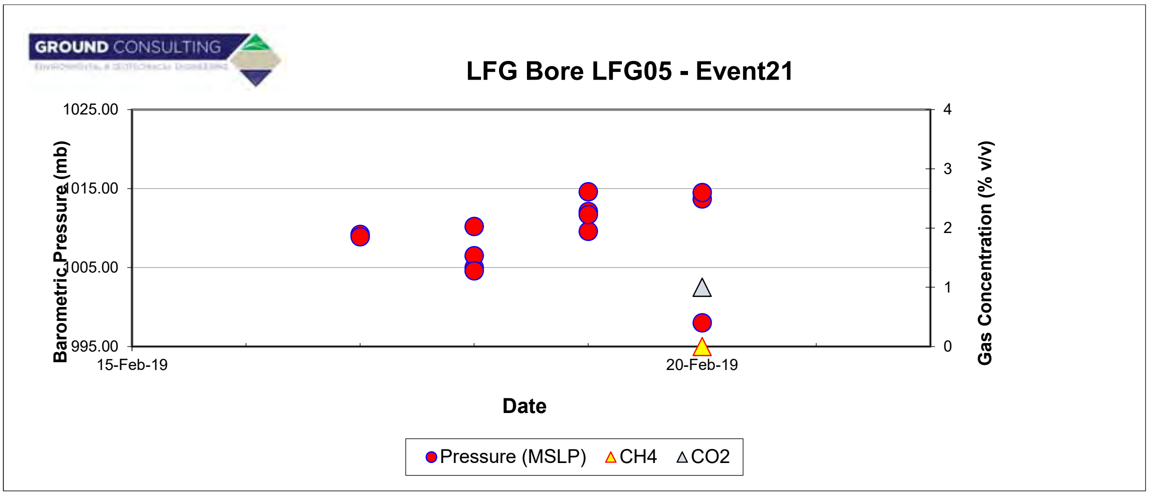
GROUND CONSULTING
LFG Bore LFG02 - Event 2
1025.00
1015.00
1005.00
995.00
Barometric Pressure (mb)
15-Feb-19
20-Feb-19
Date
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
Gas Concentration (% v/v)
Pressure (MSLP)
CH4
CO2



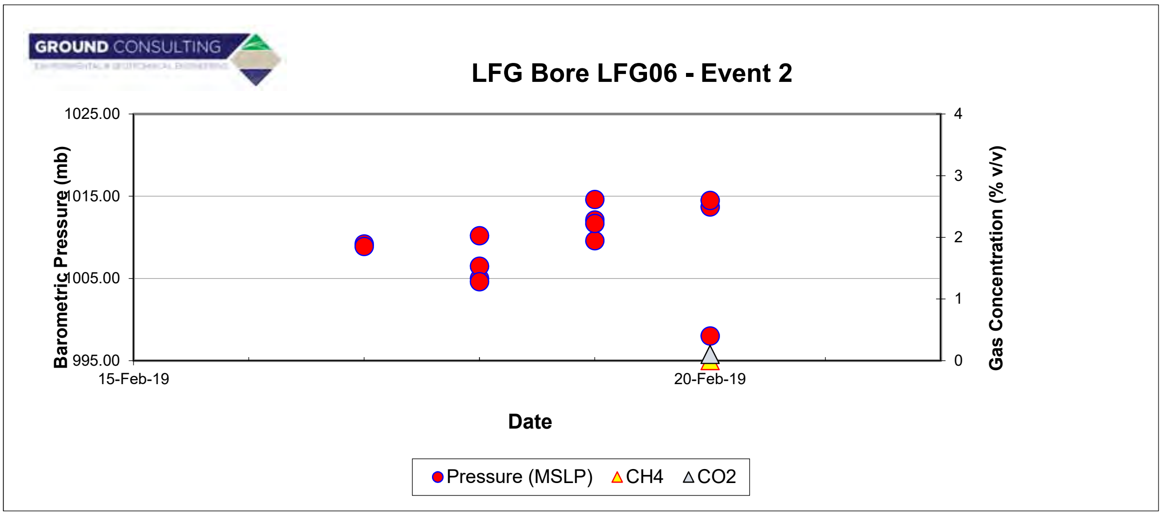
GROUND CONSULTING
LFG Bore LFG03 - Event 2
1025.00
1015.00
1005.00
995.00
Barometric Pressure (mb)
15-Feb-19
20-Feb-19
Date
0
1
2
3
4
Gas Concentration (% v/v)
Pressure (MSLP)
CH4
CO2



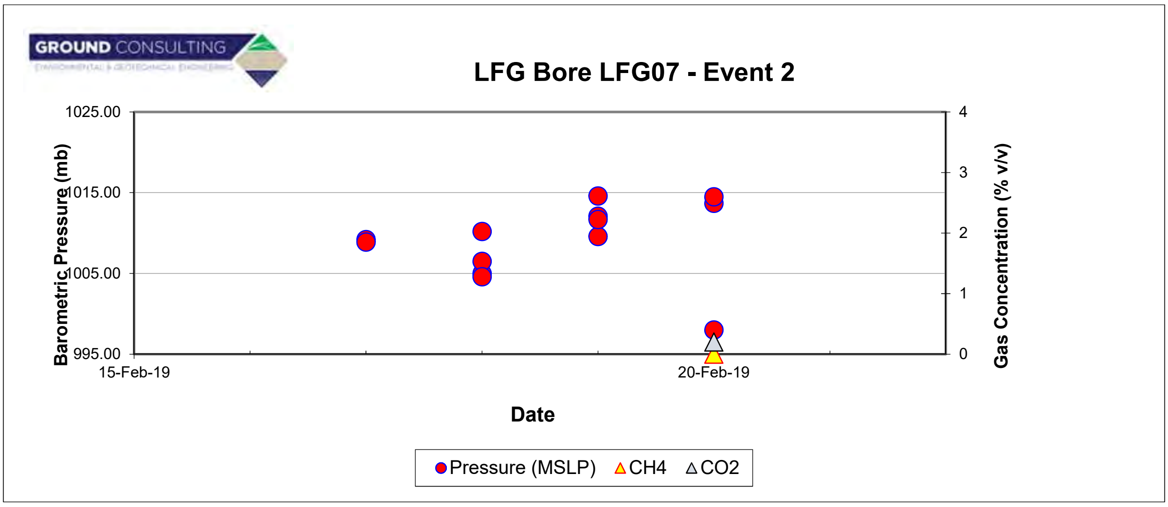
GROUND CONSULTING
LFG Bore LFG04 - Event 2
1025.00
1015.00
1005.00
995.00
Barometric Pressure (mb)
4
3
2
1
0
Gas Concentration (% v/v)
15-Feb-19
20-Feb-19
Date
Pressure (MSLP)
CH4
CO2

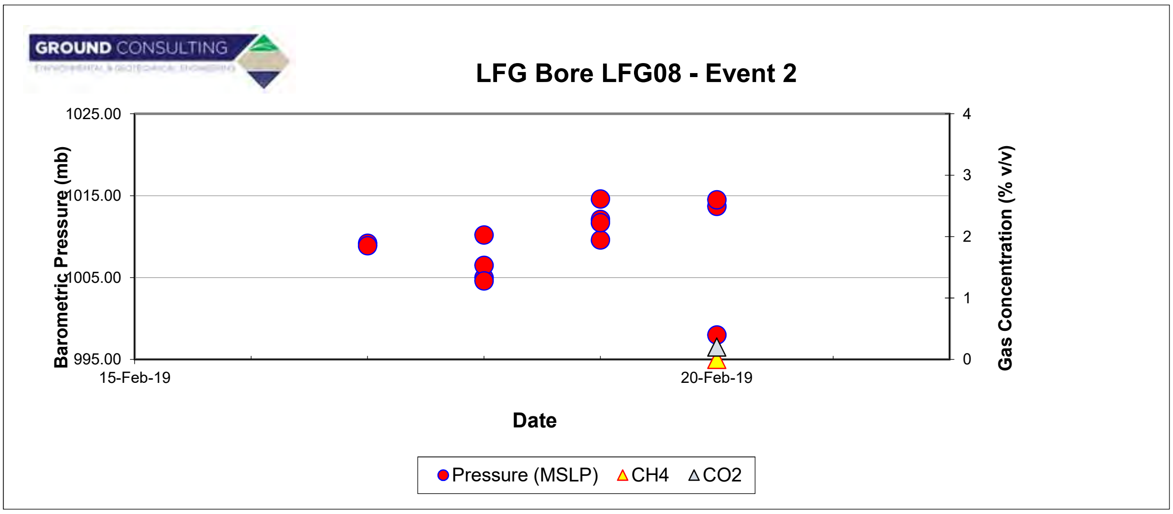


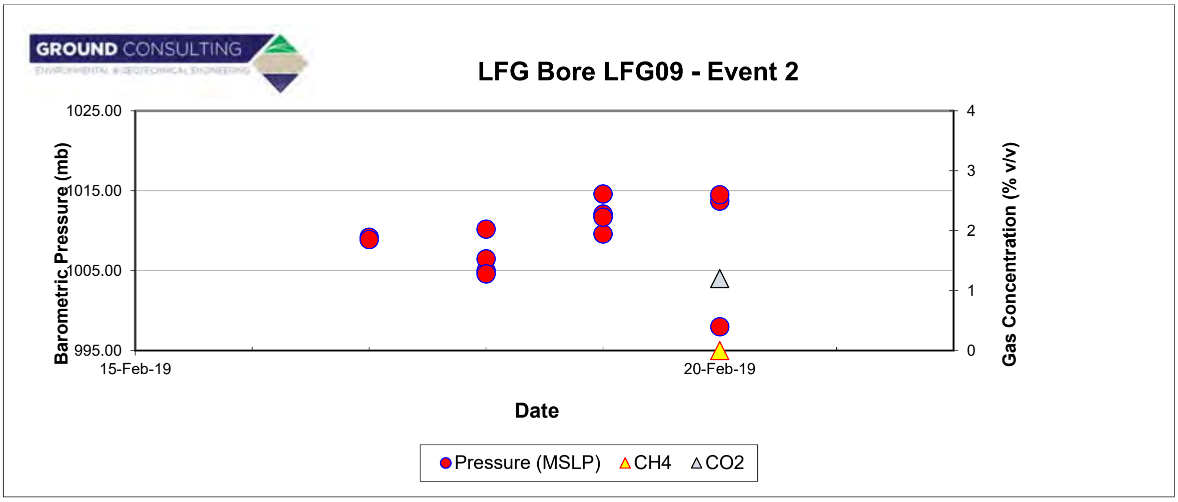
GROUND CONSULTING
LFG Bore LFG05 - Event21
1025.00
1015.00
1005.00
995.00
Barometric Pressure (mb)
4
3
2
1
0
Gas Concentration (% v/v)
15-Feb-19
20-Feb-19
Date
Pressure (MSLP)
CH4
CO2

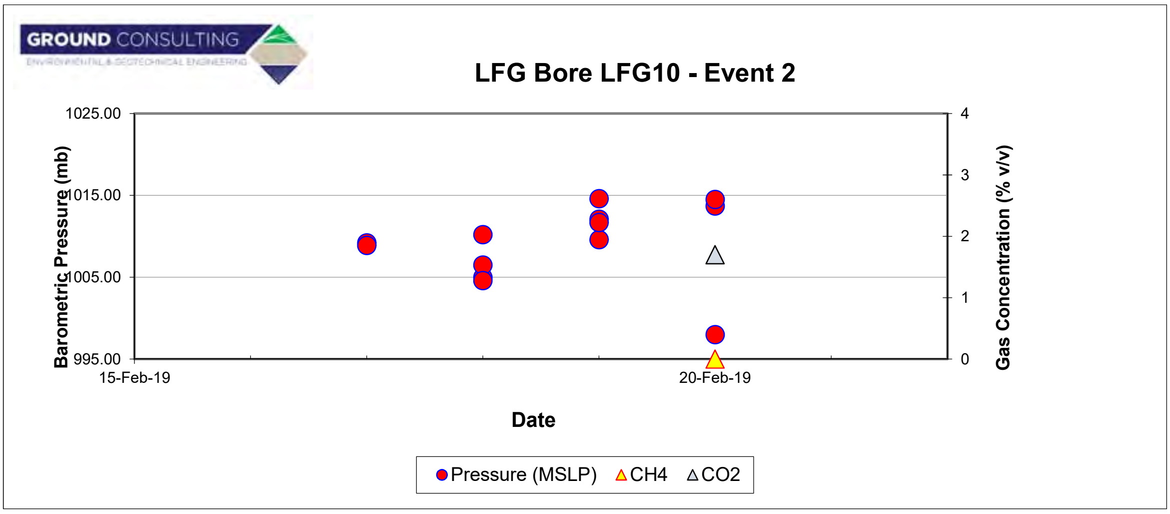


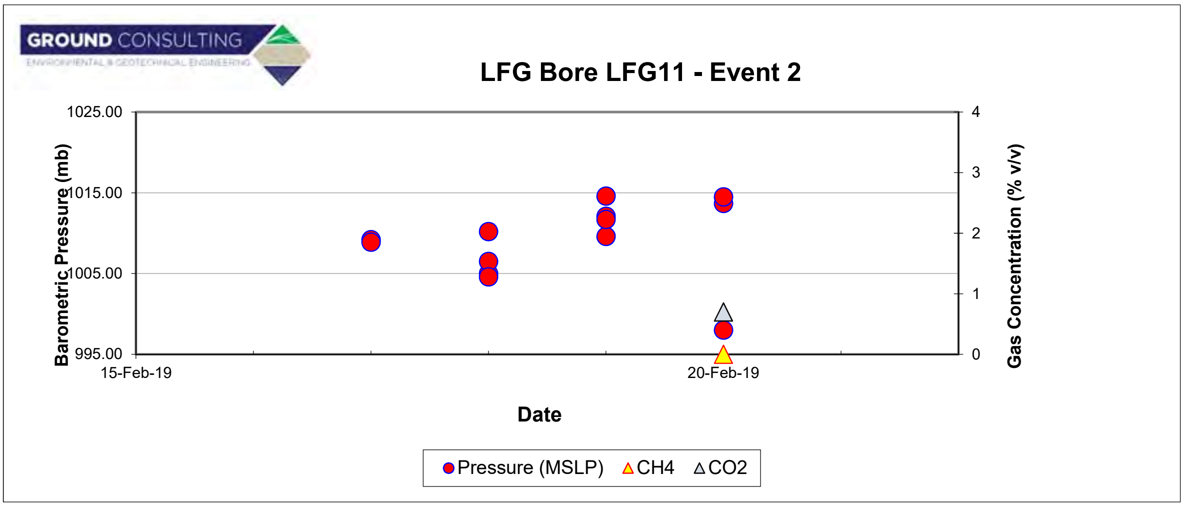
GROUND CONSULTING
LFG Bore LFG06 - Event 2
1025.00
1015.00
1005.00
995.00
Barometric Pressure (mb)
4
3
2
1
0
Gas Concentration (% v/v)
15-Feb-19
20-Feb-19
Date
Pressure (MSLP)
CH4
CO2

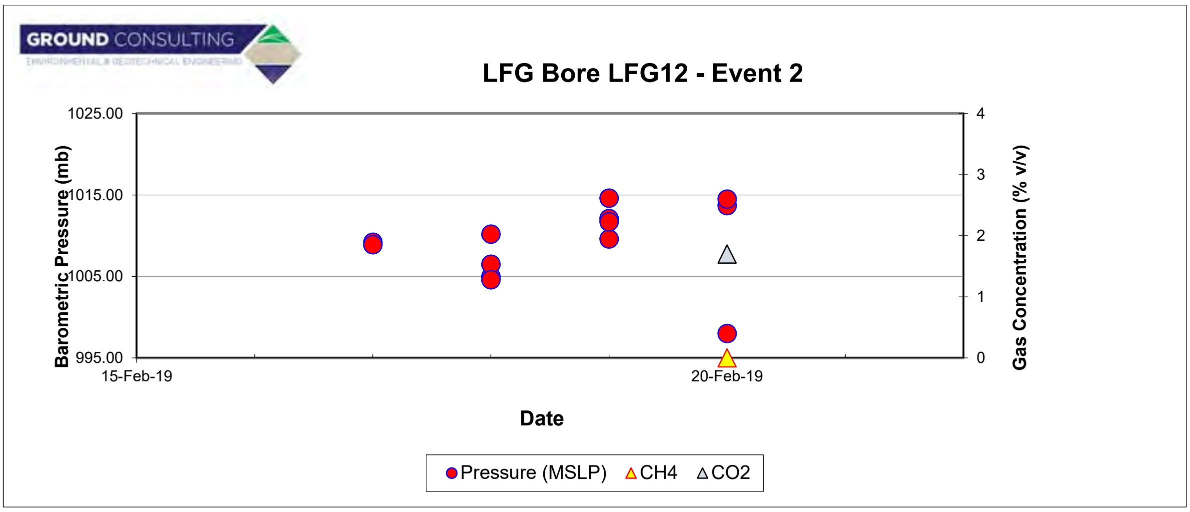

GROUND CONSULTING
LFG Bore LFG07 - Event 2
1025.00
1015.00
1005.00
995.00
Barometric Pressure (mb)
4
3
2
1
0
Gas Concentration (% v/v)
15-Feb-19
20-Feb-19
Date
Pressure (MSLP)
CH4
CO2

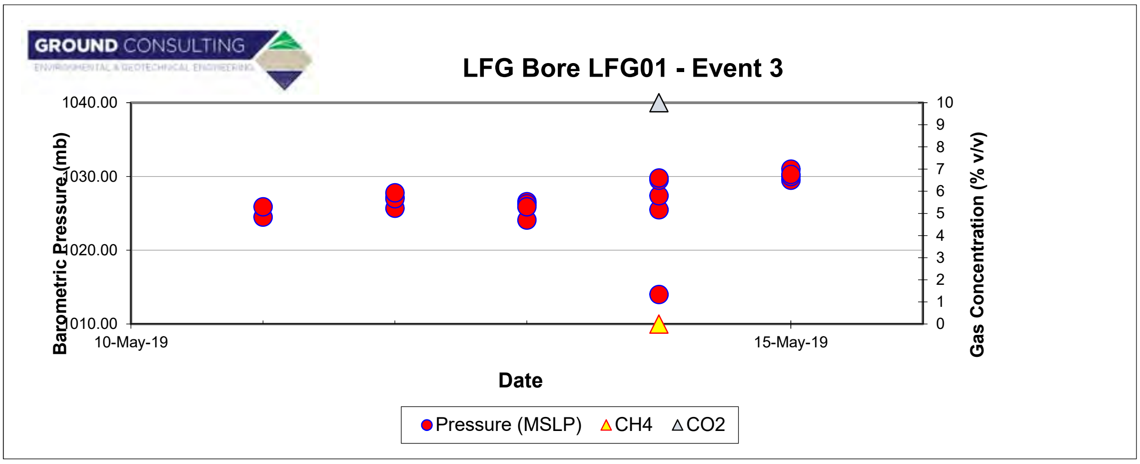

GROUND CONSULTING
LFG Bore LFG08 - Event 2
1025.00
1015.00
1005.00
995.00
Barometric Pressure (mb)
4
3
2
1
0
Gas Concentration (% v/v)
15-Feb-19
20-Feb-19
Date
Pressure (MSLP)
CH4
CO2

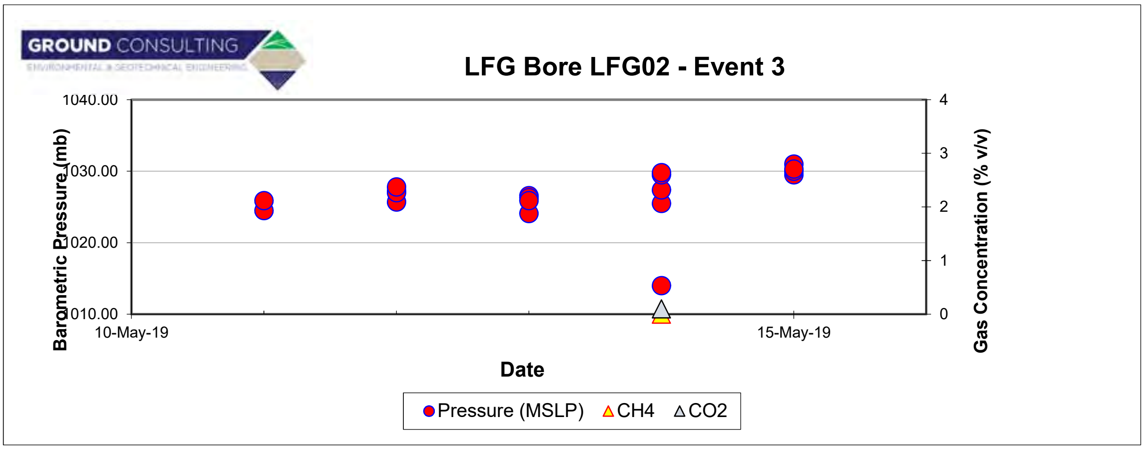

GROUND CONSULTING
LFG Bore LFG09 - Event 2
1025.00
1015.00
1005.00
995.00
Barometric Pressure (mb)
4
3
2
1
0
Gas Concentration (% v/v)
15-Feb-19
20-Feb-19
Date
Pressure (MSLP)
CH4
CO2

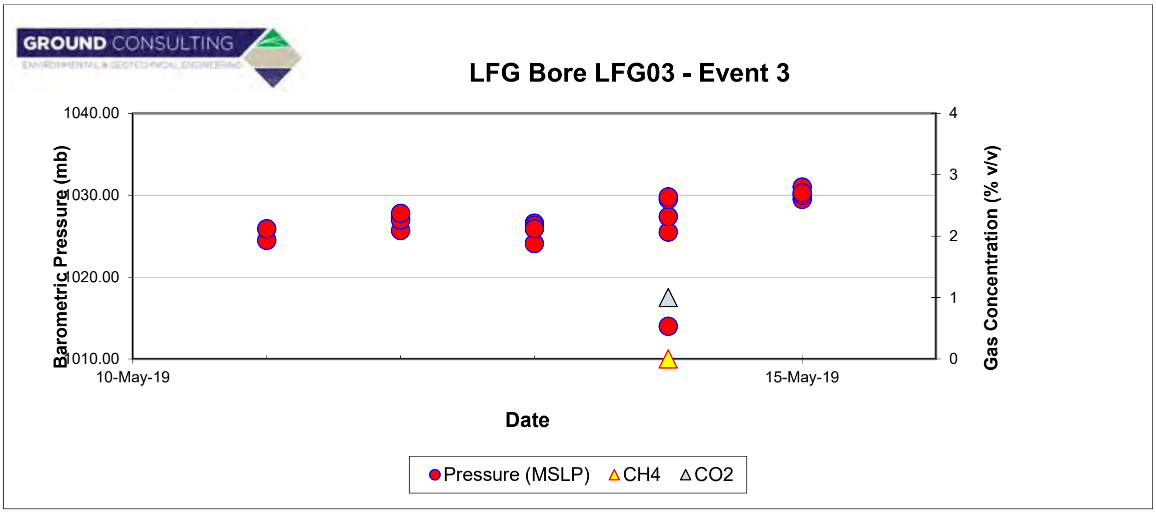

GROUND CONSULTING
ENVIRONMENTAL & GEOTECHNICAL ENGINEERING
LFG Bore LFG10 - Event 2
Barometric Pressure (mb)
1025.00
1015.00
1005.00
995.00
Gas Concentration (% v/v)
4
3
2
1
0
15-Feb-19
20-Feb-19
Date
Pressure (MSLP)
CH4
CO2

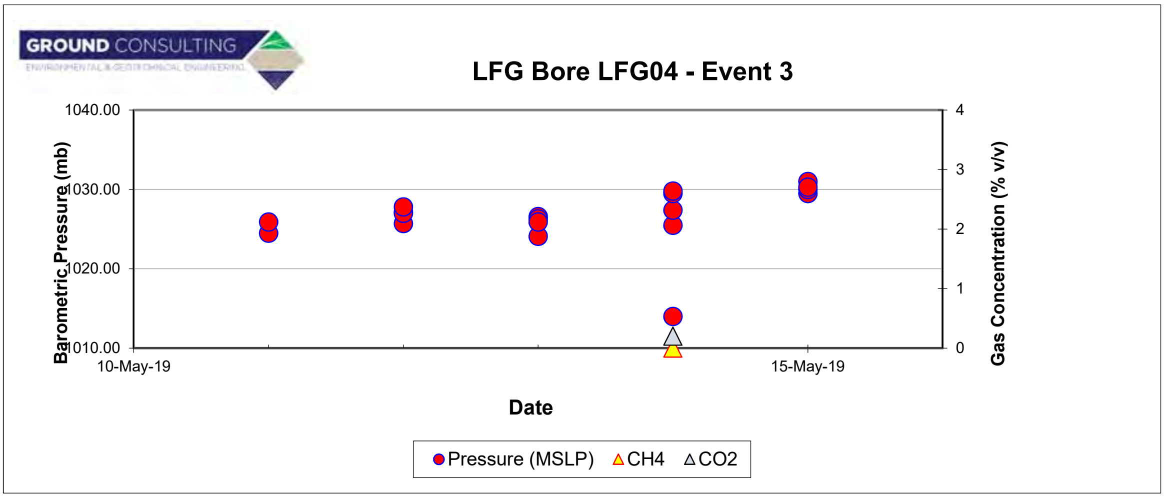

GROUND CONSULTING
ENVIRONMENTAL & GEOTECHNICAL ENGINEERING
LFG Bore LFG11 - Event 2
Barometric Pressure (mb)
1025.00
1015.00
1005.00
995.00
Gas Concentration (% v/v)
4
3
2
1
0
15-Feb-19
20-Feb-19
Date
Pressure (MSLP)
CH4
CO2

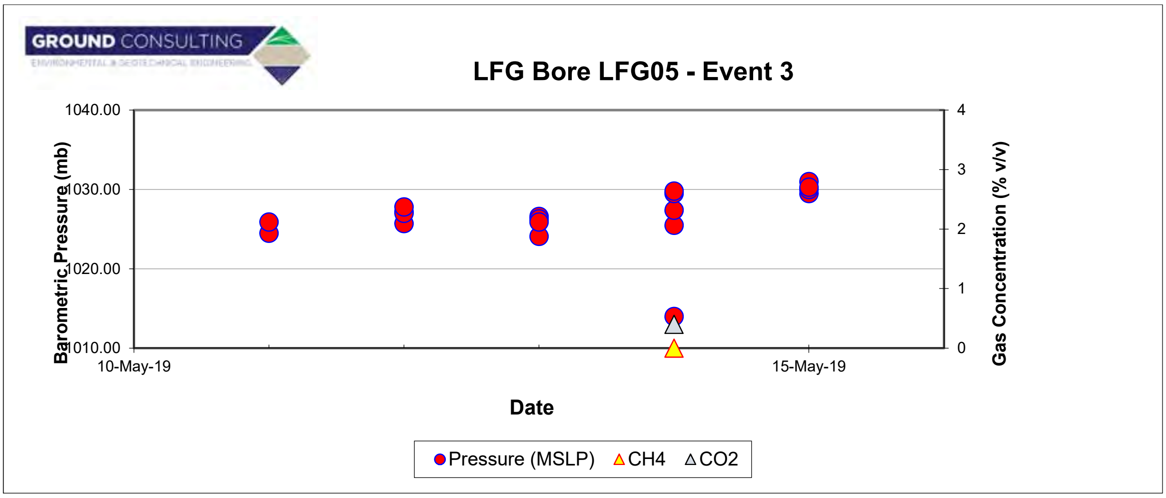

GROUND CONSULTING
ENVIRONMENTAL & GEOTECHNICAL ENGINEERING
LFG Bore LFG12 - Event 2
Barometric Pressure (mb)
1025.00
1015.00
1005.00
995.00
Gas Concentration (% v/v)
4
3
2
1
0
15-Feb-19
20-Feb-19
Date
Pressure (MSLP)
CH4
CO2

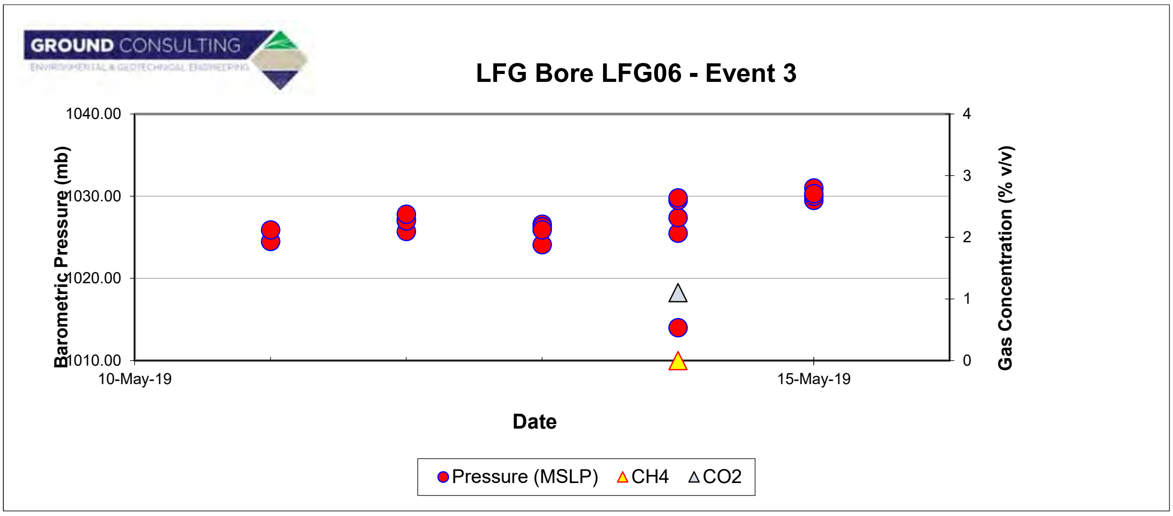

GROUND CONSULTING
LFG Bore LFG01 - Event 3
1040.00
1030.00
1020.00
1010.00
Barometric Pressure (mb)
10-May-19
15-May-19
Date
10
9
8
7
6
5
4
3
2
1
0
Gas Concentration (% v/v)
Pressure (MSLP)
CH4
CO2

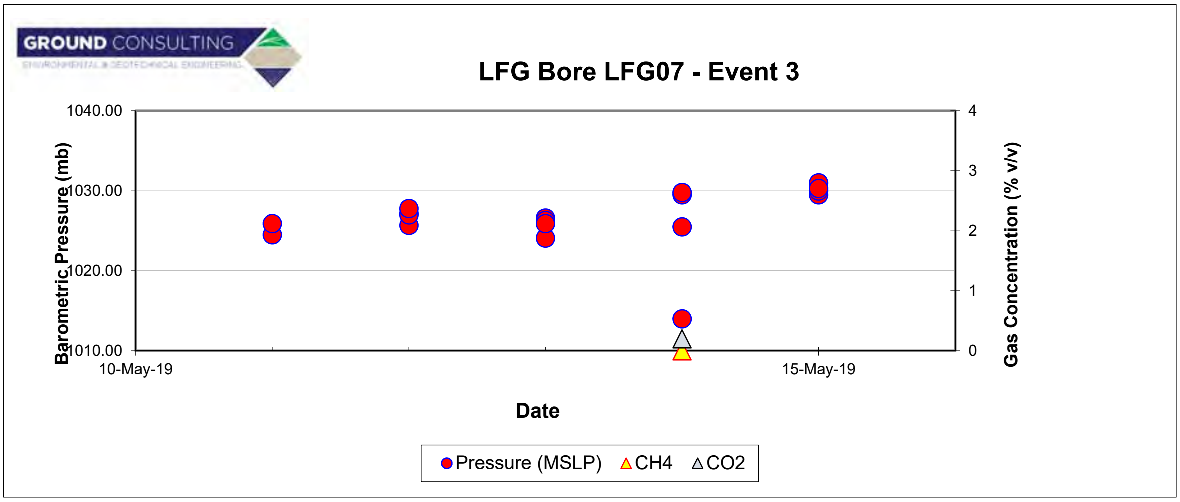

GROUND CONSULTING
LFG Bore LFG02 - Event 3
1040.00
1030.00
1020.00
1010.00
Barometric Pressure (mb)
10-May-19
15-May-19
Date
4
3
2
1
0
Gas Concentration (% v/v)
Pressure (MSLP)
CH4
CO2

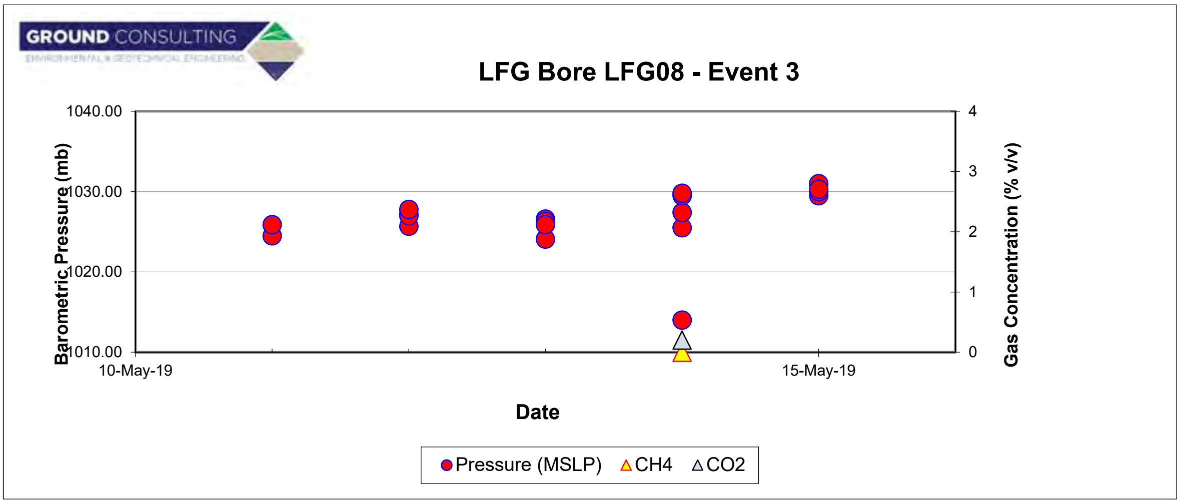

GROUND CONSULTING
LFG Bore LFG03 - Event 3
1040.00
1030.00
1020.00
1010.00
Barometric Pressure (mb)
10-May-19
15-May-19
Date
4
3
2
1
0
Gas Concentration (% v/v)
Pressure (MSLP)
CH4
CO2

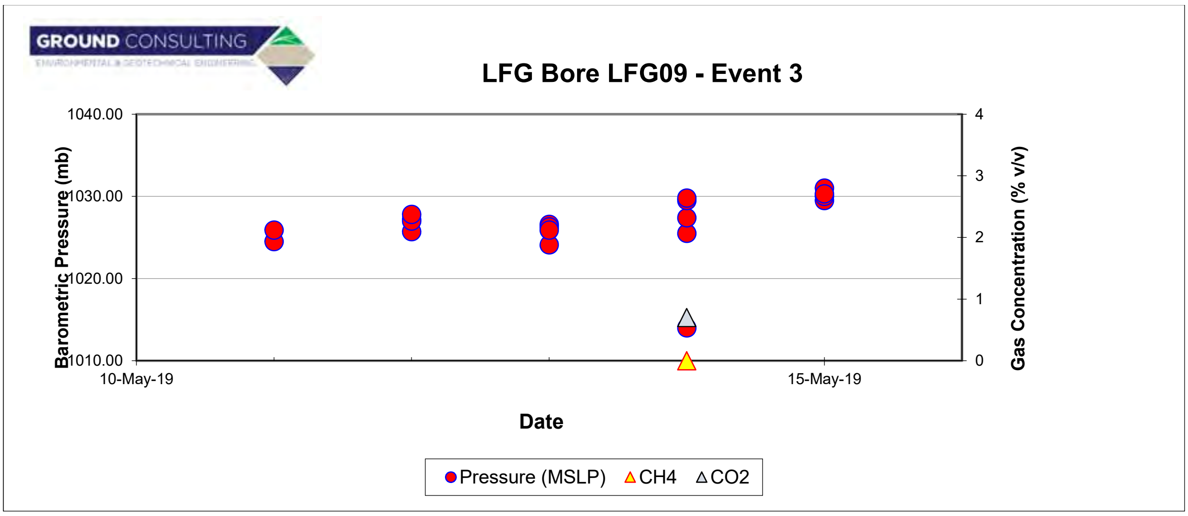

GROUND CONSULTING
ENVIRONMENTAL & GEOTECHNICAL ENGINEERING
LFG Bore LFG04 - Event 3
Barometric Pressure (mb)
1040.00
1030.00
1020.00
1010.00
Gas Concentration (% v/v)
4
3
2
1
0
10-May-19
15-May-19
Date
Pressure (MSLP)
CH4
CO2

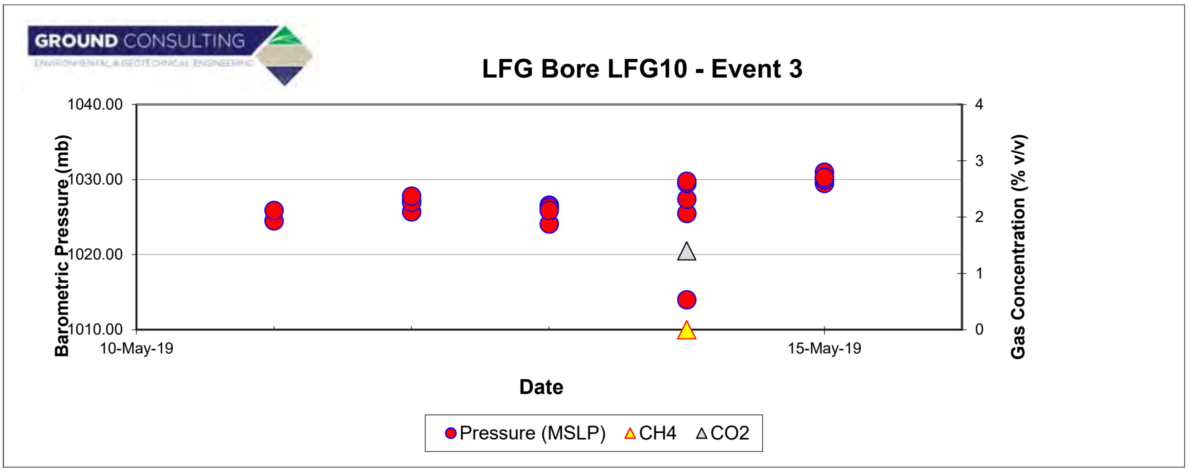

GROUND CONSULTING
ENVIRONMENTAL & GEOTECHNICAL ENGINEERING
LFG Bore LFG05 - Event 3
Barometric Pressure (mb)
1040.00
1030.00
1020.00
1010.00
Gas Concentration (% v/v)
4
3
2
1
0
10-May-19
15-May-19
Date
Pressure (MSLP)
CH4
CO2

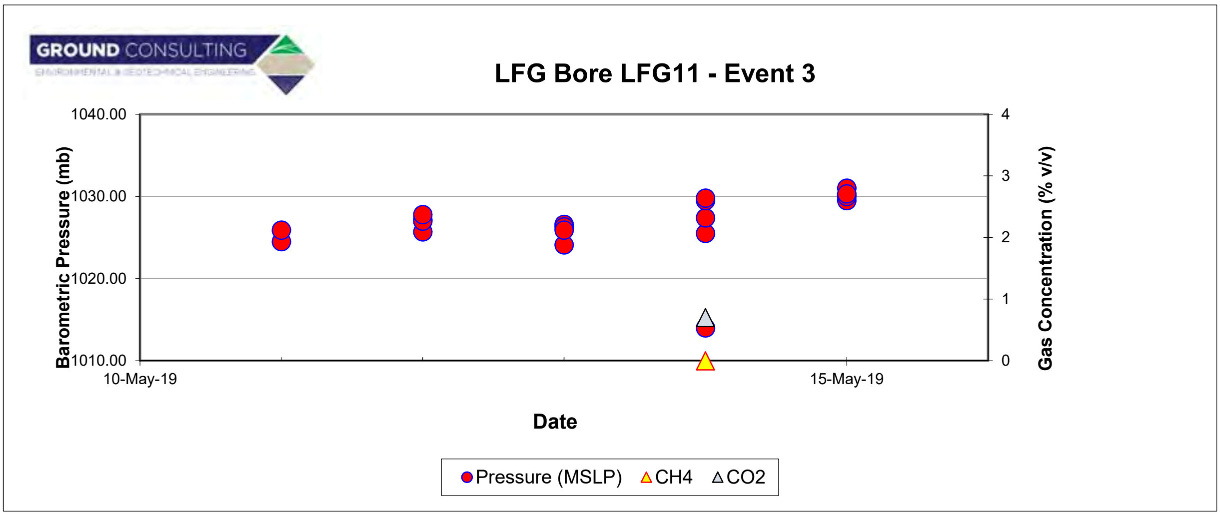

GROUND CONSULTING
ENVIRONMENTAL & GEOTECHNICAL ENGINEERING
LFG Bore LFG06 - Event 3
Barometric Pressure (mb)
1040.00
1030.00
1020.00
1010.00
Gas Concentration (% v/v)
4
3
2
1
0
10-May-19
15-May-19
Date
Pressure (MSLP)
CH4
CO2

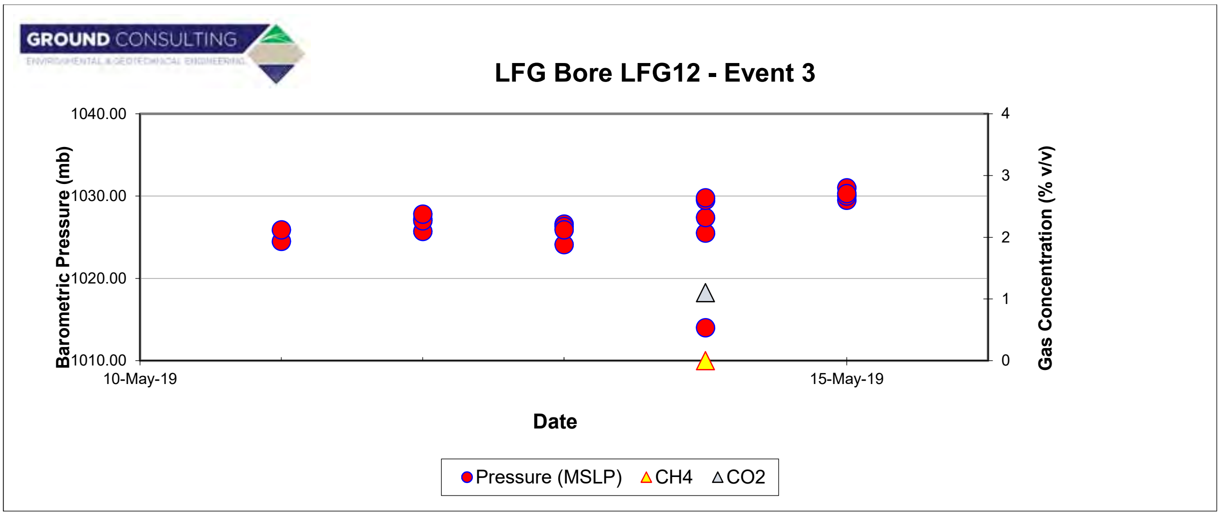

GROUND CONSULTING
LFG Bore LFG07 - Event 3
Barometric Pressure (mb)
1040.00
1030.00
1020.00
1010.00
Gas Concentration (% v/v)
4
3
2
1
0
10-May-19
15-May-19
Date
Pressure (MSLP)
CH4
CO2


GROUND CONSULTING
LFG Bore LFG08 - Event 3
Barometric Pressure (mb)
1040.00
1030.00
1020.00
1010.00
Gas Concentration (% v/v)
4
3
2
1
0
10-May-19
15-May-19
Date
Pressure (MSLP)
CH4
CO2


GROUND CONSULTING
LFG Bore LFG09 - Event 3
Barometric Pressure (mb)
1040.00
1030.00
1020.00
1010.00
Gas Concentration (% v/v)
4
3
2
1
0
10-May-19
15-May-19
Date
Pressure (MSLP)
CH4
CO2


GROUND CONSULTING
ENVIRONMENTAL & GEOTECHNICAL ENGINEERING
LFG Bore LFG10 - Event 3
1040.00
1030.00
1020.00
1010.00
Barometric Pressure (mb)
4
3
2
1
0
Gas Concentration (% v/v)
10-May-19
15-May-19
Date
Pressure (MSLP)
CH4
CO2


GROUND CONSULTING
ENVIRONMENTAL & GEOTECHNICAL ENGINEERING
LFG Bore LFG11 - Event 3
1040.00
1030.00
1020.00
1010.00
Barometric Pressure (mb)
4
3
2
1
0
Gas Concentration (% v/v)
10-May-19
15-May-19
Date
Pressure (MSLP)
CH4
CO2


GROUND CONSULTING
ENVIRONMENTAL & GEOTECHNICAL ENGINEERING
LFG Bore LFG12 - Event 3
1040.00
1030.00
1020.00
1010.00
Barometric Pressure (mb)
4
3
2
1
0
Gas Concentration (% v/v)
10-May-19
15-May-19
Date
Pressure (MSLP)
CH4
CO2

Appendix G
Field Sheets, Analysis Request Forms, Calibration and Weather Data

Daily Sampler's Check Form

Samplers Name: Julian Phillip **Date:** 28/11/18

ALS

MultiMeter ID: 24

* Check Results against acceptable limit below and calibrate instrument or take extra sample if result does not comply.

** If equipment is used, enter Equipment ID into the box on the far right or if not used insert N/A into the box.

1. pH Meter - Check

Buffers	4.00	7.00	10.00	Temp (°C)	Slope	Daily pH Check at 5th Site - should be within acceptance limits	
Batch No:	18/358	18/365	18/339				
Acceptance limit	3.90 - 4.10	6.90 - 7.10	9.90 - 10.10		95-102% (56.5 - 60 mv)	pH:	(7.00 or 10.00)
Enter Results	4.00	6.90	9.90				Equipment ID
Cal Results *** with new buffers							24

*** Only if calibration is required

Read the pH meter daily in pH 7.00 Buffer and obtain a millivolt (mv) reading (it must be between -30 and +30)

Tick box if within limit, if not tell supervisor

2. DO Meter Check

	Result		Equipment ID
Air calibration	98.3%	Result must be within 95 to 102 %, or as per instruction manual	24

** Must complete a DO Calibration/Winkler Check form CALM042W every month and show Team Leader/Supervisor.

* If no D O Cap on meter, prepare a bottle with wet paper with deionised water and keep it closed for 15 min, then read the air in the bottle.

3. EC Meter Check EC Check at 5th site: Std = ____________ µS/cm Result ____________ µS/cm, if outside acceptance limits, recalibrate.

Check with at least 2 standards above and below the water being tested. If testing water below 146.9, always check with DI water = < 2 µS/cm.

Standard	DI	146.9	1413	12890	Other ________
Result		150.6	1383	12629	
Batch No. at least last 5 numbers	N/A	18/334	18/379	18/340	

Equipment ID: 24

Acceptance limit (µS/cm) 0.001M KCl 146.9 (142.6-151.3), 0.01M KCl 1412 (1369 -1455), 0.1M KCl 12890 (12503-13277), 0.5M KCl 58670 (56900 - 60430)

4. Turbidimeter - Check (acceptance limits in brackets) Other possible standards

Standards - (NTU)	DI Water (<0.1)	10 (9.5 -10.5)	20 (19 -21)	80 (76 -84)	100 (95 - 105)	800 (760-840)	Other:______	Equipment ID
Results (NTU)								N/A
Batch No of standards:								

5. Car Fridge Temperature Check

Type of Refrigeration Please Circle Esky / Electric

Fridge/Esky ID	Fridge 1	Fridge 2
Thermometer ID	12	
Temperature (°C)	2.8	

Acceptance limit (2 - 8 °C), as per AS 2031

Does the temperature result comply with the above acceptance limit (if not - please make a comment below)? Circle - Yes or No

* Place blank sample into fridge at the start of the day and enter temperature of blank at last sample site.

6. Chlorine Meter ID :

7. When recording temperature for reporting purposes a traceable thermometer must be used: Thermometer ID: ____________

Comments:

* If unsure check information in the sampling procedure.

FDFM(045/10) Date Approved 18/05/2018

PE No:
18-52967

Water Resources Group - Analysis Request Form

Date Received	Program	Company
		Latrobe City Council

ALS

Sampler : Julian Phillips

Date Scheduled :

Date Sampled: 28 / 11 / 2018

Program Description : La Trobe ground water

Sampled by ALS USING PROCEDURE EN67: YES or NO

Form : WEST

Sample No	Sample Name	Time	Site Observations	pH Units	DO mg/L	EC uS/cm	REDOX mv	Temp °C	SWL / Depth (m)
5899435	BH1	28/11/18 8:43	Bore dry. Dipper stopped at 68.4m. No water	-	-	-	-	-	-
5899437	BH2	28/11/18 9.20	Bore dry. Dipper stopped at 74.6 m. No water	-	-	-	-	-	-
5899438	BH3 Dup Trip. blank		Bore full of silt. Cap left off. Bore buried from heavy rain. Needs cleaning & reconstruction						
5899439	BH4	28/11/18 9:06	Bore dry. Dipper dropped to 20.7m. NO water	-	-	-	-	-	-
5899440	BH5	Sleeve in 10:56 28/11/18 7:44 AM 29/11/18	28/11/18. 10:56 am. Dropped sleeve Leave for 24 hrs Picked up sleeve after leaving overnight	5.35	3.78	274.4	-20.6	15.9	-

Comments:

Sample Containers

1 x Metals 60ml Red (Filtered) **1 x 60ml H2SO4 purple** **1 x 500ml plastic Green**

1 x DOC glass – amber small **1 x 500ml Amber glass** **1 x 250ml plastic Green** **3 x 40ml Vials**

PE No:
18-52967

Water Resources Group - Analysis Request Form

Date Received	Program	Company
		Latrobe City Council

Sampler : Julian Philip

Date Scheduled :

Date Sampled: 28 / 11 / 2018

Program Description :

Sampled by ALS USING PROCEDURE EN67: YES or NO

Form : WEST

Sample No	Sample Name	Time	Site Observations	pH Units	DO mg/L	EC uS/cm	REDOX mv	Temp °C	SWL / Depth (m)
5899441	DUPLICATE		No access to enough water						
5899442	TRIPLICATE		No access to enough water						
5899443	RINSATE1 (DAY 1)		Not req'd as pump was not used on day (1)	-	-	-	-	-	-
5899444	RINSATE2 (DAY 2)		Not req'd as pump was not used day (2).						
5899445	TRIP BLANK Di water from Scoresby.	28/11/18 7am	Water taken from Scoresby for the trip.						

P_150_MET_GRN (150mL green Band) **P_500_** (500mL plastic) **GA_100_HAA** (100mL Haloacetic acid) **G_40_THM** (40mL vial x 2) **GA_100_TOC** (100mL brown glass - white cap)
P_250 (250mL plastic) **P_250_MIC** (250mL plastic - red dot) **P_125** (125 mL plastic) **P_1L** (1 Litre plastic) **P_250_CHEM** (250 mL plastic) **P_250_NUTS** (250 mL plastic)

Comments: Comments:

Sample Containers

1 x Metals 60ml Red (Filtered)	**1 x 60ml H2SO4 purple**	**1 x 500ml plastic Green**	
1 x DOC glass	**1 x 500ml Amber glass**	**1 x 250ml plastic Green**	**3 x 40ml Vials**

Printed: 27/11/2018

PE No:
18-52967

Water Resources Group - Analysis Request Form

Date Received	Program	Company
		Latrobe City Council

Sampler : Julian Phillip   Date Scheduled : 28/11/18   Date Sampled: 28/11/2018

Program Description : La Trobe ground water

Sampled by ALS USING PROCEDURE EN67: YES or NO

Form : WEST

Sample No	Sample Name	Time	Site Observations	pH Units	DO mg/L	EC uS/cm	REDOX mv	Temp °C	SWL / Depth (m)
5899452	GW INTERCEPTION SYSTEM 45° angle (Rubble).		Not accessable. Filled with rubble. Need trolley to access.						
5899453	STORMWATER POND 1 Appearance - Turbid, colour + odour of pond, estimate freeboard. →	2:13	Very turbid. Light brown. No odor.	7.95	7.62	307.9	48.0	20.5	—
5899454	STORMWATER POND 2	1:53	Very turbid. Light brown colour No odor.	8.07	2.35	420.6	43.2	20.4	—
5899455	TRARALGON CREEK UPSTREAM Location Dawsons Lane.	2:55	Light brown color Slightly turbid No odor	7.60	7.35	234.0	50.1	17.5	—
5899456	TRARALGON CREEK DOWNSTREAM Location Jones Rd	3:45	No ordor non turbid slightly brown	7.11 ~~3:45~~ pp	5.83	227.2	56.9	16.5	—

P_150_MET_GRN (150mL green Band) **P_500_** (500mL plastic) **GA_100_HAA** (100mL Haloacetic acid) **G_40_THM** (40mL vial x 2) **GA_100_TOC** (100mL brown glass - white cap)
P_250 (250mL plastic) **P_250_MIC** (250mL plastic - red dot) **P_125** (125 mL plastic) **P_1L** (1 Litre plastic) **P_250_CHEM** (250 mL plastic) **P_250_NUTS** (250 mL plastic)

Comments:

Sample Containers

1 x Metals 60ml Red (Filtered)	**1 x 60ml H2SO4 purple**	**1 x 500ml plastic Green**	
1 x DOC glass	**1 x 500ml Amber glass**	**1 x 250ml plastic Green**	**3 x 40ml Vials**

PE No:
18-52967

Water Resources Group - Analysis Request Form

Date Received	Program	Company
		Latrobe City Council

Sampler : Johan Phillips

Date Scheduled : 29/11/18

Date Sampled: 29 / 11 / 2018

Program Description :

Sampled by ALS USING PROCEDURE EN67: YES or NO

Form : WEST

Sample No	Sample Name	Time	Site Observations	pH Units	DO mg/L	EC uS/cm	REDOX mv	Temp °C	SWL / Depth (m)
5899457	RO PERMEATE	8:54	Clear. No odar. Clear. Non turbid	7.32	3.05	15.8	398	19.3	–

P_150_MET_GRN (150mL green Band) **P_500_** (500mL plastic) **GA_100_HAA** (100mL Haloacetic acid) **G_40_THM** (40mL vial x 2) **GA_100_TOC** (100mL brown glass - white cap)
P_250 (250mL plastic) **P_250_MIC** (250mL plastic - red dot) **P_125** (125 mL plastic) **P_1L** (1 Litre plastic) **P_250_CHEM** (250 mL plastic) **P_250_NUTS** (250 mL plastic)

Comments:

Sample Containers

1 x Metals 60ml Red (Filtered)	**1 x 60ml H2SO4 purple**	**1 x 500ml plastic Green**	
1 x DOC glass	**1 x 500ml Amber glass**	**1 x 250ml plastic Green**	**3 x 40ml Vials**

Printed: 27/11/2018

PE No:
18-52967

Water Resources Group - Analysis Request Form

Date Received	Program	Company
		Latrobe City Council

Sampler: Julian Phillip

Date Scheduled : 28/11/18

Date Sampled: 28 / 11 / 2018
29 / 11 / 2018

Program Description :

Sampled by ALS USING
PROCEDURE EN67: YES or NO

Form : WEST

Sample No	Sample Name	Time	Site Observations	pH Units	DO mg/L	EC uS/cm	REDOX mv	Temp °C	SWL / Depth (m)
5899446	FIELD BLANK		No access to water. BH3 filled with silt.						
5899447	LEACHATE POND 1	1:28	Green color Turbid. No odor	8.72	11.08	2635	43.0	20.5	–
5899448	LEACHATE POND 2	12:51	Black color Slight odor Non turbid	8.06	6.64	12960	50.6	20.1	
5899450	LEACHATE SUMP 1 - Cell 3 ~~Downes Lane.~~	9:52 29/11/18	Light brown color Slightly turbid. No odor	7.29	1.40	18563	17.1	23.0	–
5899451	LEACHATE SUMP 2 - Cell 4 ~~Jones Rd.~~	9.25 29/11/18	Slightly turbid Black color No odor	6.93	1.14	7029	-76.4	19.7	–

P_150_MET_GRN (150mL green Band) **P_500_** (500mL plastic) **GA_100_HAA** (100mL Haloacetic acid) **G_40_THM** (40mL vial x 2) **GA_100_TOC** (100mL brown glass - white cap)
P_250 (250mL plastic) **P_250_MIC** (250mL plastic - red dot) **P_125** (125 mL plastic) **P_1L** (1 Litre plastic) **P_250_CHEM** (250 mL plastic) **P_250_NUTS** (250 mL plastic)

Comments:

Sample Containers

1 x Metals 60ml Red (Filtered)	**1 x 60ml H2SO4 purple**	**1 x 500ml plastic Green**	
1 x DOC glass	**1 x 500ml Amber glass**	**1 x 250ml plastic Green**	**3 x 40ml Vials**

Printed: 27/11/2018

GROUNDWATER SAMPLING FIELD SHEET USING LOW FLOW PURGING

ALS Environmental

General Information
Client: LaTrobe
Project: Taralgon Groundwater
Site: Taralgon
Date: 28/11/18

Bore Details
Bore ID: BH5
Screen: 93- OR 89.14 - 99m
Diameter: 50mm
Capped: ☐ ✗ Locked: ☐ ✗ Lock ID: –
Construction Report Sighted: ☐
AHD to TOC:
Condition/Comments:
No cap. Blue monument. Steel pipe present.

GPS Location & Zone
Easting: 55H 046513
Northing: 5763286

Weather
Conditions: Overcast. Mild. Breezy
Wind Speed: 11.1 km/hr
Direction: SSE
Temperature: 19.2 °C
Pressure: 1009.5 hPa

Instrumentation
Hydrosleeve used.
Device Used: ~~Micropurge~~
Serial Number: 144305
WQ Probe: YSI Quattro
Serial Number: 15F100150
In Calibration: ☐ Documented: ☐ Decontaminated: ☐
Flow Cell Used: ☐ Drawdown Meter Used: ☐ MicroPurge CPM:
Dr Hydro Sleeve used

Sample Information
Sampler: J. Phillip
Time Sampled: 7.44
Filtered: Metals
Filter Type: 0.45 µm
Esky Iced: ☐

Proper use of the drawdown meter ensures the screen can not be dewatered. Best practise requires regular monitoring of water level - at least every time the field parameters are checked - to ensure correct operation.

All Field Sheets must be submitted with COC and scanned into the project file - paper copies are to be stored in the appropriate site/project folder.

Preliminary Standing Water Level section details to be obtained before beginning the bore purging process

Micro to be sampled first. Containers to be filled in accordance with OFM005 - Sample container filling instructions

Time (hh:mm)	Temp (°C) ±0.5	EC (µS/cm) ±3%	pH (units) ±0.05	Redox (mV) ±10	DO (mg/L) ±10%	SWL (m)	Appearance (Colour, Turbidity, Odour, Gas etc.)
7:44	15.9	274.4	5.35	20.6	3.78	89.14	Non turbid
							Some debris.
							No odor.
							Clear in color

Standing Water Level
Ground Level to TOC: 0.0m
SWL on Arrival to TOC: 89.14m
Bore Depth to TOC: 102.2m
Pump Placement to TOC: –
Pre-Purge Level to TOC: –
Start of Sampling to TOC: –
End of Sampling to TOC: –
SWL on Departure to TOC:

General Comments
Placing bore sleeve at 91m.

THIS IS A CONTROLLED COPY UNLESS OTHERWISE MARKED

GROUNDWATER SAMPLING FIELD SHEET   USING LOW FLOW PURGING

ALS Environmental

General Information
Client: LaTrobe City   Project: Traralgon Grndwater
Site: Traralgon   Date: 28/11/18

Bore Details
Bore ID: BH4   Screen: 17-20.7m   Diameter: 50mm
Capped: ☑   Locked: ☐   Lock ID: .   Construction Report Sighted: ☑
AHD to TOC: ______   Condition/Comments: Blue pipe surrounding. Good condition

GPS Location & Zone
Easting: 55H 0461455   Northing: 5763000

Weather
Conditions: Sunny, Mild, breezy.
Wind Speed: 13 km/hr   Direction: E
Temperature: 16.3 °C   Pressure: 1009 hPa

Instrumentation
Device Used: Micropurge   Serial Number: 1414305
WQ Probe: YSI Quattro   Serial Number: 15F100150
In Calibration: ☑   Documented: ☑   Decontaminated: ☑
Flow Cell Used: ☐   Drawdown Meter Used: ☐   MicroPurge CPM: ______

Sample Information
Sampler: J. Phillip   Time Sampled: ______
Filtered: ______   Filter Type: ______
Esky Iced: ☐

Proper use of the drawdown meter ensures the screen can not be dewatered. Best practise requires regular monitoring of water level - at least every time the field parameters are checked - to ensure correct operation.

All Field Sheets must be submitted with COC and scanned into the project file - paper copies are to be stored in the appropriate site/project folder.

Preliminary Standing Water Level section details to be obtained before beginning the bore purging process

Micro to be sampled first. Containers to be filled in accordance with OFM005 - Sample container filling instructions

Time (hh:mm)	Temp (°C) ±0.5	EC (µS/cm) ±3%	pH (units) ±0.05	Redox (mV) ±10	DO (mg/L) ±10%	SWL (m)	Appearance (Colour, Turbidity, Odour, Gas etc.)

Standing Water Level
Ground Level to TOC: 0.5m
SWL on Arrival to TOC: –
Bore Depth to TOC: 20.7m
Pump Placement to TOC: –
Pre-Purge Level to TOC: ______
Start of Sampling to TOC: ______
End of Sampling to TOC: ______
SWL on Departure to TOC: ______

General Comments
No water. Bore dry.
Dipper lowered to 20.7m. No indication of water

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General Information
Client: LaTrobe City Project: Traralgon Groundwater
Site: Traralgon Date: 28/11/18

Bore Details
Bore ID: BH2 Screen: 59-72m Diameter: 50mm
Capped: ☑ Locked: ☐ Lock ID: ______ Construction Report Sighted: ☑
AHD to TOC: ______ Condition/Comments:
Monument. Yellow. Good condition

GPS Location & Zone
Easting: 55H 0464487 Northing: 5762991

Weather
Conditions: Sunny. Mild.
Wind Speed: 13km/hr Direction: East.
Temperature: 16.3 °C Pressure: 1009 hPa

Instrumentation
Device Used: Micropurge Serial Number: 144305
WQ Probe: YSI Quattro Serial Number: 15F100150
In Calibration: ☑ Documented: ☑ Decontaminated: ☑
Flow Cell Used: ☐ Drawdown Meter Used: ☑ MicroPurge CPM: ______

Sample Information
Sampler: J. Phillip Time Sampled: ______
Filtered: ______ Filter Type: ______
Esky Iced: ☐

Proper use of the drawdown meter ensures the screen can not be dewatered. Best practise requires regular monitoring of water level - at least every time the field parameters are checked - to ensure correct operation.

All Field Sheets must be submitted with COC and scanned into the project file - paper copies are to be stored in the appropriate site/project folder.

Preliminary Standing Water Level section details to be obtained before beginning the bore purging process

Micro to be sampled first. Containers to be filled in accordance with OFM005 - Sample container filling instructions

Time	Temp	EC	pH	Redox	DO	SWL	Appearance
(hh:mm)	(°C) ±0.5	(µS/cm) ±3%	(units) ±0.05	(mV) ±10	(mg/L) ±10%	(m)	(Colour, Turbidity, Odour, Gas etc.)

Standing Water Level
Ground Level to TOC: 0.6m
SWL on Arrival to TOC: –
Bore Depth to TOC: 74.6m
Pump Placement to TOC: –
Pre-Purge Level to TOC: –
Start of Sampling to TOC: –
End of Sampling to TOC: –
SWL on Departure to TOC:

General Comments
Bore dry.
Dipper lowered to 74.6m.
No water detected.

THIS IS A CONTROLLED COPY UNLESS OTHERWISE MARKED

GROUNDWATER SAMPLING FIELD SHEET USING LOW FLOW PURGING

ALS Environmental

General Information
Client: LaTrobe City Project: Traralgon Groundwater
Site: Date: 28/11/18

Bore Details
Bore ID: BH1 Screen: 47-66m Diameter: 50mm
Capped: ☑ Locked: ☐ Lock ID: Construction Report Sighted: ☑
AHD to TOC: Condition/Comments:

GPS Location & Zone
Easting: 55H 0461300 Northing: 5763021

Weather
Conditions: Sunny mild. Calm.
Wind Speed: 13km/hr Direction: E
Temperature: 16.3°C Pressure: 1009hPa

Instrumentation
Device Used: Micropurge Serial Number: 144305
WQ Probe: YSI Quattro Serial Number: 15F100150
In Calibration: ☑ Documented: ☑ Decontaminated: ☑
Flow Cell Used: ☐ Drawdown Meter Used: ☑ MicroPurge CPM:

Sample Information
Sampler: Julian Phillip Time Sampled:
Filtered: Filter Type:
Esky Iced: ☐

Proper use of the drawdown meter ensures the screen can not be dewatered. Best practise requires regular monitoring of water level - at least every time the field parameters are checked - to ensure correct operation.

All Field Sheets must be submitted with COC and scanned into the project file - paper copies are to be stored in the appropriate site/project folder.

Preliminary Standing Water Level section details to be obtained before beginning the bore purging process

Micro to be sampled first. Containers to be filled in accordance with OFM005 - Sample container filling instructions

Time (hh:mm)	Temp (°C) ±0.5	EC (µS/cm) ±3%	pH (units) ±0.05	Redox (mV) ±10	DO (mg/L) ±10%	SWL (m)	Appearance (Colour, Turbidity, Odour, Gas etc.)

Standing Water Level
Ground Level to TOC: 0.6m
SWL on Arrival to TOC: –
Bore Depth to TOC: 65.4m
Pump Placement to TOC:
Pre-Purge Level to TOC:
Start of Sampling to TOC:
End of Sampling to TOC:
SWL on Departure to TOC:

General Comments
Bore dry. No water detected at all. Dipper stopped at 65.4m, still no water.

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Daily Sampler's Check Form

Samplers Name: L. Bowle **Date:** 28/2/19
MultiMeter ID: SAMP-24

* Check Results against acceptable limit below and calibrate instrument or take extra sample if result does not comply.
** If equipment is used, enter Equipment ID into the box on the far right or if not used insert N/A into the box.

1. pH Meter - Check

Buffers	4.00	7.00	10.00	Temp (°C)	Slope
Batch No:	19/003	19/052	74746		
Acceptance limit	3.90 - 4.10	6.90 - 7.10	9.90 - 10.10		95-102% (56.5 - 60 mv)
Enter Results	3.92	7.01	9.91		
Cal Results *** with new buffers					

Daily pH Check at 5th Site - should be within acceptance limits
pH: 6.98 (7.00 or 10.00)

Equipment ID: SAMP24

*** Only if calibration is required

Read the pH meter daily in pH 7.00 Buffer and obtain a millivolt (mv) reading (it must be between -30 and +30) -11

Tick box if within limit, if not tell supervisor.

2. DO Meter Check

Air calibration — Result: 100.0 — Result must be within 95 to 102 %, or as per instruction manual

Equipment ID: SAMP24

** Must complete a DO Calibration/Winkler Check form CALM042W every month and show Team Leader/Supervisor.
* If no D O Cap on meter, prepare a bottle with wet paper with deionised water and keep it closed for 15 min, then read the air in the bottle.

3. EC Meter Check EC Check at 5th site: Std = ________ µS/cm Result ________ µS/cm, if outside acceptance limits, recalibrate.
Check with at least 2 standards above and below the water being tested. If testing water below 146.9, always check with DI water = < 2 µS/cm.

Standard	DI	146.9	1413	12890	Other ____
Result	1.5	150.7	1414	12803	
Batch No, at least last 5 numbers	N/A	19/051	19/050	19/037	

Equipment ID: SAMP24

Acceptance limit (µS/cm) 0.001M KCl 146.9 (142.6-151.3), 0.01M KCl 1412 (1369 -1455), 0.1M KCl 12890 (12503-13277), 0.5M KCl 58670 (56900 - 60430)

4. Turbidimeter - Check (acceptance limits in brackets)

Other possible standards

Standards - (NTU)	DI Water (<0.1)	10 (9.5 -10.5)	20 (19 -21)	80 (76 -84)	100 (95 - 105)	800 (760-840)	Other:____	Equipment ID
Results (NTU)								N/A
Batch No of standards:								

5. Car Fridge Temperature Check

Type of Refrigeration Please Circle Esky / Electric

Fridge/Esky ID	Fridge 1	Fridge 2
Thermometer ID	SAMP-21	
Temperature (°C)	4.3	

Acceptance limit (2 - 8 °C), as per AS 2031

Does the temperature result comply with the above acceptance limit (if not - please make a comment below)? Circle - Yes or No

* Place blank sample into fridge at the start of the day and enter temperature of blank at last sample site.

6. Chlorine Meter ID : N/A

7. When recording temperature for reporting purposes a traceable thermometer must be used: Thermometer ID: SAMP-21

Comments:
237.0 at 22.1°C ORP mV

* If unsure check information in the sampling procedure.

Daily Sampler's Check Form

ALS

Samplers Name: Julian Phillips **Date:** 20/02/19

MultiMeter ID:

*** Check Results against acceptable limit below and calibrate instrument or take extra sample if result does not comply.**

**** If equipment is used, enter Equipment ID into the box on the far right or if not used insert N/A into the box.**

1. pH Meter - Check

Buffers	4.00	7.00	10.00	Temp (ºC)	Slope	**Daily pH Check at 5th Site - should be within acceptance limits**	
Batch No:	19/003	19/052	18/339	22.5			
Acceptance limit	3.90 - 4.10	6.90 - 7.10	9.90 - 10.10		95-102% (56.5 - 60 mv)	pH:	(7.00 or 10.00)
Enter Results							**Equipment ID**
Cal Results * with new buffers**	3.94	6.92	9.90				24

*** Only if calibration is required

Read the pH meter daily in pH 7.00 Buffer and obtain a millivolt (mv) reading (it must be between -30 and +30) 15.5mv ✓ Tick box if within limit, if not tell supervisor.

2. DO Meter Check **Result**

Air calibration 96.2 Result must be within 95 to 102 %, or as per instruction manual

Equipment ID 24

**** Must complete a DO Calibration/Winkler Check form CALM042W every month and show Team Leader/Supervisor.**

*** If no D O Cap on meter, prepare a bottle with wet paper with deionised water and keep it closed for 15 min, then read the air in the bottle.**

3. EC Meter Check **EC Check at 5th site: Std = ___________µS/cm Result ___________µS/cm, if outside acceptance limits, recalibrate.**

Check with at least 2 standards above and below the water being tested. If testing water below 146.9, always check with DI water = < 2 µS/cm.

Standard	DI	146.9	1413	12890	Other ____
Result		142.6	1378	12673	
Batch No, at least last 5 numbers	N/A	19/051	19/050	19/037	

Equipment ID 24

Acceptance limit (µS/cm) 0.001M KCl 146.9 (142.6-151.3), 0.01M KCl 1412 (1369 -1455), 0.1M KCl 12890 (12503-13277), 0.5M KCl 58670 (56900 - 60430)

4. Turbidimeter - Check (acceptance limits in brackets) **Other possible standards**

Standards - (NTU)	**DI Water (<0.1)**	**10** (9.5 -10.5)	**20** (19 -21)	**80** (76 -84)	**100** (95 - 105)	**800 (760-840)**	**Other:____**	**Equipment ID**
Results (NTU)								NA
Batch No of standards:								

5. Car Fridge Temperature Check

Type of Refrigeration Please Circle **Esky / Electric**

Fridge/Esky ID	**Fridge 1**	**Fridge 2**
Thermometer ID	12	
Temperature (°C)	4.0	

Acceptance limit (2 - 8 ºC), as per AS 2031

Does the temperature result comply with the above acceptance limit (if not - please make a comment below)? Circle - Yes or No

* Place blank sample into fridge at the start of the day and enter temperature of blank at last sample site.

6. Chlorine Meter ID : 12

7. When recording temperature for reporting purposes a traceable thermometer must be used: **Thermometer ID:** 12

Comments:

* If unsure check information in the sampling procedure.

Daily Sampler's Check Form

Samplers Name: Jolian Phillip **Date:** ~~20~~ 19/02/19 gp

MultiMeter ID: 24

*** Check Results against acceptable limit below and calibrate instrument or take extra sample if result does not comply.**

**** If equipment is used, enter Equipment ID into the box on the far right or if not used insert N/A into the box.**

1. pH Meter - Check

Buffers	4.00	7.00	10.00	Temp (°C)	Slope	Daily pH Check at 5th Site - should be within acceptance limits	
Batch No:	19/003	19/052	19/339				
Acceptance limit	3.90 - 4.10	6.90 - 7.10	9.90 - 10.10		95-102% (56.5 - 60 mv)	pH:	(7.00 or 10.00)
Enter Results	3.92	7.05	9.98				Equipment ID
Cal Results *** with new buffers	~~19/003~~ gp	~~19/052~~ gp	~~19/339~~ gp				24

*** Only if calibration is required

Read the pH meter daily in pH 7.00 Buffer and obtain a millivolt (mv) reading (it must be between -30 and +30) -14.6

Tick box if within limit, if not tell supervisor.

2. DO Meter Check **Result** **Equipment ID**

Air calibration 100.2 Result must be within 95 to 102 %, or as per instruction manual — 24

**** Must complete a DO Calibration/Winkler Check form CALM042W every month and show Team Leader/Supervisor.**

*** If no D O Cap on meter, prepare a bottle with wet paper with deionised water and keep it closed for 15 min, then read the air in the bottle.**

3. EC Meter Check **EC Check at 5th site: Std = ____________µS/cm Result ____________µS/cm, if outside acceptance limits, recalibrate.**

Check with at least 2 standards above and below the water being tested. If testing water below 146.9, always check with DI water = < 2 µS/cm.

Standard	DI	146.9	1413	12890	Other ______
Result	1.5	142.7	1408	13017	
Batch No, at least last 5 numbers	N/A	19/051	19/050	19/037	

Equipment ID: 24

Acceptance limit (µS/cm) 0.001M KCl 146.9 (142.6-151.3), 0.01M KCl 1412 (1369 -1455), 0.1M KCl 12890 (12503-13277), 0.5M KCl 58670 (56900 - 60430)

4. Turbidimeter - Check (acceptance limits in brackets) **Other possible standards**

Standards - (NTU)	**DI Water (<0.1)**	**10** (9.5 -10.5)	**20** (19 -21)	**80** (76 -84)	**100** (95 - 105)	**800 (760-840)**	**Other:______**	**Equipment ID**
Results (NTU)								N/A
Batch No of standards:								

5. Car Fridge Temperature Check

Type of Refrigeration Please Circle Esky / Electric

Fridge/Esky ID	**Fridge 1**	**Fridge 2**
Thermometer ID	12	
Temperature (°C)	3.6	

Acceptance limit (2 - 8 °C), as per AS 2031

Does the temperature result comply with the above acceptance limit (if not - please make a comment below)? Circle - Yes or No

* Place blank sample into fridge at the start of the day and enter temperature of blank at last sample site.

6. Chlorine Meter ID : 12

7. When recording temperature for reporting purposes a traceable thermometer must be used: **Thermometer ID:** 12

Comments:

* If unsure check information in the sampling procedure.

Hyland Feb 19

PE No:
19-09734

Water Resources Group - Analysis Request Form

Date Received	Program	Company
	LATROBECITY	LaTrobe City Council

ALS

Sampler : Julian Phillips **Date Scheduled :** **Date Sampled:** 19, 02, 2019

Program Description : Miscellaneous Analysis

Sampled by ALS USING PROCEDURE EN67: YES or NO

Form : STW1

Sample No		Map Ref	Time	~~Est.Flow ML/dat~~ Redox	Gauge	Temp C	pH	EC uS/cm	Turb (NTU)	DO Mg/L	DO %Sat.
5999702	LB01 Insufficient volume		12:32						Not Req'd		Not Req'd
5999703	LB02 very muddy. Hand bale used		14:38	12.0	9.10m	20.7	7.10	13795	Not Req'd	1.38	Not Req'd
5999704	LB03 Dry. Insufficient water		14:29						Not Req'd		Not Req'd
5999705	LB04 Hand bale used		15:51	-18.2	5.07	19.1m	6.14	12571	Not Req'd	2.74	Not Req'd
5999706	LB05 Insufficient water.		15:10		-				Not Req'd		Not Req'd
5999707	LB06 Hand bale		16:05	-9.2					Not Req'd		Not Req'd
5999708	Leachate Pond 200mm from full water green		14:00	78.9		21.0	7.53	891	Not Req'd	6.70	Not Req'd

Time STW

P_150_MET_GRN (150mL green Band) **P_500_** (500mL plastic) **GA_100_HAA** (100mL Haloacetic acid) **G_40_THM** (40mL vial x 2) **GA_100_TOC** (100mL brown glass - white cap)
P_250 (250mL plastic) **P_250_MIC** (250mL plastic - red dot) **P_125** (125 mL plastic) **P_1L** (1 Litre plastic)

Comments:

Printed: 20/02/2019

PE No:
19-09730

Water Resources Group - Analysis Request Form

Date Received	Program	Company
		LaTrobe City Council

Sampler : Julian Phillip

Date Scheduled :

Date Sampled: 19.02.2019

Program Description : Hyland Quarterly Feb 2019

Sampled by ALS USING PROCEDURE EN67: YES or NO

Form : WEST

Sample No	Sample Name	Time	Condition	SWL (m)	Field Temp	DO mg/L	pH Units	EC uS/cm	Redox mv
5999656	BH1	1000		66.68m	Not Req'd	Not Req'd	Not Req'd	Not Req'd	Not Req'd
5999657	BH2	1020		dry	Not Req'd	Not Req'd	Not Req'd	Not Req'd	Not Req'd
5999658	BH3	1030		dry	Not Req'd	Not Req'd	Not Req'd	Not Req'd	Not Req'd
5999659	BH4	1010		dry	Not Req'd	Not Req'd	Not Req'd	Not Req'd	Not Req'd
5999660	BH5	1040		89.76	Not Req'd	Not Req'd	Not Req'd	Not Req'd	Not Req'd

P_150_MET_GRN (150mL green Band) P_500_ (500mL plastic) GA_100_HAA (100mL Haloacetic acid) G_40_THM (40mL vial x 2) GA_100_TOC (100mL brown glass - white cap)
P_250 (250mL plastic) P_250_MIC (250mL plastic - red dot) P_125 (125 mL plastic) P_1L (1 Litre plastic) P_250_CHEM (250 mL plastic) P_250_NUTS (250 mL plastic)

Comments:

Special Instructions:

Printed: 18/02/2019

PE No:
19-09730

Water Resources Group - Analysis Request Form

Date Received	Program	Company
		LaTrobe City Council

ALS

Sampler: Jolian Phillip

Date Scheduled :

Date Sampled: 19/02/2019

Program Description : Hyland Quarterly Feb 2019

Sampled by ALS USING PROCEDURE EN67: YES or NO

Form : WEST

Sample No	Sample Name	Time	Condition	SWL (m)	Field Temp	DO mg/L	pH Units	EC uS/cm	Redox mv
5999661	LEACHATE POND 1	930	Dark brown Dirty Strong odour		18.4	6.50	9.21	3962	90.6
5999662	LEACHATE POND 2	945			20.8	3.07	7.87	13292	91.0
5999663	LEACHATE SUMP 1 - Cell 3	1:10	Dark brown. Strong odour Non turbid		19.4	1.40	6.71	18121	-78.5
5999664	LEACHATE SUMP 2 - Cell 4	1:20	Dark brown Strong odour Non turbid		23.1	0.42	6.37	11523	-141.4
5999665	GROUNDWATER INTERCEPTION SYSTEM	0.25	Not accessable - photo taken						

Tried to measure using dipper attached to tubing. Blocked at 3m using this method.

P_150_MET_GRN (150mL green Band) P_500_ (500mL plastic) GA_100_HAA (100mL Haloacetic acid) G_40_THM (40mL vial x 2) GA_100_TOC (100mL brown glass - white cap)
P_250 (250mL plastic) P_250_MIC (250mL plastic - red dot) P_125 (125 mL plastic) P_1L (1 Litre plastic) P_250_CHEM (250 mL plastic) P_250_NUTS (250 mL plastic)

Comments:

Special Instructions:

Printed: 18/02/2019

PE No:
19-09730

Water Resources Group - Analysis Request Form

Date Received	Program	Company
		LaTrobe City Council

Sampler : Julian Phillip Date Scheduled : Date Sampled: 19.02.2019

Program Description : Hyland Quarterly Feb 2019 Sampled by ALS USING PROCEDURE EN67: YES or NO Form : WEST

Sample No	Sample Name	Time	Condition	SWL (m)	Field Temp	DO mg/L	pH Units	EC uS/cm	Redox mv
5999666	STORMWATER POND 1	920	light brown	-	17.2	5.97	7.46	414.6	94.8
5999667	STORMWATER POND 2	910	green tinge to water	-	20.2	8.50	7.76	339.8	90.1
5999668	TRARALGON CREEK UPSTREAM	835	stagnant	-	17.6	5.83	6.66	323.3	94.1
5999669	TRARALGON CREEK DOWNSTREAM	850	stagnant, oily	-	17.4	1.46	6.32	448.9	93.2
5999670	RO PERMEATE Sample Containers 1 x Metals 60ml Red 1 x DOC amber glass 3 x 40ml vials VOC 1 x 60mL H2SO4 Purple 1 x 500ml amber glass 1 x 500ml plastic 1 x 250ml plastic	Plant not operational.							

P_150_MET_GRN (150mL green Band) P_500_ (500mL plastic) GA_100_HAA (100mL Haloacetic acid) G_40_THM (40mL vial x 2) GA_100_TOC (100mL brown glass - white cap) P_250 (250mL plastic) P_250_MIC (250mL plastic - red dot) P_125 (125 mL plastic) P_1L (1 Litre plastic) P_250_CHEM (250 mL plastic) P_250_NUTS (250 mL plastic)

Comments:

Special Instructions:

Printed: 18/02/2019

GROUNDWATER SAMPLING FIELD SHEET USING LOW FLOW PURGING

ALS

General Information
Client: LCC Project:
Site: MORWELL Date: 19/02/19

Bore Details
Bore ID: LB01 Screen: Diameter: 100mm
Capped: ☑ Locked: ☒ Lock ID: Construction Report Sighted: ☐
AHD to TOC: Condition/Comments:

GPS Location & Zone
Easting: 146° 25.5744 Northing: S 38° 12.1369

Weather
Conditions: Windy mild, cloudy
Wind Speed: 24.3 km/hr Direction: WSW
Temperature: 20.5 °C Pressure: 1011.3 hPa

Instrumentation
Device Used: Micropurge hand bale. Serial Number:
WQ Probe: YSI Quattro Serial Number: 15F100150
In Calibration: ☐ Documented: ☐ Decontaminated: ☐
Flow Cell Used: ☐ Drawdown Meter Used: ☐ MicroPurge CPM:

Sample Information
Sampler: [illegible] Time Sampled:
Filtered: Filter Type:
Esky Iced: ☐

Proper use of the drowdown meter ensures the screen can not be dewatered. Best practise requires regular monitoring of water level - at least every time the field parameters are checked - to ensure correct operation.

All Field Sheets must be submitted with COC and scanned into the project file - paper copies are to be stored in the appropriate site/project folder.

Preliminary Standing Water Level section details to be obtained before beginning the bore purging process

Micro to be sampled first. Containers to be filled in accordance with OFM005 - Sample container filling instructions

Time (hh:mm)	Temp (°C) ±0.5	EC (µS/cm) ±3%	pH (units) ±0.05	Redox (mV) ±10	DO (mg/L) ±10%	SWL (m)	Appearance (Colour, Turbidity, Odour, Gas etc.)

Standing Water Level
Ground Level to TOC: 0.650m
SWL on Arrival to TOC: 12.35
Bore Depth to TOC: 12.39
Pump Placement to TOC:
Pre-Purge Level to TOC:
Start of Sampling to TOC:
End of Sampling to TOC:
SWL on Departure to TOC:

General Comments
Insufficient volume to sample.

THIS IS A CONTROLLED COPY UNLESS OTHERWISE MARKED

GROUNDWATER SAMPLING FIELD SHEET USING LOW FLOW PURGING

General Information
Client: LCC Project:
Site: Morwell Date: 19/09/19

Bore Details
Bore ID: LB02 Screen: – Diameter: 100mm
Capped: ☒ Locked: ☒ Lock ID: Construction Report Sighted: ☐
AHD to TOC: Condition/Comments:
Very muddy Draw down meter getting blocked

GPS Location & Zone
Easting: 146°25.6918 Northing: S 38° 12.1365

Weather
Conditions: Overcast, windy.
Wind Speed: 27.8 Direction: SW
Temperature: 19.5° Pressure: 1011.5hPG

Instrumentation
Device Used: Micropurge Hand bail Serial Number:
WQ Probe: YSI Quattro Serial Number: 15F100150
In Calibration: ☐ Documented: ☐ Decontaminated: ☐
Flow Cell Used: ☐ Drawdown Meter Used: ☐ MicroPurge CPM:

Sample Information
Sampler: Julian Phillip Time Sampled: 2:38
Filtered: Filter Type: -
Esky Iced: ☐

Proper use of the drawdown meter ensures the screen can not be dewatered. Best practise requires regular monitaring of water level - at least every time the field parameters are checked - to ensure correct operation.

All Field Sheets must be submitted with COC and scanned into the project file - paper copies are to be stored in the appropriate site/project folder.

Preliminary Standing Water Level section details to be obtained before beginning the bore purging process

Micro to be sampled first. Containers to be filled in accordance with OFM005 - Sample container filling instructions

Time (hh:mm)	Temp (°C) ±0.5	EC (µS/cm) ±3%	pH (units) ±0.05	Redox (mV) ±10	DO (mg/L) ±10%	SWL (m)	Appearance (Colour, Turbidity, Odour, Gas etc.)
14.40	20.9	13974	6.95	18.0	2.30	9.10	Black. Muddy
14.45	20.9	13995	7.07	29.9	2.00	9.10	Black. Muddy.
14.50	20.7	13337	6.99	21.0	1.79	9.10	Black Muddy Turbid
14.55	20.7	13795	7.10	12.0	1.38	9.10	Black Muddy Turbid

Standing Water Level
Ground Level to TOC: 0.80m
SWL on Arrival to TOC: 9.10m
Bore Depth to TOC: 10.05m
Pump Placement to TOC:
Pre-Purge Level to TOC:
Start of Sampling to TOC:
End of Sampling to TOC:
SWL on Departure to TOC:

General Comments
Very muddy bore.
Hand bale used
no pump

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GROUNDWATER SAMPLING FIELD SHEET USING LOW FLOW PURGING

ALS

General Information
Client: LCC
Project:
Site: Horewell
Date: 19/02/19

Bore Details
Bore ID: LB08
Screen: –
Diameter: 100mm
Capped: ☒ Locked: ☒ Lock ID: Construction Report Sighted: ☐
AHD to TOC: Condition/Comments:

GPS Location & Zone
Easting: -35°128.09"
Northing: 146°

Weather
Conditions: Windy.
Wind Speed: 27.8
Direction: SW
Temperature: 19.5°C
Pressure: 1011.5 hPa

Instrumentation
Device Used: Micropurge
Serial Number:
WQ Probe: YSI Quattro
Serial Number: 15F100150
In Calibration: ☐ Documented: ☐ Decontaminated: ☐
Flow Cell Used: ☐ Drawdown Meter Used: ☐ MicroPurge CPM:

Sample Information
Sampler: Julian Kelly
Time Sampled: 2 29
Filtered:
Filter Type:
Esky Iced: ☐

Proper use of the drawdown meter ensures the screen can not be dewatered. Best practise requires regular monitoring of water level - at least every time the field parameters are checked - to ensure correct operation.

All Field Sheets must be submitted with COC and scanned into the project file - paper copies are to be stored in the appropriate site/project folder.

Preliminary Standing Water Level section details to be obtained before beginning the bore purging process

Micro to be sampled first. Containers to be filled in accordance with OFM005 - Sample container filling instructions

Time (hh:mm)	Temp (°C) ±0.5	EC (µS/cm) ±3%	pH (units) ±0.05	Redox (mV) ±10	DO (mg/L) ±10%	SWL (m)	Appearance (Colour, Turbidity, Odour, Gas etc.)

Standing Water Level
Ground Level to TOC: 0.50m
SWL on Arrival to TOC:
Bore Depth to TOC: 8.71m
Pump Placement to TOC: –
Pre-Purge Level to TOC: –
Start of Sampling to TOC: –
End of Sampling to TOC: –
SWL on Departure to TOC:

General Comments
Dry. Insufficient water

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GROUNDWATER SAMPLING FIELD SHEET USING LOW FLOW PURGING

ALS

General Information
Client: ICC Project:
Site: MORWELL Date: 19/02/19

Bore Details
Bore ID: L304 Screen: Diameter: 0.3m
Capped: ☐ Locked: ☐ Lock ID: Construction Report Sighted: ☐
AHD to TOC: Condition/Comments:

GPS Location & Zone
Easting: 146°25.7102' Northing: 38°12.1205

Weather
Conditions: Windy overcast, mild
Wind Speed: 33.3 km/hr Direction: SW
Temperature: 18.9 Pressure: 1011.5hPa

Instrumentation
Hand bales used
Device Used: Micropurge Serial Number:
WQ Probe: YSI Quattro Serial Number: 15F1001S0
In Calibration: ☐ Documented: ☐ Decontaminated: ☐
Flow Cell Used: ☐ Drawdown Meter Used: ☐ MicroPurge CPM:

Sample Information
Sampler: Julia Phillip Time Sampled: 15:51
Filtered: – Filter Type: –
Esky Iced: ☐

Proper use of the drawdown meter ensures the screen can not be dewatered. Best practise requires regular monitoring of water level - at least every time the field parameters are checked - to ensure correct operation.

All Field Sheets must be submitted with COC and scanned into the project file - paper copies are to be stored in the appropriate site/project folder.

Preliminary Standing Water Level section details to be obtained before beginning the bore purging process

Micro to be sampled first. Containers to be filled in accordance with OFM005 - Sample container filling instructions

Time (hh:mm)	Temp (°C) ±0.5	EC (µS/cm) ±3%	pH (units) ±0.05	Redox (mV) ±10	DO (mg/L) ±10%	SWL (m)	Appearance (Colour, Turbidity, Odour, Gas etc.)
15.41	18.5	12549	6.07	-17.3	2.80	5.08	Dark grey.
15.46	19.2	12574	6.12	-17.9	2.78	5.07	
15.51	19.1	12571	6.14	-18.2	2.74	5.07	Not turbid
							Strong odor

Standing Water Level
Ground Level to TOC: 1.0M
SWL on Arrival to TOC: 5.08m
Bore Depth to TOC: 6.94m
Pump Placement to TOC:
Pre-Purge Level to TOC:
Start of Sampling to TOC:
End of Sampling to TOC:
SWL on Departure to TOC:

General Comments
Hand bale used. No pump.

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GROUNDWATER SAMPLING FIELD SHEET USING LOW FLOW PURGING

ALS

General Information
Client: LCC
Project:
Site: MORWELL
Date: 19/02/19

Bore Details
Bore ID: LB05
Screen:
Diameter: 0.3m
Capped: ☐ Locked: ☒ Lock ID: X Construction Report Sighted: ☐
AHD to TOC:
Condition/Comments: Tall 1.6m pipe Not much water.

GPS Location & Zone
Easting: 146° 25.6872
Northing: S38° 12.1170'

Weather
Conditions: Windy, overcast, mild
Wind Speed: 27.8
Direction: SW
Temperature: 17.5°C
Pressure: 1011.5hPa

Instrumentation
Device Used: ~~Micropurge~~ Hand bale.
Serial Number:
WQ Probe: YSI Quattro
Serial Number: 15F100150
In Calibration: ☐ Documented: ☐ Decontaminated: ☐
Flow Cell Used: ☐ Drawdown Meter Used: ☐ MicroPurge CPM:

Sample Information
Sampler: Julian Phillip
Time Sampled: 15.10
Filtered:
Filter Type:
Esky Iced: ☐

Proper use of the drawdown meter ensures the screen can not be dewatered. Best practise requires regular monitoring of water level - at least every time the field parameters are checked - to ensure correct operation.

All Field Sheets must be submitted with COC and scanned into the project file - paper copies are to be stored in the appropriate site/project folder.

Preliminary Standing Water Level section details to be obtained before beginning the bore purging process

Micro to be sampled first. Containers to be filled in accordance with OFM005 - Sample container filling instructions

Time (hh:mm)	Temp (°C) ±0.5	EC (µS/cm) ±3%	pH (units) ±0.05	Redox (mV) ±10	DO (mg/L) ±10%	SWL (m)	Appearance (Colour, Turbidity, Odour, Gas etc.)
					1.64		
15.10	20.5	38883	6.44	-124.9	~~135.6~~	10.30	very black very turbid strong odour. Not enough water to sample.

Standing Water Level
Ground Level to TOC: 1.6m
SWL on Arrival to TOC: 10.30m
Bore Depth to TOC: 10.58m
Pump Placement to TOC:
Pre-Purge Level to TOC:
Start of Sampling to TOC:
End of Sampling to TOC:
SWL on Departure to TOC:

General Comments
Hand bale used.
No pump used.
Insufficient water to sample

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GROUNDWATER SAMPLING FIELD SHEET USING LOW FLOW PURGING

ALS

General Information
Client: LCC Project:
Site: MORWELL Date: 19/02/19

Bore Details
Bore ID: LB06 Screen: Diameter: 0.3M
Capped: ☐ Locked: ☐ Lock ID: Construction Report Sighted: ☐
AHD to TOC: Condition/Comments:

GPS Location & Zone
Easting: 146 25° 7223' Northing: 538° 12.1453

Weather
Conditions: Cool, windy, overcast
Wind Speed: 24.1 Direction: WSW
Temperature: 20.5 °C Pressure: 1011.3hPa

Instrumentation
Device Used: Micropurge Hand baled Serial Number:
WQ Probe: YSI Quattro Serial Number: 15F100150
In Calibration: ☑ Documented: ☐ Decontaminated: ☐
Flow Cell Used: ☐ Drawdown Meter Used: ☐ MicroPurge CPM: —

Sample Information
Sampler: Julian Phillip Time Sampled:
Filtered: Filter Type:
Esky Iced: ☐

Proper use of the drawdown meter ensures the screen can not be dewatered. Best practise requires regular monitoring of water level - at least every time the field parameters are checked - to ensure correct operation.

All Field Sheets must be submitted with COC and scanned into the project file - paper copies are to be stored in the appropriate site/project folder.

Preliminary Standing Water Level section details to be obtained before beginning the bore purging process

Micro to be sampled first. Containers to be filled in accordance with OFM005 - Sample container filling instructions

Time (hh:mm)	Temp (°C) ±0.5	EC (µS/cm) ±3%	pH (units) ±0.05	Redox (mV) ±10	DO (mg/L) ±10%	SWL (m)	Appearance (Colour, Turbidity, Odour, Gas etc.)
15:55	19.3		6.10	-9.6	2.12	8.52	Dark grey
16:00	20.1		6.31	-9.5	2.08		Strong odour
16:05	20.7		6.42	-9.2	2.02		Slightly turbid

Standing Water Level
Ground Level to TOC: 8.52m
SWL on Arrival to TOC: 1.6m
Bore Depth to TOC: 11.10m
Pump Placement to TOC:
Pre-Purge Level to TOC:
Start of Sampling to TOC:
End of Sampling to TOC:
SWL on Departure to TOC:

General Comments
Hand bale. No pump.

EC = 690 ms/cm

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Groundwater Gauging Record

Client: LCC **Site:** Myland **Date:** 19/2/19

Sampler/s: i Burke T. Phillip

Bore ID	Time	Standing Water Level to Top Of Casing(cm)	Comments:
BH 1	1000	66.68m	Depth 68.05 m not locked
BH 2	1020	dry	Depth 74.35 m not locked
BH 3	1030	dry, damaged, blocked	Depth 50.20m not locked, no monument
BH 4	1010	dry	Depth ~~20~~.65 m not locked
BH5	1040	89.76m	Depth 100.75m not locked

ᵓE No:
19-09779

Water Resources Group - Analysis Request Form

Date Received	Program	Company
		LaTrobe City Council

Sampler : L Bailie   Date Scheduled :   Date Sampled: 28/2/19

Program Description :   Sampled by ALS USING PROCEDURE EN67: YES or NO

Form : WEST

Sample No	Sample Name	Time	Condition	SWL (m)	Field Temp	DO mg/L	pH Units	EC uS/cm	Redox mv
6000208	BH3	blocked	at	50	20m				
6000209	BH5	1100		89.67	18.4	1.52	3.78	297.5	62.7
6000210	DUPLICATE	not	enough	sample					
6000211	TRIPLICATE EXTERNAL SENT TO CHECKTEST LAB	not	enough Not Req'd	sample Not Req'd	Not Req'd	Not Req'd	Not Req'd	Not Req'd	Not Req'd
6000212	RINSATE	1140	Not Req'd	Not Req'd	Not Req'd	Not Req'd	Not Req'd	Not Req'd	Not Req'd

P_150_MET_GRN (150mL green Band) P_500_ (500mL plastic) GA_100_HAA (100mL Haloacetic acid) G_40_THM (40mL vial x 2) GA_100_TOC (100mL brown glass - white cap)
P_250 (250mL plastic) P_250_MIC (250mL plastic - red dot) P_125 (125 mL plastic) P_1L (1 Litre plastic) P_250_CHEM (250 mL plastic) P_250_NUTS (250 mL plastic)

Comments:

Special Instructions:

Sample Containers
1 x Metals 60ml Red   1 x 60mL H2SO4 Purple   1 x 500ml plastic
1 x DOC amber glass   1 x 500ml amber glass   1 x 250ml plastic
3 x 40ml vials

Printed: 19/02/2019

PE No:
19-09779

Water Resources Group - Analysis Request Form

Date Received	Program	Company
		LaTrobe City Council

Sampler : L Bovile

Date Scheduled :

Date Sampled: 28, 2, 19

Program Description :

Sampled by ALS USING PROCEDURE EN67: YES or NO

Form : WEST

Sample No	Sample Name	Time	Condition	SWL (m)	Field Temp	DO mg/L	pH Units	EC uS/cm	Redox mv
6000213	FIELD BLANK	1150	Not Req'd	Not Req'd	Not Req'd	Not Req'd	Not Req'd	Not Req'd	Not Req'd
6000214	TRIP BLANK	1200	Not Req'd	Not Req'd	Not Req'd	Not Req'd	Not Req'd	Not Req'd	Not Req'd

P_150_MET_GRN (150mL green Band) P_500_ (500mL plastic) GA_100_HAA (100mL Haloacetic acid) G_40_THM (40mL vial x 2) GA_100_TOC (100mL brown glass - white cap)
P_250 (250mL plastic) P_250_MIC (250mL plastic - red dot) P_125 (125 mL plastic) P_1L (1 Litre plastic) P_250_CHEM (250 mL plastic) P_250_NUTS (250 mL plastic)

Comments:

Special Instructions:

Sample Containers

1 x Metals 60ml Red	1 x 60mL H2SO4 Purple	1 x 500ml plastic
1 x DOC amber glass	1 x 500ml amber glass	1 x 250ml plastic
3 x 40ml vials		

Printed: 19/02/2019

GROUNDWATER SAMPLING FIELD SHEET USING LOW FLOW PURGING

ALS Environmental

General Information
Client: LCC Project: Hyland
Site: Hyland Date: 28/2/19

Bore Details
Bore ID: BH05 Screen: 93-99 Diameter: 50mm
Capped: ☐ no Locked: no ☐ Lock ID: Construction Report Sighted: ☐
AHD to TOC: Condition/Comments:

GPS Location & Zone
Easting: Northing:

Weather
Conditions: sunny
Wind Speed: 15 Direction: ENE
Temperature: 22.6 Pressure: 1020.5 hPa

Instrumentation
Device Used: solinst 407 Serial Number: –
WQ Probe: YSI Serial Number: 15E100150
In Calibration: ☑ Documented: ☑ Decontaminated: ☑
Flow Cell Used: ☑ Drawdown Meter Used: ☑ MicroPurge CPM: 2

Sample Information
Sampler: L. Bradley Time Sampled: 1100
Filtered: yes Filter Type: 0.45µm
Esky Iced: ☑

Proper use of the drawdown meter ensures the screen can not be dewatered. Best practise requires regular monitoring of water level - at least every time the field parameters are checked - to ensure correct operation.

All Field Sheets must be submitted with COC and scanned into the project file - paper copies are to be stored in the appropriate site/project folder.

Preliminary Standing Water Level section details to be obtained before beginning the bore purging process

Micro to be sampled first. Containers to be filled in accordance with OFM005 - Sample container filling instructions

Time (hh:mm)	Temp (°C) ±0.5	EC (µS/cm) ±3%	pH (units) ±0.05	Redox (mV) ±10	DO (mg/L) ±10%	SWL (m)	Appearance (Colour, Turbidity, Odour, Gas etc.)
1040	21.0	337.8	5.47	21.2	3.93	89.67	orange, turbid, sulfur
1042	19.9	304.2	4.80	38.9	3.46	89.83	"
1044	18.8	300.0	4.02	59.9	2.85	89.85	"
1046	19.0	300.0	3.80	64.3	2.32	89.88	"
1048	18.6	298.3	3.76	64.3	1.73	89.90	"
1050	18.7	299.4	3.75	63.9	1.74	89.93	"
1052	18.4	298.8	3.76	63.1	1.55	89.96	"
1054	18.4	297.8	3.77	63.1	1.57	89.97	"
1056	18.3	297.1	3.77	62.7	1.59	90.00	"
1058	18.4	297.5	3.78	62.7	1.52	90.02	"
1100	start	sampling.				90.02	
1132	finish	sampling				90.36	

Standing Water Level
Ground Level to TOC: −0.27
SWL on Arrival to TOC: 89.67
Bore Depth to TOC: 100.75
Pump Placement to TOC: 96.00
Pre-Purge Level to TOC: 89.30
Start of Sampling to TOC: 90.02
End of Sampling to TOC: 90.36
SWL on Departure to TOC: 90.49

General Comments
top of case 27cm below ground level. uncapped, unlocked.
slow recharge

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Groundwater Gauging Record

Client: **Site:** Hyland **Date:** 19/2/19

Sampler/s: L Bowler T. Phillip

Bore ID	Time	Standing Water Level to Top Of Casing(cm)	Comments:
BH 1	1000	66.68m	Depth 68.05 m not locked
BH 2	1020	dry	Depth 74.35 m not locked
BH 3	1030	dry, damaged, blocked	Depth 50.20m not locked, no movement
BH 4	1010	dry	Depth 70.65 m not locked
BH5	1040	89.76m	screen 93.00 – 99.00m not locked

PE No:
19-21318

Water Resources Group - Analysis Request Form

Date Received	Program	Company
		LaTrobe City Council

Sampler : L. Bourke

Date Scheduled :

Date Sampled: 16 / 5 / 19

Program Description :

Sampled by ALS USING PROCEDURE EN67: YES or NO

Form : WEST

Sample No	Sample Name	Time	Site Details	SWL (m)	Field Temp	DO mg/L	pH Units	EC uS/cm	REDOX mv
6090005	LEACHATE POND 1	950	- 1 metre from full - Green odour - no odour.		11.6	10.57	9.74	5945	-21.7
6090006	LEACHATE POND 2	935	1 metre from full. - leachate odour - dark brown/green.		13.4 ~~18.9~~	6.09 ~~0.39~~	8.51 ~~7.21~~	~~14903~~ ~~13773~~ 14851	~~-32.9~~ ~~-231.2~~ -25.9
6090007	LEACHATE SUMP 1 - Cell 3	925	- dark brown - leachate odour.	-	18.3	1.26	7.36	22190	-59.1
6090008	LEACHATE SUMP 2 - Cell 4	915	leachate odour brown.		18.9	0.39	7.21	13773	-231.2
6090009	GW INTERCEPTION SYSTEM		Dry.						

P_150_MET_GRN (150mL green Band) **P_500_** (500mL plastic) **GA_100_HAA** (100mL Haloacetic acid) **G_40_THM** (40mL vial x 2) **GA_100_TOC** (100mL brown glass - white cap)
P_250 (250mL plastic) **P_250_MIC** (250mL plastic - red dot) **P_125** (125 mL plastic) **P_1L** (1 Litre plastic) **P_250_CHEM** (250 mL plastic) **P_250_NUTS** (250 mL plastic)

Printed: 30/04/2019

PE No:
19-21318

Water Resources Group - Analysis Request Form

Date Received	Program	Company
		LaTrobe City Council

Sampler : Leo Bourke.

Date Scheduled :

Date Sampled: 16 / 5 / 19

Program Description :

Sampled by ALS USING PROCEDURE EN67: YES or NO

Form : WEST

Sample No	Sample Name	Time	Site Details	SWL (m)	Field Temp	DO mg/L	pH Units	EC uS/cm	REDOX mv
6090010	STORMWATER POND 1	10 10	Fall to spilling turbid, creamy colour, cloudy no odour	-	11.4	~~7.4~~ 7.32	~~8.13~~ 7.98	324.0	~~20.5~~ -17.6
6090011	STORMWATER POND 2	10 25	Turbid creamy cloudy ½ metre below plate no odour		11.9	9.25	8.05	392.3	-9.8
6090012	TRARALGON CREEK US	8 15	Low flow clear to light brown odourless	-	10.9	11.02	6.90	302	25.1
6090013	TRARALGON CREEK DS	8 50	no flow, light oil on surface clear	-	11.1	6.52	7.05	306	15.3
6090014	RO PERMEATE Not Working.	—							

P_150_MET_GRN (150mL green Band) **P_500_** (500mL plastic) **GA_100_HAA** (100mL Haloacetic acid) **G_40_THM** (40mL vial x 2) **GA_100_TOC** (100mL brown glass - white cap)
P_250 (250mL plastic) **P_250_MIC** (250mL plastic - red dot) **P_125** (125 mL plastic) **P_1L** (1 Litre plastic) **P_250_CHEM** (250 mL plastic) **P_250_NUTS** (250 mL plastic)

Daily Sampler's Check Form

Samplers Name: L. Boville **Date:** 13/6/19

MultiMeter ID: 25

*** Check results against acceptable limits below and calibrate instrument or take extra sample if results do not comply.**

** If equipment is used, enter Equipment ID into the box on the far right or if not used insert N/A into the box.

1. pH Meter - Calibration or Check

Buffers	4.00	7.00	10.00			Daily pH Check at 5th Site - should be within acceptance limits	
ALSnet Batch Number eg 18/338	19/150	19/158	19/159		Slope↓		
Acceptance limit	3.90 - 4.10	6.90 - 7.10	9.90 - 10.10	Temp (°C)↓	95-102% (56.5 - 60 mv)	pH:→	(7.00 or 10.00)
Check Results			9.96				Equipment ID ↓
Cal Results *** with new buffers	3.98	7.00					25

*** Only if calibration is required

Record the pH meter daily in pH 7.00 Buffer and obtain a millivolt (mv) reading (it must be between -30 and +30) → -16.5

2. DO Meter Check Result Equipment ID ↓

Air calibration 99.4 Result must be within 95 to 102 %, or as per instruction manual 25

** Must complete a DO Calibration/Winkler Check form CALM042W every month and show Team Leader/Supervisor.

* If no D O Cap on meter, prepare a bottle with wet paper with deionised water and keep it closed for 15 min, then read the air in the bottle.

3. EC Meter Check

Check with at least 2 standards, one above and below the water being tested. If testing water below 146.9, always check with DI water = < 2 µS/cm.

Standard (µS/cm)	DI	146.9	1413	12890	58670	5th Site check	Equipment ID ↓
Result (µS/cm)	1.3	150.6	1416				25
ALSnet number eg 18/338	N/A	19/148	19/112				

Acceptance limit (µS/cm) 0.001M KCl 146.9 (142.6-151.3), 0.01M KCl 1412 (1369 -1455), 0.1M KCl 12890 (12503-13277), 0.5M KCl 58670 (56900 - 60430)

4. Turbidimeter - Check

Standards - (NTU)	DI Water (<0.2)	Low Std:		Med Std:		High Std:		Equipment ID ↓
Ranges: →								
Results (NTU) →:								

Lot or Set number or of Gelex standards: 5 % Acceptance criteria

* If Sample Readings are less than 1.0 NTU, the DI Water value must be taken off recorded results.

5. Car Fridge Temperature Check

Type of Refrigeration - Circle/Highlight → Esky / Fridge

Fridge/Esky ID →	Fridge 1	Fridge 2	
Thermometer ID →	21		Acceptance limit (2 - 8 °C), as per AS 2031
Temperature (°C)	4.8		Does the temperature result comply with the above acceptance limit (if not - please make a comment below)? Circle - Yes or No

* Place blank sample into fridge at the start of the day and enter temperature of blank at last sample site.

6. Chlorine Meter ID →: N/R

7. When recording temperature for reporting purposes a traceable thermometer must be used: Thermometer ID: 21

***** If using electronically the range cells will populate for the turbidity and conditional formatting for results has been used where possible.**

Comments:

235.7 at 20.1 °C ORP mV

* If unsure check information in the sampling procedure.

Groundwater Gauging Record

Client: LCC Site: Myland Date: 13/6/19

Sampler/s: L. Burke

Bore ID	Time	Standing Water Level to Top Of Casing(cm)	Comments:
BH5			
BH3	910	blocked at 4.9m	no monument, uncapped
BH2	950	74.36m dry	unlocked
BH4	940	20.49m dry	unlocked
BH1	955	67.85 dry	unlocked

PE No:
19-28316

Water Resources Group - Analysis Request Form

Date Received	Program	Company
		LaTrobe City Council

Sampler : C Burke

Date Scheduled :

Date Sampled: 13 / 6 / 19

Program Description :

Sampled by ALS USING PROCEDURE EN67: YES or NO

Form : WEST

Sample No	Sample Name	Time	Site Details	SWL (m)	Field Temp	DO mg/L	pH Units	EC uS/cm	REDOX mv
6141679	BH5	1107		89.79	15.8	0.17	4.21	322	-64.9
6141680	DUP	1107							
6141681	TRIPLICATE PLEASE SEND TO ALS SPRINGVALE	1107							
6141682	RINSATE	1220							

P_150_MET_GRN (150mL green Band) **P_500_** (500mL plastic) **GA_100_HAA** (100mL Haloacetic acid) **G_40_THM** (40mL vial x 2) **GA_100_TOC** (100mL brown glass - white cap)
P_250 (250mL plastic) **P_250_MIC** (250mL plastic - red dot) **P_125** (125 mL plastic) **P_1L** (1 Litre plastic) **P_250_CHEM** (250 mL plastic) **P_250_NUTS** (250 mL plastic)

Sample Containers

1 x Metals 60ml Red (Filtered)	1 x 60ml H2SO4 purple	1 x 500ml plastic Green	
1 x DOC glass	1 x 500ml Amber glass	1 x 250ml plastic Green	3 x 40ml Vials

GROUNDWATER SAMPLING FIELD SHEET USING LOW FLOW PURGING

ALS Environmental

General Information

Client: LCC Project: LCC
Site: Hyland Date: 13/6/19

Bore Details

Bore ID: BH05 Screen: 93-99 Diameter: 50mm
Capped: ☐ Locked: ☐ Lock ID: ____ Construction Report Sighted: ☐
AHD to TOC: ____ Condition/Comments: ____

GPS Location & Zone

Easting: 146°33.605' Northing: 38°16.655'

Weather

Conditions: sunny
Wind Speed: 26 Direction: WNW
Temperature: 15.3 Pressure: 1014 hPa

Instrumentation

Device Used: ~~Micropurge~~ Solinst 407 Serial Number: ____
WQ Probe: YSI Quattro Serial Number: 15F100150
In Calibration: ☑ Documented: ☑ Decontaminated: ☑
Flow Cell Used: ☑ Drawdown Meter Used: ☑ MicroPurge CPM: /

Sample Information

Sampler: L.Barlow Time Sampled: 1107
Filtered: no Filter Type: no
Esky Iced: ☑

Proper use of the drawdown meter ensures the screen can not be dewatered. Best practise requires regular monitoring of water level - at least every time the field parameters are checked - to ensure correct operation.

All Field Sheets must be submitted with COC and scanned into the project file - paper copies are to be stored in the appropriate site/project folder.

Preliminary Standing Water Level section details to be obtained before beginning the bore purging process

Micro to be sampled first. Containers to be filled in accordance with OFM005 - Sample container filling instructions

Time (hh:mm)	Temp (°C) ±0.5	EC (µS/cm) ±3%	pH (units) ±0.05	Redox (mV) ±10	DO (mg/L) ±10%	SWL (m)	Appearance (Colour, Turbidity, Odour, Gas etc.)
1047	16.0	305	4.55	-77.4	1.48	90.07	light brown, turbid, slightly silty
1049	15.8	308	4.43	-74.0	1.20	90.10	
1051	16.2	316	4.22	-67.8	1.67	90.12	
1053	16.3	322	4.17	-67.3	1.12	90.16	
1055	16.0	322	4.18	-66.5	0.79	90.19	
1057	15.9	3.19	4.15	-63.9	0.43	96.21	
1059	15.8	319	4.13	-61.8	0.25	90.22	
1101	15.7	319	4.17	-62.8	0.20	90.24	
1103	15.8	320	4.19	-63.7	0.18	90.26	
1105	15.8	322	4.21	-64.9	0.17	90.29	
1107	start sampling						
1200	finish sampling						

Standing Water Level

Ground Level to TOC:	-0.27
SWL on Arrival to TOC:	89.79
Bore Depth to TOC:	100.75
Pump Placement to TOC:	96.00
Pre-Purge Level to TOC:	89.62
Start of Sampling to TOC:	90.29
End of Sampling to TOC:	90.86
SWL on Departure to TOC:	90.98

General Comments

9 L TAKEN

top of case 27 cm below ground level, uncapped, unlocked

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Appendix H
NATA Accredited Laboratory Reports

ALS Water

CERTIFICATE OF ANALYSIS

Batch No:	**18-52967**	*Page*	Page 1 of 7
Final Report	728738	*Laboratory*	Scoresby Laboratory
Client:		*Address*	Caribbean Business Park, 22 Dalmore Drive, Scoresby, VIC 3179
		Phone	03 8756 8000
		Fax	03 9763 1862
Contact:	**LaTrobe City Council**	Contact:	Brad Snibson Client Manager Brad.Snibson@alsglobal.com
Address:	PO Box 264 MORWELL VIC 3840		
Client Program Ref:	**Hyland Nov 2018**	Date Sampled:	27-Nov-2018 - 28-Nov-2018
ALS Program Ref:	**LATROBECITY**	Date Samples Received:	28-Nov-2018
PO No:	**PO required**	*Date Issued:*	**14-Dec-2018**

The hash (#) below indicates methods not covered by NATA accreditation in the performance of this service .

Analysis		*Method*	*Laboratory*	*Analysis*		*Method*	*Laboratory*	*Analysis*	*Method*	*Laboratory*
DO (Field)		EN67.2	Scoresby	**EC (Field)**		EN67.2	Scoresby			
Field Information	#	FIELD	Scoresby	**pH (Field)**		EN67.2	Scoresby			
Redox (Field)	#	EA075FD	Scoresby	**Temp (Field)**		EN67.2	Scoresby			
Alkalinity		WD037	Scoresby	**BTEXN**		WP074	Scoresby			
Chloride		WD045G	Scoresby	**MS Sol. Metals**		WG020A	Scoresby			
NH3 as N (DA)		WK055G	Scoresby	**NO3-N**		EK058GV	Scoresby			
OES Scan		WG005A (Si not NATA); EA065-69	Scoresby	**pH**		WA005	Scoresby			
Reactive P (HL)		WK071G	Scoresby	**TDS at 180°C +/- 5°C**		WA015	Scoresby			
SO4 DA		WD041G	Scoresby	**TOC (SFA)**		WP005SF 002SF	Scoresby			
TRH F2	#	WP071	Scoresby	**TRH & TPH (>C10)**		WP071	Scoresby			
TRH (C6-C10) & F1		WP071 (F1 not NATA)	Scoresby	**TRH by Headspace**	#	WP125A	Scoresby			

Result for pH in water tested in the laboratory may be indicative only as holding time is generally not achievable.

TOC is analysed as NPOC and VOCs if present may be compromised when removing inorganic carbon .

Measurement Uncertainties values for your compliance results are available at this link

Signatories

Name	Title	Name	Title
Brad Snibson	**Client Manager**	**Hoa Nguyen**	**Analyst**
Hao Zhang	**Team Leader Organics**	**Joseph De Alwis**	**Analyst**
John Earl	**Team Leader Metals**	**John Levvey**	**Principal Trace Metals Chemist**
Kosta Christopoulos	**Deputy Team Leader Organics**	**Mario Solorzano**	**Analyst**
Melani Wijayasiri	**Analyst**		

Batch No: **18-52967**
Report Number: **728738**
Client:
Client Program Ref: **Hyland Nov 2018**

Field Results

Sample	Sampled Date	Your Ref	Sample Type	Temp (Field) Temp °C	pH (Field) pH Units	EC (Field) EC uS/cm	DO (Field) DO mg/L	Redox (Field) Redox mV	Field Information Field Information -
5899435	27-11-18	BH1	WATER						Dry @ 68.4m
5899437	27-11-18	BH2	WATER						Dry @ 74.6m
5899438	27-11-18	BH3	WATER						Bore buried
5899439	27-11-18	BH4	WATER						Dry @ 20.7m
5899440	28-11-18	BH5	WATER	15.9	5.4	270	3.8	-20.6	
5899441	27-11-18	DUPLICATE	WATER						Bores dry
5899442	27-11-18	TRIPLICATE	WATER						Bores dry
5899443	27-11-18	RINSATE1 (DAY 1)	WATER						Bores dry
5899444	27-11-18	RINSATE2 (DAY 2)	WATER						Bores dry
5899446	27-11-18	FIELD BLANK	WATER						Bores dry
5899447	28-11-18	LEACHATE POND 1	WATER	20.5	8.7	2600	11.1	43.0	
5899448	28-11-18	LEACHATE POND 2	WATER	20.1	8.1	13000	6.6	50.6	
5899450	28-11-18	LEACHATE SUMP 1 - Cell 3	WATER	23.0	7.3	19000	1.4	17.1	
5899451	28-11-18	LEACHATE SUMP 2 - Cell 4	WATER	19.7	6.9	7000	1.1	-76.4	
5899452	27-11-18	GW INTERCEPTION SYSTEM	WATER						No access
5899453	28-11-18	STORMWATER POND 1	WATER	20.5	8.0	310	7.6	48.0	
5899454	28-11-18	STORMWATER POND 2	WATER	20.4	8.1	420	2.4	43.2	
5899455	28-11-18	TRARALGON CREEK	WATER	17.5	7.6	230	7.4	50.1	
5899456	28-11-18	TRARALGON CREEK	WATER	16.5	7.1	230	5.8	56.9	
5899457	28-11-18	RO PERMEATE	WATER	19.3	7.3	16	3.0	39.8	

Samples collected by ALS according to procedure EN/67.

A blank space indicates no test performed. Soil microbiological testing was commenced within 4 days from the day collected unless otherwise stated.
MM524: Plate count results <10 per mL and >300 per mL are deemed as approximate.
MM526: Plate count results <2,500 per mL and >250,000 per mL are deemed as approximate.
Calculated results are based on raw data.
Legionella species refers to Legionella species other than Legionella pneumophila

Batch No: **18-52967**
Report Number: **728738**
Client:
Client Program Ref: **Hyland Nov 2018**

Chemistry

Sample	Sampled Date	Your Ref	Sample Type	pH pH Units	TOC (SFA) TOC mg/L	TDS at 180°C +/- 5°C TDS 180 mg/L	Chloride Cl mg/L	SO4 DA SO4 mg/L	Alkalinity Bicarbonate Alk. mg CaCO3 / L	Alkalinity Carbonate Alk. mg CaCO3 / L	Alkalinity Hydroxide Alk mg CaCO3 / L	Alkalinity Total Alkalinity mg CaCO3 / L
5899440	28-11-18	BH5	WATER	5.6	5.6	160	63	17	21	<2	<2	21
5899445	28-11-18	TRIP BLANK	WATER	5.7	<0.5	<5	<1	<1	<2	<2	<2	<2
5899447	28-11-18	LEACHATE POND 1	WATER	8.7	70	1600	500	250	360	50	<2	410
5899448	28-11-18	LEACHATE POND 2	WATER	8.4	330	7800	2500	340	3800	<2	<2	3800
5899450	28-11-18	LEACHATE SUMP 1 - Cell 3	WATER	7.6	710	7100	2400	<50 LINT	7400	<2	<2	7400
5899451	28-11-18	LEACHATE SUMP 2 - Cell 4	WATER	7.2	270	2800	610	<20 LINT	3000	<2	<2	3000
5899453	28-11-18	STORMWATER POND 1	WATER	8.0	8.4	170	43	21	70	<2	<2	70
5899454	28-11-18	STORMWATER POND 2	WATER	7.4	14	270	47	35	100	<2	<2	100
5899455	28-11-18	TRARALGON CREEK	WATER	7.8	4.4	110	40	<2 LINT	54	<2	<2	54
5899456	28-11-18	TRARALGON CREEK	WATER	7.5	4.7	110	39	<2 LINT	52	<2	<2	52
5899457	28-11-18	RO PERMEATE	WATER	6.5	1.0	10	1	<1	5	<2	<2	5

LINT Level of Reporting raised due to interferences in the sample matrix

Nutrients

Sample	Sampled Date	Your Ref	Sample Type	Reactive P (HL) Reactive P mg P / L	NH3 as N (DA) NH3 mg N / L	NO3-N NO3 mg N / L
5899440	28-11-18	BH5	WATER	<0.01	0.2	0.03
5899445	28-11-18	TRIP BLANK	WATER	<0.01	<0.1	<0.01
5899447	28-11-18	LEACHATE POND 1	WATER	<0.01	0.5	<0.01
5899448	28-11-18	LEACHATE POND 2	WATER	4.3	30	37
5899450	28-11-18	LEACHATE SUMP 1 - Cell 3	WATER	5.7	1400	<0.2 LINT
5899451	28-11-18	LEACHATE SUMP 2 - Cell 4	WATER	3.9	460	<0.05 LINT
5899453	28-11-18	STORMWATER POND 1	WATER	<0.01	0.3	0.08
5899454	28-11-18	STORMWATER POND 2	WATER	<0.01	0.7	<0.01
5899455	28-11-18	TRARALGON CREEK	WATER	<0.01	<0.1	0.04
5899456	28-11-18	TRARALGON CREEK	WATER	<0.01	<0.1	0.09
5899457	28-11-18	RO PERMEATE	WATER	<0.01	0.1	0.57

LINT Level of Reporting raised due to interferences in the sample matrix

Samples collected by ALS according to procedure EN/67.

A blank space indicates no test performed. Soil microbiological testing was commenced within 4 days from the day collected unless otherwise stated.
MM524: Plate count results <10 per mL and >300 per mL are deemed as approximate.
MM526: Plate count results <2,500 per mL and >250,000 per mL are deemed as approximate.
Calculated results are based on raw data.
Legionella species refers to Legionella species other than Legionella pneumophila

Batch No: 18-52967
Report Number: 728738
Client:
Client Program Ref: Hyland Nov 2018

Metals

Sample	Sampled Date	Your Ref	Sample Type	Ca (OES Scan) mg/L	Mg (OES Scan) mg/L	K (OES Scan) mg/L	Na (OES Scan) mg/L
5899440	28-11-18	BH5	WATER	8.3	3.0	1.2	32
5899445	28-11-18	TRIP BLANK	WATER	<0.1	<0.1	<0.1	<0.1
5899447	28-11-18	LEACHATE POND 1	WATER	34	28	170	420
5899448	28-11-18	LEACHATE POND 2	WATER	130	460	740	2300
5899450	28-11-18	LEACHATE SUMP 1 - Cell 3	WATER	170	270	800	1900
5899451	28-11-18	LEACHATE SUMP 2 - Cell 4	WATER	210	89	270	480
5899453	28-11-18	STORMWATER POND 1	WATER	17	6.5	5.9	25
5899454	28-11-18	STORMWATER POND 2	WATER	36	7.7	6.6	27
5899455	28-11-18	TRARALGON CREEK	WATER	9.1	5.5	1.4	23
5899456	28-11-18	TRARALGON CREEK	WATER	8.8	5.4	1.4	23
5899457	28-11-18	RO PERMEATE	WATER	<0.1	<0.1	0.5	2.1

Metals - Soluble

Sample	Sampled Date	Your Ref	Sample Type	Iron (MS Sol. Metals) mg/L	Manganese (MS Sol. Metals) mg/L
5899440	28-11-18	BH5	WATER	0.92	0.041
5899445	28-11-18	TRIP BLANK	WATER	<0.01	<0.001
5899447	28-11-18	LEACHATE POND 1	WATER	0.02	<0.001
5899448	28-11-18	LEACHATE POND 2	WATER	0.46	0.55
5899450	28-11-18	LEACHATE SUMP 1 - Cell 3	WATER	7.2	0.34
5899451	28-11-18	LEACHATE SUMP 2 - Cell 4	WATER	2.0	0.71
5899453	28-11-18	STORMWATER POND 1	WATER	0.05	0.003
5899454	28-11-18	STORMWATER POND 2	WATER	0.05	0.081
5899455	28-11-18	TRARALGON CREEK	WATER	0.28	0.050
5899456	28-11-18	TRARALGON CREEK	WATER	0.19	0.033
5899457	28-11-18	RO PERMEATE	WATER	<0.01	<0.001

Samples collected by ALS according to procedure EN/67.

A blank space indicates no test performed. Soil microbiological testing was commenced within 4 days from the day collected unless otherwise stated.
MM524: Plate count results <10 per mL and >300 per mL are deemed as approximate.
MM526: Plate count results <2,500 per mL and >250,000 per mL are deemed as approximate.
Calculated results are based on raw data.
Legionella species refers to Legionella species other than Legionella pneumophila

Batch No: **18-52967**
Report Number: **728738**
Client:
Client Program Ref: **Hyland Nov 2018**

BTEXN

Sample	Sampled Date	Your Ref	Sample Type	Benzene mg/L	Toluene mg/L	Ethyl Benzene mg/L	Xylene - m & p mg/L	Xylene - o mg/L	Total Xylenes mg/L	BTEX (Sum) mg/L
Analysis:				BTEXN	BTEXN	BTEXN	BTEXN	BTEXN	BTEXN	BTEXN
5899440	28-11-18	BH5	WATER	<0.001	<0.001	<0.001	<0.002	<0.001	<0.002	<0.002
5899445	28-11-18	TRIP BLANK	WATER	<0.001	<0.001	<0.001	<0.002	<0.001	<0.002	<0.002
5899447	28-11-18	LEACHATE POND 1	WATER	<0.001	<0.001	<0.001	<0.002	<0.001	<0.002	<0.002
5899448	28-11-18	LEACHATE POND 2	WATER	<0.001	<0.001	<0.001	<0.002	<0.001	<0.002	<0.002
5899450	28-11-18	LEACHATE SUMP 1 - Cell 3	WATER	<0.001	<0.001	<0.001	<0.002	0.032	0.032	0.032
5899451	28-11-18	LEACHATE SUMP 2 - Cell 4	WATER	<0.001	0.11	0.060	0.14	0.077	0.22	0.39
5899453	28-11-18	STORMWATER POND 1	WATER	<0.001	<0.001	<0.001	<0.002	<0.001	<0.002	<0.002
5899454	28-11-18	STORMWATER POND 2	WATER	<0.001	<0.001	<0.001	<0.002	<0.001	<0.002	<0.002
5899455	28-11-18	TRARALGON CREEK	WATER	<0.001	<0.001	<0.001	<0.002	<0.001	<0.002	<0.002
5899456	28-11-18	TRARALGON CREEK	WATER	<0.001	<0.001	<0.001	<0.002	<0.001	<0.002	<0.002
5899457	28-11-18	RO PERMEATE	WATER	<0.001	<0.001	<0.001	<0.002	<0.001	<0.002	<0.002

TRH/TPH (Volatile)

Sample	Sampled Date	Your Ref	Sample Type	TPH C6-C9 mg/L	TRH C6-C10 mg/L	TRHC6-C10 minus BTEX mg/L	TRHC6-C9 mg/L
Analysis:				TRH (C6-C10) & F1	TRH (C6-C10) & F1	TRH (C6-C10) & F1	TRH by Headspace
5899440	28-11-18	BH5	WATER	<0.1	<0.1	<0.1	
5899445	28-11-18	TRIP BLANK	WATER	<0.1	<0.1	<0.1	
5899447	28-11-18	LEACHATE POND 1	WATER				<0.5
5899448	28-11-18	LEACHATE POND 2	WATER				<0.5
5899450	28-11-18	LEACHATE SUMP 1 - Cell 3	WATER				<0.5
5899451	28-11-18	LEACHATE SUMP 2 - Cell 4	WATER				1.0
5899453	28-11-18	STORMWATER POND 1	WATER	<0.1	<0.1	<0.1	
5899454	28-11-18	STORMWATER POND 2	WATER	<0.1	<0.1	<0.1	
5899455	28-11-18	TRARALGON CREEK	WATER	<0.1	<0.1	<0.1	
5899456	28-11-18	TRARALGON CREEK	WATER	<0.1	<0.1	<0.1	
5899457	28-11-18	RO PERMEATE	WATER				<0.5

Samples collected by ALS according to procedure EN/67.

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TRH/TPH

Sample	Sampled Date	Your Ref	Sample Type	TRH F2: TRHC10-C16 minus NAP mg/L	TRH & TPH (>C10): TPH C10-C14 mg/L	TRH & TPH (>C10): TPH C15-C28 mg/L	TRH & TPH (>C10): TPH C29-C36 mg/L	TRH & TPH (>C10): TRH>C10-C16 mg/L	TRH & TPH (>C10): TRH>C16-C34 mg/L	TRH & TPH (>C10): TRH>C34-C40 mg/L	TRH & TPH (>C10): Sum of TRH>C10-C40 mg/L
5899440	28-11-18	BH5	WATER	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
5899445	28-11-18	TRIP BLANK	WATER	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
5899447	28-11-18	LEACHATE POND 1	WATER	<0.2	<0.2 LORR	<0.2 LORR	<0.2 LORR	<0.2 LORR	<0.2 LORR	<0.2 LORR	<0.2 LORR
5899448	28-11-18	LEACHATE POND 2	WATER	0.2	0.1	0.5	<0.1	0.2	0.5	<0.1	0.7
5899450	28-11-18	LEACHATE SUMP 1 - Cell 3	WATER	1.3	1.1	1.8	0.4	1.3	1.8	0.2	3.3
5899451	28-11-18	LEACHATE SUMP 2 - Cell 4	WATER	1.1	1.0	1.1	0.3	1.1	1.1	0.1	2.3
5899453	28-11-18	STORMWATER POND 1	WATER	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
5899454	28-11-18	STORMWATER POND 2	WATER	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
5899455	28-11-18	TRARALGON CREEK	WATER	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
5899456	28-11-18	TRARALGON CREEK	WATER	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
5899457	28-11-18	RO PERMEATE	WATER	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

LORR Limit of Reporting has been raised due to high moisture content, insufficient sample or matrix interference.

Samples collected by ALS according to procedure EN/67.

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Legionella species refers to Legionella species other than Legionella pneumophila

CERTIFICATE OF ANALYSIS

Batch No:	**19-09779**	Page	Page 1 of 4
Final Report	743674	*Laboratory*	Scoresby Laboratory
		Address	Caribbean Business Park, 22 Dalmore Drive, Scoresby, VIC 3179
		Phone	03 8756 8000
		Fax	03 9763 1862
Client:	**LaTrobe City Council**	Contact:	Brad Snibson
Contact:	**Chandana Vidanaarachchi**		Client Manager
Address:	PO Box 264 MORWELL VIC 3840		Brad.Snibson@alsglobal.com
Client Program Ref:	**Hyland Feb 2019**	Date Sampled:	28-Feb-2019
ALS Program Ref:	**LATROBECITY**	Date Samples Received:	28-Feb-2019
PO No:	**PO required**	*Date Issued:*	**13-Mar-2019**

The hash (#) below indicates methods not covered by NATA accreditation in the performance of this service .

Analysis		*Method*	*Laboratory*	*Analysis*		*Method*	*Laboratory*	*Analysis*	*Method*	*Laboratory*
DO (Field)		EN67.2	Scoresby	**EC (Field)**		EN67.2	Scoresby			
Field Information	#	FIELD	Scoresby	**pH (Field)**		EN67.2	Scoresby			
Redox (Field)	#	EA075FD	Scoresby	**St. Water Lev**	#	FIELD	Scoresby			
Temp (Field)		EN67.2	Scoresby	**Alkalinity**		WD037	Scoresby			
BTEXN		WP074	Scoresby	**Chloride**		WD045G	Scoresby			
MS Sol. Metals		WG020A	Scoresby	**NH3 as N (DA)**		WK055G	Scoresby			
NO3-N		EK058GV	Scoresby	**OES Scan**		WG005A (Si not NATA); EA065-69	Scoresby			
pH		WA005	Scoresby	**Reactive P (HL)**		WK071G	Scoresby			
TDS at 180°C +/- 5°C		WA015	Scoresby	**SO4 DA**		WD041G	Scoresby			
TOC (SFA)		WP005SF 002SF	Scoresby	**TRH F2**	#	WP071	Scoresby			
TRH & TPH (>C10)		WP071	Scoresby	**TRH (C6-C10) & F1**		WP071 (F1 not NATA)	Scoresby			

Result for pH in water tested in the laboratory may be indicative only as holding time is generally not achievable.

TOC is analysed as NPOC and VOCs if present may be compromised when removing inorganic carbon .

Measurement Uncertainties values for your compliance results are available at this link

Signatories

Name	Title	Name	Title
Brad Snibson	Client Manager	Chatura Perera	Team Leader Nutrients
John Earl	Team Leader Metals	Kosta Christopoulos	Deputy Team Leader Organics
Mario Solorzano	Analyst	Melani Wijayasiri	Analyst

Batch No: **19-09779**
Report Number: **743674**
Client: **LaTrobe City Council**
Client Program Ref: **Hyland Feb 2019**

Field Results

Sample	Sampled Date	Your Ref	Analysis: / Component: / Units: / Sample Type	Temp (Field) Temp °C	pH (Field) pH Units	EC (Field) EC uS/cm	DO (Field) DO mg/L	Redox (Field) Redox mV	St. Water Lev Water Level M	Field Information Field Information -
6000208	28-02-19	BH3	WATER							Blocked @ 50M
6000209	28-02-19	BH5	WATER	18.4	3.8	300	1.5	62.7	90	
6000210	28-02-19	DUPLICATE	WATER							No volume
6000211	28-02-19	TRIPLICATE EXTERNAL	WATER							No volume

Chemistry

Sample	Sampled Date	Your Ref	Analysis: / Component: / Units: / Sample Type	pH pH Units	TOC (SFA) TOC mg/L	TDS at 180°C +/- 5°C TDS 180 mg/L	Chloride Cl mg/L	SO4 DA SO4 mg/L	Alkalinity Bicarbonate Alk. mg CaCO3 / L	Alkalinity Carbonate Alk. mg CaCO3 / L	Alkalinity Hydroxide Alk mg CaCO3 / L	Alkalinity Total Alkalinity mg CaCO3 / L
6000209	28-02-19	BH5	WATER	4.6	11	140	71	19	7	<2	<2	7
6000212	28-02-19	RINSATE	WATER	5.5	<0.5	<5	<1	<1	<2	<2	<2	<2
6000213	28-02-19	FIELD BLANK	WATER	5.5	<0.5	<5	<1	<1	<2	<2	<2	<2
6000214	28-02-19	TRIP BLANK	WATER	5.5	<0.5	<5	<1	<1	<2	<2	<2	<2

Nutrients

Sample	Sampled Date	Your Ref	Analysis: / Component: / Units: / Sample Type	Reactive P (HL) Reactive P mg P / L	NH3 as N (DA) NH3 mg N / L	NO3-N NO3 mg N / L
6000209	28-02-19	BH5	WATER	0.01	0.4	0.02
6000212	28-02-19	RINSATE	WATER	<0.01	<0.1	<0.01
6000213	28-02-19	FIELD BLANK	WATER	<0.01	<0.1	<0.01
6000214	28-02-19	TRIP BLANK	WATER	<0.01	<0.1	<0.01

Metals

Sample	Sampled Date	Your Ref	Analysis: / Component: / Units: / Sample Type	OES Scan Ca mg/L	OES Scan Mg mg/L	OES Scan K mg/L	OES Scan Na mg/L
6000209	28-02-19	BH5	WATER	4.1	4.1	0.8	37
6000212	28-02-19	RINSATE	WATER	<0.1	<0.1	<0.1	<0.1
6000213	28-02-19	FIELD BLANK	WATER	<0.1	<0.1	<0.1	<0.1
6000214	28-02-19	TRIP BLANK	WATER	<0.1	<0.1	<0.1	<0.1

Samples collected by ALS according to procedure EN/67.

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Batch No: 19-09779
Report Number: 743674
Client: LaTrobe City Council
Client Program Ref: Hyland Feb 2019

Metals - Soluble

Sample	Sampled Date	Your Ref	Sample Type	Iron (MS Sol. Metals) mg/L	Manganese (MS Sol. Metals) mg/L
6000209	28-02-19	BH5	WATER	1.9	0.049
6000212	28-02-19	RINSATE	WATER	<0.01	<0.001
6000213	28-02-19	FIELD BLANK	WATER	<0.01	<0.001
6000214	28-02-19	TRIP BLANK	WATER	<0.01	<0.001

BTEXN

Sample	Sampled Date	Your Ref	Sample Type	Benzene (BTEXN) mg/L	Toluene (BTEXN) mg/L	Ethyl Benzene (BTEXN) mg/L	Xylene - m & p (BTEXN) mg/L	Xylene - o (BTEXN) mg/L	Total Xylenes (BTEXN) mg/L	BTEX (Sum) (BTEXN) mg/L
6000209	28-02-19	BH5	WATER	<0.001	<0.001	<0.001	<0.002	<0.001	<0.002	<0.002
6000212	28-02-19	RINSATE	WATER	<0.001	<0.001	<0.001	<0.002	<0.001	<0.002	<0.002
6000213	28-02-19	FIELD BLANK	WATER	<0.001	<0.001	<0.001	<0.002	<0.001	<0.002	<0.002
6000214	28-02-19	TRIP BLANK	WATER	<0.001	<0.001	<0.001	<0.002	<0.001	<0.002	<0.002

TRH/TPH (Volatile)

Sample	Sampled Date	Your Ref	Sample Type	TPH C6-C9 (TRH (C6-C10) & F1) mg/L	TRH C6-C10 (TRH (C6-C10) & F1) mg/L	TRHC6-C10 minus BTEX (TRH (C6-C10) & F1) mg/L
6000209	28-02-19	BH5	WATER	<0.1	<0.1	<0.1
6000212	28-02-19	RINSATE	WATER	<0.1	<0.1	<0.1
6000213	28-02-19	FIELD BLANK	WATER	<0.1	<0.1	<0.1
6000214	28-02-19	TRIP BLANK	WATER	<0.1	<0.1	<0.1

TRH/TPH

Sample	Sampled Date	Your Ref	Sample Type	TRHC10-C16 minus NAP (TRH F2) mg/L	TPH C10-C14 (TRH & TPH (>C10)) mg/L	TPH C15-C28 (TRH & TPH (>C10)) mg/L	TPH C29-C36 (TRH & TPH (>C10)) mg/L	TRH>C10-C16 (TRH & TPH (>C10)) mg/L	TRH>C16-C34 (TRH & TPH (>C10)) mg/L	TRH>C34-C40 (TRH & TPH (>C10)) mg/L	Sum of TRH>C10-C40 (TRH & TPH (>C10)) mg/L
6000209	28-02-19	BH5	WATER	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
6000212	28-02-19	RINSATE	WATER	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
6000213	28-02-19	FIELD BLANK	WATER	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
6000214	28-02-19	TRIP BLANK	WATER	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

Samples collected by ALS according to procedure EN/67.

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Legionella species refers to Legionella species other than Legionella pneumophila

ALS Water

CERTIFICATE OF ANALYSIS

Batch No:	**19-21318**	*Page*	
Final Report	758440	*Laboratory*	Scoresby Laboratory
		Address	Caribbean Business Park, 22 Dalmore Drive, Scoresby, VIC 3179
Client:	**LaTrobe City Council**	*Phone*	03 8756 8000
		Fax	03 9763 1862
Contact:	**Chandana Vidanaarachchi**	Contact:	Tuyen Nguyen Client Manager Tuyen.Nguyen@alsglobal.com
Address:	PO Box 264 MORWELL VIC 3840		
Client Program Ref:	**LCC - Hyland Landfill**	Date Sampled:	16-May-2019
ALS Program Ref:	**BORE-HYLAND**	Date Samples Received:	16-May-2019
PO No:	**Not Available**	*Date Issued:*	**06-Jun-2019**

The hash (#) below indicates methods not covered by NATA accreditation in the performance of this service .

Analysis		*Method*	*Laboratory*	*Analysis*		*Method*	*Laboratory*	*Analysis*	*Method*	*Laboratory*
DO (Field)		EN67.2	Scoresby	**EC (Field)**		EN67.2	Scoresby			
pH (Field)		EN67.2	Scoresby	**Redox (Field)**	#	EA075FD	Scoresby			
Temp (Field)		EN67.2	Scoresby	**Alkalinity**		WD037	Scoresby			
BTEXN		WP074	Scoresby	**Chloride**		WD045G	Scoresby			
MS Sol. Metals		WG020A	Scoresby	**NH3 as N (DA)**		WK055G	Scoresby			
NO3-N		EK058GV	Scoresby	**OES Scan**		WG005A (Si not NATA); EA065-69	Scoresby			
pH		WA005	Scoresby	**Reactive P (HL)**		WK071G	Scoresby			
TDS at 180°C +/- 5°C		WA015	Scoresby	**SO4 DA**		WD041G	Scoresby			
TOC (SFA)		WP005SF 002SF	Scoresby	**TRH F2**	#	WP071	Scoresby			
TRH & TPH (>C10)		WP071	Scoresby	**TRH (C6-C10) & F1**		WP071 (F1 not NATA)	Scoresby			
TRH by Headspace	#	WP125A	Scoresby							

Result for pH in water tested in the laboratory may be indicative only as holding time is generally not achievable.

TOC is analysed as NPOC and VOCs if present may be compromised when removing inorganic carbon .

Measurement Uncertainties values for your compliance results are available at this link

Signatories

Name	Title	Name	Title
Chatura Perera	**Team Leader Nutrients**	**Hao Zhang**	**Team Leader Organics**
Joseph De Alwis	**Analyst**	**John Earl**	**Team Leader Metals**
Kosta Christopoulos	**Deputy Team Leader Organics**	**Melani Wijayasiri**	**Analyst**
Tuyen Nguyen	**Client Manager**		

Batch No: **19-21318**
Report Number: **758440**
Client: **LaTrobe City Council**
Client Program Ref: **LCC - Hyland Landfill**

Field Results

Sample	Sampled Date	Your Ref	Sample Type	Temp (Field) Temp °C	pH (Field) pH Units	EC (Field) EC uS/cm	DO (Field) DO mg/L	Redox (Field) Redox mV
6090005	16-05-19	LEACHATE POND 1	WATER	11.6	9.7	5900	10.6	-21.7
6090006	16-05-19	LEACHATE POND 2	WATER	13.4	8.5	15000	6.1	-25.9
6090007	16-05-19	LEACHATE SUMP 1 - Cell 3	WATER	18.3	7.4	22000	1.3	-59.1
6090008	16-05-19	LEACHATE SUMP 2 - Cell 4	WATER	18.9	7.2	14000	<0.5	-231.2
6090010	16-05-19	STORMWATER POND 1	WATER	11.4	8.0	320	7.3	-17.6
6090011	16-05-19	STORMWATER POND 2	WATER	11.9	8.0	390	9.2	-9.8
6090012	16-05-19	TRARALGON CREEK US	WATER	10.9	6.9	300	11.0	25.1
6090013	16-05-19	TRARALGON CREEK DS	WATER	11.1	7.0	310	6.5	15.3

Chemistry

Sample	Sampled Date	Your Ref	Sample Type	pH pH Units	TOC (SFA) TOC mg/L	TDS at 180°C +/- 5°C TDS 180 mg/L	Chloride Cl mg/L	SO4 DA SO4 mg/L	Alkalinity Bicarbonate Alk. mg CaCO3 / L	Alkalinity Carbonate Alk. mg CaCO3 / L	Alkalinity Hydroxide Alk mg CaCO3 / L	Alkalinity Total Alkalinity mg CaCO3 / L
6090005	16-05-19	LEACHATE POND 1	WATER	9.7	260	4100	1400	270	590	380	<2	960
6090006	16-05-19	LEACHATE POND 2	WATER	8.6	330	8400	3100	300	3900	260	<2	4100
6090007	16-05-19	LEACHATE SUMP 1 - Cell 3	WATER	7.4	640	8400	2700	<100 LINT	7200	<2	<2	7200
6090008	16-05-19	LEACHATE SUMP 2 - Cell 4	WATER	7.3	350	5700	1500	<50 LINT	4300	<2	<2	4300
6090010	16-05-19	STORMWATER POND 1	WATER	7.3	8.9	300	40	41	61	<2	<2	61
6090011	16-05-19	STORMWATER POND 2	WATER	8.0	9.0	200	56	22	92	<2	<2	92
6090012	16-05-19	TRARALGON CREEK US	WATER	7.5	4.7	140	64	<10 LINT	53	<2	<2	53
6090013	16-05-19	TRARALGON CREEK DS	WATER	7.0	5.3	140	67	14	46	<2	<2	46

LINT Level of Reporting raised due to interferences in the sample matrix

Samples collected by ALS according to procedure EN/67.

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Batch No: **19-21318**
Report Number: **758440**
Client: **LaTrobe City Council**
Client Program Ref: **LCC - Hyland Landfill**

Nutrients

Sample	Sampled Date	Your Ref	Sample Type	Reactive P (HL)	NH3 as N (DA)	NO3-N
			Component:	Reactive P	NH3	NO3
			Units:	mg P / L	mg N / L	mg N / L
6090005	16-05-19	LEACHATE POND 1	WATER	0.03	0.8	<0.01
6090006	16-05-19	LEACHATE POND 2	WATER	3.9	53	15
6090007	16-05-19	LEACHATE SUMP 1 - Cell 3	WATER	5.3	1000	<0.2 LINT
6090008	16-05-19	LEACHATE SUMP 2 - Cell 4	WATER	5.0	510	<0.1 LINT
6090010	16-05-19	STORMWATER POND 1	WATER	<0.01	0.5	0.08
6090011	16-05-19	STORMWATER POND 2	WATER	<0.01	0.1	0.04
6090012	16-05-19	TRARALGON CREEK US	WATER	0.02	<0.1	0.05
6090013	16-05-19	TRARALGON CREEK DS	WATER	<0.01	<0.1	<0.01

LINT Level of Reporting raised due to interferences in the sample matrix

Metals

Sample	Sampled Date	Your Ref	Sample Type	OES Scan	OES Scan	OES Scan	OES Scan
			Component:	Ca	Mg	K	Na
			Units:	mg/L	mg/L	mg/L	mg/L
6090005	16-05-19	LEACHATE POND 1	WATER	15	19	460	1600
6090006	16-05-19	LEACHATE POND 2	WATER	75	500	1400	3600
6090007	16-05-19	LEACHATE SUMP 1 - Cell 3	WATER	190	360	690	3000
6090008	16-05-19	LEACHATE SUMP 2 - Cell 4	WATER	140	190	610	1500
6090010	16-05-19	STORMWATER POND 1	WATER	28	7.7	5.7	23
6090011	16-05-19	STORMWATER POND 2	WATER	28	9.4	7.2	35
6090012	16-05-19	TRARALGON CREEK US	WATER	14	7.5	1.6	28
6090013	16-05-19	TRARALGON CREEK DS	WATER	12	7.0	1.8	29

Samples collected by ALS according to procedure EN/67.

A blank space indicates no test performed. Soil microbiological testing was commenced within 4 days from the day collected unless otherwise stated.
MM524: Plate count results <10 per mL and >300 per mL are deemed as approximate.
MM526: Plate count results <2,500 per mL and >250,000 per mL are deemed as approximate.
Calculated results are based on raw data.
Legionella species refers to Legionella species other than Legionella pneumophila

Batch No: **19-21318**
Report Number: **758440**
Client: **LaTrobe City Council**
Client Program Ref: **LCC - Hyland Landfill**

Metals - Soluble

Sample	Sampled Date	Your Ref	Sample Type	Iron mg/L (MS Sol. Metals)	Manganese mg/L (MS Sol. Metals)
6090005	16-05-19	LEACHATE POND 1	WATER	0.21	0.007
6090006	16-05-19	LEACHATE POND 2	WATER	0.48	0.55
6090007	16-05-19	LEACHATE SUMP 1 - Cell 3	WATER	3.2	0.47
6090008	16-05-19	LEACHATE SUMP 2 - Cell 4	WATER	0.75	0.44
6090010	16-05-19	STORMWATER POND 1	WATER	0.02	0.004
6090011	16-05-19	STORMWATER POND 2	WATER	0.01	<0.001
6090012	16-05-19	TRARALGON CREEK US	WATER	0.93	0.051
6090013	16-05-19	TRARALGON CREEK DS	WATER	0.64	0.052

BTEXN

Sample	Sampled Date	Your Ref	Sample Type	Benzene mg/L (BTEXN)	Toluene mg/L (BTEXN)	Ethyl Benzene mg/L (BTEXN)	Xylene - m & p mg/L (BTEXN)	Xylene - o mg/L (BTEXN)	Total Xylenes mg/L (BTEXN)	BTEX (Sum) mg/L (BTEXN)
6090005	16-05-19	LEACHATE POND 1	WATER	<0.01 LORR	<0.01 LORR	<0.01 LORR	<0.02 LORR	<0.01 LORR	<0.02 LORR	<0.02 LORR
6090006	16-05-19	LEACHATE POND 2	WATER	<0.01 LORR	<0.01 LORR	<0.01 LORR	<0.02 LORR	<0.01 LORR	<0.02 LORR	<0.02 LORR
6090007	16-05-19	LEACHATE SUMP 1 - Cell 3	WATER	0.010	<0.01 LORR	0.031	0.069	0.037	0.11	0.15
6090008	16-05-19	LEACHATE SUMP 2 - Cell 4	WATER	<0.01 LORR	0.013	0.046	0.15	0.071	0.22	0.28
6090010	16-05-19	STORMWATER POND 1	WATER	<0.01 LORR	<0.01 LORR	<0.01 LORR	<0.02 LORR	<0.01 LORR	<0.02 LORR	<0.02 LORR
6090011	16-05-19	STORMWATER POND 2	WATER	<0.01 LORR	<0.01 LORR	<0.01 LORR	<0.02 LORR	<0.01 LORR	<0.02 LORR	<0.02 LORR
6090012	16-05-19	TRARALGON CREEK US	WATER	<0.001	<0.001	<0.001	<0.002	<0.001	<0.002	<0.002
6090013	16-05-19	TRARALGON CREEK DS	WATER	<0.001	<0.001	<0.001	<0.002	<0.001	<0.002	<0.002

LORR — Limit of Reporting has been raised due to high moisture content, insufficient sample or matrix interference.

Samples collected by ALS according to procedure EN/67.

A blank space indicates no test performed. Soil microbiological testing was commenced within 4 days from the day collected unless otherwise stated.
MM524: Plate count results <10 per mL and >300 per mL are deemed as approximate.
MM526: Plate count results <2,500 per mL and >250,000 per mL are deemed as approximate.
Calculated results are based on raw data.
Legionella species refers to Legionella species other than Legionella pneumophila

Batch No: 19-21318
Report Number: 758440
Client: LaTrobe City Council
Client Program Ref: LCC - Hyland Landfill

TRH/TPH (Volatile)

Sample	Sampled Date	Your Ref	Sample Type	TRH (C6-C10) & F1 TPH C6-C9 mg/L	TRH (C6-C10) & F1 TRH C6-C10 mg/L	TRH (C6-C10) & F1 TRHC6-C10 minus BTEX mg/L	TRH by Headspace TRHC6-C9 mg/L
6090005	16-05-19	LEACHATE POND 1	WATER				<0.5
6090006	16-05-19	LEACHATE POND 2	WATER				<0.5
6090007	16-05-19	LEACHATE SUMP 1 - Cell 3	WATER				0.8
6090008	16-05-19	LEACHATE SUMP 2 - Cell 4	WATER				0.8
6090010	16-05-19	STORMWATER POND 1	WATER				<0.5
6090011	16-05-19	STORMWATER POND 2	WATER				<0.5
6090012	16-05-19	TRARALGON CREEK US	WATER	<0.1	<0.1	<0.1	
6090013	16-05-19	TRARALGON CREEK DS	WATER	<0.1	<0.1	<0.1	

TRH/TPH

Sample	Sampled Date	Your Ref	Sample Type	TRH F2 TRHC10-C16 minus NAP mg/L	TRH & TPH (>C10) TPH C10-C14 mg/L	TRH & TPH (>C10) TPH C15-C28 mg/L	TRH & TPH (>C10) TPH C29-C36 mg/L	TRH & TPH (>C10) TRH>C10-C16 mg/L	TRH & TPH (>C10) TRH>C16-C34 mg/L	TRH & TPH (>C10) TRH>C34-C40 mg/L	TRH & TPH (>C10) Sum of TRH>C10-C40 mg/L
6090005	16-05-19	LEACHATE POND 1	WATER		<0.2 LORR	<0.2 LORR	<0.2 LORR	<0.2 LORR	0.4	<0.2 LORR	0.4
6090006	16-05-19	LEACHATE POND 2	WATER		0.1	0.5	<0.1	0.2	0.5	<0.1	0.7
6090007	16-05-19	LEACHATE SUMP 1 - Cell 3	WATER		1.0	2.1	0.4	1.3	2.1	<0.1	3.4
6090008	16-05-19	LEACHATE SUMP 2 - Cell 4	WATER		0.7	1.3	0.3	0.8	1.3	<0.1	2.1
6090010	16-05-19	STORMWATER POND 1	WATER		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
6090011	16-05-19	STORMWATER POND 2	WATER		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
6090012	16-05-19	TRARALGON CREEK US	WATER	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
6090013	16-05-19	TRARALGON CREEK DS	WATER	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

LORR Limit of Reporting has been raised due to high moisture content, insufficient sample or matrix interference.

Samples collected by ALS according to procedure EN/67.

A blank space indicates no test performed. Soil microbiological testing was commenced within 4 days from the day collected unless otherwise stated.
MM524: Plate count results <10 per mL and >300 per mL are deemed as approximate.
MM526: Plate count results <2,500 per mL and >250,000 per mL are deemed as approximate.
Calculated results are based on raw data.
Legionella species refers to Legionella species other than Legionella pneumophila

Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EM1909141**	Page	: 1 of 5
Client	: **ALS WATER RESOURCES GROUP**	Laboratory	: Environmental Division Melbourne
Contact	: TUYEN NGUYEN	Contact	: Customer Services EM
Address	: CARIBBEAN BUSINESS PARK 22 DALMORE DRIVE SCORESBY VIC, AUSTRALIA 3179	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 8756 8000	Telephone	: +61-3-8549 9600
Project	: 19-28316	Date Samples Received	: 13-Jun-2019 16:20
Order number	:	Date Analysis Commenced	: 13-Jun-2019
C-O-C number	: ----	Issue Date	: 20-Jun-2019 17:09
Sampler	: Leo Bourke		
Site	: Hyland Landfill		
Quote number	: EN/109/18 Scoresby for EM batches		
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. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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*
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

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

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

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

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

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

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

- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- ED045G: The presence of thiocyanate can positively contribute to the chloride result, thereby may bias results higher than expected. Results should be scrutinised accordingly.
- EP071:EM1909143-001 poor duplicate precision due to suspected sample heterogeneity. Insufficient sample remains to confirm via re-extraction and re-analysis.
- 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**)			*Client sample ID*	**6141681 Triplicate**	----	----	----	----
			Client sampling date / time	13-Jun-2019 00:00	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EM1909141-001**	--------	--------	--------	--------
				Result	----	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**4.58**	----	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**250**	----	----	----	----
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	<1	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	<1	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**22**	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**77**	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**5**	----	----	----	----
Magnesium	7439-95-4	1	mg/L	**4**	----	----	----	----
Sodium	7440-23-5	1	mg/L	**41**	----	----	----	----
Potassium	7440-09-7	1	mg/L	<1	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Manganese	7439-96-5	0.001	mg/L	**0.046**	----	----	----	----
Iron	7439-89-6	0.05	mg/L	**1.94**	----	----	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.18**	----	----	----	----
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	<0.01	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	----	----	----	----
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	**0.01**	----	----	----	----
EN055: Ionic Balance								
ø **Total Anions**	----	0.01	meq/L	**2.63**	----	----	----	----
ø **Total Cations**	----	0.01	meq/L	**2.36**	----	----	----	----

Analytical Results

Sub-Matrix: WATER
(Matrix: WATER)

Compound	CAS Number	LOR	Unit	6141681 Triplicate	----	----	----	----
			Client sampling date / time	13-Jun-2019 00:00	----	----	----	----
				EM1909141-001	--------	--------	--------	--------
				Result	----	----	----	----
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	**26**	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	----	----	----	----
C10 - C14 Fraction	----	50	µg/L	<50	----	----	----	----
C15 - C28 Fraction	----	100	µg/L	<100	----	----	----	----
C29 - C36 Fraction	----	50	µg/L	<50	----	----	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	----	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	----	----	----	----
>C10 - C16 Fraction	----	100	µg/L	<100	----	----	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	----	----	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	----	----	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	----	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	----	----	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	----	----	----	----
Toluene	108-88-3	2	µg/L	<2	----	----	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	----	----	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	----	----	----	----
^ Total Xylenes	----	2	µg/L	<2	----	----	----	----
^ Sum of BTEX	----	1	µg/L	<1	----	----	----	----
Naphthalene	91-20-3	5	µg/L	<5	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	**108**	----	----	----	----
Toluene-D8	2037-26-5	2	%	**95.8**	----	----	----	----
4-Bromofluorobenzene	460-00-4	2	%	**114**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **WATER**

Compound	*CAS Number*	*Recovery Limits (%)* Low	High
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	73	129
Toluene-D8	2037-26-5	70	125
4-Bromofluorobenzene	460-00-4	71	129

ALS Water

CERTIFICATE OF ANALYSIS

Batch No:	**19-28316**	*Page*	Page 1 of 4
Final Report	761865	*Laboratory*	Scoresby Laboratory
		Address	Caribbean Business Park, 22 Dalmore Drive, Scoresby, VIC 3179
		Phone	03 8756 8000
Client:	**LaTrobe City Council**	*Fax*	03 9763 1862
Contact:	**Chandana Vidanaarachchi**	Contact:	Tuyen Nguyen Client Manager Tuyen.Nguyen@alsglobal.com
Address:	PO Box 264 MORWELL VIC 3840		
Client Program Ref:	**LCC - Hyland Landfill**	Date Sampled:	13-Jun-2019
ALS Program Ref:	**BORE-HYLAND**	Date Samples Received:	13-Jun-2019
PO No:	**P142372**	*Date Issued:*	**24-Jun-2019**

The hash (#) below indicates methods not covered by NATA accreditation in the performance of this service .

Analysis		*Method*	*Laboratory*	*Analysis*		*Method*	*Laboratory*	*Analysis*	*Method*	*Laboratory*
DO (Field)		EN67.2	Scoresby	**EC (Field)**		EN67.2	Scoresby			
pH (Field)		EN67.2	Scoresby	**Redox (Field)**	#	EA075FD	Scoresby			
St. Water Lev	#	FIELD	Scoresby	**Temp (Field)**		EN67.2	Scoresby			
Alkalinity		WD037	Scoresby	**BTEXN**		WP074	Scoresby			
Chloride		WD045G	Scoresby	**MS Sol. Metals**		WG020A	Scoresby			
NH3 as N (DA)		WK055G	Scoresby	**NO3-N**		EK058GV	Scoresby			
OES Scan		WG005A (Si not NATA); EA065-69	Scoresby	**pH**		WA005	Scoresby			
Reactive P (HL)		WK071G	Scoresby	**TDS at 180°C +/- 5°C**		WA015	Scoresby			
SO4 DA		WD041G	Scoresby	**TOC (SFA)**		WP005SF 002SF	Scoresby			
TRH F2	#	WP071	Scoresby	**TRH & TPH (>C10)**		WP071	Scoresby			
TRH (C6-C10) & F1		WP071 (F1 not NATA)	Scoresby							

Result for pH in water tested in the laboratory may be indicative only as holding time is generally not achievable.

TOC is analysed as NPOC and VOCs if present may be compromised when removing inorganic carbon .

Measurement Uncertainties values for your compliance results are available at this link

Signatories

Name	Title	Name	Title
Brad Snibson	**Client Manager**	**Chatura Perera**	**Team Leader Nutrients**
Hao Zhang	**Team Leader Organics**	**John Earl**	**Team Leader Metals**
John Levvey	**Principal Trace Metals Chemist**	**Kosta Christopoulos**	**Chemist/Analyst**
Mario Solorzano	**Analyst**	**Melani Wijayasiri**	**Analyst**

Batch No: **19-28316**
Report Number: **761865**
Client: **LaTrobe City Council**
Client Program Ref: **LCC - Hyland Landfill**

Field Results

Sample	Sampled Date	Your Ref	Sample Type	Temp (Field) Temp °C	pH (Field) pH Units	EC (Field) EC uS/cm	DO (Field) DO mg/L	Redox (Field) Redox mV	St. Water Lev Water Level M
6141679	13-06-19	BH5	WATER	15.8	4.2	320	<0.5	-64.9	90

Chemistry

Sample	Sampled Date	Your Ref	Sample Type	pH pH Units	TOC (SFA) TOC mg/L	TDS at 180°C +/- 5°C TDS 180 mg/L	Chloride Cl mg/L	SO4 DA SO4 mg/L	Alkalinity Bicarbonate Alk. mg CaCO3 / L	Alkalinity Carbonate Alk. mg CaCO3 / L	Alkalinity Hydroxide Alk mg CaCO3 / L	Alkalinity Total Alkalinity mg CaCO3 / L
6141679	13-06-19	BH5	WATER	4.5	2.6	140	78	24	9	<2	<2	9
6141680	13-06-19	DUPLICATE DUP	WATER	4.5	2.6	140	77	24	10	<2	<2	10
6141682	13-06-19	RINSATE RINSATE	WATER	5.3	<0.5	<5	<1	<1	<2	<2	<2	<2

Nutrients

Sample	Sampled Date	Your Ref	Sample Type	Reactive P (HL) Reactive P mg P / L	NH3 as N (DA) NH3 mg N / L	NO3-N NO3 mg N / L
6141679	13-06-19	BH5	WATER	<0.01	0.2	<0.01
6141680	13-06-19	DUPLICATE DUP	WATER	<0.01	0.2	<0.01
6141682	13-06-19	RINSATE RINSATE	WATER	<0.01	<0.1	<0.01

Metals

Sample	Sampled Date	Your Ref	Sample Type	OES Scan Ca mg/L	OES Scan Mg mg/L	OES Scan K mg/L	OES Scan Na mg/L
6141679	13-06-19	BH5	WATER	5.2	4.6	0.9	39
6141680	13-06-19	DUPLICATE DUP	WATER	5.2	4.6	0.9	39
6141682	13-06-19	RINSATE RINSATE	WATER	<0.1	<0.1	<0.1	<0.1

Samples collected by ALS according to procedure EN/67.

A blank space indicates no test performed. Soil microbiological testing was commenced within 4 days from the day collected unless otherwise stated.
MM524: Plate count results <10 per mL and >300 per mL are deemed as approximate.
MM526: Plate count results <2,500 per mL and >250,000 per mL are deemed as approximate.
Calculated results are based on raw data.
Legionella species refers to Legionella species other than Legionella pneumophila

Metals - Soluble

Sample	Sampled Date	Your Ref	Sample Type	Iron mg/L (MS Sol. Metals)	Manganese mg/L (MS Sol. Metals)
6141679	13-06-19	BH5	WATER	0.06	0.043
6141680	13-06-19	DUPLICATE DUP	WATER	0.06	0.040
6141682	13-06-19	RINSATE RINSATE	WATER	<0.01	<0.001

BTEXN

Sample	Sampled Date	Your Ref	Sample Type	Benzene mg/L (BTEXN)	Toluene mg/L (BTEXN)	Ethyl Benzene mg/L (BTEXN)	Xylene - m & p mg/L (BTEXN)	Xylene - o mg/L (BTEXN)	Total Xylenes mg/L (BTEXN)	BTEX (Sum) mg/L (BTEXN)
6141679	13-06-19	BH5	WATER	<0.001	<0.001	<0.001	<0.002	<0.001	<0.002	<0.002
6141680	13-06-19	DUPLICATE DUP	WATER	<0.001	<0.001	<0.001	<0.002	<0.001	<0.002	<0.002
6141682	13-06-19	RINSATE RINSATE	WATER	<0.001	<0.001	<0.001	<0.002	<0.001	<0.002	<0.002

TRH/TPH (Volatile)

Sample	Sampled Date	Your Ref	Sample Type	TPH C6-C9 mg/L (TRH (C6-C10) & F1)	TRH C6-C10 mg/L (TRH (C6-C10) & F1)	TRHC6-C10 minus BTEX mg/L (TRH (C6-C10) & F1)
6141679	13-06-19	BH5	WATER	<0.1	<0.1	<0.1
6141680	13-06-19	DUPLICATE DUP	WATER	<0.1	<0.1	<0.1
6141682	13-06-19	RINSATE RINSATE	WATER	<0.1	<0.1	<0.1

TRH/TPH

Sample	Sampled Date	Your Ref	Sample Type	TRHC10-C16 minus NAP mg/L (TRH F2)	TPH C10-C14 mg/L (TRH & TPH (>C10))	TPH C15-C28 mg/L (TRH & TPH (>C10))	TPH C29-C36 mg/L (TRH & TPH (>C10))	TRH>C10-C16 mg/L (TRH & TPH (>C10))	TRH>C16-C34 mg/L (TRH & TPH (>C10))	TRH>C34-C40 mg/L (TRH & TPH (>C10))	Sum of TRH>C10-C40 mg/L (TRH & TPH (>C10))
6141679	13-06-19	BH5	WATER	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
6141680	13-06-19	DUPLICATE DUP	WATER	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
6141682	13-06-19	RINSATE RINSATE	WATER	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

Samples collected by ALS according to procedure EN/67.

A blank space indicates no test performed. Soil microbiological testing was commenced within 4 days from the day collected unless otherwise stated.
MM524: Plate count results <10 per mL and >300 per mL are deemed as approximate.
MM526: Plate count results <2,500 per mL and >250,000 per mL are deemed as approximate.
Calculated results are based on raw data.
Legionella species refers to Legionella species other than Legionella pneumophila

Appendix I
QA/QC Results

Appendix I-1
ESdat QA/QC Results

ESDAT QA Checker
Project:V2101_ALS_Hyland
Filter: SDG in('18-52967')

Overview Summary
- Count of Samples
- Count of Results

Holding Times
- Holding Time Errors (0)

Blanks
- Field Blanks
- Detects in Lab Blanks (1)
- SDG's without Storage Blanks (1)
- SDG's without Method Blanks (0)

Duplicates
- Field and Interlab Duplicates
- Lab Duplicates with high RPDs (0)
- Duplicate Samples with incorrect or missing Parent Samples (1)
- Samples at the same Location/Depth/Time not specified as duplicates (0)

Surrogates
- Surrogate Variation > 25% or outside lab LCL or UCL (0)

Lab Control Samples
- SDG's without a Laboratory Control Sample (0)
- Laboratory Control Samples, Error > 25% (0)

Certified and Standard Reference Materials
- Certified Reference Materials - Error > 25% (0)

Matrix Spikes
- SDG's without a Matrix Spike (0)
- Trip Spikes with invalid Control Sample (0)
- Less than 1 matrix spike in 20 samples, or less than 1 matrix duplicate in 20 samples (1)
- Matrix Spike Recoveries less than 30% or greater than 150% or outside lab LCL or UCL (0)
- Trip Spike Recoveries (30% - 150% is acceptable) (0)

Inorganic
- Na + CL > TDS (0)
- BOD > COD (0)
- BOD > COD (0)

Other
- Unit Conversion Problems (6)
- OriginalChemNames Requiring Validation (2)
- Samples with no Results (0)
- Samples associated with Wells which are not specified in the Well Table (0)
- Aborted Analysis (10)

Contents
Count of Samples

Matrix Type	WATER
First Sample Date	27/11/2018
Last Sample Date	28/11/2018
Sampling Period (days)	2
Number of Samples Submitted	21
Number of Non QA Samples Submitted	15
Number of Field Blanks	1
Number of Trip Blanks	1
Number of Rinsates	2
Number of Field Duplicates	1
Number of Trip Spikes	0
Number of Lab Duplicates	18
Number of LCSs	0
Number of CRMs	0
Number of Method Blanks	15
Number of Storage Blanks	0
Number of Matrix Spikes	14
Number of Matrix Spike Dupes	0

Contents
Count of Results

Matrix_Type	Sample_Type	Reg	Leached	Spike_Compounds	Surrogate
WATER	Normal	405	0	0	0
WATER	MB	57	0	0	0
WATER	LAB_D	55	0	0	0
WATER	NCP	46	0	0	0
WATER	MS	16	0	22	0
WATER	Trip_B	36	0	0	0
WATER	Rinsate	2	0	0	0
WATER	Interlab_D	1	0	0	0
WATER	Field_D	1	0	0	0
WATER	Field_B	1	0	0	0

Contents
Field Blanks

WATER

Field Blanks (WATER)
Filter: SDG in('18-52967')

Filter	Method_Type	ChemName	Units	EQL	18-52967	18-52967	18-52967	18-52967
				Field ID	FIELD BLANK	RINSATE1 (DAY 1)	RINSATE2 (DAY 2)	TRIP BLANK
				Sampled_Date/Time	27/11/2018	27/11/2018	27/11/2018	28/11/2018
				Sample Type	Field_B	Rinsate	Rinsate	Trip_B
Dissolved Oxygen	Dissolved Oxygen	Dissolved Oxygen	mg/l	0.5				
Dissolved Oxygen								
EC (FIELD)	EC (FIELD)	EC (field)	uS/cm	10				
EC (FIELD)								
Field Information	Field Information	Field Information	-		**-999**	**-999**	**-999**	
Field Information								
MAHS	MAHS	Benzene	µg/l	1				<1
MAHS		Toluene	µg/l	1				<1
MAHS		Ethylbenzene	µg/l	1				<1
MAHS		Xylene (m & p)	µg/l	2				<2
MAHS		Xylene (o)	µg/l	1				<1
MAHS		Xylene Total	µg/l	2				<2
MAHS		Total BTEX	µg/l	2				<2
MAHS								
MS Soluble Metals-LL	MS Soluble Metals-LL	Iron (Filtered)	mg/l	0.01				<0.01
MS Soluble Metals-LL		Manganese (Filtered)	mg/l	0.001				<0.001
MS Soluble Metals-LL								
OES Scan	OES Scan	Calcium	mg/l	0.1				<0.1
OES Scan		Magnesium	mg/l	0.1				<0.1
OES Scan		Potassium	mg/l	0.1				<0.1
OES Scan		Sodium	mg/l	0.1				<0.1
OES Scan								
pH (Field)	pH (Field)	pH sediment, 0.01M calcium chloride extract, units	Units					
pH (Field)								
Redox Potential	Redox Potential	Redox Potential (Field)	mV					
Redox Potential								
TDS AT 180C	TDS AT 180C	TDS	mg/l	5				<5
TDS AT 180C								
TOC	TOC	TOC	mg/l	0.5				<0.5
TOC								
TRH & TPH (>C10)	TRH & TPH (>C10)	C10-C14	µg/l	100				<100
TRH & TPH (>C10)		C15-C28	µg/l	100				<100
TRH & TPH (>C10)		C29-C36	µg/l	100				<100
TRH & TPH (>C10)		C10-C16	µg/l	100				<100
TRH & TPH (>C10)		C16-C34	µg/l	100				<100
TRH & TPH (>C10)		C34-C40	µg/l	100				<100
TRH & TPH (>C10)		C10-C40 (Sum of total)	µg/l	100				<100
TRH & TPH (>C10)								
TRH & TPH C6-C10	TRH & TPH C6-C10	C6-C9	µg/l	100				<100
TRH & TPH C6-C10		C6-C10	µg/l	100				<100
TRH & TPH C6-C10		C6-C10 (F1 minus BTEX)	µg/l	100				<100
TRH & TPH C6-C10								
TRH by Headspace	TRH by Headspace	C6-C9	µg/l	500				
TRH by Headspace								
TRH F2	TRH F2	C10-C16 (F2 minus Naphthalene)	µg/l	100				<100
TRH F2								
W-ALK	W-ALK	Alkalinity (Carbonate as CaCO3)	mg/L	2				<2
W-ALK		Alkalinity (Hydroxide) as CaCO3	mg/L	2				<2
W-ALK		Alkalinity (total) as CaCO3	mg/L	2				<2
W-ALK								
W-Chloride(DA)	W-Chloride(DA)	Chloride	mg/l	1				<1

WATER

Field Blanks (WATER)
Filter: SDG in('18-52967')

				SDG	18-52967	18-52967	18-52967	18-52967
				Field ID	FIELD BLANK	RINSATE1 (DAY 1)	RINSATE2 (DAY 2)	TRIP BLANK
				Sampled_Date/Time	27/11/2018	27/11/2018	27/11/2018	28/11/2018
				Sample Type	Field_B	Rinsate	Rinsate	Trip_B
W-Chloride(DA)								
W-SO4-Da	W-SO4-Da	Sulphate	mg/l	1				<1

Contents
Detects in Lab Blanks

SDG	Lab_Report_Number	Matrix_Type	SampleCode	Field_ID	Depth	Sampled_Date-Time	Sample_Type	Compound	Prefix	Result	Extraction_Date
18-52967	18-52967	WATER	18-52967_5906002				MB	pH, units		5.7 Units	30/11/2018

Contents

SDG's without Storage Blanks

SDG

18-52967

Contents
Field Duplicates

WATE Field Duplicates (WATER)
Filter: SDG in('18-529

SDG	18-52967	18-52967	
Field ID	BH3	DUPLICATE	RPD
Sampled Date/Time	27/11/2018	27/11/2018	

Filter	Method_T	ChemNan	Units	EQL			

*RPDs have only been considered where a concentration is greater than 1 times the EQL.
**High RPDs are in bold (Acceptable RPDs for each EQL multiplier range are: 80 (1-10 x EQL); 50 (10-30 x EQL); 30 (> 30 x EQL))
***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary labora

Contents

Duplicate Samples with incorrect or missing Parent Samples

SDG	Sample_Type	Dupe_Field_ID	Dupe_SampleCode	Parent_SampleCode	Problem
18-52967	Interlab_D	TRIPLICATE	18-52967_5899442		Parent SampleCode not specified

Contents

Less than 1 matrix spike in 20 samples, or less than 1 matrix duplicate in 20 samples

Matrix_Type	Number_of_Samples	Number_of_Matrix_Spike_Samples	Number_of_Matrix_Spike_Dupe_Samples
WATER	82	14	0

Contents
Aborted Analysis

SampleCode	Field_ID	Depth	Sampled_Date-Time	Sample_Type	Method_Name	Compound	Result	Result_Type	Lab_Comments
18-52967_5899435	BH1		27/11/2018	Normal	Field Information	Field Information	-999	REG	Dry @ 68.4m
18-52967_5899437	BH2		27/11/2018	Normal	Field Information	Field Information	-999	REG	Dry @ 74.6m
18-52967_5899438	BH3		27/11/2018	Normal	Field Information	Field Information	-999	REG	Bore buried
18-52967_5899439	BH4		27/11/2018	Normal	Field Information	Field Information	-999	REG	Dry @ 20.7m
18-52967_5899441	DUPLICATE		27/11/2018	Field_D	Field Information	Field Information	-999	REG	Bores dry
18-52967_5899442	TRIPLICATE		27/11/2018	Interlab_D	Field Information	Field Information	-999	REG	Bores dry
18-52967_5899443	RINSATE1 (DAY 1)		27/11/2018	Rinsate	Field Information	Field Information	-999	REG	Bores dry
18-52967_5899444	RINSATE2 (DAY 2)		27/11/2018	Rinsate	Field Information	Field Information	-999	REG	Bores dry
18-52967_5899446	FIELD BLANK		27/11/2018	Field_B	Field Information	Field Information	-999	REG	Bores dry
18-52967_5899452	GW INTERCEPTION SY		27/11/2018	Normal	Field Information	Field Information	-999	REG	No access

February 2019 Monitoring Event

ESDAT QA Checker
Project:V2101_ALS_Hyland
Filter: SDG in('19-09779')

Overview Summary
- Count of Samples
- Count of Results

Holding Times
- Holding Time Errors (0)

Blanks
- Field Blanks
- Detects in Lab Blanks (1)
- SDG's without Storage Blanks (1)
- SDG's without Method Blanks (0)

Duplicates
- Field and Interlab Duplicates
- Lab Duplicates with high RPDs (0)
- Duplicate Samples with incorrect or missing Parent Samples (0)
- Samples at the same Location/Depth/Time not specified as duplicates (0)

Surrogates
- Surrogate Variation > 25% or outside lab LCL or UCL (0)

Lab Control Samples
- SDG's without a Laboratory Control Sample (0)
- Laboratory Control Samples, Error > 25% (0)

Certified and Standard Reference Materials
- Certified Reference Materials - Error > 25% (0)

Matrix Spikes
- SDG's without a Matrix Spike (0)
- Trip Spikes with invalid Control Sample (0)
- Less than 1 matrix spike in 20 samples, or less than 1 matrix duplicate in 20 samples (1)
- Matrix Spike Recoveries less than 30% or greater than 150% or outside lab LCL or UCL (0)
- Trip Spike Recoveries (30% - 150% is acceptable) (0)

Inorganic
- Na + CL > TDS (0)
- BOD > COD (0)
- BOD > COD (0)

Other
- Unit Conversion Problems (6)
- OriginalChemNames Requiring Validation (2)
- Samples with no Results (0)
- Samples associated with Wells which are not specified in the Well Table (0)
- Aborted Analysis (3)

Contents
Count of Samples

Matrix Type	WATER
First Sample Date	28/02/2019
Last Sample Date	28/02/2019
Sampling Period (days)	1
Number of Samples Submitted	7
Number of Non QA Samples Submitted	3
Number of Field Blanks	1
Number of Trip Blanks	1
Number of Rinsates	1
Number of Field Duplicates	1
Number of Trip Spikes	0
Number of Lab Duplicates	9
Number of LCSs	0
Number of CRMs	0
Number of Method Blanks	7
Number of Storage Blanks	0
Number of Matrix Spikes	8
Number of Matrix Spike Dupes	0

Contents

Count of Results

Matrix_Type	Sample_Type	Reg	Leached	Spike_Compounds	Surrogate
WATER	Normal	44	0	0	0
WATER	Trip_B	36	0	0	0
WATER	Rinsate	36	0	0	0
WATER	Field_B	36	0	0	0
WATER	LAB_D	29	0	0	0
WATER	NCP	27	0	0	0
WATER	MB	22	0	0	0
WATER	MS	3	0	14	0
WATER	Field_D	1	0	0	0

Contents
Field Blanks

WATER

Field Blanks (WATER)
Filter: SDG in('19-09779')

Filter	Method_Type	ChemName	Units	EQL			
				SDG	19-09779	19-09779	19-09779
				Field ID	FIELD BLANK	RINSATE	TRIP BLANK
				Sampled_Date/Time	28/02/2019	28/02/2019	28/02/2019
				Sample Type	Field_B	Rinsate	Trip_B
Filter	**Method_Type**	**ChemName**	**Units**	**EQL**			
Dissolved Oxygen	Dissolved Oxygen	Dissolved Oxygen	mg/l	0.5			
Dissolved Oxygen							
EC (FIELD)	EC (FIELD)	EC (field)	uS/cm	10			
EC (FIELD)							
Field Information	Field Information	Field Information	-				
Field Information							
MAHS	MAHS	Benzene	µg/l	1	<1	<1	<1
MAHS		Toluene	µg/l	1	<1	<1	<1
MAHS		Ethylbenzene	µg/l	1	<1	<1	<1
MAHS		Xylene (m & p)	µg/l	2	<2	<2	<2
MAHS		Xylene (o)	µg/l	1	<1	<1	<1
MAHS		Xylene Total	µg/l	2	<2	<2	<2
MAHS		Total BTEX	µg/l	2	<2	<2	<2
MAHS							
MS Soluble Metals-LL	MS Soluble Metals-LL	Iron (Filtered)	mg/l	0.01	<0.01	<0.01	<0.01
MS Soluble Metals-LL		Manganese (Filtered)	mg/l	0.001	<0.001	<0.001	<0.001
MS Soluble Metals-LL							
OES Scan	OES Scan	Calcium	mg/l	0.1	<0.1	<0.1	<0.1
OES Scan		Magnesium	mg/l	0.1	<0.1	<0.1	<0.1
OES Scan		Potassium	mg/l	0.1	<0.1	<0.1	<0.1
OES Scan		Sodium	mg/l	0.1	<0.1	<0.1	<0.1
OES Scan							
pH (Field)	pH (Field)	pH sediment, 0.01M calcium chloride extract, units	Units				
pH (Field)							
Redox Potential	Redox Potential	Redox Potential (Field)	mV				
Redox Potential							
Stand Water Lvl AHD	Stand Water Lvl AHD	Standing Water Level compared to AHD (m) (Field)	m				
Stand Water Lvl AHD							
TDS AT 180C	TDS AT 180C	TDS	mg/l	5	<5	<5	<5
TDS AT 180C							
TOC	TOC	TOC	mg/l	0.5	<0.5	<0.5	<0.5
TOC							
TRH & TPH (>C10)	TRH & TPH (>C10)	C10-C14	µg/l	100	<100	<100	<100
TRH & TPH (>C10)		C15-C28	µg/l	100	<100	<100	<100
TRH & TPH (>C10)		C29-C36	µg/l	100	<100	<100	<100
TRH & TPH (>C10)		C10-C16	µg/l	100	<100	<100	<100
TRH & TPH (>C10)		C16-C34	µg/l	100	<100	<100	<100
TRH & TPH (>C10)		C34-C40	µg/l	100	<100	<100	<100
TRH & TPH (>C10)		C10-C40 (Sum of total)	µg/l	100	<100	<100	<100
TRH & TPH (>C10)							
TRH & TPH C6-C10	TRH & TPH C6-C10	C6-C9	µg/l	100	<100	<100	<100
TRH & TPH C6-C10		C6-C10	µg/l	100	<100	<100	<100
TRH & TPH C6-C10		C6-C10 (F1 minus BTEX)	µg/l	100	<100	<100	<100
TRH & TPH C6-C10							
TRH F2	TRH F2	C10-C16 (F2 minus Naphthalene)	µg/l	100	<100	<100	<100
TRH F2							
W-ALK	W-ALK	Bicarbonate Alkalinity as CaCO3	mg CaCO3/L	2	<2	<2	<2
W-ALK		Alkalinity (Carbonate as CaCO3)	mg/L	2	<2	<2	<2
W-ALK		Alkalinity (Hydroxide) as CaCO3	mg/L	2	<2	<2	<2
W-ALK		Alkalinity (total) as CaCO3	mg/L	2	<2	<2	<2
W-ALK							
W-Chloride(DA)	W-Chloride(DA)	Chloride	mg/l	1	<1	<1	<1
W-Chloride(DA)							
W-SO4-Da	W-SO4-Da	Sulphate	mg/l	1	<1	<1	<1

Contents

Detects in Lab Blanks

SDG	Lab_Report_Number	Matrix_Type	SampleCode	Field_ID	Depth	Sampled_Date-Time	Sample_Type	Compound	Prefix	Result	Extraction_Date
19-09779	19-09779	WATER	19-09779_6018113				MB	pH, units		5.8 Units	1/03/2019

Contents
SDG's without Storage Blanks

SDG
19-09779

Contents
Field Duplicates

WATE Field Duplicates (WATER)
Filter: SDG in('19-097

SDG	19-09779	19-09779	
Field ID	BH3	DUPLICATE	**RPD**
Sampled Date/Time	28/02/2019	28/02/2019	

Filter	**Method_T**	**ChemNan**	**Units**	**EQL**			

*RPDs have only been considered where a concentration is greater than 1 times the EQL.
**High RPDs are in bold (Acceptable RPDs for each EQL multiplier range are: 80 (1-10 x EQL); 50 (10-30 x EQL); 30 (> 30 x EQL))
***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary labora

Contents

Less than 1 matrix spike in 20 samples, or less than 1 matrix duplicate in 20 samples

Matrix_Type	Number_of_Samples	Number_of_Matrix_Spike_Samples	Number_of_Matrix_Spike_Dupe_Samples
WATER	39	8	0

Contents
Aborted Analysis

SampleCode	Field_ID	Depth	Sampled_Date-Time	Sample_Type	Method_Name	Compound	Result	Result_Type	Lab_Comments
19-09779_6000208	BH3		28/02/2019	Normal	Field Information	Field Information	-999	REG	Blocked @ 50M
19-09779_6000210	DUPLICATE		28/02/2019	Field_D	Field Information	Field Information	-999	REG	No volume
19-09779_6000211	TRIPLICATE EXTERNAL		28/02/2019	Normal	Field Information	Field Information	-999	REG	No volume

May 2019 Monitoring Event

ESDAT QA Checker
Project:V2101_ALS_Hyland
Filter: SDG in('19-21318')

Overview Summary

- Count of Samples
- Count of Results

Holding Times

- Holding Time Errors (0)

Blanks

- Field Blanks
- Detects in Lab Blanks (1)
- SDG's without Storage Blanks (1)
- SDG's without Method Blanks (0)

Duplicates

- Field and Interlab Duplicates
- Lab Duplicates with high RPDs (0)
- Duplicate Samples with incorrect or missing Parent Samples (0)
- Samples at the same Location/Depth/Time not specified as duplicates (0)

Surrogates

- Surrogate Variation > 25% or outside lab LCL or UCL (0)

Lab Control Samples

- SDG's without a Laboratory Control Sample (0)
- Laboratory Control Samples, Error > 25% (0)

Certified and Standard Reference Materials

- Certified Reference Materials - Error > 25% (0)

Matrix Spikes

- SDG's without a Matrix Spike (0)
- Trip Spikes with invalid Control Sample (0)
- Less than 1 matrix spike in 20 samples, or less than 1 matrix duplicate in 20 samples (1)
- Matrix Spike Recoveries less than 30% or greater than 150% or outside lab LCL or UCL (0)
- Trip Spike Recoveries (30% - 150% is acceptable) (0)

Inorganic

- Na + CL > TDS (0)
- BOD > COD (0)
- BOD > COD (0)

Other

- Unit Conversion Problems (6)
- OriginalChemNames Requiring Validation (2)
- Samples with no Results (0)
- Samples associated with Wells which are not specified in the Well Table (0)
- Aborted Analysis (0)

Contents
Count of Samples

Matrix Type	WATER
First Sample Date	16/05/2019
Last Sample Date	16/05/2019
Sampling Period (days)	1
Number of Samples Submitted	8
Number of Non QA Samples Submitted	8
Number of Field Blanks	0
Number of Trip Blanks	0
Number of Rinsates	0
Number of Field Duplicates	0
Number of Trip Spikes	0
Number of Lab Duplicates	14
Number of LCSs	0
Number of CRMs	0
Number of Method Blanks	13
Number of Storage Blanks	0
Number of Matrix Spikes	10
Number of Matrix Spike Dupes	0

Contents

Count of Results

Matrix_Type	Sample_Type	Reg	Leached	Spike_Compounds	Surrogate
WATER	Normal	310	0	0	0
WATER	MB	47	0	0	0
WATER	LAB_D	47	0	0	0
WATER	NCP	37	0	0	0
WATER	MS	7	0	15	0

Contents
Detects in Lab Blanks

SDG	Lab_Report_Number	Matrix_Type	SampleCode	Field_ID	Depth	Sampled_Date-Time	Sample_Type	Compound	Prefix	Result	Extraction_Date
19-21318	19-21318	WATER	19-21318_6112328				MB	pH, units		5.6 Units	17/05/2019

Contents

SDG's without Storage Blanks

SDG

19-21318

Contents

Less than 1 matrix spike in 20 samples, or less than 1 matrix duplicate in 20 samples

Matrix_Type	Number_of_Samples	Number_of_Matrix_Spike_Samples	Number_of_Matrix_Spike_Dupe_Samples
WATER	55	10	0

June 2019 Monitoring

ESDAT QA Checker
Project:V2101_ALS_Hyland
Filter: SDG in('19-28316')

Overview Summary

- Count of Samples
- Count of Results

Holding Times

- Holding Time Errors (0)

Blanks

- Field Blanks
- Detects in Lab Blanks (1)
- SDG's without Storage Blanks (1)
- SDG's without Method Blanks (0)

Duplicates

- Field and Interlab Duplicates
- Lab Duplicates with high RPDs (3)
- Duplicate Samples with incorrect or missing Parent Samples (0)
- Samples at the same Location/Depth/Time not specified as duplicates (0)

Surrogates

- Surrogate Variation > 25% or outside lab LCL or UCL (0)

Lab Control Samples

- SDG's without a Laboratory Control Sample (0)
- Laboratory Control Samples, Error > 25% (0)

Certified and Standard Reference Materials

- Certified Reference Materials - Error > 25% (0)

Matrix Spikes

- SDG's without a Matrix Spike (0)
- Trip Spikes with invalid Control Sample (0)
- Less than 1 matrix spike in 20 samples, or less than 1 matrix duplicate in 20 samples (1)
- Matrix Spike Recoveries less than 30% or greater than 150% or outside lab LCL or UCL (0)
- Trip Spike Recoveries (30% - 150% is acceptable) (0)

Inorganic

- Na + CL > TDS (0)
- BOD > COD (0)
- BOD > COD (0)

Other

- Unit Conversion Problems (6)
- OriginalChemNames Requiring Validation (2)
- Samples with no Results (0)
- Samples associated with Wells which are not specified in the Well Table (0)
- Aborted Analysis (0)

Contents
Count of Samples

Matrix Type	WATER
First Sample Date	13/06/2019
Last Sample Date	13/06/2019
Sampling Period (days)	1
Number of Samples Submitted	3
Number of Non QA Samples Submitted	1
Number of Field Blanks	0
Number of Trip Blanks	0
Number of Rinsates	1
Number of Field Duplicates	1
Number of Trip Spikes	0
Number of Lab Duplicates	13
Number of LCSs	0
Number of CRMs	0
Number of Method Blanks	12
Number of Storage Blanks	0
Number of Matrix Spikes	11
Number of Matrix Spike Dupes	0

Filter: SDG in('19-28316')

Contents
Count of Results

Matrix_Type	Sample_Type	Reg	Leached	Spike_Compounds	Surrogate
WATER	MB	50	0	0	0
WATER	Normal	42	0	0	0
WATER	LAB_D	40	0	0	0
WATER	NCP	39	0	0	0
WATER	Rinsate	36	0	0	0
WATER	Field_D	36	0	0	0
WATER	MS	7	0	22	0

Contents
Field Blanks

WATER

Field Blanks (WATER)
Filter: SDG in('19-28316')

SDG	19-28316
Field ID	RINSATE RINSATE
Sampled_Date/Time	13/06/2019
Sample Type	Rinsate

Filter	Method_Type	ChemName	Units	EQL	
Dissolved Oxygen	Dissolved Oxygen	Dissolved Oxygen	mg/l	0.5	
Dissolved Oxygen					
EC (FIELD)	EC (FIELD)	EC (field)	uS/cm	10	
EC (FIELD)					
MAHS	MAHS	Benzene	µg/l	1	<1
MAHS		Toluene	µg/l	1	<1
MAHS		Ethylbenzene	µg/l	1	<1
MAHS		Xylene (m & p)	µg/l	2	<2
MAHS		Xylene (o)	µg/l	1	<1
MAHS		Xylene Total	µg/l	2	<2
MAHS		Total BTEX	µg/l	2	<2
MAHS					
MS Soluble Metals-LL	MS Soluble Metals-LL	Iron (Filtered)	mg/l	0.01	<0.01
MS Soluble Metals-LL		Manganese (Filtered)	mg/l	0.001	<0.001
MS Soluble Metals-LL					
OES Scan	OES Scan	Calcium	mg/l	0.1	<0.1
OES Scan		Magnesium	mg/l	0.1	<0.1
OES Scan		Potassium	mg/l	0.1	<0.1
OES Scan		Sodium	mg/l	0.1	<0.1
OES Scan					
pH (Field)	pH (Field)	pH sediment, 0.01M calcium chloride extract, units	Units		
pH (Field)					
Redox Potential	Redox Potential	Redox Potential (Field)	mV		
Redox Potential					
Stand Water Lvl AHD	Stand Water Lvl AHD	Standing Water Level compared to AHD (m) (Field)	m		
Stand Water Lvl AHD					
TDS AT 180C	TDS AT 180C	TDS	mg/l	5	<5
TDS AT 180C					
TOC	TOC	TOC	mg/l	0.5	<0.5
TOC					
TRH & TPH (>C10)	TRH & TPH (>C10)	C10-C14	µg/l	100	<100
TRH & TPH (>C10)		C15-C28	µg/l	100	<100
TRH & TPH (>C10)		C29-C36	µg/l	100	<100
TRH & TPH (>C10)		C10-C16	µg/l	100	<100
TRH & TPH (>C10)		C16-C34	µg/l	100	<100
TRH & TPH (>C10)		C34-C40	µg/l	100	<100
TRH & TPH (>C10)		C10-C40 (Sum of total)	µg/l	100	<100
TRH & TPH (>C10)					
TRH & TPH C6-C10	TRH & TPH C6-C10	C6-C9	µg/l	100	<100
TRH & TPH C6-C10		C6-C10	µg/l	100	<100
TRH & TPH C6-C10		C6-C10 (F1 minus BTEX)	µg/l	100	<100
TRH & TPH C6-C10					
TRH F2	TRH F2	C10-C16 (F2 minus Naphthalene)	µg/l	100	<100
TRH F2					
W-ALK	W-ALK	Bicarbonate Alkalinity as CaCO3	mg CaCO3/L	2	<2
W-ALK		Alkalinity (Carbonate as CaCO3)	mg/L	2	<2
W-ALK		Alkalinity (Hydroxide) as CaCO3	mg/L	2	<2
W-ALK		Alkalinity (total) as CaCO3	mg/L	2	<2
W-ALK					
W-Chloride(DA)	W-Chloride(DA)	Chloride	mg/l	1	<1
W-Chloride(DA)					
W-SO4-Da	W-SO4-Da	Sulphate	mg/l	1	<1

Contents
Detects in Lab Blanks

SDG	Lab_Report_Number	Matrix_Type	SampleCode	Field_ID	Depth	Sampled_Date-Time	Sample_Type	Compound	Prefix	Result	Extraction_Date
19-28316	19-28316	WATER	19-28316_6145807				MB	pH, units		5.7 Units	14/06/2019

Contents
SDG's without Storage Blanks

SDG
19-28316

Contents
Field Duplicates

WATER	Field Duplicates (WATER) Filter: SDG in('19-283			SDG Field ID Sampled Date/Time	19-28316 BH5 13/06/2019	19-28316 DUP DUPLICATE 13/06/2019	RPD
Filter	**Method_T**	**ChemNan**	**Units**	**EQL**			
TRH & TP	TRH & TP	C10-C16	µg/l	100	<100.0	<100.0	0
TRH & TP		C16-C34	µg/l	100	<100.0	<100.0	0
TRH & TP		C34-C40	µg/l	100	<100.0	<100.0	0
TRH & TP		C10-C40 (	µg/l	100	<100.0	<100.0	0
TRH & TPH (>C10)							
TRH & TP	TRH & TP	C6-C10	µg/l	100	<100.0	<100.0	0
TRH & TP		C6-C10 (F	µg/l	100	<100.0	<100.0	0
TRH & TPH C6-C10							
TRH F2	TRH F2	C10-C16 (	µg/l	100	<100.0	<100.0	0
TRH F2							
W-ALK	W-ALK	Bicarbona	mg CaCO:	2	9.0	10.0	11
W-ALK							
MAHS	MAHS	Benzene	µg/l	1	<1.0	<1.0	0
MAHS		Toluene	µg/l	1	<1.0	<1.0	0
MAHS		Ethylbenze	µg/l	1	<1.0	<1.0	0
MAHS		Xylene (m	µg/l	2	<2.0	<2.0	0
MAHS		Xylene (o)	µg/l	1	<1.0	<1.0	0
MAHS		Xylene To	µg/l	2	<2.0	<2.0	0
MAHS		Total BTE	µg/l	2	<2.0	<2.0	0
MAHS							
OES Scan	OES Scan	Sodium	mg/l	0.1	39.0	39.0	0
OES Scan							
TDS AT 1	TDS AT 1	TDS	mg/l	5	140.0	140.0	0
TDS AT 180C							
TOC	TOC	TOC	mg/l	0.5	2.6	2.6	0
TOC							
W-ALK	W-ALK	Alkalinity (	mg/L	2	<2.0	<2.0	0
W-ALK		Alkalinity (	mg/L	2	<2.0	<2.0	0
W-ALK		Alkalinity (	mg/L	2	9.0	10.0	11
W-ALK							
W-Chlorid	W-Chlorid	Chloride	mg/l	1	78.0	77.0	1
W-Chloride(DA)							
W-SO4-D	W-SO4-D	Sulphate	mg/l	1	24.0	24.0	0
W-SO4-Da							
MS Solubl	MS Solubl	Iron (Filter	mg/l	0.01	0.06	0.06	0
MS Solubl		Manganes	mg/l	0.001	0.043	0.04	7
MS Soluble Metals-LL							
OES Scan	OES Scan	Calcium	mg/l	0.1	5.2	5.2	0
OES Scan		Magnesiur	mg/l	0.1	4.6	4.6	0
OES Scan		Potassium	mg/l	0.1	0.9	0.9	0
OES Scan							
TRH & TP	TRH & TP	C10-C14	µg/l	100	<100.0	<100.0	0
TRH & TP		C15-C28	µg/l	100	<100.0	<100.0	0
TRH & TP		C29-C36	µg/l	100	<100.0	<100.0	0
TRH & TPH (>C10)							
TRH & TP	TRH & TP	C6-C9	µg/l	100	<100.0	<100.0	0

*RPDs have only been considered where a concentration is greater than 1 times the EQL.
**High RPDs are in bold (Acceptable RPDs for each EQL multiplier range are: 80 (1-10 x EQL); 50 (10-30 x EQL); 30 (> 30 x EQL))
***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the pı

Contents
Lab Duplicates with high RPDs

SDG	Lab_Report_Number	Matrix_Type	Lab_Duplicate	Field_ID	Depth	Sampled_Date-Time	Method_Name	Compound	Parent_Result	Dupe_Result	Result_Unit	EQL	RPD
19-28316	19-28316	WATER	19-28316_6149474				OES Metals	Magnesium	15	12	mg/L	0.1 mg/L	22
19-28316	19-28316	WATER	19-28316_6149474				OES Metals	Potassium	150	120	mg/L	0.1 mg/L	22
19-28316	19-28316	WATER	19-28316_6150871				OES Metals	Magnesium	3	2	mg/L	0.1 mg/L	40

Contents

Less than 1 matrix spike in 20 samples, or less than 1 matrix duplicate in 20 samples

Matrix_Type	Number_of_Samples	Number_of_Matrix_Spike_Samples	Number_of_Matrix_Spike_Dupe_Samples
WATER	50	11	0

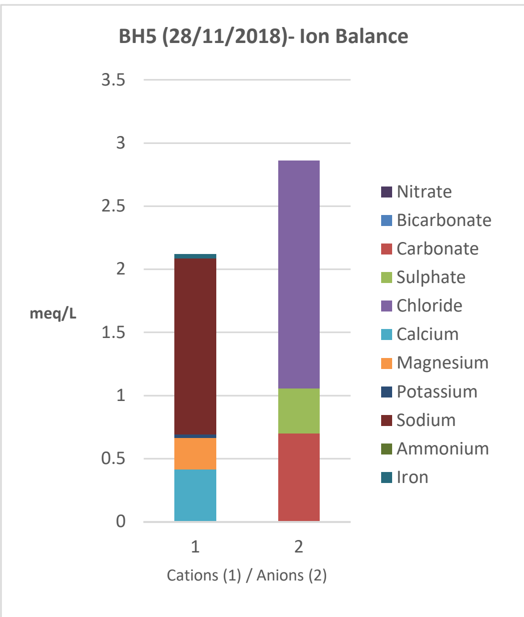
Appendix I-2
Ionic Balance Charts

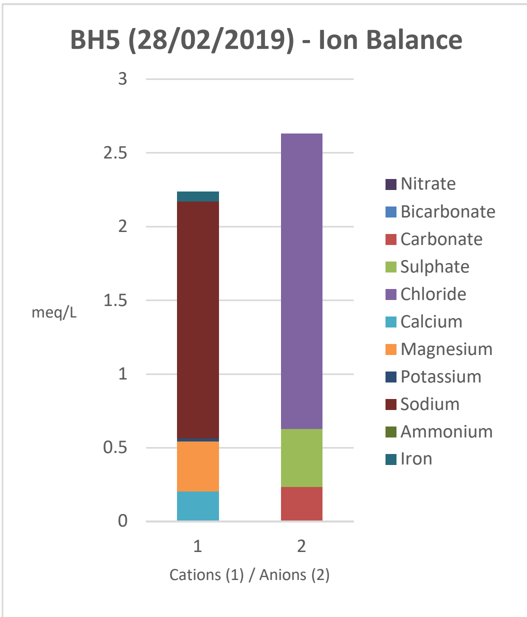
HYLAND Landfill
V2101
28/11/18
Latrobe Council

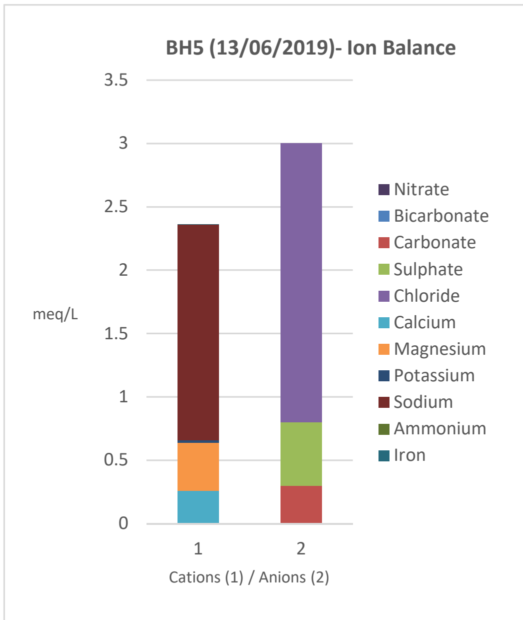
Groundwater Geochemistry

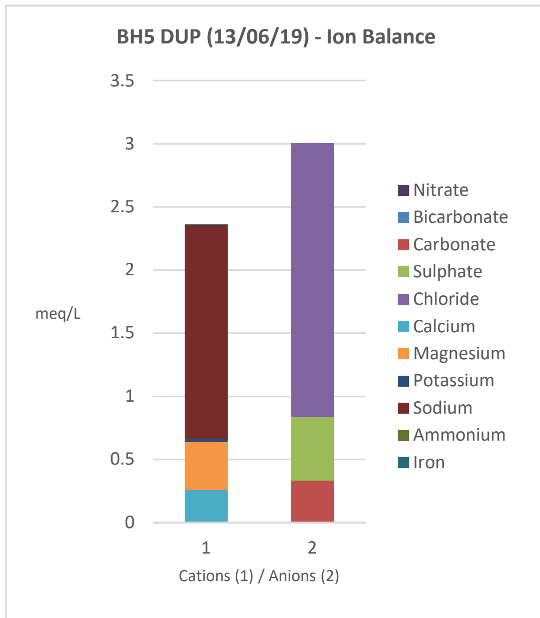
	Units	Conversion	28/11/18 BH5	28/02/19 BH5	13/06/19 BH5	13/06/19 BH5 (DUP)
Bicarbonate	mg/L	61.01				
Carbonate	mg/L	30	21	7	9	10
Sulphate	mg/L	48.03	17	19	24	24
Chloride	mg/L	35.46	64	71	78	77
Nitrate	mg/L	62.01				
Calcium	mg/L	20.04	8.3	4.1	5.2	5.2
Magnesium	mg/L	12.16	3	4.1	4.6	4.6
Potassium	mg/L	39.1	1.2	0.8	0.9	0.9
Sodium	mg/L	23	32	37	39	39
Iron	mg/L	27.9225	0.92	1.9	0.06	0.06
Ammonia/Ammonium	mg/L	18.038				
TDS	mg/L		160	140	140	140

Anions											
Bicarbonate	me/L	0.0	me/L	0.0	me/L	0.0	me/L	0.0	me/L	0.0	me/L
Carbonate	me/L	0.7	me/L	0.2	me/L	0.3	me/L	0.3	me/L	0.0	me/L
Sulphate	me/L	0.4	me/L	0.4	me/L	0.5	me/L	0.5	me/L	0.0	me/L
Chloride	me/L	1.8	me/L	2.0	me/L	2.2	me/L	2.2	me/L	0.0	me/L
Nitrate	me/L	0.0	me/L	0.0	me/L	0.0	me/L	0.0	me/L	0.0	me/L
	total	**2.9**		**2.6**		**3.0**		**3.0**		**0.0**	
Cations											
Calcium	me/L	0.4	me/L	0.2	me/L	0.3	me/L	0.3	me/L	0.0	me/L
Magnesium	me/L	0.2	me/L	0.3	me/L	0.4	me/L	0.4	me/L	0.0	me/L
Potassium	me/L	0.0	me/L	0.0	me/L	0.0	me/L	0.0	me/L	0.0	me/L
Sodium	me/L	1.4	me/L	1.6	me/L	1.7	me/L	1.7	me/L	0.0	me/L
Iron	me/L	0.0	me/L	0.1	me/L	0.0	me/L	0.0	me/L	0.0	me/L
Ammonium	me/L	0.0	me/L	0.0	me/L	0.0	me/L	0.0	me/L	0.0	me/L
	total	**2.1**		**2.2**		**2.4**		**2.4**		**0.0**	
		-14.9		**-8.1**		**-12.0**		**-12.0**		**#DIV/0!**	









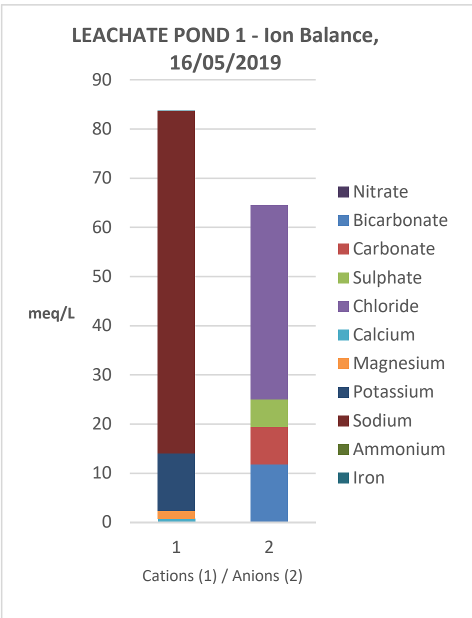
HYLAND Landfill

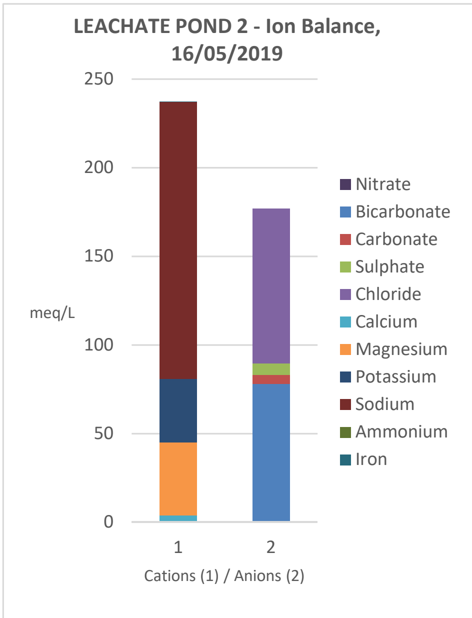
16/05/19
Latrobe Council

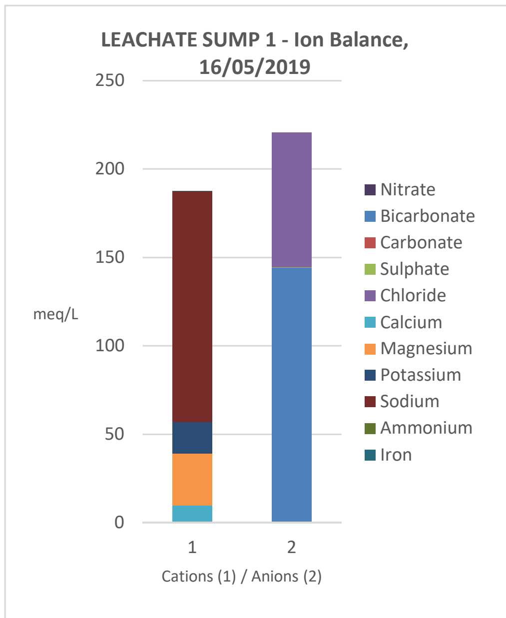
Groundwater Geochemistry

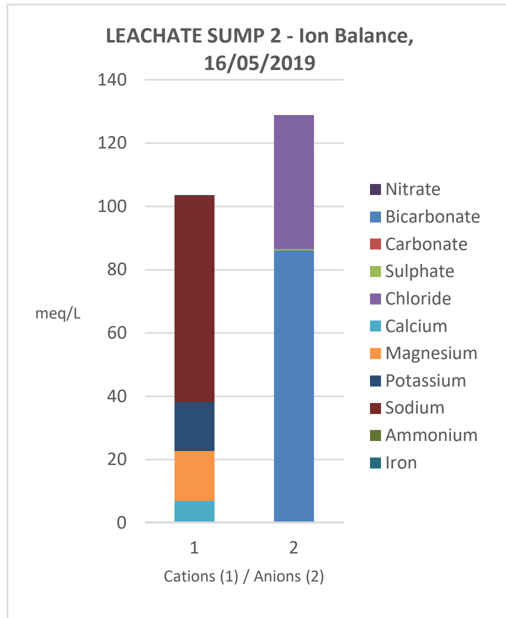
	Units	**Conversion**	**16/05/19** LEACHATE POND 1	**16/05/19** LEACHATE POND 2	**16/05/19** LEACHATE SUMP 1 CELL 3	**16/05/19** LEACHATE SUMP 2 CELL 4
Bicarbonate	mg/L	61.01	719.8	4758	8784	5246
Carbonate	mg/L	30	228	156	1	1
Sulphate	mg/L	48.03	270	300	25	25
Chloride	mg/L	35.46	1400	3100	2700	1500
Nitrate	mg/L	62.01				
Calcium	mg/L	20.04	15	75	190	140
Magnesium	mg/L	12.16	19	500	360	190
Potassium	mg/L	39.1	460	1400	690	610
Sodium	mg/L	23	1600	3600	3000	1500
Iron	mg/L	27.9225	0.21	0.48	3.2	0.75
Ammonia/Ammonium	mg/L	18.038				
TDS	mg/L		4100	8400	8400	5700

Anions											
Bicarbonate	me/L	11.8	me/L	78.0	me/L	144.0	me/L	86.0	me/L	0.0	me/L
Carbonate	me/L	7.6	me/L	5.2	me/L	0.0	me/L	0.0	me/L	0.0	me/L
Sulphate	me/L	5.6	me/L	6.2	me/L	0.5	me/L	0.5	me/L	0.0	me/L
Chloride	me/L	39.5	me/L	87.4	me/L	76.1	me/L	42.3	me/L	0.0	me/L
Nitrate	me/L	0.0	me/L	0.0	me/L	0.0	me/L	0.0	me/L	0.0	me/L
	total	**64.5**		**176.9**		**220.7**		**128.8**		**0.0**	
Cations											
Calcium	me/L	0.7	me/L	3.7	me/L	9.5	me/L	7.0	me/L	0.0	me/L
Magnesium	me/L	1.6	me/L	41.1	me/L	29.6	me/L	15.6	me/L	0.0	me/L
Potassium	me/L	11.8	me/L	35.8	me/L	17.6	me/L	15.6	me/L	0.0	me/L
Sodium	me/L	69.6	me/L	156.5	me/L	130.4	me/L	65.2	me/L	0.0	me/L
Iron	me/L	0.0	me/L	0.0	me/L	0.1	me/L	0.0	me/L	0.0	me/L
Ammonium	me/L	0.0	me/L	0.0	me/L	0.0	me/L	0.0	me/L	0.0	me/L
	total	**83.6**		**237.2**		**187.3**		**103.5**		**0.0**	
		12.9		**14.6**		**-8.2**		**-10.9**		**#DIV/0!**	







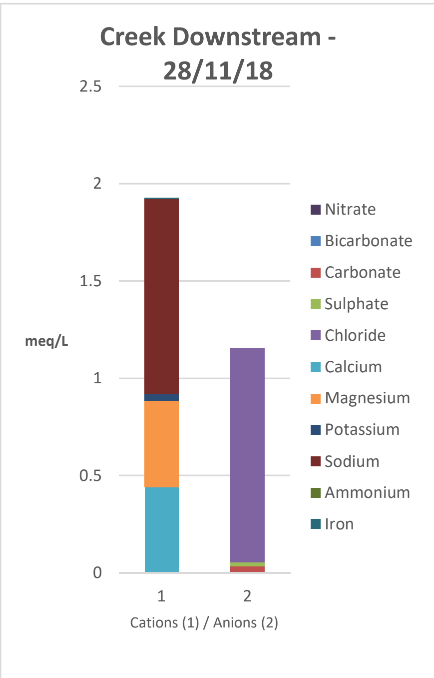


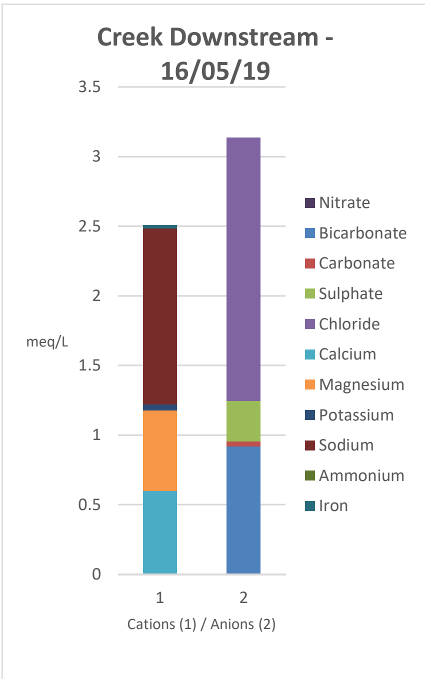
HYLAND Landfill
V2101
28/11/18
Latrobe Council

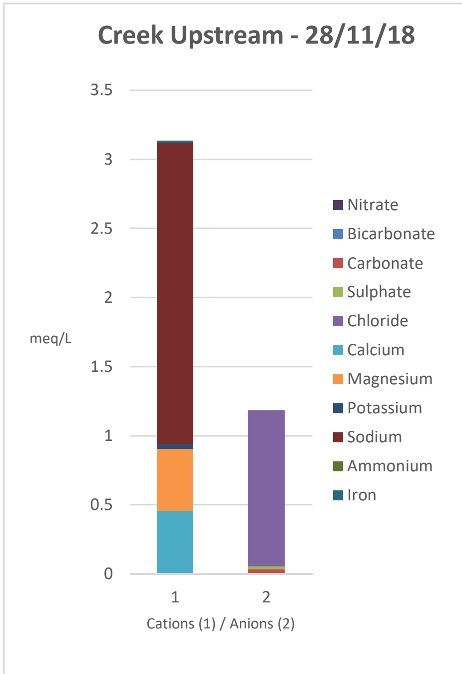
Groundwater Geochemistry

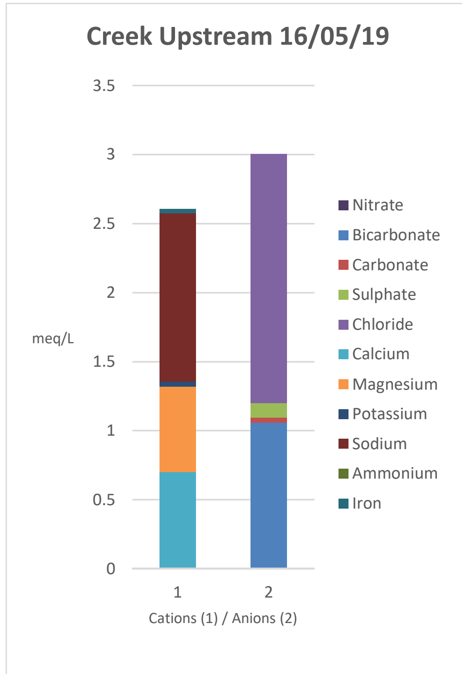
	Units	Conversion	28/11/2018 TRARALGON CREEK (DS)	16/5/2019 TRARALGON CREEK (DS)	11/28/2018 TRARALGON CREEK (US)	16/5/2019 TRARALGON CREEK (US)
Bicarbonate	mg/L	61.01	0	56.12	0	64.66
Carbonate	mg/L	30	1	1	1	1
Sulphate	mg/L	48.03	1	14	1	5
Chloride	mg/L	35.46	39	67	40	64
Nitrate	mg/L	62.01				
Calcium	mg/L	20.04	8.8	12	9.1	14
Magnesium	mg/L	12.16	5.4	7	5.5	7.5
Potassium	mg/L	39.1	1.4	1.8	1.4	1.6
Sodium	mg/L	23	23	29	50.1	28
Iron	mg/L	27.9225	0.19	0.64	0.28	0.93
Ammonia/Ammonium	mg/L	18.038				
TDS	mg/L		110	140	110	140

Anions											
Bicarbonate	me/L	0.0	me/L	0.9	me/L	0.0	me/L	1.1	me/L	0.0	me/L
Carbonate	me/L	0.0	me/L	0.0	me/L	0.0	me/L	0.0	me/L	0.0	me/L
Sulphate	me/L	0.0	me/L	0.3	me/L	0.0	me/L	0.1	me/L	0.0	me/L
Chloride	me/L	1.1	me/L	1.9	me/L	1.1	me/L	1.8	me/L	0.0	me/L
Nitrate	me/L	0.0	me/L	0.0	me/L	0.0	me/L	0.0	me/L	0.0	me/L
	total	**1.2**		**3.1**		**1.2**		**3.0**		**0.0**	
Cations											
Calcium	me/L	0.4	me/L	0.6	me/L	0.5	me/L	0.7	me/L	0.0	me/L
Magnesium	me/L	0.4	me/L	0.6	me/L	0.5	me/L	0.6	me/L	0.0	me/L
Potassium	me/L	0.0	me/L	0.0	me/L	0.0	me/L	0.0	me/L	0.0	me/L
Sodium	me/L	1.0	me/L	1.3	me/L	2.2	me/L	1.2	me/L	0.0	me/L
Iron	me/L	0.0	me/L	0.0	me/L	0.0	me/L	0.0	me/L	0.0	me/L
Ammonium	me/L	0.0	me/L	0.0	me/L	0.0	me/L	0.0	me/L	0.0	me/L
	total	**1.9**		**2.5**		**3.1**		**2.6**		**0.0**	
		25.1		**-11.2**		**45.2**		**-7.0**		**#DIV/0!**	



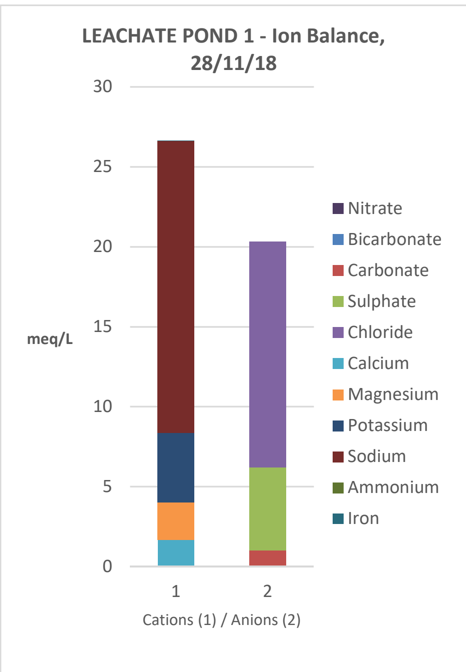


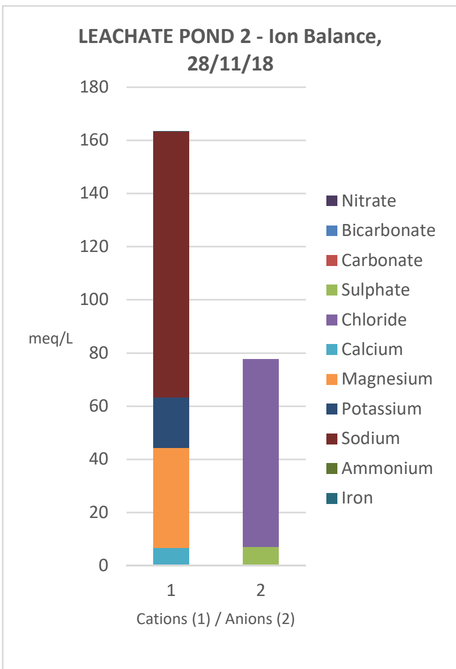


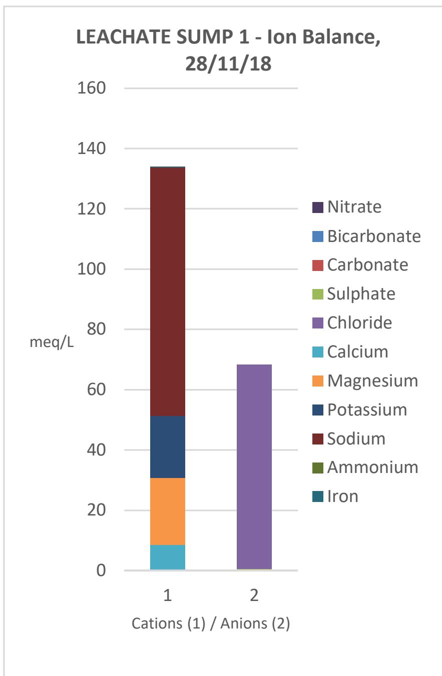


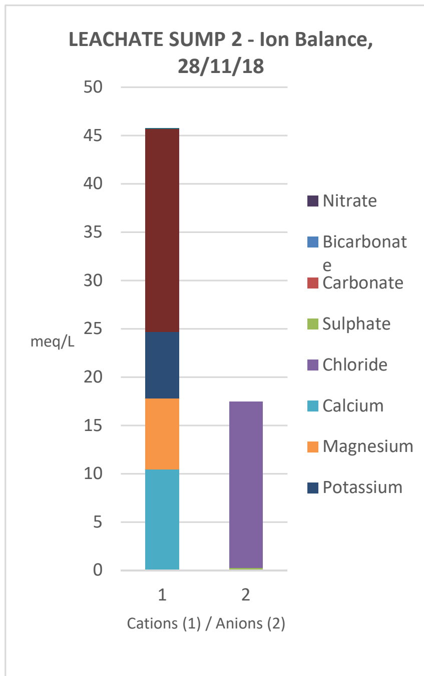
HYLAND Landfill
V2101
28/11/18
Latrobe Council

Groundwater Geochemistry			**28/11/18** LEACHATE POND 1		**28/11/18** LEACHATE POND 2		**28/11/18** LEACHATE SUMP 1 CELL 3		**28/11/18** LEACHATE SUMP 2 CELL 4			
	Units	**Conversion**										
Bicarbonate	mg/L	61.01										
Carbonate	mg/L	30	30		1		1		2			
Sulphate	mg/L	48.03	250		340		25		10			
Chloride	mg/L	35.46	500		2500		2400		610			
Nitrate	mg/L	62.01										
Calcium	mg/L	20.04	34		130		170		210			
Magnesium	mg/L	12.16	28		460		270		89			
Potassium	mg/L	39.1	170		740		800		270			
Sodium	mg/L	23	420		2300		1900		482			
Iron	mg/L	27.9225	0.02		0.46		7.2		2			
Ammonia/Ammonium	mg/L	18.038										
TDS	mg/L		1600		7800		7100		2800			
Anions												
Bicarbonate		me/L	0.0	me/L	0.0	me/L	0.0	me/L	0.0	me/L	0.0	me/L
Carbonate		me/L	1.0	me/L	0.0	me/L	0.0	me/L	0.1	me/L	0.0	me/L
Sulphate		me/L	5.2	me/L	7.1	me/L	0.5	me/L	0.2	me/L	0.0	me/L
Chloride		me/L	14.1	me/L	70.5	me/L	67.7	me/L	17.2	me/L	0.0	me/L
Nitrate		me/L	0.0	me/L	0.0	me/L	0.0	me/L	0.0	me/L	0.0	me/L
		total	**20.3**		**77.6**		**68.2**		**17.5**		**0.0**	
Cations												
Calcium		me/L	1.7	me/L	6.5	me/L	8.5	me/L	10.5	me/L	0.0	me/L
Magnesium		me/L	2.3	me/L	37.8	me/L	22.2	me/L	7.3	me/L	0.0	me/L
Potassium		me/L	4.3	me/L	18.9	me/L	20.5	me/L	6.9	me/L	0.0	me/L
Sodium		me/L	18.3	me/L	100.0	me/L	82.6	me/L	21.0	me/L	0.0	me/L
Iron		me/L	0.0	me/L	0.0	me/L	0.3	me/L	0.1	me/L	0.0	me/L
Ammonium		me/L	0.0	me/L	0.0	me/L	0.0	me/L	0.0	me/L	0.0	me/L
		total	**26.6**		**163.3**		**134.0**		**45.7**		**0.0**	
			13.4		**35.6**		**32.5**		**44.7**		**#DIV/0!**	









HYLAND Landfill
V2101
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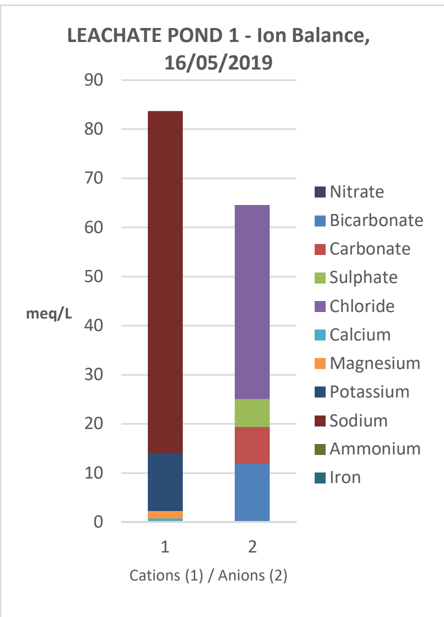
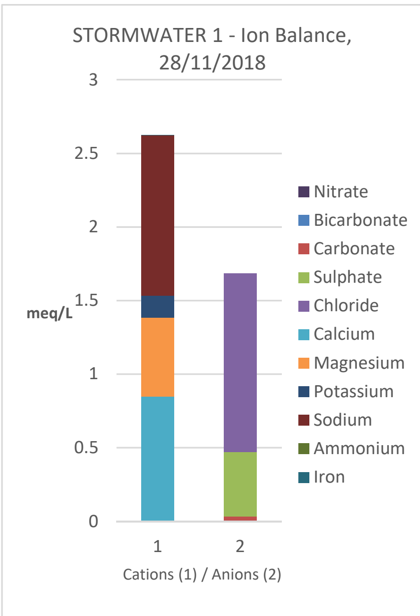
Latrobe Council

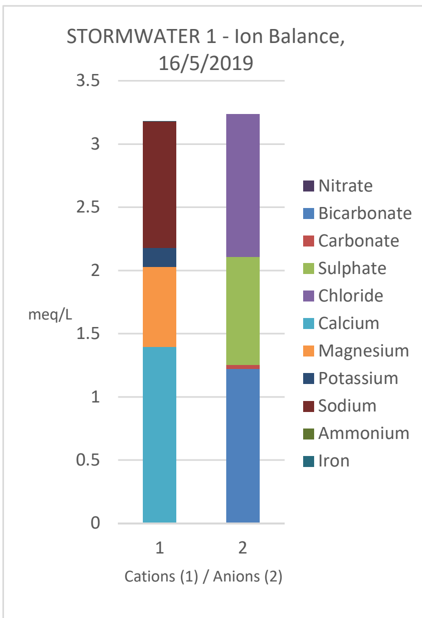
Groundwater Geochemistry

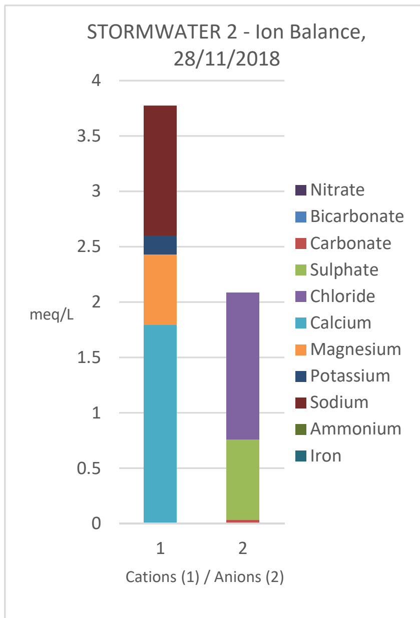
	Units	Conversion	11/28/2018 STORMWATER 1	16/5/2019 STORMWATER 1	11/28/2018 STORMWATER 2	16/5/2019 STORMWATER 2
Bicarbonate	mg/L	61.01	0	74.42	0	112.24
Carbonate	mg/L	30	1	1	1	1
Sulphate	mg/L	48.03	21	41	35	22
Chloride	mg/L	35.46	43	40	47	56
Nitrate	mg/L	62.01				
Calcium	mg/L	20.04	17	28	36	28
Magnesium	mg/L	12.16	6.5	7.7	7.7	9.4
Potassium	mg/L	39.1	5.9	5.7	6.6	7.2
Sodium	mg/L	23	25	23	27	35
Iron	mg/L	27.9225	0.05	0.02	0.06	0.01
Ammonia/Ammonium	mg/L	18.038				
TDS	mg/L		170	300	270	200

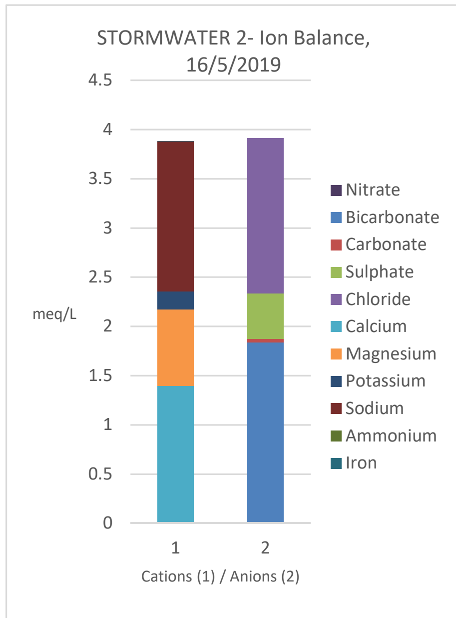
Anions												
Bicarbonate	me/L	0.0	me/L	1.2	me/L	0.0	me/L	1.8	me/L	0.0	me/L
Carbonate	me/L	0.0	me/L	0.0	me/L	0.0	me/L	0.0	me/L	0.0	me/L
Sulphate	me/L	0.4	me/L	0.9	me/L	0.7	me/L	0.5	me/L	0.0	me/L
Chloride	me/L	1.2	me/L	1.1	me/L	1.3	me/L	1.6	me/L	0.0	me/L
Nitrate	me/L	0.0	me/L	0.0	me/L	0.0	me/L	0.0	me/L	0.0	me/L
	total	**1.7**		**3.2**		**2.1**		**3.9**		**0.0**	
Cations											
Calcium	me/L	0.8	me/L	1.4	me/L	1.8	me/L	1.4	me/L	0.0	me/L
Magnesium	me/L	0.5	me/L	0.6	me/L	0.6	me/L	0.8	me/L	0.0	me/L
Potassium	me/L	0.2	me/L	0.1	me/L	0.2	me/L	0.2	me/L	0.0	me/L
Sodium	me/L	1.1	me/L	1.0	me/L	1.2	me/L	1.5	me/L	0.0	me/L
Iron	me/L	0.0	me/L	0.0	me/L	0.0	me/L	0.0	me/L	0.0	me/L
Ammonium	me/L	0.0	me/L	0.0	me/L	0.0	me/L	0.0	me/L	0.0	me/L
	total	**2.6**		**3.2**		**3.8**		**3.9**		**0.0**	
		21.8		**-0.9**		**28.8**		**-0.4**		**#DIV/0!**	











HYLAND Landfill
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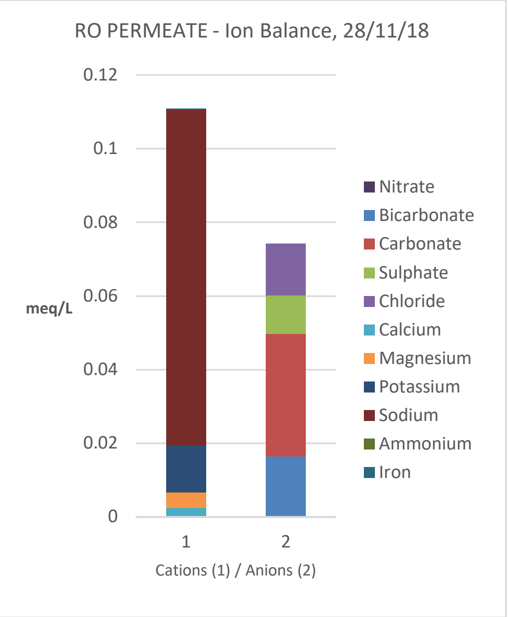
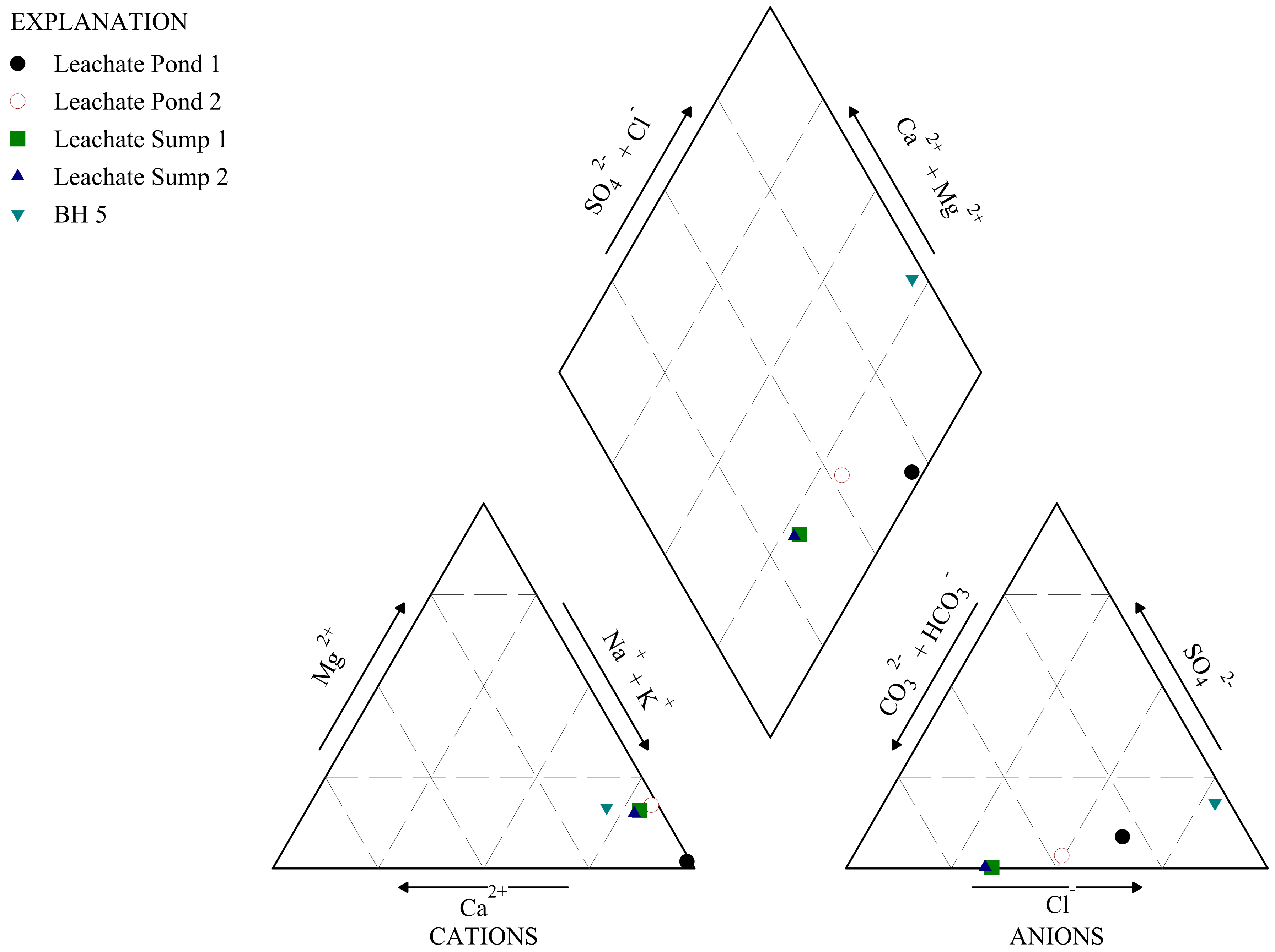
Latrobe Council

Groundwater Geochemistry			28/11/18	
			RO PERMEATE	
	Units	**Conversion**		
Bicarbonate	mg/L	61.01	1	
Carbonate	mg/L	30	1	
Sulphate	mg/L	48.03	0.5	
Chloride	mg/L	35.46	0.5	
Nitrate	mg/L	62.01		
Calcium	mg/L	20.04	0.05	
Magnesium	mg/L	12.16	0.05	
Potassium	mg/L	39.1	0.5	
Sodium	mg/L	23	2.1	
Iron	mg/L	27.9225	0.01	
Ammonia/Ammonium	mg/L	18.038		
TDS	mg/L		10	
Anions				
Bicarbonate		me/L	0.0	me/L
Carbonate		me/L	0.0	me/L
Sulphate		me/L	0.0	me/L
Chloride		me/L	0.0	me/L
Nitrate		me/L	0.0	me/L
		total	**0.1**	
Cations				
Calcium		me/L	0.0	me/L
Magnesium		me/L	0.0	me/L
Potassium		me/L	0.0	me/L
Sodium		me/L	0.1	me/L
Iron		me/L	0.0	me/L
Ammonium		me/L	0.0	me/L
		total	**0.1**	
			19.8	



Hyland Landfill - Piper Trilinear Diagram (Leachate Vs Groundwater)



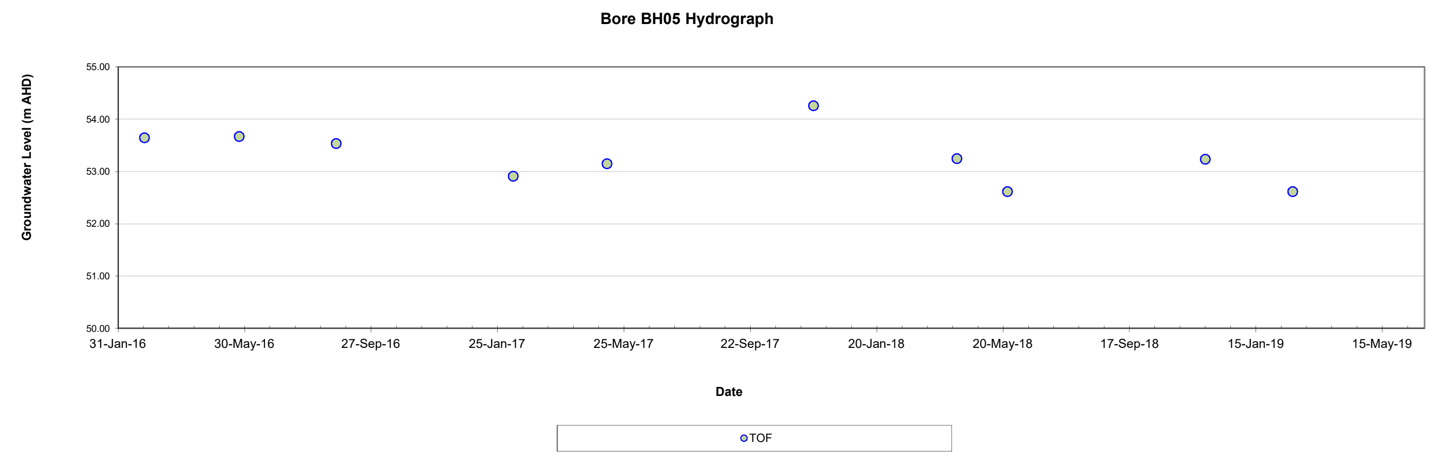
Appendix J
Trend Plots

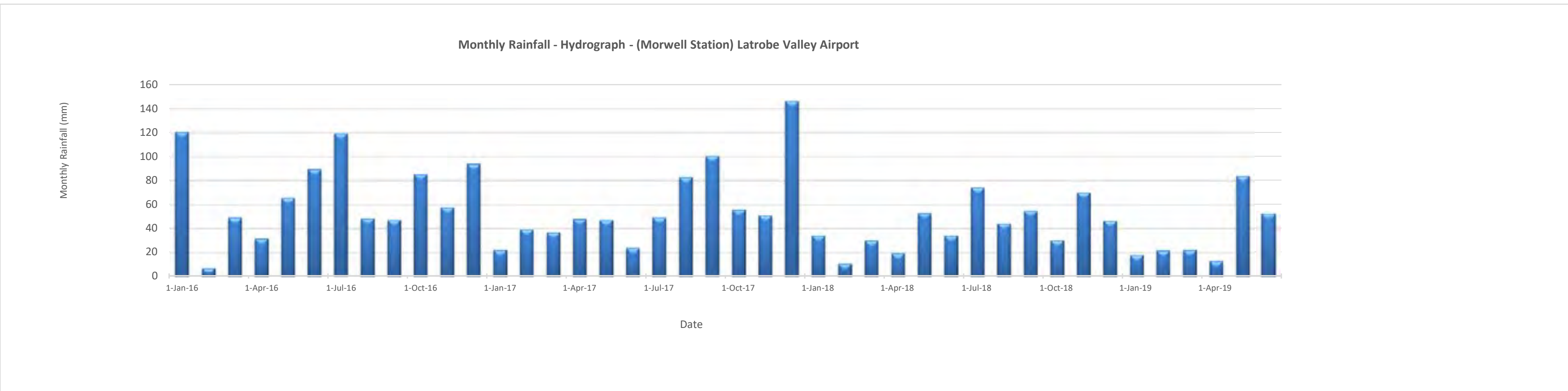
Hyland Landfill

BH05	Top of Casing (m)	142.378
	Well total depth (m)	100.75
	Ground Surface Level (m AHD)	142.648
	Top of well screen depth (m)	93.00
	Base of well screen depth (m)	99.00
	Top of well screen (AHD m)	49.65
	Base of well screen (AHD m)	43.65

Exceedance | Lab EC values

Date	Days	TOC (mg/L)	Ammonia (as N) (mg/L)	Nitrate (as N) (mg/L)	Copper (mg/L)	Iron (mg/L)	Lead (mg/L)	Manganese (mg/L)	Nickel (mg/L)	Selenium (mg/L)	Zinc (mg/L)	DO (mg/L)	Field EC (uS/cm)	Field ORP (mV)	TOF (m TOC)	TOF (m AHD)	PSH (mm)	NAPL-Water (Depth m)	NAPL-Water (m AHD)	NAPL-Air (Depth m)	NAPL-Air (m AHD)	Sample Method
23-Jun-95	0															#VALUE!	0	#VALUE!	#VALUE!		#VALUE!	
25-Feb-16	7552														88.73	53.648	0	88.73	53.65	88.73	53.65	
25-May-16	7642														88.71	53.668	0	88.71	53.67	88.71	53.67	
25-Aug-16	7734														88.84	53.538	0	88.84	53.54	88.84	53.54	
9-Feb-17	7902														89.47	52.908	0	89.47	52.91	89.47	52.91	
9-May-17	7991														89.23	53.148	0	89.23	53.15	89.23	53.15	
22-Aug-17	8096																					
21-Nov-17	8187														88.12	54.258	0	88.12	54.26	88.12	54.26	
6-Apr-18	8323														89.13	53.248	0	89.13	53.25	89.13	53.25	
24-May-18	8371														89.76	52.618	0	89.76	52.62	89.76	52.62	
28-Nov-18	8559	5.6	0.2	0.03								3.78	274.4	-20.6	89.14	53.238	0	89.14	53.24	89.14	53.24	
19-Feb-19	8642	11	0.4	0.02								1.52	297.5	62.7	89.76	52.618	0	89.76	52.62	89.76	52.62	
13-Jun-19	8756	2.6	0.2	0.005								0.17	322	-64.9	89.79	52.588	0	89.79	52.59	89.79	52.59	





Appendix K
Monitoring Activity Compliance

Monitoring Activity Compliance by Monitoring Parameters (Groundwater, Leachate, and Surface Water)

Element	Parameter	Unit	Description	QTR 1 (August 2018)	QTR 2 (November 2018)	QTR 3 (February 2019)	QTR 4 (May 2019)	Comments
Groundwater	Level	m (in AHD)	Calculated as Top of Casing (ToC) levels less standing water levels (SWL) depth below ToC. Depth to base of bore below ToC. Casing "stick up".	N/A	Not fully compliant. Only BH5 could be sampled (with HydrasSeeve)	Not fully compliant. Only BH1 and BH5 was sampled. However, sample volumes were too low for any analysis.	Not compliant. All wells were dry. BH5 was sampled in June2019.	Per email communication, contract was granted only in November instead of July, hence only three monitoring events. Groundwater samples taken only from BH5 on June 2019.
	Quality	Various	Field: Temperature, Electrical Conductivity, pH, Oxidation-Reduction Potential, Dissolved Oxygen, Physical appearance.	N/A	As above	As above	As above	As above
			Laboratory: pH, TDS. Ammonia (as N), Nitrate (as N), Bicarbonate, Chloride, Sulpjhate, Sodium, Potassium, Calcium, Magnesium, Total Organic Carbon (TOC), Total Phosphate, Total Recoverable Hydrocarbons (TRH)- 2013 NEPM fractions, and BTEXNs. Total Iron (filtered) and Total Manganese (filtered)	N/A	As above	As above	As above	As above
	Purged Volume	L	Metered volumes form bores in monitoring network	N/A	As above	As above	As above	As above
	Condition	Descriptive	Qualitative description of the condition of the bore and headworks (e.g. damage, disturbances).	N/A	✓	✓	✓	Conditions clearly reported
Leachate	Level	m (in AHD/RL) if possible	Depth of sampling location	N/A	Not compliant.	Not compliant.	Not complaint	No mention whether the levels could be measured.
	Quality	Various	Field: Temperature, Electrical Conductivity, pH, Oxidation-Reduction Potential, Dissolved Oxygen, Physical appearance.	N/A	✓	✓	✓	All reqired field parameters reported.
			Laboratory: pH, TDS. Ammonia (as N), Nitrate (as N), Bicarbonate, Chloride, Sulpjhate, Sodium, Potassium, Calcium, Magnesium, Total Organic Carbon (TOC), Total Phosphate, Total Recoverable Hydrocarbons (TRH)- 2013 NEPM fractions, and BTEXNs.	N/A	✓	✓	✓	All required analysis performed. Limits of reporting had to be increased for some samples.
	Condition	Descriptive	Turbidity, colour, odour of the pond, estimated freeboard	N/A	✓	✓	✓	Conditions clearly reported
Stormwater Pond	Level	m (in AHD/RL) if possible	Depth of sampling location	N/A	Not compliant.	Not compliant.	Not compliant.	Samplng depths have not been reported.
	Quality	Various	Field: Temperature, Electrical Conductivity, pH, Oxidation-Reduction Potential, Dissolved Oxygen, Physical appearance.	N/A	✓	✓	✓	All required field parameters taken and reported.
			Laboratory: pH, TDS. Ammonia (as N), Nitrate (as N), Bicarbonate, Chloride, Sulpjhate, Sodium, Potassium, Calcium, Magnesium, Total Organic Carbon (TOC), Total Phosphate, Total Recoverable Hydrocarbons (TRH)- 2013 NEPM fractions, and BTEXNs.	N/A	✓	✓	✓	All required analysis performed.
	Condition	Descriptive	Turbidity, colour, odour of the pond, estimated freeboard	N/A	✓	✓	✓	Conditions clearly reported.
Surface Water	Level	m (in AHD/RL) if possible	Depth of sampling location	N/A	Not compliant.	Not compliant.	Not complaint.	Sample depths not reported.
	Quality	Various	Field: Temperature, Electrical Conductivity, pH, Oxidation-Reduction Potential, Dissolved Oxygen, Physical appearance.	N/A	✓	✓	✓	All required field parameters taken and reported.
			Laboratory: pH, TDS. Ammonia (as N), Nitrate (as N), Bicarbonate, Chloride, Sulpjhate, Sodium, Potassium, Calcium, Magnesium, Total Organic Carbon (TOC), Total Phosphate, Total Recoverable Hydrocarbons (TRH)- 2013 NEPM fractions, and BTEXNs.	N/A	✓	✓	✓	All required analysis performed.
	Condition	Descriptive	Turbidity, colour, odour	N/A	✓	✓	✓	Conditions clearly reported.

Monitoring Activity Compliance by Monitoring Parameters (Landfill Gas)

Element	Parameter	Unit	Description	QTR 1 (August 2018)	QTR 2 (November 2018)	QTR 3 (February 2019)	QTR 4 (May 2019)	Comments
Landfill Gas (subsurface)	Quality	Various	Field: Atmospheric pressure, relative pressure, peak CH4, CO2, O2 and stabilized CH4, CO2, O2, CO and H2S flow (L/s) and comments.	N/A	✓	✓	✓	August sampling not conducted due to delay in contract.
	Condition	Descriptive	Qualitative description of the condition of the bore and headworks (e.g. damage, distrbances).	N/A	✓	✓	✓	Clear description provided.
Landfill Gas (interim and final cap)	Quality	Various	Field: Atmospheric pressure, relative pressure, peak CH4.	N/A	✓	✓	✓	Reporting per contract.
	Condition	Descriptive	Qualitative description of the condition of the cap (cracks, odour, status of vegetation, leachate)	N/A	✓	✓	✓	Reporting per contract.
Landfill Gas (Buildings and Services)	Quality	Various	Field: Atmospheric pressure, relative pressure, peak CH4, CO2, and O2.	N/A				Reporting per contract.
	Condition	Descriptive	Qualitative description of the condition of the buildings and service pits (including possible LFG access points, cracks and odour)	N/A	✓	✓	✓	Reporting per contract.

Monitoring Activity Compliance by Segment and Location

Element	ID	QTR 1 28/11/18	Comments	QTR 2 19/02/19	Comments	QTR 3 16/05/19	Comments
Groundwater	BH01	×	Dry	✓		×	Dry
	BH02	×	Dry	×	Dry	×	Dry
	BH03	×	Full of silt	×	Dry	×	Blocked at 49m
	BH04	×	Dry	×	Dry	×	Dry
	BH05	✓	Dropped sleeve	✓		×	Sampled on June 13th
Perched Groundwater	Cell 3B Groundwater Interception System	×	Not accessible,filled with rubble	×	Not accessable, filled with rubble	×	Not accessible, filled with rubble
Leachate	Leachate Pond 1	✓	Turbid, green colour, no odour	✓	Dark brown, dirty, strong odour	✓	1 metre from full, green colour, odourless
	Leachate Pond 2	✓	Non turbid, black colour, slight odour	✓		✓	1 metre from full, leachate odour, dark brown/green
	Leachate Sump - Cell 1	✓	Slightly turbid, light brown, no odour	✓	Dark brown, non turbid, strong odour	✓	Dark brown, leachate odour
	Leachate Sump - Cell 2	✓	Slightly turbid, light brown, no odour	✓	Dark brown, non turbid, strong odour	✓	Brown, leachate odour
Surface Water	Stormater Pond 1	✓	Very turbid, light brown, no odour	✓	Light brown	✓	Full to spilling, turbid, creamy colour, cloudy, no odour
	Stormater Pond 2	✓	Very turbid, light brown, no odour	✓	Green tinge to water	✓	Turbid, creamy, cloudy, 1/2 metre below full, no odour
	Traralgon Creek (US)	✓	Slightly turbid, light brown, no odour	✓	Stagnant	✓	Low flow, clear to light brown, odourless
	Traralgon Creek (DS)	✓	Non turbid, slightly brown, no odour	✓	Stagnant, oily	✓	no flow, light oil on surface, clear
	RO Permeate	✓	Non turbid, clear, no odour	×	Plant not operational	×	Plant not operational

Appendix E

Hyland Highway Landfill Risk Assessment Register (updated December 2019)

Location	Environmental Category	Aspect	Description of potential impacts	Pathways for risk	Existing controls	Relevant licence condition	Likelihood	Consequence	Risk	Comment
Existing cells	Water - groundwater	Leachate seepage	Contamination of groundwater down-gradient, aquifer beneficial uses	Seepage of leachate through landfill floor and leach ate pond floor.	Cell 1/2 and Cell 3 (west) has been capped. The final surface is mounded above ground level, promoting surface water runoff and limiting ingress into the waste mass. Base and sides of cells are HDPE and clay lined. Both leachate ponds are HDPE and clay lined. Leachate is treated by RO and discharged to the primary stormwater pond.	LI_DL1, LI_L4, LI_L4.1, LI_L6	Not likely	Minor	Low	No evidence of leachate seepage from completed and operating cells. There have been two effective groundwater monitoring bores (BH3 and BH5). Monitoring bore BH3 damaged and is to be replaced. Water quality analysis of downgradient bore BH5 does not indicate leachate impact. Monitoring bore BH3 is inferred to monitor a perched aquifer. Leachate volumes to and from leachate ponds monitored to assist with identification of potential leakage. Monitoring of leachate level in ponds required as per verified monitoring program.
Existing cells	Water - groundwater	Leachate seepage	Contamination of groundwater down-gradient, aquifer beneficial uses	Seepage of contaminated stormwater sourced from uncapped areas and overflows from leachate ponds and stormwater ponds.	Cell 1/2 and Cell 3 (west) has been capped. Site has peripheral (cut-off) drains to divert stormwater from landfill areas to segregate clean stormwater from contaminated (leachate) water. Runoff from uncapped landfill areas is captured as leachate.	LI_DLI, LI_L6	Not likely	Minor	Low	Water quality analysis of downgradient bore BH5 does not indicate leachate impact.
Existing cells & leachate ponds	Water - groundwater	Seepage of contaminated stormwater	Contamination of groundwater down-gradient, aquifer beneficial uses	Perched groundwater seepage into landfill from north resulting in ingress of groundwater into landfill with leachate build-up and groundwater contamination.	Groundwater interception system behind northern Cell 3B side liner.	LI_DLI, LI_L6	Not likely	Medium	Medium	Site monitoring indicates perched water behind sideliner, water appears of good quality. Waste level is elevated, hence limited potential for liner damage. Ongoing monitoring and maintenance of systems is required. Confirm the level of the Cell 3B Interception Bore level bubbler to confirm it is at the bottom of the upper batter in the north-west corner. Can be achieved by measuring depth to pump installed at Cell 3B interception bore and confirming it operates from 132.0 m AHD and the bubbler level measurements are from this location.
Existing cells	Water - surface water	RO permeate discharge to wetland via stormwater pond.	Contaminated runoff impacting on nearby surface water beneficial uses.	Overflow from stormwater pond to wetland.	The RO plant generates a permeate which is discharged to surface water via the stormwater ponds.	LI_DW1, LI_DL1, LI_L4	Probable	Minor	Medium	No exceedances of surface water beneficial use water quality guideline values (triggers) occurred were reported at the secondary stormwater pond from the 28 November 2018 monitoring event. Some minor ammonia and phosphorus exceedances had been reported following the February 2017 monitoring even As the November 2018 RO permeate TOC concentration of 1.0 mg/L was below the secondary stormwater pond's concentration of 9.0 mg/L, the RO permeate is unlikely to be the source of TOC to this pond.

Location	Environmental Category	Aspect	Description of potential impacts	Pathways for risk	Existing controls	Relevant licence condition	Likelihood	Consequence	Risk	Comment
Existing cells	Water - surface water	Runoff from uncapped landfill.	Contaminated runoff impacting on nearby surface water beneficial uses.	Runoff from uncapped above ground landfill.	Runoff from uncapped landfill reports as leachate. Discharge to the receiving environment via collected leachate.	LI_DW1, LI_DL1, LI_L4	Not likely	Minor	Low	No exceedances of surface water beneficial use water quality guideline values (triggers) occurred were reported at the secondary stormwater pond from the 28 November 2018 monitoring event. Some minor ammonia and phosphorus exceedances had been reported following the February 2017 monitoring even As the November 2018 RO permeate TOC concentration of 1.0 mg/L was below the secondary stormwater pond's concentration of 9.0 mg/L, the RO permeate is unlikely to be the source of TOC to this pond.
Existing cells	Water - surface water	Overflow from leachate ponds.	Contaminated runoff impacting on nearby surface water beneficial uses.	Pond overflows into surface waters to the south-west.	Cell 1/2 and Cell 3 (west) has been capped. It is mounded above ground level, promoting surface water runoff and limiting ingress into the waste mass Cell 3 (east) has intermediate cover but not final cap. Cell 4 has daily cover. Site has peripheral (cut-off) drains to divert stormwater from landfill areas to segregate clean stormwater from contaminated (leachate) water.	LI_DW1, LI_DL1, LI_L4	Not likely	Medium	Medium	No overflow identified over audit period. Install piezometer in Leachate Pond No. 2 and monitor and record.
Existing cells	Air - odour	Odour emissions from surface	Off-site offensive odour at nearest residence	Uncovered waste. Inadequate maintenance and implementation of appropriate procedures and site operational practices.	Cell 1/2 and Cell 3 (west) has been capped. Aerator in Leachate Pond LP2 has been augmented with higher capacity aerators.	LI_L3, LI_A1, LI_WA1, LI_WA1_5	Rare	Medium	Medium	Nearest residences are 1.25 km from the site. LCC have an odour log. Odour related non-compliances were reported over audit period. Undertake automatic odour monitoring trial with sensor to be installed to the west of the site
Existing cells	Air - dust	Dust emissions from landfill, vehicles and equipment movement on landfill.	Health of workers and nearby residents, visual amenity	Windy, dry conditions. Inadequate maintenance and implementation of appropriate procedures and site operational practices.	Cell 1/ 2 and part Cell 3 final cap completed. Water spraying for dust control is undertaken with on-site tanker.	LI_A3	Probable	Negligible	Low	No dust related complaints received over the past three years.
Existing cells	Air - landfill gas	Gas emissions from landfill	Health of on-site workers (plant operators) and risk to vegetation.	Direct emissions from Cell 5 while filling and areas of Cell 4 with intermediate cover and without LFG control impacting on plant operators through explosion and asphyxiation.	Cell 1/2 and Cell 3 (west) cap has been completed. Vertical LFG wells installed in Cells 1/2, 3 and 4 (west). Base and sides of cells are HDPE and clay lined.	LI_L5, LI_L6	Not likely	Medium	Medium	Cell 1/ 2 and Cell 3 (west) have final capping installed. Vertical well LFG extraction system installed. The potential for lateral migration towards operating Cell 5 is mitigated by within waste sacrificial LFG extraction system.
Existing cells	Air - landfill gas	Gas emissions from landfill	Health of on-site workers (plant operators) and risk to vegetation.	Direct emissions through leaking at and above ground LFG extraction system impacting on on-plant operators through explosion and asphyxiation.	Cell 1/2 and Cell 3 (west) cap has been completed. Vertical LFG wells installed in Cells 1/2, 3 and 4 (west). Base and sides of cells are HDPE and clay lined.	LI_L5, LI_L6	Not likely	Medium	Medium	Cell 1/ 2 and Cell 3 (west) have final capping installed. Vertical well LFG extraction system installed. The potential for lateral migration towards operating Cell 5 is mitigated by within waste sacrificial LFG extraction system. Emissions at penetrations observed in cap and intermediate cover.

Location	Environmental Category	Aspect	Description of potential impacts	Pathways for risk	Existing controls	Relevant licence condition	Likelihood	Consequence	Risk	Comment
Existing cells	Air - landfill gas	Gas emissions from landfill	Health of on-site workers and risk to vegetation	Lateral migration within the site due to wind, atmospheric pressure differentials.	Cell 1/2 and Cell 3 (west) cap has been completed. Vertical LFG wells installed in Cells 1/2, 3 and 4 (west). Base and sides of cells are HDPE and clay lined.	LI_L5, LI_L6	Not likely	Medium	Medium	Landfill cells are lined (base and sides). Limited underground services near landfill connected with sensitive receptors. Monitoring of subsurface services indicates concentrations ae below Landfill BPEM action levels. The subsurface service LFG monitoring sites should be extended to include pits associated with electrical conduit trench to the leachate pumping and treatment system within the site and the ingress and egress to and from the north-south stormwater pipe under the landfill.
Existing cells	Air - landfill gas	Gas emissions from landfill	Human health of on site workers and visitors to the Education Centre.	Lateral migration to Education centre and surrounds via geological pathways and services. Lateral migration into on-site excavations and borings.	Cell 1/2 and Cell 3 (west) cap has been completed. Vertical LFG wells installed in Cells 1/2, 3 and 4 (west). Base and sides of cells are HDPE and clay lined.	LI_L5, LI_L6	Not likely	Medium	Medium	Education centre is north-west of landfill and may contain service trenches/pits. Monitoring of building and structures indicates concentrations are below Landfill BPEM action level.
Existing cells	Air - landfill gas	Gas emissions from landfill	Human health of residents and risk to vegetation.	Lateral migration off-site to nearest residence via geological pathways and services.	Cell 1/2 and Cell 3 (west) cap has been completed, including a LFG management system. Base and sides of cells are HDPE and clay lined. Leachate ponds are HDPE and clay lined. Nearest residences are 1.25 km from the landfill site. Nearest industry is Motocross track which is about 600 m from the landfill site. These distances exceed Landfill BPEM requirement of minimum 500 m.	LI_L5, LI_L6	Not likely	Minor	Low	Nearest residences 1.25 km from the site. Landfill BPEM subsurface CO_2 action level exceedances, particularly in north-west corner noted. Underground services connecting the landfill with sensitive receptors are not known. Implement LFG extraction optimisation plan as per Run Energy (2019) and upgrade LFG control system to address LYLF001 subsurface elevated CO2 concentrations.
Existing cells	Land	Litter nuisance.	Aesthetics, amenity	Dry windy conditions. Lateral migration of litter off-site via vehicles, uncovered waste, waste spills.	Daily cover, intermediate cover and final cap, regular inspections and clean-up on site. Property is fenced.	LI_WM3	Probable	Minor	Medium	Litter was under control during the October 2019 site inspection. Upgrade litter fence along northern boundary (eastern section) of the site to reduce the risk of off-site litter migration (once Cell 5 is within a few meters from the ground surface in the northern area.
Existing cells	Noise	Excessive noise generation	Nuisance to site workers and surrounding residences.	Inadequately maintained vehicles and mobile equipment.	Restricted operating hours. Contractors made aware of need to minimise noise.	LI_A2	Not likely	Minor	Low	Nearest residences 1.25 km from the site.
Weighbridge area, asbestos skip	Air - dust	Dust associated with handling of asbestos stored in asbestos skip.	Health of workers	Windy, dry conditions. Inadequate maintenance and implementation of appropriate procedures and site operational practices.	Asbestos wrapped.	LI_A3, LI_WA1.5	Not likely	Minor	Low	LCC generally manages in accordance with licence condition LI_WA1.5. Ensuring asbestos within skips is disposed of within 3 months as per Licence Condition LI_WA1.5.

Location	Environmental Category	Aspect	Description of potential impacts	Pathways for risk	Existing controls	Relevant licence condition	Likelihood	Consequence	Risk	Comment
Weighbridge area, insulation caged trailer	Air - dust	Dust associated with handling of insulation batts stored in caged trailer.	Health of workers	Windy, dry conditions. Inadequate maintenance and implementation of appropriate procedures and site operational practices.	Handling procedure not subject to audit.	LI_A3, LI_WA1.5	Not likely	Minor	Low	Insulation batts are placed in a caged trailer which is taken to the landfill daily. Review whether the practice of accepting and storage of insulation batts in dedicated skip the same area as the asbestos skip is consistent with Licence Condition LI_WA1.5 and implement any recommendation arising from the review
Vehicular access areas, weighbridge.	Water - surface water	Contamination of stormwater by spilled waste	Rain falling on waste, spills leading to runoff, contamination and discharge to surface waters.	Inadequately covered loads or contained loads leading to spills.	Spills cleaned up by operations staff once they are observed.	LI_DW1	Not likely	Minor	Low	
Vehicular access areas, weighbridge.	Water - surface water	Contamination of stormwater by spilled fuel and oil	Runoff contamination and discharge to surface waters.	Inadequately maintained vehicles and mobile equipment. Inadequately maintained fuel storage areas.	Spills cleaned up by operations staff once they are observed.	LI_DW1	Not likely	Minor	Low	
Vehicular access areas, office and weighbridge.	Water - groundwater	Contamination of groundwater by spilled fuel and oil	Contamination of groundwater down-gradient, aquifer beneficial uses	Inadequately maintained vehicles and mobile equipment. Inadequately maintained fuel storage areas.	Spills cleaned up by operations staff once they are observed.	LI_DL1	Not likely	Minor	Low	
All trafficable areas and areas where mobile equipment is operating	Air	Vehicle emissions	Human health impacts from exhaust gases, greenhouse gas emissions	Inadequately maintained vehicles and mobile equipment.	Contractors made aware of need to maintain equipment.	N/A	Not likely	Minor	Low	

Risk Based Assessment Approach

			Consequence				
			1 Negligible	2 Minor	3 Medium	4 Significant	5 Severe
Likelihood	A	Almost Certain	High	High	Very high	Very high	Very high
	B	Likely	Medium	High	High	Very high	Very high
	C	Probable	Low	Medium	High	Very high	Very high
	D	Not likely	Low	Low	Medium	High	Very high
	E	Rare	Low	Low	Medium	High	High

Numerical Representation of Risk Table

			Consequence				
			1 Negligible	2 Minor	3 Medium	4 Significant	5 Severe
Likelihood	A	Almost Certain	3	3	4	4	4
	B	Likely	2	3	3	4	4
	C	Probable	1	2	3	4	4
	D	Not likely	1	1	2	3	4
	E	Rare	1	1	2	3	3

Appendix F

Hyland Highway Landfill Compliance Risk Register (updated December 2019)

No.	EPA Licence Condition	Environmental Risk			Monitoring requirement	Indicators	Trigger Levels	Monitoring Location	Monitoring Frequency	QA/QC Measures
		Risk	Rating	Comment						
LI_G1	You must ensure that waste is not discharged, emitted or deposited beyond the boundaries of the premises except in accordance with this licence or under the Act.	Refer Licence Conditions related to off-site discharges (i.e. LI_A1, LI_A2, LI_A3, LI_DW1, LI_DL1.2, LI_D1.3, LI_WM3, LI_WM4, LI_L4, LI_L4.1, & [illegible]	N/A	N/A	Refer relevant monitoring requirement below (as per licence condition).	N/A	N/A	N/A	N/A	N/A
LI_G2	You must immediately notify EPA of non-compliance with any condition of this licence by calling 1300 EPA VIC (1300 372 842), sending an email to contact@epa.vic.gov.au, or using the EPA Interaction Portal.	Not Applicable - Administrative requirement.	N/A	N/A	Monitor non-compliances.	Various requirements (refer below).	Various requirements (refer below).	Various requirements (refer below).	As non-compliances occur.	Implement appropriate procedure, maintain records for reporting of non-conformances, and for remedial actions. Maintain records of EPA correspondence and a record of follow up actions.
LI_G3	By 30 September each year you must submit an annual performance statement to EPA for the previous financial year in accordance with the Annual Performance Statement Guidelines (EPA Publication 1320.3, released June 2011).	Not Applicable - Administrative requirement.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
LI_G4	Documents and monitoring records used for preparation of the annual performance statement must be retained at the premises for five years from the date of each statement, and be able to be immediately produced upon request by an officer of the Authority.	Not Applicable - Administrative requirement.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
LI_G6	You must provide EPA with a financial assurance determined by the EPA, and maintain such assurance (including any part of such assurance) so that it can be claimed on, utilised or realised as and when required.	Not Applicable - Administrative requirement.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
LI_A1	You must ensure that odours offensive to the senses of human beings are not discharged, emitted or released beyond the boundaries of the premises.	Odour associated with tipping and compaction, and exposure of wastes.	L	The nearest residence is located approximately 1.25 km from the site. An odour related non-compliances was reported in the APS 18-19.	Odour survey. Complaints register. Odour log.	Offensive odour.	Offensive odour at boundary.	Odour (olfactory) survey along boundary of premises.	When complaint received. Annually.	Maintain procedure for receiving complaints. Maintain records of complaints and follow up actions. Report on odour survey outcomes including site and weather conditions.
LI_A2	You must ensure that there are no emissions of noise and/or vibrations from the premises which are detrimental to either of the following: a) the environment in the area around the premises; and b) the wellbeing of persons and/or their property in the area around the premises.	Noise associated with tipping, compaction, and all vehicle and mobile equipment movements.	L	The nearest residence is located approximately 1.25 km from the site. No noise related non-compliances were reported in APS 18-19.	Noise survey. Complaints register.	Unacceptable noise.	Unacceptable noise beyond boundary (i.e. complaint).	Noise survey along boundary of premises and near boundary of adjacent residence and at source of complaint.	When complaint received. Annually.	Maintain procedure for receiving complaints. Maintain records of complaints and follow up actions. Report on noise survey outcomes including site and weather conditions.

No.	EPA Licence Condition	Environmental Risk			Monitoring requirement	Indicators	Trigger Levels	Monitoring Location	Monitoring Frequency	QA/QC Measures
		Risk	Rating	Comment						
LI_A3	You must ensure that nuisance dust and/or nuisance airborne particles are not discharged or emitted beyond the boundaries of the premises, except as permitted by this licence.	Dust associated with tipping, compaction, and all vehicle and mobile equipment movements and earthworks.	L	The nearest residence is located approximately 1.25 km from the site. No dust related non-compliances were reported in APS 18-19.	Dust survey. Complaints register.	Nuisance dust.	Nuisance dust beyond boundary (i.e. complaint).	Dust (visual) survey along boundary of premises, near boundary of adjacent residence, and at source of complaint.	When complaint received. Annually.	Maintain procedure for receiving complaints. Maintain records of complaints and follow up actions. Report on dust (visual) survey outcomes including site and weather conditions.
LI_WA1	You must ensure all of the following: a) only waste of a type shown in Schedule 2 of this licence is accepted at the premises; and b) if it is identified that any waste has been received at the premises that is of a type not shown in Schedule 2 in contravention of paragraph a) above, such waste must be placed in a designated and sign-posted temporary storage area and sent for disposal to a site licensed by EPA to receive such waste within 21 days of the date it was received.	Tipping of non-conforming waste.	L	Acceptance of non-conforming wastes could contaminate groundwater / surface water.	The site surrendered the acceptance of Category C (contaminated soil) as part of the EPA final Works Approval Amendment 2010. General waste requires visual inspection.	Types of waste received. Detection of prohibited wastes.	Non-conforming wastes at working face or weighbridge.	Working face. Weighbridge	All incoming waste.	Maintain a documented waste acceptance procedure, including records of staff training. Maintain signs advising which wastes may be deposited. Gatehouse to be staffed at all times during operation. Maintain weighbridge records, including records of visual inspections. Maintain records of all non-compliances, including follow up actions.

No.	EPA Licence Condition	Environmental Risk			Monitoring requirement	Indicators	Trigger Levels	Monitoring Location	Monitoring Frequency	QA/QC Measures
		Risk	Rating	Comment						
LI_WA1.5	You must not accept any waste for storage pending any licenced operation except asbestos waste of domestic origin stored in a single 12m3 sized consolidated bin at the site marked 'Highland Highway Landfill Part B (Site of Asbestos)' in Schedule 1B, and managed according to the following: A) at all times storage does not exceed a single consolidation bin with a locked lid or locked behind doors or gates with access only allowed to those appropriately trained in asbestos management; B) all packages placed in the consolidation bin are appropriately packaged in accordance with the requirements of EPA publication No: IWRG611.1 "Asbestos transport and disposal"; C) the consolidation bin is lined with plastic in accordance with requirements of EPA publication No: IWRG611.1 "Asbestos transport and disposal:, D) the waste stored within the consolidated bin must be disposed of as soon as reasonably practicable and, no longer than 3 months from when the first package was placed in the bin; E) the tabulated quantity and date of asbestos waste received at the consolidation site and the tabulated quantity and date of asbestos waste collected from the consolidation site for final disposal at a licenced facility must be kept for a period of at least 2 years; F) transport and disposal of the waste from the consolidation site must be in accordance with regulations; EPA Industrial Waste Resource Guidelines, 2009; EPA Publication IWRG611.1 "Asbestos transport and disposal"; and all applicable EPA publications (as amended from time to time); G) EPA must be notified immediately of any incident or spill of wastes and; H) Spill Management Plan ("SMP") for transportation of the waste to and from the consolidation site and a SMP for the consolidation site to avoid and safely manage spills	Improper handling of asbestos.	L	The nearest residence is located approximately 1.25 km from the site. A non-compliances with this condition was reported in the APS 18-19.	Asbestos waste from domestic origin only. Asbestos waste not kept on site longer than 3 months.		Asbestos bin not locked.	Asbestos bin adjacent to the weighbridge.	Daily inspection. When asbestos transportation occurs.	Maintain a documented procedure for acceptance of asbestos waste of a domestic origin. Maintain records of all asbestos received and transported off-site for disposal; quantity and dates of movement. Ensure disposal bin is locked at all times. Maintain a Spill Management Plan.
LI_WM3	You must ensure that litter is not deposited beyond the boundaries of the premises.	Off site movement of litter from vehicles and working face.	M	Wind-blown litter presents aesthetic issue. No non-compliances were reported in the ASP 16-17.	Litter survey Monitor complaints register.	Litter outside of property boundary.	Litter beyond boundary (i.e. complaint)	Litter (visual) survey along boundary of premises. Inspection of waste loads at weighbridge	Weekly inspection. When complaint received. Annually.	Maintain a documented procedure for receiving complaints. Maintain records of all complaints received by the site (including those received via EPA) and follow up actions. Maintain records of inspections of site perimeter.
LI_WM4	You must ensure that waste does not burn at the premises.	Toxic gas, damage to vegetation	L-M	Careful management required.	Visual inspection	Unacceptable wastes received, including hot wastes. Lack of cover	Heat and/or smouldering	Landfill cells	Daily.	Maintain records of all complaints received by the site (including those received via EPA) and follow up actions. Maintain records of inspections and actions.

No.	EPA Licence Condition	Environmental Risk			Monitoring requirement	Indicators	Trigger Levels	Monitoring Location	Monitoring Frequency	QA/QC Measures
		Risk	Rating	Comment						
LI_L1	You must develop and put into place a monitoring program that accords with Section A of the Landfill Licensing Guidelines, (EPA Publication 1323.3, released September 2016). The program must evaluate the risks to the environment associated with the operation of the landfill and the steps which can be taken to manage such risks and enable both you and EPA to determine changes in the condition of the environment or impacts to environmental quality as a result of activities at the premises. The monitoring program must be verified by a person who has been appointed as an environmental auditor under the Environment Protection Act 1970.	Not Applicable - Administrative requirement.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
LI_L2	You must engage a person who has been appointed as an environmental auditor under the Environment Protection Act 1970 to conduct and submit to EPA environmental audits of the risk of harm actually or potentially arising from landfill operation under Section 53V of the Act at the frequency specified in the monitoring program.	Not Applicable - Administrative requirement.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
LI_L3	You must ensure that surface water is segregated from active landfill cells.	Non segregated surface water being contaminated by leachate.	L-M	Stormwater diversion system in place for clean stormwater. RO permeate discharges through stormwater ponds. Stormwater from the site eventually discharges to Traralgon Creek.	Refer Section 10 of the LOA (December 2019).	Refer Section 10 of the LOA (December 2019).	Refer Section 10 of the LOA (December 2019).	Refer Section 10 of the LOA (December 2019).	Refer Section 10 of the LOA (December 2019).	Refer Section 10 of the LOA (December 2019).
LI_L4	Waters contaminated by leachate must not be discharged beyond the boundaries of the premises	Leachate seepage from existing landfill.	M	Landfill is lined and leachate collection system is in place.	Refer Section 10 of the LOA (December 2019).	Refer Section 10 of the LOA (December 2019).	Refer Section 10 of the LOA (December 2019).		Refer Section 10 of the LOA (December 2019).	Refer Section 10 of the LOA (December 2019).
LI_L4.1	You must extract leachate from cell(s) 3 and 4 such that the depth of leachate above the lowest point of the drainage layer does not exceed 300mm.	Leachate seepage from existing landfill.	M	Level measurement system has been installed.	Record of leachate levels in cells.	Refer Section 10 of the LOA (December 2019).	Refer Section 10 of the LOA (December 2019).	Refer Section 10 of the LOA (December 2019).	Refer Section 10 of the LOA (December 2019).	Prepare and implement a leachate management operations manual.
LI_L5	You must take all practicable measures to prevent emissions of landfill gas from exceeding the action levels specified in Table 6.4 of EPA (2015) Landfill BPEM.	Potential for accumulation of gas in site structures and on-site direct emissions.	L-M	Site structures have sealed pavement and nearest residences are at least 1.25 km away.	Refer Section 10 of the LOA (December 2019).	Refer Section 10 of the LOA (December 2019).	Refer Section 10 of the LOA (December 2019).	Refer Section 10 of the LOA (December 2019).	Refer Section 10 of the LOA (December 2019).	Refer Section 10 of the LOA (December 2019).

No.	EPA Licence Condition	Environmental Risk			Monitoring requirement	Indicators	Trigger Levels	Monitoring Location	Monitoring Frequency	QA/QC Measures
		Risk	Rating	Comment						
LI_L6	All waste in the cell(s) listed in Schedule 2 apart from at the active tipping face must be covered at all times.	Dust, odour, and litter emanating from active cell if not covered adequately.	L	The nearest residence is located approximately 1.25 km in a south-east direction. No dust related non-compliances were reported in APS 18-19.	Visual inspection.	Cover applied to all waste at the appropriate depth.	Requisite thickness of cover material. Presence of vermin. Litter across site.	Active cell	Visual inspection at end of each day.	Daily cover inspection sheet. Procedure for applying daily cover. Intermediate cover observations. Record of dust and odour surveys.
LI_L7.1	You must cover waste asbestos immediately upon deposition in one of these ways: a) with a layer of waste (not including waste asbestos) at least 1 metre thick or a layer of soil at least 0.3 metres thick; or b) using alternative cover approved by EPA in writing.	Dust, odour, and litter emanating from active cell if not covered adequately.	L	The nearest residence is located approximately 1.25 km in a south-east direction. No dust related non-compliances were reported in APS 18-19.	Visual inspection.	Daily cover applied to all waste at the appropriate depth.	Requisite thickness of cover material. Presence of vermin. Litter across site.	Active cell	Visual inspection at end of each day.	Daily cover inspection sheet. Procedure for applying daily cover. Record of dust and odour surveys.
LI_L8	You must: a) limit the area of the tipping face of each cell to 900m2; b) only operate one tipping face at any time unless a second tipping face is required for short term operational reasons; and c) ensure the active tipping face is mechanically stable as per Section 7.6 of the EPA (2105) Landfill BPEM.	Dust, odour, and litter emanating from active cell	L	The nearest residence is located approximately 1.25 km in a south-east direction. No dust related non-compliances were reported in APS 18-19.	Visual inspection.	Dust, odour, and/or litter emanating from active cell.	Excessive area	Active cell	Visual inspections each day.	Records of dust, litter and odour surveys.
LI_L9	You must ensure all of the following: a) Waste that is accepted for disposal at the premises is only placed into cell(s) listed in Schedule 2; and b) Waste for disposal is not placed outside of the perimeter of any cell(s) listed in Schedule 2.	Contamination of groundwater	L	Acceptance of non-conforming wastes could contaminate groundwater / surface water.	Refer Section 10 of the LOA (December 2019).	Refer Section 10 of the LOA (December 2019).	Refer Section 10 of the LOA (December 2019).	Refer Section 10 of the LOA (December 2019).	Refer Section 10 of the LOA (December 2019).	Refer Section 10 of the LOA (December 2019).
LI_L10	You must ensure that waste that has been previously deposited is not recovered and reprocessed except in accordance with written approval from EPA.	Not Applicable - Administrative requirement.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
LI_L11	You must ensure that waste is not stockpiled at the premises prior to deposit in a cell except in accordance with written approval from EPA.	Not Applicable - Administrative requirement.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
LI_L12	You must ensure that an independent annual survey is conducted by a licensed surveyor, or other method approved by EPA in writing, by the end of June each year for each landfill cell at the premises and submitted to EPA with your annual performance statement. The survey must: a) confirm the volume and mass of air space consumed since the last survey; and b) verify that the top of the waste deposited in cells is in compliance with the EPA approved pre-settlement contour plan.	Not Applicable - Administrative requirement.	N/A	N/A	Weighbridge records, Landfill cell surveys.	Quantity of waste and remaining airspace.	Remaining airspace. Approved pre-settlement contours.	Weighbridge. Landfill cells.	All incoming waste.	Maintain records of site survey. Keep approved pre-settlement contours on file. Maintain records of capacity calculations.

No.	EPA Licence Condition	Environmental Risk			Monitoring requirement	Indicators	Trigger Levels	Monitoring Location	Monitoring Frequency	QA/QC Measures
		Risk	Rating	Comment						
LI_L13	You must manage each landfill cell so that the surface contour prior to settlement conforms to the surface profile grades in Section 8.1.5 of the EPA (2015) Landfill BPEM or otherwise as approved by EPA in writing and so that the top of waste prior to settlement is not higher at any point than the pre-settlement top of waste approved contour plan shown in Schedule 1C.	Not Applicable - Administrative requirement.	N/A	N/A	Landfill cell surveys.	Quantity of waste and remaining airspace.	Remaining airspace. Approved pre-settlement contours.	Weighbridge. Landfill cells.	All incoming waste.	Maintain records of site survey. Keep approved pre-settlement contours on file.
LI_L15	You must take measures to prevent hotspots in the waste mass at the landfill site.	Toxic gas, damage to vegetation	L-M	Careful management required.	Visual inspection	Unacceptable wastes received, including hot wastes. Lack of cover	Heat and/or smouldering	Landfill cells	Daily.	Maintain records of all complaints received by the site (including those received via EPA) and follow up actions. Maintain records of inspections and actions.
LI_L16	You must report hotspots within the waste mass to EPA within 24 hours of detection.	Not Applicable - Administrative requirement.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
LI_L17	You must manage hotspots within the waste mass in accordance with the Landfill Licensing Guidelines (EPA Publication 1323.3, released September 2016).	Toxic gas, damage to vegetation	L-M	Careful management required.	Visual inspection	Unacceptable wastes received, including hot wastes. Lack of cover	Heat and/or smouldering	Landfill cells	Daily.	Maintain records of all complaints received by the site (including those received via EPA) and follow up actions. Maintain records of inspections and actions.
LI_L18	You must: a) notify EPA of your intention to commence construction of a new landfill cell at the premises by written notice in accordance with Appendix 7 of the Landfill Licensing Guidelines (EPA Publication 1323.3, released September 2016); and b) not start constructing a new cell without written EPA approval.	Not Applicable - Administrative requirement	N/A	N/A	As per Cell construction quality assurance (CQA) plan to be approved by EPA auditor.	As per Cell CQA plan to be approved by EPA auditor.	As per Cell CQA plan to be approved by EPA auditor.	As per Cell CQA plan to be approved by EPA auditor	As per Cell CQA plan to be approved by EPA auditor.	As per Cell CQA plan to be approved by EPA auditor.
LI_L19	Prior to commencing construction of a new landfill cell you must submit the following material to EPA so that it may consider whether or not to grant approval for the construction of the new cell: a) detailed designs of the landfill cell meaning plans, technical specifications and a construction quality assurance plan which comply with Section 6 and Appendices D, E and F of the Best Practice Environmental Management, Siting, Design, Operation and Rehabilitation of Landfills (EPA Publication 788.3, released August 2015); b) an assessment report of the of the detailed designs prepared by a person who has been appointed as an environmental auditor under the Environment Protection Act 1970 in accordance with Appendix 14 of the Landfill Licensing Guidelines (EPA Publication 1323.3, released September 2016); and c) a completed and signed auditor declaration in the format shown in Appendix 15 of the Landfill Licensing Guidelines (EPA Publication 1323.3, released September 2016).	Not Applicable - Administrative requirement	N/A	N/A	As per Cell construction quality assurance (CQA) plan to be approved by EPA auditor.	As per Cell CQA plan to be approved by EPA auditor.	As per Cell CQA plan to be approved by EPA auditor.	As per Cell CQA plan to be approved by EPA auditor	As per Cell CQA plan to be approved by EPA auditor.	As per Cell CQA plan to be approved by EPA auditor.

No.	EPA Licence Condition	Environmental Risk			Monitoring requirement	Indicators	Trigger Levels	Monitoring Location	Monitoring Frequency	QA/QC Measures
		Risk	Rating	Comment						
LI_L20	Upon approval by EPA to construct each new landfill cell, you must engage a person who has been appointed as an environmental auditor under the Environment Protection Act 1970 to conduct an environmental audit and submit an environmental audit report to EPA. The environmental audit report must: a) verify that the construction of the new landfill cell is in accordance with EPA approved designs; b) assess any potential risks associated with the construction or use of the new landfill cell; and c) be prepared in accordance with Section 53V of the Environment Protection Act 1970.	Not Applicable - Administrative requirement	N/A	N/A	As per Cell construction quality assurance (CQA) plan to be approved by EPA auditor.	As per Cell CQA plan to be approved by EPA auditor.	As per Cell CQA plan to be approved by EPA auditor.	As per Cell CQA plan to be approved by EPA auditor	As per Cell CQA plan to be approved by EPA auditor.	As per Cell CQA plan to be approved by EPA auditor.
LI_L21	You must not commence filling of any new landfill cell with waste without the written approval of EPA.	Not Applicable - Administrative requirement	N/A	N/A	As per Cell construction quality assurance (CQA) plan to be approved by EPA auditor.	As per Cell CQA plan to be approved by EPA auditor.	As per Cell CQA plan to be approved by EPA auditor.	As per Cell CQA plan to be approved by EPA auditor	As per Cell CQA plan to be approved by EPA auditor.	As per Cell CQA plan to be approved by EPA auditor.
LI_L22	You must implement a rehabilitation plan for the landfill. The plan must: a) be revised after each cell is full, if necessary; b) meet the requirements of Section 8 of EPA (2015) Landfill BPEM; c) set timeframes for placement of final capping of all completed cells, calculated from the date that the cell became full; and d) set timeframes for the progressive capture and treatment of landfill gas and leachate from each completed cell.	Land not being suitable for intended use. Landfill not progressively rehabilitated.	L	Finished surface contour has been prepared and approved by EPA. Capping has been completed for Cell 1/2 and Cell 3 (west).	Review of operational life of each landfill cell. Independent supervision of cap construction.	Remaining air space relative to the approved pre-settlement contours. Specifications for landfill cap (BPEM requirements as a minimum). Practical or other considerations with regard to filling of each landfill cell. Operational life of each landfill cell.	Approved pre-settlement contours. As per landfill cap specifications Filling of landfill cell no longer permitted. Filling of landfill cell no longer practical.	Landfill cells	Independent supervision of cap construction.	Rehabilitation plan provided in LCC (2018) Latrobe City Council Hyland Highway Landfill Rehabilitation Plan.
LI_L23	You must place intermediate cover on all cells within one month of the date that the cell became full. The intermediate cover must comprise a minimum of 500 mm of compacted clay or compacted clay rich soil or alternative cover approved by EPA in writing.	Dust, odour, and litter emanating from active cell if not covered adequately.	L	The nearest residence is located approximately 1.25 km in a south-east direction. No dust related non-compliances were reported in APS 18-19.	Visual inspection.	Daily cover applied to all waste at the appropriate depth.	Requisite thickness of cover material. Presence of vermin. Litter across site.	Active cell	Visual inspection at end of each day.	Daily cover inspection sheet. Procedure for applying daily cover. Record of dust and odour surveys.

No.	EPA Licence Condition	Environmental Risk			Monitoring requirement	Indicators	Trigger Levels	Monitoring Location	Monitoring Frequency	QA/QC Measures
		Risk	Rating	Comment						
LI_L24	In circumstances where the deposit of waste in a cell is likely to cease for a period of three months or more, you must place intermediate cover on the cell within one month of the date that waste was last placed in the cell. The intermediate cover must comprise a minimum of 500 mm of compacted clay or compacted clay rich soil or alternative cover approved by EPA in writing.	Dust, odour, and litter emanating from active cell if not covered adequately.	L	The nearest residence is located approximately 1.25 km in a south-east direction. No dust related non-compliances were reported in APS 18-19.	Visual inspection.	Daily cover applied to all waste at the appropriate depth.	Requisite thickness of cover material. Presence of vermin. Litter across site.	Active cell	Visual inspection at end of each day.	Daily cover inspection sheet. Procedure for applying daily cover. Record of dust and odour surveys.
LI_L25	Prior to commencing construction of each new section of landfill cap you must submit the following to EPA for approval: a) detailed designs of the landfill cap, meaning plans, technical specifications and a construction quality assurance plan which comply with Section 8 and Appendices D, E and F of the Best Practice Environmental Management, Siting, Design, Operation and Rehabilitation of Landfills (EPA Publication 788.3, released August 2015); b) an assessment report of the detailed designs of the cap prepared by a person who has been appointed as an environmental auditor under the Environment Protection Act 1970 in accordance with Appendix 14 of the Landfill Licensing Guidelines (EPA Publication 1323.3, released September 2016); and c) a completed and signed auditor declaration in the format shown in Appendix 15 of the Landfill Licensing Guidelines (EPA Publication 1323.3, released September 2016).	Not Applicable - Administrative requirement	N/A	N/A	As per cap construction quality assurance (CQA) plan to be approved by EPA auditor.	As per cap CQA plan to be approved by EPA auditor.	As per cap CQA plan to be approved by EPA auditor.	As per cap CQA plan to be approved by EPA auditor	As per cap CQA plan to be approved by EPA auditor.	As per cap CQA plan to be approved by EPA auditor.
LI_L26	Upon approval by EPA to construct each new landfill cap you must engage a person who has been appointed as an environmental auditor under the Environment Protection Act 1970 to conduct and submit an environmental audit report to EPA. The environmental audit report must: a) verify that the construction of the cap is in accordance with EPA approved designs; b) assess any potential risks associated with the construction; and c) be prepared in accordance with Section 53V of the Environment Protection Act 1970.	Not Applicable - Administrative requirement	N/A	N/A	As per cap construction quality assurance (CQA) plan to be approved by EPA auditor.	As per cap CQA plan to be approved by EPA auditor.	As per cap CQA plan to be approved by EPA auditor.	As per cap CQA plan to be approved by EPA auditor	As per cap CQA plan to be approved by EPA auditor.	As per cap CQA plan to be approved by EPA auditor.
LI_L27	You must complete final capping of caps within 2 years of the date that cap became full, in compliance with the approved rehabilitation plan.	Not Applicable - Administrative requirement	N/A	N/A	As per cap construction quality assurance (CQA) plan to be approved by EPA auditor.	As per cap CQA plan to be approved by EPA auditor.	As per cap CQA plan to be approved by EPA auditor.	As per cap CQA plan to be approved by EPA auditor	As per cap CQA plan to be approved by EPA auditor.	As per cap CQA plan to be approved by EPA auditor.

No.	EPA Licence Condition	Environmental Risk			Monitoring requirement	Indicators	Trigger Levels	Monitoring Location	Monitoring Frequency	QA/QC Measures
		Risk	Rating	Comment						
LI_L28	You must provide EPA with at least 6 month's notice of your intention to cease accepting waste at the premises.	Not Applicable - Administrative requirement.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
LI_DW1	You must ensure that surface water discharged from the premises is not contaminated with waste.	Sourced from waste spilled at weighbridge, from uncapped above natural ground surface cells. Also sourced from fuel spillages. Erosion is another potential source.	M	Stormwater diversion system in place for clean stormwater. RO permeate discharges through stormwater ponds. Stormwater from the site eventually discharges to Traralgon Creek.	Refer Section 10 of the LOA (December 2019).	Refer Section 10 of the LOA (December 2019).	Refer Section 10 of the LOA (December 2019).	Refer Section 10 of the LOA (December 2019).	Refer Section 10 of the LOA (December 2019).	Refer Section 10 of the LOA (December 2019).
LI_DL1.2	You must ensure that the activities carried on at the premises do not do either of the following: a) cause detriment to any beneficial use which may be made of the land on the premises outside of the boundary of any landfill cells; and b) pollute land on the premises contrary to section 45 of the Environment Protection Act 1970.	Spillage of waste at the weighbridge and during the transfer to the active cell, overfilling of cell increasing potential for land contamination.	L	Acceptance of non-conforming wastes could contaminate land.	Refer Section 10 of the LOA (December 2019).	Refer Section 10 of the LOA (December 2019).	Refer Section 10 of the LOA (December 2019).	Refer Section 10 of the LOA (December 2019).	Refer Section 10 of the LOA (December 2019).	Refer Section 10 of the LOA (December 2019).
LI_DL1.3	You must ensure that the activities carried on at the premises do not do either of the following: a) cause detriment to any beneficial use which may be made of groundwater both within and beyond the boundary of the premises. b) pollute groundwater both within and beyond the boundary of the premises contrary to section 39 of the Environment Protection Act 1970.	Spillage of waste at the weighbridge and during the transfer to the active cell, overfilling of cell increasing potential for surface water contamination; waste/litter discharged to the environment, soil cross contamination due to general vehicle movements.	M	Acceptance of non-conforming wastes could contaminate groundwater / surface water.	Refer Section 10 of the LOA (December 2019).	Refer Section 10 of the LOA (December 2019).	Refer Section 10 of the LOA (December 2019).	Refer Section 10 of the LOA (December 2019).	Refer Section 10 of the LOA (December 2019).	Refer Section 10 of the LOA (December 2019).