# Levin Landfill Annual Compliance Report July 2020 – June 2021 (as required by Resource Consents DP6009, DP6010, DP6011 and DP102259)

**PREPARED FOR Horowhenua District Council | September 2021**

We design with community in mind

Stantec

# Revision Schedule

| Rev No | Date | Description | Signature of Typed Name (documentation on file) | | | |
|---|---|---|---|---|---|---|
| | | | **Prepared by** | **Checked by** | **Reviewed by** | **Approved by** |
| **0** | 29/09/21 | Draft for Client | Julia O'Brien | Phil Landmark | Paul Heveldt | Roger Hulme |
| **1** | 30/09/21 | Final | Julia O'Brien | Phil Landmark | Paul Heveldt | Roger Hulme |

# Quality Statement

This document has been prepared for the benefit of Horowhenua District Council. No liability is accepted by this company or any employee or sub-consultant of this company with respect to its use by any other person.
This disclaimer shall apply notwithstanding that the report may be made available to Horowhenua District Council and other persons for an application for permission or approval to fulfil a legal requirement.

| PROJECT MANAGER | PROJECT TECHNICAL LEAD |
|---|---|
| **Roger Hulme** | Paul Heveldt |

| | | |
|---|---|---|
| **PREPARED BY** | | |
| Julia O'Brien and Phil Landmark | | 20/09/2021 |
| **CHECKED BY** | | |
| Phil Landmark | | 23/09/2021 |
| **REVIEWED BY** | | |
| Paul Heveldt | | 28/09/2021 |
| **APPROVED FOR ISSUE BY** | | |
| Roger Hulme | | 30/09/2021 |

Stantec Building, Level 15, 10 Brandon Street, Wellington, 6011
PO Box 13-052, Armagh, Christchurch 8141
TEL +64 4 381 6700
STATUS Final | Project No 310101088

# Executive Summary

Horowhenua District Council is required to carry out compliance monitoring for the Levin Landfill as part of Resource Consents DP6009, DP6010, DP6011 and DP102259. This report summarises the findings for the July 2020 to June 2021 annual monitoring period, including monitoring results for:

- Background groundwater condition;
- The landfill leachate pond;
- Groundwater bores within the new landfill and irrigation area;
- Shallow aquifers, down-gradient of the old landfill;
- Deep aquifer;
- Hokio Stream;
- Stormwater,
- Landfill gas and odour, and
- Bio-filter.

Monitoring results for other aspects of the landfill operations, such as sampling of the landfill gas flare and collection wells, are reported separately as per additional resource consent requirements.

### Quality Control and Assurance

Workshop training on appropriate sampling procedures was conducted in March 2018 for all personnel involved in monitoring. No further training has been undertaken in this reporting period.

### Background Groundwater (Bores G1S, G1D)

The quality of the background groundwater up-hydraulic gradient from the landfill site is not subject to any resource consent conditions. However, for comparison purposes, both the ANZECC 2000 Livestock Drinking Water (LDW) trigger values and the Drinking Water Standards New Zealand (DWS NZ) guidelines were used to benchmark the quality of this upgradient groundwater. Samples from the shallow bore (G1S) exceeded the DWS NZ guidelines for aluminium, iron, and manganese concentrations. The DWS NZ guidelines for iron and manganese were also exceeded at the deep bore (G1D). These results indicate an impact on groundwater from activities outside the landfill.

It is understood that past leachate irrigation occurred in the area to the south-east of the site only and not in the south-west of the site and therefore, bores D5, F2 and F3 have been analysed as they may be considered representative of background groundwater quality. There were no exceedances of the LDW trigger values or the DWS NZ guidelines for these bores.

### Shallow Aquifer Down-gradient of Old Landfill (Bores E2S, B1, B2, B3, C1, C2, C2DS, G2S, Xs1, Xs2)

Median results in these bores did not exceed the LDW trigger values in the 2020-2021 monitoring period, and therefore the hydraulically down-gradient bores complied with the resource consent conditions. Bores located immediately down-gradient hydraulically of the old unlined landfill continue to show elevated concentrations of leachate indicators, namely ammoniacal nitrogen, chloride and boron, and conductivity, which are above background concentrations. Bore G1S has been considered as representative of background groundwater conditions for this report.

### Deep (Gravel) Aquifer (Bores E1D, C2DD, E2D, Xd1)

Leachate indicator parameters in samples from deep aquifer boreholes hydraulically down-gradient of the old landfill are close to background concentrations, as defined by G1D. The median concentration of manganese exceeded the DWS NZ guideline values (GV) at bores C2DD and XD1 but there were no other exceedances in the four deep aquifer bores. Concentrations for key indicators such as chloride and conductivity appeared to be elevated above those observed in ‘background’ bores.

### Hokio Stream (Surface Water Sampling Locations: HS1A, HS1, HS2, HS3)

Nitrate-N concentrations exceeded the consent limit (ANZECC AE (95%) trigger values) at HS1A, HS1, HS2, and HS3 during the reporting period. The ANZECC AE (95%) trigger values were not exceeded for any other parameters during the reporting period.

### Tatana Drain

Ammoniacal-N, BOD, and Nitrate-N concentrations all exceeded the ANZECC AE (95%) trigger values at site SW3. Note that the new consent conditions require monitoring only at SW3 which is now called “TD1”.

### New Landfill and Irrigation Area (Bores D1, D2, D3r, D4, D5, D6, E1S, F1, F2, F3)

None of the applicable LDW trigger values were exceeded in the bores within the new landfill and irrigation area (up-gradient of the old landfill) during the 2020-2021 reporting period. Note that no irrigation of leachate has occurred on site since 2008. Elevated nitrate nitrogen, chloride and conductivity levels were observed in bores located hydraulically up-gradient and down-gradient of the leachate pond.

### Mass Loading Evaluation

Overall, the lower concentrations predicted in the 2020-2021 mass contaminant load assessment show general agreement with actual monitoring results obtained. While there appears to be a minor impact on Hokio Stream from leachate-impacted groundwater and surface water it is noted that the stream is also potentially impacted by upstream land uses.

### Stormwater Impact Monitoring (Bores E1D, E1S, D2)

Groundwater samples from shallow aquifer bores located hydraulically up-gradient and down-gradient of the stormwater soakage area and across-gradient from the new landfill had relatively similar characteristics and were consistent with results for the background bore (G1S). This indicates that the shallow aquifer water quality is not being significantly affected by stormwater that may have been in contact with refuse. Similarly, results from the deep aquifer bore did not appear to show an impact from stormwater that may have been in contact with refuse.

### Landfill Gas and Odour Monitoring

Methane was detected at low levels within selected monitoring bores in all four monitoring rounds in the 2020-2021 monitoring period. Hydrogen sulphide was also detected in one of the monitoring rounds. Potential reasons for these detections could not be determined, due to a lack of available information.

Odour monitoring at the landfill boundary has been implemented in accordance with the Odour Management Plan. Twenty-one odour inspections were undertaken during the reporting period with no further action being considered necessary. Monthly surface methane emission monitoring is required over all temporary and capped areas of the landfill and at the bio-filter. HDC has engaged Envirowaste to do this testing and this commenced in March 2021. As such, HDC is non-compliant in doing surface emissions testing between the months of July 2020 and February 2021.

There are a range of inspections and maintenance requirements for the bio-filter. HDC complies with some of these but still needs to implement a daily visual check of the bio-filter, as well as monitoring and recording the pH of the filter bed media. Raking and loosening of the bio-filter media commenced in August 2020.

Collection of meteorological data from an on-site weather station has been undertaken through the reporting period. The weather station has been replaced and from April 2021 it has recorded data every 1 minute, as required by the resource consent.

# Contents


1 Introduction ..... 1

1.1 Background ..... 1
1.2 Scope ..... 1

2 Context ..... 2

2.1 Geology and Hydrogeology ..... 2
2.2 Timeline for Landfill Development ..... 3

3 Monitoring Programme ..... 3

3.1 Interpretation of Median Values and Ranges ..... 3
3.2 Note regarding Interpretation of “Non-Detected” Results ..... 3

4 Groundwater Monitoring ..... 4

4.1 Monitoring Rationale ..... 4
4.2 Description of Monitoring Bores ..... 4
4.3 Background Groundwater Results ..... 5
4.4 Shallow Groundwater Results ..... 8

4.4.1 Groundwater Quality Hydraulically Up-Gradient of the Old Landfill ..... 8
4.4.2 Groundwater Quality Hydraulically Down-Gradient of the Old Irrigation Area ..... 12

4.5 Deep Gravel Aquifer Results ..... 12
4.6 Leachate ..... 15
4.7 Groundwater Quality Discussion ..... 17

4.7.1 Background ..... 17
4.7.2 Shallow Aquifer Hydraulically Up-Gradient of the Old Landfill ..... 17
4.7.3 Shallow Aquifer Hydraulically Down-Gradient of the Old Landfill ..... 17
4.7.4 Deep Gravel Aquifer ..... 18
4.7.5 Leachate ..... 18
4.7.6 Overall Groundwater Quality ..... 18

5 Hokio Stream ..... 18

5.1 Description of Sampling Locations ..... 18
5.2 Sampling Results ..... 19
5.3 Surface Water Quality Analysis ..... 23
5.4 Tatana Property Drain ..... 25

5.4.1 Description of Sampling Locations ..... 25
5.4.2 Sampling Results ..... 26

6 Mass Loading Evaluation for the Hokio Stream ..... 27

6.1 Background ..... 27
6.2 Mass Loading Analysis Update ..... 28

6.2.1 Current assumptions ..... 31

7 Stormwater Discharges ..... 31
8 Landfill Gas and Odour Monitoring ..... 32
8.1 Odour Monitoring at Landfill Boundary ..... 32
8.2 Gas Detection in Groundwater Monitoring Wells ..... 34
8.3 Monitoring of Surface Emissions and Bio-filter ..... 35
8.4 Meteorological Data ..... 36
9 Monitoring Results Compliance ..... 36
9.1 Groundwater - Sand Aquifer ..... 36
9.2 Groundwater - Gravel Aquifer ..... 36
9.3 Surface Water – Hokio Stream and Tatana's Drain ..... 37
9.4 Stormwater ..... 37
9.5 Landfill Gas and Odour Monitoring ..... 37
10 Refuse Density ..... 38
11 Old Landfill Remediation ..... 38
12 Leachate Irrigation ..... 40
13 Site Walkover Records ..... 40
14 Vermin and Pest Control ..... 40
15 Weed Control ..... 41
16 Hazardous Waste Disposal ..... 41
17 Special Waste Disposal ..... 41
17.1 Special Waste Permits ..... 41
17.2 Biosolids and Sludges ..... 41
17.3 Liquid Wastes ..... 41
18 Landfill Development ..... 41
19 Conclusions ..... 42
20 Recommendations ..... 43
Appendix A Relevant consent conditions ..... 1
Appendix B Monitoring programs ..... 1
Appendix C Site plan ..... 1
Appendix D Number of samples per site ..... 1
Appendix E Tabulated analysis results ..... 1
Appendix F Leachate indicator graphs ..... 1
Appendix G Mass contaminant load calculations ..... 1
Appendix H Odour assessments ..... 1
Appendix I Gas sampling ..... 1
Appendix J Surface emissions reports ..... 1
Appendix K Survey plan ..... 1
Appendix L Settlement monitoring points ..... 1
Appendix M Special waste log ..... 1

## List of Tables

Table 1-1: Summary of Consent Reporting Requirements ..... 1
Table 4-1: Background monitoring bores median results (2020-2021 monitoring period) ..... 6
Table 4-2: Groundwater hydraulically up-gradient of Old Landfill and down-gradient of new landfill: median or singular results (2020-2021 monitoring period) ..... 10
Table 4-3: VOCs detected in samples from bores hydraulically up-gradient of Old Landfill and down-gradient of new landfill, 2020-2021 ..... 11
Table 4-4: Gravel aquifer median or singular results (2020-2021 monitoring period) – *bores listed L to R (west to east)* ..... 13

Table 4-5: Median or range of results for Leachate (2020-2021 monitoring period) ..... 15
Table 4-6 SVOCs and VOCs detected in samples of leachate, 2020-2021. Exceedances of the ANZECC 2000 default guidelines are in bold. ..... 16
Table 4-7: Comparison of median nitrate-N concentrations in up-gradient bores with previous two reporting periods (2018-2019 and 2019-2020) ..... 17
Table 5-1: Hokio Stream median or range of water quality results (2020-2021 monitoring period) 19
Table 5-2: Tatana's Property Drain median water quality results ..... 26
Table 6-1: Updated Model Input Data 2016-2021 ..... 28
Table 6-2: Predicted Leachate Impact on Hokio Stream 2020-2021 ..... 30
Table 7-1: Summary of Selected 2020-2021 Bore Results for Stormwater Consent ..... 32
Table 8-1: Summary of Odour Assessments at the Landfill Boundary ..... 33
Table 8-2: Summary of Surface Emissions Testing Carried Out at Levin Landfill ..... 35
Table 8-3: Summary of Bio-filter Inspections and Maintenance ..... 35
Table 10-1: Refuse Density 2012 –2021 ..... 38
Table 17-1: Summary of Biosolids and Sludges Disposed at Levin Landfill in 2020 - 2021 ..... 41

## List of Figures

Figure 2-1 Shallow Groundwater Flow Direction ..... 2
Figure 5-1: Hokio Stream Sampling Locations (HS1A, HS1, HS2 and HS3) ..... 19
Figure 5-2: Hokio Stream Faecal Coliform Counts, since 1994 ..... 21
Figure 5-3: Ammoniacal-Nitrogen Concentrations measured in Hokio Stream, since 1994. With the ANZECC AE (95%) trigger value depicted by a green line. ..... 22
Figure 5-4 Conductivity measured in Hokio Stream since 1994 ..... 22
Figure 5-5 Chloride measured in Hokio Stream since 1994 ..... 22
Figure 5-6 Boron measured in Hokio Stream since 1994. With the ANZECC AE (95%) trigger value depicted by a green line. ..... 23
Figure 5-7 Box plots of paired water quality results (Conductivity and pH) for Hokio Stream sites HS1 and HS3, 2011 – 2021; n = 50 (for both parameters). ..... 24
Figure 5-8 Box plots of paired water quality results (Chemical Oxygen Demand and Total Suspended Solids) for Hokio Stream sites HS1 and HS3, 2011 – 2021; *n* = 50 (for both parameters). ..... 24
Figure 5-9 Box plots of paired water quality results (Chloride and Faecal Coliforms) for Hokio Stream sites HS1 and HS3, 2011 - 2021; *n* = 50 (for both parameters). ..... 25
Figure 5-10 Box plots of paired water quality results (Ammoniacal-nitrogen) for Hokio Stream sites HS1 and HS3, 2011 – 2020; *n* = 50 ..... 25
Figure 6-1 Assumptions for aquifer extent applied in mass load calculations (screenshot from model spreadsheet, 2021) ..... 31
Figure 8-1 Location of Landfill Boundary Odour Assessments (Source: Figure 5.1 of the Odour Management Plan) ..... 34
Figure 11-1 Photographs taken on 19 January 2021 showing repairs made to the old landfill surface. ..... 39
Figure 11-2 Evidence of ponding on top of the old landfill caused by vehicle movements (20/09/21) ..... 40

# Abbreviations

| | |
|---|---|
| DWSNZ | Drinking Water Standards New Zealand |
| GVs | Guideline value |
| HDC | Horowhenua District Council |
| HRC | Horizons Regional Council |
| IANZ | International Accreditation New Zealand |
| LDW | ANZECC 2000 Livestock Drinking Water |
| MAVs | Maximum acceptable values |
| NLG | Neighbourhood Liaison Group |
| Stantec | Stantec New Zealand |
| SVOC | Semi-volatile organic compounds |
| VOC | Volatile organic compounds |
| WWTP | Wastewater Treatment Plant |

# 1 Introduction

## 1.1 Background

Levin Landfill has been operating on the Hokio Beach Road site for over 50 years. The current resource consents for the new lined and old un-lined landfills were granted in 2002 and have been subject to two reviews since then. The latest review commenced in 2015 and was concluded in December 2019.

As consent holder for the discharge permits related to the activities that occur at the Levin Landfill, the Horowhenua District Council (HDC) is required to prepare and submit an Annual Report to Horizons Regional Council (HRC). Stantec New Zealand (Stantec) has been commissioned to prepare the Annual Report for HDC.

Table 1-1 summarises the reporting requirements and indicates where in this report the required information may be accessed. Appendix A details the consent conditions[1] that require reporting on annually. This consent is the operative consent for this reporting period.

**Table 1-1: Summary of Consent Reporting Requirements**

| Discharge Permit & Condition No. | General Description | Section in the Annual Report |
|---|---|---|
| DP 6009 – condition 8 | Hazardous waste disposal | Section 15 |
| DP 6009 – condition 14 | Condition of the old landfill | Section 11 |
| DP 6009 – condition 35 | Forward Annual Report to the NLG | Not applicable |
| DP 6010 – condition 5 | Groundwater, surface water and leachate environmental monitoring | Sections 4, 5 and 9 |
| DP 6010 – condition 11(d) | Contaminant mass load projections | Section 6 |
| DP 6010 – condition 11(e) | Significance of contaminant mass load projections | Section 6 |
| DP 6010 – condition 14 | Refuse density | Section 10 |
| DP 6010 – condition 15(f) | Remediation of the old landfill | Section 11 |
| DP 6010 – condition 27 | Leachate irrigation | Section 12 |
| DP 6011 – condition 3 | Odour investigations at landfill boundary | Section 8 |
| DP 6011 – condition 4(a) and 7 | Landfill gas monitoring in groundwater monitoring wells | Section 8 |
| DP 6011 – condition 4(e), 4(g) and 7 | Monthly methane surface monitoring of capped areas and bio-filter | Section 8 |
| DP 6011 – condition 4(j) | Measure and record bio-filter parameters and maintain it | Section 8 |
| DP 6011 – condition 4(p) | Meteorological data | Section 8 |
| DP 102259 – condition 16 | Stormwater monitoring | Section 7 |

## 1.2 Scope

This report is for the reporting period of July 2020 to June 2021. Stantec staff carried out an assessment of the monitoring results and have prepared this monitoring report.

Groundwater, surface water and gas sampling (of groundwater bores) is undertaken by Downer throughout the compliance year as required by the current consent conditions. Envirowaste is responsible for undertaking gas sampling across the landfill. Laboratory analyses have been undertaken by Eurofins ELS in Lower Hutt. ELS is an IANZ (International Accreditation New Zealand) approved laboratory for the tests conducted.

[1] Reviewed consent conditions as finalised on 19 December 2019.

# 2 Context

## 2.1 Geology and Hydrogeology

Local geology consists of dune sands at the surface with a wedge of coastal sand deposits (which thicken towards the coast) interlaid with gravels beneath. The sands are generally uniform, grey-brown, fine to medium grained. The overlying topsoil comprises of dark grey and brown fine-grained sand.

Between the site and Hokio Stream there is an area of developed pasture which is underlain by peats of unknown thickness. In recent years the owner of this land has been progressively filling the area with cleanfill, levelling and re-planting. Towards the coast there are areas of swamp. Excavations carried out on a property west of the site on Hokio Beach Road showed at least one metre of peat containing large logs.

Depressions between dunes show evidence of being below the winter water table in some areas. These areas generally are underlain by organic silts, peats or silty sands. To the south of the site some depressions appear to be permanently below the water table.

HRC hydrology staff have advised in the past that "the general confined groundwater flow direction is towards the west". A conceptual model of shallow groundwater in the general region of the landfill is shown in Figure 2-1. We recommend that a review of the groundwater flow directions around both landfill sites be undertaken to ensure that the interpretations based on this general understanding are still accurate.

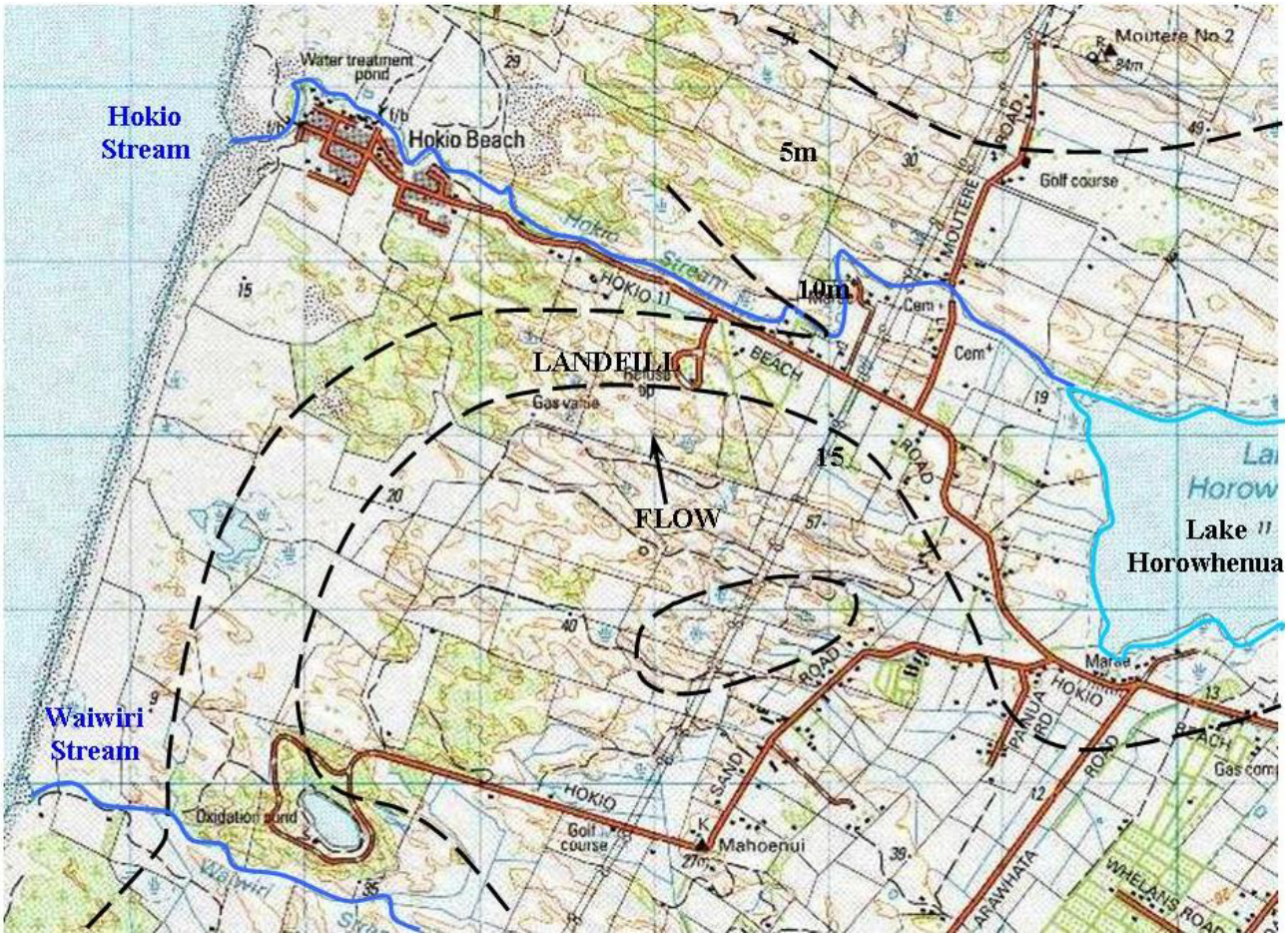



**Figure 2-1 Shallow Groundwater Flow Direction**

Shallow groundwater flow is in a northerly to westerly direction. Drainage patterns in the coastal strip are influenced by sand dune dominated topography. This considerably complicates the shallow groundwater flow pattern. While deeper aquifers will flow towards the coast, shallow groundwater flow will be affected by surface watercourses and topography. The sand aquifer is shallow and has low to moderate permeability. It contains lenses of peat from swamps overlain by aeolian sand deposits.

There are several private bores within a 1.5km radius of the site. Sampling of groundwater on a private property was last undertaken in March 2014. The results were made available to the property owners and Horizons Regional Council.

## 2.2 Timeline for Landfill Development

Key milestones in the history of the Levin Landfill are outlined as follows:

- 1970s – Old landfill accepting municipal solid waste.
- 1994 – Commenced installation of groundwater monitoring bores.
- 2002 – Resource consents granted for old, unlined landfill and new landfill operations on the site.
- May 2004 – New landfill commenced operation with Stage 1A.
- 2004 – 2008 – Leachate irrigated on site.
- 2008 – Stage 2 is constructed.
- May 2008 – Leachate irrigation ceased.
- 2009 – 2010 – Resource consent review process.
- 2009 – Four new groundwater monitoring bores installed (G1D; G1S; G2S, and D3r, as a replacement for bore D3)
- 2013 – Stage 3A is constructed.
- 2015 – Stage 3B is constructed.
- 2015 – Initiation of resource consent review process.
- 2016 – Biofilter is installed.
- 2017 – Stage 3C is constructed.
- 2017 – Landfill gas flare is commissioned.
- 2019 – Finalisation of resource consent review process.

# 3 Monitoring Programme

The sampling program carried out in the 2020-2021 monitoring period for discharge permits DP6009, DP6010 and DP102259 is summarised in the table in Appendix B.

Gas monitoring is carried out in July, October, January, and April each year at the groundwater bore locations, as per consent DP 6011. Additional gas emission sampling is carried out on the surface of the landfill, as per consent DP 6011.

Since January 2010 water from the boreholes has been tested for dissolved nutrients and metals rather than total concentrations. For simplicity, results from monitoring prior to January 2010 (when samples were tested for total metal and nutrient concentrations) have not been compared to the results from January 2010 onwards. (Refer to the Site Plan in Appendix C for borehole locations).

## 3.1 Interpretation of Median Values and Ranges

The monitoring data collected over the 2020-2021 period covered by this report are typically analysed in terms of median values, in comparison with the relevant guidelines or trigger values identified in the applicable discharge consent. It is important to note that due to the sampling programme schedule (Appendix B), some monitoring locations are sampled only once or twice each year (i.e., annual or 6-monthly sampling) for specific parameters. In these cases, a single result or range has been presented for comparison with guidelines/trigger values, rather than a calculated median. This is because it is inappropriate to calculate median values where there are less than three data points available. Sampling frequencies for all parameters at each monitoring location have been included in the reporting tables, to provide context for the results and interpretation of trends.

## 3.2 Note regarding Interpretation of “Non-Detected” Results

For those chemical constituents that were found to be present in concentrations below laboratory detection limits during the reporting period, the results have been assumed to be 50% of the laboratory limit, and a median calculated on this basis. This is standard practice when dealing with chemical concentrations in water. However, the same rule cannot be applied for faecal coliforms in the context of the Levin Landfill.

The laboratory detection limit for faecal coliforms is 4 CFU/100mL. As the resource consent requires that groundwater results for faecal coliforms be compared against the NZ Drinking Water Standard (NZDWS; for compliance), which is NIL (i.e., 0 CFU/100mL), we have indicated whether faecal coliforms have or have not been detected, rather than calculating a median as we would for chemical constituents (described above). This method has been applied in all instances where faecal coliforms are assessed for compliance with the NZDWS.

# 4 Groundwater Monitoring

## 4.1 Monitoring Rationale

From 1994 onwards groundwater monitoring bores have been installed at the Levin Landfill site to determine:

- The background groundwater quality.
- The direction of groundwater flow.
- Groundwater quality down-gradient of each of the two landfilling areas and other activities on site, such as the discontinued leachate irrigation area and the leachate pond.

There are presently 28 groundwater monitoring bores that are being sampled regularly, as required by the consent conditions.

No monitoring has been carried out within the old unlined landfill footprint. Measurement of actual effects at various distances down-gradient of the landfill and comparison with background groundwater quality provides the most relevant information to assess effects of the landfill on groundwater quality.

Leachate from the old unlined landfill migrates in a downward direction and will mix with groundwater which flows beneath the landfill area. The chemical composition of the groundwater is expected to be affected to a greater degree immediately down-gradient (hydraulically) of the old unlined landfill due to cumulative leachate loading.

The results of the 2020 – 2021 compliance year have been discussed in the following sections and have been grouped based on groundwater depth and the way in which bores have been grouped in the resource consent conditions. Shallow bores have also been grouped by their location relative to the old unlined landfill and new lined landfill.

The number of samples taken per site has varied through the monitoring period and thus this will affect the comparability of averages. Where this differs, it is noted. However, for reference purposes, a complete list of the number of samples per site can be found in Appendix D.

## 4.2 Description of Monitoring Bores

A Site Plan showing the location and depth of the monitoring bores has been included in Appendix C. The following description of the spatial relationship between the bores and the landfill areas is based on the assessment of groundwater movement performed in 2011. It is recommended that the groundwater flow and its direction around the site is reviewed to confirm that the understanding provided here remains accurate.

### Deep Bores

Bore G1D is located hydraulically up-gradient of both the old and new landfills in the deep aquifer. The bore at the southeast corner of the site indicates background deep groundwater quality. Deep aquifer bore E1D is located to the west of the old, closed landfill, and deep aquifer bores C2DD and E2D are located hydraulically down-gradient from both the closed landfill and the new operational landfill. Bore Xd1 was installed at the end of 2020 at the north-western corner of the site, downgradient from bore E2D and so downgradient of both the closed landfill and the new operational landfill.

### Shallow Bores

Bore G1S is located hydraulically up-gradient of both the old and new landfills in the shallow aquifer. The bore at the southeast corner of the site is representative of background shallow groundwater quality.

Bores D1, D2, D3r, D6 and E1S are located hydraulically up-gradient of the old unlined landfill. Therefore, they represent groundwater uninfluenced by leachate from the old landfill. These boreholes are located hydraulically down-gradient of the new landfill and irrigation areas. The new landfill is lined and has a leachate collection system which significantly reduces the potential for leachate to enter groundwater. Bores D4 and D5 are across or hydraulically up-gradient of the new lined landfill and the old, closed landfill and are away from any areas irrigated between 2004 and 2008. Sampling from D4 and D5 began in December 2004.

Bore F1 is located hydraulically down-gradient of the area where leachate from the lined landfill was irrigated in the south-east of the site. Bores F2 and F3 are in the vicinity of areas originally planned for leachate irrigation. Irrigation did not occur on the western side of the site and hence these bores can be used to represent background groundwater quality. Leachate has not been irrigated at the site since May 2008 at which time the pumping of leachate to the Levin Wastewater Treatment Plant (WWTP) began. It is most unlikely that the leachate will be irrigated to land in the future. Given that irrigation has not occurred over the past 12 years, the F-series bores are used as across-gradient bores for the lined landfill.

Bores B1, B2 and B3 are located on a line parallel to the northern-most extent of tipping for the unlined old landfill (refer to Site Plan, Appendix C). They are all within 50 metres of the old unlined landfill. The B series bores are on the down-gradient edge of the old landfill, with the age of adjacent fill reducing from sample location B1 to B3. Bore B3 is located in the swampy area and, in the 2013 annual report, was suspected to be inadequately sealed because of high faecal coliform counts. However, the results for faecal coliforms at B3 have been stable since January 2016.

The C series bores are located further hydraulically down-gradient from the old unlined landfill towards Hokio Beach Road (refer to Site Plan, Appendix C). Bore C1 is located hydraulically down-gradient of bore B1. It is adjacent to a peaty swamp area, which may affect its water quality. Bore C2 is located in the vicinity of bores B2 and B3 but further hydraulically down-gradient of the old unlined landfill. It is located hydraulically down-gradient of a swampy area, which may also affect groundwater quality in this bore.

Bore C2DS, which is also down gradient of the old unlined landfill, is screened deeper than the other shallow bores within the coastal sands, although an influence from recharge through peats is still possible.

Bore E2S is located northwest of the old landfill to detect if there is any groundwater which contains leachate moving directly towards the nearest houses downstream of the site. This bore is across gradient to the west of the B and C series bores which are within the known plume.

Bore G2S was installed in late 2009 and is located to the north hydraulically down-gradient of the old landfill by Hokio Beach Road and the entrance road to the landfill.

Bores Xs1 and Xs2 were installed in late 2020 within the Hokio Beach Road reserve. Bore Xs1 is adjacent to Tatana's property and represents groundwater quality close to Hokio Stream. Bore Xs2 is hydraulically up-gradient from the old landfill site.

Bore D3r was replaced in July 2021 by two bores (D3rs and D3rd) located approximately 140 metres northwards of the old D3r bore. The replacement occurred since the old D3r bore was located within the footprint of the future Stage 1B of the landfill. Test results for the new bores have not been included in this report.

## 4.3 Background Groundwater Results

Groundwater is collected from two background bores (G1S and G1D) situated hydraulically up-gradient from the new and old landfills to the southeast of the site (See Site Plan, Appendix C). These two bores were constructed in late 2009 to enable groundwater samples to be collected from the shallow and deep aquifers. Both bores were first sampled in January 2010. Results from bores F2, F3 and D5 can also be used to characterise background shallow groundwater quality.

The water quality results (medians) for the 2020-2021 sampling year from these background bores are presented in Table 4-1. Results for key indicators (ammoniacal-N, chloride, boron and conductivity) have been coloured to highlight more elevated values (with colour intensity increasing with concentration), to assist in identifying areas with potential contamination issues spatially across the site (i.e., west to east).

Water quality from the natural background water hydraulically up-gradient from the landfill site is not subject to any water quality limits in the existing resource consent. However, for comparison purposes, both the ANZECC Livestock Drinking Water trigger values (LDW) and the Drinking Water Standards of New Zealand (DWSNZ) maximum acceptable values (MAVs) and guideline values (GVs) for aesthetic determinants were used to benchmark the quality of water up-gradient from the landfill site.

Please note, there are differences between the numbers of samples taken at each site. For more information, please see Appendix D.

**Table 4-1: Background monitoring bores median results (2020-2021 monitoring period)**

| Determinant | Units | DWSNZ (MAV) | ANZECC LDW | D5 | F2 | F3 | G1S | G1D |
|---|---|---|---|---|---|---|---|---|
| **Leachate indicators** | | | | | | | | |
| Ammoniacal-N | mg/L | 1.17 | | 0.005 | 0.005 | 0.005 | 0.045 | 0.1 |
| Boron | mg/L | 1.4 | 5 | 0.03 | 0.04 | 0.015 | 0.015 | 0.04 |
| Chloride | mg/L | 250* | | 29.85 | 22.5 | 19.5 | 62.7 | 31.6 |
| Conductivity | mS/m | | | 29.45 | 21.6 | 21.85 | 41.55 | 28 |
| | | | | | | | | |
| Faecal coliforms | CFU/100mL | NIL | 100 | ND | ND | ND | ND | ND |
| pH | - | 7 to 8.5* | 6 to 9 | 7.05 | 7.1 | 7.05 | **6.65** | 7.15 |
| Suspended Solids | mg/l | | | 2.5 | 2.75 | 21.25 | 45 | 12 |
| Phenol | mg/l | | | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 |
| VFA | mg/L | | | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 |
| TOC | mg/L | | | 1.95 | 1.6 | 1.45 | 39.05 | 1.85 |
| Alkalinity | mg CaCO3/L | | | 65 | 50.5 | 44.5 | 80 | 57 |
| COD | mg/l | | | 14.25 | 12.25 | 7.5 | 98 | 7.5 |
| BOD | mg/L | | | 0.5 | 0.5 | 0.5 | 1.75 | 0.5 |
| Nitrate-N | mg/L | 11.3 | 90.3 | 1.54 | 0.34 | 1.8 | 0.04 | 0.005 |
| Sulphate | mg/L | 250* | 1000 | 19.25 | 9.28 | 7.625 | 4.785 | 18.85 |
| Hardness | mg CaCO3/L | 200* | | 65 | 37 | 34 | 40 | 53.5 |
| Calcium | mg/L | | 1000 | 11.35 | 5.775 | 5.1 | 7.565 | 8.2 |
| Magnesium | mg/L | | | 8.975 | 5.38 | 5.085 | 5.115 | 7.975 |
| Potassium | mg/L | | | 7.415 | 5.25 | 4.98 | 3.94 | 6.045 |
| Sodium | mg/L | 200* | | 30.35 | 25.95 | 25.3 | 69.6 | 30.85 |
| DRP | mg/L | | | 0.0985 | 0.134 | 0.1395 | 0.0715 | 0.0405 |
| Aluminium | mg/L | 0.1* | 5 | 0.001 | 0.001 | 0.0015 | **0.1475** | 0.001 |

| Determinant | Units | DWSNZ (MAV) | ANZECC LDW | D5 | F2 | F3 | G1S | G1D |
|---|---|---|---|---|---|---|---|---|
| Arsenic | mg/L | 0.01 | 0.1 | 0.00075 | 0.001 | 0.0015 | 0.002 | 0.0025 |
| Cadmium | mg/L | 0.004 | 0.01 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| Chromium | mg/L | 0.05 | 1 | 0.0005 | 0.0005 | 0.0005 | 0.0025 | 0.0005 |
| Copper | mg/L | 2 | 0.4# | 0.001 | 0.0014 | 0.00105 | 0.0097 | 0.000525 |
| Iron | mg/L | 0.2* | | 0.0595 | 0.012 | 0.00375 | **3.505** | **0.6015** |
| Lead | mg/L | 0.01 | 0.1 | 0.00025 | 0.00025 | 0.00025 | 0.0003 | 0.000375 |
| Manganese | mg/L | 0.4 | | 0.0122 | 0.0045 | 0.00025 | **0.0695** | **0.0634** |
| Mercury | mg/L | | | 0.00025 | 0.00025 | 0.00025 | 0.0003 | 0.00025 |
| Nickel | mg/L | 0.08 | 1 | 0.00025 | 0.00025 | 0.00025 | 0.0016 | 0.00025 |
| Zinc | mg/L | 1.5* | 20 | 0.001 | 0.001 | 0.001 | 0.0015 | 0.001 |

Note: * denotes guideline values for aesthetic determinants (G.V.), # copper trigger values range from 0.4 mg/L for sheep, up to 5 mg/L for poultry. “ND” indicates where faecal coliforms were not detected.
**Bold red text** – denotes an exceedance of the relevant DWSNZ standard.

For the 2020-2021 monitoring period the median pH from the samples taken from the shallow borehole (G1S) was below the DWSNZ GV range of 7 to 8.5, at 6.65 pH units. The pH recorded in this bore has been consistently low since monitoring began in 2010. The median pH values for the deeper borehole (G1D) and boreholes F2, F3 and D5 were within the DWSNZ range and the LDW trigger value range.

For the 2020-2021 monitoring period the iron concentrations at G1D continued to fluctuate above the DWSNZ GV; this trend is consistent with historical data. The median iron concentration at G1S was well above the DWSNZ GV, at 3.505 mg/L (compared with the DWSNZ GV of 0.2 mg/L). This is lower than the previous monitoring period 2019-2020 which reported an iron concentration of 6.03 mg/L and the monitoring period before that 2018-2019 which reported an iron concentration of 13.1 mg/L at G1S. This shows the concentration of iron is reducing over time however this should continue to be monitored to ensure this trend continues and eventually meets the DWSNZ GV.

For the 2020-2021 monitoring period the aluminium concentration at G1S was above the DWSNZ GV (0.1 mg/L) with a concentration of 0.1475 mg/L.

For the 2020-2021 monitoring period the manganese concentrations at G1S and G1D were above the DWSNZ GV (0.4 mg/L) with concentrations of 0.0695 mg/L and 0.0634 mg/L respectively.

Key leachate parameters chloride and ammoniacal nitrogen recorded results below the relevant guideline values. The results show that G1S has the highest concentrations of chloride and conductivity, as well as sharing the highest concentration of boron with G1D. However, G1D has the highest concentration of ammoniacal – N.

## 4.4 Shallow Groundwater Results

This section discusses groundwater quality hydraulically up and down-gradient of the old unlined landfill footprint in the shallow unconfined aquifer (referred to as the 'sand aquifer'). The D-series, F-series, E1S and G1S bores are all hydraulically up-gradient of the old landfill. In addition, bores D1, D2, D3r, D6 and E1S are hydraulically upgradient of the old unlined landfill but down-gradient of the new lined landfill. These bores can therefore be used as 'early detection' bores for leachate breakouts from the new landfill. D1 and D6 bores are also located down-gradient of the leachate pond and therefore may provide some indication of leachate leakage from the pond.

The B-series, C-series, E2S and G2S bores are all hydraulically down-gradient of the old landfill and are therefore used to assess the impact from the old unlined landfill on groundwater.

The resource consent requires results from these bores to be compared against the LDW trigger values. The results from the 2020-2021 monitoring period for these bores are presented in Table 4-2 along with the shallow background bore results (G1S – from Table 4-1). Results for key indicators have been coloured to highlight more elevated values (with colour intensity increasing with concentration), to assist in identifying areas with potential contamination issues spatially across the site (i.e., west to east, and down-gradient to up-gradient). A complete table of results for the bores over the last 10 years is presented in Appendix E.

### 4.4.1 Groundwater Quality Hydraulically Up-Gradient of the Old Landfill

Bores hydraulically up-gradient of the old landfill include bores which are down-gradient of the new landfill.

None of the applicable LDW trigger values were exceeded at groundwater bores up-gradient of the old landfill during the 2020 - 2021 reporting period. The results indicate that there is no leachate from the new lined landfill impacting on groundwater down-gradient of the landfill.

Concentrations of ammoniacal-N have been consistently elevated within bore D2 when compared to background bore G1S since monitoring began in both bores. In the 2019-2020 annual report, it was noted that since 2015 there appeared to be a slight increasing trend, and that this should continue to be tracked. This slight increase plateaued in the April 2019 monitoring round and has since stabilised with only slight fluctuations between each quarter's monitoring. The D2 bore is located down-gradient of the new landfill and therefore elevated concentrations of key leachate indicator parameters such as ammoniacal-N could indicate a break-out of leachate. It is noted however that the concentration of ammoniacal-N has been consistently elevated since monitoring began in 1997, seven years before the new landfill began operation.

Bores D1 and D6 are both down-gradient of the leachate pond and were recorded in the 2019-2020 annual report as having increased in concentrations of nitrate-N since 2008. This increase stopped in October 2018 and, since then, has in fact shown a decreasing trend. The concentrations observed are discussed further in Section 4.5.

Bore F1 is located down-gradient of the leachate irrigation area. Irrigation ceased in 2008 and therefore it is considered unlikely the slightly elevated concentrations of DRP observed are a result of the discharge of leachate to land in this area. The concentration of DRP recorded in this bore has been consistent since 2007.

Please note, there are differences between the number of samples taken at each site. For more information, please see Appendix D.

Selected down-gradient bores were also analysed for volatile organic compounds (VOC) and semi-volatile organic compounds (SVOC) throughout the monitoring period 2020-2021. The range of concentrations detected above laboratory detection limits at each location are detailed in Table 4-3 and no exceedances of the ANZECC 2000 guideline were detected.

**Table 4-2: Groundwater hydraulically up-gradient of Old Landfill and down-gradient of new landfill: median or singular results (2020-2021 monitoring period)**

| Determinant | Units | ANZECC LDW | D5 | E1S | D4 | D3r | D2 | D6 | D1 | F1 | G1S |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Leachate indicators** | | | | | | | | | | | |
| Ammoniacal-N | mg/L | | 0.005 | 0.19 | 0.245 | 0.17 | 0.53 | 0.005 | 0.005 | 0.005 | 0.045 |
| Boron | mg/L | 5 | 0.03 | 0.0175 | 0.04 | 0.03 | 0.055 | 0.055 | 0.05 | 0.03 | 0.015 |
| Chloride | mg/L | | 29.85 | 28.15 | 42.4 | 22.1 | 33.8 | 19.3 | 28.55 | 53.25 | 62.7 |
| Conductivity | mS/m | | 29.45 | 26.55 | 30.45 | 21.95 | 36.65 | 40.05 | 48.65 | 47.65 | 41.55 |
| | | | | | | | | | | | |
| Faecal coliforms | CFU/100mL | 100 | 2 | 2 | 2 | 2 | 5 | 2 | 2 | 2 | 2 |
| pH | - | 6 to 9 | 7.05 | 6.9 | 6.95 | 6.75 | 6.4 | 6.8 | 6.7 | 6.9 | 6.65 |
| Suspended Solids | mg/l | | 2.5 | 31.5 | 2.5 | 3.25 | 6.5 | 2.5 | 2.5 | 2.5 | 45 |
| Phenol | mg/l | | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 |
| VFA | mg/L | | 2.5 | 2.5 | 25 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 |
| TOC | mg/L | | 1.95 | 6.5 | 3.4 | 3 | 11.8 | 1.05 | 1.25 | 4.95 | 39.05 |
| Alkalinity | mg CaCO3/L | | 65 | 73.5 | 65 | 55 | 130.5 | 75 | 138 | 114 | 80 |
| COD | mg/l | | 14.25 | 19 | 7.5 | 11.75 | 39 | 7.5 | 11.245 | 26 | 98 |
| BOD | mg/L | | 0.5 | 2.25 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 1.75 |
| Nitrate-N | mg/L | 90.3 | 1.54 | 0.005 | 0.005 | 0.175 | 0.005 | 18.95 | 10.44 | 1.765 | 0.04 |
| Sulphate | mg/L | 1000 | 19.25 | 5.315 | 12.75 | 8.7 | 0.01 | 16.82 | 5.05 | 7.265 | 4.785 |
| Hardness | mg CaCO3/L | | 65 | 57 | 59.5 | 36 | 95.5 | 94.5 | 135 | 127.5 | 40 |
| Calcium | mg/L | 1000 | 11.35 | 11.1 | 11.4 | 7.025 | 17 | 17.65 | 25.15 | 18.8 | 7.565 |
| Magnesium | mg/L | | 8.975 | 7.115 | 7.6 | 4.44 | 12.9 | 12.25 | 17.5 | 19.5 | 5.115 |
| Potassium | mg/L | | 7.415 | 6 | 6.28 | 5.555 | 8.855 | 8.445 | 10.02 | 9.12 | 3.94 |
| Sodium | mg/L | | 30.35 | 27.2 | 32.7 | 25.4 | 31.35 | 31.3 | 43.15 | 42.45 | 69.6 |
| DRP | mg/L | | 0.0985 | 0.0635 | 0.023 | 0.0185 | 0.0455 | 0.0985 | 0.099 | 0.162 | 0.0715 |
| Aluminium | mg/L | 5 | 0.001 | 0.008 | 0.001 | 0.001 | 0.013 | 0.001 | 0.001 | 0.001 | 0.1475 |
| Arsenic | mg/L | 0.1 | 0.00075 | 0.002 | 0.003 | 0.0075 | 0.00075 | 0.001 | 0.001 | 0.002 | 0.002 |

| Determinant | Units | ANZECC LDW | D5 | E1S | D4 | D3r | D2 | D6 | D1 | F1 | G1S |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Cadmium | mg/L | 0.01 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| Chromium | mg/L | 1 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.00075 | 0.0005 | 0.0005 | 0.0005 | 0.0025 |
| Copper | mg/L | 0.4[#] | 0.001 | 0.000675 | 0.00025 | 0.00025 | 0.00025 | 0.000425 | 0.000675 | 0.0021 | 0.00965 |
| Iron | mg/L | | 0.0595 | 4.8 | 0.985 | 2.475 | 10.09 | 0.0135 | 0.0025 | 0.0025 | 3.505 |
| Lead | mg/L | 0.1 | 0.00025 | 0.002 | 0.00025 | 0.00025 | 0.00025 | 0.00025 | 0.00025 | 0.00025 | 0.00025 |
| Manganese | mg/L | | 0.0122 | 0.2375 | 0.2015 | 0.178 | 0.3175 | 0.000425 | 0.00025 | 0.00475 | 0.06945 |
| Mercury | mg/L | | 0.00025 | 0.00025 | 0.00025 | 0.00025 | 0.00025 | 0.00025 | 0.00025 | 0.00025 | 0.00025 |
| Nickel | mg/L | 1 | 0.00025 | 0.00025 | 0.00025 | 0.00025 | 0.00025 | 0.00025 | 0.00025 | 0.00025 | 0.0016 |
| Zinc | mg/L | 20 | 0.001 | 0.0015 | 0.001 | 0.001 | 0.003 | 0.0015 | 0.001 | 0.001 | 0.0015 |

Note: The counts for faecal coliforms should be used with caution as a high result for one sample will appear misleading as the other samples were not detected.

**Table 4-3: VOCs detected in samples from bores hydraulically up-gradient of Old Landfill and down-gradient of new landfill, 2020-2021**

| Date | Determinant | Laboratory detection limit (from Eurofins-ELS) mg/L | ANZECC 2000 DGV (mg/L) | Detected concentrations at down-gradient bores (mg/L) | | | | | | Common source/usage of determinant (from relevant ANZECC 2000 Volume 2, Section 8.3.7 technical briefs) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | D1 | D3r | D4 | D5 | D6 | F1 | |
| 13/04/2021 | VOC-016 Toluene | 0.0005 | 0.18 | ND | ND | ND | 0.0006 | ND | 0.0007 | Hydrocarbon; fuel additives (vehicles) |
| 14/04/2021 | | | | 0.0012 | 0.0006 | ND | ND | 0.0008 | ND | |
| 15/04/2021 | | | | ND | ND | 0.0005 | ND | ND | ND | |

Note: ND indicates the value was below the laboratory detection limit.

### 4.4.2 Groundwater Quality Hydraulically Down-Gradient of the Old Irrigation Area

Given that irrigation has not occurred over the past 12 years, the F-series bores are used as cross-gradient monitoring bores for the lined landfill. The monitoring record for these bores has been assessed in the previous sections (Section 4.3 (Bores F2 and F3) and Section 4.4.1 (Bore F1)).

The water quality results for the F series bores are similar to those observed for background shallow groundwater quality, hydraulically up-gradient of the old landfill. Leachate indicators (conductivity, boron, chloride, and ammoniacal nitrogen) are not elevated in these bores; this is as expected since no irrigation of leachate has occurred on the site since 2008.

## 4.5 Deep Gravel Aquifer Results

The resource consent requires results from gravel (deep) aquifers to be compared against the DWSNZ limits. A complete table of results for the gravel aquifer bores over the last 10 years is presented in Appendix E.

Median concentrations for parameters analysed during the 2020-2021 monitoring period for the four bores intercepting the gravel aquifer (E1D, C2DD, E2D and XD1) are provided in Table 4-4.

Results for the background deep-bore G1D have also been included in Table 4-4 for comparison. This is the only background bore in the deep aquifer. Results for key indicators have been coloured to highlight more elevated values (with the highest being a darker shade) to assist in identifying areas with potential contamination issues spatially across the site (i.e., west to east, and down-gradient to up-gradient).

The DWSNZ GVs were **exceeded** for four parameters as follows:

- Iron (at G1D; median of 0.6015 mg/L was over three times the DWSNZ GV of 0.2 mg/L)
- Manganese (at C2DD; median of 0.6465 mg/L was significantly higher than the DWSNZ GV of 0.4 mg/L)
- Manganese (at XD1; median of 0.48 mg/L was marginally higher than the DWSNZ GV of 0.4 mg/L)
- Faecal coliforms at XD1 were 3 col/100ml which is above the DWSNZ GV of nil.

Please note, there are differences between the number of samples taken at each site. For more information, please see Appendix D

Deep bores were also analysed for VOCs and SVOCs throughout the monitoring period 2020-2021. Of these bores, the following contaminants exceeded the guideline values (with bore locations in parentheses) in April 2021:

- SVOC-072 Bis(2-ethylhexyl)adipate (E2D)
- VOC-016 Toluene (G1D)

**Table 4-4: Gravel aquifer median or singular results (2020-2021 monitoring period) – *bores listed L to R (west to east)***

| Determinant | Units | DWSNZ (MAV) | E2D | E1D | C2DD | G1D | XD1 |
|---|---|---|---|---|---|---|---|
| **Leachate indicators** | | | | | | | |
| Ammoniacal-N | mg/L | 1.17 | 0.28 | 0.21 | 0.33 | 0.1 | 0.225 |
| Boron | mg/L | 1.4 | 0.05 | 0.06 | 0.06 | 0.04 | 0.06 |
| Chloride | mg/L | 250* | 43.95 | 39.05 | 40.85 | 31.6 | 58.8 |
| Conductivity | mS/m | | 40.4 | 44.7 | 53.85 | 28.0 | 54.1 |
| | | | | | | | |
| Faecal coliforms | CFU/100mL | NIL | *2* | *2* | *2* | *2* | **3** |
| pH | - | 7 to 8.5* | 7.6 | 7.55 | 7.5 | 7.15 | 7.6 |
| Suspended Solids | mg/l | | 7.5 | 29.5 | 376.0 | 12.0 | 9 |
| Phenol | mg/l | | 0.03 | 0.03 | 0.03 | 0.03 | 0.025 |
| VFA | mg/L | | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 |
| TOC | mg/L | | 2.4 | 2.95 | 4.75 | 1.85 | 4.7 |
| Alkalinity | mg CaCO3/L | | 109.5 | 152.0 | 210.5 | 57.0 | 162 |
| COD | mg/l | | 7.5 | 20.5 | 16.75 | 7.5 | 28 |
| BOD | mg/L | | 0.5 | 0.5 | 1.0 | 0.5 | 1 |
| Nitrate-N | mg/L | 11.3 | 0.01 | 0.01 | 0.01 | 0.01 | 0.005 |
| Sulphate | mg/L | 250* | 8.16 | 0.01 | 0.03 | 18.85 | 0.01 |
| Hardness | mg CaCO3/L | 200* | 101.0 | 133.0 | 166.0 | 53.5 | 167 |
| Calcium | mg/L | | 24.75 | 31.85 | 42.35 | 8.2 | 39.1 |
| Magnesium | mg/L | | 9.53 | 13.05 | 14.55 | 7.98 | 16.7 |
| Potassium | mg/L | | 6.01 | 5.1 | 7.34 | 6.05 | 5.32 |
| Sodium | mg/L | 200* | 34.65 | 36.55 | 39.25 | 30.85 | 50 |
| D.R. Phosphorus | mg/L | | 0.41 | 0.4 | 0.63 | 0.04 | 0.109 |
| Aluminium | mg/L | 0.1* | 0.001 | 0.0015 | 0.002 | 0.001 | 0.004 |

| Determinant | Units | DWSNZ (MAV) | E2D | E1D | C2DD | G1D | XD1 |
|---|---|---|---|---|---|---|---|
| Arsenic | mg/L | 0.01 | 0.001 | 0.007 | 0.004 | 0.0025 | 0.0005 |
| Cadmium | mg/L | 0.004 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| Chromium | mg/L | 0.05 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |
| Copper | mg/L | 2 | 0.0003 | 0.0003 | 0.0003 | 0.0005 | 0.00025 |
| Iron | mg/L | 0.2* | 0.056 | 0.0245 | 0.0235 | **0.6015** | 0.071 |
| Lead | mg/L | 0.01 | 0.0003 | 0.0003 | 0.0003 | 0.0004 | 0.00025 |
| Manganese | mg/L | 0.4 | 0.314 | 0.233 | **0.6465** | 0.0634 | **0.48** |
| Mercury | mg/L | | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.00025 |
| Nickel | mg/L | 0.08 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.000675 |
| Zinc | mg/L | 1.5* | 0.001 | 0.001 | 0.0025 | 0.001 | 0.001 |

Note: * denotes guideline values for aesthetic determinants (G.V.); **Bold red text** – denotes an exceedance of the DWSNZ.

# 4.6 Leachate

The leachate pond has not been used to store leachate for several years. The leachate pumping system has been connected so that leachate is pumped to a manhole next to the leachate pond from where it is pumped to the Levin WWTP. Samples of leachate are now taken directly from the manhole next to the leachate pond.
The monitoring results for the leachate are **not subject to any specific guidelines or trigger values in the resource consent**. However, typical leachate characteristics for Class 1-type landfills published by the Waste Management Institute of New Zealand (*Technical Guidelines for Disposal to Land*, August 2018, WasteMINZ) have been included to contextualise the observed state of the leachate (Table 4-5).

**Table 4-5: Median or range of results for Leachate (2020-2021 monitoring period)**

| Determinant | Units | Typical Leachate Characteristics* | Leachate |
|---|---|---|---|
| **Leachate indicators** | | | |
| Ammoniacal-N | mg/L | 3.4 -1,440 | 1,240 |
| Boron | mg/L | 0.54 – 20.1 | 6.4 |
| Chloride | mg/L | 45 – 2,584 | 1,090 |
| Conductivity | mS/m | 308 – 27,900 | 1,385 |
| | | | |
| Faecal coliforms | CFU/100mL | - | 330 |
| pH | - | 5.9 - 8.5 | 7.9 |
| Suspended Solids | mg/l | - | 48 |
| Phenol | mg/l | - | 0.025 |
| VFA | mg/L | - | 11 |
| TOC | mg/L | 17.2 - 822 | 594 |
| Alkalinity | mg CaCO3/L | 264 – 6,820 | 5,790 |
| COD | mg/l | 84 – 5,090 | 3,220 |
| BOD | mg/L | 12 – 3,867 | 87.5 |
| Nitrate-N | mg/L | - | 0.54 |
| Sulphate | mg/L | 1 - 780 | 75.45 |
| Hardness | mg CaCO3/L | - | 481.5 |
| Calcium | mg/L | 20 – 600*** | 103 |
| Magnesium | mg/L | 40 – 350*** | 54 |
| Potassium | mg/L | 10 – 2,500** | 667.5 |
| Sodium | mg/L | 50 – 4,000** | 877 |
| DRP | mg/L | - | 11.8 |
| Aluminium | mg/L | - | 0.5755 |
| Arsenic | mg/L | 0.005 – 1.60** | 0.3005 |
| Cadmium | mg/L | 0.0005 – 0.140** | **0.0001** |
| Chromium | mg/L | 0.005 – 50.4 | 0.603 |
| Copper | mg/L | 0.004 – 1.40** | 0.01395 |
| Iron | mg/L | 1.6 - 220 | 4.25 |
| Lead | mg/L | 0.001 – 0.42 | 0.0027 |
| Manganese | mg/L | 0.03 – 45*** | 1.115 |

| Determinant | Units | Typical Leachate Characteristics* | Leachate |
|---|---|---|---|
| Mercury | mg/L | 0.2 – 50*** | **0.00025** |
| Nickel | mg/L | 0.02 – 2.05** | 0.111 |
| Zinc | mg/L | 0.009 – 24.2 | 0.081 |

Notes: *for Class 1-type landfills, Table 5-5, p82, Technical Guidelines for Disposal to Land, WasteMINZ August 2018 (same as Table 4.2 of the CAE Landfill Guidelines 2000, but corrections made to Table 5-5 in line with Table 4.2).
**Data taken from Table 5-4, p81 of the same guideline, for determinants for which no differences in concentrations between the phases of landfill development could be observed in the table.
***Data taken from Table 5-4, p81 of the same guideline, for determinants during the methanogenic phase.

The median results (or observed ranges) for leachate were mostly within the typical leachate composition range for Class 1 landfills published in the *Technical Guidelines for Disposal to Land* (WasteMINZ 2018). The exceptions to this were for cadmium and mercury (results shown in bold), which were below the lower range (0.0005 mg/L and 0.2 mg/L respectively) with concentrations of 0.0001 mg/L and 0.00025 mg/L, respectively.

Samples of leachate were collected and analysed for VOCs and SVOCs during the monitoring period 2020-2021. Two SVOCs and ten VOCs were detected from the samples and compared against the relevant ANZECC guidelines in Table 4-6 below. Of these 12 results, only two results exceeded the guideline values. These exceedances occurred for carbofuran which showed an exceedance of the 99$^{th}$, 95$^{th}$, and 90$^{th}$ percentile in the October 2020 sample, and for Naphthalene which also exceeded the guideline in the April 2021 sample, with an exceedance of the 99$^{th}$ percentile.

**Table 4-6 SVOCs and VOCs detected in samples of leachate, 2020-2021. Exceedances of the ANZECC 2000 default guidelines are in bold.**

| Date sampled | Determinant | Detected concentration (mg/L) | ANZECC 2000 default guideline value(s) for toxicants (percentile for species protection in brackets) (mg/L) | Common source/usage of determinant (from relevant ANZECC 2000 Volume 2, Section 8.3.7 technical briefs) |
|---|---|---|---|---|
| 15/10/2020 | SVOC-029 Carbofuran | **0.012** | 0.00006 (99$^{th}$ percentile)<br>0.0012 (95$^{th}$ percentile)<br>0.004 (90$^{th}$ percentile)<br>0.015 (80$^{th}$ percentile) | Insecticides applied to fruit, vegetable, and cereal crops. |
| 15/10/2020 | SVOC-062 Naphthalene | 0.0013 | 0.0025 (99$^{th}$ percentile)<br>0.016 (95$^{th}$ percentile)<br>0.037 (90$^{th}$ percentile)<br>0.085 (80$^{th}$ percentile) | A Polycyclic Aromatic Hydrocarbon (PAH) found in runoff from road surfaces; generally produced from anthropogenic combustion processes |
| 15/10/2020 | VOC-003 Benzene | 0.0016 | Not defined | No brief available |
| 15/10/2020 | VOC-007 Naphthalene | 0.0017 | 0.0025 (99$^{th}$ percentile)<br>0.016 (95$^{th}$ percentile)<br>0.037 (90$^{th}$ percentile)<br>0.085 (80$^{th}$ percentile) | A Polycyclic Aromatic Hydrocarbon (PAH) found in runoff from road surfaces; generally produced from anthropogenic combustion processes |
| 15/10/2020 | VOC-010 o-Xylene | 0.0066 | 0.2 (99$^{th}$ percentile)<br>0.35 (95$^{th}$ percentile)<br>0.47 (90$^{th}$ percentile)<br>0.64 (80$^{th}$ percentile) | Hydrocarbon; used in aviation fuel and polyester manufacture. |
| 15/10/2020 | VOC-016 Toluene | 0.002 | 0.18 | Hydrocarbon; fuel additives (vehicles) |
| 15/10/2020 | VOC-017 Total p,m Xylene, Ethylbenzene | 0.004 | Not defined | No brief available |
| 12/04/2021 | VOC-003 Benzene | 0.0033 | Not defined | No brief available |
| 12/04/2021 | VOC-007 Naphthalene | **0.0046** | 0.0025 (99$^{th}$ percentile)<br>0.016 (95$^{th}$ percentile) | A Polycyclic Aromatic Hydrocarbon (PAH) found in |

| Date sampled | Determinant | Detected concentration (mg/L) | ANZECC 2000 default guideline value(s) for toxicants (percentile for species protection in brackets) (mg/L) | Common source/usage of determinant (from relevant ANZECC 2000 Volume 2, Section 8.3.7 technical briefs) |
|---|---|---|---|---|
| | | | 0.037 (90th percentile)<br>0.085 (80th percentile) | runoff from road surfaces; generally produced from anthropogenic combustion processes |
| 12/04/2021 | VOC-010 o-Xylene | 0.0165 | 0.2 (99th percentile)<br>0.35 (95th percentile)<br>0.47 (90th percentile)<br>0.64 (80th percentile) | Hydrocarbon; used in aviation fuel and polyester manufacture. |
| 12/04/2021 | VOC-016 Toluene | 0.0076 | 0.18 | Hydrocarbon; fuel additives (vehicles) |
| 12/04/2021 | VOC-017 Total p,m Xylene, Ethylbenzene | 0.0399 | Not defined | No brief available |

# 4.7 Groundwater Quality Discussion

## 4.7.1 Background

Current monitoring results indicate that shallow background groundwater quality in bore G1S continues to be characterised by low pH. The median concentration of iron in bore G1D continues to fluctuate above the DWSNZ GV. The presence of iron is likely due to hydrogeological conditions found at the site and is common in groundwater in this area.

The sulphate concentration in bore G1S continues to decrease compared to the significant increase seen during the 2018/19 monitoring period and is now within historical ranges.

Historically (and within this report) bores G1S and G1D have been used to represent reference background conditions, for comparison with the down-gradient bores. It is noted however the D2, F5 and F3 bores are also screened up-gradient within the shallow aquifer and record lower concentrations of key leachate indicators. It is possible therefore that one or a combination of these bores may be more appropriate as a reference background.

## 4.7.2 Shallow Aquifer Hydraulically Up-Gradient of the Old Landfill

Previously the nitrate-nitrogen concentrations were most elevated in bores D1 and D6. The median concentration of nitrate-nitrogen in bore D1 has decreased compared to the previous two reporting periods (as shown in Table 4-7). For D6, the median concentration of nitrate-nitrogen has not significantly changed compared with the previous two reporting periods and is consistent with historical records.

Concentrations for other leachate indicators such as boron, chloride and ammoniacal nitrogen were consistent with background concentrations and historic monitoring records for the 2019-2020 reporting period.

**Table 4-7: Comparison of median nitrate-N concentrations in up-gradient bores with previous two reporting periods (2018-2019 and 2019-2020)**

| Reporting period | Median concentration of nitrate-N (mg/L) in up-gradient groundwater bores | |
|---|---|---|
| | D1 | D6 |
| 2020/21 | 10.44 | 18.95 |
| 2019/20 | 11.5 | 14.3 |
| 2018/19 | 36.8 | 22.9 |

## 4.7.3 Shallow Aquifer Hydraulically Down-Gradient of the Old Landfill

Leachate indicators (such as chloride, ammoniacal-nitrogen and boron) have been detected at elevated concentrations in bores situated hydraulically down-gradient of the old landfill, particularly bores B1, B2, B3 and C2 (compared with lower concentrations at bores C1 and C2DS). Boron is the only leachate indicator with an assigned LDW trigger value (5 mg/L) and this was not exceeded in any of the shallow aquifer down-gradient bores. However, the water quality in samples from E2S is similar to those from the shallow aquifer hydraulically up-gradient of the site (D- and F-series

bores, and G1S). Concentrations of landfill leachate indicators such as chloride and boron are much lower at E2S than at the other down-gradient bore locations. It is therefore likely that this bore is not intercepting the leachate plume originating from the old unlined landfill.

Bores B1, B2, B3 and C2 all appear to be located and screened within the leachate plume. While there has historically been some variability in the concentration of the key leachate indicators when assessed as a whole, there appears to be a decreasing or stable trend in the key leachate indicators across these four bores. However, boron and ammoniacal-nitrogen concentrations have been gradually increasing at bores B3 and C2 since monitoring began. Concentrations of both indicators have been fairly stable since the 2018-2019 monitoring period though are still elevated compared to pre-2018 records.

It was recommended in the 2019-2020 annual report that groundwater levels were recorded at the same time as any scheduled groundwater quality monitoring events from October 2019 onwards, to enable further assessment of groundwater flow directions. Groundwater levels continue to be measured during monitoring events and show historical variations. Levels measured in the 2020-2021 reporting year are within the historical ranges for Bores B2, B2, B3, C1, and C2.

### 4.7.4 Deep Gravel Aquifer

Faecal coliforms were not detected within the deep C2DD and E2D bores but were detected in bore XD1 during this reporting period, with the concentration detected at bore XD1 of 3 col/100ml being above the DWSNZ GV of nil col/100ml. The DWSNZ GV (0.4 mg/L) for manganese was exceeded within bores C2DD (0.6465 mg/L) and XD1 (0.48 mg/L). This is very similar to the results from the previous 2019-2020 monitoring period which also saw no faecal coliforms detected and an exceedance of 0.6035 mg/L for manganese. Bore XD1 has only been sampled twice to date and, on the first occasion, no faecal coliforms were detected.

### 4.7.5 Leachate

Results from the 2020-2021 monitoring period are within the range of data obtained from recent previous rounds. The concentrations of parameters are mostly within the range reported for Class 1 landfills in the *Land Disposal Guidelines*. The exceptions to this were for cadmium and mercury, which were below the lower range (0.0005 mg/L and 0.2 mg/L respectively) and were, therefore, not of any concern.

Several SVOCs and VOCs were detected in leachate samples collected through the monitoring period 2020-2021, however, of these, only two results exceeded the ANZECC 2000 DGVs for toxicity in freshwater; these were carbofuran and naphthalene.

### 4.7.6 Overall Groundwater Quality

Conductivity, boron, chloride and ammoniacal nitrogen are all indicators of the presence of landfill leachate at the site and are not generally observed in elevated concentrations up-hydraulic gradient of the old landfill, except in many of the bores on the eastern side of the site where chloride, calcium and sulphate and hence conductivity are all elevated. The four leachate indicator parameters have been graphically plotted for all groundwater bores and this is presented in Appendix F.

# 5 Hokio Stream

## 5.1 Description of Sampling Locations

Hokio Stream is sourced from Lake Horowhenua (within the Lake Horowhenua Water Management Zone [Hokio sub-zone *Hoki_1b*], under Schedule A of the HRC One Plan (2014)) and flows through a rural farming area for much of its course. The stream passes through the Hokio Beach settlement near the coast and has a small estuary at its mouth. The Hokio Stream catchment forms a narrow band through the coastal dunes from Lake Horowhenua to the Tasman Sea. The length of the stream itself is approximately 8 km. The stream is associated with several areas of swampy ground throughout its length. These areas are generally covered in a thick growth of flax making the stream largely inaccessible in these regions but providing excellent cover and habitat for eels and whitebait. Hokio Stream is classified as having a stream order of four, with “warm, dry” climate and low elevation under the New Zealand River Environment Classification (REC2, NIWA 2010).

Stream samples were taken by grab sampling at sites HS1A, HS1, HS2 and HS3 (Figure 5-1) to investigate if landfill leachate present within the shallow groundwater down-gradient of the landfill is affecting the water quality of Hokio Stream. Sites HS1A and HS1 are situated up-stream of the old landfill, HS2 is situated alongside the old landfill and up-stream of the Tatana Property Drain discharge, and HS3 is located approximately 50m down-stream of the landfill site property boundary and the Tatana Property Drain discharge.

The physico-chemical conditions measured at HS1A and HS1 are assumed to be representative of the combined 'background' (i.e., originating from upstream of the landfill), while HS2 and HS3 include landfill discharge-related flows in the Hokio Stream. Since April 2020, sampling location HS1A has been monitored with the purpose of completely replacing sampling location HS1 after 24 months. Sampling location HS1A is located further upstream than HS1 and has been sampled to provide greater certainty in comparisons between upstream and downstream sites of the landfill.

**Figure 5-1: Hokio Stream Sampling Locations (HS1A, HS1, HS2 and HS3)**

## 5.2 Sampling Results

The range of water quality monitoring results recorded for the 2020-2021 compliance year are presented in Table 5-1. A full set of results for Hokio Stream over the last 10 years is presented in Appendix E. The analytical results have been compared with the ANZECC AE (95%) trigger values as per the consent conditions.

All parameters monitored complied with the ANZECC AE trigger values except for nitrate – N. The **consented limit (the ANZECC AE 95% trigger value) for nitrate -N was exceeded** at HS1A, HS1, HS2 and HS3 (based on median values for the reporting period).

Figure 5-2 depicts faecal coliform counts at all four monitoring locations within the Hokio Stream since 1994. The counts have historically varied across all sites, with frequent exceedances of the LDW trigger values at all locations for this parameter.

Please note, there are differences between the number of samples taken at each site. For phenol and VFAs, HS1A had 12 samples taken throughout the 2020-2021 monitoring period (one for each month). This is different from HS1, HS2, and HS3 which were not tested for phenol and VFAs in January 2021 and therefore only had 11 samples taken for the 2020-2021 monitoring period for those two parameters.

**Table 5-1: Hokio Stream median or range of water quality results (2020-2021 monitoring period)**

| Determinant | Units | No. of samples per site | ANZECC AE (95%) | HS1A | HS1 | HS2 | HS3 |
|---|---|---|---|---|---|---|---|
| **Leachate indicators** | | | | | | | |

| Determinant | Units | No. of samples per site | ANZECC AE (95%) | HS1A | HS1 | HS2 | HS3 |
|---|---|---|---|---|---|---|---|
| Ammoniacal-N | mg/L | 12 | 2.1 | 0.035 | 0.015 | 0.085 | 0.065 |
| Boron | mg/L | 12 | 0.370 | 0.055 | 0.055 | 0.06 | 0.06 |
| Chloride | mg/L | 12 | - | 23.45 | 24.15 | 24.95 | 25.2 |
| Conductivity | mS/m | 12 | - | 23.45 | 23.7 | 24.25 | 24.45 |
| | | | | | | | |
| Faecal coliforms | CFU/100mL | 12 | - | 235 | 145 | 165 | 140 |
| pH | - | 12 | - | 7.75 | 7.75 | 7.7 | 7.7 |
| Suspended Solids | mg/L | 12 | - | 51.5 | 33.5 | 42 | 31.5 |
| Phenol | mg/L | 11* | 0.320 | 0.025 | 0.025 | 0.025 | 0.025 |
| VFA | mg/L | 11* | - | 2.5 | 2.5 | 2.5 | 2.5 |
| TOC | mg/L | 12 | - | 8.35 | 8.05 | 7.85 | 8.65 |
| Alkalinity | mg CaCO3/L | 12 | - | 49 | 48 | 55 | 51 |
| COD | mg/L | 12 | - | 40 | 52 | 45.5 | 55.5 |
| BOD | mg/L | 12 | 2 | 1.25 | 1 | 0.75 | 1.25 |
| Nitrate-N | mg/L | 12 | 0.16 | **0.415** | **0.415** | **0.455** | **0.455** |
| Sulphate | mg/L | 12 | - | 17.45 | 18.55 | 17.35 | 18.25 |
| Hardness | mg CaCO3/L | 12 | - | 61 | 63 | 63 | 63.5 |
| Calcium | mg/L | 12 | - | 13.05 | 13.65 | 13.65 | 13.7 |
| Magnesium | mg/L | 12 | - | 6.88 | 6.915 | 6.985 | 6.97 |
| Potassium | mg/L | 12 | - | 2.925 | 3.14 | 3.255 | 3.16 |
| Sodium | mg/L | 12 | - | 18.55 | 18.65 | 19.95 | 19.5 |
| DRP | mg/L | 12 | - | 0.01 | 0.01 | 0.0095 | 0.012 |
| Aluminium | mg/L | 12 | 0.055 | 0.015 | 0.0145 | 0.011 | 0.013 |
| Arsenic | mg/L | 12 | 0.024 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |
| Cadmium | mg/L | 12 | 0.0002 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| Chromium | mg/L | 12 | 0.001 | 0.0005 | 0.0005 | 0.0005 | 0.0005 |
| Copper | mg/L | 12 | 0.0014 | 0.00125 | 0.0013 | 0.00115 | 0.00115 |
| Iron | mg/L | 12 | - | 0.035 | 0.035 | 0.0395 | 0.0415 |
| Lead | mg/L | 12 | 0.0034 | 0.00025 | 0.00025 | 0.00025 | 0.00025 |
| Manganese | mg/L | 12 | 1.9 | 0.0117 | 0.0127 | 0.0229 | 0.0203 |
| Mercury | mg/L | 12 | 0.0006 | 0.00025 | 0.00025 | 0.00025 | 0.00025 |
| Nickel | mg/L | 12 | 0.011 | 0.00025 | 0.00025 | 0.00025 | 0.00025 |
| Zinc | mg/L | 12 | 0.008 | 0.001 | 0.001 | 0.001 | 0.001 |

Note: **Bold** – denotes an exceedance of the ANZECC AE (95%) trigger values. Where the number of samples collected was 3 or more, a median of all samples for the monitoring period is reported.

* For phenol and VFA, HS1A had 12 samples taken throughout the 2020-2021 monitoring period (one for each month). This is unlike HS1, HS2, and HS3 which were not sampled for phenols and VFAs in January 2021 and therefore only had 11 samples taken for the 2020-2021 monitoring period for those two parameters.

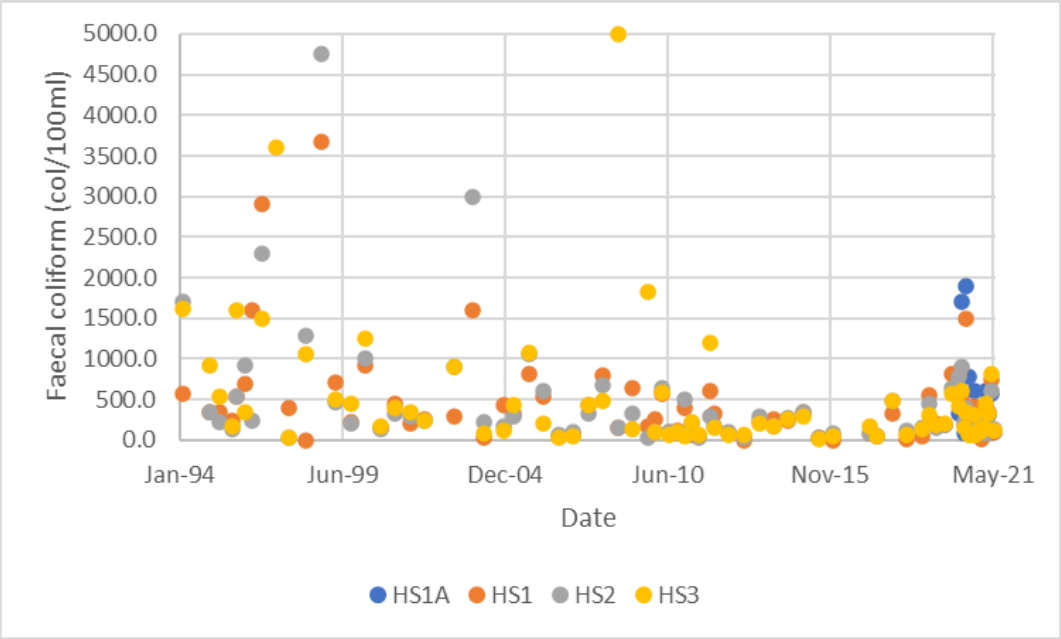



**Figure 5-2: Hokio Stream Faecal Coliform Counts, since 1994**

Figure 5-3 below plots the ammoniacal-nitrogen concentrations measured at the four sampling locations in the Hokio Stream since 1994, referenced against the ANZECC AE (95%) trigger value. All sites sampled within Hokio Stream were below the trigger value, with just one exception which was a significant exceedance at site HS2 in October 2016. Given this was the only exceedance it is considered an anomaly.

Conductivity and concentrations of ammoniacal-nitrogen and chloride have been reviewed for all Hokio Stream sites, in the context of the historical monitoring record. Historic results (and those for the latest monitoring period, 2020-2021) for conductivity and chloride are presented in Figure 5-4 and Figure 5-5 below.

Figure 5-6 below plots the boron concentrations measured at the four sampling locations in the Hokio Stream since 1994, referenced against the ANZECC AE (95%) trigger value. All sites sampled within Hokio Stream were below the trigger value, with just four exceptions. These were: at sites HS1, HS2, and HS3 in August 1996; and at site HS1 in April 2014. Given these are the only exceedances noted they are considered anomalies.

These parameters (ammoniacal-nitrogen, conductivity, chloride, and boron) are used as indicators of presence of leachate in Hokio Stream and have been monitored since 1994. On review of these historical records, it appears that all four parameters are relatively stable, and there is no clear increase or decrease at each of the locations over the long term.

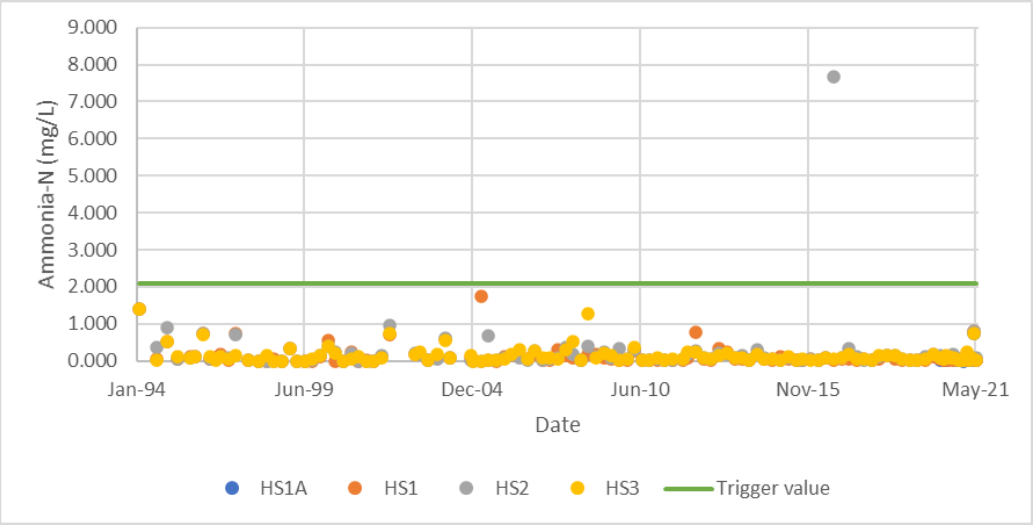


**Figure 5-3: Ammoniacal-Nitrogen Concentrations measured in Hokio Stream, since 1994. With the ANZECC AE (95%) trigger value depicted by a green line.**

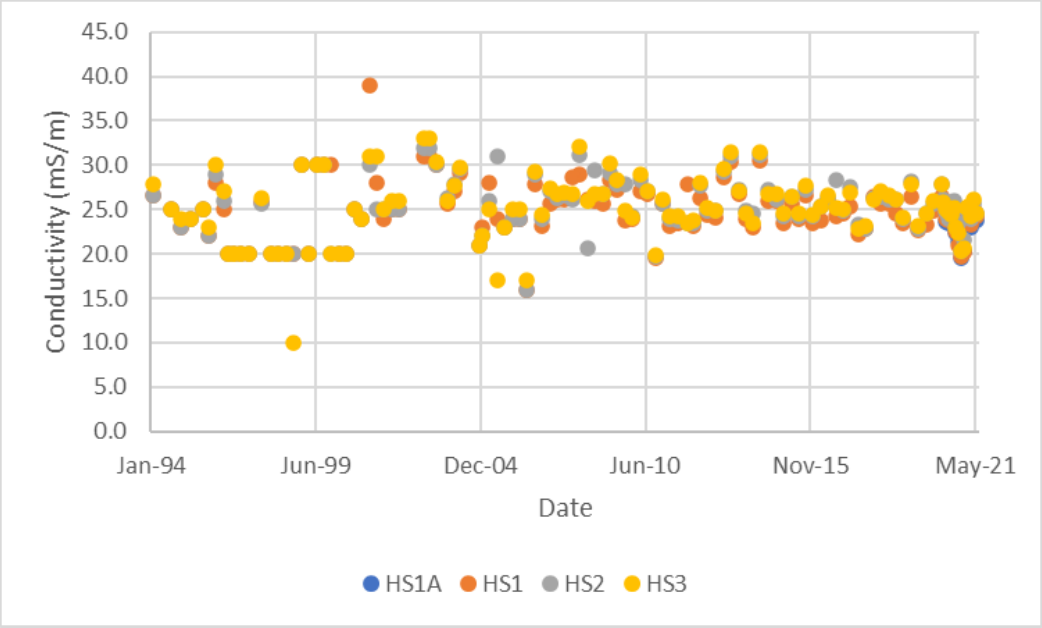



**Figure 5-4 Conductivity measured in Hokio Stream since 1994**

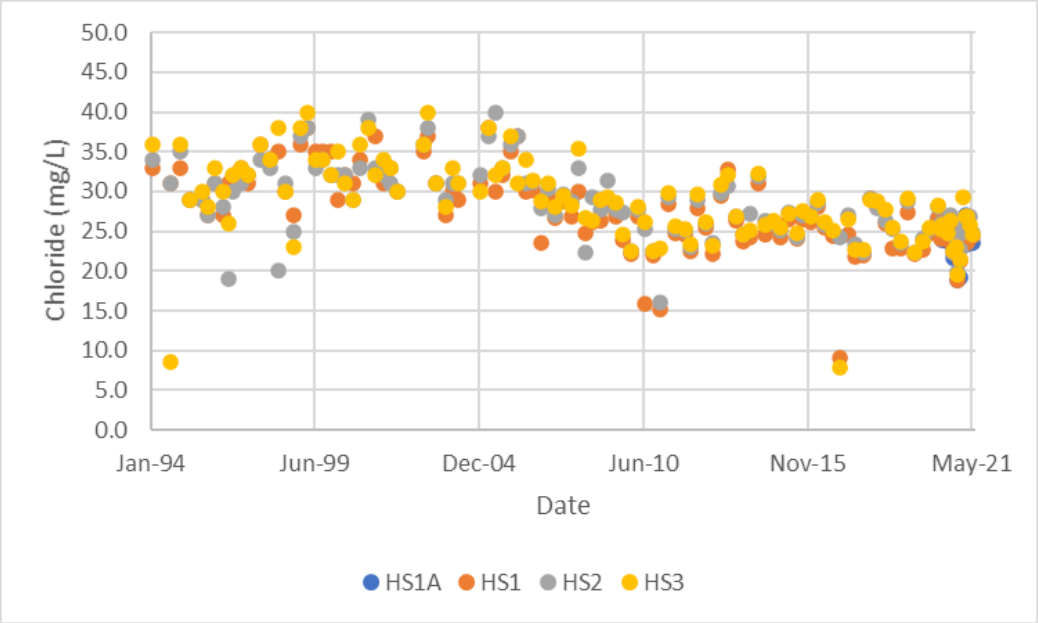



**Figure 5-5 Chloride measured in Hokio Stream since 1994**

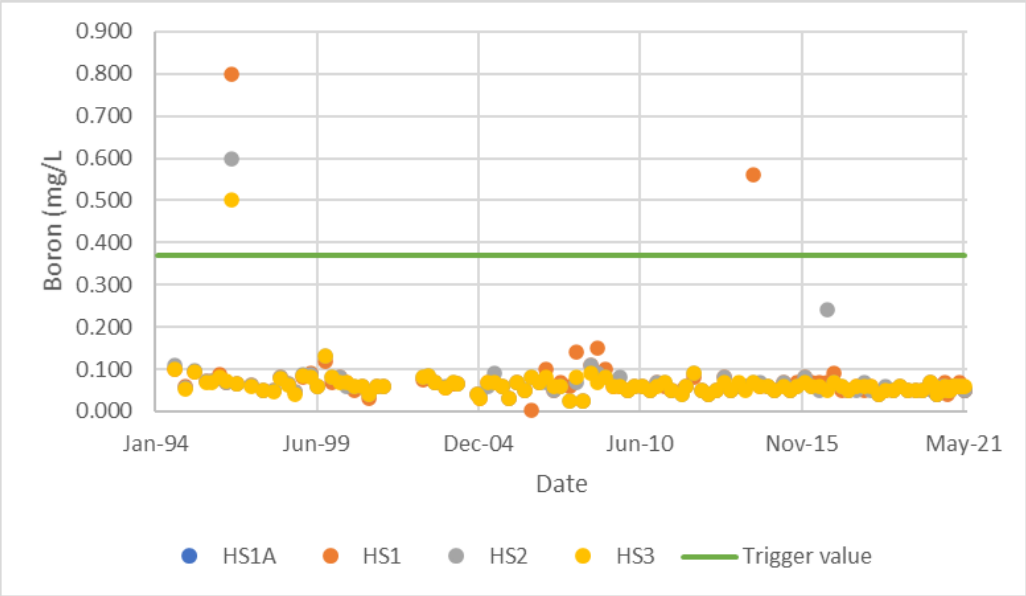



**Figure 5-6 Boron measured in Hokio Stream since 1994. With the ANZECC AE (95%) trigger value depicted by a green line.**

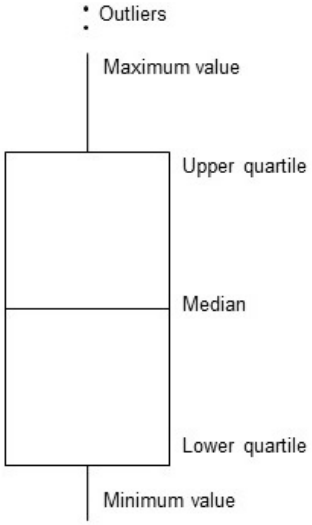
# 5.3 Surface Water Quality Analysis

An assessment of differences in water quality results between Hokio Stream sites upstream (HS1) and downstream (HS3) of the landfill has been undertaken for selected contaminants based on samples collected over the ten-year period from July 2011 to June 2021 inclusive. The assessment has included generation of box plots (Figure 5-7 to Figure 5-10) to enable a visual assessment of the data. In summary, there is a minor increase as we move downstream from HS1 to HS3in ammoniacal-nitrogen, conductivity, COD, and chloride concentrations. However, we see the opposite with pH and E coli with these parameters decreasing as we move from HS1 to HS3. The concentration of suspended solids showed no decreasing or increasing trends between the two sites.

Since April 2020, sampling location HS1A has been monitored with the purpose of replacing sampling location HS1 completely after 24 months. Sampling location HS1A is located further upstream than HS1 and has been sampled to provide greater certainty in comparisons between upstream and downstream sites of the landfill. Therefore, the results for sampling location HS1A are not discussed in this section though will be included in the following annual report for the 2021-2022 reporting period.

The following guide should be used to interpret the box plots in Figure 5-7 to Figure 5-10:[2]

[2] We note that in the box plots presented here, outliers were determined as being any values outside a range of over 1.5 times the interquartile range (IQR). The 'maximum' value is equal to the largest value no further than 1.5 times the IQR, while the 'minimum' value is equal to the smallest value no further than 1.5 times the IQR. Plots were generated using the geom_plot() function in R.



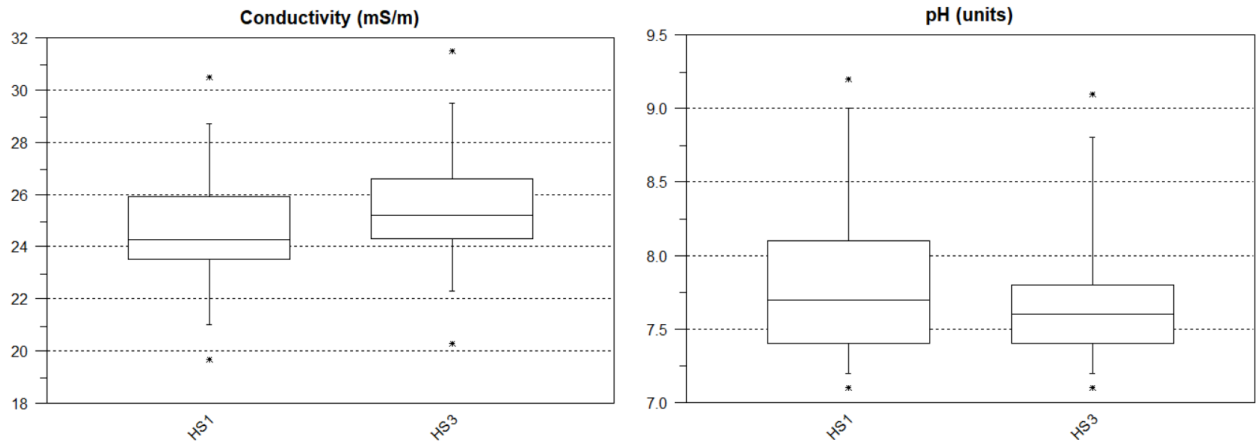




Figure 5-7 Box plots of paired water quality results (Conductivity and pH) for Hokio Stream sites HS1 and HS3, 2011 – 2021; n = 50 (for both parameters).

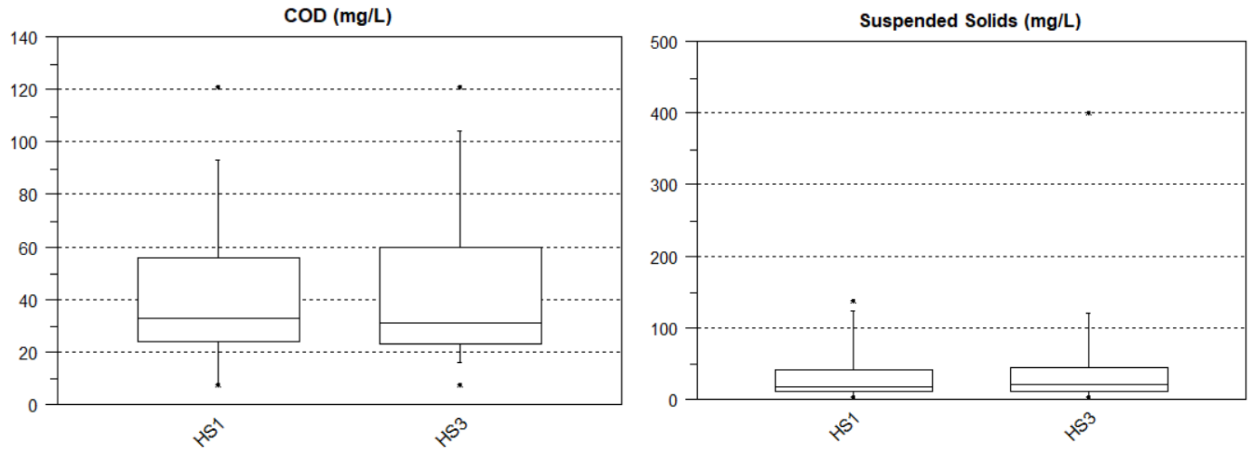



Figure 5-8 Box plots of paired water quality results (Chemical Oxygen Demand and Total Suspended Solids) for Hokio Stream sites HS1 and HS3, 2011 – 2021; *n* = 50 (for both parameters).

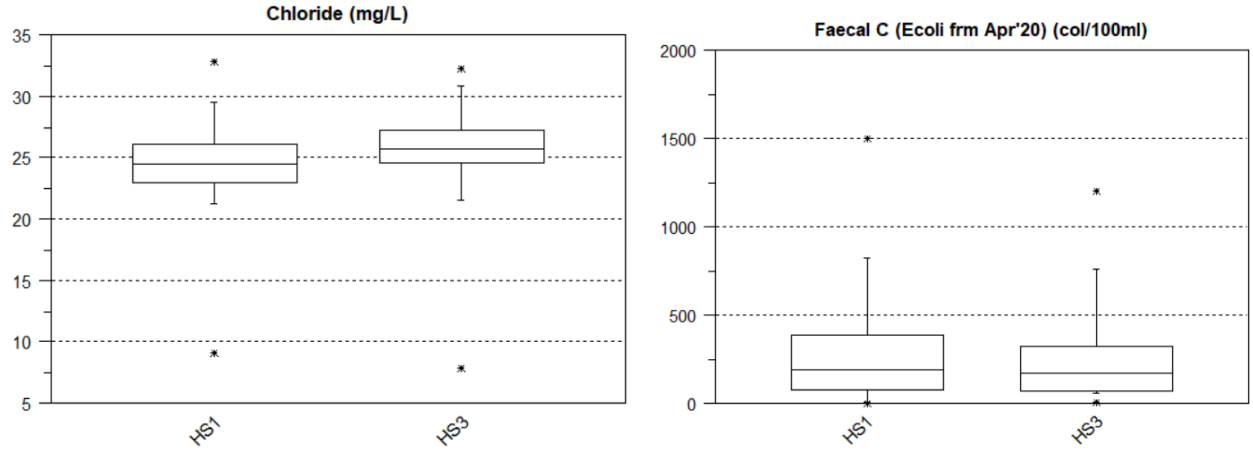



Figure 5-9 Box plots of paired water quality results (Chloride and Faecal Coliforms) for Hokio Stream sites HS1 and HS3, 2011 - 2021; *n* = 50 (for both parameters).

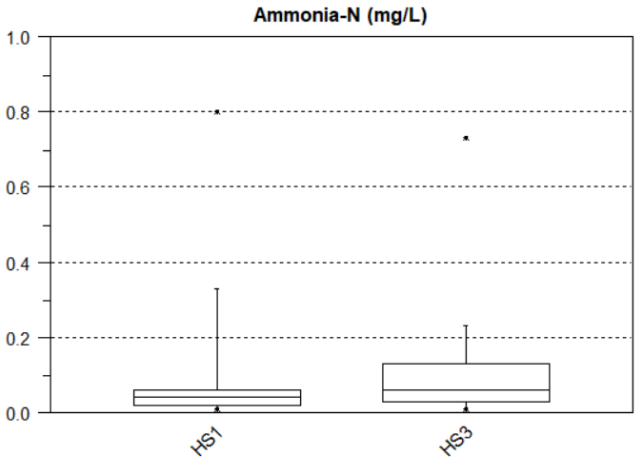



Figure 5-10 Box plots of paired water quality results (Ammoniacal-nitrogen) for Hokio Stream sites HS1 and HS3, 2011 – 2020; *n* = 50

# 5.4 Tatana Property Drain

## 5.4.1 Description of Sampling Locations

Stantec was commissioned by HDC in March 2015 to undertake a review of the water quality within a private drain located to the north of the Levin Landfill and to provide recommendations as to whether further monitoring and/or remediation was required. The report noted that water in the shallow drain was being impacted by landfill leachate within the vicinity of the unlined closed section of the landfill. The drain also interacts with the shallow groundwater aquifer, with groundwater emerging (daylighting) as surface water to the north of the landfill.

HRC subsequently requested that surface water in this drain along the Tatana property's boundary be monitored quarterly. Four sampling points were selected to represent upstream (SW1), midstream (SW2 & SW3) and downstream (SW4) flows at the Tatana property (see Figure 5-1).

The 2015 resource consent review (finalised in December 2019) has changed the requirements for sampling the Tatana Drain.

Sampling at SW1, SW2 and SW4 was discontinued after January 2020, and only SW3 has continued to be sampled from April 2020. SW3 is now called "TD1".

## 5.4.2 Sampling Results

During the 2020-2021 monitoring period, samples were collected in from TD1 in July 2020, October 2020, March 2021, and April 2021. The median water quality results for all parameters met the ANZECC AE (95%) trigger values, except for ammoniacal-n, BOD, nitrate-N, and boron concentrations, with these results indicated in **bold**, red lettering in Table 5-2.

Table 5-2: Tatana's Property Drain median water quality results

| Determinant | Units | No. of samples per site | ANZECC AE (95%) | SW3 (now TD1) |
|---|---|---|---|---|
| **Leachate indicators** | | | | |
| Ammoniacal-N | mg/L | 4 | 2.1 | **21.62** |
| Boron | mg/L | 4 | 0.370 | **0.54** |
| Chloride | mg/L | 4 | - | 127.15 |
| Conductivity | mS/m | 4 | - | 123.55 |
| | | | | |
| Faecal coliforms | CFU/100mL | 4 | - | 39 |
| pH | - | 4 | - | 7.3 |
| Suspended Solids | mg/L | 2 | - | 63.5 |
| Phenol | mg/L | 2 | 0.320 | 0.025 |
| VFA | mg/L | 2 | - | 4.25 |
| TOC | mg/L | 2 | - | 35 |
| Alkalinity | mg CaCO3/L | 2 | - | 419 |
| COD | mg/L | 4 | - | 202 |
| BOD | mg/L | 4 | 2 | **2.25** |
| Nitrate-N | mg/L | 4 | 0.16 | **0.875** |
| Sulphate | mg/L | 2 | - | 3.44 |
| Hardness | mg CaCO3/L | 2 | - | 271 |
| Calcium | mg/L | 2 | - | 53.9 |
| Magnesium | mg/L | 2 | - | 33 |
| Potassium | mg/L | 2 | - | 35.6 |
| Sodium | mg/L | 2 | - | 95.8 |
| DRP | mg/L | 2 | - | 0.029 |
| Aluminium | mg/L | 4 | 0.055 | 0.0095 |
| Arsenic | mg/L | 2 | 0.024 | 0.00075 |
| Cadmium | mg/L | 2 | 0.0002 | 0.0001 |
| Chromium | mg/L | 2 | 0.001 | 0.00075 |
| Copper | mg/L | 2 | 0.0014 | 0.000575 |
| Iron | mg/L | 2 | - | 0.235 |
| Lead | mg/L | 4 | 0.0034 | 0.00025 |
| Manganese | mg/L | 4 | 1.9 | 0.1905 |
| Mercury | mg/L | 4 | 0.0006 | 0.00025 |

| Determinant | Units | No. of samples per site | ANZECC AE (95%) | SW3 (now TD1) |
|---|---|---|---|---|
| Nickel | mg/L | 4 | 0.011 | 0.00235 |
| Zinc | mg/L | 2 | 0.008 | 0.002 |

Note: **Bold** – denotes an exceedance of the ANZECC AE (95%) trigger values.

The Tatana Property drain appears to be intercepting leachate-contaminated shallow groundwater, and then discharging this to the Hokio Stream. The key leachate parameters (ammoniacal nitrogen, conductivity and chloride) are all lower within the drain than in the shallow groundwater bores which are screened in the leachate plume. There was a slight increase observed in ammoniacal-nitrogen, conductivity, and chloride between sites HS1 and HS3. The median concentration values for conductivity did increase between HS2 and HS3 (where the Tatana property drain joins Hokio Stream), but by a very small margin.

The monitoring of Tatana's Drain indicates **non-compliance with the required ANZECC AE (95%) trigger values**.

The HRC compliance audit report of the 2019 - 2020 annual report recommended further work be done to understand the effect of the landfill. In response to this, the recommendations of this report (see section 18) include recommendations to:

- Determine correlations between wet weather events and sampling results for the Tatana Drain and Hokio Stream.
- Understand the temporal analysis of surface water monitoring.
- Improve the understanding of the effects the Tatana Drain may have on the Hokio Stream through modelling the surface water mixing.
- Take reference water levels at Tatana Drain.

# 6 Mass Loading Evaluation for the Hokio Stream

This section summarises the consent requirements and assessment of effects of landfill leachate in respect of mass loading projections for the Hokio Stream.

Consent conditions 11(d) and 11(e) of the Discharge Permit 6010 require, respectively, that an evaluation of contaminant mass load projections for the discharge of parameters from the landfill to the Hokio Stream is undertaken annually and that the significance of the findings be determined. The relevant consent text is provided in Appendix A.

## 6.1 Background

A Mass Contaminant Loading Assessment was originally completed for Levin Landfill in April 2011. The modelling incorporated many simplifying assumptions and the conservative estimation of parameters, including:

- That all aquifer through-flow discharges to the Hokio Stream. This is considered unlikely but has been incorporated into the model to provide a worst-case assessment.
- A further assumed worst-case scenario, that no attenuation of contaminants occurs between the monitoring wells and the discharge point into the Hokio Stream.
- Estimation of input parameters, including hydraulic conductivity 'K', has been conservative.
- Full vertical mixing of contaminants in the aquifer has been assumed to the relevant depth of plume considered.
- A low flow of 174 L/s in the Hokio Stream has been assumed. This is significantly lower than the mean flow of approximately 900 L/s and therefore will generally provide a worst-case assessment.

In combination these assumptions mean that the predicted downstream concentrations are likely to be significantly higher than in reality.

The assumptions underpinning the mass loading calculations have been reviewed in an attempt to identify any other factors which may be influencing the observed changes in spatial patterns in the plume that are referred to in Section 4.4.4.

Further, for this monitoring period, some additional changes have been made to the mass loading assessment assumptions, as explained in the next section.

Since April 2020, sampling location HS1A has been monitored with the purpose of replacing sampling location HS1 after 24 months. Sampling location HS1A is located further upstream than HS1 and has been sampled to provide

greater certainty in comparisons between upstream and downstream sites of the landfill. Given that there is presently limited information from sampling location HS1A, the results for sampling location HS1A have not been included in this section, although they will be included in the next annual report for the 2021-2022 monitoring period.

## 6.2 Mass Loading Analysis Update

The input data into the model spreadsheet includes groundwater quality within the leachate plume and upstream and downstream water quality within the Hokio Stream (HS1 and HS3 respectively). The data for the last five years were used to recalculate the input information which is summarised in Table 6-1. Medians over five years are considered appropriate to use, given that some parameters in the indicator list (e.g., sodium) are only tested once per year.

Bores B2, B3, C1, C2, C2DS and G2S have been used to represent the leachate plume in undertaking the mass loading analysis. Bores B2 and B3 were included in the mass loading analysis last year because of the high concentrations of parameters that are being recorded at those bores. It is noted that bore G2S is likely to be at the edge of, or outside, the leachate plume and therefore may no longer be representative of the main body of the leachate plume.

As in previous years, the shallow groundwater 'background' concentration of contaminants was included in the calculation to determine if any changes in the Hokio Stream water quality are influenced by background concentrations of contaminants in shallow groundwater. For this annual report, bores, D5, F2, and F3 have been included as being representative of background water quality. In contrast, bore G1s has been removed from the analysis to provide a better representation of the background water quality.

For the bores representing the leachate plume, the maximum and median results from the last five years for ammonia-N, boron, chloride, sodium, nitrate-N and DRP have been averaged and compared to the values used last year. Results for the maximum and median values for ammoniacal-N and boron were all similar to the 2019-2020 annual report. For the other parameters there were increases and decreases compared to the 2019-2020 annual report, this is denoted in the Table 6-1 as grey cells when the values have decreased and orange where the values have increased. Notably, surface water sampling locations upstream (HS1 and HS2) show a decrease in median nitrate-N and DRP. Bores representing the leachate plume show an increase in the average of maximum values for chloride, sodium, nitrate-N, and DRP. Bores representing the leachate plume also show an increase in the average of median values for nitrate-N and DRP.

**Table 6-1: Updated Model Input Data 2016-2021**

| Site | Ammoniacal-N g/m$^3$ | Boron g/m$^3$ | Chloride g/m$^3$ | Sodium g/m$^3$ | Nitrate-N g/m$^3$ | DRP g/m$^3$ |
|---|---|---|---|---|---|---|
| **HS1** (upstream) **5-year median** | 0.030 | 0.055 | 24.4 | 19.8 | 0.4150 | 0.016 |
| **HS3** (downstream) **5-year median** | 0.06 | 0.060 | 25.5 | 20.5 | 0.4550 | 0.0165 |
| **D5, F2, F3** (background groundwater) **5-year median** | 0.01 | 0.023 | 25.2 | 25.8 | 1.1500 | 0.127 |
| **Bores representing leachate plume** (B2, B3, C1, C2, C2DS, G2S) **average of maximum values** (over 5-years) | 79.03 | 1.685 | 385.0 | 261.8 | 26.0033 | 0.052 |
| **Bores representing leachate plume** (B2, B3, C1, C2, C2DS, G2S) **average of median values** (over 5-years) | 61.33 | 1.141 | 222.9 | 173.8 | 2.8517 | 0.027 |
| **Bores representing leachate plume - average of maximum values** (*removing background*) | 79.02 | 1.648 | 346.3 | 230.6 | 23.0867 | -0.095* |
| **Bores representing leachate plume - average of median values** (*removing background*) | 61.33 | 1.118 | 197.7 | 148.1 | 1.70 | -0.100* |

The median and maximum concentration of DRP when the background concentration is factored out gives a negative concentration (as indicated by results with an asterisk * in Table 6-1). Essentially this indicates that the background concentration of DRP is higher than that found in the leachate plume, which implies that leachate is not influencing the concentration of this parameter in groundwater down-gradient of the old landfill.

The plume width has been estimated as 300-500 m; this estimate has been retained within the mass contaminant loading model since 2014.

The predicted downstream concentrations of leachate indicators in the Hokio stream were calculated based on the average of maximum and median values from the leachate plume bores (B2, B3, C1, C2, C2DS and G2S). The ranges of results obtained are presented in Table 6-2. For comparison, the median results for the upstream and downstream sample locations (HS1 and HS3) are also included in Table 6-2. The detailed mass contaminant loading calculations are included in Appendix G.

The predicted downstream concentrations at HS1 and HS3 are similar, both when background concentrations are included and when they are excluded.

The predicted range of concentrations from the 2020-2021 mass contaminant load assessment shows general agreement with actual monitoring results obtained from HS1 and HS3. The concentrations obtained by sampling at the upstream site (HS1) and the predicted concentrations for the downstream site (HS3) meet ANZECC Lowland River DGV for 95$^{th}$ percentile species protection, the LDW trigger values and the Horizons One Plan guideline values, except for nitrate-n and DRP. Concentrations of nitrate-N, and DRP at HS3 exceeded the ANZECC Lowland River DGV for 95$^{th}$ percentile species protection. Concentrations of DRP also exceeded ANZECC Lowland River DGV for 95$^{th}$ percentile species protection. Nitrate-N and DRP exceeded the Horizons One Plan concentrations at HS3, and DRP at site HS1 exceeded the Horizons One Plan concentrations.

The inference from these results is that the leachate contamination within the groundwater plume from the old landfill area is affecting the quality of water in the Hokio Stream to a minor extent only. By far the greatest contributions to the concentrations of measured parameters in the Hokio Stream are arising from sources unrelated to the old landfill and are in fact originating from upstream of the landfill site

The water quality of the Hokio Stream is influenced strongly by its urban and rural catchments. The actual and predicted results indicate that the impact from the Levin Landfill on the Hokio Stream is likely to be minimal within the wider catchment context.

**Table 6-2: Predicted Leachate Impact on Hokio Stream 2020-2021**

| | | Ammoniacal-N g/m³ | Boron g/m³ | Chloride g/m³ | Sodium g/m³ | Nitrate-N g/m³ | DRP g/m³ |
|---|---|---|---|---|---|---|---|
| Guideline values | ANZECC 2000 DGVs for Freshwater (Table 3.3.10 Lowland River) | 0.021 | - | - | - | 0.444 | 0.01 |
| | ANZECC 2000 DGVs for Freshwater (Table 3.4.1 95% protection) | 0.9 | 0.37 | - | - | - | - |
| | ANZECC LDW trigger values | NA | 5 | - | - | 90.3 | NA |
| | Horizons One Plan - Hokio Stream (Schedule E) | 0.4 | - | - | - | 0.167 (SIN) | 0.01 |
| Predicted range of downstream concentration including background concentrations | | 0.05-0.49 | 0.06 | 24.46-26.51 | 19.85 – 21.22 | **0.42 – 0.56** | **0.016** |
| Predicted range of downstream concentration excluding background concentrations | | 0.05 – 0.49 | 0.06 | 24.45 – 26.28 | 19.84 – 21.03 | **0.42 – 0.55** | **0.015 – 0.016** |
| Actual 2016-2021 median upstream concentration (HS1) | | 0.030 | 0.055 | 24.4 | 19.8 | 0.4150 | **0.016** |
| Actual 2016-2021 median downstream concentration (HS3) | | 0.06 | 0.060 | 25.5 | 20.5 | **0.4550** | **0.0165** |

Note: bold text indicates predicted exceedances of the ANZECC lowland river DGVs, underlined text indicates exceedance of the Horizons One Plan for the Hokio Stream. There were no predicted exceedances of the ANZECC Livestock Drinking Water trigger values or the ANZECC toxicity 95% protection trigger values.

### 6.2.1 Current assumptions

The assumptions currently applied to calculate mass loads for contaminants from the landfill are summarised below.

#### Flow volume of Hokio Stream

A minimum flow of 174 L/s (15,034 $m^3$/day) is assumed in the Hokio Stream. This has been applied since 2011; the flow volume selected represents a conservative approach as it is significantly lower than the mean flow of 900 L/s.

#### Extent of the groundwater aquifer

Various combinations of aquifer width and depth are applied in the calculations as part of the sensitivity analysis; results are therefore reported as ranges.

The assumptions applied in each combination are depicted in Figure 6-1.

| | | Thickness (m) | | |
|---|---|---|---|---|
| | | 5 | 10 | 15 |
| Width (m) | 300 | 1500 | 3000 | 4500 |
| | 400 | 2000 | 4000 | 6000 |
| | 500 | 2500 | 5000 | 7500 |

**Figure 6-1 Assumptions for aquifer extent applied in mass load calculations (screenshot from model spreadsheet, 2021)**

#### Hydraulic conductivity (*k*)

Mass load calculations assume a hydraulic conductivity of 0.00002 m/s (1.73 m/day) (this can range between 0.5 – 2.0 m/day based on field data collected in July 2012).

#### Hydraulic gradient (*i*)

A value of 0.0059 has been maintained since 2011. This was developed based on groundwater level monitoring undertaken between 2004 and 2010. We recommend that this is reviewed using groundwater level data recorded during the next year's sampling events.

#### Background groundwater quality

Calculations have been run to account for background groundwater quality by removing loads from bores D2, F2 and F3 (as representative of 'background) from the calculations for 5-year averaged maximum and median values. A second series of calculations has been done including background groundwater quality which shows that there is minimal difference between including or excluding the background water quality concentrations of monitored parameters.

# 7 Stormwater Discharges

Condition 16 of Discharge Permit 102259 requires that annual monitoring to determine the effects of stormwater soakage on groundwater quality be carried out on site. This can be done in conjunction with the sampling of groundwater under Condition 15 of Discharge Permit 102259.

As shown in the Site Plan in Appendix C, stormwater is discharged to a central inter-dune depression located to the west of the access road leading to the lined landfill area. From here it soaks to groundwater. When groundwater levels are high in winter, water tends to pond in the inter-dune depression.

Based on the current understanding of groundwater flow directions, bores D3r and F3 are hydraulically up-gradient of the stormwater soakage area, and bores E1D, E1S, D4 and D2 are hydraulically down-gradient.

The environmental monitoring results for the last 10 years are presented in Appendix E. Table 7-1 below summarises compliance for the 2020-2021 sampling period with the ANZECC 2000 LDW trigger values. Compliance is assessed using median values across the reporting period.

The results indicate that groundwater quality in the bores D3r, F3, E1S, D4 and D2 is similar to that of the background bore (G1S). However, we note that the suitability of bore G1S as a representation of background groundwater quality is to be confirmed following a review of groundwater flow directions, once sufficient groundwater level data have been collected.

A summary of these results can be found in section 4.

**Table 7-1: Summary of Selected 2020-2021 Bore Results for Stormwater Consent**

| Borehole | ANZECC 2000 LDW | Comments |
|---|---|---|
| D3r (background) | Complies | Nil |
| F3 (background) | Complies | Nil |
| E1D | Complies | Nil |
| E1S | Complies | Nil |
| D4 | Complies | Nil |
| D2 | Complies | Nil |

# 8 Landfill Gas and Odour Monitoring

The resource consent review that was concluded in December 2019 introduced new reporting requirements for landfill gas and odour monitoring under Discharge Permit 6011.

Condition 8F of Discharge Permit 6011 requires the Permit Holder to maintain a log of all other inspections, investigations and actions taken in accordance with all monitoring and odour inspection conditions of the consent. A summary is to be included in the Annual Report which follows under this section.

## 8.1 Odour Monitoring at Landfill Boundary

Condition 3 of Discharge Permit 6011 requires the Permit Holder to undertake monitoring at the landfill boundary for offensive odour or dust. This is to be in accordance with the methodology set out in the Odour Management Plan, as required under condition 4(m)(iii) of Discharge Permit 6011.

HDC has carried out twenty-one odour assessments at the landfill boundary on eighteen different days. A summary of the results is given in Table 8-1 below with the full set of results being attached in Appendix H. The location of the landfill boundary is seen in Figure 8-1 below.

**Table 8-1: Summary of Odour Assessments at the Landfill Boundary**

| Created | Location - Wind direction[1] | Wind speed | Odour intensity | Odour character | General hedonic tone | Apparent source of odour | Action undertaken |
|---|---|---|---|---|---|---|---|
| 17-07-20 13:54 | E - From NW | 1 - Light air | 1 - Very weak | 10 - Faecal, manure, sewer | -1 - A bit unpleasant | Cow manure in next door paddock | N/A |
| 24-07-20 13:39 | E - From NW | 4 - Moderate breeze | 0 - No odour | | | N/A | N/A |
| 24-07-20 13:53 | D - From W | 4 - Moderate breeze | 1 - Very weak | 20 - Fresh rubbish | -1 - A bit unpleasant | Either tip face or decaying wood. Hard to tell character as very weak | N/A |
| 03-08-20 9:28 | G - From NE | 2 - Light breeze | 2 - Weak | 20 - Fresh rubbish | -1 - A bit unpleasant | I believe the source of odour is the tip face. However, odour is weak and also has an earthy character | N/A |
| 03-08-20 9:42 | H - From E | 1 - Light air | 1 - Very weak | 17 - Bark/soil | 0 - Neutral | Surrounding trees and grass | N/A |
| 31-08-20 9:54 | E - From NW | 2 - Light breeze | 2 - Weak | 20 - Fresh rubbish | -1 - A bit unpleasant | Tip face (mostly weak, with some moments brief of distinct odour) | N/A |
| 09-09-20 13:58 | E - From NW | 3 - Gently breeze | 3 - Distinct | 20 - Fresh rubbish | -2 - unpleasant | Intermittent distinct odour seemingly originating from tip face. Majority of time very weak to no odour. | N/A |
| 09-09-20 14:47 | D - From W | 2 - Light breeze | 3 - Distinct | 20 - Fresh rubbish | -2 - unpleasant | Tip face - consistent smell at fence line. | N/A |
| 25-09-20 9:29 | F - From N | 2 - Light breeze | 1 - Very weak | 20 - Fresh rubbish | -1 - A bit unpleasant | Tip | N/A |
| 08-10-20 14:25 | C - From SW | 1 - Light air | 1 - Very weak | 4 - Herbal, green, cut grass | 1 - A bit pleasant | Pine trees & grass | |
| 06-11-20 12:15 | E - From NW | 3 - Gently breeze | 2 - Weak | 20 - Fresh rubbish | -1 - A bit unpleasant | Landfill Tip face | Ongoing proactive odour assessment. |
| 13-11-20 14:30 | E - From NW | 2 - Light breeze | 2 - Weak | 4 - Herbal, green, cut grass | 0 - Neutral | Long grass | N/A |
| 18-12-20 13:39 | E - From NW | 3 - Gently breeze | 1 - Very weak | 17 - Bark/soil | 0 - Neutral | Pine trees and grass etc | N/A |
| 12-01-21 9:04 | G - From NE | 1 - Light air | 2 - Weak | 20 - Fresh rubbish | -2 - unpleasant | Tip face | |
| 12-02-21 11:23 | D - From W | 2 - Light breeze | 2 - Weak | 20 - Fresh rubbish | -1 - A bit unpleasant | Tip face | N/A |
| 12-03-21 11:38 | C - From SW | 1 - Light air | 1 - Very weak | 16 - Musty, earthy, mouldy | 0 - Neutral | Musty woods and leaves | N/A |
| 26-03-21 14:25 | E - From NW | 3 - Gently breeze | 0 - No odour | | | N/A | N/A |
| 09-04-21 11:16 | G - From NE | 2 - Light breeze | 3 - Distinct | 20 - Fresh rubbish | -2 - unpleasant | Tip face | |
| 16-04-21 9:47 | D - From W | 2 - Light breeze | 2 - Weak | 20 - Fresh rubbish | -1 - A bit unpleasant | Tip face fresh rubbish. | N/A |
| 13-05-21 11:10 | D - From W | 1 - Light air | 1 - Very weak | 16 - Musty, earthy, mouldy | 0 - Neutral | Pine trees and greenery in the area | N/A |
| 08-06-21 8:56 | G - From NE | 2 - Light breeze | 2 - Weak | 4 - Herbal, green, cut grass | 0 - Neutral | Long grass + paddock next door | N/A |

NOTES: (1) The location of the assessment is based on Figure 5.1 of the Odour Management Plan which is reproduced as Figure 8.1 in this report.

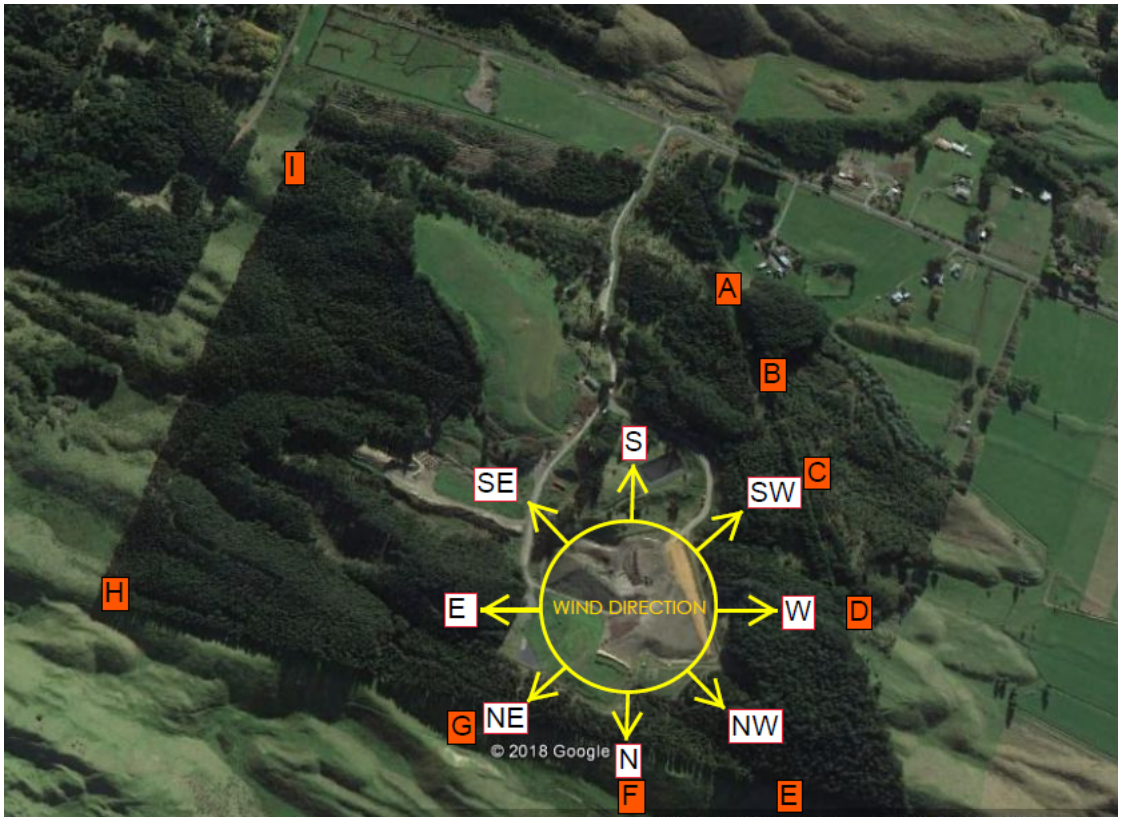



**Figure 8-1 Location of Landfill Boundary Odour Assessments (Source: Figure 5.1 of the Odour Management Plan)**

On two occasions no odour was detected at all. On nine occasions the conclusions of the assessors were: "*I did detect odour and consider it would not be objectionable at any location for any duration or frequency*". For the remaining ten occasions, the conclusions were: "*I did detect odour and consider it would not be objectionable, UNLESS it became continuous*".

In all cases no further action was undertaken.

## 8.2 Gas Detection in Groundwater Monitoring Wells

Condition 4(a) of Discharge Permit 6011 requires landfill gas sampling to be undertaken at each bore on every occasion that groundwater sampling is carried out.

Landfill gas monitoring commenced in January 2010**. Low concentrations of methane ($CH_4$) were detected** during the October 2020, April 2021, and June/July 2021 monitoring rounds. High concentrations of methane were detected in the January 2021 monitoring round and hydrogen sulphide was detected in the June/July 20201 monitoring round. A summary of these results is as follows:

- 1 October 2020 – methane was detected in trace amounts in 10 of the 23 groundwater monitoring bores. The highest recorded level was 0.08% in bore E2D, which is 800ppm.
- 5 January 2021 – methane was detected in various amounts in 20 of the 23 groundwater monitoring bores. The highest recorded level was 0.94% in bore D4, which was 9,400ppm. Another nine bores also recorded levels above 5,000ppm.
- 8, 9, and 12 April 2021 – methane was detected in only 1 of the 26 groundwater monitoring bores, with a concentration of 0.02% being recorded.
- 9 June, 13 and 14 July 2021 – out of 29 bores, methane was detected in 14 bores with the highest recorded level being 0.55% in bore D6. Hydrogen sulphide was also detected at bore D5 with a concentration of 0.05% (500ppm)

Refer to Appendix I for the gas monitoring results. We note that the results were collected by a third party on behalf of HDC, and we have not been able to independently verify details regarding the data provided to us (and presented in Appendix I), such as the units of measurement, measurement uncertainty ranges and potential reasons for the exceedances (such as equipment malfunction, or other operational cause).

It is recommended that gas detection results be provided to HDC and the party responsible for compiling the quarterly reports as soon as they are available, rather than waiting for the Annual Report. This has been acted on for the last four quarterly reports.

## 8.3 Monitoring of Surface Emissions and Bio-filter

Condition 4(e) of Discharge Permit 6011 requires the Permit Holder to undertake monthly methane surface monitoring of the temporary and permanent capped areas of the landfill and the bio-filter.

Condition 4(f) of Discharge Permit 6011 states the levels which the surface concentrations of methane should not exceed. Any exceedance requires remedial action to be undertaken within 24 hours and retesting to be done within 24 hours of the remediation having been done.

HDC has engaged Envirowaste to undertake the surface emissions monitoring and this commenced in March 2021. As such, HDC has not fully complied with the resource consent conditions to monitor surface emissions on a monthly basis.

Table 8-2 summarises the surface emissions testing undertaken in the reporting year. The reports provided by Envirowaste for the testing are included in full in Appendix J.

**Table 8-2: Summary of Surface Emissions Testing Carried Out at Levin Landfill**

| Date of Assessment | Methane results >200ppm | Compliance | Actions taken | Methane results on re-test | Compliance |
|---|---|---|---|---|---|
| 18 March 2021 | 14 locations > 200ppm; $CH_4$ concentrations varied from 319 ppm to 4,395 ppm | No | Remediated areas using either clay material or bentonite granules and water, depending on size of area | Vary from 0 ppm to 194 ppm | Yes |
| 22 April 2021 | 7 locations > 200ppm; $CH_4$ concentrations varied from 217 ppm to 1,278 ppm | No | Remediated areas using bentonite granules and water. One area was also treated with clayey material when re-test was > 200 ppm. | Vary from 13 ppm to 155 ppm | Yes |
| 27 May 2021 | 29 locations > 200ppm; $CH_4$ concentrations varied from 211 ppm to 800 ppm | No | Remediated areas using either clay material or bentonite granules and water, depending on size of area | Vary from 9 ppm to 186 ppm | Yes |
| 11 June 2021 | 15 locations > 200ppm; $CH_4$ concentrations varied from 224 ppm to 600 ppm | No | Remediated areas using bentonite granules and water. | Vary from 40 ppm to 185 ppm | Yes |

Surface emissions testing of the bio-filter was carried out in April 2021, May 2021, June 2021 with 0 ppm being recorded.

Condition 4(j) of Discharge Permit 6011 sets out the requirements for monitoring and recording data at the bio-filter. Table 8-3 below sets out a summary of the requirements and notes the extent to which compliance has been achieved.

**Table 8-3: Summary of Bio-filter Inspections and Maintenance**

| Requirement | Comments | Compliance |
|---|---|---|
| Daily visual inspection | Not fully consistent. HDC staff carry out visual checks when on site and the Contractor does a visual check weekly. | No |
| Continuous display of fan discharge differential pressure | Differential pressure and moisture content available on SCADA from June 2020. | Yes |
| Weekly monitoring and recording of the bio-filter bed moisture content | Done through SCADA telemetry | Yes |
| Weekly recording of pressure across the bio-filter bed | Done through SCADA telemetry | Yes |
| Weekly recording of the pH of the bio-filter media | Not implemented | No |
| Quarterly raking and loosening of bio-filter media | Commenced in August 2020 | Yes |

During the monitoring period discussions were had with HRC and the NLG about de-commissioning the bio-filter and having the landfill gas that used to be directed to it, piped to the landfill gas ring main so that it can be flared off.

Not only would this be an environmentally improved way of dealing with the landfill gas, but the bio-filter has experienced problems with drainage water flowing back to the fan from the bio-filter bed, which has disrupted the running of the fan.

It was agreed that this change should be implemented and a consent variation has been applied for with HRC to effect this.

## 8.4 Meteorological Data

Condition 4(p) of Discharge Permit 6011 requires the Permit Holder to collect meteorological data from an on-site weather station. Condition 4(q) requires the Permit Holder to provide that information to the Regional Council.

Prior to March 2021 weather data was taken from the old weather station at 645 Hokio Beach Road. The data was recorded at this station every 15 minutes, rather than at 1-minute intervals. The new weather station was initially ordered in mid-2020, but delivery was delayed until 2021.

From April 2021 onwards weather data has been taken from the new station located at the landfill office. Issues occurred with some of the readings in June 2021 (particularly temperature and humidity) due to water ingress causing corrosion of the plug-in sensor terminals. The station has since been repaired and was reinstalled in mid-August.

The following data has been collected over the reporting period:

- wind direction and speed
- air temperature
- barometric pressure
- relative humidity
- rainfall.

The information collected meets the consent requirements except that monitoring was to have been at 1-minute intervals and was to be averaged to 10-minute time periods. The new weather station complies with this though the old weather station did not.

# 9 Monitoring Results Compliance

This section contains a brief summary of compliance (or otherwise) with the resource consent conditions for the landfill site. This summary should be considered in the context provided throughout this report, especially around the existing consent requirements for monitoring (i.e., where a single sample is required per year) and where non-compliance has been reported as a result of a low/marginal detection as opposed to a significantly elevated result.

## 9.1 Groundwater - Sand Aquifer

Consent conditions for the site (Discharge Permit 6010, Condition 11) require shallow groundwater quality to be compared with ANZECC 2000 LDW trigger values. These values were not exceeded by median results during the 2020-2021 monitoring period.

## 9.2 Groundwater - Gravel Aquifer

Condition 12 of Discharge Permit 6010 requires groundwater quality within the deeper gravel aquifer to be compared with DWSNZ values.

There were four exceedances in samples from bores monitoring the gravel aquifer during the 2020-2021 monitoring period:

- The iron concentration in G1D exceeded the NZDWS GV
- The manganese concentration in C2DD and XD1 exceeded the NZDWS GV
- Faecal coliforms at XD1 exceeded the NZDWS GV.

Historically both iron and manganese concentrations have exceeded the NZDWS GVs and so those exceedances are not considered to be significant.

XD1 has only been sampled twice; on one occasion faecal coliforms were not detected and on the other they were so there is no consistent history of results to draw upon. What is certain is that faecal coliforms have rarely been elevated in the deep aquifer, so the detection result is more likely to be an anomaly.

## 9.3 Surface Water – Hokio Stream and Tatana's Drain

Consent conditions for the site (Discharge Permit 6010, Condition 11) require that surface water quality in the Hokio Stream and Tatana Drain be compared with ANZECC AE (95%) trigger values.

The nitrate-N concentrations exceeded the trigger value at sites HS1A, HS1, HS2, and HS3 in the Hokio Stream. At Tatana's Drain, samples from the SW3 (now TD1) monitoring site exceeded the trigger values for ammoniacal-N, BOD, nitrate-N, and boron.

It is recognised that there is contamination of the groundwater arising from leachate from the old, closed landfill. As determined from site observations, flows within the Tatana Drain are literally a trickle, particularly during the summer periods and whilst the Tatana Drain connects to the Hokio Stream, the volume flow within the Tatana Drain is significantly less[3] than that of the Hokio Stream and any effects from the inflow of Tatana Drain water to the Hokio Stream will be rapidly diluted.

The significance of the Tatana Drain from an ecological point of view has not been established, however it is known to have been developed by the owner of the property and is periodically cleaned out by the owner using an excavator. On that basis, the ecological values of the drain are likely to be low.

## 9.4 Stormwater

Groundwater bores E1D, E1S, D4 and D2 are currently understood to be located hydraulically down-gradient of the stormwater soakage area on the site, and groundwater quality in these bores was compared with the ANZECC 2000 LDW trigger values. There were no exceedances of the LDW trigger values during the 2020-2021 monitoring period.

## 9.5 Landfill Gas and Odour Monitoring

Odour monitoring was carried out on twenty-one occasions at the landfill boundary in accordance with the methodology described in the Odour Management Plan. No further action was considered necessary following the inspections.

Concentrations of methane, carbon dioxide, hydrogen sulphide and oxygen were monitored quarterly during the 2020-2021 monitoring period with elevated levels of methane and hydrogen-sulphide being measured on occasions (refer to Section 8-2). A copy of gas monitoring results is provided in Appendix I. The existing consent does not require assessment of the concentrations of landfill gases detected against any limits. However, the elevated results in some groundwater bores stress the need for samplers to take precautions when sampling and to avoid inhaling gases from the bores when measurements are being taken.

Monthly surface methane emissions monitoring is required over all temporary and capped areas of the landfill and at the bio-filter. HDC has engaged Envirowaste to undertake this testing. Surface emissions monitoring of areas that have been capped with temporary capping has been carried out from March 2021.

On each occasion there have been areas identified on the landfill where methane concentrations have exceeded 200 ppm, thus requiring remediation.

Remediation has been undertaken to repair the capped surface and this has been done either using bentonite granules with water being added or by compacting additional clay material onto the capping surface. Re-test results have complied with the allowable methane concentration levels.

There are a range of inspections and maintenance requirements for the bio-filter. HDC complies with some of these but still needs to implement a daily visual check of the bio-filter, as well as monitoring and recording the pH of the filter bed media. Raking and loosening of the bio-filter media commenced in August 2020.

HDC is required to collect meteorological data from an on-site weather station. This has been undertaken throughout the reporting period. The old weather station recorded weather data every 15-minutes as opposed to the 1-minute interval stated in the consent conditions, however, the new weather station installed at the site office complies with the consent conditions.

[3] Flow in the Tatana Drain has been estimated to be between 10L/s and 50L/s, whereas the average flow reported in the Hokio Stream (September 1980 – June 1982) was 833L/s.

# 10 Refuse Density

Condition 14 of Discharge Permit 6010 requires that the in-situ density of the waste be checked each year through an annual survey of the landfill and borrow areas. The compaction density is required to be between 600 and 800kg/m$^3$ (0.6 – 0.8 tonnes/m$^3$).

The methodology used is the same that has been used for the past 14 years of compaction analyses. The evaluation was performed using waste quantity data obtained from weighbridge records and the corresponding volume of airspace used from surveys carried out in June 2020 and July 2021.

Refuse disposal data for the assessment period from July 2020 to June 2021 was provided by MidWest Disposals Ltd. The volume of airspace used in the landfill was determined from the comparison of topographic surveys performed in June 2020 and July 2021 by Adamson Shaw Surveyors.

The topographic survey information is provided in Appendix K. The airspace consumed by refuse and daily cover was 42,340 m$^3$.

The results of the evaluation are summarised Table 10-1.

**Table 10-1: Refuse Density 2012 –2021**

| Year | 12-13 | 13-14 | 14-15 | 15-16 | 16-17 | 17 - 18 | 18 - 19 | 19 - 20 | 20 - 21 |
|---|---|---|---|---|---|---|---|---|---|
| Volume used (m$^3$) | 37,799 | 44,058 | 37,962 | 36,599 | 30,004 | 39,192 | 32,437 | 58,287 | 42,340 |
| Waste tonnage (tonnes) | 32,784 | 38,141 | 35,834 | 36,981 | 29,894 | 36,420 | 30,160 | 38,132 | 38,921 |
| Apparent density (tonnes/m$^3$) | 0.87 | 0.87 | 0.94 | 1.01 | 1.00 | 0.93 | 0.93 | 0.65 | 0.92 |
| Airspace rate of use (m$^3$/tonne) | 1.15 | 1.16 | 1.06 | 0.99 | 1.00 | 1.08 | 1.08 | 1.53 | 1.09 |

The Apparent Density for the year 2020-2021 was 0.92 tonnes/m$^3$ which is slightly higher than the 0.90 t/m$^3$ average over the 2012 to 2021 period.

**The compaction density meets the consent requirement to be above 0.6 t/m$^3$**.

Other observations that have been made include:

- The waste tonnage received at the landfill between July 2020 and June 2021 was 38,921 tonnes.
- In the previous year the pro-rated annual waste tonnage was 33,139 tonnes.
- In real terms, the 2020/2021 annual tonnage increased by 17.4% compared to the 2019/2020 year's tonnage.
- There was an estimated 11,574 m$^3$ of sand excavated from the borrow area, and which, presumably, was all used for cover purposes. The percentage of sand to refuse is 30% which is relatively high but is a reflection of the shape of the landfill, with much of the completed side slopes requiring intermediate cover.
- This past year there was an estimated 1,096m$^3$ of crushed glass having been used in the landfill.
- There was an estimated 177m$^3$ of cleanfill used for cover purposes.
- Approximately 2,364 m$^3$ of greenwaste mulch was used as a sand protection layer over the front face, top and side slopes of the landfill.
- This past year no imported wood/bark was used for daily cover.

# 11 Old Landfill Remediation

Condition 15 of Discharge Permit 6010 required the old landfill (Area A) to be remediated by April 2011. The remediation was to encompass:

- Grading the landfill faces and cap to a final slope of between 1V : 3H and 1V : 4H
- Slope the final landfill surface to promote run-off to the outside of the footprint to prevent ponding on the landfill surface
- Ensure the landfill cap incorporates a layer of at least 700mm in thickness. Where extra material is required, it must be of clayey soil origin
- Establish grass or tussock vegetation on the capped landfill.

Condition 15(f) of Discharge Permit 6010 requires that the condition of the unlined landfill be reported annually, together with any maintenance carried out in the previous year.

The capping of the old landfill was carried out as outlined in the 2010 -2011 Levin Landfill Compliance Report. The old landfill area has good grass cover. The top of the old landfill has been used for stockpiling clay and topsoil materials that will be used in the future elsewhere on the landfill.

To monitor settlement, ten monitoring points were established on top of the old landfill as part of the survey which was carried out in June 2014. The locations of the monitoring points are shown in Appendix L. Also shown is the extent of settlement estimated by comparing this year's survey information with that done last year.

Monitoring point IT6, which was located on a mound of clayey soil, has been destroyed with the clayey material being used elsewhere on site. Also, monitoring point IT8 could not be located, presumably having been covered with clay or topsoil materials. It is recommended that the monitoring points that have been lost or destroyed be re-established.

The most settlement has occurred at the southern end of the closed landfill, which is not surprising since this is the area where there have been truck movements bringing in clay and topsoil materials.

Monitoring point IT7 has settled the most (259mm ±10mm) since monitoring began, with monitoring point IT10 settling 228mm over the same period. Over this past year monitoring point IT10 settled the most (53mm) with monitoring point IT7 settling 45mm over the same period.

Settlement of the old landfill is to be expected as the underlying waste degrades.

A recommendation of last year's Annual Report was that some minor depressions that had formed on the surface of the old landfill and which had been exacerbated through vehicles tracking onto the landfill in winter, causing localised rutting, should be filled in. HRC's compliance report[4] required those areas be filled with capping material by 29 January 2021. This work was completed by the required date and the completed works are shown in Figure 11-1 below.

**Figure 11-1 Photographs taken on 19 January 2021 showing repairs made to the old landfill surface.**

A visual inspection of the old landfill surface was done on 20 September 2021 by a Stantec staff member. The inspection followed a prolonged period of rain. It was clear during the inspection that further rutting of the clay cap has been caused by vehicles, presumably when the topsoil material was stockpiled on top of the landfill. There are also other

[4] "*Levin Landfill Compliance Report – 1 July 2017 – 18 December 2019*"; Horizons Regional Council, 27 July 2020.

areas along the highest part of the closed landfill (essentially the spur of the capped area) where settlement has occurred and the ground underfoot is “soggy” following the rain events.

The photographs below (Figure 11-2) show where some of the ponding is occurring. As recommended previously, those areas where ponding is presently occurring need to be filled in with clayey material which is available on top of the old landfill. It is recommended further that this remedial work be done when the existing capping has dried out sufficiently to allow vehicles to travel over the cap without damaging it further.

**Figure 11-2 Evidence of ponding on top of the old landfill caused by vehicle movements (20/09/21)**

# 12 Leachate Irrigation

In 2004, the old landfill site stopped receiving waste and the first stage of the new lined landfill began operating on site. Initially leachate from the lined landfill was collected in a leachate pond and irrigated on site. Leachate irrigation to the area of pine trees to the south-east of the lined landfill was curtailed at the end of 2008 and leachate was recirculated to Stage 1A.

At the beginning of June 2009 a pipeline was extended from the leachate pond to the Levin WWTP, allowing leachate to be pumped directly to that facility. From June 2009 until December 2012 most of the leachate was pumped to the Levin WWTP with some leachate being re-circulated through Stage 1A (about 5m$^3$ per day when operating). Since January 2012 all leachate (about 50m$^3$ per day) has been pumped to the Levin WWTP.

Modifications made to the leachate pumping system allows leachate from the leachate pond to be pumped to a manhole located next to the leachate pond, from where it is pumped to the Levin WWTP. This allows leachate pumping to occur without having to fill up the leachate pond which was thought to be a possible source of odour.

# 13 Site Walkover Records

Condition 28 of Discharge Permit 6010 requires that the landfill be inspected for leachate breakout, settlement and other adverse environmental effects at least once per month until such a time as discharge of refuse to the landfill ceases.

The current landfill is inspected weekly, and observations recorded on the Weekly Site Walkover Sheet. A consistent report has been that potholes need repairing in the unsealed access road and that there are cats and seagulls on site.

A leachate breakout was recorded on 18 December 2020 at the base of the landfill near the flare. There were no other signs of ground settlement and other adverse environmental effects detected during the 2020-2021 reporting period. A copy of the weekly site walkover records is not included in this report but can be provided by HDC if required.

The old landfill is surveyed for settlement as described in Section 11 of this report.

# 14 Vermin and Pest Control

Condition 29 (5) of Discharge Permit 6010 requires that the landfill be inspected for the presence of vermin, birds and other pests and that appropriate measures be taken to control them.

Through observation the operator is aware of the presence of feral cats. Shooting of feral cats and seagulls is carried out regularly. Bait stations are used, and the operator will be aware of the need to replace baits if there is more increased vermin activity.

# 15 Weed Control

Spaying of gorse took place at the Levin Landfill in November 2020. This was managed by HDC's Parks and Property team and completed by Hayes Spraying Ltd.

# 16 Hazardous Waste Disposal

Hazardous waste is waste that poses a present or future threat to people or the environment as a result of one or more of the following characteristics:

- explosiveness
- flammability
- capacity to oxidise
- corrosiveness
- toxicity
- eco-toxicity

Envirowaste keeps a log of hazardous waste received which indicates that no loads of hazardous waste were received over the past year and HDC has confirmed that no applications were received for the disposal of hazardous waste.

# 17 Special Waste Disposal

## 17.1 Special Waste Permits

Eighteen special waste permits were issued in the 2020 – 2021 reporting period. Appendix M lists details of the special wastes for which permits were issued. Mostly the special wastes consisted of spoiled or expired foodstuffs (e.g., liquorice, eggs, chickens), but also included packaging and some meth-contaminated wastes.

## 17.2 Biosolids and Sludges

Table 17-1 lists the quantities of sludge and wastewater treatment plant screenings (i.e., biosolids) disposed of at the landfill during the monitoring period.

**Table 17-1: Summary of Biosolids and Sludges Disposed at Levin Landfill in 2020 - 2021**

| Month | Sludge (tonnes) | Screenings (tonnes) |
|---|---|---|
| July 2020 | 91.93 | 3.99 |
| August 2020 | 75.03 | 1.84 |
| September 2020 | 86.26 | 2.65 |
| October 2020 | 106.31 | 1.71 |
| November 2020 | 100.35 | 2.51 |
| December 2020 | 124.13 | 2.22 |
| January 2021 | 93.85 | 4.7 |
| February 2021 | 119.58 | 1.62 |
| March 2021 | 130.65 | 2.38 |
| April 2021 | 117.76 | 2.03 |
| May 2021 | 120.91 | 1.33 |
| June 2021 | 121.64 | 5.72 |
| **TOTAL** | **1,288.40** | **32.70** |

## 17.3 Liquid Wastes

No liquid waste was accepted at the Levin Landfill in 2020-2021, neither were any applications received for liquid waste disposal at the landfill in 2020-2021.

# 18 Landfill Development

Reporting on the development that has occurred at the landfill over the previous year and noting what is proposed for the coming year is not a requirement of the conditions of consent. However, it has been included in this Annual Report for information purposes.

The following developments occurred at the landfill site in 2020/2021:

- Installation of groundwater bores XD1, XS1 and XS2.
- Replacement of groundwater bore D3(r) with a shallow (D3rs) and a deep bore (D3rd).
- Filling in of minor areas on the old, closed landfill where vehicle tracking had caused the ground surface to settle.

The following development activities are proposed for 2021/2022:

- Further extension of the landfill gas collection network, including installation of vertical gas wells on top of the landfill.
- Connection of the landfill gas collection network to the leachate collection manhole.
- De-commissioning of the bio-filter.
- Capping, topsoiling and grassing of the side slopes and completed top area of the landfill.

# 19 Conclusions

HDC is required to carry out compliance monitoring as part of Resource Consents DP6009, DP6010, DP6011 and DP102259. This report summarises the findings from the July 2020 to June 2021 monitoring period.

During the 2020-2021 monitoring period, there was one exceedance (for nitrate-N) observed in samples at sites HS1A, HS1, HS2, and HS3 in the Hokio Steam.

Twelve individual SVOCs and VOCs were also detected at low levels in the leachate pond, with the ANZECC 2000 99$^{th}$, 95$^{th}$, and 90$^{th}$ percentile trigger values for carbofuran and naphthalene being exceeded.

Background groundwater quality in bore G1S is characterised by low pH levels and elevated chloride, iron, and aluminium concentrations in the shallow aquifer. Bore G1D also had elevated iron, manganese, boron, and ammoniacal-N concentrations.

Concentrations of leachate indicators in bores hydraulically down-gradient from the new landfill are comparable to background concentrations.

Monitoring results for all shallow bores down-hydraulic gradient of the old landfill indicated leachate influence, with elevated concentrations of ammoniacal nitrogen, chloride, conductivity, and boron. The leachate plume appears to have a confined radius northward and is not extending to the north-west and the north-east. The plume width is estimated at 300-500 m; a key model assumption which has been retained since 2014.

As outlined in Section 6, mass load calculations were undertaken to predict a range of contaminant concentrations in the Hokio Stream for specific indicator parameters (ammoniacal-nitrogen, boron, chloride, sodium, nitrate-nitrogen and dissolved reactive phosphorus). The mass load calculation compares these predicted concentrations with median and maximum concentrations (averaged over five years) in the bores which are considered to be most representative of the leachate plume, these being bores B2, B3, C1, C2, C2DS and G2S. This year's assessment confirmed that the predicted concentrations are in general agreement with the actual concentrations measured in the Hokio Stream. The monitoring results also indicate that the impact from the landfill on the Hokio Stream is likely to be minimal, with a much greater influence arising from sources unrelated to the landfill within the stream's urban and rural catchments.

The drain on the Tatana Property is intercepting leachate-contaminated shallow groundwater prior to discharging to the Hokio Stream. The key leachate parameters (ammoniacal nitrogen, conductivity and chloride) are all present in lower concentrations within this drain than in the shallow groundwater bores which are screened in the leachate plume. There was some evidence for an increase in ammoniacal-nitrogen, conductivity, and chloride concentrations between sites HS1 and HS3. Concentrations at the monitoring site SW3 (now TD1) exceeded the trigger values for ammoniacal-N, BOD, and nitrate-N.

Monitoring data for the 2020-2021 period indicates that stormwater from the landfill is not impacting groundwater, as groundwater quality in shallow bores down-gradient from the soakage area reflected that observed in the background bore (G1S). The suitability of bore G1S as a representative bore for background groundwater quality assessment requires a review, given the characteristics and trends noted in this report.

The annual survey shows compaction levels meet the resource consent requirements and are close to the average compaction values measured over the past ten years.
Monitoring of the old landfill shows that settlement is occurring, which is not unexpected. However, vehicles bringing in topsoil material have caused rutting of the cap surface in places, resulting in minor ponding occurring. These areas need to be filled in with clayey soil. This will need to be done after the rainy season to avoid any further damage to the landfill cap. There are also other areas along the "spur" of the old landfill which are soggy underfoot following rainy periods due to minor settlement having occurred. These areas also need to be filled in and remediated to prevent ponding.

Changes to the resource consent conditions following the 2015 consent review process have increased the requirements for undertaking landfill gas and odour monitoring.

Odour monitoring at the landfill boundary has been implemented in accordance with the methodology described in the Odour Management Plan. No further action was considered necessary following the twenty-one odour inspections undertaken during the reporting period.

Gas detection within the groundwater monitoring wells has been undertaken when groundwater has been sampled. The results show an indication of methane on occasions, and a significant presence in one bore on a single occasion. Hydrogen sulphide was also detected on one occasion. The results are provided by a third party and confirmation of the units used (i.e., either ppm or %) has not yet been verified.

Monthly surface methane emissions monitoring is required over all temporary and capped areas of the landfill and at the bio-filter. HDC has engaged Envirowaste to do this testing which started in April 2021. As such, HDC is non-compliant with the consent condition that requires monthly testing of surface gas emissions. On the four occasions for which surface emissions have been tested, locations have been identified on the landfill surface where the concentrations of methane have exceeded the allowable levels. On all occasions the surface has been remediated using either additional clay capping material or by sealing surface fissures with bentonite granules mixed with water. Re-testing has shown the remediation to be successful on all occasions.

There are a range of inspections and maintenance requirements for the bio-filter. HDC complies with some of these but still needs to implement a daily visual check of the bio-filter, as well as monitoring and recording the pH of the filter bed media. Raking and loosening of the bio-filter media commenced in August 2020.

HDC is required to collect meteorological data from an on-site weather station. This has been undertaken through the reporting period. A new weather station was installed at the landfill site office in early 2021 allowing weather data to be collected at 1-minute intervals, as stated in the consent conditions, as opposed to the 15-minute interval rate at which the old weather station was capable of collecting.

# 20 Recommendations

A series of recommendations are made below, which will improve the understanding of the impact of the landfill. Some of these recommendations have been drawn from a memorandum[5] prepared by Stantec for HDC in response to HRC's request for an action plan to be prepared to deal with HRC's audit compliance report actions.

1. To obtain a correlation between wet weather events and sampling results, the following recommendations are made, to be acted on for the 2021-2022 reporting period:
   - Obtain rainfall data from the landfill weather station, or from the closest available weather station if the landfill weather data is unsuitable. The rainfall data collected should cover the same sampling months as that of Hokio Stream (between April 2020 and March 2022).
   - Start monitoring TD1 monthly (when the Hokio Stream sampling is carried out).
   - Record monthly the water levels within groundwater bores C2 and C2DS to provide a measure of the groundwater levels close to the Tatana Drain.
   - Record monthly the water levels within groundwater bores XS1 and XS2 to provide a measure of the groundwater levels close to the Hokio Stream.
   - Record by way of a subjective description the water levels in the Hokio Stream and Tatana Drain, when monthly sampling is carried out (e.g., stream flowing full; Tatana Drain is flowing "X" centimetres deep etc.).
   - Determine by survey the relative base level of the Hokio Stream and Tatana property drain at the monitoring locations so that the water levels can be interpreted.
   - Prepare a graph showing concentrations of leachate indicators (ammonia-N, chloride, boron and conductivity) against time for Hokio Stream sampling locations and SW1, with daily rainfall superimposed.
   - Prepare graphs of bore water levels against daily and monthly rainfall to determine the patterns for groundwater levels against rainfall.
2. Assess the temporal analysis of surface water monitoring data at TD1 (this could be achieved providing monthly sampling is completed, as discussed above).
3. To further improve the understanding of the effects that the Tatana Drain may be having on the Hokio Stream, it is recommended that surface water modelling mixing is undertaken which would require flow assessments on a quarterly basis. This would require the following additional information to assess the flows in the Tatana Drain and Hokio Stream:
   - Contact HRC to determine what information is available on flows within the Hokio Stream that could update the information that has been the basis for the mass contaminant load assessment.

[5] "*Memorandum – Draft Plan for Actioning Horizon's Audit Compliance Report Actions*"; Memo prepared by Stantec for HDC, August 2021

- Undertake a survey along the length of the Tatana Drain so that it can be modelled hydraulically, based on its channel profile and grade, and that a measure of the flow rate can be determined monthly based on the depth of flow measured in the drain at TD1.

4. Carry out a further visual inspection of the old landfill surface after a period of rain to identify areas where localised settlement has occurred and where additional filling with clayey soils is required.
5. To take measurements of the depth to water in all groundwater bores monitored and to take reference water levels of the Tatana property drain and the Hokio Stream bores. This should be recorded, at a minimum, whenever samples are being collected for water quality analysis. This information will aid in the analysis of interactions between the landfill areas, groundwater and surface water. Once groundwater levels have been recorded for a year, the frequency and location of groundwater level monitoring should be reviewed to determine if it is still required.
6. Review the suitability of bores used as reference background water quality monitoring locations.
7. Review the estimated width and direction of the leachate plume and check that the bores used in the mass balance calculations still provide a good representation of the leachate plume quality.
8. Review groundwater flow directions around both landfill sites to ensure that the interpretations in the annual report are still accurate.
9. Landfill gas monitoring records should include information about weather conditions on the date of each sampling event (including atmospheric pressure and ambient temperature), and units of measurement need to be clearly marked. These records need to be provided to the party compiling the quarterly reports as soon as they become available.
10. Undertake a detailed site inspection of the old landfill surface at least once per year within 7 days of a prolonged period of rainfall to identify any areas that may have water ponding and where additional filling with clay capping is required.
11. Undertake to fill low-lying areas on the surface of the old landfill with clayey soil.

# Appendix

We design with community in mind

# **Appendix A** Relevant consent conditions

# Relevant Consent Conditions

The Annual Report is required to meet the following consent conditions:

- Discharge Permit 6009 – Discharge solid waste to land
  - ✓ Condition 8

    *"The Permit Holder shall develop and implement a procedure for the landfill operator, such that potentially hazardous material, as listed in Annex 1 attached to and forming part of this permit, will not be accepted for disposal at the Levin landfill without specific authorization. The Operations Manager of the Horowhenua District Council, or some other designated person, is able at their discretion to accept quantities of such wastes. The waste shall be accompanied by a Hazardous Waste Manifest, as listed in Annex 1, which will form part of the permanent record and shall be reported by the Regional Council by 30 September each year for the term of this Permit.*

  - ✓ Condition 14

    *"The Permit holder shall submit an annual report to the Regional Council by 30 September each year for the duration of this Permit documenting the condition of the unlined landfill and any maintenance carried out during the previous year. The annual report shall address but not be limited to those aspects listed in Conditions 14(n) to 14(r) above. The annual report shall include a plan of the unlined landfill specifically documenting the shape of the closed landfill and any changes during the previous year related to Condition 14(q) [The annual report can be written in conjunction with the annual report required as part of Condition 15 (f) for Consent Number 6010]"*

  - ✓ Condition 35 (b)

    *"The Permit holder shall … Forward an annual report to members and to the Regional Council and the District Council"*

- Discharge Permit 6010 – Discharge landfill leachate onto and into ground
  - ✓ Condition 5

    *"The results of monitoring under Conditions 3 and 4 of this Permit shall be reported to the Regional Council by 30 September each year for the duration of this Permit"*

  - ✓ Condition 11(d)

    *"The Permit Holder shall annually review the data derived from the groundwater monitoring program and evaluate contaminant mass load projections for discharges from the landfill to the Hokio Stream. The contaminant mass load projections shall be based primarily, but not exclusively, on the monitoring data obtained for the "B", "C" and "X" series bores indicated in Table D of this discharge permit. The annual report required under Condition 5 shall include the following information:*

    *i. A summary of the methodology used to calculate the mass load projections.*

    *ii. The calculated mass loads transported in the groundwater and comparable mass loads in the Hokio Stream.*

    *iii. An analysis of the implications of the mass load calculations with respect to ensuring discharges from the landfill would not result in a decline in the water quality in the Hokio Stream under Condition 3"*

- ✓ Condition 11 (e)

  *"Should the groundwater parameters tested for under Condition 3 of this consent, and subsequent evaluation and indicative assessment of contaminant mass loads under Condition 11 (d) of this consent indicate that contaminants sourced from either the closed or active areas of the Levin Landfill are likely to result in a significant effect associated with the landfill leachate as identified through an investigation under Condition 3, then Condition 11(c ) applies.*

- ✓ Condition 14

  *"In-situ refuse density shall be determined through annual calculation based on information derived from topographic surveys of the landfill and borrow areas, and from weighbridge records. The survey should be carried out within one month of the anniversary of the previous survey"*

- ✓ Condition 15 (f)

  *"The Permit holder shall submit an annual report to the Regional Council by 30 September each year for the duration of this Permit documenting the condition of the unlined landfill and any maintenance carried out during the previous year. The annual report shall address but not be limited to those aspects listed in Conditions 15(a) to (e) above. The annual report shall include a plan of the unlined landfill specifically documenting the shape of the closed landfill and any changes during the previous year. [The annual report can be written in conjunction with the annual report required as part of Condition 14 for Consent Number 6009]"*

- ✓ Condition 27

  *"The Permit holder shall keep a log of:*

  *a) The dates and times of leachate irrigation;*

  *b) The total volume of leachate irrigated daily;*

  *c) The volumes of leachate irrigated to specific areas;*

  *d) Weather and ground conditions during irrigation;*

  *e) Observations made during the weekly inspections of the pump, irrigation system;*

  *f) and irrigation areas; and*

  *g) Repairs and maintenance carried out on the irrigation system.*

  *Copies of this log shall be forwarded to the Regional Council's Environmental Protection Manager on 28 February and 31 August of each year that the irrigation system is operated.*

- Discharge Permit 6011 – Discharge landfill gas, odour and dust to air

  - ✓ Condition 4 (g)

    *"The Permit shall include records of surface emission monitoring for methane must be included in the Annual Report required by Condition 39 of Discharge Permit 6009 and must also be provided to Manawatu-Wanganui Regional Council on request.*

- ✓ Condition 7

  *"The Permit Holder shall also keep a record of landfill gas monitoring results including:*

  *a) Date and time of sampling*

  *b) The concentrations of gasses detected*

  *c) Weather conditions at the time of sampling.*

  *The monitoring results shall be made available to the Regional Council on a quarterly basis"*

- ✓ Condition 8F

  *"The Permit Holder shall maintain a log of all other inspections, investigations and actions taken in accordance with all monitoring and odour inspection conditions of this consent. The inspection and investigation log shall be made available to the Manawatu-Wanganui Regional Council on request and submitted in summary form in the Annual Report".*

- Discharge Permit 102259 – Discharge stormwater to land and potentially to groundwater via ground soakage

  - ✓ Condition 16

    *"The results of monitoring under Condition 14 of this permit shall be reported to Horizon Manawatu's Team Leader Compliance by 31 August each year for the duration of this Permit beginning 31 August 2003. The annual report shall be supplemented by the raw water quality analysis data being forwarded to the Regional Council as soon as practically possible following the receipt of laboratory analysis certificates".*

# **Appendix B** Monitoring programs

## LEVIN LANDFILL - SUMMARY OF SURFACE AND GROUNDWATER MONITORING REQUIREMENTS (July 2021 - April 2024).

**(The testing regime is based on Consent Conditions following the completion of the 2015 Resource Consent Review process).**

| Reports Due | | Sampling Month | Table A (Condition 3, DP 6010) | Table B (Condition 3, DP 6010) | | | | | | | | | | | | | | | | | | | | | | Table C (Condition 3, DP 6010) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Deep Aquifer Bores | Shallow Aquifer Bores | | | | | | | | | | | | | | | | | | Irrigation Bores | | | | Hokio Stream[4] | | | | Tatana Drain | Leachate Pond[5] | |
| Annual | Quarterly | | C2dd | E1d | E2d | G1d | Xd1 | D3rd[1] | C1 | C2 | C2ds | D4 | B1 | B2 | B3s | E1s | E2s | D1[2] | D2[2] | D3rs[1,2] | D6[2] | G1s | G2s | Xs1 | Xs2 | D5[3] | F1[3] | F2[3] | F3[3] | HS1 | HS1A | HS2 | HS3 | TD1 | | |
| **Sep-21** | **Aug-21** | **Jul-21** | I | I + SW | I | I | C | C | I | I | I | I + SW | I | I | I | I + SW | I + SW | I | I + SW | C + SW | I | I + SW | I | C | C | I | I | I | I + SW | Monthly Compre. To 03/2022 | | | | I | Monthly Compre. | |
| | **Nov-21** | **Oct-21** | I | I + SW | I | I | C | C | I | I | I | I + SW | I | I | I | I + SW | I + SW | I | I + SW | C + SW | I | I + SW | I | C | C | I | I | I | I + SW | | | | | C | | A |
| | **Feb-22** | **Jan-22** | I | I + SW | I | I | C | C | I | I | I | I + SW | I | I | I | I + SW | I + SW | I | I + SW | C + SW | I | I + SW | I | C | C | I | I | I | I + SW | | | | | I | | |
| | **May-22** | **Apr-22** | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | | C | C | C | C | C + A | |
| **Sep-22** | **Aug-22** | **Jul-22** | I | I + SW | I | I | I | C | I | I | I | I + SW | I | I | I | I + SW | I + SW | I | I + SW | C + SW | I | I + SW | I | I | I | I | I | I | I + SW | Discontinue after 2 years, i.e. after March 2022 | I | I | I | I | I | |
| | **Nov-22** | **Oct-22** | I | I + SW | I | I | I | C | I | I | I | I + SW | I | I | I | I + SW | I + SW | I | I + SW | C + SW | I | I + SW | I | I | I | I | I | I | I + SW | | C | C | C | C | C | |
| | **Feb-23** | **Jan-23** | I | I + SW | I | I | I | C | I | I | I | I + SW | I | I | I | I + SW | I + SW | I | I + SW | C + SW | I | I + SW | I | I | I | I | I | I | I + SW | | I | I | I | I | I | |
| | **May-23** | **Apr-23** | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | | C | C | C | C | C | |
| **Sep-23** | **Aug-23** | **Jul-23** | I | I + SW | I | I | I | I | I | I | I | I + SW | I | I | I | I + SW | I + SW | I | I + SW | I + SW | I | I + SW | I | I | I | I | I | I | I + SW | | I | I | I | I | I | |
| | **Nov-23** | **Oct-23** | I | I + SW | I | I | I | I | I | I | I | I + SW | I | I | I | I + SW | I + SW | I | I + SW | I + SW | I | I + SW | I | I | I | I | I | I | I + SW | | C | C | C | C | C | |
| | **Feb-24** | **Jan-24** | I | I + SW | I | I | I | I | I | I | I | I + SW | I | I | I | I + SW | I + SW | I | I + SW | I + SW | I | I + SW | I | I | I | I | I | I | I + SW | | I | I | I | I | I | |
| | **May-24** | **Apr-24** | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | C + A | | C | C | C | C | C | |
| | | | Measure groundwater level and sample all bores for $CH_4$, $CO_2$ and $O_2$ each time that groundwater is sampled (Condition 4a of DP 6011) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Notes:

(1) Replacement bore D3r consists of two nested piezometers that have been calledL D3rs and D3rd.
(2) See table below
(3) If irrigation re-commences then the annual sampling is to change from comprehensive + 3 times indicator to bi-annual comprehensive + indicator (Clause D of Condition 3, DP 6010) .
(4) See table below
(5) See table below
C Comprehensive list (see below)
I Indicator list (see below)
A Pesticide and SVOC analysis
SW Add sodium and iron analysis (for stormwater consent 102559)

A reduction in sampling frequency at any **groundwater monitoring point** is conditional on (Clauses A - D of Condition 3, DP 6010):

A. Completion of the initial monitoring program;
B. Good consistency of groundwater sample analysis results, or a clearly identified reason for inconsistent results that excludes the contaminant source being landfill operations, stored waste or leachate;
C. No decline in groundwater quality as determined from indicator parameter trends over a period of four consecutive sampling rounds;
D. If a well being monitored on a conditional frequency becomes non-compliant with condition C, the monitoring frequency for that well should return to the initial monitoring frequency until conditions B and C are again being fulfilled.

(2) If site management planning indicates any **early detection monitoring well** is likely to become buried or otherwise destroyed within the following year as a result of normal operations (Clauses E - H, Condition 3, DP 6010):

E. This must be communicated to the regional council;
F. A replacement well is to be constructed in a position agreed upon with Horizons Regional Council
G. The replacement well should be installed in a position suitable to act as a early detection well and be classed as an early detection well;
H. The replacement well should be constructed as a nested well (or two separate wells) with screens positioned in both shallow and deep aquifers.

(4) A reduction in sampling frequency at the **Hokio Stream monitoring locations (HS1A, HS2 and HS3)** is conditional on (Clauses I - L, Condition 3 of DP 6010):

I. No signficant increases in the concentrations between monitoring sites HS1A and HS3, for parameters exceeding the trigger values contained in Table C1 at Site HS3.
J. A statistical analysis approach is to be used to determine if there is a significant increase in contaminant levels between HS1A and HS3.
K. Following the 24 month monitoring period, there shall be no significant increases in concentrations between monitoring sites HS1A and HS3.
L. If the Hokio Stream monitoring locations are being sampled on a conditional frequency and do not meet condition K, the monitoring frequency for all three monitoring locations (HS1A, HS2 and HS3) shall return to the base case intensive monitoring until conditions J and K are again being fulfilled.

(5) A reduction in sampling frequency at the **leachate pond outlet** is conditional on (Clauses M - P, Condition 3, DP 6010):

M. Completion of the initial 2 year monitoring program;
N. Good consistency of water sample analysis results, or a clearly identified reason for inconsistent results;
O. No decline in water quality over a period of four consecutive sampling rounds;
P. If the leachate pond outlet is being sampled on a conditional frequency and becomes non-compliant with condition O, the monitoring frequency should return to the base case intensive monitoring until conditions N and O are again being fulfilled.

**COMPREHENSIVE PARAMETER LIST (Table E of Condition 3, DP 6010)**

| | |
|---|---|
| Characterising parameters | pH |
| | electrical conductivity (EC) |
| | alkalinity |
| | total hardness |
| | suspended solids |
| Oxygen demand | COD and $scBOD_5$ |
| Nutrients* | NO3-N, NH4-N, DRP and $SO_4$ |
| Metals* | Al, As, Cd, Cr, Cu, Fe, Mg, Mn, Ni, Pb, Zn and Hg |
| Other elements | B, Ca, Cl, K and Na |
| Organics | Total organic carbon, total phenols, volatile acids |
| Biological | E. coli |

* Analyses performed for nutrients and metals are for dissolved rather than total concentrations

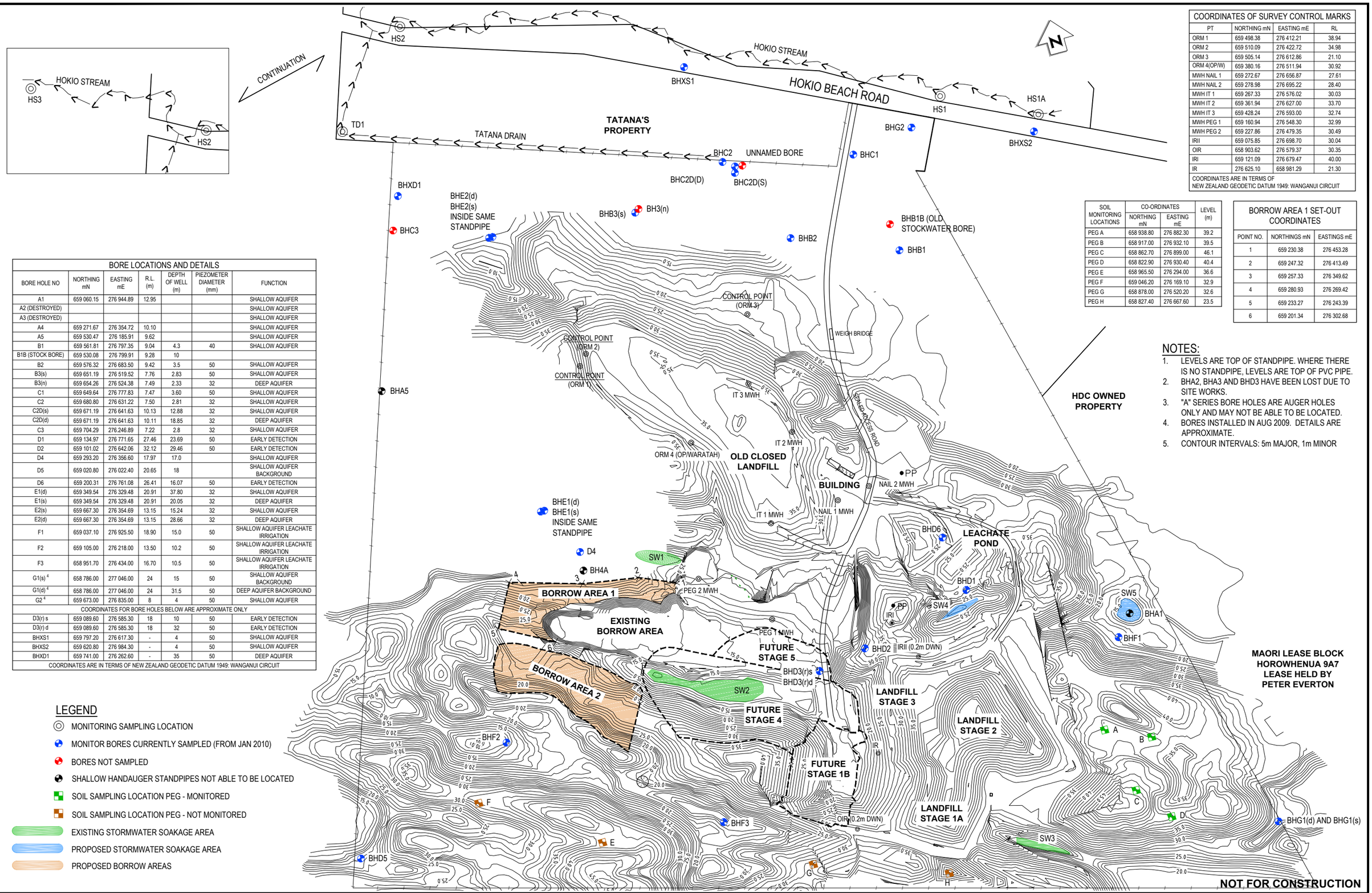
**INDICATOR PARAMETER LIST (Table F, Condition 3, DP 6010)**

| | |
|---|---|
| Characterising parameters | pH |
| | electrical conductivity (EC) |
| Oxygen demand | COD and $scBOD_5$ |
| Nutrients* | NO3-N and NH4-N |
| Metals* | AL, Mn, Ni, Pb and Hg |
| Other elements | B and Cl |
| Biological+ | E. coli |

* Analyses performed for nutrients and metals are for dissolved rather than total concentrations

+ E. coli added from April 2019 sampling onwards

# **Appendix C** Site plan




| COORDINATES OF SURVEY CONTROL MARKS | | | |
|---|---|---|---|
| PT | NORTHING mN | EASTING mE | RL |
| ORM 1 | 659 498.38 | 276 412.21 | 38.94 |
| ORM 2 | 659 510.09 | 276 422.72 | 34.98 |
| ORM 3 | 659 505.14 | 276 612.86 | 21.10 |
| ORM 4(OP/W) | 659 380.16 | 276 511.94 | 30.92 |
| MWH NAIL 1 | 659 272.67 | 276 656.87 | 27.61 |
| MWH NAIL 2 | 659 278.98 | 276 695.22 | 28.40 |
| MWH IT 1 | 659 267.33 | 276 576.02 | 30.03 |
| MWH IT 2 | 659 361.94 | 276 627.00 | 33.70 |
| MWH IT 3 | 659 428.24 | 276 593.00 | 32.74 |
| MWH PEG 1 | 659 160.94 | 276 548.30 | 32.99 |
| MWH PEG 2 | 659 227.86 | 276 479.35 | 30.49 |
| IRII | 659 075.85 | 276 698.70 | 30.04 |
| OIR | 658 903.62 | 276 579.37 | 30.35 |
| IRI | 659 121.09 | 276 679.47 | 40.00 |
| IR | 276 625.10 | 658 981.29 | 21.30 |
| COORDINATES ARE IN TERMS OF NEW ZEALAND GEODETIC DATUM 1949: WANGANUI CIRCUIT | | | |

| SOIL MONITORING LOCATIONS | CO-ORDINATES | | LEVEL (m) |
|---|---|---|---|
| | NORTHING mN | EASTING mE | |
| PEG A | 658 938.80 | 276 882.30 | 39.2 |
| PEG B | 658 917.00 | 276 932.10 | 39.5 |
| PEG C | 658 862.70 | 276 899.00 | 46.1 |
| PEG D | 658 822.90 | 276 930.40 | 40.4 |
| PEG E | 658 965.50 | 276 294.00 | 36.6 |
| PEG F | 659 046.20 | 276 169.10 | 32.9 |
| PEG G | 658 878.00 | 276 520.20 | 32.6 |
| PEG H | 658 827.40 | 276 667.60 | 23.5 |

| BORROW AREA 1 SET-OUT COORDINATES | | |
|---|---|---|
| POINT NO. | NORTHINGS mN | EASTINGS mE |
| 1 | 659 230.38 | 276 453.28 |
| 2 | 659 247.32 | 276 413.49 |
| 3 | 659 257.33 | 276 349.62 |
| 4 | 659 280.93 | 276 269.42 |
| 5 | 659 233.27 | 276 243.39 |
| 6 | 659 201.34 | 276 302.68 |

| BORE LOCATIONS AND DETAILS | | | | | | |
|---|---|---|---|---|---|---|
| BORE HOLE NO | NORTHING mN | EASTING mE | R.L. (m) | DEPTH OF WELL (m) | PIEZOMETER DIAMETER (mm) | FUNCTION |
| A1 | 659 060.15 | 276 944.89 | 12.95 | | | SHALLOW AQUIFER |
| A2 (DESTROYED) | | | | | | SHALLOW AQUIFER |
| A3 (DESTROYED) | | | | | | SHALLOW AQUIFER |
| A4 | 659 271.67 | 276 354.72 | 10.10 | | | SHALLOW AQUIFER |
| A5 | 659 530.47 | 276 185.91 | 9.62 | | | SHALLOW AQUIFER |
| B1 | 659 561.81 | 276 797.35 | 9.04 | 4.3 | 40 | SHALLOW AQUIFER |
| B1B (STOCK BORE) | 659 530.08 | 276 799.91 | 9.28 | 10 | | |
| B2 | 659 576.32 | 276 683.50 | 9.42 | 3.5 | 50 | SHALLOW AQUIFER |
| B3(s) | 659 651.19 | 276 519.52 | 7.76 | 2.83 | 50 | SHALLOW AQUIFER |
| B3(n) | 659 654.26 | 276 524.38 | 7.49 | 2.33 | 32 | DEEP AQUIFER |
| C1 | 659 649.64 | 276 777.83 | 7.47 | 3.60 | 50 | SHALLOW AQUIFER |
| C2 | 659 680.80 | 276 631.22 | 7.50 | 2.81 | 32 | SHALLOW AQUIFER |
| C2D(s) | 659 671.19 | 276 641.63 | 10.13 | 12.88 | 32 | SHALLOW AQUIFER |
| C2D(d) | 659 671.19 | 276 641.63 | 10.11 | 18.85 | 32 | DEEP AQUIFER |
| C3 | 659 704.29 | 276.246.89 | 7.22 | 2.8 | 32 | SHALLOW AQUIFER |
| D1 | 659 134.97 | 276 771.65 | 27.46 | 23.69 | 50 | EARLY DETECTION |
| D2 | 659 101.02 | 276 642.06 | 32.12 | 29.46 | 50 | EARLY DETECTION |
| D4 | 659 293.20 | 276 356.60 | 17.97 | 17.0 | | SHALLOW AQUIFER |
| D5 | 659 020.80 | 276 022.40 | 20.65 | 18 | | SHALLOW AQUIFER BACKGROUND |
| D6 | 659 200.31 | 276 761.08 | 26.41 | 16.07 | 50 | EARLY DETECTION |
| E1(d) | 659 349.54 | 276 329.48 | 20.91 | 37.80 | 32 | SHALLOW AQUIFER |
| E1(s) | 659 349.54 | 276 329.48 | 20.91 | 20.05 | 32 | DEEP AQUIFER |
| E2(s) | 659 667.30 | 276 354.69 | 13.15 | 15.24 | 32 | SHALLOW AQUIFER |
| E2(d) | 659 667.30 | 276 354.69 | 13.15 | 28.66 | 32 | DEEP AQUIFER |
| F1 | 659 037.10 | 276 925.50 | 18.90 | 15.0 | 50 | SHALLOW AQUIFER LEACHATE IRRIGATION |
| F2 | 659 105.00 | 276 218.00 | 13.50 | 10.2 | 50 | SHALLOW AQUIFER LEACHATE IRRIGATION |
| F3 | 658 951.70 | 276 434.00 | 16.70 | 10.5 | 50 | SHALLOW AQUIFER LEACHATE IRRIGATION |
| G1(s) [4] | 658 786.00 | 277 046.00 | 24 | 15 | 50 | SHALLOW AQUIFER BACKGROUND |
| G1(d) [4] | 658 786.00 | 277 046.00 | 24 | 31.5 | 50 | DEEP AQUIFER BACKGROUND |
| G2 [4] | 659 673.00 | 276 835.00 | 8 | 4 | 50 | SHALLOW AQUIFER |
| COORDINATES FOR BORE HOLES BELOW ARE APPROXIMATE ONLY | | | | | | |
| D3(r) s | 659 089.60 | 276 585.30 | 18 | 10 | 50 | EARLY DETECTION |
| D3(r) d | 659 089.60 | 276 585.30 | 18 | 32 | 50 | EARLY DETECTION |
| BHXS1 | 659 797.20 | 276 617.30 | - | 4 | 50 | SHALLOW AQUIFER |
| BHXS2 | 659 620.80 | 276 984.30 | - | 4 | 50 | SHALLOW AQUIFER |
| BHXD1 | 659 741.00 | 276 262.60 | - | 35 | 50 | DEEP AQUIFER |
| COORDINATES ARE IN TERMS OF NEW ZEALAND GEODETIC DATUM 1949: WANGANUI CIRCUIT | | | | | | |

## LEGEND

- MONITORING SAMPLING LOCATION
- MONITOR BORES CURRENTLY SAMPLED (FROM JAN 2010)
- BORES NOT SAMPLED
- SHALLOW HANDAUGER STANDPIPES NOT ABLE TO BE LOCATED
- SOIL SAMPLING LOCATION PEG - MONITORED
- SOIL SAMPLING LOCATION PEG - NOT MONITORED
- EXISTING STORMWATER SOAKAGE AREA
- PROPOSED STORMWATER SOAKAGE AREA
- PROPOSED BORROW AREAS

## NOTES:

1. LEVELS ARE TOP OF STANDPIPE. WHERE THERE IS NO STANDPIPE, LEVELS ARE TOP OF PVC PIPE.
2. BHA2, BHA3 AND BHD3 HAVE BEEN LOST DUE TO SITE WORKS.
3. "A" SERIES BORE HOLES ARE AUGER HOLES ONLY AND MAY NOT BE ABLE TO BE LOCATED.
4. BORES INSTALLED IN AUG 2009. DETAILS ARE APPROXIMATE.
5. CONTOUR INTERVALS: 5m MAJOR, 1m MINOR

NOT FOR CONSTRUCTION

DO NOT SCALE - IF IN DOUBT, ASK

ORIGINAL SIZE A1

| REV | REVISIONS | DRN | CHK | APP | DATE |
|---|---|---|---|---|---|
| E | FOR INFORMATION - BHD3(r)s AND BHD3(r)d ADDED, AND CONTOURS UPDATED FROM JULY 2021 SURVEY | BCJ | PSL | PSL | 24.09.21 |
| D | FOR INFORMATION - BORROW AREA 2 RELOCATED, DEFINED AREAS OF FUTURE STAGES 1B, 4 AND 5 | BCJ | PSL | PSL | 01.06.21 |
| C | FOR INFORMATION - BORROW AREA AND LANDFILL AREA UPDATES AND BORE HOLES AND SAMPLING LOCATIONS ADDED FOR HOKIO STREAM AND TATANA DRAIN | BCJ | PSL | PSL | 24.03.21 |
| B | FOR INFORMATION - BORROW AREA AND LANDFILL AREA UPDATES | BCJ | PSL | PSL | 22.09.20 |
| A | FOR INFORMATION | BCJ | PSL | PSL | 26.08.19 |

| | | |
|---|---|---|
| SURVEYED | MWH | |
| DESIGNED | N/A | - |
| DRAWN | Brent James | 08.2019 |
| CAD REVIEW | Brent James | 23.09.21 |
| APPROVED | Phil Landmark | 23.09.21 |
| PROF REGISTRATION: | | |

Stantec

Client:

HOROWHENUA DISTRICT COUNCIL
LEVIN LANDFILL

MONITORING BORES, SOIL SAMPLING LOCATIONS & BORROW AREAS
SITE PLAN, LOCATION AND DETAILS

Status Stamp: FOR INFORMATION ONLY
Date Stamp: 24.09.21
Scales: 1:2000 (A1) 1:4000 (A3)
Drawing No.: 310101088-19-001-G001
Rev.: E

26/08/2019 9:35 a.m.

COPYRIGHT © THESE DRAWINGS SHALL ONLY BE USED FOR THE PURPOSE FOR WHICH THEY WERE SUPPLIED. ANY RE-USE IS PROHIBITED AND NO PART OF THIS DOCUMENT MAY BE REPRODUCED OR DISTRIBUTED WITHOUT THE WRITTEN PERMISSION OF STANTEC.

pw:\\stantec-ap-pw.bentley.com:stantec-ap-pw-01\Documents\New Zealand Clients\Horowhenua District Council\80500724 (310101088) - Levin Landfill Volumes\2019\General\310101088-19-001-G001

# **Appendix D** Number of samples per site

| Determinants | B1 | B2 | B3 (B3s) | C1 | C2 | C2DD | C2DS | D1 | D2 | D3r | D4 | D5 | D6 | E1S | E1D | E2S | E2D | F1 | F2 | F3 | HS1A | HS1 | HS2 | HS3 | Leachate Pond | G1S | G1D | G2S | TD1 | XD1 | XS1 | XS2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ammonia-N | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 12 | 12 | 12 | 12 | 12 | 8 | 8 | 8 | 8 | 2 | 2 | 2 |
| Boron | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 12 | 12 | 12 | 12 | 12 | 8 | 8 | 8 | 5 | 2 | 2 | 2 |
| Chloride | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 12 | 12 | 12 | 12 | 12 | 8 | 8 | 8 | 8 | 2 | 2 | 2 |
| Conductivity | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 12 | 12 | 12 | 12 | 12 | 8 | 8 | 8 | 8 | 2 | 2 | 2 |
| Faecal C | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 12 | 12 | 12 | 12 | 12 | 8 | 8 | 8 | 8 | 2 | 2 | 2 |
| pH | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 12 | 12 | 12 | 12 | 12 | 8 | 8 | 8 | 8 | 2 | 2 | 2 |
| Suspended Solids | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 12 | 12 | 12 | 12 | 12 | 3 | 3 | 3 | 6 | 1 | 2 | 2 |
| Phenol | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 12 | 11 | 11 | 11 | 11 | 2 | 2 | 2 | 3 | 1 | 2 | 2 |
| VFA | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 12 | 11 | 11 | 11 | 11 | 2 | 2 | 2 | 3 | 1 | 2 | 2 |
| TOC | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 12 | 12 | 12 | 12 | 12 | 3 | 3 | 3 | 3 | 1 | 2 | 2 |
| Alkalinity | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 12 | 12 | 12 | 12 | 12 | 3 | 3 | 3 | 3 | 1 | 2 | 2 |
| COD | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 12 | 12 | 12 | 12 | 12 | 8 | 8 | 8 | 8 | 2 | 2 | 2 |
| scBOD | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 12 | 12 | 12 | 12 | 12 | 5 | 5 | 5 | 8 | 2 | 2 | 2 |
| Nitrate-N | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 12 | 12 | 12 | 12 | 12 | 8 | 8 | 8 | 8 | 2 | 2 | 2 |
| Sulphate | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 12 | 12 | 12 | 12 | 12 | 3 | 3 | 3 | 3 | 1 | 2 | 2 |
| Hardness | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 12 | 12 | 12 | 12 | 12 | 3 | 3 | 3 | 3 | 1 | 2 | 2 |
| Calcium | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 12 | 12 | 12 | 12 | 12 | 3 | 3 | 3 | 3 | 1 | 2 | 2 |
| Magnesium | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 12 | 12 | 12 | 12 | 12 | 3 | 3 | 3 | 3 | 1 | 2 | 2 |
| Potassium | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 12 | 12 | 12 | 12 | 12 | 3 | 3 | 3 | 3 | 1 | 2 | 2 |
| Sodium | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 4 | 4 | 4 | 2 | 2 | 4 | 4 | 4 | 2 | 2 | 2 | 4 | 12 | 12 | 12 | 12 | 12 | 8 | 6 | 6 | 3 | 1 | 2 | 2 |
| D.R. Phosphorus | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 12 | 12 | 12 | 12 | 12 | 3 | 3 | 3 | 3 | 1 | 1 | 2 |
| Aluminium | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 12 | 12 | 12 | 12 | 12 | 8 | 8 | 8 | 5 | 2 | 2 | 2 |
| Arsenic | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 12 | 12 | 12 | 12 | 12 | 3 | 3 | 3 | 3 | 1 | 2 | 2 |
| Cadmium | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 12 | 12 | 12 | 12 | 12 | 3 | 3 | 3 | 3 | 1 | 2 | 2 |
| Chromium | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 12 | 12 | 12 | 12 | 12 | 3 | 3 | 3 | 3 | 1 | 2 | 2 |
| Copper | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 12 | 12 | 12 | 12 | 12 | 3 | 3 | 3 | 3 | 1 | 2 | 2 |
| Iron | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 4 | 4 | 4 | 2 | 2 | 4 | 4 | 4 | 2 | 2 | 2 | 4 | 12 | 12 | 12 | 12 | 12 | 8 | 6 | 6 | 6 | 1 | 2 | 2 |
| Lead | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 12 | 12 | 12 | 12 | 12 | 8 | 8 | 8 | 5 | 2 | 2 | 2 |
| Manganese | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 12 | 12 | 12 | 12 | 12 | 8 | 8 | 8 | 8 | 2 | 2 | 2 |
| Mercury | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 12 | 12 | 12 | 12 | 12 | 5 | 5 | 5 | 5 | 2 | 2 | 2 |
| Nickel | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 12 | 12 | 12 | 12 | 12 | 8 | 8 | 8 | 5 | 2 | 2 | 2 |
| Zinc | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 12 | 12 | 12 | 12 | 12 | 3 | 3 | 3 | 3 | 1 | 2 | 2 |

# **Appendix E** Tabulated analysis results

**B1** Monitoring Bore HDC Levin Landfill

| Determinand | | ANZECC STOCK | Median | Maximum | Annual Median | Jun-21 | May-21 | Apr-21 | Mar-21 | Feb-21 | Jan-21 | Dec-20 | Nov-20 | Oct-20 | Jul-20 | Apr-20 | Jan-20 | Oct-19 | Jul-19 | Apr-19 | Jan-19 | Oct-18 | Jul-18 | Apr-18 | Jan-18 | Oct-17 | Jul-17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Water level | mBGL | | 1.0600 | 1.960 | 1.205 | 1.205 | | 1.21 | | | 0.863 | | | 1.96 | 1.00 | 1.39 | 1.14 | 0.875 | 1.01 | 1.33 | 1.15 | 0.96 | 1.06 | 1.16 | 1.035 | 0.57 | 0.65 |
| pH | | 6 to 9 | 6.9500 | 7.800 | 6.75 | | | 6.5 | | | 7.0 | | | 6.7 | 6.8 | 6.9 | 7.8 | 7.0 | 7.0 | 7.6 | 7.2 | 6.9 | 6.9 | 6.7 | 6.9 | 7.1 | 7.5 |
| Suspended Solids | mg/l | | 3.0000 | 10.000 | 3 | | | *3* | | | *3* | | | | | *3* | | | | *3* | *3* | | | | 10 | | |
| Phenol | mg/L | | 0.0250 | 0.025 | 0.025 | | | *0.025* | | | | | | | | *0.025* | | | | *0.005* | *0.025* | | | | *0.025* | | |
| VFA | mg/L | | 2.5000 | 52.000 | 52 | | | 52.0 | | | | | | | | *2.5* | | | | *2.5* | *2.5* | | | | 5 | | |
| TOC | mg/L | | 15.9500 | 30.100 | 21.55 | | | 30.1 | | | 13.0 | | | | | 22.8 | | | | 17.2 | 14.7 | | | | 13.3 | | |
| Alkalinity | mg CaCO3/L | | 456.0000 | 681.000 | 537 | | | 681 | | | 393 | | | | | 624 | | | | 519 | 309 | | | | 299 | | |
| Conductivity | mS/m | | 185.5000 | 276.000 | 188.5 | | | 241 | | | 174 | | | 168 | 203 | 276 | 167 | 123 | 119 | 190 | 156 | 181 | 191 | 168 | 196 | 219 | 223 |
| COD | mg/L | | 79.0000 | 129.000 | 88.5 | | | 118 | | | 63 | | | 90 | 87 | 60 | 69 | 87 | 58 | 102 | 92 | 71 | 49 | 113 | 41 | 51 | 129 |
| BOD (scBOD frm Apr'20) | mg/L | | 0.7500 | 22.000 | 0.5 | | | *3* | | | *0.5* | | | *0.5* | *0.5* | 0.5 | | | | 1.0 | *1.5* | | | | 22 | | |
| Faecal C (Ecoli frm Apr'20) | col/100ml | 100 | 2.0000 | 40.000 | 3 | | | 4 | | | 4 | | | *2* | *2.0* | *2.0* | 20 | 40 | *2* | *2* | *2* | | | | *2* | | |
| Chloride | mg/L | | 314.0000 | 508.000 | 277.5 | | | 4 | | | 291 | | | 264 | 354 | 506 | 283 | 139 | 118 | 297 | 269 | 366 | 422 | 331 | 447 | 508 | 432 |
| Nitrate-N | mg/L | 90.3 | 3.7400 | 13.100 | 8.9 | | | 4.36 | | | 13.10 | | | 11.20 | 6.60 | 1.50 | 8.16 | 8.45 | 9.46 | 1.13 | 3.16 | 4.32 | 3.02 | 0.23 | *0.05* | 0.32 | 0.73 |
| Sulphate | mg/L | 1000 | 7.1800 | 47.000 | 3.86 | | | 3.2 | | | 4.52 | | | | | 2.85 | | | | 9.84 | 47.0 | | | | 45.9 | | |
| Ammonia-N | mg/L | | 13.3500 | 23.000 | 10.49 | | | 14.3 | | | 8.580 | | | 7.6 | 12.4 | 16.80 | 9.79 | 7.10 | 7.79 | 18.1 | 11.1 | 11.9 | 14.9 | 23.0 | 21.0 | 21.1 | 16.9 |
| Hardness | mg CaCO3/L | | 519.0000 | 670.000 | 522 | | | 578 | | | 466.000 | | | | | 670 | | | | 470 | 379 | | | | 568 | | |
| Calcium | mg/L | 1000 | 99.4000 | 122.000 | 98.5 | | | 112.0 | | | 85.000 | | | | | 122 | | | | 90.8 | 66.7 | | | | 108 | | |
| Magnesium | mg/L | | 66.9500 | 88.900 | 67.05 | | | 72.6 | | | 61.500 | | | | | 88.9 | | | | 59.0 | 50.9 | | | | 72.4 | | |
| Potassium | mg/L | | 22.3000 | 29.900 | 21.35 | | | 25.6 | | | 17.100 | | | | | 29.9 | | | | 23.3 | 18.2 | | | | 21.3 | | |
| Sodium | mg/L | | 143.0000 | 257.000 | 174 | | | 216 | | | 132.000 | | | | | 257 | 132 | 121 | 111 | 145 | 124 | 150 | 143 | 128 | 145 | 157 | |
| D.R. Phosphorus | mg/L | | 0.1040 | 0.115 | 0.107 | | | 0.115 | | | 0.099 | | | | | 0.105 | | | | 0.104 | 0.099 | | | | 0.104 | | |
| Aluminium | mg/L | 5 | 0.0045 | 0.015 | 0.0045 | | | 0.005 | | | 0.004 | | | 0.005 | 0.004 | 0.005 | 0.004 | 0.004 | 0.007 | 0.004 | 0.002 | 0.004 | 0.002 | 0.006 | 0.005 | 0.008 | 0.015 |
| Arsenic | mg/L | 0.5 | 0.0005 | 0.001 | 0.00075 | | | 0.001 | | | *0.0005* | | | | | 0.001 | | | | *0.0005* | *0.0005* | | | | 0.0005 | | |
| Boron | mg/L | 5 | 0.6000 | 1.470 | 0.95 | | | 1.47 | | | 0.830 | | | 0.69 | 1.07 | 1.20 | 0.53 | 0.56 | 0.64 | 0.89 | 0.49 | 0.41 | 0.35 | 0.49 | 0.43 | 0.55 | 1.08 |
| Cadmium | mg/L | 0.01 | 0.0001 | 0.000 | 0.0001 | | | *0.0001* | | | *0.0001* | | | | | *0.0001* | | | | 0.0003 | 0.0004 | | | | 0.0001 | | |
| Chromium | mg/L | 1 | 0.0005 | 0.001 | 0.00075 | | | 0.001 | | | *0.0005* | | | | | *0.0005* | | | | *0.0005* | *0.0005* | | | | 0.0005 | | |
| Copper | mg/L | 0.4 | 0.0057 | 0.012 | 0.0081 | | | 0.0116 | | | 0.0046 | | | | | 0.0094 | | | | 0.0058 | 0.0055 | | | | 0.0048 | | |
| Iron | mg/L | | 0.0320 | 0.088 | 0.0515 | | | 0.047 | | | 0.056 | | | | | 0.032 | 0.02 | 0.01 | 0.02 | 0.047 | 0.017 | 0.02 | 0.01 | 0.04 | 0.088 | 0.06 | |
| Lead | mg/L | 0.1 | 0.0003 | 0.001 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.0006* | *0.00025* |
| Manganese | mg/L | | 9.8450 | 17.500 | 10.27 | | | 12.6 | | | 9.070 | | | 9.84 | 10.7 | 17.50 | 8.56 | 5.97 | 6.23 | 11.0 | 8.28 | 9.85 | 10.4 | 9.38 | 12.6 | 12.0 | 9.10 |
| Mercury | mg/L | | 0.0003 | 0.001 | 0.00025 | | | 0.00050 | | | *0.00025* | | | *0.00025* | *0.00025* | *0.00025* | | | | | | | | | | | |
| Nickel | mg/L | 1 | 0.0021 | 0.006 | 0.00255 | | | 0.0056 | | | 0.0023 | | | 0.0019 | 0.0028 | 0.0045 | 0.0019 | 0.0010 | 0.0013 | 0.0033 | 0.0017 | 0.0016 | 0.0014 | 0.0028 | 0.0020 | 0.0021 | 0.0024 |
| Zinc | mg/L | 20 | 0.0065 | 0.020 | 0.0065 | | | 0.006 | | | 0.007 | | | | | 0.005 | | | | 0.007 | 0.003 | | | | 0.020 | | |

If value is <, divide by 2 and make *italic*

**B2** Monitoring Bore HDC Levin Landfill

| Determinand | | ANZECC STOCK | Median | Maximum | Annual Median | Jun-21 | May-21 | Apr-21 | Mar-21 | Feb-21 | Jan-21 | Dec-20 | Nov-20 | Oct-20 | Jul-20 | Apr-20 | Jan-20 | Oct-19 | Jul-19 | Apr-19 | Jan-19 | Oct-18 | Jul-18 | Apr-18 | Jan-18 | Oct-17 | Jul-17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Water level | mBGL | | 1.38 | 1.65 | 1.32 | 1.38 | | 1.38 | | | 1.07 | | | 1.32 | 1.13 | 1.65 | 1.45 | 1.21 | 1.44 | 1.61 | 1.46 | 1.3 | 1.41 | 1.48 | 1.12 | 0.65 | 0.94 |
| pH | | 6 to 9 | 6.95 | 7.20 | 6.65 | | | 6.7 | | | 7.1 | | | 6.6 | 6.6 | 6.9 | 7.1 | 6.6 | 6.7 | 7.2 | 6.9 | 7.0 | 7.1 | 6.8 | 7.2 | 7.0 | 7.0 |
| Suspended Solids | mg/l | | 5.00 | 29.00 | 16 | | | 29 | | | *3* | | | | | 9 | | | | *3* | *3* | | | | 7 | | |
| Phenol | mg/L | | 0.03 | 0.03 | 0.025 | | | *0.025* | | | | | | | | *0.025* | | | | *0.025* | *0.025* | | | | *0.025* | | |
| VFA | mg/L | | 2.50 | 10.00 | 2.5 | | | *2.5* | | | | | | | | *2.5* | | | | 6 | *2.5* | | | | 10 | | |
| TOC | mg/L | | 30.05 | 39.40 | 32.4 | | | 36.4 | | | 28.4 | | | | | 31.7 | | | | 25.6 | 26.4 | | | | 39.4 | | |
| Alkalinity | mg CaCO3/L | | 639.50 | 783.00 | 649.5 | | | 783 | | | 516 | | | | | 723 | | | | 688 | 466 | | | | 591 | | |
| Conductivity | mS/m | | 172.50 | 250.00 | 220.5 | | | 218 | | | 161 | | | 223 | 250 | 209 | 176 | 189 | 135 | 186 | 152 | 151 | 138 | 172 | 173 | 117 | 157 |
| COD | mg/L | | 82.50 | 115.00 | 101 | | | 111 | | | 91 | | | 115 | 76 | 81 | 84 | 78 | 50 | 112 | 36 | 81 | 70 | 91 | 81 | 108 | 93 |
| BOD (scBOD frm Apr'20) | mg/L | | 1.50 | 5.90 | 1.75 | | | *3.0* | | | *0.5* | | | *0.5* | 5.9 | *0.5* | | | | *1.5* | *1.5* | | | | *3* | | |
| Faecal C (Ecoli frm Apr'20) | col/100ml | 100 | 2.00 | 48.00 | 5 | | | *2* | | | 44 | | | 8 | *2.0* | *2.0* | 4 | 28 | 48 | *2* | *2* | | | | *2* | | |
| Chloride | mg/L | | 99.60 | 141.00 | 130 | | | 134 | | | 88.1 | | | 126 | 134 | 141 | 94.7 | 123 | 87.2 | 125 | 101 | 90.6 | 83.5 | 136 | 98.2 | 33.2 | 95.3 |
| Nitrate-N | mg/L | 90.3 | 18.70 | 133.00 | 66 | | | 17.00 | | | 37.60 | | | 94.40 | 133.00 | 21.8 | 44.2 | 34.7 | 30.4 | 4.03 | 16.9 | 18.4 | 16.5 | 19.0 | 0.36 | 0.02 | 4.61 |
| Sulphate | mg/L | 1000 | 16.30 | 123.00 | 8.11 | | | 3.22 | | | 13.0 | | | | | 8.85 | | | | 19.6 | 45.7 | | | | 123.0 | | |
| Ammonia-N | mg/L | | 43.15 | 77.50 | 36.7 | | | 77.5 | | | 28.4 | | | 42.7 | 30.7 | 51.6 | 43.8 | 45.5 | 21.4 | 55.2 | 43.6 | 32.6 | 30.0 | 49.5 | 77.0 | 35.4 | 14.1 |
| Hardness | mg CaCO3/L | | 418.50 | 546.00 | 482.5 | | | 538 | | | 427 | | | | | 546 | | | | 410 | 235 | | | | 244 | | |
| Calcium | mg/L | 1000 | 90.60 | 122.00 | 107.8 | | | 122.0 | | | 93.6 | | | | | 117 | | | | 90.6 | 50.1 | | 1.1 | | 64.7 | | |
| Magnesium | mg/L | | 45.75 | 61.60 | 51.6 | | | 56.3 | | | 46.9 | | | | | 61.6 | | | | 44.6 | 25.6 | | | | 19.9 | | |
| Potassium | mg/L | | 57.25 | 68.10 | 51.55 | | | 61.4 | | | 41.7 | | | | | 57.6 | | | | 56.9 | 47.4 | | | | 68.1 | | |
| Sodium | mg/L | | 119.00 | 154.00 | 112 | | | 105 | | | 119 | | | | | 115.0 | 99.6 | 103 | 85.0 | 132 | 130 | 122 | 114 | 148 | 154 | 131 | |
| D.R. Phosphorus | mg/L | | 0.03 | 0.05 | 0.033 | | | 0.025 | | | 0.041 | | | | | 0.021 | | | | 0.029 | 0.035 | | | | 0.053 | | |
| Aluminium | mg/L | 5 | 0.02 | 0.06 | 0.0125 | | | 0.004 | | | 0.020 | | | 0.014 | 0.011 | 0.009 | 0.011 | 0.011 | 0.017 | 0.012 | 0.014 | 0.018 | 0.016 | 0.018 | 0.062 | 0.045 | 0.036 |
| Arsenic | mg/L | 0.5 | 0.00 | 0.01 | 0.0025 | | | 0.004 | | | 0.001 | | | | | 0.006 | | | | 0.003 | 0.003 | | | | 0.003 | | |
| Boron | mg/L | 5 | 1.25 | 2.37 | 1.73 | | | 2.37 | | | 1.77 | | | 1.69 | 1.65 | 1.69 | 1.02 | 1.37 | 0.92 | 1.20 | 1.07 | 0.78 | 0.93 | 1.25 | 1.25 | 1.24 | 1.33 |
| Cadmium | mg/L | 0.01 | 0.00 | 0.00 | 0.0001 | | | *0.0001* | | | *0.0001* | | | | | *0.0001* | | | | *0.0001* | *0.0001* | | | | *0.0001* | | |
| Chromium | mg/L | 1 | 0.00 | 0.00 | 0.00075 | | | 0.001 | | | *0.0005* | | | | | 0.001 | | | | 0.001 | *0.0005* | | | | 0.001 | | |
| Copper | mg/L | 0.4 | 0.00 | 0.00 | 0.0032 | | | 0.0025 | | | 0.0039 | | | | | 0.0031 | | | | 0.0018 | 0.0026 | | | | 0.0039 | | |
| Iron | mg/L | | 0.32 | 1.97 | 0.199 | | | 0.315 | | | 0.083 | | | | | 0.722 | 1.34 | 0.14 | 0.04 | 0.264 | 1.06 | 0.09 | 0.09 | 1.23 | 1.97 | 0.36 | |
| Lead | mg/L | 0.1 | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* |
| Manganese | mg/L | | 2.34 | 5.02 | 3.965 | | | 3.16 | | | 2.41 | | | 5.02 | 4.8 | 4.33 | 3.43 | 3.14 | 2.27 | 2.72 | 1.93 | 2.06 | 1.17 | 1.74 | 1.54 | 1.61 | 0.995 |
| Mercury | mg/L | | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | *0.00025* | | | | | | | | | | | |
| Nickel | mg/L | 1 | 0.00 | 0.00 | 0.0026 | | | 0.0031 | | | 0.0022 | | | 0.0026 | 0.0026 | 0.0030 | 0.0021 | 0.0018 | 0.0010 | 0.0018 | 0.0018 | 0.0027 | 0.0029 | 0.0017 | 0.0038 | 0.0047 | 0.0046 |
| Zinc | mg/L | 20 | 0.00 | 0.02 | 0.0055 | | | 0.003 | | | 0.008 | | | | | 0.004 | | | | 0.003 | *0.001* | | | | 0.016 | | |

**B3 (B3s)** Monitoring Bore HDC Levin Landfill

| Determinand | | ANZECC STOCK | Median | Maximum | Annual Median | Jun-21 | May-21 | Apr-21 | Mar-21 | Feb-21 | Jan-21 | Dec-20 | Nov-20 | Oct-20 | Jul-20 | Apr-20 | Jan-20 | Oct-19 | Jul-19 | Apr-19 | Jan-19 | Oct-18 | Jul-18 | Apr-18 | Jan-18 | Oct-17 | Jul-17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Water level | mBGL | | 0.15 | 0.30 | 0.135 | 0.135 | | 0.14 | | | 0.00 | | | 0.15 | 0.15 | 0.15 | 0.1 | 0.135 | 0.21 | 0.27 | 0.2 | 0.15 | 0.2 | 0.24 | 0.3 | 0 | 0 |
| pH | | 6 to 9 | 7.00 | 7.20 | 7.05 | | | 7.1 | | | 7.2 | | | 7.0 | 7.0 | 7.1 | 7.0 | 6.9 | 7.1 | 7.0 | 6.9 | 6.8 | 6.9 | 6.9 | 6.9 | 6.9 | 7.2 |
| Suspended Solids | mg/l | | 82.50 | 111.00 | 81 | | | 81 | | | 81 | | | | | 74 | | | | 111 | 84 | | | | 108 | | |
| Phenol | mg/L | | 0.03 | 0.03 | 0.025 | | | *0.025* | | | | | | | | *0.025* | | | | *0.025* | *0.025* | | | | *0.005* | | |
| VFA | mg/L | | 2.50 | 6.00 | 2.5 | | | *2.5* | | | | | | | | 2.5 | | | | 6 | *2.5* | | | | *2.5* | | |
| TOC | mg/L | | 69.00 | 79.10 | 57.3 | | | 61.6 | | | 53.0 | | | | | 70.6 | | | | 72.7 | 67.4 | | | | 79.1 | | |
| Alkalinity | mg CaCO3/L | | 1195.00 | 1290.00 | 994.5 | | | 1070 | | | 919 | | | | | 1180 | | | | 1290 | 1280 | | | | 1210 | | |
| Conductivity | mS/m | | 295.50 | 350.00 | 263 | | | 265 | | | 246 | | | 261 | 291 | 288 | 254 | 270 | 294 | 324 | 318 | 319 | 297 | 304 | 309 | 329 | 350 |
| COD | mg/L | | 212.00 | 699.00 | 174 | | | 100 | | | 150 | | | 211 | 198 | 213 | 150 | 119 | 221 | 624 | 199 | 310 | 249 | 699 | 240 | 281 | 72 |
| BOD (scBOD frm Apr'20) | mg/L | | 3.00 | 7.00 | 3 | | | *3* | | | 7.0 | | | *0.5* | *3* | *3* | | | | *3* | *3* | | | | 7 | | |
| Faecal C (Ecoli frm Apr'20) | col/100ml | 100 | 2.00 | 68.00 | 2 | | | 68 | | | *0.5* | | | *2* | *2.0* | *2.0* | *2.0* | *2* | *2* | *2* | *2* | | | | 4 | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | mg/L | | 196.00 | 264.00 | 160.5 | | | 166 | | | 159 | | | 159 | 162 | 194 | 172 | 177 | 179 | 213 | 219 | 238 | 200 | 220 | 198 | 217 | 264 |
| Nitrate-N | mg/L | 90.3 | 0.05 | 11.60 | 0.05 | | | *0.05* | | | *0.05* | | | *0.05* | *0.05* | *0.05* | 0.02 | *0.05* | *0.05* | *0.050* | *0.005* | *0.005* | *0.05* | *0.05* | *0.05* | 11.6 | 0.68 |
| Sulphate | mg/L | 1000 | 0.03 | 1.94 | 0.025 | | | 0.04 | | | *0.01* | | | | | *0.01* | | | | *0.01* | 0.33 | | | | 1.94 | | |
| Ammonia-N | mg/L | | 171.50 | 198.00 | 173 | | | 177.0 | | | 159.0 | | | 169.0 | 177.0 | 143 | 140 | 141 | 170 | 170 | 179 | 185 | 166 | 174 | 173 | 177 | 198 |
| Hardness | mg CaCO3/L | | 424.50 | 517.00 | 264.5 | | | 300 | | | 229 | | | | | 509 | | | | 517 | 475 | | | | 374 | | |
| Calcium | mg/L | 1000 | 88.25 | 105.00 | 51.75 | | | 58.5 | | | 45.0 | | | | | 89.7 | | | | 105.0 | 98.6 | | | | 86.8 | | |
| Magnesium | mg/L | | 47.80 | 69.20 | 32.7 | | | 37.2 | | | 28.2 | | | | | 69.2 | | | | 61.8 | 55.2 | | | | 40.4 | | |
| Potassium | mg/L | | 104.00 | 109.00 | 105.5 | | | 104.0 | | | 107.0 | | | | | 91.5 | | | | 109 | 104 | | | | 101 | | |
| Sodium | mg/L | | 152.00 | 178.00 | 124.5 | | | 127 | | | 122 | | | | | 152 | 129 | 141 | 157 | 170 | 155 | 178 | 158 | 151 | 141 | 154 | |
| D.R. Phosphorus | mg/L | | 0.04 | 0.06 | 0.0325 | | | 0.034 | | | 0.031 | | | | | 0.031 | | | | 0.043 | 0.044 | | | | 0.058 | | |
| Aluminium | mg/L | 5 | 0.01 | 0.01 | 0.006 | | | 0.005 | | | 0.006 | | | 0.006 | 0.006 | 0.007 | 0.005 | 0.003 | 0.003 | 0.007 | 0.004 | 0.004 | 0.003 | 0.004 | 0.009 | 0.007 | 0.005 |
| Arsenic | mg/L | 0.5 | 0.02 | 0.04 | 0.0265 | | | 0.022 | | | 0.031 | | | | | 0.035 | | | | 0.020 | 0.026 | | | | 0.011 | | |
| Boron | mg/L | 5 | 1.33 | 1.67 | 1.145 | | | 1.00 | | | 1.11 | | | 1.18 | 1.35 | 1.40 | 0.80 | 1.17 | 1.40 | 1.38 | 1.31 | 0.89 | 0.90 | 1.34 | 1.51 | 1.67 | 1.67 |
| Cadmium | mg/L | 0.01 | 0.00 | 0.00 | 0.0001 | | | *0.0001* | | | *0.0001* | | | | | *0.0001* | | | | *0.0001* | *0.0001* | | | | *0.0001* | | |
| Chromium | mg/L | 1 | 0.01 | 0.01 | 0.004 | | | 0.004 | | | 0.004 | | | | | 0.005 | | | | 0.005 | 0.005 | | | | 0.005 | | |
| Copper | mg/L | 0.4 | 0.00 | 0.02 | 0.005 | | | 0.0091 | | | 0.0009 | | | | | 0.0007 | | | | 0.0027 | 0.0017 | | | | 0.0184 | | |
| Iron | mg/L | | 0.90 | 1.40 | 0.623 | | | 0.393 | | | 0.853 | | | | | 1.03 | 1.40 | 0.74 | 0.34 | 1.37 | 0.857 | 1.11 | 0.90 | 1.30 | 0.709 | 1.01 | |
| Lead | mg/L | 0.1 | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* |
| Manganese | mg/L | | 3.36 | 5.32 | 2.85 | | | 2.65 | | | 2.52 | | | 3.05 | 3.4 | 4.84 | 3.86 | 3.39 | 3.83 | 3.94 | 3.32 | 2.68 | 2.87 | 2.75 | 2.08 | 4.39 | 5.32 |
| Mercury | mg/L | | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | *0.00025* | | | | | | | | | | | |
| Nickel | mg/L | 1 | 0.01 | 0.02 | 0.0094 | | | 0.0098 | | | 0.0072 | | | 0.0090 | 0.0118 | 0.0136 | 0.0106 | 0.0085 | 0.0101 | 0.0117 | 0.0126 | 0.0131 | 0.0113 | 0.0110 | 0.0127 | 0.0226 | 0.0166 |
| Zinc | mg/L | 20 | 0.00 | 0.01 | 0.0015 | | | *0.001* | | | 0.002 | | | | | *0.001* | | | | 0.003 | *0.001* | | | | 0.009 | | |

**C1** Monitoring Bore HDC Levin Landfill

| Determinand | | ANZECC STOCK | Median | Maximum | Annual Median | Jun-21 | May-21 | Apr-21 | Mar-21 | Feb-21 | Jan-21 | Dec-20 | Nov-20 | Oct-20 | Jul-20 | Apr-20 | Jan-20 | Oct-19 | Jul-19 | Apr-19 | Jan-19 | Oct-18 | Jul-18 | Apr-18 | Jan-18 | Oct-17 | Jul-17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Water level | mBGL | | 0.22 | 3.60 | 0.10 | 0.40 | | 0.40 | | | 0.00 | | | 0.020 | 0.10 | 0.55 | 0.31 | 3.6 | 0.20 | 0.22 | 0.24 | 0.12 | 0.22 | 0.31 | 0.4 | 0 | 0 |
| pH | | 6 to 9 | 6.70 | 7.00 | 6.7 | | | 6.7 | | | 6.8 | | | 6.600 | 6.7 | 6.7 | 7.0 | 6.6 | 6.6 | 6.8 | 6.9 | 6.7 | 6.4 | 6.5 | 6.7 | 6.9 | 6.5 |
| Suspended Solids | mg/l | | 51.00 | 395.00 | 258.5 | | | 122 | | | 395 | | | | | 40 | | | | 21 | 62 | | | | 10 | | |
| Phenol | mg/L | | 0.03 | 0.03 | 0.025 | | | *0.025* | | | | | | | | *0.025* | | | | *0.025* | *0.025* | | | | *0.025* | | |
| VFA | mg/L | | 2.50 | 5.00 | 2.5 | | | *2.5* | | | | | | | | *2.5* | | | | *2.5* | *2.5* | | | | 5 | | |
| TOC | mg/L | | 15.30 | 17.20 | 15.8 | | | 17.2 | | | 14.4 | | | | | 16.6 | | | | 13.8 | 14.6 | | | | 16.0 | | |
| Alkalinity | mg CaCO3/L | | 271.50 | 343.00 | 284 | | | 281 | | | 287 | | | | | 249 | | | | 262 | 222 | | | | 343 | | |
| Conductivity | mS/m | | 127.00 | 150.00 | 123 | | | 107 | | | 114 | | | 146.000 | 132 | 127 | 143 | 127 | 145 | 116 | 99 | 132 | 150 | 134 | 121 | 89.2 | 99.9 |
| COD | mg/L | | 58.00 | 285.00 | 68.5 | | | 56 | | | 285 | | | 81.000 | 54 | 54 | 76 | 85 | 70 | 45 | 36 | 51 | 48 | 49 | 60 | 134 | 69 |
| BOD (scBOD frm Apr'20) | mg/L | | 1.25 | 3.00 | 1.75 | | | *3.0* | | | *3.0* | | | *0.500* | *0.5* | 1 | | | | *1.5* | *3* | | | | 1 | | |
| Faecal C (Ecoli frm Apr'20) | col/100ml | 100 | 2.00 | 16.00 | *2* | | | *2* | | | *0.5* | | | *2.000* | *2.0* | *2.0* | *2.0* | *2.0* | *2* | *2* | 16 | | | | *2* | | |
| Chloride | mg/L | | 227.00 | 298.00 | 209 | | | 129 | | | 181 | | | 283.000 | 237 | 217 | 252 | 244 | 283 | 193 | 156 | 239 | 298 | 244 | 158 | 97.3 | 138 |
| Nitrate-N | mg/L | 90.3 | 0.01 | 0.49 | 0.005 | | | *0.05* | | | *0.005* | | | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.05* | *0.005* | *0.005* | *0.005* | 0.49 | *0.05* | *0.05* | *0.005* | *0.005* |
| Sulphate | mg/L | 1000 | 25.15 | 32.60 | 31 | | | 31.1 | | | 30.9 | | | | | 32.6 | | | | 18.7 | 19.4 | | | | 3.93 | | |
| Ammonia-N | mg/L | | 0.50 | 10.80 | 7.17 | | | 7.82 | | | 10.8 | | | 5.640 | 6.52 | 2.91 | 0.41 | 0.41 | 0.76 | 0.59 | 1.10 | 0.27 | 0.37 | 0.33 | 0.35 | 0.28 | 0.18 |
| Hardness | mg CaCO3/L | | 246.50 | 306.00 | 231.5 | | | 231 | | | 232 | | | | | 306 | | | | 261 | 196 | | | | 293 | | |
| Calcium | mg/L | 1000 | 46.85 | 52.20 | 44 | | | 43.7 | | | 44.3 | | | | | 52.2 | | | | 49.4 | 36.4 | | | | 51.7 | | |
| Magnesium | mg/L | | 31.45 | 42.60 | 29.5 | | | 29.5 | | | 29.5 | | | | | 42.6 | | | | 33.4 | 25.5 | | | | 41.8 | | |
| Potassium | mg/L | | 14.05 | 23.50 | 22.05 | | | 20.6 | | | 23.5 | | | | | 16.70 | | | | 9.88 | 11.4 | | | | 10.3 | | |
| Sodium | mg/L | | 126.00 | 190.00 | 103.5 | | | 95 | | | 112 | | | | | 122 | 157 | 151 | 137 | 119 | 116 | 145 | 190 | 168 | 126 | 95.3 | |
| D.R. Phosphorus | mg/L | | 0.02 | 0.02 | 0.014 | | | 0.015 | | | 0.013 | | | | | 0.011 | | | | 0.016 | 0.020 | | | | 0.024 | | |
| Aluminium | mg/L | 5 | 0.01 | 0.02 | 0.01 | | | 0.012 | | | 0.008 | | | 0.018 | 0.007 | 0.009 | 0.005 | 0.006 | 0.010 | 0.005 | 0.014 | 0.007 | 0.002 | 0.007 | 0.006 | 0.011 | 0.019 |
| Arsenic | mg/L | 0.5 | 0.00 | 0.00 | 0.0025 | | | 0.001 | | | 0.004 | | | | | *0.0005* | | | | *0.0005* | *0.0005* | | | | *0.0005* | | |
| Boron | mg/L | 5 | 0.60 | 0.74 | 0.705 | | | 0.64 | | | 0.74 | | | 0.720 | 0.69 | 0.57 | 0.47 | 0.62 | 0.69 | 0.45 | 0.57 | 0.48 | 0.50 | 0.66 | 0.60 | 0.59 | 0.52 |
| Cadmium | mg/L | 0.01 | 0.00 | 0.00 | 0.0001 | | | *0.00010* | | | *0.00010* | | | | | *0.0001* | | | | *0.0001* | *0.0001* | | | | *0.0001* | | |
| Chromium | mg/L | 1 | 0.00 | 0.00 | 0.0005 | | | *0.0005* | | | *0.0005* | | | | | *0.0005* | | | | *0.0005* | *0.0005* | | | | *0.0005* | | |
| Copper | mg/L | 0.4 | 0.00 | 0.00 | 0.000525 | | | 0.0008 | | | 0.00025 | | | | | 0.0008 | | | | 0.0012 | 0.0005 | | | | *0.00025* | | |
| Iron | mg/L | | 1.30 | 4.50 | 1.1805 | | | 1.65 | | | 0.711 | | | | | 2.53 | 3.35 | 0.78 | 3.49 | 0.577 | 2.14 | 4.50 | 0.07 | 0.95 | 0.856 | 1.30 | |
| Lead | mg/L | 0.1 | 0.00 | 0.00 | 0.00025 | | | 0.00060 | | | 0.00025 | | | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | 0.0007 | *0.00025* | *0.00025* | *0.00025* | *0.00025* | 0.0017 | 0.0006 |
| Manganese | mg/L | | 0.37 | 0.47 | 0.3905 | | | 0.350 | | | 0.3540 | | | 0.471 | 0.4 | 0.410 | 0.323 | 0.197 | 0.419 | 0.328 | 0.241 | 0.388 | 0.379 | 0.356 | 0.411 | 0.439 | 0.234 |
| Mercury | mg/L | | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | *0.00025* | | | | | | | | | | | |
| Nickel | mg/L | 1 | 0.00 | 0.00 | 0.00085 | | | 0.0008 | | | 0.0008 | | | 0.0009 | 0.0009 | 0.0012 | 0.0009 | 0.0006 | 0.0007 | 0.0008 | 0.0007 | 0.0010 | 0.0008 | 0.0008 | 0.0009 | 0.0031 | 0.0014 |
| Zinc | mg/L | 20 | 0.00 | 0.02 | 0.001 | | | *0.001* | | | 0.001 | | | | | *0.001* | | | | 0.003 | *0.001* | | | | 0.019 | | |

**C2** Monitoring Bore HDC Levin Landfill

| Determinand | | ANZECC STOCK | Median | Maximum | Annual Median | Jun-21 | May-21 | Apr-21 | Mar-21 | Feb-21 | Jan-21 | Dec-20 | Nov-20 | Oct-20 | Jul-20 | Apr-20 | Jan-20 | Oct-19 | Jul-19 | Apr-19 | Jan-19 | Oct-18 | Jul-18 | Apr-18 | Jan-18 | Oct-17 | Jul-17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Water level | mBGL | | 0.33 | 2.84 | 0.22 | 0.32 | | 0.32 | | | 0.00 | | | 0.220 | 0.20 | 0.47 | 0.42 | 0.245 | 0.36 | 0.44 | 0.385 | 0.33 | 0.34 | 0.4 | 2.84 | 0.05 | 0 |
| pH | | 6 to 9 | 7.00 | 7.40 | 6.95 | | | 7.0 | | | 7.4 | | | 6.900 | 6.9 | 7.2 | 6.9 | 7.0 | 7.1 | 7.1 | 7.0 | 6.8 | 7.0 | 6.9 | 6.9 | 6.9 | 7.2 |
| Suspended Solids | mg/l | | 106.50 | 516.00 | 221.5 | | | 111 | | | 332 | | | | | 516 | | | | 21 | 14 | | | | 102 | | |
| Phenol | mg/L | | 0.03 | 0.03 | 0.025 | | | *0.025* | | | | | | | | *0.025* | | | | *0.025* | *0.025* | | | | *0.005* | | |
| VFA | mg/L | | 2.50 | 2.50 | 2.5 | | | *2.5* | | | | | | | | *2.5* | | | | *2.5* | *2.5* | | | | *2.5* | | |
| TOC | mg/L | | 46.40 | 48.30 | 42.1 | | | 45.2 | | | 39.0 | | | | | 45.6 | | | | 47.2 | 48.3 | | | | 48.3 | | |
| Alkalinity | mg CaCO3/L | | 919.00 | 1110.00 | 885 | | | 871 | | | 899 | | | | | 818 | | | | 968 | 939 | | | | 1110 | | |
| Conductivity | mS/m | | 297.00 | 396.00 | 247.5 | | | 263 | | | 250 | | | 239.000 | 245 | 346 | 372 | 298.0 | 242 | 296 | 320 | 324 | 252 | 283 | 395 | 393 | 396 |
| COD | mg/L | | 143.00 | 765.00 | 132 | | | 175 | | | 135 | | | 129.000 | 105 | 127 | 157 | 113 | 141 | 472 | 244 | 145 | 115 | 765 | 221 | 160 | 69 |
| BOD (scBOD frm Apr'20) | mg/L | | 3.00 | 22.00 | 4.45 | | | *3* | | | 22.0 | | | *0.500* | 5.9 | *3* | | | | *3* | *3* | | | | *3* | | |
| Faecal C (Ecoli frm Apr'20) | col/100ml | 100 | 4.00 | 3900.00 | 2 | | | 4 | | | *1* | | | *2.000* | *2.0* | *2.0* | 8 | 4 | 3900 | 1070 | *2* | | | | 16 | | |
| Chloride | mg/L | | 329.00 | 588.00 | 206.5 | | | 215 | | | 201 | | | 161.000 | 212 | 492 | 524 | 368 | 170 | 292 | 377 | 366 | 210 | 292 | 527 | 588 | 516 |
| Nitrate-N | mg/L | 90.3 | 0.05 | 10.80 | 0.05 | | | 0.19 | | | *0.05* | | | *0.050* | *0.05* | 0.08 | *0.005* | *0.05* | *0.05* | *0.05* | *0.005* | *0.005* | *0.05* | *0.05* | *0.05* | 10.8 | 0.01 |
| Sulphate | mg/L | 1000 | 16.40 | 42.30 | 5.5 | | | 6.58 | | | 4.42 | | | | | 42.3 | | | | 11.4 | 25.5 | | | | 21.4 | | |
| Ammonia-N | mg/L | | 156.50 | 181.00 | 147 | | | 149.0 | | | 156.0 | | | 145.000 | 140.0 | 169 | 181 | 157 | 124 | 141 | 157 | 174 | 134 | 132 | 171 | 171 | 177 |
| Hardness | mg CaCO3/L | | 256.50 | 482.00 | 225 | | | 227 | | | 223 | | | | | 277 | | | | 236 | 293 | | | | 482 | | |
| Calcium | mg/L | 1000 | 53.05 | 105.00 | 47.25 | | | 47.6 | | | 46.9 | | | | | 54.7 | | | | 51.4 | 61.4 | | | | 105 | | |
| Magnesium | mg/L | | 29.35 | 53.00 | 25.95 | | | 26.3 | | | 25.6 | | | | | 34.0 | | | | 26.0 | 32.4 | | | | 53.0 | | |
| Potassium | mg/L | | 85.05 | 114.00 | 84.1 | | | 84.8 | | | 83.4 | | | | | 91.5 | | | | 78.3 | 85.3 | | | | 114 | | |
| Sodium | mg/L | | 233.00 | 311.00 | 177.5 | | | 189 | | | 166 | | | | | 291 | 256 | 206 | 183 | 262 | 295 | 230 | 187 | 233 | 311 | 276 | |
| D.R. Phosphorus | mg/L | | 0.02 | 0.03 | 0.021 | | | 0.016 | | | 0.026 | | | | | 0.013 | | | | 0.024 | 0.021 | | | | 0.023 | | |
| Aluminium | mg/L | 5 | 0.01 | 0.04 | 0.0155 | | | 0.018 | | | 0.016 | | | 0.015 | 0.014 | 0.041 | 0.024 | 0.007 | 0.018 | 0.013 | 0.011 | 0.006 | 0.010 | 0.015 | 0.012 | 0.006 | 0.008 |
| Arsenic | mg/L | 0.5 | 0.00 | 0.00 | 0.002 | | | 0.002 | | | 0.002 | | | | | 0.002 | | | | 0.002 | 0.001 | | | | 0.001 | | |
| Boron | mg/L | 5 | 1.90 | 2.24 | 1.75 | | | 2.05 | | | 1.69 | | | 1.430 | 1.81 | 2.24 | 1.64 | 1.85 | 1.81 | 2.17 | 2.06 | 1.60 | 1.55 | 1.94 | 2.01 | 1.97 | 2.06 |
| Cadmium | mg/L | 0.01 | 0.00 | 0.00 | 0.0001 | | | *0.0001* | | | *0.0001* | | | | | *0.0001* | | | | *0.0001* | *0.0001* | | | | *0.0001* | | |
| Chromium | mg/L | 1 | 0.00 | 0.00 | 0.002 | | | 0.002 | | | 0.002 | | | | | 0.002 | | | | 0.002 | 0.002 | | | | 0.002 | | |
| Copper | mg/L | 0.4 | 0.00 | 0.00 | 0.0006 | | | 0.0006 | | | 0.0006 | | | | | 0.0017 | | | | 0.0005 | *0.00025* | | | | 0.0046 | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Iron | mg/L | | 0.48 | 2.48 | 1.3345 | | | 0.719 | | | 1.95 | | | | | 0.158 | 0.48 | 0.63 | 2.48 | 0.994 | 1.48 | 0.48 | 0.28 | 0.38 | 0.311 | 0.46 | |
| Lead | mg/L | 0.1 | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* |
| Manganese | mg/L | | 0.07 | 0.33 | 0.0472 | | | 0.0531 | | | 0.0516 | | | 0.04280 | 0.0402 | 0.0650 | 0.0820 | 0.0512 | 0.0524 | 0.0558 | 0.0778 | 0.0923 | 0.0734 | 0.0755 | 0.187 | 0.326 | 0.241 |
| Mercury | mg/L | | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | *0.00025* | | | | | | | | | | | |
| Nickel | mg/L | 1 | 0.01 | 0.01 | 0.004 | | | 0.0053 | | | 0.0035 | | | 0.0039 | 0.0041 | 0.0017 | 0.0052 | 0.0033 | 0.0049 | 0.0060 | 0.0060 | 0.0054 | 0.0049 | 0.0061 | 0.0064 | 0.0080 | 0.0071 |
| Zinc | mg/L | 20 | 0.01 | 0.01 | 0.0065 | | | 0.003 | | | 0.010 | | | | | 0.009 | | | | 0.002 | 0.003 | | | | 0.010 | | |

**C2DD** Monitoring Bore HDC Levin Landfill (Deep)

| Determinand | | NZDW MAV | Median | Maximum | Annual Median | Jun-21 | May-21 | Apr-21 | Mar-21 | Feb-21 | Jan-21 | Dec-20 | Nov-20 | Oct-20 | Jul-20 | Apr-20 | Jan-20 | Oct-19 | Jul-19 | Apr-19 | Jan-19 | Oct-18 | Jul-18 | Apr-18 | Jan-18 | Oct-17 | Jul-17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Water level | mBGL | | 2.51 | 3.73 | 2.79 | 2.79 | | 2.79 | | | 2.455 | | | 2.3800 | 3.73 | 3.07 | 2.59 | 2.39 | 2.26 | 2.69 | 2.51 | 2.47 | 2.5 | 2.895 | 2.65 | 2.31 | 2.46 |
| pH | | 7 to 8.5* | 7.40 | 8.00 | 7.5 | | | 7.3 | | | 7.6 | | | 7.4000 | 7.6 | 7.7 | 8.0 | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 7.3 | 7.4 | 7.3 | 7.4 | 7.6 |
| Suspended Solids | mg/l | | 23.00 | 565.00 | 376 | | | 187 | | | 565 | | | | | *3* | | | | 27 | *3* | | | | 19 | | |
| Phenol | mg/L | | 0.03 | 0.03 | 0.025 | | | *0.025* | | | | | | | | *0.025* | | | | *0.025* | *0.025* | | | | *0.005* | | |
| VFA | mg/L | | 2.50 | 2.50 | 2.5 | | | *2.5* | | | | | | | | *2.5* | | | | *2.5* | *2.5* | | | | *2.5* | | |
| TOC | mg/L | | 4.10 | 5.50 | 4.75 | | | 5.5 | | | 4.0 | | | | | 4.2 | | | | 3.9 | 4.0 | | | | 4.2 | | |
| Alkalinity | mg CaCO3/L | | 193.00 | 221.00 | 210.5 | | | 200 | | | 221 | | | | | 194 | | | | 186 | 192 | | | | 182 | | |
| Conductivity | mS/m | | 52.15 | 62.40 | 53.85 | | | 55.5 | | | 54.4 | | | 53.3000 | 52.9 | 52.5 | 55.2 | 51.6 | 52.3 | 50.6 | 51.0 | 51.1 | 62.4 | 52.0 | 49.0 | 48.9 | 50.0 |
| COD | mg/L | | 7.50 | 47.00 | 16.75 | | | 26 | | | *7.5* | | | 34.0000 | *7.5* | *7.5* | *7.5* | 7.5 | *7.5* | *7.5* | *7.5* | 47 | 23 | *7.5* | 24 | *7.5* | *7.5* |
| BOD (scBOD frm Apr'20) | mg/L | | 0.50 | 1.50 | 1 | | | *1.5* | | | *1.5* | | | 0.5000 | *0.5* | *0.5* | | | | *0.5* | *0.5* | | | | *0.5* | | |
| Faecal C (Ecoli frm Apr'20) | col/100ml | NIL | 2.00 | 4.00 | 2 | | | *2* | | | *2* | | | *2* | *2* | *2* | *2* | 2.0 | *2* | *2* | *2* | | *2* | *2* | 4 | | |
| Chloride | mg/L | 250* | 38.50 | 46.50 | 40.85 | | | 41.3 | | | 46 | | | 38.8000 | 40 | 40.5 | 41.0 | 38.2 | 38.2 | 37.7 | 37.7 | 39.0 | 46.5 | 36.8 | 35.3 | 35.6 | 34.9 |
| Nitrate-N | mg/L | 11.3 | 0.01 | 2.60 | 0.005 | | | *0.005* | | | *0.005* | | | *0.0050* | 2.60 | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | 0.28 | 0.31 | 0.03 |
| Sulphate | mg/L | 250* | 0.03 | 0.12 | 0.025 | | | 0.04 | | | *0.01* | | | | | 0.03 | | | | 0.02 | 0.02 | | | | 0.12 | | |
| Ammonia-N | mg/L | 1.17 | 0.32 | 0.37 | 0.325 | | | 0.31 | | | 0.33 | | | 0.3200 | 0.3 | 0.33 | 0.33 | 0.32 | 0.33 | 0.37 | 0.32 | 0.32 | 0.36 | 0.32 | 0.02 | *0.005* | 0.28 |
| Hardness | mg CaCO3/L | 200* | 164.50 | 168.00 | 166 | | | 166 | | | 166 | | | | | 168 | | | | 161 | 163 | | | | 148 | | |
| Calcium | mg/L | | 42.25 | 43.80 | 42.35 | | | 42.6 | | | 42.1 | | | | | 43.8 | | | | 41.5 | 42.4 | | | | 38.5 | | |
| Magnesium | mg/L | | 14.10 | 14.70 | 14.55 | | | 14.4 | | | 14.7 | | | | | 14.3 | | | | 13.9 | 13.7 | | | | 12.7 | | |
| Potassium | mg/L | | 6.33 | 7.57 | 7.34 | | | 7.57 | | | 7.1 | | | | | 6.32 | | | | 5.54 | 6.33 | | | | 5.45 | | |
| Sodium | mg/L | 200* | 39.10 | 43.10 | 39.25 | | | 39.1 | | | 39.4 | | | | | 39.4 | 39.4 | 15.3 | 26.5 | 37.5 | 40.8 | 40.6 | 43.1 | 30.9 | 36.4 | 37.6 | |
| D.R. Phosphorus | mg/L | | 0.65 | 0.67 | 0.629 | | | 0.617 | | | 0.641 | | | | | 0.667 | | | | 0.660 | 0.671 | | | | 0.602 | | |
| Aluminium | mg/L | 0.1* | 0.00 | 0.02 | 0.002 | | | *0.001* | | | 0.003 | | | 0.0230 | *0.001* | *0.001* | *0.001* | *0.001* | 0.006 | 0.002 | *0.001* | 0.006 | 0.003 | *0.001* | 0.003 | 0.002 | 0.004 |
| Arsenic | mg/L | 0.01 | 0.00 | 0.00 | 0.004 | | | 0.004 | | | 0.004 | | | | | 0.003 | | | | 0.003 | 0.003 | | | | 0.003 | | |
| Boron | mg/L | 1.4 | 0.06 | 0.10 | 0.06 | | | 0.06 | | | 0.07 | | | 0.0600 | 0.06 | 0.07 | 0.07 | 0.06 | 0.05 | 0.06 | 0.06 | 0.05 | 0.07 | 0.06 | 0.07 | 0.10 | 0.06 |
| Cadmium | mg/L | 0.004 | 0.00 | 0.00 | 0.0001 | | | *0.0001* | | | *0.0001* | | | | | *0.0001* | | | | *0.0001* | *0.0001* | | | | *0.0001* | | |
| Chromium | mg/L | 0.05 | 0.00 | 0.00 | 0.0005 | | | *0.0005* | | | *0.0005* | | | | | *0.0005* | | | | *0.0005* | *0.0005* | | | | *0.0005* | | |
| Copper | mg/L | 2 | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | | | *0.00025* | | | | *0.00025* | *0.00025* | | | | 0.0010 | | |
| Iron | mg/L | 0.2* | 0.02 | 0.05 | 0.0235 | | | 0.016 | | | 0.031 | | | | | 0.02 | 0.04 | 0.02 | 0.01 | 0.016 | 0.017 | 0.03 | 0.01 | 0.02 | 0.054 | 0.05 | |
| Lead | mg/L | 0.01 | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* |
| Manganese | mg/L | 0.4 | 0.60 | 0.74 | 0.6465 | | | 0.742 | | | 0.662 | | | 0.6270 | 0.6 | 0.583 | 0.701 | 0.624 | 0.488 | 0.533 | 0.555 | 0.580 | 0.668 | 0.583 | 0.0917 | 0.153 | 0.608 |
| Mercury | mg/L | | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | *0.00025* | | | | | | | | | | | |
| Nickel | mg/L | 0.08 | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | 0.0007 | *0.00025* | *0.00025* | *0.00025* | *0.00025* |
| Zinc | mg/L | 1.5* | 0.00 | 0.01 | 0.0025 | | | 0.004 | | | *0.001* | | | | | *0.001* | | | | *0.001* | *0.001* | | | | 0.008 | | |

* = GV

**C2DS** Monitoring Bore HDC Levin Landfill (shallow)

| Determinand | | ANZECC STOCK | Median | Maximum | Annual Median | Jun-21 | May-21 | Apr-21 | Mar-21 | Feb-21 | Jan-21 | Dec-20 | Nov-20 | Oct-20 | Jul-20 | Apr-20 | Jan-20 | Oct-19 | Jul-19 | Apr-19 | Jan-19 | Oct-18 | Jul-18 | Apr-18 | Jan-18 | Oct-17 | Jul-17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Water level | mBGL | | 2.40 | 3.69 | 2.88 | 2.88 | | 2.88 | | | 2.547 | | | 2.12 | 3.69 | 2.43 | 2.3 | 2.12 | 2.51 | 2.435 | 2.26 | 2.2 | 2.73 | 2.31 | 0.37 | 2.34 | 2.40 |
| pH | | 6 to 9 | 6.80 | 7.50 | 6.8 | | | 6.8 | | | 7.1 | | | 6.8 | 6.8 | 7.0 | 6.7 | 6.7 | 6.7 | 7.0 | 6.8 | 6.6 | 6.8 | 6.7 | 6.7 | 6.7 | 7.5 |
| Suspended Solids | mg/l | | 98.50 | 208.00 | 98.5 | | | 95 | | | 102 | | | | | 52 | | | | 104 | 56 | | | | 208 | | |
| Phenol | mg/L | | 0.03 | 0.03 | 0.025 | | | *0.025* | | | | | | | | *0.025* | | | | *0.025* | *0.025* | | | | *0.005* | | |
| VFA | mg/L | | 2.50 | 2.50 | 2.5 | | | *2.5* | | | | | | | | *2.5* | | | | *2.5* | *2.5* | | | | *2.5* | | |
| TOC | mg/L | | 29.80 | 32.80 | 25.45 | | | 26.2 | | | 24.7 | | | | | 32.0 | | | | 28.8 | 30.8 | | | | 32.8 | | |
| Alkalinity | mg CaCO3/L | | 689.00 | 839.00 | 497.5 | | | 464 | | | 531 | | | | | 716 | | | | 662 | 758 | | | | 839 | | |
| Conductivity | mS/m | | 173.00 | 231.00 | 143.5 | | | 117 | | | 137 | | | 150 | 163 | 170 | 182 | 170 | 178 | 157 | 173 | 231 | 173 | 202 | 200 | 187 | 215 |
| COD | mg/L | | 96.50 | 150.00 | 99.5 | | | 82 | | | 105 | | | 106 | 94 | 89 | 97 | 82 | 100 | 73 | 77 | 115 | 91 | 150 | 105 | 96 | 105 |
| BOD (scBOD frm Apr'20) | mg/L | | 3.00 | 3.00 | 2 | | | *3.0* | | | *3.0* | | | 1.0 | *0.5* | *3* | | | | *3* | *3* | | | | 1 | | |
| Faecal C (Ecoli frm Apr'20) | col/100ml | 100 | 2.00 | 2.00 | 2 | | | *2* | | | *2* | | | *2* | *2.0* | *2.0* | *2.0* | *2* | *2* | *2* | *2* | | | | *2* | | |
| Chloride | mg/L | | 123.00 | 187.00 | 113.5 | | | 81.2 | | | 118 | | | 122 | 109 | 125 | 124 | 111 | 133 | 110 | 109 | 142 | 110 | 150 | 154 | 139 | 187 |
| Nitrate-N | mg/L | 90.3 | 0.05 | 0.05 | 0.05 | | | *0.05* | | | *0.005* | | | *0.05* | *0.05* | *0.005* | *0.05* | *0.05* | *0.05* | *0.050* | *0.005* | *0.005* | *0.05* | *0.05* | *0.05* | *0.05* | *0.005* |
| Sulphate | mg/L | 1000 | 0.01 | 1.54 | 0.01 | | | *0.010* | | | *0.010* | | | | | *0.01* | | | | *0.01* | 0.03 | | | | *0.01* | | 1.54 |
| Ammonia-N | mg/L | | 1.54 | 1.79 | 1.315 | | | 1.33 | | | 1.27 | | | 1.3 | 1.6 | 1.79 | 1.71 | 1.54 | 1.45 | 1.77 | 1.57 | 1.18 | 1.59 | 1.41 | 1.69 | 1.33 | |
| Hardness | mg CaCO3/L | | 578.50 | 690.00 | 435.5 | | | 406 | | | 465 | | | | | 589 | | | | 568 | 606 | | | | 690 | | |
| Calcium | mg/L | 1000 | 133.00 | 185.00 | 114.5 | | | 108.0 | | | 121.0 | | | | | 134 | | | | 132 | 144 | | | | 185 | | |
| Magnesium | mg/L | | 56.60 | 61.70 | 36.25 | | | 33.2 | | | 39.3 | | | | | 61.7 | | | | 58.0 | 59.9 | | | | 55.2 | | |
| Potassium | mg/L | | 14.85 | 16.70 | 12.7 | | | 12.3 | | | 13.1 | | | | | 16.7 | | | | 14.6 | 15.6 | | | | 15.1 | | |
| Sodium | mg/L | | 115.00 | 166.00 | 102.3 | | | 99.6 | | | 105 | | | | | 115 | 108 | 105 | 132 | 104 | 113 | 166 | 141 | 137 | 129 | 116 | |
| D.R. Phosphorus | mg/L | | 0.03 | 0.12 | 0.027 | | | 0.025 | | | 0.029 | | | | | 0.122 | | | | 0.070 | 0.029 | | | | 0.039 | | |
| Aluminium | mg/L | 5 | 0.00 | 0.01 | 0.0015 | | | *0.001* | | | *0.001* | | | 0.002 | 0.003 | 0.001 | 0.010 | *0.001* | *0.001* | *0.001* | *0.001* | *0.001* | *0.001* | *0.001* | *0.001* | *0.001* | *0.001* |
| Arsenic | mg/L | 0.5 | 0.00 | 0.00 | 0.0025 | | | 0.002 | | | 0.003 | | | | | 0.003 | | | | 0.001 | 0.002 | | | | 0.001 | | |
| Boron | mg/L | 5 | 0.87 | 1.39 | 0.9 | | | 0.85 | | | 0.86 | | | 0.94 | 1.39 | 0.87 | 0.52 | 0.89 | 1.01 | 0.82 | 0.86 | 0.79 | 0.64 | 1.01 | 0.83 | 0.96 | 1.05 |
| Cadmium | mg/L | 0.01 | 0.00 | 0.00 | 0.0001 | | | *0.0001* | | | *0.0001* | | | | | *0.0001* | | | | *0.0001* | *0.0001* | | | | *0.0001* | | |
| Chromium | mg/L | 1 | 0.00 | 0.00 | 0.0005 | | | *0.0005* | | | *0.0005* | | | | | *0.0005* | | | | *0.0005* | *0.0005* | | | | *0.0005* | | |
| Copper | mg/L | 0.4 | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | | | *0.00025* | | | | *0.00025* | *0.00025* | | | | *0.00025* | | |
| Iron | mg/L | | 9.45 | 22.50 | 9.455 | | | 2.61 | | | 16.30 | | | | | 22.5 | 20.2 | 4.55 | 9.45 | 3.75 | 19.1 | 17.1 | 2.04 | 9.12 | 1.3 | 19.8 | |
| Lead | mg/L | 0.1 | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* |
| Manganese | mg/L | | 2.90 | 6.04 | 2.195 | | | 1.76 | | | 2.05 | | | 2.38 | 2.3 | 2.75 | 2.93 | 2.92 | 2.80 | 2.40 | 2.87 | 4.53 | 3.22 | 4.23 | 3.96 | 6.04 | 5.97 |
| Mercury | mg/L | | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | 0.00025 | | | | | | | | | | | |
| Nickel | mg/L | 1 | 0.00 | 0.00 | 0.00225 | | | 0.0022 | | | 0.0018 | | | 0.0023 | 0.0029 | 0.0029 | 0.0026 | 0.0015 | 0.0023 | 0.0021 | 0.0023 | 0.0037 | 0.0027 | 0.0030 | 0.0027 | 0.0038 | 0.0037 |
| Zinc | mg/L | 20 | 0.00 | 0.01 | 0.001 | | | *0.001* | | | *0.001* | | | | | *0.001* | | | | *0.001* | *0.001* | | | | 0.006 | | |

**D1** Monitoring Bore HDC Levin Landfill

| Determinand | | ANZECC STOCK | Median | Maximum | Annual Median | Jun-21 | May-21 | Apr-21 | Mar-21 | Feb-21 | Jan-21 | Dec-20 | Nov-20 | Oct-20 | Jul-20 | Apr-20 | Jan-20 | Oct-19 | Jul-19 | Apr-19 | Jan-19 | Oct-18 | Jul-18 | Apr-18 | Jan-18 | Oct-17 | Jul-17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Water level | mBGL | | 16.85 | 17.23 | 17.00 | 17.04 | | 17.04 | | | 16.895 | | | 16.920 | 17.00 | 17.23 | 16.72 | 16.65 | 16.32 | 16.915 | 16.77 | 16.615 | 16.79 | 16.85 | 16.71 | 16.75 | 16.86 |
| pH | | 6 to 9 | 6.70 | 7.60 | 6.70 | | | 6.7 | | | 6.7 | | | 6.600 | 6.7 | | 7.6 | 6.8 | 6.7 | 6.8 | 6.8 | 6.6 | 6.7 | 6.7 | 6.9 | 6.9 | 6.7 |
| Suspended Solids | mg/l | | 3.00 | 25.00 | 2.50 | | | *2* | | | *3* | | | | | | | | | *3* | *3* | | | | 25 | | |
| Phenol | mg/L | | 0.03 | 0.03 | 0.03 | | | *0.025* | | | | | | | | | | | | *0.025* | *0.025* | | | | *0.025* | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VFA | mg/L | | 2.50 | 6.00 | 2.50 | | | *2.5* | | | | | | | | | | | | | *2.5* | *6.0* | | | | *2.5* | | | | |
| TOC | mg/L | | 1.20 | 1.40 | 1.25 | | | 1.3 | | | 1.2 | | | | | | | | | | 1.1 | 1.4 | | | | 1.2 | | | | |
| Alkalinity | mg CaCO3/L | | 133.00 | 151.00 | 138.00 | | | 133 | | | 143 | | | | | | | | | | 114 | 151 | | | | 68 | | | | |
| Conductivity | mS/m | | 49.70 | 61.50 | 48.65 | | | 48.4 | | | 48.2 | | | 49.600 | 48.9 | | 46.6 | 52.3 | 51.9 | 52.4 | 58.2 | 60.2 | 56.4 | 49.7 | 44.3 | 46.6 | 61.5 | | | |
| COD | mg/L | | 7.50 | 37.00 | 11.25 | | | 21 | | | *7.5* | | | *7.500* | 14.99 | | *7.5* | 7.5 | *7.5* | *7.5* | *7.5* | 37 | *7.5* | *7.5* | *7.5* | *7.5* | *7.5* | | | |
| BOD (scBOD frm Apr'20) | mg/L | | 0.50 | 1.50 | 0.50 | | | *0.5* | | | *0.5* | | | *0.500* | *0.5* | | | | | *1.5* | *1.5* | | | | *0.5* | | | | |
| Faecal C (Ecoli frm Apr'20) | col/100ml | 100 | 2.00 | 180.00 | 2.00 | | | *2.000* | | | *2.000* | | | *2.000* | *2.0* | | *2.0* | *2* | 4 | *2* | *2* | | | | 180 | | | | |
| Chloride | mg/L | | 32.40 | 50.50 | 28.55 | | | 27.2 | | | 32.7 | | | 28.200 | 28.9 | | 30.3 | 36.1 | 36.9 | 32.4 | 36.9 | 36.6 | 41.8 | 30.9 | 26.9 | 31.9 | 50.5 | | | |
| Nitrate-N | mg/L | 90.3 | 14.70 | 25.10 | 10.44 | | | 9.44 | | | 9.98 | | | 10.900 | 11.40 | | 10.6 | 11.5 | 13.0 | 14.7 | 16.7 | 20.9 | 20.7 | 18.4 | 24.9 | 22.1 | 25.1 | | | |
| Sulphate | mg/L | 1000 | 5.43 | 6.44 | 5.05 | | | 5.07 | | | 5.03 | | | | | | | | | 6.27 | 6.44 | | | | 5.43 | | | | |
| Ammonia-N | mg/L | | 0.01 | 0.09 | 0.01 | | | *0.005* | | | 0.02 | | | *0.005* | *0.005* | | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | 0.09 | *0.005* | | | |
| Hardness | mg CaCO3/L | | 135.00 | 153.00 | 135.00 | | | 139 | | | 131 | | | | | | | | | 135 | 153 | | | | 121 | | | | |
| Calcium | mg/L | 1000 | 25.00 | 29.10 | 25.15 | | | 25.9 | | | 24.4 | | | | | | | | | 25.0 | 29.1 | | | | 22.9 | | | | |
| Magnesium | mg/L | | 17.50 | 19.50 | 17.50 | | | 18.0 | | | 17.0 | | | | | | | | | 17.5 | 19.5 | | | | 15.4 | | | | |
| Potassium | mg/L | | 9.34 | 10.70 | 10.02 | | | 10.7 | | | 9.34 | | | | | | | | | 9.3 | 10.2 | | | | 7.62 | | | | |
| Sodium | mg/L | | 40.25 | 54.20 | 43.15 | | | 43 | | | 43.1 | | | | | | 39.4 | 14.2 | 23.5 | 41.1 | 54.2 | 44.9 | 43.1 | 38.6 | 36.5 | 33.8 | | | | |
| D.R. Phosphorus | mg/L | | 0.10 | 0.10 | 0.10 | | | 0.100 | | | 0.098 | | | | | | | | | 0.092 | 0.084 | | | | 0.096 | | | | |
| Aluminium | mg/L | 5 | 0.00 | 0.02 | 0.0010 | | | *0.001* | | | *0.001* | | | *0.001* | *0.001* | | 0.009 | *0* | 0.006 | *0.001* | *0.001* | *0.001* | 0.002 | *0.001* | 0.005 | 0.018 | 0.003 | | | |
| Arsenic | mg/L | 0.5 | 0.00 | 0.00 | 0.0010 | | | 0.001 | | | 0.001 | | | | | | | | | 0.001 | 0.001 | | | | 0.001 | | | | |
| Boron | mg/L | 5 | 0.05 | 0.07 | 0.0500 | | | 0.05 | | | 0.06 | | | 0.050 | 0.05 | | 0.05 | 0.05 | *0.015* | *0.015* | 0.05 | *0.015* | 0.04 | 0.04 | 0.06 | 0.06 | 0.07 | | | |
| Cadmium | mg/L | 0.01 | 0.00 | 0.00 | 0.0001 | | | *0.0001* | | | *0.0001* | | | | | | | | | *0.0001* | 0.0002 | | | | *0.0001* | | | | |
| Chromium | mg/L | 1 | 0.00 | 0.00 | 0.0005 | | | *0.0005* | | | *0.0005* | | | | | | | | | *0.0005* | *0.0005* | | | | *0.0005* | | | | |
| Copper | mg/L | 0.4 | 0.00 | 0.00 | 0.0007 | | | 0.0011 | | | *0.00025* | | | | | | | | | *0.00025* | *0.00025* | | | | *0.00025* | | | | |
| Iron | mg/L | | 0.01 | 4.66 | 0.0025 | | | *0.0025* | | | *0.0025* | | | | | | 0.02 | *0.005* | 4.66 | *0.0025* | 0.015 | *0.005* | *0.005* | *0.005* | 0.008 | 0.03 | | | | |
| Lead | mg/L | 0.1 | 0.00 | 0.00 | 0.0003 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | 0.0005 | 0.0011 | *0.00025* | | | |
| Manganese | mg/L | | 0.00 | 0.22 | 0.0003 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | | 0.0050 | *0.00025* | 0.218 | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | 0.0080 | 0.0208 | 0.0008 | | | |
| Mercury | mg/L | | 0.00 | 0.00 | 0.0003 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | | | | | | | | | | | | | | | |
| Nickel | mg/L | 1 | 0.00 | 0.00 | 0.0003 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | | | |
| Zinc | mg/L | 20 | 0.00 | 0.00 | 0.0010 | | | *0.001* | | | *0.001* | | | | | | | | | *0.001* | *0.001* | | | | 0.003 | | | | |

**D2** Monitoring Bore HDC Levin Landfill

| Determinand | | ANZECC STOCK | Median | Maximum | Annual Median | Jun-21 | May-21 | Apr-21 | Mar-21 | Feb-21 | Jan-21 | Dec-20 | Nov-20 | Oct-20 | Jul-20 | Apr-20 | Jan-20 | Oct-19 | Jul-19 | Apr-19 | Jan-19 | Oct-18 | Jul-18 | Apr-18 | Jan-18 | Oct-17 | Jul-17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Water level | mBGL | | 21.47 | 21.68 | 21.60 | 21.68 | | 21.68 | | | 21.40 | | | 21.580 | 21.60 | 21.66 | 21.35 | 21.25 | 21.6 | 21.5 | 21.37 | 21.235 | 21.42 | 21.39 | 21.35 | 21.47 | 21.5 |
| pH | | 6 to 9 | 6.45 | 6.80 | 6.40 | | | 6.5 | | | 6.4 | | | 6.400 | 6.4 | 6.3 | 6.8 | 6.5 | 6.4 | 6.7 | 6.4 | 6.4 | 6.5 | 6.4 | 6.7 | 6.5 | 6.7 |
| Suspended Solids | mg/l | | 10.00 | 17.00 | 6.50 | | | 10 | | | *3* | | | | | 17 | | | | 10 | 7 | | | | 12 | | |
| Phenol | mg/L | | 0.03 | 0.03 | 0.03 | | | *0.025* | | | | | | | | *0.025* | | | | *0.025* | *0.025* | | | | *0.025* | | |
| VFA | mg/L | | 2.50 | 10.00 | 2.50 | | | *2.5* | | | | | | | | *2.5* | | | | *2.5* | 6 | | | | 10 | | |
| TOC | mg/L | | 12.00 | 13.70 | 11.80 | | | 11.7 | | | 11.9 | | | | | 13.2 | | | | 11.9 | 13.7 | | | | 12.1 | | |
| Alkalinity | mg CaCO3/L | | 105.00 | 134.00 | 130.50 | | | 134 | | | 127 | | | | | 109 | | | | 100 | 101 | | | | 96 | | |
| Conductivity | mS/m | | 34.95 | 40.20 | 36.65 | | | 40.2 | | | 37.7 | | | 34.400 | 35.6 | 33.6 | 31.1 | 34.7 | 37.6 | 34.9 | 35.4 | 38.2 | 34.9 | 36.0 | 35.0 | 33.5 | 30.6 |
| COD | mg/L | | 37.00 | 89.00 | 39.00 | | | 38 | | | 30 | | | 40.000 | 48 | 31 | 36 | 35 | 32 | 21 | 37 | 58 | 37 | 43 | 44 | 27 | 89 |
| BOD (scBOD frm Apr'20) | mg/L | | 2.25 | 3.00 | 1.75 | | | *3.0* | | | *3.0* | | | *0.500* | *0.5* | *1.5* | | | | *1.5* | *3* | | | | 3 | | |
| Faecal C (Ecoli frm Apr'20) | col/100ml | 100 | 2.00 | 32.00 | 5.00 | | | 8 | | | *0.5* | | | *2.000* | 32 | *2* | *2* | *2* | 20 | *2* | 8 | | | | *2* | | |
| Chloride | mg/L | | 38.00 | 44.90 | 33.80 | | | 33 | | | 35.6 | | | 31.500 | 34.6 | 32.8 | 32.9 | 35.2 | 42.1 | 39.0 | 41.3 | 44.9 | 41.6 | 41.9 | 40.5 | 39.8 | 37.0 |
| Nitrate-N | mg/L | 90.3 | 0.01 | 0.39 | 0.01 | | | *0.005* | | | *0.005* | | | 0.020 | *0.005* | *0.005* | *0.05* | *0.05* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | 0.39 | 0.01 |
| Sulphate | mg/L | 1000 | 0.80 | 4.96 | 0.01 | | | *0.01* | | | *0.01* | | | | | *0.01* | | | | 1.99 | 1.58 | | | | 4.96 | | |
| Ammonia-N | mg/L | | 0.48 | 0.62 | 0.53 | | | 0.51 | | | 0.55 | | | 0.490 | 0.62 | 0.49 | 0.43 | 0.47 | 0.48 | 0.50 | 0.45 | 0.47 | 0.43 | 0.43 | 0.47 | 0.39 | 0.48 |
| Hardness | mg CaCO3/L | | 88.00 | 100.00 | 95.50 | | | 100 | | | 91 | | | | | 87 | | | | 87 | 89 | | | | 86 | | |
| Calcium | mg/L | 1000 | 15.90 | 17.60 | 17.00 | | | 17.6 | | | 16.4 | | | | | 15.4 | | | | 14.6 | 15.2 | | | | 16.4 | | |
| Magnesium | mg/L | | 12.20 | 13.70 | 12.90 | | | 13.7 | | | 12.1 | | | | | 11.8 | | | | 12.3 | 12.3 | | | | 11.0 | | |
| Potassium | mg/L | | 7.21 | 9.73 | 8.86 | | | 9.73 | | | 7.98 | | | | | 7.10 | | | | 7.32 | 6.69 | | | | 5.28 | | |
| Sodium | mg/L | | 28.65 | 32.60 | 31.35 | | | 31.4 | | | 31.3 | | | 30.600 | 32.6 | 32.6 | 26.0 | 7.84 | 20.4 | 27.6 | 29.3 | 31.6 | 32.1 | 25.2 | 28.0 | 25.7 | 27.9 |
| D.R. Phosphorus | mg/L | | 0.04 | 0.06 | 0.05 | | | 0.036 | | | 0.055 | | | | | 0.038 | | | | 0.039 | 0.032 | | | | 0.055 | | |
| Aluminium | mg/L | 5 | 0.01 | 0.03 | 0.01 | | | 0.004 | | | 0.013 | | | 0.015 | 0.013 | 0.014 | 0.026 | 0.004 | *0.001* | 0.014 | 0.012 | 0.015 | 0.014 | 0.015 | 0.010 | 0.022 | 0.009 |
| Arsenic | mg/L | 0.5 | 0.00 | 0.00 | 0.00 | | | *0.0005* | | | 0.001 | | | | | 0.001 | | | | 0.001 | *0.0005* | | | | 0.001 | | |
| Boron | mg/L | 5 | 0.04 | 0.07 | 0.06 | | | 0.05 | | | 0.07 | | | 0.060 | 0.04 | 0.04 | 0.05 | 0.05 | 0.03 | *0.015* | 0.03 | *0.015* | *0.015* | 0.04 | 0.03 | 0.05 | *0.015* |
| Cadmium | mg/L | 0.01 | 0.00 | 0.00 | 0.00 | | | *0.0001* | | | *0.0001* | | | | | *0.0001* | | | | *0.0001* | *0.0001* | | | | *0.0001* | | |
| Chromium | mg/L | 1 | 0.00 | 0.00 | 0.00 | | | *0.0005* | | | 0.001 | | | | | 0.001 | | | | 0.001 | *0.0005* | | | | *0.0005* | | |
| Copper | mg/L | 0.4 | 0.00 | 0.00 | 0.00 | | | *0.00025* | | | *0.00025* | | | | | *0.00025* | | | | *0.00025* | *0.00025* | | | | 0.0014 | | |
| Iron | mg/L | | 9.79 | 17.20 | 10.09 | | | 3.95 | | | 17.20 | | | 9.280 | 10.90 | 15.0 | 14.9 | 9.04 | 0.02 | 11.9 | 8.22 | 10.3 | 13.0 | 8.12 | 8.51 | 16.40 | 6.76 |
| Lead | mg/L | 0.1 | 0.00 | 0.00 | 0.00 | | | *0.00025* | | | *0.00025* | | | 0.0028 | *0.00025* | *0.00025* | 0.0014 | *0.00025* | *0.00025* | *0.00025* | 0.0006 | *0.00025* | *0.00025* | 0.0027 | *0.00025* | 0.0014 | 0.0005 |
| Manganese | mg/L | | 0.32 | 0.41 | 0.32 | | | 0.362 | | | 0.314 | | | 0.317 | 0.318 | 0.306 | 0.332 | 0.325 | 0.0153 | 0.338 | 0.300 | 0.335 | 0.306 | 0.339 | 0.300 | 0.413 | 0.313 |
| Mercury | mg/L | | 0.00 | 0.00 | 0.00 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | *0.00025* | | | | | | | | | | | |
| Nickel | mg/L | 1 | 0.00 | 0.00 | 0.00 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* |
| Zinc | mg/L | 20 | 0.01 | 0.02 | 0.00 | | | 0.005 | | | *0.001* | | | | | 0.005 | | | | 0.006 | 0.007 | | | | 0.019 | | |

**D3r** Monitoring Bore HDC Levin Landfill

| Determinand | | ANZECC STOCK | Median | Maximum | Annual Median | Jun-21 | May-21 | Apr-21 | Mar-21 | Feb-21 | Jan-21 | Dec-20 | Nov-20 | Oct-20 | Jul-20 | Apr-20 | Jan-20 | Oct-19 | Jul-19 | Apr-19 | Jan-19 | Oct-18 | Jul-18 | Apr-18 | Jan-18 | Oct-17 | Jul-17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Water level | mBGL | | 4.69 | 4.94 | 4.69 | 4.69 | | 4.69 | | | 4.55 | | | 4.940 | 4.70 | 4.89 | 4.67 | 4.695 | 4.56 | 4.874 | 4.745 | 4.62 | 4.81 | 4.775 | 4.44 | 4.39 | 4.65 |
| pH | | 6 to 9 | 6.80 | 7.20 | 6.75 | | | 6.8 | | | 6.7 | | | 6.700 | 6.8 | 7.0 | 7.2 | 6.8 | 6.8 | 6.9 | 6.8 | 6.7 | 6.8 | 6.7 | 6.7 | 6.7 | 6.5 |
| Suspended Solids | mg/l | | 3.25 | 72.00 | 3.25 | | | *3* | | | *3.5* | | | | | *3* | | | | *3* | 8 | | | | 72 | | |
| Phenol | mg/L | | 0.03 | 0.03 | 0.025 | | | *0.025* | | | | | | | | *0.025* | | | | *0.025* | *0.025* | | | | *0.025* | | |
| VFA | mg/L | | 2.50 | 6.00 | 2.5 | | | *2.5* | | | | | | | | *2.5* | | | | *2.5* | 6 | | | | *2.5* | | |
| TOC | mg/L | | 2.95 | 3.10 | 3 | | | 3.0 | | | 3.0 | | | | | 3.1 | | | | 2.9 | 2.6 | | | | 1.5 | | |
| Alkalinity | mg CaCO3/L | | 56.00 | 116.00 | 55 | | | 55 | | | 55 | | | | | 56 | | | | 56 | 57 | | | | 116 | | |
| Conductivity | mS/m | | 22.65 | 53.60 | 21.95 | | | 22.30 | | | 21.7 | | | 22.100 | 21.8 | 21.4 | 22.0 | 22.0 | 23.0 | 53.6 | 22.1 | 24.3 | 27.3 | 28.2 | 33.4 | 30.5 | 29.4 |
| COD | mg/L | | 7.50 | 40.00 | 11.75 | | | 19 | | | *7.5* | | | *7.500* | 16 | *7.5* | 18 | 7.5 | *7.5* | *7.5* | *7.5* | 40 | *7.5* | *7.5* | 19 | 16 | *7.5* |
| BOD (scBOD frm Apr'20) | mg/L | | 1.00 | 3.00 | 0.5 | | | *3* | | | *0.5* | | | *0.500* | *0.5* | *0.5* | | | | *1.5* | *1.5* | | | | *3* | | |
| Faecal C (Ecoli frm Apr'20) | col/100ml | 100 | 2.00 | 2.00 | 2 | | | *2.000* | | | *0.5* | | | *2.000* | *2.0* | *2* | *2* | *2* | *2* | *2* | *2* | | | | *2* | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chloride | mg/L | | 22.15 | 25.90 | 22.1 | | | 20.9 | | | 23.3 | | | 22.100 | 22.1 | 21.7 | 22.0 | 21.8 | 21.6 | 22.7 | 22.4 | 22.2 | 22.5 | 23.5 | 21.8 | 25.9 | 25.3 |
| Nitrate-N | mg/L | 90.3 | 0.21 | 0.65 | 0.175 | | | 0.17 | | | 0.16 | | | 0.190 | 0.18 | 0.18 | 0.29 | 0.19 | 0.17 | 0.21 | 0.20 | 0.27 | 0.35 | 0.36 | 0.27 | 0.65 | 0.55 |
| Sulphate | mg/L | 1000 | 7.61 | 9.86 | 8.7 | | | 9.86 | | | 7.54 | | | | | 6.96 | | | | 8.48 | 7.68 | | | | 5.86 | | |
| Ammonia-N | mg/L | | 0.17 | 0.19 | 0.17 | | | 0.15 | | | 0.19 | | | 0.160 | 0.18 | 0.18 | 0.17 | 0.17 | 0.12 | 0.17 | 0.17 | 0.17 | 0.17 | 0.18 | 0.19 | 0.06 | 0.18 |
| Hardness | mg CaCO3/L | | 36.00 | 69.00 | 36 | | | 36 | | | 36 | | | | | 34 | | | | 35 | 36 | | | | 69 | | |
| Calcium | mg/L | 1000 | 7.03 | 14.30 | 7.025 | | | 7.07 | | | 6.98 | | | | | 6.81 | | | | 7.17 | 6.99 | | | | 14.3 | | |
| Magnesium | mg/L | | 4.44 | 8.08 | 4.44 | | | 4.44 | | | 4.44 | | | | | 4.19 | | | | 4.24 | 4.49 | | | | 8.08 | | |
| Potassium | mg/L | | 5.42 | 6.71 | 5.555 | | | 5.54 | | | 5.57 | | | | | 4.90 | | | | 4.53 | 5.30 | | | | 6.71 | | |
| Sodium | mg/L | | 25.55 | 28.90 | 25.4 | | | 24.8 | | | 25.5 | | | 25.300 | 25.7 | 27.3 | 25.10 | 8.79 | 21.3 | 26.1 | 25.9 | 23.3 | 25.3 | 25.6 | 28.9 | 28.1 | 27.7 |
| D.R. Phosphorus | mg/L | | 0.02 | 0.06 | 0.0185 | | | 0.017 | | | 0.020 | | | | | 0.015 | | | | 0.016 | 0.013 | | | | 0.063 | | |
| Aluminium | mg/L | 5 | 0.00 | 0.01 | 0.001 | | | *0.001* | | | 0.002 | | | *0.001* | *0.001* | *0.0010* | 0.002 | *0.001* | 0.003 | *0.001* | *0.001* | *0.001* | *0.001* | *0.001* | *0.001* | 0.005 | *0.001* |
| Arsenic | mg/L | 0.5 | 0.01 | 0.01 | 0.0075 | | | 0.007 | | | 0.008 | | | | | 0.011 | | | | 0.004 | 0.007 | | | | 0.002 | | |
| Boron | mg/L | 5 | 0.03 | 0.04 | 0.03 | | | 0.03 | | | 0.03 | | | 0.040 | 0.03 | *0.015* | 0.03 | 0.03 | 0.03 | *0.015* | 0.03 | *0.015* | 0.03 | 0.04 | 0.04 | 0.04 | 0.04 |
| Cadmium | mg/L | 0.01 | 0.00 | 0.00 | 0.0001 | | | *0.0001* | | | *0.0001* | | | | | *0.0001* | | | | *0.0001* | *0.0001* | | | | *0.0001* | | |
| Chromium | mg/L | 1 | 0.00 | 0.00 | 0.0005 | | | *0.0005* | | | *0.0005* | | | | | *0.0005* | | | | *0.0005* | *0.0005* | | | | *0.0005* | | |
| Copper | mg/L | 0.4 | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | | | *0.00025* | | | | *0.00025* | *0.00025* | | | | *0.00025* | | |
| Iron | mg/L | | 2.54 | 4.00 | 2.475 | | | 2.89 | | | 2.35 | | | 1.050 | 2.60 | 2.86 | 2.95 | 4.00 | 2.20 | 0.83 | 2.47 | 2.90 | 3.81 | 0.98 | 1.86 | 2.36 | 3.61 |
| Lead | mg/L | 0.1 | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* |
| Manganese | mg/L | | 0.19 | 0.40 | 0.178 | | | 0.177 | | | 0.179 | | | 0.184 | 0.166 | 0.176 | 0.193 | 0.201 | 0.160 | 0.171 | 0.189 | 0.228 | 0.244 | 0.284 | 0.370 | 0.398 | 0.370 |
| Mercury | mg/L | | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | *0.00025* | | | | | | | | | | | |
| Nickel | mg/L | 1 | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* |
| Zinc | mg/L | 20 | 0.00 | 0.01 | 0.001 | | | *0.001* | | | *0.001* | | | | | *0.001* | | | | *0.001* | *0.001* | | | | 0.005 | | |

**D4** Monitoring Bore HDC Levin Landfill

| Determinand | | ANZECC STOCK | Median | Maximum | Annual Median | Jun-21 | May-21 | Apr-21 | Mar-21 | Feb-21 | Jan-21 | Dec-20 | Nov-20 | Oct-20 | Jul-20 | Apr-20 | Jan-20 | Oct-19 | Jul-19 | Apr-19 | Jan-19 | Oct-18 | Jul-18 | Apr-18 | Jan-18 | Oct-17 | Jul-17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Water level | mBGL | | 8.10 | 11.00 | 7.98 | 7.98 | | 7.98 | | | 7.83 | | | 8.28000 | 8.10 | 8.25 | 8.7 | 8.01 | 8.41 | 11 | 8.115 | 7.985 | 8.17 | 8.17 | 4.36 | 7.68 | 7.9 |
| pH | | 6 to 9 | 7.00 | 7.70 | 6.95 | | | 7.0 | | | 7.2 | | | 6.80000 | 6.9 | 7.1 | 7.7 | 7.1 | 6.9 | 7.1 | 7.0 | 6.8 | 7.0 | 6.9 | 6.9 | 7.0 | 7.2 |
| Suspended Solids | mg/l | | 3.00 | 12.00 | 2.5 | | | *2* | | | *3* | | | | | 5 | | | | *3* | *3* | | | | 12 | | |
| Phenol | mg/L | | 0.03 | 0.03 | 0.025 | | | *0.025* | | | | | | | | *0.025* | | | | *0.025* | *0.025* | | | | *0.005* | | |
| VFA | mg/L | | 2.50 | 25.00 | 25 | | | 25.0 | | | | | | | | *2.5* | | | | *2.5* | *2.5* | | | | 5.0 | | |
| TOC | mg/L | | 2.40 | 3.50 | 3.4 | | | 3.5 | | | 3.3 | | | | | 2.4 | | | | 2.1 | 1.9 | | | | 2.4 | | |
| Alkalinity | mg CaCO3/L | | 55.00 | 65.00 | 65 | | | 65 | | | 65 | | | | | 55 | | | | 53 | 52 | | | | 55 | | |
| Conductivity | mS/m | | 30.85 | 34.40 | 30.45 | | | 30.6 | | | 30.3 | | | 31.10000 | 30.2 | 31.3 | 31.5 | 32.7 | 29.4 | 27.1 | 29.7 | 34.4 | 32.0 | 34.2 | 31.9 | 27.5 | 30.5 |
| COD | mg/L | | 7.50 | 20.00 | 7.5 | | | *7.5* | | | *7.5* | | | *7.50000* | *7.5* | *7.5* | *7.5* | 7.5 | *7.5* | *7.5* | *7.5* | 20 | *7.5* | 18 | *7.5* | 16 | *7.5* |
| BOD (scBOD frm Apr'20) | mg/L | | 0.50 | 3.00 | 0.5 | | | *3.0* | | | *0.5* | | | *0.50000* | *0.5* | *0.5* | | | | *1.5* | *1.5* | | | | *0.5* | | |
| Faecal C (Ecoli frm Apr'20) | col/100ml | 100 | 2.00 | 8.00 | 2 | | | *2* | | | *0.5* | | | *2.00000* | 8 | *2* | *2* | *2* | *2* | *2* | *2* | | | | 8 | | |
| Chloride | mg/L | | 44.60 | 58.00 | 42.4 | | | 36.4 | | | 40.9 | | | 44.30000 | 43.9 | 44.6 | 49.2 | 53.5 | 45.3 | 38.5 | 44.6 | 58.0 | 48.1 | 50.7 | 45.1 | 39.1 | 41.2 |
| Nitrate-N | mg/L | 90.3 | 0.01 | 0.13 | 0.005 | | | *0.005* | | | *0.005* | | | *0.00500* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | 0.13 | 0.03 | *0.005* |
| Sulphate | mg/L | 1000 | 13.10 | 20.00 | 12.75 | | | 11.8 | | | 13.7 | | | | | 12.5 | | | | 11.2 | 14.9 | | | | 20.0 | | |
| Ammonia-N | mg/L | | 0.22 | 0.25 | 0.245 | | | 0.24 | | | 0.25 | | | 0.25000 | 0.22 | 0.21 | 0.21 | 0.23 | 0.22 | 0.23 | 0.22 | 0.24 | 0.22 | 0.22 | 0.05 | 0.11 | 0.17 |
| Hardness | mg CaCO3/L | | 59.50 | 62.00 | 59.5 | | | 60 | | | 59 | | | | | 62 | | | | 48 | 54 | | | | 62 | | |
| Calcium | mg/L | 1000 | 10.90 | 11.60 | 11.4 | | | 11.6 | | | 11.2 | | | | | 11.0 | | | | 9.26 | 9.61 | | | | 10.8 | | |
| Magnesium | mg/L | | 7.60 | 8.52 | 7.6 | | | 7.67 | | | 7.53 | | | | | 8.39 | | | | 5.96 | 7.17 | | | | 8.52 | | |
| Potassium | mg/L | | 6.08 | 6.62 | 6.28 | | | 6.09 | | | 6.5 | | | | | 6.62 | | | | 4.64 | 6.06 | | | | 5.68 | | |
| Sodium | mg/L | | 32.50 | 35.60 | 32.7 | | | 29.2 | | | 33.4 | | | 32.00000 | 33.4 | 31.7 | 31.4 | 33.7 | 32.2 | 29.1 | 32.8 | 35.6 | 31.5 | 32.9 | 32.8 | 31.9 | 33.4 |
| D.R. Phosphorus | mg/L | | 0.02 | 0.06 | 0.023 | | | 0.021 | | | 0.0250 | | | | | 0.016 | | | | 0.021 | 0.023 | | | | 0.058 | | |
| Aluminium | mg/L | 5 | 0.00 | 0.01 | 0.001 | | | *0.001* | | | *0.001* | | | *0.00100* | *0.001* | *0.001* | *0.001* | *0.001* | *0.001* | *0.001* | *0.001* | *0.001* | *0.001* | *0.001* | 0.005 | 0.002 | *0.001* |
| Arsenic | mg/L | 0.5 | 0.00 | 0.00 | 0.003 | | | 0.003 | | | 0.003 | | | | | 0.004 | | | | 0.002 | 0.003 | | | | *0.0005* | | |
| Boron | mg/L | 5 | 0.04 | 0.08 | 0.04 | | | *0.015* | | | 0.04 | | | 0.04000 | 0.08 | 0.04 | *0.015* | 0.03 | 0.04 | *0.015* | *0.015* | 0.04 | *0.015* | 0.06 | 0.04 | *0.015* | *0.015* |
| Cadmium | mg/L | 0.01 | 0.00 | 0.00 | 0.0001 | | | *0.0001* | | | *0.0001* | | | | | *0.0001* | | | | *0.0001* | *0.0001* | | | | *0.0001* | | |
| Chromium | mg/L | 1 | 0.00 | 0.00 | 0.0005 | | | *0.0005* | | | *0.0005* | | | | | *0.0005* | | | | *0.0005* | *0.0005* | | | | *0.0005* | | |
| Copper | mg/L | 0.4 | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | | | *0.00025* | | | | *0.00025* | *0.00025* | | | | 0.0010 | | |
| Iron | mg/L | | 0.80 | 1.91 | 0.985 | | | 1.54 | | | 1.59 | | | 0.43000 | 0.38 | 1.51 | 0.831 | 0.77 | 1.91 | 0.15 | 0.83 | 0.91 | 0.35 | 1.23 | 0.628 | 0.37 | 0.36 |
| Lead | mg/L | 0.1 | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* |
| Manganese | mg/L | | 0.18 | 0.21 | 0.2015 | | | 0.209 | | | 0.202 | | | 0.20100 | 0.18 | 0.189 | 0.175 | 0.175 | 0.181 | 0.151 | 0.175 | 0.211 | 0.186 | 0.213 | 0.0025 | 0.136 | 0.174 |
| Mercury | mg/L | | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | *0.00025* | | | | | | | | | | | |
| Nickel | mg/L | 1 | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* |
| Zinc | mg/L | 20 | 0.00 | 0.00 | 0.001 | | | *0.001* | | | *0.001* | | | | | *0.001* | | | | *0.001* | *0.001* | | | | 0.003 | | |

**D5** Monitoring Bore HDC Levin Landfill

| Determinand | | ANZECC STOCK | Median | Maximum | Annual Median | Jun-21 | May-21 | Apr-21 | Mar-21 | Feb-21 | Jan-21 | Dec-20 | Nov-20 | Oct-20 | Jul-20 | Apr-20 | Jan-20 | Oct-19 | Jul-19 | Apr-19 | Jan-19 | Oct-18 | Jul-18 | Apr-18 | Jan-18 | Oct-17 | Jul-17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Water level | mBGL | | 9.76 | 10.08 | 9.59 | 9.59 | | 9.59 | | | 9.49 | | | 10.075 | 9.62 | 9.93 | 9.76 | 9.755 | 9.77 | 9.93 | 9.79 | 9.665 | 9.9 | 9.8 | 9.2 | 9.29 | 9.58 |
| pH | | 6 to 9 | 7.10 | 7.90 | 7.05 | | | 7.0 | | | 7.4 | | | 7.000 | 7.1 | 7.4 | 7.9 | 7.2 | 7.0 | 7.1 | 7.4 | 7.1 | 7.0 | 7.0 | 7.2 | 7.0 | 7.2 |
| Suspended Solids | mg/l | | 3.00 | 9.00 | 2.5 | | | *2* | | | *3* | | | | | *2.5* | | | | *3* | *3* | | | | 9 | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Phenol | mg/L | | 0.03 | 0.03 | 0.025 | | | *0.025* | | | | | | | | *0.025* | | | | *0.025* | *0.005* | | | | *0.005* | | |
| VFA | mg/L | | 2.50 | 8.00 | 2.5 | | | *2.5* | | | | | | | | *2.5* | | | | *2.5* | *2.5* | | | | 8 | | |
| TOC | mg/L | | 1.95 | 2.10 | 1.95 | | | 1.9 | | | 2.0 | | | | | 2.0 | | | | 1.9 | 2.1 | | | | 1.8 | | |
| Alkalinity | mg CaCO3/L | | 64.50 | 68.00 | 65 | | | 62 | | | 68 | | | | | 63 | | | | 66 | 67 | | | | 57 | | |
| Conductivity | mS/m | | 29.45 | 31.80 | 29.45 | | | 29.4 | | | 31.2 | | | 29.400 | 29.5 | 29.9 | 29.4 | 30.7 | 28.7 | 31.2 | 31.8 | 31.1 | 25.0 | 29.7 | 24.8 | 24.1 | 27.8 |
| COD | mg/L | | 7.50 | 55.00 | 14.25 | | | *7.5* | | | 21 | | | 50.000 | *7.5* | *7.5* | *7.5* | *7.5* | 22.0 | *7.5* | 21.0 | 55.0 | *7.5* | *7.5* | *7.5* | 20 | *7.5* |
| BOD (scBOD frm Apr'20) | mg/L | | 0.50 | 1.50 | 0.5 | | | *1.5* | | | *0.5* | | | *0.500* | *0.5* | *0.5* | *0.5* | *0.5* | | *0.5* | *0.5* | | | | *0.5* | | |
| Faecal C (Ecoli frm Apr'20) | col/100ml | 100 | 2.00 | 4.00 | 2 | | | *2* | | | *0.5* | | | *2.000* | *2.0* | *2.0* | *2.0* | *2* | 4 | *2* | *2* | | | | *2* | | |
| Chloride | mg/L | | 29.40 | 54.80 | 29.85 | | | 26.7 | | | 29.9 | | | 54.800 | 29.8 | 29.1 | 30.0 | 29.5 | 29.3 | 29.9 | 31.5 | 32.2 | 29.2 | 27.3 | 23.8 | 23.6 | 27.7 |
| Nitrate-N | mg/L | 90.3 | 1.26 | 2.39 | 1.54 | | | 1.73 | | | 0.84 | | | 1.640 | 1.44 | 1.18 | 1.34 | 1.15 | 1.45 | 1.03 | 0.86 | 0.97 | 1.07 | 0.99 | 2.39 | 2.25 | 1.68 |
| Sulphate | mg/L | 1000 | 21.75 | 28.30 | 19.25 | | | 16.0 | | | 22.5 | | | | | 21.0 | | | | 24.2 | 28.30 | | | | 9.81 | | |
| Ammonia-N | mg/L | | 0.01 | 0.01 | 0.005 | | | *0.005* | | | *0.005* | | | *0.005* | *0.005* | *0.005* | 0.01 | *0.005* | *0.005* | *0.005* | 0.01 | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* |
| Hardness | mg CaCO3/L | | 65.50 | 72.00 | 65 | | | 61 | | | 69 | | | | | 64 | | | | 67 | 72 | | | | 48 | | |
| Calcium | mg/L | 1000 | 11.40 | 12.70 | 11.35 | | | 10.3 | | | 12.4 | | | | | 11.1 | | | | 11.7 | 12.7 | | | | 8.89 | | |
| Magnesium | mg/L | | 8.95 | 9.72 | 8.975 | | | 8.61 | | | 9.34 | | | | | 8.86 | | | | 9.03 | 9.72 | | | | 6.20 | | |
| Potassium | mg/L | | 7.18 | 7.83 | 7.415 | | | 7.0 | | | 7.83 | | | | | 7.83 | | | | 6.55 | 7.36 | | | | 4.43 | | |
| Sodium | mg/L | | 29.40 | 36.80 | 30.35 | | | 28.3 | | | 32.4 | | | | | 32.5 | 29.4 | 33.0 | 36.8 | 32.1 | 33.1 | 27.6 | 23.1 | 27.7 | 25.2 | 23.8 | |
| D.R. Phosphorus | mg/L | | 0.10 | 0.14 | 0.0985 | | | 0.104 | | | 0.093 | | | | | 0.096 | | | | 0.100 | 0.084 | | | | 0.138 | | |
| Aluminium | mg/L | 5 | 0.00 | 0.01 | 0.001 | | | *0.001* | | | *0.001* | | | *0.001* | *0.001* | *0.001* | *0.001* | *0.001* | *0.001* | *0.001* | *0.001* | 0.003 | *0.001* | *0.001* | 0.005 | 0.012 | *0.001* |
| Arsenic | mg/L | 0.5 | 0.00 | 0.00 | 0.00075 | | | *0.0005* | | | 0.001 | | | | | 0.001 | | | | 0.001 | 0.001 | | | | *0.0005* | | |
| Boron | mg/L | 5 | 0.02 | 0.04 | 0.03 | | | 0.03 | | | 0.03 | | | 0.030 | 0.03 | 0.04 | 0.03 | *0.015* | *0.015* | 0.030 | *0.015* | *0.015* | *0.015* | *0.015* | *0.015* | *0.015* | *0.015* |
| Cadmium | mg/L | 0.01 | 0.00 | 0.00 | 0.0001 | | | *0.0001* | | | *0.0001* | | | | | *0.0001* | | | | *0.0001* | *0.0001* | | | | *0.0001* | | |
| Chromium | mg/L | 1 | 0.00 | 0.00 | 0.0005 | | | *0.0005* | | | *0.0005* | | | | | *0.0005* | | | | *0.0005* | *0.0005* | | | | *0.0005* | | |
| Copper | mg/L | 0.4 | 0.00 | 0.00 | 0.001 | | | 0.0006 | | | 0.0014 | | | | | 0.0009 | | | | 0.0005 | 0.0005 | | | | 0.0010 | | |
| Iron | mg/L | | 0.05 | 0.11 | 0.0595 | | | 0.033 | | | 0.086 | | | | | 0.070 | 0.06 | 0.05 | *0.005* | 0.043 | 0.113 | 0.07 | 0.03 | 0.07 | 0.006 | 0.04 | |
| Lead | mg/L | 0.1 | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | 0.0011 | *0.00025* |
| Manganese | mg/L | | 0.01 | 0.05 | 0.0122 | | | 0.0095 | | | 0.0185 | | | 0.0149 | 0.006 | 0.0193 | 0.0148 | 0.0162 | 0.0035 | 0.0109 | 0.0203 | 0.0203 | 0.0078 | 0.0140 | 0.0032 | 0.0125 | 0.0450 |
| Mercury | mg/L | | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | *0.00025* | | | | | | | | | | | |
| Nickel | mg/L | 1 | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | 0.0007 | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | 0.0005 | *0.00025* |
| Zinc | mg/L | 20 | 0.00 | 0.00 | 0.001 | | | *0.001* | | | *0.001* | | | | | *0.001* | | | | *0.001* | *0.001* | | | | 0.004 | | |

**D6** Monitoring Bore HDC Levin Landfill

| Determinand | | ANZECC STOCK | Median | Maximum | Annual Median | Jun-21 | May-21 | Apr-21 | Mar-21 | Feb-21 | Jan-21 | Dec-20 | Nov-20 | Oct-20 | Jul-20 | Apr-20 | Jan-20 | Oct-19 | Jul-19 | Apr-19 | Jan-19 | Oct-18 | Jul-18 | Apr-18 | Jan-18 | Oct-17 | Jul-17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Water level | mBGL | | 16.40 | 17.30 | 16.5 | 16.59 | | 16.59 | | | 16.49 | | | 16.500 | 15.30 | 16.62 | 16.23 | 16.22 | 16.38 | 16.523 | 16.36 | 16.21 | 16.38 | 16.4 | 17.3 | 16.3 | 16.41 |
| pH | | 6 to 9 | 6.80 | 7.10 | 6.8 | | | 6.9 | | | 6.8 | | | 6.700 | 6.8 | 7.1 | 7.1 | 7.0 | 6.8 | 7.0 | 6.8 | 6.7 | 6.7 | 6.8 | 6.9 | 6.9 | 6.6 |
| Suspended Solids | mg/l | | 3.00 | 22.00 | 2.5 | | | *2* | | | *3* | | | | | *2.5* | | | | *3* | *3* | | | | 22 | | |
| Phenol | mg/L | | 0.03 | 0.03 | 0.025 | | | *0.025* | | | | | | | | *0.025* | | | | *0.025* | *0.025* | | | | *0.025* | | |
| VFA | mg/L | | 2.50 | 16.00 | 2.5 | | | *2.5* | | | | | | | | *2.5* | | | | *2.5* | *2.5* | | | | 16 | | |
| TOC | mg/L | | 1.00 | 1.20 | 1.05 | | | 1.2 | | | 0.9 | | | | | 1.0 | | | | 0.9 | 1.0 | | | | 1.0 | | |
| Alkalinity | mg CaCO3/L | | 73.00 | 81.00 | 75 | | | 69 | | | 81 | | | | | 73 | | | | 75 | 73 | | | | 60 | | |
| Conductivity | mS/m | | 42.00 | 46.50 | 40.05 | | | 37.5 | | | 36.6 | | | 44.700 | 42.6 | 37.2 | 29.1 | 31.9 | 41.9 | 43.4 | 44.5 | 45.5 | 46.5 | 42.1 | 37.1 | 27.7 | 43.1 |
| COD | mg/L | | 7.50 | 45.00 | 7.5 | | | *7.5* | | | *7.5* | | | *7.500* | *7.5* | *7.5* | *7.5* | *7.5* | *7.5* | *7.5* | *7.5* | 45 | 33 | *7.5* | *7.5* | *7.5* | *7.5* |
| BOD (scBOD frm Apr'20) | mg/L | | 0.50 | 1.50 | 0.5 | | | *0.5* | | | *0.5* | | | *0.500* | *0.5* | *0.5* | | | | *1.5* | *1.5* | | | | *0.5* | | |
| Faecal C (Ecoli frm Apr'20) | col/100ml | 100 | 2.00 | 240.00 | 2 | | | *2.000* | | | 24 | | | *2.000* | *2.0* | 240 | *2.0* | *2* | *2* | *2* | *2* | | | | 110 | | |
| Chloride | mg/L | | 21.50 | 31.00 | 19.3 | | | 17.4 | | | 17.7 | | | 20.900 | 22.1 | 19.8 | 14.2 | 16.3 | 27.7 | 26.4 | 26.2 | 28.8 | 31.0 | 26.8 | 19.5 | 14.1 | 30.9 |
| Nitrate-N | mg/L | 90.3 | 17.80 | 23.90 | 18.95 | | | 16.60 | | | 16.70 | | | 21.200 | 23.90 | 16.9 | 11.1 | 11.7 | 17.7 | 21.7 | 22.9 | 23.8 | 22.9 | 19.9 | 17.9 | 11.5 | 15.8 |
| Sulphate | mg/L | 1000 | 4.84 | 28.10 | 16.82 | | | 28.1 | | | 5.54 | | | | | 4.34 | | | | 4.82 | 4.85 | | | | 3.40 | | |
| Ammonia-N | mg/L | | 0.01 | 0.05 | 0.005 | | | *0.005* | | | 0.050 | | | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* |
| Hardness | mg CaCO3/L | | 96.00 | 104.00 | 94.5 | | | 97 | | | 92 | | | | | 95 | | | | 104 | 101 | | | | 82 | | |
| Calcium | mg/L | 1000 | 17.90 | 18.50 | 17.65 | | | 17.8 | | | 17.5 | | | | | 18.0 | | | | 18.5 | 18.5 | | | | 15.7 | | |
| Magnesium | mg/L | | 12.55 | 13.20 | 12.25 | | | 12.8 | | | 11.7 | | | | | 12.3 | | | | 13.1 | 13.2 | | | | 10.5 | | |
| Potassium | mg/L | | 8.08 | 8.89 | 8.445 | | | 8.89 | | | 8.0 | | | | | 8.16 | | | | 7.31 | 8.67 | | | | 6.46 | | |
| Sodium | mg/L | | 31.80 | 40.90 | 31.3 | | | 30.8 | | | 31.8 | | | | | 33.9 | 26.7 | 9.72 | 24.8 | 37.9 | 38.4 | 40.9 | 38.9 | 35.9 | 30.0 | 24.9 | |
| D.R. Phosphorus | mg/L | | 0.10 | 0.12 | 0.0985 | | | 0.098 | | | 0.099 | | | | | 0.101 | | | | 0.093 | 0.094 | | | | 0.122 | | |
| Aluminium | mg/L | 5 | 0.00 | 0.03 | 0.001 | | | *0.001* | | | *0.001* | | | *0.001* | *0.001* | 0.003 | *0.001* | *0.001* | 0.016 | *0.001* | *0.001* | *0.001* | *0.001* | 0.032 | 0.010 | 0.008 | 0.004 |
| Arsenic | mg/L | 0.5 | 0.00 | 0.00 | 0.001 | | | 0.001 | | | 0.001 | | | | | 0.001 | | | | 0.001 | 0.001 | | | | 0.001 | | |
| Boron | mg/L | 5 | 0.05 | 0.07 | 0.055 | | | 0.05 | | | 0.06 | | | 0.060 | 0.05 | 0.05 | 0.05 | 0.05 | 0.03 | 0.03 | 0.07 | 0.05 | 0.05 | 0.05 | 0.05 | 0.06 | 0.04 |
| Cadmium | mg/L | 0.01 | 0.00 | 0.00 | 0.0001 | | | *0.0001* | | | *0.0001* | | | | | *0.0001* | | | | *0.0001* | *0.0001* | | | | *0.0001* | | |
| Chromium | mg/L | 1 | 0.00 | 0.01 | 0.0005 | | | *0.0005* | | | *0.0005* | | | | | *0.0005* | | | | *0.0005* | *0.005* | | | | *0.0005* | | |
| Copper | mg/L | 0.4 | 0.00 | 0.01 | 0.000425 | | | 0.0006 | | | *0.00025* | | | | | 0.0057 | | | | *0.00025* | *0.00025* | | | | *0.00025* | | |
| Iron | mg/L | | 0.01 | 14.20 | 0.0135 | | | 0.02 | | | 0.007 | | | | | *0.0025* | *0.005* | *0.005* | 14.2 | *0.0025* | *0.0025* | *0.005* | *0.005* | 0.080 | 0.024 | 0.02 | |
| Lead | mg/L | 0.1 | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | 0.0019 | *0.00025* | *0.00025* | *0.00025* |
| Manganese | mg/L | | 0.00 | 0.37 | 0.000425 | | | 0.0018 | | | *0.00025* | | | *0.00025* | 0.0006 | 0.0009 | *0.00025* | *0.00025* | 0.372 | *0.00025* | *0.00025* | *0.00025* | *0.00025* | 0.0037 | 0.0041 | 0.0051 | 0.0019 |
| Mercury | mg/L | | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | *0.00025* | | | | | | | | | | | |
| Nickel | mg/L | 1 | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* |
| Zinc | mg/L | 20 | 0.00 | 0.00 | 0.0015 | | | 0.002 | | | *0.001* | | | | | 0.004 | | | | *0.001* | *0.001* | | | | 0.002 | | |

**E1S** Monitoring Bore HDC Levin Landfill

| Determinand | | ANZECC STOCK | Median | Maximum | Annual Median | Jun-21 | May-21 | Apr-21 | Mar-21 | Feb-21 | Jan-21 | Dec-20 | Nov-20 | Oct-20 | Jul-20 | Apr-20 | Jan-20 | Oct-19 | Jul-19 | Apr-19 | Jan-19 | Oct-18 | Jul-18 | Apr-18 | Jan-18 | Oct-17 | Jul-17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Water level | mBGL | | 11.39 | 11.60 | 11.51 | 11.51 | | 11.51 | | | 11.35 | | | 11.510 | 11.60 | 11.51 | 11.327 | 11.385 | 11.25 | 11.495 | 11.35 | 11.235 | 11.41 | 11.39 | 11.27 | 11.29 | 11.37 |
| pH | | 6 to 9 | 7.00 | 7.60 | 6.9 | | | 6.9 | | | 6.9 | | | 6.800 | 7.0 | 7.2 | 7.1 | 7.0 | 6.9 | 7.6 | 7.3 | 6.8 | 7.1 | 6.9 | 7.1 | 7.0 | 7.1 |
| Suspended Solids | mg/l | | 6.00 | 58.00 | 31.5 | | | 5 | | | 58 | | | | | *7* | | | | *3* | *3* | | | | 13 | | |
| Phenol | mg/L | | 0.03 | 0.03 | 0.025 | | | *0.025* | | | | | | | | *0.025* | | | | *0.025* | *0.025* | | | | *0.005* | | |
| VFA | mg/L | | 2.50 | 9.00 | 2.5 | | | *2.5* | | | | | | | | *2.5* | | | | *2.5* | *2.5* | | | | 9 | | |
| TOC | mg/L | | 4.45 | 6.60 | 6.5 | | | 6.4 | | | 6.6 | | | | | 5.2 | | | | 3.7 | 3.7 | | | | 2.4 | | |
| Alkalinity | mg CaCO3/L | | 64.50 | 77.00 | 73.5 | | | 70 | | | 77 | | | | | 68 | | | | 61 | 58 | | | | 47 | | |
| Conductivity | mS/m | | 26.90 | 29.80 | 26.55 | | | 26.7 | | | 25.7 | | | 27.400 | 26.4 | 27.1 | 26.6 | 26.9 | 26.7 | 26.7 | 26.4 | 26.9 | 26.9 | 27.7 | 28.9 | 29.5 | 29.8 |
| COD | mg/L | | 7.50 | 25.00 | 19 | | | 25 | | | 18 | | | 19.000 | 19 | *7.5* | 19 | *7.5* | *7.5* | *25.0* | *7.5* | *7.5* | *7.5* | *7.5* | *7.5* | *7.5* | *7.5* |
| BOD (scBOD frm Apr'20) | mg/L | | 1.50 | 5.90 | 2.25 | | | *3.0* | | | *1.5* | | | *0.500* | 5.9 | *0.5* | | | | *1.5* | *1.5* | | | | *0.5* | | |
| Faecal C (Ecoli frm Apr'20) | col/100ml | 100 | 2.00 | 2.00 | 2 | | | *2.000* | | | *2.000* | | | *2.000* | *2.0* | *2.0* | *2.0* | *2* | *2* | *2* | *2* | | | | *2* | | |
| Chloride | mg/L | | 32.10 | 44.60 | 28.15 | | | 26.1 | | | 28.5 | | | 27.800 | 28.7 | 28.7 | 29.7 | 30.0 | 30.7 | 33.5 | 33.6 | 35.6 | 35.1 | 37.9 | 43.0 | 44.6 | 42.8 |
| Nitrate-N | mg/L | 90.3 | 0.01 | 0.01 | 0.005 | | | *0.005* | | | *0.005* | | | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | 0.01 | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* |
| Sulphate | mg/L | 1000 | 10.15 | 14.10 | 5.315 | | | 5.37 | | | 5.26 | | | | | 9.1 | | | | 11.2 | 11.4 | | | | 14.1 | | |
| Ammonia-N | mg/L | | 0.18 | 0.23 | 0.19 | | | 0.18 | | | 0.2 | | | 0.230 | 0.18 | 0.17 | 0.16 | 0.18 | 0.18 | 0.18 | 0.16 | 0.21 | 0.15 | 0.16 | 0.15 | 0.14 | 0.16 |
| Hardness | mg CaCO3/L | | 53.50 | 59.00 | 57 | | | 59 | | | 55 | | | | | 59 | | | | 52 | 52 | | | | 51 | | |
| Calcium | mg/L | 1000 | 10.08 | 11.60 | 11.1 | | | 11.6 | | | 10.6 | | | | | 11.0 | | | | 9.56 | 9.19 | | | | 8.28 | | |
| Magnesium | mg/L | | 7.17 | 7.62 | 7.115 | | | 7.19 | | | 7.04 | | | | | 7.62 | | | | 6.76 | 7.14 | | | | 7.36 | | |
| Potassium | mg/L | | 5.98 | 6.22 | 6 | | | 5.95 | | | 6.05 | | | | | 6.22 | | | | 5.02 | 6.01 | | | | 5.17 | | |
| Sodium | mg/L | | 27.75 | 31.70 | 27.2 | | | 26 | | | 27.6 | | | 26.800 | 29.2 | 28.9 | 25.80 | 9.45 | 22.9 | 28.1 | 29.3 | 28.2 | 25.9 | 26.4 | 29.3 | 27.9 | 31.7 |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D.R. Phosphorus | mg/L | | 0.06 | 0.07 | 0.0635 | | | 0.059 | | | 0.068 | | | | | 0.053 | | | 0.054 | 0.065 | | | | 0.055 | | |
| Aluminium | mg/L | 5 | 0.01 | 0.02 | 0.008 | | | 0.004 | | | 0.016 | | | 0.007 | 0.009 | 0.006 | 0.006 | *0.001* | 0.002 | 0.002 | 0.006 | 0.003 | 0.003 | 0.006 | 0.004 | 0.006 | 0.004 |
| Arsenic | mg/L | 0.5 | 0.00 | 0.00 | 0.002 | | | 0.001 | | | 0.003 | | | | | 0.002 | | | 0.002 | 0.002 | | | | 0.002 | | |
| Boron | mg/L | 5 | 0.02 | 0.04 | 0.0175 | | | *0.015* | | | 0.03 | | | *0.015* | 0.02 | 0.03 | *0.015* | *0.015* | 0.04 | *0.015* | *0.015* | *0.015* | *0.015* | *0.015* | 0.03 | *0.015* | *0.015* |
| Cadmium | mg/L | 0.01 | 0.00 | 0.00 | 0.0001 | | | *0.0001* | | | *0.0001* | | | | | *0.0001* | | | | *0.0001* | *0.0001* | | | | *0.0001* | | |
| Chromium | mg/L | 1 | 0.00 | 0.00 | 0.0005 | | | *0.0005* | | | *0.0005* | | | | | *0.0005* | | | | *0.0005* | *0.0005* | | | | *0.0005* | | |
| Copper | mg/L | 0.4 | 0.00 | 0.00 | 0.000675 | | | *0.00025* | | | 0.0011 | | | | | *0.0006* | | | | *0.0005* | *0.00025* | | | | 0.0008 | | |
| Iron | mg/L | | 4.10 | 4.83 | 4.8 | | | 1.96 | | | 4.77 | | | 4.830 | 4.83 | 4.65 | 4.22 | 4.63 | 0.02 | 3.97 | 4.22 | 3.79 | 3.79 | 3.94 | 3.08 | 4.22 | 3.39 |
| Lead | mg/L | 0.1 | 0.00 | 0.01 | 0.002 | | | *0.00025* | | | 0.00700 | | | 0.0018 | 0.00220 | 0.0005 | *0.00025* | 0.0023 | *0.00025* | 0.0009 | 0.0006 | 0.0008 | 0.0019 | 0.0014 | 0.0033 | *0.00025* | 0.0008 |
| Manganese | mg/L | | 0.22 | 0.24 | 0.2375 | | | 0.239 | | | 0.236 | | | 0.241 | 0.229 | 0.243 | 0.219 | 0.242 | 0.0353 | 0.209 | 0.219 | 0.208 | 0.192 | 0.207 | 0.157 | 0.224 | 0.210 |
| Mercury | mg/L | | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | *0.00025* | | | | | | | | | | | |
| Nickel | mg/L | 1 | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* |
| Zinc | mg/L | 20 | 0.00 | 0.00 | 0.0015 | | | *0.001* | | | 0.002 | | | | | *0.001* | | | | *0.001* | *0.001* | | | | *0.001* | | |

**E1D** Monitoring Bore HDC Levin Landfill

| Determinand | | NZDW MAV | Median | Maximum | Annual Median | Jun-21 | May-21 | Apr-21 | Mar-21 | Feb-21 | Jan-21 | Dec-20 | Nov-20 | Oct-20 | Jul-20 | Apr-20 | Jan-20 | Oct-19 | Jul-19 | Apr-19 | Jan-19 | Oct-18 | Jul-18 | Apr-18 | Jan-18 | Oct-17 | Jul-17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Water level | mBGL | | 11.30 | 12.14 | 11.4 | 11.41 | | 11.41 | | | | | | 11.3900 | 11.32 | 11.38 | 11.25 | 11.165 | 11.33 | 11.43 | 11.27 | 11.135 | 11.27 | 11.28 | 12.14 | 10.94 | 11.22 |
| pH | | 7 to 8.5* | 7.50 | 8.10 | 7.55 | | | 7.5 | | | 7.6 | | | 7.5000 | 7.7 | 7.7 | 7.9 | 7.5 | 7.5 | 8.1 | 7.5 | 7.6 | 7.5 | 7.5 | 7.5 | 7.5 | 7.7 |
| Suspended Solids | mg/l | | 12.00 | 50.00 | 29.5 | | | 9 | | | 50 | | | | | *2.5* | | | | *3* | 27 | | | | 15 | | |
| Phenol | mg/L | | 0.03 | 0.03 | 0.025 | | | *0.025* | | | | | | | | *0.025* | | | | *0.025* | *0.025* | | | | *0.005* | | |
| VFA | mg/L | | 2.50 | 2.50 | 2.5 | | | *2.5* | | | | | | | | *2.5* | | | | *2.5* | *2.5* | | | | *2.5* | | |
| TOC | mg/L | | 2.95 | 3.20 | 2.95 | | | 3.0 | | | 2.9 | | | | | 3.1 | | | | 2.8 | 3.2 | | | | 2.9 | | |
| Alkalinity | mg CaCO3/L | | 157.50 | 161.00 | 152 | | | 151 | | | 153 | | | | | 155 | | | | 160 | 161 | | | | 161 | | |
| Conductivity | mS/m | | 45.35 | 45.90 | 44.7 | | | 44.7 | | | 44.7 | | | 44.9000 | 44.3 | 45.5 | 45.8 | 45.9 | 45.2 | 45.7 | 45.6 | 45.5 | 45.5 | 45.2 | 45.9 | 44.0 | 44.4 |
| COD | mg/L | | 12.75 | 45.00 | 20.5 | | | 26 | | | *7.5* | | | 18.0000 | 23 | *7.5* | *7.5* | *7.5* | 45 | *7.5* | 37 | 38 | *7.5* | *7.5* | 23 | 18 | *7.5* |
| BOD (scBOD frm Apr'20) | mg/L | | 0.50 | 2.00 | 0.5 | | | *1.5* | | | *0.5* | | | *0.5000* | *0.5* | *0.5* | | | | *2* | *0.5* | | | | 0.5 | | |
| Faecal C (Ecoli frm Apr'20) | col/100ml | NIL | 2.00 | 2.00 | 2 | | | *2.0000* | | | *2.0000* | | | *2.0000* | *2.0* | *2.0* | *2.0* | *2* | *2* | *1.5* | *2.0* | | | | *2* | | |
| Chloride | mg/L | 250* | 39.25 | 40.90 | 39.05 | | | 38.5 | | | 38.9 | | | 39.2000 | 40.1 | 38.7 | 38.2 | 39.0 | 39.4 | 39.3 | 39.0 | 39.6 | 39.6 | 37.9 | 39.3 | 40.9 | 40.7 |
| Nitrate-N | mg/L | 11.3 | 0.01 | 0.01 | 0.005 | | | *0.005* | | | *0.005* | | | *0.0050* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* |
| Sulphate | mg/L | 250* | 0.01 | 0.01 | 0.01 | | | *0.01* | | | *0.01* | | | | | *0.01* | | | | *0.01* | *0.01* | | | | *0.01* | | |
| Ammonia-N | mg/L | 1.17 | 0.21 | 0.25 | 0.21 | | | 0.2 | | | 0.19 | | | 0.2200 | 0.22 | 0.20 | 0.19 | 0.21 | 0.21 | 0.23 | 0.20 | 0.22 | 0.19 | 0.20 | 0.20 | 0.24 | 0.25 |
| Hardness | mg CaCO3/L | 200* | 134.00 | 141.00 | 133 | | | 138 | | | 128 | | | | | 131 | | | | 124 | 141 | | | | 137 | | |
| Calcium | mg/L | | 32.20 | 34.70 | 31.85 | | | 32.6 | | | 31.1 | | | | | 31.8 | | | | 28.7 | 34.7 | | | | 33.5 | | |
| Magnesium | mg/L | | 12.80 | 13.80 | 13.05 | | | 13.8 | | | 12.3 | | | | | 12.4 | | | | 12.6 | 13.1 | | | | 13.0 | | |
| Potassium | mg/L | | 5.03 | 5.14 | 5.1 | | | 5.14 | | | 5.06 | | | | | 5.03 | | | | 5.03 | 4.96 | | | | 4.38 | | |
| Sodium | mg/L | 200* | 36.80 | 43.90 | 36.55 | | | 37.2 | | | 35.5 | | | 36.0000 | 37.1 | 36.5 | 37.2 | 14.7 | 43.9 | 35.9 | 39.6 | 37.3 | 42.0 | 39.5 | 36.1 | 35.6 | 33.7 |
| D.R. Phosphorus | mg/L | | 0.39 | 0.42 | 0.4045 | | | 0.390 | | | 0.419 | | | | | 0.411 | | | | 0.391 | 0.395 | | | | 0.389 | | |
| Aluminium | mg/L | 0.1* | 0.00 | 0.00 | 0.0015 | | | *0.0010* | | | 0.002 | | | *0.0010* | 0.003 | *0.001* | 0.003 | *0.001* | *0.001* | 0.001 | 0.003 | *0.001* | 0.002 | 0.004 | 0.002 | *0.001* | *0.001* |
| Arsenic | mg/L | 0.01 | 0.01 | 0.01 | 0.007 | | | 0.007 | | | 0.007 | | | | | 0.007 | | | | 0.007 | 0.008 | | | | 0.006 | | |
| Boron | mg/L | 1.4 | 0.05 | 0.06 | 0.055 | | | 0.06 | | | 0.06 | | | 0.0500 | 0.05 | 0.06 | 0.06 | 0.06 | 0.04 | *0.015* | 0.05 | 0.04 | 0.06 | 0.04 | 0.05 | 0.05 | 0.04 |
| Cadmium | mg/L | 0.004 | 0.00 | 0.00 | 0.0001 | | | *0.0001* | | | *0.0001* | | | | | *0.0001* | | | | *0.0001* | *0.0001* | | | | *0.0001* | | |
| Chromium | mg/L | 0.05 | 0.00 | 0.00 | 0.0005 | | | *0.0005* | | | *0.0005* | | | | | *0.0005* | | | | *0.0005* | *0.0005* | | | | *0.0005* | | |
| Copper | mg/L | 2 | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | | | *0.00025* | | | | *0.00025* | *0.00025* | | | | *0.00025* | | |
| Iron | mg/L | 0.2* | 0.05 | 0.11 | 0.0245 | | | 0.023 | | | 0.026 | | | 0.0300 | 0.02 | 0.03 | 0.05 | 0.04 | 0.05 | 0.037 | 0.036 | 0.05 | 0.11 | 0.07 | 0.084 | 0.05 | 0.06 |
| Lead | mg/L | 0.01 | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* |
| Manganese | mg/L | 0.4 | 0.24 | 0.27 | 0.233 | | | 0.24 | | | 0.226 | | | 0.2400 | 0.226 | 0.248 | 0.274 | 0.258 | 0.235 | 0.241 | 0.229 | 0.256 | 0.252 | 0.259 | 0.200 | 0.256 | 0.268 |
| Mercury | mg/L | | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | *0.00025* | | | | | | | | | | | |
| Nickel | mg/L | 0.08 | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* |
| Zinc | mg/L | 1.5* | 0.00 | 0.00 | 0.001 | | | *0.001* | | | *0.001* | | | | | *0.001* | | | | *0.001* | *0.001* | | | | *0.001* | | |

* = GV

**E2S** Monitoring Bore HDC Levin Landfill

| Determinand | | ANZECC STOCK | Median | Maximum | Annual Median | Jun-21 | May-21 | Apr-21 | Mar-21 | Feb-21 | Jan-21 | Dec-20 | Nov-20 | Oct-20 | Jul-20 | Apr-20 | Jan-20 | Oct-19 | Jul-19 | Apr-19 | Jan-19 | Oct-18 | Jul-18 | Apr-18 | Jan-18 | Oct-17 | Jul-17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Water level | mBGL | | 4.77 | 5.67 | 5.57 | 5.57 | | 5.57 | | | 4.515 | | | 5.670 | 5.55 | 4.97 | 4.79 | 4.635 | 4.75 | 4.965 | 4.77 | 4.665 | 4.76 | 4.8 | 4.57 | 4.28 | 4.40 |
| pH | | 6 to 9 | 7.50 | 7.90 | 7.6 | | | 7.7 | | | 7.8 | | | 7.500 | 7.4 | 7.6 | 7.9 | 7.7 | 7.4 | 7.5 | 7.4 | 7.4 | 7.5 | 7.3 | 7.4 | 7.5 | 7.6 |
| Suspended Solids | mg/l | | 3.00 | 18.00 | 2.5 | | | *2* | | | *3* | | | | | *2.5* | | | | *3* | *3* | | | | 18 | | |
| Phenol | mg/L | | 0.03 | 0.03 | 0.025 | | | *0.025* | | | | | | | | *0.025* | | | | *0.025* | *0.025* | | | | *0.005* | | |
| VFA | mg/L | | 2.50 | 6.00 | 2.5 | | | *2.5* | | | | | | | | *2.5* | | | | *2.5* | 6 | | | | *2.5* | | |
| TOC | mg/L | | 2.90 | 3.30 | 3.1 | | | 3.3 | | | 2.9 | | | | | 2.9 | | | | 2.7 | 3.1 | | | | 2.9 | | |
| Alkalinity | mg CaCO3/L | | 147.50 | 151.00 | 115 | | | 85 | | | 145 | | | | | 146 | | | | 149 | 150 | | | | 151 | | |
| Conductivity | mS/m | | 44.50 | 45.00 | 40.15 | | | 35.5 | | | 43.8 | | | 36.500 | 43.8 | 44.9 | 44.5 | 44.8 | 44.2 | 44.5 | 44.5 | 44.6 | 35.0 | 45.0 | 44.9 | 44.5 | 44.7 |
| COD | mg/L | | 7.50 | 27.00 | 11.75 | | | 16 | | | 18 | | | 7.500 | *7.5* | *7.5* | 27 | *7.5* | *7.5* | *7.5* | *7.5* | *7.5* | *7.5* | *7.5* | 22 | *7.5* | *7.5* |
| BOD (scBOD frm Apr'20) | mg/L | | 0.50 | 1.50 | 0.5 | | | *1.5* | | | *0.5* | | | *0.500* | *0.5* | *0.5* | | | | *1.5* | *1.5* | | | | *0.5* | | |
| Faecal C (Ecoli frm Apr'20) | col/100ml | 100 | 2.00 | 20.00 | 2 | | | *2.000* | | | *0.5* | | | *2.000* | *2.0* | 2 | *2.0* | 2 | 2 | 2 | 2 | | | | 20 | | |
| Chloride | mg/L | | 41.55 | 48.00 | 42.5 | | | 39.4 | | | 44 | | | 45.700 | 40.7 | 40.7 | 41.8 | 41.0 | 41.4 | 41.8 | 42.1 | 42.0 | 48.0 | 41.7 | 41.4 | 41.4 | 40.4 |
| Nitrate-N | mg/L | 90.3 | 0.01 | 0.04 | 0.005 | | | *0.005* | | | *0.005* | | | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | 0.04 | *0.005* | *0.005* |
| Sulphate | mg/L | 1000 | 0.07 | 14.10 | 7.055 | | | 14.1 | | | *0.01* | | | | | *0.01* | | | | *0.01* | 7.54 | | | | 0.13 | | |
| Ammonia-N | mg/L | | 0.26 | 0.33 | 0.305 | | | 0.33 | | | 0.28 | | | 0.330 | 0.26 | 0.25 | 0.25 | 0.26 | 0.25 | 0.27 | 0.25 | 0.26 | 0.28 | 0.25 | 0.14 | 0.28 | 0.29 |
| Hardness | mg CaCO3/L | | 117.00 | 123.00 | 112 | | | 101 | | | 123 | | | | | 119 | | | | 112 | 120 | | | | 115 | | |
| Calcium | mg/L | 1000 | 26.25 | 29.60 | 28.75 | | | 29.6 | | | 27.9 | | | | | 26.0 | | | | 25.4 | 26.5 | | | | 25.7 | | |
| Magnesium | mg/L | | 12.60 | 13.00 | 9.84 | | | 6.68 | | | 13.0 | | | | | 13.0 | | | | 11.9 | 12.9 | | | | 12.3 | | |
| Potassium | mg/L | | 5.78 | 6.46 | 5.895 | | | 5.62 | | | 6.17 | | | | | 6.46 | | | | 5.45 | 5.93 | | | | 5.28 | | |
| Sodium | mg/L | | 40.90 | 45.00 | 37.4 | | | 26.8 | | | 44.2 | | | 31.400 | 43.4 | 41.2 | 42.7 | 41.7 | 44.5 | 40.6 | 44.1 | 45.0 | 33.6 | 39.0 | 39.7 | 40.1 | 40.4 |
| D.R. Phosphorus | mg/L | | 0.57 | 0.62 | 0.424 | | | 0.238 | | | 0.610 | | | | | 0.621 | | | | 0.567 | 0.576 | | | | 0.568 | | |
| Aluminium | mg/L | 5 | 0.00 | 0.01 | 0.001 | | | *0.001* | | | *0.001* | | | *0.001* | *0.001* | 0.004 | *0.001* | *0.001* | *0.001* | *0.001* | 0.003 | *0.001* | *0.001* | *0.001* | 0.008 | *0.001* | *0.001* |
| Arsenic | mg/L | 0.5 | 0.00 | 0.00 | 0.00075 | | | *0.0005* | | | 0.001 | | | | | 0.001 | | | | 0.001 | 0.002 | | | | 0.001 | | |
| Boron | mg/L | 5 | 0.05 | 0.06 | 0.0325 | | | *0.015* | | | 0.06 | | | *0.015* | 0.05 | 0.05 | 0.04 | 0.05 | 0.05 | *0.015* | 0.05 | 0.04 | *0.015* | 0.05 | 0.05 | 0.06 | *0.05* |
| Cadmium | mg/L | 0.01 | 0.00 | 0.00 | 0.0001 | | | *0.0001* | | | *0.0001* | | | | | *0.0001* | | | | *0.0001* | *0.0001* | | | | *0.0001* | | |
| Chromium | mg/L | 1 | 0.00 | 0.00 | 0.0005 | | | *0.0005* | | | *0.0005* | | | | | *0.0005* | | | | *0.0005* | *0.0005* | | | | *0.0005* | | |
| Copper | mg/L | 0.4 | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | | | *0.00025* | | | | *0.00025* | 0.00025 | | | | 0.0005 | | |
| Iron | mg/L | | 0.06 | 0.14 | 0.045 | | | 0.064 | | | 0.019 | | | 0.030 | 0.06 | 0.047 | 0.03 | 0.02 | 0.05 | 0.055 | 0.070 | 0.09 | 0.06 | 0.14 | 0.139 | 0.08 | 0.06 |
| Lead | mg/L | 0.1 | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | 0.0015 | *0.00025* | *0.00025* | 0.0005 | 0.0020 | *0.00025* | *0.00025* |
| Manganese | mg/L | | 0.38 | 0.47 | 0.311 | | | 0.237 | | | 0.376 | | | 0.246 | 0.377 | 0.386 | 0.389 | 0.283 | 0.404 | 0.376 | 0.380 | 0.406 | 0.248 | 0.419 | 0.286 | 0.473 | 0.432 |
| Mercury | mg/L | | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | *0.00025* | | | | | | | | | | | |
| Nickel | mg/L | 1 | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | 0.0006 | 0.0009 | 0.0006 | 0.0007 |
| Zinc | mg/L | 20 | 0.00 | 0.06 | 0.0015 | | | 0.002 | | | *0.001* | | | | | 0.003 | | | | *0.001* | 0.011 | | | | 0.055 | | |

**E2D** Monitoring Bore HDC Levin Landfill

| Determinand | | NZDW | Median | Maximum | Annual | Jun-21 | May-21 | Apr-21 | Mar-21 | Feb-21 | Jan-21 | Dec-20 | Nov-20 | Oct-20 | Jul-20 | Apr-20 | Jan-20 | Oct-19 | Jul-19 | Apr-19 | Jan-19 | Oct-18 | Jul-18 | Apr-18 | Jan-18 | Oct-17 | Jul-17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| | | MAV | | | Median | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Water level | mBGL | | 5.62 | 6.17 | 4.78 | 4.78 | | 4.78 | | | 5.40 | | | 4.7650 | 6.17 | 5.79 | 5.7 | 5.58 | 5.66 | 5.81 | 5.69 | 5.62 | 5.7 | 5.7 | 5.44 | 5.15 | 5.36 |
| pH | | 7 to 8.5* | 7.60 | 8.00 | 7.6 | | | 7.5 | | | 7.7 | | | 7.3000 | 7.8 | 7.7 | 8.0 | 7.7 | 7.6 | 7.6 | 7.7 | 7.5 | 7.6 | 7.4 | 7.6 | 7.4 | 7.8 |
| Suspended Solids | mg/l | | 9.50 | 25.00 | 7.5 | | | 7 | | | 8 | | | | | 14 | | | | *3* | 11 | | | | 25 | | |
| Phenol | mg/L | | 0.03 | 0.03 | 0.025 | | | *0.025* | | | | | | | | *0.025* | | | | *0.025* | *0.025* | | | | *0.005* | | |
| VFA | mg/L | | 2.50 | 5.00 | 2.5 | | | *2.5* | | | | | | | | *2.5* | | | | *2.5* | *2.5* | | | | 5 | | |
| TOC | mg/L | | 2.10 | 2.80 | 2.4 | | | 2.8 | | | 2.0 | | | | | 2.1 | | | | 1.9 | 2.1 | | | | 2.5 | | |
| Alkalinity | mg CaCO3/L | | 81.50 | 138.00 | 109.5 | | | 138 | | | 81 | | | | | 76 | | | | 76 | 82 | | | | 83 | | |
| Conductivity | mS/m | | 35.10 | 44.80 | 40.4 | | | 44.4 | | | 34.7 | | | 44.8000 | 36.4 | 35.4 | 34.6 | 34.4 | 34.8 | 34.9 | 36.7 | 35.2 | 35.0 | 33.8 | 34.8 | 36.8 | 38.5 |
| COD | mg/L | | 7.50 | 41.00 | 7.5 | | | *7.5* | | | *7.5* | | | *7.5000* | *7.5* | *7.5* | 20 | *7.5* | *7.5* | *7.5* | 30 | 41 | *7.5* | *7.5* | 27 | 18 | *7.5* |
| BOD (scBOD frm Apr'20) | mg/L | | 0.50 | 1.50 | 0.5 | | | *0.5* | | | *0.5* | | | *0.5000* | *0.5* | *0.5* | | | | *1.5* | *0.5* | | | | 1 | | |
| Faecal C (Ecoli frm Apr'20) | col/100ml | NIL | 2.00 | 4.00 | 2 | | | 4 | | | *0.5* | | | *2.0000* | *2.0* | *2.0* | *2.0* | *2* | *2* | *2* | *2* | | | | 4 | | |
| Chloride | mg/L | 250* | 47.95 | 53.50 | 43.95 | | | 40.6 | | | 47.3 | | | 40.6000 | 48.1 | 47.8 | 45.0 | 45.9 | 48.2 | 48.4 | 50.5 | 49.0 | 48.4 | 44.9 | 43.4 | 52.4 | 53.5 |
| Nitrate-N | mg/L | 11.3 | 0.01 | 0.22 | 0.005 | | | *0.005* | | | *0.005* | | | *0.0050* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | 0.22 | *0.005* | *0.005* |
| Sulphate | mg/L | 250* | 10.35 | 16.30 | 8.155 | | | *0.01* | | | 16.3 | | | | | 12.4 | | | | 10.0 | 10.7 | | | | 9.55 | | |
| Ammonia-N | mg/L | 1.17 | 0.30 | 0.53 | 0.275 | | | 0.25 | | | 0.29 | | | 0.2600 | 0.3 | 0.30 | 0.29 | 0.29 | 0.30 | 0.34 | 0.34 | 0.30 | 0.29 | 0.29 | 0.23 | 0.53 | 0.35 |
| Hardness | mg CaCO3/L | 200* | 88.50 | 121.00 | 101 | | | 121 | | | 81 | | | | | 83 | | | | 75 | 101 | | | | 94 | | |
| Calcium | mg/L | | 24.95 | 29.70 | 24.75 | | | 26.8 | | | 22.7 | | | | | 23.1 | | | | 20.0 | 29.7 | | | | 29.0 | | |
| Magnesium | mg/L | | 6.06 | 13.20 | 9.525 | | | 13.2 | | | 5.85 | | | | | 6.14 | | | | 5.97 | 6.46 | | | | 5.31 | | |
| Potassium | mg/L | | 5.37 | 6.67 | 6.005 | | | 6.67 | | | 5.34 | | | | | 5.67 | | | | 5.40 | 5.11 | | | | 4.40 | | |
| Sodium | mg/L | 200* | 30.00 | 41.30 | 34.65 | | | 40.9 | | | 28.4 | | | | | 30.2 | 30.0 | 10.9 | 27.2 | 28.1 | 31.0 | 32.5 | 26.0 | 41.3 | 24.4 | 33.3 | |
| D.R. Phosphorus | mg/L | | 0.21 | 0.62 | 0.413 | | | 0.624 | | | 0.202 | | | | | 0.198 | | | | 0.148 | 0.218 | | | | 0.292 | | |
| Aluminium | mg/L | 0.1* | 0.00 | 0.01 | 0.001 | | | *0.001* | | | *0.001* | | | *0.0010* | *0.001* | *0.001* | *0.001* | *0.001* | *0.001* | *0.001* | 0.003 | *0.001* | 0.002 | *0.001* | 0.004 | 0.005 | 0.002 |
| Arsenic | mg/L | 0.01 | 0.00 | 0.00 | 0.001 | | | 0.001 | | | 0.001 | | | | | 0.001 | | | | 0.002 | *0.0005* | | | | *0.0005* | | |
| Boron | mg/L | 1.4 | 0.02 | 0.07 | 0.045 | | | 0.07 | | | 0.03 | | | 0.0600 | *0.015* | *0.015* | *0.015* | *0.015* | *0.015* | *0.015* | *0.015* | *0.015* | *0.015* | *0.015* | *0.015* | 0.03 | *0.015* |
| Cadmium | mg/L | 0.004 | 0.00 | 0.00 | 0.0001 | | | *0.0001* | | | *0.0001* | | | | | *0.0001* | | | | *0.0001* | *0.0001* | | | | *0.0001* | | |
| Chromium | mg/L | 0.05 | 0.00 | 0.00 | 0.0005 | | | *0.0005* | | | *0.0005* | | | | | *0.0005* | | | | *0.0005* | *0.0005* | | | | *0.0005* | | |
| Copper | mg/L | 2 | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | | | *0.00025* | | | | *0.00025* | 0.00025 | | | | 0.0010 | | |
| Iron | mg/L | 0.2* | 0.06 | 0.18 | 0.056 | | | 0.046 | | | 0.066 | | | | | 0.046 | 0.07 | 0.05 | 0.05 | 0.052 | 0.064 | 0.06 | 0.03 | 0.07 | 0.134 | 0.18 | |
| Lead | mg/L | 0.01 | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | 0.0007 | *0.00025* |
| Manganese | mg/L | 0.4 | 0.23 | 0.57 | 0.314 | | | 0.409 | | | 0.212 | | | 0.4020 | 0.226 | 0.234 | 0.232 | 0.229 | 0.219 | 0.230 | 0.231 | 0.237 | 0.193 | 0.228 | 0.133 | 0.570 | 0.286 |
| Mercury | mg/L | | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | *0.00025* | | | | | | | | | | | |
| Nickel | mg/L | 0.08 | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | 0.0022 | *0.00025* |
| Zinc | mg/L | 1.5* | 0.00 | 0.01 | 0.001 | | | *0.001* | | | *0.001* | | | | | *0.001* | | | | *0.001* | *0.001* | | | | 0.013 | | |

* = GV

**F1** Monitoring Bore HDC Levin Landfill

| Determinand | | ANZECC STOCK | Median | Maximum | Annual Median | Jun-21 | May-21 | Apr-21 | Mar-21 | Feb-21 | Jan-21 | Dec-20 | Nov-20 | Oct-20 | Jul-20 | Apr-20 | Jan-20 | Oct-19 | Jul-19 | Apr-19 | Jan-19 | Oct-18 | Jul-18 | Apr-18 | Jan-18 | Oct-17 | Jul-17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Water level | mBGL | | 7.91 | 8.38 | 7.905 | 7.905 | | 7.91 | | | 7.70 | | | 8.130 | 7.80 | 8.38 | 7.97 | 7.92 | 7.89 | 8.21 | 8.04 | 7.71 | 7.98 | 8.09 | 7.59 | 7.42 | 7.62 |
| pH | | 6 to 9 | 6.90 | 7.90 | 6.9 | | | 6.9 | | | 7.2 | | | 6.900 | 6.9 | 7.6 | 7.8 | 6.8 | 7.9 | 7.6 | 7.2 | 6.8 | 6.8 | 6.8 | 6.9 | 6.9 | 7.0 |
| Suspended Solids | mg/l | | 2.50 | 3.00 | 2.5 | | | *2* | | | *3* | | | | | *2.5* | | | | *2.5* | *3* | | | | *2* | | |
| Phenol | mg/L | | 0.03 | 0.03 | 0.025 | | | *0.025* | | | | | | | | *0.025* | | | | *0.025* | *0.005* | | | | *0.025* | | |
| VFA | mg/L | | 2.50 | 2.50 | 2.5 | | | *2.5* | | | | | | | | *2.5* | | | | *2.5* | *2.5* | | | | *2.5* | | |
| TOC | mg/L | | 5.45 | 6.80 | 4.95 | | | 5.1 | | | 4.8 | | | | | 5.5 | | | | 6.2 | 5.4 | | | | 6.8 | | |
| Alkalinity | mg CaCO3/L | | 130.50 | 144.00 | 114 | | | 113 | | | 115 | | | | | 131 | | | | 144 | 130 | | | | 132 | | |
| Conductivity | mS/m | | 47.90 | 55.00 | 47.65 | | | 48.5 | | | 47.8 | | | 47.500 | 47.4 | 46.6 | 43.4 | 42.4 | 46.8 | 47.2 | 48.0 | 50.6 | 52.3 | 52.5 | 54.5 | 55.0 | 53.0 |
| COD | mg/L | | 23.50 | 40.00 | 26 | | | 26 | | | 28.0 | | | *7.500* | 26 | 16 | *7.5* | *7.5* | 30 | 18 | *7.5* | 40 | 28 | 25 | 22 | *7.5* | 31 |
| BOD (scBOD frm Apr'20) | mg/L | | 0.50 | 1.50 | 0.5 | | | *1.5* | | | *0.5* | | | *0.500* | *0.5* | *0.5* | | | | *0.5* | *0.5* | | | | *0.5* | | |
| Faecal C (Ecoli frm Apr'20) | col/100ml | 100 | 2.00 | 200.00 | 2 | | | 27 | | | *0.5* | | | *2.000* | *2.0* | *2.0* | *2.0* | *2* | *2* | *2* | *2* | | | | 200 | | |
| Chloride | mg/L | | 51.00 | 96.50 | 53.25 | | | 61 | | | 57.8 | | | 28.500 | 48.7 | 49.4 | 51.0 | 51.8 | 49.6 | 48.2 | 57.6 | 74.0 | 50.9 | 48.0 | 69.6 | 96.5 | 51.0 |
| Nitrate-N | mg/L | 90.3 | 1.39 | 3.07 | 1.765 | | | 2.02 | | | 1.89 | | | 1.640 | 0.98 | 1.01 | 1.47 | 1.96 | 1.54 | 0.78 | 1.31 | 1.96 | 0.21 | 0.28 | 1.20 | 3.07 | 0.19 |
| Sulphate | mg/L | 1000 | 4.78 | 7.59 | 7.265 | | | 7.59 | | | 6.94 | | | | | 5.24 | | | | 2.90 | 4.32 | | | | 4.19 | | |
| Ammonia-N | mg/L | | 0.01 | 0.24 | 0.005 | | | *0.005* | | | *0.005* | | | *0.050* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | 0.24 | *0.005* |
| Hardness | mg CaCO3/L | | 126.50 | 156.00 | 127.5 | | | 130 | | | 125 | | | | | 125 | | | | 121 | 128 | | | | 156 | | |
| Calcium | mg/L | 1000 | 18.80 | 26.70 | 18.8 | | | 19.0 | | | 18.6 | | | | | 18.3 | | | | 17.4 | 19.7 | | | | 26.7 | | |
| Magnesium | mg/L | | 19.15 | 22.70 | 19.5 | | | 19.9 | | | 19.1 | | | | | 19.2 | | | | 18.8 | 19.1 | | | | 22.7 | | |
| Potassium | mg/L | | 8.43 | 9.18 | 9.12 | | | 9.18 | | | 9.06 | | | | | 8.95 | | | | 7.78 | 7.90 | | | | 7.57 | | |
| Sodium | mg/L | | 41.90 | 48.00 | 42.45 | | | 41.9 | | | 43 | | | | | 42.9 | 38.4 | 14.3 | 30.7 | 39.5 | 46.4 | 41.5 | 46.6 | 48.0 | 45.9 | 41.8 | |
| D.R. Phosphorus | mg/L | | 0.17 | 0.17 | 0.162 | | | 0.155 | | | 0.169 | | | | | 0.172 | | | | 0.171 | 0.160 | | | | 0.168 | | |
| Aluminium | mg/L | 5 | 0.00 | 0.01 | 0.001 | | | *0.001* | | | *0.001* | | | *0.001* | 0.002 | *0.001* | *0.001* | *0.001* | 0.003 | *0.001* | *0.001* | 0.003 | *0.001* | *0.001* | *0.001* | 0.014 | *0.001* |
| Arsenic | mg/L | 0.5 | 0.00 | 0.00 | 0.002 | | | 0.002 | | | 0.002 | | | | | 0.002 | | | | 0.002 | 0.002 | | | | 0.001 | | |
| Boron | mg/L | 5 | 0.02 | 345.00 | 0.03 | | | 0.03 | | | *0.015* | | | 0.030 | 0.03 | 345 | 0.03 | 0.03 | *0.015* | 0.03 | *0.015* | *0.015* | *0.015* | *0.015* | *0.015* | 0.04 | *0.015* |
| Cadmium | mg/L | 0.01 | 0.00 | 0.00 | 0.0001 | | | *0.0001* | | | *0.0001* | | | | | *0.0001* | | | | *0.0001* | *0.0001* | | | | *0.0001* | | |
| Chromium | mg/L | 1 | 0.00 | 0.00 | 0.0005 | | | *0.0005* | | | *0.0005* | | | | | *0.0005* | | | | *0.0005* | *0.0005* | | | | *0.0005* | | |
| Copper | mg/L | 0.4 | 0.00 | 0.00 | 0.0021 | | | 0.0013 | | | 0.0029 | | | | | 0.0030 | | | | 0.0021 | 0.0018 | | | | 0.0020 | | |
| Iron | mg/L | | 0.01 | 0.04 | 0.0025 | | | *0.0025* | | | *0.0025* | | | | | *0.0025* | *0.005* | *0.005* | *0.005* | *0.0025* | *0.0025* | *0.005* | *0.005* | *0.005* | 0.008 | 0.04 | |
| Lead | mg/L | 0.1 | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.000250* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | 0.0020 | *0.00025* |
| Manganese | mg/L | | 0.00 | 0.03 | 0.00475 | | | 0.0038 | | | 0.0042 | | | 0.0053 | 0.018 | 0.0044 | 0.0028 | 0.0030 | 0.0133 | 0.0040 | 0.0029 | 0.0028 | 0.0061 | 0.0052 | 0.0118 | 0.0319 | 0.0091 |
| Mercury | mg/L | | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.000250* | *0.00025* | *0.00025* | | | | | | | | | | | |
| Nickel | mg/L | 1 | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.000250* | 0.0009 | *0.00025* | *0.00025* | *0.00025* | 0.0014 | 0.0006 | *0.00025* | *0.00025* | 0.0007 | 0.0006 | *0.00025* | 0.0006 | 0.0008 |
| Zinc | mg/L | 20 | 0.00 | 0.00 | 0.001 | | | *0.001* | | | *0.001* | | | | | *0.001* | | | | *0.001* | *0.001* | | | | *0.001* | | |

**F2** Monitoring Bore HDC Levin Landfill

| Determinand | | ANZECC STOCK | Median | Maximum | Annual Median | Jun-21 | May-21 | Apr-21 | Mar-21 | Feb-21 | Jan-21 | Dec-20 | Nov-20 | Oct-20 | Jul-20 | Apr-20 | Jan-20 | Oct-19 | Jul-19 | Apr-19 | Jan-19 | Oct-18 | Jul-18 | Apr-18 | Jan-18 | Oct-17 | Jul-17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Water level | mBGL | | 2.91 | 5.27 | 2.76 | 2.76 | | 2.76 | | | 2.67 | | | 3.100 | 3.77 | 3.11 | 5.27 | 5.265 | 2.87 | 2.995 | 2.865 | 2.74 | 2.94 | 2.91 | 3.84 | 2.55 | 2.77 |
| pH | | 6 to 9 | 7.05 | 7.50 | 7.1 | | | 7.0 | | | 7.3 | | | 7.100 | 7.1 | 7.2 | 7.5 | 7.0 | 7.3 | 7.0 | 7.2 | 7.0 | 7.0 | 6.9 | 7.0 | 7.0 | 7.1 |
| Suspended Solids | mg/l | | 3.00 | 140.00 | 2.75 | | | *2.5* | | | *3* | | | | | *3* | | | | *2.5* | *3* | | | | 140 | | |
| Phenol | mg/L | | 0.03 | 0.03 | 0.025 | | | *0.025* | | | | | | | | *0.025* | | | | *0.025* | *0.005* | | | | *0.005* | | |
| VFA | mg/L | | 2.50 | 8.00 | 2.5 | | | *2.5* | | | | | | | | *2.5* | | | | *2.5* | 6 | | | | 8 | | |
| TOC | mg/L | | 1.60 | 10.20 | 1.6 | | | 1.6 | | | 1.6 | | | | | 1.6 | | | | 1.4 | 1.5 | | | | 10.2 | | |
| Alkalinity | mg CaCO3/L | | 52.50 | 54.00 | 50.5 | | | 51 | | | 50 | | | | | 53 | | | | 52 | 53 | | | | 54 | | |
| Conductivity | mS/m | | 22.55 | 25.50 | 21.6 | | | 21.3 | | | 21.6 | | | 21.600 | 21.7 | 22.1 | 22.2 | 22.6 | 22.9 | 22.3 | 22.5 | 22.8 | 23.6 | 23.5 | 25.1 | 25.5 | 25.5 |
| COD | mg/L | | 7.50 | 51.00 | 12.25 | | | 17 | | | 19 | | | *7.500* | *7.50* | *7.5* | *7.5* | *7.5* | 51 | *7.5* | *7.5* | 33 | *7.5* | *7.5* | *7.5* | *7.5* | *7.5* |
| BOD (scBOD frm Apr'20) | mg/L | | 0.50 | 1.50 | 0.5 | | | *1.5* | | | *0.5* | | | *0.500* | *0.5* | *0.5* | | | | *0.5* | *0.5* | | | | *0.5* | | |
| Faecal C (Ecoli frm Apr'20) | col/100ml | 100 | 2.00 | 2.00 | 2 | | | *2* | | | *2* | | | *2* | *2* | *2* | *2* | *2* | *2* | *2* | *2* | | | | *2* | | |
| Chloride | mg/L | | 23.55 | 28.60 | 22.5 | | | 22.3 | | | 22.7 | | | 21.800 | 23 | 23.2 | 22.7 | 23.4 | 22.8 | 23.7 | 24.2 | 24.9 | 25.0 | 24.2 | 27.3 | 28.6 | 28.4 |
| Nitrate-N | mg/L | 90.3 | 0.70 | 2.19 | 0.34 | | | 0.18 | | | 0.25 | | | 0.470 | 0.43 | 0.33 | 0.55 | 0.73 | 0.74 | 0.57 | 0.66 | 1.00 | 1.19 | 0.92 | 1.12 | 2.19 | 2.02 |
| Sulphate | mg/L | 1000 | 9.46 | 12.50 | 9.28 | | | 9.49 | | | 9.1 | | | | | 8.97 | | | | 10.1 | 9.42 | | | | 12.5 | | |
| Ammonia-N | mg/L | | 0.01 | 0.01 | 0.005 | | | *0.005* | | | *0.005* | | | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* |
| Hardness | mg CaCO3/L | | 38.50 | 45.00 | 37 | | | 38 | | | 36 | | | | | 37 | | | | 39 | 39 | | | | 45 | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | mg/L | 1000 | 6.17 | 7.47 | 5.775 | | | 5.81 | | | 5.74 | | | | | 6.01 | | | | 6.32 | 6.40 | | | | 7.47 | | |
| Magnesium | mg/L | | 5.57 | 6.46 | 5.38 | | | 5.59 | | | 5.17 | | | | | 5.41 | | | | 5.55 | 5.64 | | | | 6.46 | | |
| Potassium | mg/L | | 5.22 | 5.45 | 5.25 | | | 5.22 | | | 5.28 | | | | | 5.45 | | | | 4.47 | 5.21 | | | | 4.63 | | |
| Sodium | mg/L | | 26.00 | 28.20 | 25.95 | | | 26.3 | | | 25.6 | | | | | 26.1 | 24.7 | 23.6 | 23.8 | 25.6 | 28.1 | 28.2 | 22.1 | 26.6 | 27.0 | 26.0 | |
| D.R. Phosphorus | mg/L | | 0.14 | 0.16 | 0.134 | | | 0.132 | | | 0.136 | | | | | 0.148 | | | | 0.146 | 0.142 | | | | 0.158 | | |
| Aluminium | mg/L | 5 | 0.00 | 0.01 | 0.001 | | | *0.001* | | | *0.001* | | | *0.001* | *0.001* | 0.002 | *0.001* | 0.002 | 0.002 | *0.001* | *0.001* | 0.003 | *0.001* | *0.001* | 0.005 | 0.006 | *0.001* |
| Arsenic | mg/L | 0.5 | 0.00 | 0.00 | 0.001 | | | 0.001 | | | 0.001 | | | | | 0.002 | | | | 0.001 | 0.002 | | | | 0.001 | | |
| Boron | mg/L | 5 | 0.04 | 0.04 | 0.04 | | | 0.04 | | | 0.03 | | | 0.040 | 0.04 | 0.03 | 0.04 | 0.03 | 0.04 | 0.03 | 0.04 | *0.015* | *0.015* | 0.03 | 0.04 | 0.04 | 0.03 |
| Cadmium | mg/L | 0.01 | 0.00 | 0.00 | 0.0001 | | | *0.0001* | | | *0.0001* | | | | | *0.0001* | | | | *0.0001* | *0.0001* | | | | *0.0001* | | |
| Chromium | mg/L | 1 | 0.00 | 0.00 | 0.0005 | | | *0.0005* | | | *0.0005* | | | | | *0.0005* | | | | *0.0005* | *0.0005* | | | | *0.0005* | | |
| Copper | mg/L | 0.4 | 0.00 | 0.00 | 0.0014 | | | 0.0010 | | | 0.0018 | | | | | 0.0013 | | | | 0.0009 | 0.0010 | | | | 0.0012 | | |
| Iron | mg/L | | 0.01 | 0.02 | 0.012 | | | 0.015 | | | 0.009 | | | | | 0.018 | *0.005* | *0.005* | *0.005* | 0.014 | 0.020 | 0.01 | *0.005* | 0.01 | 0.008 | *0.005* | |
| Lead | mg/L | 0.1 | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* |
| Manganese | mg/L | | 0.00 | 0.04 | 0.0045 | | | 0.0139 | | | 0.005 | | | 0.0017 | 0.004 | 0.0360 | 0.0050 | 0.0017 | 0.0010 | 0.0088 | 0.0075 | 0.0036 | 0.0008 | 0.0029 | 0.0037 | 0.0104 | 0.0017 |
| Mercury | mg/L | | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | *0.00025* | | | | | | | | | | | |
| Nickel | mg/L | 1 | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | 0.0013 | *0.00025* |
| Zinc | mg/L | 20 | 0.00 | 0.00 | 0.001 | | | *0.001* | | | *0.001* | | | | | 0.002 | | | | *0.001* | *0.001* | | | | *0.001* | | |

**F3** Monitoring Bore HDC Levin Landfill

| Determinand | | ANZECC STOCK | Median | Maximum | Annual Median | Jun-21 | May-21 | Apr-21 | Mar-21 | Feb-21 | Jan-21 | Dec-20 | Nov-20 | Oct-20 | Jul-20 | Apr-20 | Jan-20 | Oct-19 | Jul-19 | Apr-19 | Jan-19 | Oct-18 | Jul-18 | Apr-18 | Jan-18 | Oct-17 | Jul-17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Water level | mBGL | | 5.22 | 6.60 | 5.165 | 5.165 | | 5.17 | | | 5.07 | | | 5.560 | 6.60 | 5.43 | 2.83 | 2.83 | 5.45 | 5.44 | 5.31 | 5.19 | 5.38 | 5.35 | 4.95 | 4.98 | 5.22 |
| pH | | 6 to 9 | 7.00 | 7.80 | 7.05 | | | 7.0 | | | 7.3 | | | 7.000 | 7.1 | 7.8 | 7.5 | 7.0 | 7.0 | 7.3 | 7.2 | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | 7.1 |
| Suspended Solids | mg/l | | 4.50 | 40.00 | 21.25 | | | *2.5* | | | 40 | | | | | *3* | | | | *2.5* | 6 | | | | 29 | | |
| Phenol | mg/L | | 0.03 | 0.03 | 0.025 | | | *0.025* | | | | | | | | *0.025* | | | | *0.025* | *0.005* | | | | 0.005 | | |
| VFA | mg/L | | 2.50 | 6.00 | 2.5 | | | *2.5* | | | | | | | | *2.5* | | | | *2.5* | 6 | | | | 5 | | |
| TOC | mg/L | | 1.40 | 1.50 | 1.45 | | | 1.5 | | | 1.4 | | | | | 1.3 | | | | 1.2 | 1.4 | | | | 1.4 | | |
| Alkalinity | mg CaCO3/L | | 45.00 | 53.00 | 44.5 | | | 43 | | | 46 | | | | | 53 | | | | 45 | 45 | | | | 43 | | |
| Conductivity | mS/m | | 20.55 | 23.50 | 21.85 | | | 19.2 | | | 20.2 | | | 23.500 | 23.5 | 19.2 | 18.4 | 20.6 | 20.6 | 20.4 | 20.2 | 21.5 | 20.4 | 20.5 | 22.9 | 20.6 | 21.2 |
| COD | mg/L | | 7.50 | 56.00 | 7.5 | | | *7.5* | | | *7.5* | | | *7.500* | *7.5* | *7.5* | *7.5* | *7.5* | 56 | 15 | *7.5* | 29 | *7.5* | *7.5* | 30 | 22 | *7.5* |
| BOD (scBOD frm Apr'20) | mg/L | | 0.50 | 1.50 | 0.5 | | | *1.5* | | | *0.5* | | | *0.500* | *0.5* | *0.5* | | | | *0.5* | *0.5* | | | | *0.5* | | |
| Faecal C (Ecoli frm Apr'20) | col/100ml | 100 | 2.00 | 16.00 | *2* | | | 16 | | | *0.5* | | | *2* | *2* | *2* | *2* | *2* | *2* | *2* | *2* | | | | *2* | | |
| Chloride | mg/L | | 21.75 | 29.60 | 19.5 | | | 17.4 | | | 17 | | | 21.600 | 22.2 | 15.4 | 14.7 | 19.4 | 20.6 | 21.9 | 21.3 | 26.8 | 23.0 | 22.9 | 29.6 | 24.1 | 25.0 |
| Nitrate-N | mg/L | 90.3 | 1.19 | 2.37 | 1.8 | | | 1.53 | | | 2.37 | | | 2.050 | 1.55 | 1.11 | 1.19 | 1.93 | 1.52 | 0.88 | 0.74 | 0.97 | 0.82 | 0.86 | 1.19 | 1.16 | 1.29 |
| Sulphate | mg/L | 1000 | 8.77 | 11.80 | 7.625 | | | 8.39 | | | 6.86 | | | | | 7.03 | | | | 11.8 | 10.7 | | | | 9.14 | | |
| Ammonia-N | mg/L | | 0.01 | 0.01 | 0.005 | | | *0.005* | | | *0.005* | | | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | 0.01 | *0.005* | *0.005* |
| Hardness | mg CaCO3/L | | 36.00 | 42.00 | 34 | | | 33 | | | 35 | | | | | 34 | | | | 37 | 38 | | | | 42 | | |
| Calcium | mg/L | 1000 | 5.50 | 6.71 | 5.1 | | | 4.84 | | | 5.36 | | | | | 5.18 | | | | 5.63 | 5.92 | | | | 6.71 | | |
| Magnesium | mg/L | | 5.32 | 6.22 | 5.085 | | | 4.99 | | | 5.18 | | | | | 5.08 | | | | 5.45 | 5.70 | | | | 6.22 | | |
| Potassium | mg/L | | 4.94 | 5.11 | 4.98 | | | 4.930 | | | 5.03 | | | | | 5.11 | | | | 4.62 | 4.95 | | | | 4.47 | | |
| Sodium | mg/L | | 22.35 | 26.80 | 25.3 | | | 22 | | | 24.5 | | | 26.800 | 26.1 | 23.0 | 20.6 | 9.08 | 22.0 | 22.0 | 24.1 | 22.0 | 20.6 | 22.7 | 22.7 | 21.2 | 23.5 |
| D.R. Phosphorus | mg/L | | 0.14 | 0.14 | 0.1395 | | | 0.136 | | | 0.143 | | | | | 0.143 | | | | 0.139 | 0.131 | | | | 0.139 | | |
| Aluminium | mg/L | 5 | 0.00 | 0.03 | 0.0015 | | | *0.001* | | | 0.002 | | | 0.030 | *0.001* | *0.001* | *0.001* | *0.001* | *0.001* | *0.001* | *0.001* | *0.001* | *0.001* | *0.001* | 0.027 | 0.010 | *0.001* |
| Arsenic | mg/L | 0.5 | 0.00 | 0.00 | 0.0015 | | | 0.002 | | | 0.001 | | | | | 0.002 | | | | 0.001 | 0.002 | | | | 0.001 | | |
| Boron | mg/L | 5 | 0.02 | 0.03 | 0.015 | | | *0.015* | | | *0.015* | | | *0.015* | 0.02 | *0.015* | 0.03 | *0.015* | *0.015* | *0.015* | *0.015* | *0.015* | *0.015* | *0.015* | *0.015* | *0.015* | *0.015* |
| Cadmium | mg/L | 0.01 | 0.00 | 0.00 | 0.0001 | | | *0.0001* | | | *0.0001* | | | | | *0.0001* | | | | *0.0001* | *0.0001* | | | | *0.0001* | | |
| Chromium | mg/L | 1 | 0.00 | 0.00 | 0.0005 | | | *0.0005* | | | *0.0005* | | | | | *0.0005* | | | | *0.0005* | *0.0005* | | | | *0.0005* | | |
| Copper | mg/L | 0.4 | 0.00 | 0.00 | 0.00105 | | | 0.0007 | | | 0.0014 | | | | | 0.0005 | | | | *0.00025* | 0.0006 | | | | 0.0012 | | |
| Iron | mg/L | | 0.01 | 0.03 | 0.00375 | | | *0.0025* | | | *0.0025* | | | 0.010 | *0.005* | *0.0025* | *0.005* | *0.005* | *0.005* | *0.0025* | *0.0025* | *0.005* | *0.005* | *0.005* | 0.026 | 0.01 | *0.005* |
| Lead | mg/L | 0.1 | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.000250* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* |
| Manganese | mg/L | | 0.00 | 0.01 | 0.00025 | | | *0.00025* | | | 0.0007 | | | *0.000250* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | 0.0018 | 0.0064 | *0.00025* |
| Mercury | mg/L | | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.000250* | *0.00025* | *0.00025* | | | | | | | | | | | |
| Nickel | mg/L | 1 | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | 0.0005 | | | *0.000250* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* |
| Zinc | mg/L | 20 | 0.00 | 0.00 | 0.001 | | | *0.001* | | | *0.001* | | | | | *0.001* | | | | *0.001* | *0.001* | | | | 0.003 | | |

**HS1A (from Apr 2020)** Hokio Stream Upstream

| Determinand | | ANZECC AE (95%) | Median | Maximum | Annual Median | Jun-21 | May-21 | Apr-21 | Mar-21 | Feb-21 | Jan-21 | Dec-20 | Nov-20 | Oct-20 | Sep-20 | Aug-20 | Jul-20 | Jun-20 | May-20 | Apr-20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| pH | | - | 7.8 | 9.3 | 7.8 | 7.7 | 7.5 | 8.0 | 7.7 | 7.5 | 8.1 | 8.6 | 9.3 | 7.80 | 7.8 | 7.5 | 7.6 | 7.6 | 8.3 | 7.8 |
| Suspended Solids | mg/l | - | 36.0 | 246.0 | 51.5 | 112 | 58 | 46 | 33 | 57 | 160 | 104 | 246 | 18.00 | 17 | 12 | 23 | 20 | 36 | 23 |
| Phenol | mg/L | 0.32 | 0.0 | 0.0 | 0.0 | *0.025* | *0.025* | *0.025* | *0.025* | *0.025* | *0.025* | *0.025* | *0.025* | *0.025* | *0.025* | *0.025* | *0.025* | *0.025* | *0.025* | *0.025* |
| VFA | mg/L | - | 2.5 | 2.5 | 2.5 | *2.5* | *2.5* | *2.5* | *2.5* | *2.5* | *2.5* | *2.5* | *2.5* | *2.50* | *2.5* | *2.5* | *2.5* | *2.5* | *2.5* | *2.5* |
| TOC | mg/L | - | 8.3 | 16.2 | 8.4 | 4.4 | 8.5 | 9.6 | 8.4 | 8.2 | 14.4 | 11.8 | 16.2 | 8.30 | 7.2 | 4.6 | 7.2 | 6.3 | 8.4 | 8.1 |
| Alkalinity | mg CaCO3/L | - | 52.0 | 67.0 | 49.0 | 53 | 65 | 59 | 57 | 54 | 44 | 47 | 51 | 44.00 | 43 | 43 | 44 | 52 | 67 | 61 |
| Conductivity | mS/m | - | 23.6 | 26.2 | 23.5 | 23.8 | 24.8 | 23.0 | 23.7 | 23.9 | 20.3 | 19.6 | 21.5 | 22.30 | 23.6 | 23.5 | 23.4 | 23.6 | 25.2 | 26.2 |
| COD | mg/L | - | 35.0 | 62.0 | 40.0 | *7.5* | 40 | 51 | 62 | 51 | 49 | 54 | 40 | 35.00 | 29 | 27 | 27 | 22 | 35 | 24 |
| BOD (scBOD frm Apr'20) | mg/L | 2 | 1.0 | 3.0 | 1.3 | *0.50* | *3* | *3* | *1.5* | 1 | *1.5* | 3 | 3 | *0.50* | *0.5* | *0.5* | *0.5* | *0.5* | *3* | *0.5* |
| Faecal C (Ecoli frm Apr'20) | col/100ml | - | 310.0 | 1900.0 | 235.0 | 110.0000 | 580 | 310 | 600 | 88 | 110 | 80 | 160 | 600.00 | 100 | 780 | 1900 | 92 | 1700 | 320 |
| Chloride | mg/L | - | 23.7 | 27.1 | 23.5 | 23.5 | 24.5 | 23.3 | 27.1 | 23.4 | 19.2 | 18.8 | 22.2 | 21.60 | 25.5 | 23.7 | 25.3 | 23.9 | 24.3 | 26.6 |
| Nitrate-N | mg/L | 0.16 | 0.4 | 1.1 | 0.4 | 0.66 | 0.420 | *0.005* | *0.005* | 0.200 | 0.020 | 0.410 | *0.005* | 0.77 | 1.05 | 1.03 | 0.660 | 0.440 | 0.140 | 0.04 |
| Sulphate | mg/L | - | 18.1 | 22.7 | 17.5 | 18.3 | 10.1 | 9.75 | 16.2 | 16.5 | 14.4 | 16.6 | 18.8 | 19.40 | 22.7 | 21.8 | 20.0 | 18.1 | 14.4 | 18.1 |
| Ammonia-N | mg/L | 2.1 | 0.0 | 0.8 | 0.0 | *0.005* | 0.750 | *0.005* | 0.040 | 0.090 | *0.005* | 0.030 | *0.005* | 0.02 | 0.040 | 0.040 | 0.090 | 0.020 | 0.010 | 0.03 |
| Hardness | mg CaCO3/L | - | 62.0 | 69.0 | 61.0 | 58 | 65 | 61 | 62 | 62 | 52 | 50 | 55 | 62.00 | 65 | 60 | 61 | 62 | 65 | 69 |
| Calcium | mg/L | - | 13.4 | 14.7 | 13.1 | 12.8 | 13.9 | 13.1 | 13.5 | 13.4 | 11.6 | 10.4 | 11.9 | 13.40 | 14.0 | 13.0 | 12.8 | 13.8 | 13.8 | 14.7 |
| Magnesium | mg/L | - | 6.9 | 7.9 | 6.9 | 6.22 | 7.35 | 6.9 | 6.95 | 6.86 | 5.64 | 5.82 | 6.08 | 7.01 | 7.2 | 6.66 | 6.9 | 6.8 | 7.4 | 7.85 |
| Potassium | mg/L | - | 2.9 | 3.3 | 2.9 | 2.9300 | 3.19 | 2.88 | 3.33 | 3.22 | 2.92 | 3.20 | 2.59 | 2.79 | 2.87 | 2.62 | 3.17 | 2.78 | 2.88 | 3.27 |
| Sodium | mg/L | - | 18.6 | 22.6 | 18.6 | 19.0 | 18.6 | 20.0 | 21.8 | 18.6 | 17.0 | 15.6 | 17.6 | 18.70 | 18.2 | 18.1 | 18.5 | 21.0 | 20.4 | 22.6 |
| D.R. Phosphorus | mg/L | - | 0.0 | 0.3 | 0.0100 | 0.01 | 0.042 | 0.308 | 0.136 | 0.023 | 0.015 | 0.008 | 0.007 | *0.0025* | *0.0025* | 0.0100 | 0.005 | 0.004 | 0.005 | 0.018 |
| Aluminium | mg/L | 0.055 | 0.0 | 0.3 | 0.0150 | 0.0050 | 0.014 | 0.004 | 0.016 | 0.326 | 0.013 | 0.032 | 0.016 | 0.022 | 0.011 | 0.008 | 0.023 | 0.015 | 0.008 | 0.011 |
| Arsenic | mg/L | 0.024 | 0.0 | 0.0 | 0.0005 | *0.0005* | *0.0005* | 0.004 | 0.003 | 0.002 | 0.001 | 0.001 | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* |
| Boron | mg/L | 0.37 | 0.1 | 0.1 | 0.0550 | 0.0500 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.05 | 0.05 | 0.06 | 0.05 | 0.05 | 0.04 | 0.06 | 0.05 | 0.06 |
| Cadmium | mg/L | 0.0002 | 0.0 | 0.0 | 0.0001 | *0.0001* | *0.0001* | *0.0001* | *0.0001* | *0.0001* | *0.0001* | *0.0001* | *0.0001* | *0.0001* | *0.0001* | *0.0001* | *0.0001* | *0.0001* | *0.0001* | *0.0001* |
| Chromium | mg/L | 0.001 | 0.0 | 0.0 | 0.0005 | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* |
| Copper | mg/L | 0.0014 | 0.0 | 0.0 | 0.0013 | 0.0010 | 0.00100 | 0.00120 | 0.00100 | 0.00250 | 0.00170 | 0.00190 | 0.00130 | 0.0016 | 0.0012 | 0.0007 | 0.00170 | 0.00070 | 0.00110 | 0.0008 |
| Iron | mg/L | - | 0.0 | 0.1 | 0.0350 | 0.019 | 0.067 | 0.011 | 0.029 | 0.034 | 0.058 | 0.057 | 0.028 | 0.065 | 0.089 | 0.024 | 0.036 | 0.027 | 0.014 | 0.019 |
| Lead | mg/L | 0.0034 | 0.0 | 0.0 | 0.0003 | *0.00025* | *0.00025* | *0.00025* | *0.00025* | 0.00160 | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* |
| Manganese | mg/L | 1.9 | 0.0 | 0.2 | 0.0117 | 0.0125 | 0.0265 | 0.0575 | 0.0443 | 0.2340 | 0.0043 | 0.0062 | 0.0016 | 0.01090 | 0.0029 | 0.0145 | 0.0099 | 0.0062 | 0.0173 | 0.0385 |
| Mercury | mg/L | 0.0006 | 0.0 | 0.0 | 0.0003 | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* |
| Nickel | mg/L | 0.011 | 0.0 | 0.0 | 0.0003 | *0.00025* | *0.00025* | 0.00050 | *0.00025* | 0.00060 | *0.00025* | *0.00025* | *0.00025* | *0.00025* | 0.0006 | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* |
| Zinc | mg/L | 0.008 | 0.0 | 0.0 | 0.0010 | *0.001* | 0.004 | *0.001* | *0.001* | 0.007 | 0.002 | 0.003 | 0.001 | *0.001* | *0.001* | *0.001* | 0.005 | *0.001* | *0.001* | *0.001* |

**HS1** Hokio Stream Upstream

| Determinand | | ANZECC AE (95%) | Median | Maximum | Annual Median | Jun-21 | May-21 | Apr-21 | Mar-21 | Feb-21 | Jan-21 | Dec-20 | Nov-20 | Oct-20 | Sep-20 | Aug-20 | Jul-20 | Jun-20 | May-20 | Apr-20 | Jan-20 | Oct-19 | Jul-19 | Apr-19 | Jan-19 | Oct-18 | Jul-18 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| pH | | - | 7.8 | 9.2 | 7.7500 | 7.70 | 7.6 | 8.0 | 7.7 | 7.4 | 8.8 | 8.7 | 9.2 | 7.80 | 7.9 | 7.5 | 7.6 | 7.7 | 8.3 | 7.7 | 7.8 | 8.1 | 7.9 | 8.2 | 9.1 | 7.7 | 7.4 |
| Suspended Solids | mg/l | - | 36.0 | 137.0 | 33.5000 | 12.00 | 56 | 42 | 34 | 137 | 57 | 33 | 64 | 18.00 | 14 | 14 | 21 | 52 | 36 | 39 | | 36 | | 70 | *3* | | 8 |
| Phenol | mg/L | 0.32 | 0.0 | 5.0 | 0.0250 | 5.00 | *0.025* | *0.025* | *0.025* | *0.025* | | *0.025* | *0.025* | *0.025* | *0.025* | *0.025* | *0.025* | *0.025* | *0.025* | *0.025* | | *0.025* | | *0.025* | *0.005* | | |
| VFA | mg/L | - | 2.5 | 60.0 | 2.5000 | *2.5* | *2.5* | *2.5* | *2.5* | *2.5* | | *2.5* | *2.5* | *2.50* | *2.5* | *2.5* | *2.5* | *2.5* | *2.5* | *2.5* | | 60 | | 6 | *2.5* | | 6 |
| TOC | mg/L | - | 7.9 | 15.2 | 8.0500 | *0.0250* | 7.9 | 9.6 | 8.1 | 8.3 | 12.6 | 15.2 | 14.9 | 8.00 | 7.3 | 4.7 | 7.1 | 6.0 | 9.0 | 7.9 | | 6.9 | | 9.7 | 7.6 | | 5.4 |
| Alkalinity | mg CaCO3/L | - | 52.0 | 77.0 | 48.0000 | 56.00 | 67 | 60 | 58 | 54 | 48 | 48 | 48 | 44.00 | 44 | 43 | 44 | 52 | 65 | 61 | | 49 | | 77 | 57 | | 46 |
| Conductivity | mS/m | - | 23.9 | 26.4 | 23.7000 | 24.20 | 25.0 | 23.3 | 24.0 | 24.3 | 20.2 | 19.7 | 21.0 | 22.50 | 23.7 | 23.7 | 23.8 | 23.9 | 25.0 | 26.4 | 24.9 | 23.3 | 22.6 | 26.4 | 23.4 | 24.5 | 25.6 |
| COD | mg/L | - | 36.5 | 100.0 | 52.0000 | *7.5000* | 29 | 61 | 77 | 56 | 83 | 87 | 50 | 34.00 | 54 | 37 | 24 | 33 | 27 | 28 | 51 | 36 | 27 | 77 | 33 | 100 | 21 |
| BOD (scBOD frm Apr'20) | mg/L | 2 | 1.5 | 11.0 | 1.0000 | *0.50* | *1.5* | *3.0* | *1.5* | *0.50* | 11 | 6 | 3 | *0.50* | *0.5* | *0.5* | *0.5* | *0.5* | *3* | *0.5* | | *3* | | 7 | 2 | | *1.5* |
| Faecal C (Ecoli frm Apr'20) | col/100ml | - | 190.0 | 1500.0 | 145.0000 | 110.00 | 740 | 350 | 400 | 120 | 16 | 120 | 140 | 410.00 | 150 | 120 | 1500 | 190 | 500 | 830 | 810 | 190 | 210 | 550 | 56 | | 16 |
| Chloride | mg/L | - | 24.1 | 27.4 | 24.1500 | 24.40 | 24.5 | 23.5 | 24.4 | 25.3 | 21.2 | 18.9 | 22.2 | 22.30 | 25.0 | 23.9 | 24.7 | 24.2 | 24.0 | 26.6 | 24.7 | 22.7 | 22.1 | 27.4 | 22.8 | 22.9 | 25.9 |
| Nitrate-N | mg/L | 0.16 | 0.4 | 2.0 | 0.4150 | 0.650 | 0.420 | *0.005* | 0.020 | 0.220 | 0.010 | 0.410 | *0.005* | 0.80 | 1.020 | 1.020 | 0.630 | 0.440 | 0.110 | 0.04 | 0.30 | 1.43 | 1.95 | *0.005* | 0.05 | 1.32 | 1.52 |
| Sulphate | mg/L | - | 18.2 | 28.4 | 18.5500 | 18.40 | 28.4 | 9.83 | 14.3 | 18.2 | 15.9 | 16.7 | 18.7 | 20.00 | 22.0 | 21.7 | 19.9 | 18.2 | 14.5 | 17.9 | | 21.6 | | 8.5 | 17.7 | | 23.8 |
| Ammonia-N | mg/L | 2.1 | 0.0 | 0.8 | 0.0150 | 0.010 | 0.800 | *0.005* | 0.010 | 0.170 | 0.020 | 0.030 | *0.005* | 0.04 | *0.005* | 0.060 | 0.010 | 0.090 | 0.020 | 0.05 | 0.12 | *0.005* | *0.005* | *0.005* | 0.03 | 0.06 | 0.14 |
| Hardness | mg CaCO3/L | - | 64.0 | 72.0 | 63.0000 | 62.0 | 65 | 64 | 71 | 65 | 54 | 51 | 57 | 60.00 | 65 | 61 | 64 | 64 | 70 | 71 | | 60 | | 72 | 63 | | 65 |
| Calcium | mg/L | - | 13.8 | 15.6 | 13.6500 | 13.70 | 14.0 | 13.8 | 15.6 | 14.3 | 11.8 | 10.6 | 12.1 | 12.90 | 14.2 | 13.1 | 13.6 | 14.0 | 14.8 | 15.1 | | 12.9 | | 15.0 | 13.4 | | 14.6 |
| Magnesium | mg/L | - | 7.1 | 8.3 | 6.9150 | 6.670 | 7.36 | 7.19 | 7.88 | 7.02 | 6.08 | 5.93 | 6.38 | 6.81 | 7.26 | 6.79 | 7.31 | 7.07 | 7.99 | 8.03 | | 6.81 | | 8.30 | 7.22 | | 6.98 |
| Potassium | mg/L | - | 3.1 | 3.5 | 3.1400 | 3.240 | 3.18 | 3.54 | 3.40 | 3.29 | 3.33 | 3.10 | 2.61 | 2.89 | 2.91 | 2.66 | 2.93 | 2.78 | 2.96 | 3.51 | | 3.32 | | 3.17 | 1.59 | | 2.74 |
| Sodium | mg/L | - | 19.5 | 24.9 | 18.6500 | 19.20 | 18.7 | 21.5 | 24.9 | 19.7 | 17.7 | 15.9 | 18.1 | 18.30 | 18.6 | 18.1 | 20.7 | 20.3 | 21.7 | 23.3 | 18.0 | 19.9 | 14.8 | 24.5 | 21.2 | 19.1 | 21.7 |
| D.R. Phosphorus | mg/L | - | 0.0 | 0.3 | 0.0100 | 0.010 | 0.047 | 0.306 | 0.137 | 0.038 | 0.012 | 0.008 | 0.007 | *0.0025* | *0.0025* | 0.010 | *0.0025* | *0.0025* | 0.006 | 0.019 | | *0.0025* | | 0.275 | 0.163 | | 0.020 |
| Aluminium | mg/L | 0.055 | 0.0 | 0.7 | 0.0145 | 0.0080 | 0.016 | 0.006 | 0.015 | 0.690 | 0.040 | 0.042 | 0.012 | 0.017 | 0.013 | 0.013 | 0.014 | 0.014 | 0.007 | 0.008 | 0.021 | 0.027 | 0.013 | 0.005 | 0.008 | 0.011 | 0.010 |
| Arsenic | mg/L | 0.024 | 0.0 | 0.0 | 0.0005 | *0.0005* | *0.0005* | 0.004 | 0.003 | 0.002 | 0.001 | 0.001 | *0.0005* | *0.000500* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | | *0.0005* | | 0.003 | 0.002 | | *0.0005* |
| Boron | mg/L | 0.37 | 0.1 | 0.1 | 0.0550 | 0.050 | 0.06 | 0.07 | 0.06 | 0.06 | 0.06 | 0.05 | 0.04 | 0.07 | 0.05 | 0.05 | 0.04 | 0.06 | 0.06 | 0.07 | 0.05 | 0.05 | 0.05 | 0.06 | 0.05 | 0.05 | 0.04 |
| Cadmium | mg/L | 0.0002 | 0.0 | 0.0 | 0.0001 | *0.0001* | *0.0001* | *0.0001* | *0.0001* | *0.0001* | *0.0001* | *0.0001* | *0.0001* | *0.00010* | *0.0001* | *0.0001* | *0.0001* | *0.0001* | *0.0001* | *0.0001* | | *0.0001* | | *0.0001* | *0.0001* | | *0.0001* |
| Chromium | mg/L | 0.001 | 0.0 | 0.0 | 0.0005 | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | | *0.0005* | | *0.0005* | *0.0005* | | *0.0005* |
| Copper | mg/L | 0.0014 | 0.0 | 0.0 | 0.0013 | 0.00140 | 0.00070 | 0.00170 | 0.00100 | 0.00270 | 0.00140 | 0.00190 | 0.00120 | 0.00170 | 0.00110 | 0.00070 | 0.00120 | 0.00070 | 0.01100 | 0.0009 | | 0.0012 | | *0.00025* | 0.0007 | | *0.00025* |
| Iron | mg/L | - | 0.0 | 0.1 | 0.0350 | 0.0160 | 0.048 | 0.047 | 0.035 | 0.030 | 0.035 | 0.057 | 0.027 | 0.041 | 0.082 | 0.025 | 0.032 | 0.044 | 0.028 | 0.011 | 0.05 | 0.068 | 0.07 | 0.107 | 0.076 | 0.05 | 0.058 |
| Lead | mg/L | 0.0034 | 0.0 | 0.0 | 0.0003 | *0.00025* | *0.00025* | *0.00025* | *0.00025* | 0.00230 | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* |
| Manganese | mg/L | 1.9 | 0.0 | 0.3 | 0.0127 | 0.01650 | 0.0231 | 0.0665 | 0.0638 | 0.2560 | 0.0040 | 0.0075 | 0.0020 | 0.00830 | 0.0029 | 0.0154 | 0.0100 | 0.0091 | 0.0158 | 0.0339 | 0.0404 | 0.0140 | 0.0182 | 0.0915 | 0.0094 | 0.0259 | 0.0299 |
| Mercury | mg/L | 0.0006 | 0.0 | 0.0 | 0.0003 | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | | | | | | | |
| Nickel | mg/L | 0.011 | 0.0 | 0.0 | 0.0003 | 0.00060 | *0.00025* | 0.0007 | *0.00025* | 0.00070 | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* |
| Zinc | mg/L | 0.008 | 0.0 | 0.0 | 0.0010 | 0.0040 | *0.001* | 0.002 | *0.001* | 0.013 | *0.001* | *0.001* | *0.001* | *0.001* | *0.001* | *0.001* | *0.001* | *0.001* | *0.001* | *0.001* | | *0.001* | | *0.001* | *0.001* | | *0.001* |

**HS2** Hokio Stream Beside Landfill

| Determinand | | ANZECC AE (95%) | Median | Maximum | Annual Median | Jun-21 | May-21 | Apr-21 | Mar-21 | Feb-21 | Jan-21 | Dec-20 | Nov-20 | Oct-20 | Sep-20 | Aug-20 | Jul-20 | Jun-20 | May-20 | Apr-20 | Jan-20 | Oct-19 | Jul-19 | Apr-19 | Jan-19 | Oct-18 | Jul-18 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| pH | | - | 7.7 | 9.0 | 7.7000 | 7.7 | 7.5 | 7.8 | 7.6 | 7.5 | 8.2 | 8.3 | 9.0 | 7.80 | 7.7 | 7.5 | 7.6 | 7.6 | 8.1 | 7.7 | 7.8 | 7.9 | 7.7 | 7.9 | 8.9 | 7.5 | 7.4 |
| Suspended Solids | mg/l | - | 33.0 | 118.0 | 42.0000 | 14 | 60 | 49 | 35 | 52 | 87 | 69 | 118 | 20.00 | 17 | 12 | 29 | 87 | 33 | 24 | | 31 | | 66 | *3* | | 8 |
| Phenol | mg/L | 0.32 | 0.0 | 0.0 | 0.0250 | *0.025* | *0.025* | *0.025* | *0.025* | *0.025* | | *0.025* | *0.025* | *0.025* | *0.025* | *0.025* | *0.025* | *0.025* | *0.025* | *0.025* | | *0.025* | | *0.025* | *0.005* | | |
| VFA | mg/L | - | 2.5 | 30.0 | 2.5000 | *2.5* | *2.5* | *2.5* | *2.5* | *2.5* | | *2.5* | *2.5* | *2.50* | *2.5* | *2.5* | *2.5* | *2.5* | *2.5* | *2.5* | | 30 | | 6 | *2.5* | | *2.5* |
| TOC | mg/L | - | 7.8 | 17.5 | 7.8500 | 4.6 | 7.8 | 9.2 | 8.6 | 7.8 | 12.5 | 17.5 | 15.5 | 7.90 | 7.8 | 4.9 | 7.7 | 6.1 | 8.7 | 7.6 | | 6.7 | | 9.5 | 7.4 | | 5.5 |
| Alkalinity | mg CaCO3/L | - | 56.0 | 79.0 | 55.0000 | 56 | 67 | 60 | 61 | 57 | 54 | 46 | 60 | 47.00 | 52 | 46 | 45 | 54 | 67 | 65 | | 52 | | 79 | 59 | | 48 |
| Conductivity | mS/m | - | 24.7 | 28.1 | 24.2500 | 24.6 | 25.7 | 24.0 | 25.0 | 24.9 | 21.6 | 20.4 | 23.5 | 23.00 | 25.9 | 24.5 | 23.9 | 24.7 | 26.2 | 27.9 | 25.7 | 24.5 | 22.8 | 28.1 | 23.9 | 26.1 | 26.1 |
| COD | mg/L | - | 32.0 | 112.0 | 45.5000 | 7.5 | 44 | 57 | 75 | 47 | 77 | 112 | 57 | 31.00 | 33 | 27 | 22 | 24 | 25 | 21 | 48 | 29 | 31 | 86 | 29 | 92 | 24 |
| BOD (scBOD frm Apr'20) | mg/L | 2 | 1.5 | 10.0 | 0.7500 | *0.50* | *3* | *3* | *1* | 1 | 10 | 3 | 3 | *0.50* | *0.5* | *0.5* | *0.5* | *0.5* | *3* | *0.5* | | *3* | | 8 | 2 | | *2* |
| Faecal C (Ecoli frm Apr'20) | col/100ml | - | 190.0 | 900.0 | 165.0000 | 140 | 600 | 330 | 310 | 80 | 190 | 100 | 120 | 210.00 | 120 | 88 | 400 | 220 | 900 | 790 | 650 | 190 | 160 | 450 | 150 | | 120 |
| Chloride | mg/L | - | 25.2 | 28.8 | 24.9500 | 24.7 | 26.9 | 25.0 | 26.1 | 25.1 | 22.6 | 19.8 | 24.1 | 22.40 | 27.1 | 24.9 | 25.2 | 25.7 | 25.9 | 28.0 | 25.2 | 24.0 | 22.3 | 28.8 | 23.6 | 25.3 | 26.3 |
| Nitrate-N | mg/L | 0.16 | 0.5 | 2.0 | 0.4550 | 0.78 | 0.500 | *0.005* | 0.060 | 0.220 | 0.110 | 0.410 | 0.020 | 0.78 | 1.03 | 1.03 | 0.710 | 0.500 | 0.170 | 0.08 | 0.30 | 1.47 | 2.02 | *0.005* | 0.08 | 1.32 | 1.53 |
| Sulphate | mg/L | - | 17.8 | 23.8 | 17.3500 | 18.2 | 10.5 | 10.0 | 14.4 | 16.6 | 15.3 | 16.4 | 18.1 | 19.40 | 21.4 | 21.5 | 19.2 | 18.6 | 14.7 | 17.3 | | 21.4 | | 8.4 | 17.8 | | 23.8 |
| Ammonia-N | mg/L | 2.1 | 0.1 | 0.8 | 0.0850 | 0.09 | 0.790 | 0.030 | 0.010 | 0.190 | 0.010 | 0.030 | *0.005* | 0.08 | 0.18 | 0.10 | 0.090 | 0.070 | 0.100 | 0.14 | 0.16 | 0.10 | 0.02 | 0.01 | 0.04 | 0.14 | 0.14 |
| Hardness | mg CaCO3/L | - | 63.0 | 75.0 | 63.0000 | 63 | 69 | 63 | 65 | 64 | 58 | 52 | 62 | 60.00 | 70 | 63 | 61 | 63 | 68 | 74 | | 63 | | 75 | 68 | | 65 |
| Calcium | mg/L | - | 13.9 | 15.9 | 13.6500 | 14.0 | 14.9 | 13.6 | 14.2 | 13.9 | 12.6 | 10.9 | 13.4 | 12.90 | 15.3 | 13.7 | 13.1 | 13.9 | 14.6 | 15.9 | | 13.5 | | 15.8 | 14.5 | | 14.7 |
| Magnesium | mg/L | - | 7.0 | 8.6 | 6.9850 | 6.73 | 7.81 | 7.02 | 7.13 | 7.05 | 6.38 | 6.12 | 6.99 | 6.77 | 7.74 | 6.98 | 6.96 | 6.87 | 7.76 | 8.35 | | 7.04 | | 8.58 | 7.57 | | 6.94 |
| Potassium | mg/L | - | 3.3 | 3.9 | 3.2550 | 3.25 | 3.85 | 2.92 | 3.26 | 3.36 | 3.90 | 3.35 | 2.97 | 2.96 | 3.52 | 2.83 | 3.09 | 2.88 | 3.11 | 3.62 | | 3.32 | | 3.40 | 1.65 | | 2.8 |
| Sodium | mg/L | - | 20.2 | 25.4 | 19.9500 | 21.2 | 20.1 | 20.1 | 22.6 | 19.5 | 19.2 | 16.5 | 20.8 | 18.40 | 19.6 | 20.2 | 19.8 | 21.3 | 21.7 | 24.3 | 17.4 | 20.1 | 15.0 | 25.4 | 21.8 | 20.6 | 21.5 |
| D.R. Phosphorus | mg/L | - | 0.0 | 0.3 | 0.0095 | 0.011 | 0.063 | 0.304 | 0.123 | 0.036 | 0.013 | 0.008 | 0.007 | *0.0025* | *0.0025* | 0.006 | 0.006 | 0.004 | 0.009 | 0.020 | | *0.0025* | | 0.266 | 0.171 | | 0.022 |
| Aluminium | mg/L | 0.055 | 0.0 | 0.2 | 0.0110 | 0.004 | 0.009 | 0.003 | 0.005 | 0.197 | 0.022 | 0.038 | 0.011 | 0.02 | 0.011 | 0.010 | 0.015 | 0.021 | 0.005 | 0.007 | 0.023 | 0.027 | 0.013 | 0.003 | 0.008 | 0.012 | 0.009 |
| Arsenic | mg/L | 0.024 | 0.0 | 0.0 | 0.0005 | *0.0005* | *0.0005* | 0.004 | 0.002 | 0.001 | 0.001 | 0.001 | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | | *0.0005* | | 0.003 | 0.002 | | *0.0005* |
| Boron | mg/L | 0.37 | 0.1 | 0.1 | 0.0600 | 0.05 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.05 | 0.05 | 0.06 | 0.06 | 0.05 | 0.04 | 0.06 | 0.06 | 0.07 | 0.05 | 0.05 | 0.05 | 0.06 | 0.05 | 0.06 | 0.04 |
| Cadmium | mg/L | 0.0002 | 0.0 | 0.0 | 0.0001 | *0.0001* | *0.0001* | *0.0001* | *0.0001* | *0.0001* | *0.0001* | *0.0001* | *0.0001* | *0.0001* | *0.0001* | *0.0001* | *0.0001* | *0.0001* | *0.0001* | *0.0001* | | *0.0001* | | *0.0001* | *0.0001* | | *0.0001* |
| Chromium | mg/L | 0.001 | 0.0 | 0.0 | 0.0005 | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | | 0.004 | | *0.0005* | *0.0005* | | *0.0005* |
| Copper | mg/L | 0.0014 | 0.0 | 0.0 | 0.0012 | 0.0009 | 0.00070 | 0.00150 | 0.00090 | 0.00180 | 0.00160 | 0.00180 | 0.00100 | 0.0015 | 0.0011 | 0.0008 | 0.00120 | 0.00070 | 0.00090 | 0.0016 | | 0.0014 | | *0.00025* | 0.0007 | | *0.00025* |
| Iron | mg/L | - | 0.0 | 0.1 | 0.0395 | 0.020 | 0.067 | 0.011 | 0.035 | 0.027 | 0.056 | 0.113 | 0.036 | 0.043 | 0.104 | 0.029 | 0.049 | 0.026 | 0.021 | 0.010 | 0.05 | 0.077 | 0.07 | 0.051 | 0.093 | 0.06 | 0.062 |
| Lead | mg/L | 0.0034 | 0.0 | 0.0 | 0.0003 | *0.00025* | *0.00025* | *0.00025* | *0.00025* | 0.00110 | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* |
| Manganese | mg/L | 1.9 | 0.0 | 0.2 | 0.0229 | 0.0231 | 0.0444 | 0.0600 | 0.0481 | 0.1780 | 0.0036 | 0.0321 | 0.0026 | 0.0139 | 0.0130 | 0.0227 | 0.0150 | 0.0120 | 0.0232 | 0.0420 | 0.0424 | 0.0252 | 0.0199 | 0.105 | 0.0110 | 0.0466 | 0.0357 |
| Mercury | mg/L | 0.0006 | 0.0 | 0.0 | 0.0003 | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | | | | | | | |
| Nickel | mg/L | 0.011 | 0.0 | 0.0 | 0.0003 | *0.00025* | *0.00025* | 0.00050 | *0.00025* | 0.00060 | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* |
| Zinc | mg/L | 0.008 | 0.0 | 0.0 | 0.0010 | 0.01 | *0.001* | *0.001* | *0.001* | 0.004 | 0.002 | 0.002 | *0.001* | 0.001 | *0.001* | 0.003 | *0.001* | *0.001* | *0.001* | *0.001* | | *0.001* | | *0.001* | *0.001* | | *0.001* |

**HS3** Hokio Stream Downstream

| Determinand | | ANZECC AE (95%) | Median | Maximum | Annual Median | Jun-21 | May-21 | Apr-21 | Mar-21 | Feb-21 | Jan-21 | Dec-20 | Nov-20 | Oct-20 | Sep-20 | Aug-20 | Jul-20 | Jun-20 | May-20 | Apr-20 | Jan-20 | Oct-19 | Jul-19 | Apr-19 | Jan-19 | Oct-18 | Jul-18 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| pH | | - | 7.7 | 9.1 | 7.7000 | 7.7 | 7.5 | 7.6 | 7.6 | 7.5 | 8.2 | 8.3 | 9.1 | 7.700 | 7.7 | 7.5 | 7.7 | 7.6 | 8.0 | 7.6 | 7.7 | 7.8 | 7.7 | 7.9 | 8.8 | 7.4 | 7.4 |
| Suspended Solids | mg/l | - | 31.0 | 400.0 | 31.5000 | 9.0 | 400 | 40 | 23 | 54 | 49 | 47 | 43 | 19.000 | 15 | 9 | 20 | 85 | 31 | 21 | | 34 | | 67 | *3* | | 11 |
| Phenol | mg/L | 0.32 | 0.0 | 0.0 | 0.0250 | 0.04 | *0.025* | *0.025* | *0.025* | *0.025* | | *0.025* | *0.025* | *0.025* | *0.025* | *0.025* | *0.025* | *0.025* | *0.025* | *0.025* | | *0.025* | | *0.025* | *0.005* | | |
| VFA | mg/L | - | 2.5 | 30.0 | 2.5000 | 4.9 | *2.5* | *2.5* | *2.5* | *2.5* | | *2.5* | *2.5* | *2.500* | *2.5* | *2.5* | *2.5* | *2.5* | *2.5* | *2.5* | | 30 | | 9 | *2.5* | | 6 |
| TOC | mg/L | - | 8.0 | 49.7 | 8.6500 | 4.7 | 49.7 | 9.0 | 8.6 | 8.7 | 10.4 | 15.7 | 13.2 | 8.000 | 7.7 | 4.8 | 6.7 | 6.1 | 9.5 | 7.8 | | 6.8 | | 9.0 | 7.4 | | 5.6 |
| Alkalinity | mg CaCO3/L | - | 56.0 | 78.0 | 51.0000 | 57.0 | 65 | 59 | 62 | 59 | 47 | 49 | 53 | 46.000 | 49 | 46 | 48 | 56 | 65 | 65 | | 51 | | 78 | 59 | | 49 |
| Conductivity | mS/m | - | 24.9 | 27.8 | 24.4500 | 24.5 | 26.1 | 24.3 | 25.3 | 25.2 | 20.7 | 20.3 | 22.3 | 23.000 | 25.2 | 24.4 | 24.7 | 25.0 | 25.8 | 27.8 | 25.9 | 24.5 | 23.1 | 27.8 | 24.1 | 26.2 | 26.6 |
| COD | mg/L | - | 34.5 | 107.0 | 55.5000 | 14.99 | 67 | 69 | 66 | 45 | 69 | 99 | 67 | 32.000 | 31 | 28 | 25 | 36 | 33 | 23 | 53 | 27 | 31 | 107 | 31 | 82 | 24 |
| BOD (scBOD frm Apr'20) | mg/L | 2 | 1.5 | 9.0 | 1.2500 | 0.9 | *3* | *3* | *1.5* | *0.500* | 7 | 2 | 2 | *0.500* | *0.5* | *0.5* | 1.0 | *0.5* | *3* | *0.50* | | *3* | | 9 | 1 | | *2* |
| Faecal C (Ecoli frm Apr'20) | col/100ml | - | 190.0 | 810.0 | 140.0000 | 120.0 | 810 | 330 | 450 | 160 | 120 | 120 | 72 | 310.000 | 60 | 62 | 350 | 150 | 600 | 410 | 580 | 200 | 190 | 310 | 140 | | 65 |
| Chloride | mg/L | - | 25.5 | 29.3 | 25.2000 | 24.6 | 25.8 | 26.8 | 26.8 | 29.3 | 21.5 | 19.5 | 23.0 | 22.500 | 26.4 | 24.8 | 25.6 | 25.8 | 25.2 | 28.3 | 25.5 | 23.7 | 22.4 | 29.1 | 23.7 | 25.5 | 27.7 |
| Nitrate-N | mg/L | 0.16 | 0.5 | 2.1 | 0.4550 | 0.76 | 0.500 | *0.005* | 0.090 | 0.260 | 0.070 | 0.410 | *0.005* | 0.790 | 1.01 | 1.03 | 0.630 | 0.540 | 0.200 | 0.09 | 0.31 | 1.46 | 2.09 | *0.005* | 0.09 | 1.34 | 1.54 |
| Sulphate | mg/L | - | 18.2 | 23.6 | 18.2500 | 18.2 | 14.3 | 10.3 | 14.8 | 19.6 | 15.5 | 16.5 | 18.3 | 19.500 | 21.5 | 21.4 | 19.3 | 18.4 | 14.5 | 17.5 | | 21.2 | | 8.5 | 17.9 | | 23.6 |
| Ammonia-N | mg/L | 2.1 | 0.1 | 0.7 | 0.0650 | 0.03 | 0.730 | 0.070 | *0.005* | 0.230 | 0.010 | 0.030 | *0.005* | 0.060 | 0.07 | 0.09 | 0.110 | 0.140 | 0.040 | 0.09 | 0.18 | 0.04 | *0.005* | *0.005* | 0.05 | 0.13 | 0.15 |
| Hardness | mg CaCO3/L | - | 65.0 | 73.0 | 63.5000 | 64.0 | 72 | 59 | 70 | 65 | 55 | 52 | 56 | 62.000 | 68 | 63 | 65 | 66 | 70 | 73 | | 63 | | 72 | 68 | | 68 |

| | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Calcium | mg/L | - | 14.5 | 16.2 | 13.7000 | 14.3 | 16.2 | 12.8 | 15.5 | 14.6 | 11.9 | 10.9 | 12.0 | 13.500 | 14.8 | 13.7 | 13.7 | 14.5 | 14.8 | 15.8 | | 13.5 | | 15.4 | 14.8 | | 15.3 |
| Magnesium | mg/L | - | 7.3 | 8.2 | 6.9700 | 6.95 | 7.67 | 6.58 | 7.59 | 6.95 | 6.02 | 6.04 | 6.29 | 6.990 | 7.45 | 7.00 | 7.35 | 7.27 | 7.93 | 8.20 | | 7.14 | | 8.23 | 7.59 | | 7.29 |
| Potassium | mg/L | - | 3.2 | 3.6 | 3.1600 | 3.12 | 3.64 | 3.17 | 3.39 | 3.38 | 3.56 | 3.12 | 0.79 | 3.090 | 3.21 | 2.46 | 3.15 | 3.32 | 3.05 | 3.64 | | 3.62 | | 3.53 | 1.70 | | 2.84 |
| Sodium | mg/L | - | 20.5 | 24.8 | 19.5000 | 21.5 | 20.5 | 19.2 | 23.6 | 19.8 | 18.0 | 16.2 | 17.8 | 19.100 | 18.9 | 20.3 | 20.8 | 23.2 | 21.9 | 23.8 | 18.5 | 20.4 | 15.6 | 24.8 | 21.6 | 20.9 | 22.6 |
| D.R. Phosphorus | mg/L | - | 0.0 | 0.3 | 0.0120 | 0.012 | 0.017 | 0.301 | 0.111 | 0.045 | 0.012 | 0.007 | 0.007 | *0.0025* | *0.0025* | 0.014 | 0.005 | 0.004 | 0.005 | 0.024 | | *0.0050* | | 0.268 | 0.176 | | 0.024 |
| Aluminium | mg/L | 0.055 | 0.0 | 0.4 | 0.0130 | 0.004 | 0.413 | 0.002 | 0.011 | 0.214 | 0.029 | 0.044 | 0.012 | 0.022 | 0.010 | 0.008 | 0.014 | 0.012 | 0.009 | 0.005 | 0.014 | 0.034 | 0.014 | 0.012 | 0.007 | 0.013 | 0.010 |
| Arsenic | mg/L | 0.024 | 0.0 | 0.0 | 0.0005 | 0 | *0.0005* | 0.004 | 0.002 | 0.002 | 0.001 | 0.001 | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | | *0.0005* | | 0.003 | 0.002 | | *0.0005* |
| Boron | mg/L | 0.37 | 0.1 | 0.1 | 0.0600 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.05 | 0.05 | 0.060 | 0.05 | 0.05 | 0.04 | 0.06 | 0.06 | 0.07 | 0.05 | 0.05 | 0.05 | 0.06 | 0.05 | 0.05 | 0.04 |
| Cadmium | mg/L | 0.0002 | 0.0 | 0.0 | 0.0001 | 0.0001 | *0.0001* | *0.0001* | *0.0001* | *0.0001* | *0.0001* | *0.0001* | *0.0001* | *0.0001* | *0.0001* | *0.0001* | *0.0001* | *0.0001* | *0.0001* | *0.0001* | | *0.0001* | | *0.0001* | *0.0001* | | *0.0001* |
| Chromium | mg/L | 0.001 | 0.0 | 0.0 | 0.0005 | 0 | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.001* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | *0.0005* | | *0.0005* | | *0.0005* | *0.0005* | | *0.0005* |
| Copper | mg/L | 0.0014 | 0.0 | 0.0 | 0.0012 | 0.001 | 0.00080 | 0.00100 | 0.00090 | 0.00190 | 0.00140 | 0.00180 | 0.00110 | 0.0015 | 0.00120 | 0.0006 | 0.00120 | 0.00080 | 0.00100 | 0.0030 | | 0.0017 | | *0.00025* | 0.0007 | | *0.00025* |
| Iron | mg/L | - | 0.0 | 0.7 | 0.0415 | 0.022 | 0.727 | 0.013 | 0.037 | 0.036 | 0.060 | 0.078 | 0.031 | 0.069 | 0.111 | 0.035 | 0.046 | 0.037 | 0.018 | 0.021 | 0.04 | 0.106 | 0.09 | 0.044 | 0.101 | 0.06 | 0.081 |
| Lead | mg/L | 0.0034 | 0.0 | 0.0 | 0.0003 | 0.0004 | 0.00060 | *0.00025* | *0.00025* | 0.00120 | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* |
| Manganese | mg/L | 1.9 | 0.0 | 0.2 | 0.0203 | 0.0217 | 0.0586 | 0.0610 | 0.0624 | 0.1860 | 0.0032 | 0.0086 | 0.0050 | 0.0176 | 0.0119 | 0.0216 | 0.0190 | 0.0150 | 0.0213 | 0.0406 | 0.0475 | 0.0279 | 0.0239 | 0.0921 | 0.0125 | 0.0494 | 0.0375 |
| Mercury | mg/L | 0.0006 | 0.0 | 0.0 | 0.0003 | 0.0004 | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | | | | | | | |
| Nickel | mg/L | 0.011 | 0.0 | 0.0 | 0.0003 | 0.0004 | *0.00025* | *0.00025* | *0.00025* | 0.00060 | *0.00025* | *0.00025* | *0.00025* | *0.00025* | 0.0005 | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | 0.0005 | *0.00025* | *0.00025* | *0.00025* | *0.00025* |
| Zinc | mg/L | 0.008 | 0.0 | 0.0 | 0.0010 | 0.002 | 0.002 | *0.001* | *0.001* | 0.005 | *0.001* | *0.001* | 0.008 | *0.001* | *0.001* | *0.001* | 0.003 | *0.001* | *0.001* | *0.001* | | *0.001* | | *0.001* | *0.001* | | *0.001* |
| Horizons One Plan Standard | NH4 | | | | | | | | | | | | | | | | | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 |
| ANZECC Stock Drinking Wat | Feacs | | | | | | | | | | | | | | | | | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

**Leachate Pond**

(sampled at pump station as of 2017)

| Determinand | | Typical Leachate* | Median | Maximum | Annual Median | Jun-21 | May-21 | Apr-21 | Mar-21 | Feb-21 | Jan-21 | Dec-20 | Nov-20 | Oct-20 | Sep-20 | Aug-20 | Jul-20 | Jun-20 | May-20 | Apr-20 | Jan-20 | Oct-19 | Jul-19 | Apr-19 | Jan-19 | Oct-18 | Jul-18 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| pH | | 5.9 - 8.5 | 7.9000 | 8.2000 | 7.9000 | 8.0 | 7.9 | 7.6 | 8.2 | 8.0 | 7.9 | 8.0 | 7.9 | 7.90 | 8.1 | 7.8 | 7.7 | 7.9 | 8.2 | 7.9 | 7.7 | 7.7 | 7.7 | 8.0 | 7.6 | 7.8 | 7.4 |
| Suspended Solids | mg/l | | 51.0000 | 150.0000 | 48.0000 | 21.0 | 30 | 48 | 38 | 33 | 57 | 100 | 48 | 92.00 | 51 | 45 | 150 | 80 | 90 | 35 | | 40 | | 136 | 72 | | 106 |
| Phenol | mg/L | | 0.0250 | 0.2500 | 0.0250 | *0.025* | *0.025* | *0.025* | *0.025* | *0.025* | | *0.025* | *0.025* | *0.025* | *0.025* | *0.025* | 0.04 | 0.04 | 0.06 | *0.25* | | *0.025* | | *0.025* | 0.13 | | |
| VFA | mg/L | | 10.0000 | 140.0000 | 11.0000 | *25.0* | *2.500* | 140 | 16 | 11 | | *2.5* | 9 | 13.00 | *2.5* | *2.5* | 36 | 5 | 6 | *2.5* | | 12 | | 45 | 15 | | 6 |
| TOC | mg/L | 17.2 - 822 | 622.0000 | 931.0000 | 594.0000 | 589.00 | 931 | 741 | 643 | 551 | 582 | 503 | 683 | 596.00 | 547 | 680 | 592 | 622 | 804 | 804 | | 530 | | 820 | 753 | | 385 |
| Alkalinity | mg CaCO3/L | 264 - 6820 | 5870.0000 | 7260.0000 | 5790.0000 | 5710.00 | 7000 | 6740 | 6480 | 5520 | 5680 | 4860 | 5890 | 5870.00 | 5100 | 6460 | 5490 | 5780 | 6370 | 6750 | | 4950 | | 7260 | 6480 | | 3270 |
| Conductivity | mS/m | 264 - 27900 | 1385.0000 | 1690.0000 | 1385.0000 | 1410.00 | 1690 | 1620 | 1570 | 1360 | 1330 | 1.1 | 1470 | 1360.00 | 1280 | 1460 | 135 | 1420 | 1490 | 1610 | 1430 | 1210 | 1350 | 1.7 | 1530 | 1290 | 860 |
| COD | mg/L | 84 - 5090 | 2775.0000 | 5080.0000 | 3220.0000 | 4970.00 | 4980 | 4650 | 2760 | 5080 | 3880 | 2340 | 3560 | 2650.00 | 2880 | 2880 | 2470 | 2200 | 1550 | 2330 | 2220 | 2270 | 3690 | 3680 | 2790 | 2220 | 2030 |
| BOD (scBOD frm Apr'20) | mg/L | Dec-67 | 98.0000 | 172.0000 | 87.5000 | 66.00 | 134 | 149 | 104 | 79 | 172 | 71 | 108 | 67.00 | 76 | 96 | 73 | 79 | 81 | 98 | | 146 | | 146 | 137 | | 110 |
| Faecal C (Ecoli frm Apr'20) | col/100ml | | 200.0000 | 320000.0000 | 330.0000 | 200.00 | 390 | *500* | *2* | 270 | 45500 | 110 | 2100 | 24.00 | 9100 | 130 | 65000 | 100 | 200 | 24 | 12 | 96 | 2000 | 1000 | 100 | | 320000 |
| Chloride | mg/L | 100 – 5000** | 1090.0000 | 1380.0000 | 1090.0000 | 1130.00 | 1350 | 1240 | 1270 | 1050 | 1200 | 816 | 1050 | 973.00 | 943 | 1380 | 1010 | 1170 | 1150 | 1210 | 1010 | 857 | 1010 | 1290 | 1140 | 834 | 654 |
| Nitrate-N | mg/L | | 0.5000 | 11.8000 | 0.5400 | 10.40 | *0.50* | *0.05* | *0.50* | *0.05* | *0.50* | 9.30 | 0.58 | 0.66 | 4.48 | *0.50* | 11.70 | 8.93 | 11.80 | 0.25 | *0.50* | *0.05* | 0.60 | *0.05* | 0.08 | 0.05 | 1.99 |
| Sulphate | mg/L | 1 - 780 | 88.3000 | 294.0000 | 75.4500 | 137.00 | 74.8 | 35.2 | 44.9 | 24.9 | 54.5 | 137 | 61.7 | 76.10 | 144 | 120 | 216 | 294 | 210 | 54.8 | | 85.5 | | 137 | 88 | | 193 |
| Ammonia-N | mg/L | 3.4 -1440 | 1235.0000 | 1620.0000 | 1240.0000 | 1200.00 | 1460 | 1500 | 1390 | 1280 | 1120 | 969 | 1300 | 1130.00 | 1010 | 1340 | 1140 | 1170 | 1300 | 1450 | 1270 | 1010 | 1100 | 1620 | 1320 | 1140 | 616 |
| Hardness | mg CaCO3/L | | 514.0000 | 620.0000 | 481.5000 | 595.00 | 520 | 480 | 438 | 409 | 436 | 446 | 458 | 497.00 | 483 | 533 | 577 | 514 | 517 | 522 | | 414 | | 607 | 578 | | 620 |
| Calcium | mg/L | | 106.0000 | 157.0000 | 103.0000 | 124.00 | 109 | 101 | 89.6 | 87 | 93.7 | 99.3 | 96.2 | 108.00 | 105 | 115 | 131 | 113 | 106 | 106 | | 85.3 | | 119 | 113 | | 157 |
| Magnesium | mg/L | | 55.4000 | 74.7000 | 54.0000 | 68.90 | 60.2 | 55.4 | 52.0 | 46.4 | 48.9 | 47.9 | 52.9 | 54.90 | 53.1 | 59.8 | 60.6 | 55.9 | 61.4 | 62.3 | | 48.8 | | 74.7 | 71.7 | | 54.9 |
| Potassium | mg/L | | 648.0000 | 1200.0000 | 667.5000 | 1200.00 | 746 | 803 | 694 | 738 | 645 | 546 | 639 | 642.00 | 574 | 690 | 625 | 832 | 7.85 | 648 | | 555 | | 750 | 698 | | 463 |
| Sodium | mg/L | | 897.0000 | 1200.0000 | 877.0000 | 1200.00 | 1120 | 1010 | 1020 | 841 | 811 | 747 | 907 | 847.00 | 716 | 941 | 625 | 887 | 1050 | 993 | 815 | 738 | 932 | 1140 | 1020 | 799 | 562 |
| D.R. Phosphorus | mg/L | | 11.2000 | 15.3000 | 11.8000 | 10.60 | 15.2 | 14.3 | 15.3 | 12.4 | 15.1 | 8.41 | 11.2 | 8.74 | 8.25 | 13.7 | 8.73 | 6.99 | 9.71 | 13.0 | | 9.04 | | 11.9 | 11.7 | | 4.57 |
| Aluminium | mg/L | | 0.5660 | 1.0700 | 0.5755 | 1.070 | 0.964 | 0.795 | 0.787 | 0.709 | 0.576 | 0.377 | 0.575 | 0.541 | 0.377 | 0.557 | 0.402 | 0.577 | 0.026 | 0.586 | 0.506 | 0.307 | 0.186 | 0.683 | 0.780 | 0.461 | 0.276 |
| Arsenic | mg/L | 45 - 2584 | 0.3140 | 0.6840 | 0.3005 | 0.6840 | 0.407 | 0.359 | 0.376 | 0.278 | 0.314 | 0.295 | 0.282 | 0.254 | 0.257 | 0.290 | 0.306 | 0.405 | 0.001 | 0.388 | | 0.312 | | 0.399 | 0.504 | | 0.372 |
| Boron | mg/L | | 6.1850 | 16.8000 | 6.4000 | 16.80 | 6.94 | 6.89 | 6.32 | 6.48 | 6.05 | 5.77 | 5.97 | 6.64 | 5.83 | 6.88 | 5.57 | 8.06 | 0.07 | 5.69 | 5.97 | 5.34 | 7.05 | 8.03 | 6.62 | 5.50 | 5.74 |
| Cadmium | mg/L | | 0.0001 | 0.0100 | 0.0001 | *0.0001* | *0.0010* | *0.0100* | 0.0100 | *0.0001* | *0.0001* | *0.0001* | *0.0001* | *0.0001* | *0.0001* | *0.0001* | *0.0001* | 0.0010 | *0.0001* | *0.0010* | | *0.0001* | | 0.0002 | *0.0005* | | *0.0001* |
| Chromium | mg/L | 30 – 1600** | 0.6040 | 1.1000 | 0.6030 | 1.10 | 1.060 | 0.693 | 0.833 | 0.784 | 0.598 | 0.521 | 0.604 | 0.576 | 0.500 | 0.602 | 0.506 | 0.697 | *0.0005* | 0.709 | | 0.208 | | 0.628 | 0.666 | | 0.301 |
| Copper | mg/L | 0.005 – 50.4 | 0.0137 | 0.0375 | 0.0140 | 0.03750 | 0.0176 | 0.0137 | 0.0087 | 0.0080 | 0.0120 | 0.0187 | 0.0100 | 0.0142 | 0.0158 | 0.0095 | 0.0290 | 0.0225 | 0.0007 | 0.0073 | | 0.0044 | | 0.0080 | 0.019 | | 0.0193 |
| Iron | mg/L | | 4.3550 | 6.1800 | 4.2500 | 5.340 | 4.09 | 4.64 | 4.24 | 4.26 | 4.21 | 3.27 | 4.21 | 4.73 | 3.81 | 5.86 | 4.41 | 4.30 | 5.61 | 5.25 | 4.42 | 2.53 | 4.70 | 6.18 | 6.18 | 4.10 | 2.66 |
| Lead | mg/L | 1.6 - 220 | 0.0025 | 0.0250 | 0.0027 | 0.00640 | *0.0025* | *0.0250* | 0.0025 | 0.0027 | 0.0025 | 0.0025 | 0.0027 | 0.0034 | 0.0021 | 0.0031 | 0.0028 | 0.0052 | *0.00025* | *0.0025* | 0.0017 | 0.0009 | 0.0023 | 0.0020 | 0.005 | 0.0019 | 0.0021 |
| Manganese | mg/L | | 1.1050 | 1.9200 | 1.1150 | 1.920 | 1.30 | 1.28 | 1.22 | 1.17 | 1.03 | 1.09 | 1.00 | 1.09 | 0.96 | 1.10 | 1.13 | 1.16 | 0.0992 | 1.04 | 1.15 | 0.852 | 1.22 | 1.11 | 1.47 | 0.893 | 1.04 |
| Mercury | mg/L | | 0.0003 | 0.0250 | 0.0003 | *0.00025* | *0.00250* | *0.02500* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.0025* | | | | | | | |
| Nickel | mg/L | | 0.1110 | 0.2110 | 0.1110 | 0.2110 | 0.134 | 0.137 | 0.127 | 0.111 | 0.109 | 0.0947 | 0.109 | 0.107 | 0.0953 | 0.112 | 0.111 | 0.147 | 0.00025 | 0.125 | 0.107 | 0.0729 | 0.123 | 0.126 | 0.140 | 0.0952 | 0.0820 |
| Zinc | mg/L | 0.001 – 0.42 | 0.0760 | 0.2100 | 0.0810 | 0.210 | 0.086 | *0.100* | 0.004 | 0.054 | 0.057 | 0.073 | 0.072 | 0.076 | 0.156 | 0.104 | 0.119 | 0.155 | 0.001 | 0.068 | | 0.039 | | 0.049 | 0.148 | | 0.172 |

* for Class 1-type landfills, Table 5-5, p79, Technical Guidelines for Disposal to Land,, WasteMINZ April 2016.

**G1S**

| Determinand | | ANZECC STOCK | Median | Maximum | Annual Median | Jun-21 | May-21 | Apr-21 | Mar-21 | Feb-21 | Jan-21 | Dec-20 | Nov-20 | Oct-20 | Jul-20 | Apr-20 | Jan-20 | Oct-19 | Jul-19 | Apr-19 | Jan-19 | Oct-18 | Jul-18 | Apr-18 | Jan-18 | Oct-17 | Jul-17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Water level | mBGL | | 14.2900 | 14.5300 | 14.3000 | 14.2900 | | 14.29 | | | 14.35 | | | 14.3750 | 14.30 | 14.52 | 14.21 | 14.11 | 14.32 | 14.53 | 14.31 | 14.13 | 14.25 | 14.375 | 14.02 | 13.74 | 14.04 |
| pH | | 6 to 9 | 6.5500 | 6.9000 | 6.6500 | | | 6.7 | | | 6.9 | | | 6.6000 | 6.6 | 6.9 | 6.6 | 6.5 | 6.3 | 6.4 | 6.3 | 6.2 | 6.1 | 6.2 | 6.6 | 6.5 | 6.7 |
| Suspended Solids | mg/l | | 22.0000 | 251.0000 | 45.0000 | | | 49 | | | 41 | | | | | *2.5* | | | | *3* | *3* | | | | 251 | | |
| Phenol | mg/L | | 0.0250 | 0.0250 | 0.0250 | | | *0.025* | | | | | | | | *0.025* | | | | *N/a* | *0.005* | | | | *0.025* | | |
| VFA | mg/L | | 2.5000 | 8.0000 | 2.5000 | | | *2.5* | | | | | | | | *2.5* | | | | *N/a* | *2.5* | | | | 8 | | |
| TOC | mg/L | | 26.8000 | 45.7000 | 39.0500 | | | 32.4 | | | 45.7 | | | | | 38.4 | | | | 11.0 | 10.2 | | | | 21.2 | | |
| Alkalinity | mg CaCO3/L | | 63.5000 | 91.0000 | 80.0000 | | | 69 | | | 91 | | | | | 58 | | | | 40 | 24 | | | | 70 | | |
| Conductivity | mS/m | | 73.7500 | 181.0000 | 41.5500 | | | 39.6 | | | 37.2 | | | 43.5000 | 65.7 | 65.9 | 81.6 | 122 | 126 | 136 | 181 | 129 | 167.0 | 136.0 | 46.3 | 41.6 | 41.9 |
| COD | mg/L | | 68.0000 | 125.0000 | 98.0000 | | | 91 | | | 125 | | | 105.0000 | 74 | 99 | 107 | 43 | 58 | 111 | 93 | 61 | 44 | *7.5* | 62 | 53 | 44 |
| BOD (scBOD frm Apr'20) | mg/L | | 2.2500 | 3.0000 | 1.7500 | | | *3.0* | | | *3.0* | | | *0.5000* | *0.5* | *0.5* | | | | *1.5* | *3.0* | | | | *3* | | |
| Faecal C (Ecoli frm Apr'20) | col/100ml | 100 | 2.0000 | 52000.0000 | 2.0000 | | | *2* | | | *2* | | | *2* | *2* | 16 | *2* | *2* | *2* | *2* | *2* | | | | 52000 | | |
| Chloride | mg/L | | 147.5000 | 513.0000 | 62.7000 | | | 66.3 | | | 46 | | | 59.1000 | 139 | 130 | 156 | 276 | 330 | 362 | 513 | 300 | 420 | 389 | 70.1 | 68.9 | 69.7 |
| Nitrate-N | mg/L | 90.3 | 0.2350 | 1.2700 | 0.0400 | | | 0.03 | | | *0.005* | | | *0.0500* | 0.07 | 0.06 | 0.05 | *0.05* | 0.25 | 0.30 | 1.27 | 0.26 | 0.36 | 0.37 | 0.46 | 0.27 | 0.22 |
| Sulphate | mg/L | 1000 | 27.7000 | 1920.0000 | 4.7850 | | | 6.27 | | | 3.3 | | | | | 33.8 | | | | 60.9 | 1920 | | | | 21.6 | | |
| Ammonia-N | mg/L | | 0.0500 | 0.0900 | 0.0450 | | | 0.05 | | | 0.05 | | | 0.0400 | 0.04 | 0.04 | 0.04 | 0.05 | 0.06 | 0.08 | 0.05 | 0.05 | 0.09 | 0.08 | 0.02 | 0.02 | 0.03 |
| Hardness | mg CaCO3/L | | 69.0000 | 373.0000 | 40.0000 | | | 41 | | | 39 | | | | | 59 | | | | 214 | 373 | | | | 79 | | |
| Calcium | mg/L | 1000 | 12.6500 | 73.9000 | 7.5650 | | | 7.56 | | | 7.57 | | | | | 11.1 | | | | 43.0 | 73.9 | | | | 14.2 | | |
| Magnesium | mg/L | | 9.0550 | 45.7000 | 5.1150 | | | 5.34 | | | 4.89 | | | | | 7.61 | | | | 25.9 | 45.7 | | | | 10.5 | | |
| Potassium | mg/L | | 5.3200 | 13.2000 | 3.9400 | | | 3.93 | | | 3.95 | | | | | 5.93 | | | | 10.1 | 13.2 | | | | 4.71 | | |
| Sodium | mg/L | | 108.0000 | 170.0000 | 69.6000 | | | 69.6 | | | 67.4 | | | 69.6000 | 101 | 94.2 | 117 | 170 | 151 | 144 | 156 | 136 | 136 | 115 | 51.6 | 44.2 | 50.4 |
| D.R. Phosphorus | mg/L | | 0.0405 | 0.0720 | 0.0715 | | | 0.071 | | | 0.072 | | | | | 0.038 | | | | 0.022 | 0.043 | | | | 0.022 | | |
| Aluminium | mg/L | 5 | 0.0340 | 0.1940 | 0.1475 | | | 0.138 | | | 0.194 | | | 0.1570 | 0.075 | 0.137 | 0.113 | 0.021 | 0.013 | 0.014 | 0.013 | 0.018 | 0.005 | 0.012 | 0.036 | 0.067 | 0.032 |
| Arsenic | mg/L | 0.5 | 0.0015 | 0.0020 | 0.0020 | | | 0.002 | | | 0.002 | | | | | 0.002 | | | | 0.001 | 0.001 | | | | *0.0005* | | |
| Boron | mg/L | 5 | 0.0150 | 0.0200 | 0.0150 | | | *0.015* | | | *0.015* | | | *0.0150* | 0.02 | *0.015* | *0.015* | *0.015* | *0.015* | *0.015* | *0.015* | *0.015* | *0.015* | *0.015* | *0.015* | *0.015* | *0.015* |
| Cadmium | mg/L | 0.01 | 0.0001 | 0.0002 | 0.0001 | | | *0.0001* | | | *0.0001* | | | | | *0.0001* | | | | *0.0001* | 0.0002 | | | | *0.0001* | | |
| Chromium | mg/L | 1 | 0.0008 | 0.0030 | 0.0025 | | | 0.002 | | | 0.003 | | | | | 0.001 | | | | *0.0005* | *0.0005* | | | | *0.0005* | | |
| Copper | mg/L | 0.4 | 0.0076 | 0.0113 | 0.0097 | | | 0.0080 | | | 0.0113 | | | | | 0.0086 | | | | 0.0025 | 0.0018 | | | | 0.0072 | | |
| Iron | mg/L | | 4.4550 | 19.3000 | 3.5050 | | | 2.89 | | | 3.67 | | | 3.3400 | 4.29 | 3.49 | 4.62 | 7.44 | 8.29 | 14.8 | 19.3 | 9.4 | 11.3 | 10.9 | 0.327 | 2.26 | 3.79 |
| Lead | mg/L | 0.1 | 0.0003 | 0.0030 | 0.0003 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | *0.00025* | 0.0006 | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | 0.0030 | *0.00025* |
| Manganese | mg/L | | 0.1560 | 0.4150 | 0.0695 | | | 0.0461 | | | 0.0609 | | | 0.1760 | 0.078 | 0.0635 | 0.136 | 0.176 | 0.180 | 0.269 | 0.415 | 0.212 | 0.286 | 0.237 | 0.100 | 0.0634 | 0.0693 |
| Mercury | mg/L | | 0.0003 | 0.0003 | 0.0003 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | *0.00025* | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nickel | mg/L | 1 | 0.0010 | 0.0020 | 0.0016 | | | 0.0016 | | | 0.0020 | | | 0.0016 | 0.0012 | 0.0016 | 0.0020 | 0.0007 | 0.0007 | 0.0010 | 0.0012 | 0.0008 | 0.0009 | 0.0009 | 0.0010 | 0.0009 | 0.0008 |
| Zinc | mg/L | 20 | 0.0020 | 0.0040 | 0.0015 | | | *0.001* | | | 0.002 | | | | | 0.003 | | | | 0.002 | 0.004 | | | | *0.001* | | |

**G1D**

| Determinand | | NZDW MAV | Median | Maximum | Annual Median | Jun-21 | May-21 | Apr-21 | Mar-21 | Feb-21 | Jan-21 | Dec-20 | Nov-20 | Oct-20 | Jul-20 | Apr-20 | Jan-20 | Oct-19 | Jul-19 | Apr-19 | Jan-19 | Oct-18 | Jul-18 | Apr-18 | Jan-18 | Oct-17 | Jul-17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Water level | mBGL | | 14.75 | 15.85 | 14.81 | 14.81 | | 14.81 | | | 14.50 | | | 14.8100 | 14.75 | 15.05 | 14.8 | 14.635 | 14.65 | 15.85 | 14.89 | 14.68 | 14.38 | 14.86 | 14.63 | 14.24 | 14.05 |
| pH | | 7 to 8.5* | 7.15 | 7.70 | 7.15 | | | 7.1 | | | 7.2 | | | 7.0000 | 7.2 | 7.7 | 7.2 | 7.2 | 7.0 | 7.6 | 7.4 | 7.0 | 7.1 | 7.0 | 7.1 | 7.0 | 7.3 |
| Suspended Solids | mg/l | | 3.00 | 28.00 | 12 | | | *2* | | | 22 | | | | | *2.5* | | | | *3* | *3* | | | | 28 | | |
| Phenol | mg/L | | 0.03 | 0.03 | 0.025 | | | *0.025* | | | | | | | | *0.025* | | | | *N/a* | *0.005* | | | | *0.025* | | |
| VFA | mg/L | | 3.75 | 6.00 | 2.5 | | | *2.5* | | | | | | | | *2.5* | | | | *N/a* | 6 | | | | 5.0 | | |
| TOC | mg/L | | 2.00 | 2.60 | 1.85 | | | 1.9 | | | 1.8 | | | | | 2.0 | | | | 2.0 | 2.1 | | | | 2.6 | | |
| Alkalinity | mg CaCO3/L | | 58.50 | 63.00 | 57 | | | 58 | | | 56 | | | | | 59 | | | | 63 | 60 | | | | 50 | | |
| Conductivity | mS/m | | 28.40 | 30.80 | 28 | | | 28.1 | | | 27.6 | | | 28.1000 | 27.9 | 28.3 | 28.0 | 28.0 | 28.6 | 28.6 | 29.1 | 29.6 | 30.8 | 30.8 | 26.6 | 28.8 | 28.5 |
| COD | mg/L | | 7.50 | 63.00 | 7.5 | | | *7.5000* | | | 19 | | | *7.5000* | *7.5* | *7.5* | *7.5* | *7.5* | 63 | 17 | *7.5* | 28 | *7.5* | *7.5* | *7.5* | *7.5* | *7.5* |
| BOD (scBOD frm Apr'20) | mg/L | | 0.50 | 3.00 | 0.5 | | | *3.0* | | | *0.5* | | | *0.5000* | *0.5* | *0.5* | | | | *1.5* | *3* | | | | *0.5* | | |
| Faecal C (Ecoli frm Apr'20) | col/100ml | NIL | 2.00 | 5000.00 | 2 | | | *2* | | | *2* | | | *2* | *2* | *2* | *2* | *2* | *2* | *2* | 2 | | | | 5000 | | |
| Chloride | mg/L | 250* | 32.85 | 36.50 | 31.6 | | | 31.5 | | | 30.7 | | | 31.7000 | 33 | 31.5 | 31.5 | 31.9 | 31.5 | 32.7 | 33.1 | 34.6 | 36.5 | 36.0 | 33.7 | 34.5 | 34.5 |
| Nitrate-N | mg/L | 11.3 | 0.01 | 0.11 | 0.005 | | | *0.005* | | | *0.005* | | | *0.0050* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | 0.005 | 0.11 | *0.005* | *0.005* | *0.005* | 0.02 | *0.005* | *0.005* |
| Sulphate | mg/L | 250* | 19.80 | 1790.00 | 18.85 | | | 19.5 | | | 18.2 | | | | | 20.1 | | | | 20.2 | 1790 | | | | 17.4 | | |
| Ammonia-N | mg/L | 1.17 | 0.10 | 0.11 | 0.1 | | | 0.09 | | | 0.1 | | | 0.1000 | 0.1 | 0.10 | 0.09 | 0.10 | 0.09 | 0.10 | 0.07 | 0.10 | 0.11 | 0.09 | 0.09 | 0.09 | 0.10 |
| Hardness | mg CaCO3/L | 200* | 51.50 | 56.00 | 53.5 | | | 56 | | | 51 | | | | | 50 | | | | 49 | 53 | | | | 52 | | |
| Calcium | mg/L | | 8.21 | 8.72 | 8.2 | | | 8.35 | | | 8.05 | | | | | 7.83 | | | | 8.06 | 8.72 | | | | 8.63 | | |
| Magnesium | mg/L | | 7.48 | 8.50 | 7.975 | | | 8.5 | | | 7.45 | | | | | 7.51 | | | | 6.97 | 7.57 | | | | 7.39 | | |
| Potassium | mg/L | | 5.90 | 6.27 | 6.045 | | | 6.07 | | | 6.02 | | | | | 6.27 | | | | 5.58 | 5.77 | | | | 4.77 | | |
| Sodium | mg/L | 200* | 32.00 | 37.70 | 30.85 | | | 31 | | | 30.7 | | | | | 32.0 | 32.0 | 37.7 | 19.0 | 31.7 | 34.1 | 34.4 | 33.5 | 35.3 | 29.9 | 29.8 | |
| D.R. Phosphorus | mg/L | | 0.05 | 0.31 | 0.0405 | | | 0.034 | | | 0.047 | | | | | 0.030 | | | | 0.047 | 0.314 | | | | 0.060 | | |
| Aluminium | mg/L | 0.1* | 0.00 | 0.02 | 0.001 | | | *0.0010* | | | 0.006 | | | *0.0010* | *0.001* | 0.002 | *0.001* | *0.001* | *0.001* | 0.004 | 0.020 | 0.003 | *0.001* | 0.004 | 0.005 | *0.001* | *0.001* |
| Arsenic | mg/L | 0.01 | 0.00 | 0.00 | 0.0025 | | | 0.002 | | | 0.003 | | | | | 0.003 | | | | 0.003 | 0.003 | | | | 0.002 | | |
| Boron | mg/L | 1.4 | 0.04 | 0.05 | 0.04 | | | 0.04 | | | 0.04 | | | 0.0400 | 0.04 | 0.04 | 0.05 | *0.015* | 0.05 | 0.04 | 0.04 | *0.015* | *0.015* | 0.03 | 0.03 | 0.03 | *0.015* |
| Cadmium | mg/L | 0.004 | 0.00 | 0.00 | 0.0001 | | | *0.0001* | | | *0.0001* | | | | | *0.0001* | | | | *0.0001* | 0.0002 | | | | *0.0001* | | |
| Chromium | mg/L | 0.05 | 0.00 | 0.00 | 0.0005 | | | *0.0005* | | | *0.0005* | | | | | *0.0005* | | | | *0.0005* | *0.0005* | | | | *0.0005* | | |
| Copper | mg/L | 2 | 0.00 | 0.00 | 0.000525 | | | *0.00025* | | | 0.0008 | | | | | *0.00025* | | | | *0.00025* | 0.0006 | | | | *0.00025* | | |
| Iron | mg/L | 0.2* | 0.44 | 2.43 | 0.6015 | | | 0.675 | | | 0.528 | | | | | 0.44 | 0.70 | 0.19 | 1.49 | 0.647 | 2.43 | 0.22 | 0.19 | 0.40 | 0.248 | 0.33 | |
| Lead | mg/L | 0.01 | 0.00 | 0.00 | 0.000375 | | | 0.00050 | | | 0.00090 | | | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | 0.0011 | 0.0008 | *0.00025* |
| Manganese | mg/L | 0.4 | 0.06 | 0.07 | 0.0634 | | | 0.0641 | | | 0.0627 | | | 0.0616 | 0.067 | 0.0703 | 0.0645 | 0.0580 | 0.0650 | 0.0616 | 0.0654 | 0.0688 | 0.0589 | 0.0704 | 0.0690 | 0.0626 | 0.0701 |
| Mercury | mg/L | | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | *0.00025* | | | | | | | | | | | |
| Nickel | mg/L | 0.08 | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* |
| Zinc | mg/L | 1.5* | 0.00 | 0.00 | 0.001 | | | *0.001* | | | *0.001* | | | | | *0.001* | | | | *0.001* | 0.003 | | | | *0.001* | | |

* = GV

**G2S**

| Determinand | | ANZECC STOCK | Median | Maximum | Annual Median | Jun-21 | May-21 | Apr-21 | Mar-21 | Feb-21 | Jan-21 | Dec-20 | Nov-20 | Oct-20 | Jul-20 | Apr-20 | Jan-20 | Oct-19 | Jul-19 | Apr-19 | Jan-19 | Oct-18 | Jul-18 | Apr-18 | Jan-18 | Oct-17 | Jul-17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Water level | mBGL | | 2.25 | 2.55 | 2.11 | 2.36 | | 2.36 | | | 1.87 | | | 1.800 | 2.11 | 2.55 | 2.38 | 2.145 | 2.18 | 2.51 | 2.25 | 2.26 | 2.06 | 2.36 | 2.25 | 1.67 | 1.76 |
| pH | | 6 to 9 | 6.95 | 7.20 | 7.2 | | | 6.8 | | | 7.2 | | | 7.200 | 7.2 | 7.0 | 6.9 | 7.0 | 6.6 | 7.1 | 6.9 | 6.7 | 6.7 | 6.6 | 6.8 | 7.0 | 7.0 |
| Suspended Solids | mg/l | | 3.25 | 92.00 | 2.75 | | | *2* | | | *3.5* | | | | | 8 | | | | *2.5* | *3* | | | | 92 | | |
| Phenol | mg/L | | 0.03 | 0.03 | 0.025 | | | *0.025* | | | | | | | | *0.025* | | | | *N/a* | *0.005* | | | | *0.025* | | |
| VFA | mg/L | | 2.50 | 8.00 | 2.5 | | | *2.5* | | | | | | | | *2.5* | | | | *N/a* | *2.5* | | | | 8 | | |
| TOC | mg/L | | 12.70 | 15.60 | 6.15 | | | 1.4 | | | 10.9 | | | | | 15.6 | | | | 14.6 | 12.9 | | | | 12.5 | | |
| Alkalinity | mg CaCO3/L | | 421.00 | 523.00 | 281.5 | | | 276 | | | 287 | | | | | 427 | | | | 523 | 418 | | | | 424 | | |
| Conductivity | mS/m | | 175.00 | 267.00 | 144 | | | 133 | | | 155 | | | 235.000 | 104 | 190 | 267 | 133 | 186 | 177 | 200 | 131 | 189 | 189 | 173.0 | 16.1 | 136 |
| COD | mg/L | | 48.50 | 148.00 | 53 | | | 66 | | | 38 | | | 66.000 | 40 | 53 | 69 | 22 | 90 | 80 | 148 | 60 | 36 | 27 | 44 | 27 | 23 |
| BOD (scBOD frm Apr'20) | mg/L | | 1.50 | 3.00 | 0.5 | | | *3.0* | | | *0.5* | | | *0.500* | *0.5* | *0.5* | | | | *2.5* | *3.0* | | | | *3* | | |
| Faecal C (Ecoli frm Apr'20) | col/100ml | 100 | 2.00 | 16.00 | 2 | | | *2.000* | | | *2.000* | | | *2.000* | *2.0* | *2.000* | *2.000* | *2* | *2* | *2* | *2* | | | | 16 | | |
| Chloride | mg/L | | 305.50 | 616.00 | 269 | | | 227 | | | 311 | | | 584.000 | 136 | 323 | 616 | 194 | 327 | 246 | 376 | 160 | 332 | 318 | 272 | 300 | 224 |
| Nitrate-N | mg/L | 90.3 | 0.01 | 0.05 | 0.0275 | | | *0.05* | | | *0.005* | | | *0.050* | *0.005* | *0.005* | *0.005* | *0.005* | *0.05* | *0.005* | *0.005* | *0.005* | *0.005* | *0.005* | *0.05* | *0.005* | 0.01 |
| Sulphate | mg/L | 1000 | 2.79 | 5.86 | 4.495 | | | 5.51 | | | 3.48 | | | | | 5.86 | | | | 1.07 | 2.79 | *0.005* | | | 2.21 | | |
| Ammonia-N | mg/L | | 0.01 | 0.06 | 0.02 | | | 0.02 | | | 0.02 | | | *0.005* | 0.0 | 0.02 | 0.02 | *0.005* | 0.01 | *0.005* | 0.01 | *0.005* | 0.06 | 0.01 | 0.01 | *0.005* | *0.005* |
| Hardness | mg CaCO3/L | | 291.50 | 415.00 | 248.5 | | | 237 | | | 260 | | | | | 304 | | | | 312 | 415 | | | | 279 | | |
| Calcium | mg/L | 1000 | 62.85 | 91.60 | 48.05 | | | 44.3 | | | 51.8 | | | | | 61.0 | | | | 66.5 | 91.6 | | | | 64.7 | | |
| Magnesium | mg/L | | 33.50 | 45.10 | 31.1 | | | 30.6 | | | 31.6 | | | | | 36.8 | | | | 35.4 | 45.1 | | | | 31.0 | | |
| Potassium | mg/L | | 25.25 | 35.00 | 20.75 | | | 18.0 | | | 23.5 | | | | | 25.5 | | | | 25.0 | 35.0 | | | | 26.3 | | |
| Sodium | mg/L | | 224.00 | 281.00 | 170.5 | | | 156 | | | 185 | | | | | 272 | 281 | 187 | 224 | 244 | 250 | 178 | 248 | 245 | 221 | 172 | |
| D.R. Phosphorus | mg/L | | 0.02 | 0.03 | 0.0175 | | | 0.017 | | | 0.018 | | | | | 0.018 | | | | 0.024 | 0.013 | | | | 0.028 | | |
| Aluminium | mg/L | 5 | 0.00 | 0.01 | 0.003 | | | 0.003 | | | 0.003 | | | *0.001* | 0.003 | 0.003 | *0.001* | 0.004 | *0.001* | *0.001* | 0.003 | 0.004 | *0.001* | 0.006 | 0.002 | 0.005 | 0.007 |
| Arsenic | mg/L | 0.5 | 0.00 | 0.00 | 0.0005 | | | *0.0005* | | | *0.0005* | | | | | *0.0005* | | | | *0.0005* | *0.0005* | | | | *0.0005* | | |
| Boron | mg/L | 5 | 0.90 | 1.27 | 0.985 | | | 1.02 | | | 0.84 | | | 0.950 | 1.06 | 1.21 | 1.15 | 0.57 | 0.98 | 1.27 | 0.95 | 0.73 | 0.66 | 0.77 | 0.82 | 0.52 | 0.66 |
| Cadmium | mg/L | 0.01 | 0.00 | 0.00 | 0.0001 | | | *0.0001* | | | *0.0001* | | | | | *0.0001* | | | | *0.0001* | *0.0001* | | | | *0.0001* | | |
| Chromium | mg/L | 1 | 0.00 | 0.00 | 0.0005 | | | *0.0005* | | | *0.0005* | | | | | *0.0005* | | | | *0.0005* | *0.0005* | | | | *0.0005* | | |
| Copper | mg/L | 0.4 | 0.01 | 0.01 | 0.0052 | | | 0.0065 | | | 0.0039 | | | | | 0.0010 | | | | 0.0080 | 0.0046 | | | | 0.0064 | | |
| Iron | mg/L | | 0.12 | 0.44 | 0.1015 | | | 0.169 | | | 0.034 | | | | | 0.032 | 0.08 | 0.12 | 0.44 | 0.048 | 0.187 | 0.05 | 0.13 | 0.13 | 0.109 | 0.24 | |
| Lead | mg/L | 0.1 | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* | *0.00025* |
| Manganese | mg/L | | 0.13 | 0.42 | 0.1395 | | | 0.160 | | | 0.119 | | | 0.201 | 0.0838 | 0.215 | 0.416 | 0.0928 | 0.163 | 0.133 | 0.171 | 0.0586 | 0.0879 | 0.121 | 0.149 | 0.0322 | 0.0213 |
| Mercury | mg/L | | 0.00 | 0.00 | 0.00025 | | | *0.00025* | | | *0.00025* | | | *0.00025* | *0.00025* | *0.00025* | | | | | | | | | | | |
| Nickel | mg/L | 1 | 0.00 | 0.00 | 0.00325 | | | 0.0034 | | | 0.0031 | | | 0.0026 | 0.0036 | 0.0046 | 0.0038 | 0.0033 | 0.0042 | 0.0043 | 0.0039 | 0.0040 | 0.0029 | 0.0036 | 0.0039 | 0.0034 | 0.0027 |
| Zinc | mg/L | 20 | 0.00 | 0.02 | 0.0015 | | | 0.002 | | | *0.001* | | | | | 0.006 | | | | *0.001* | *0.001* | | | | 0.015 | | |

**Tatana extra sampling SW1 (discontinued since Apr 2020)**

| Determinand | | ANZECC STOCK | Median | Maximum | Annual Median | Jan-21 | Dec-20 | Nov-20 | Oct-20 | Jul-20 | Apr-20 | Jan-20 | Oct-19 | Jul-19 | Apr-19 | Jan-19 | Oct-18 | Jul-18 | Apr-18 | Jan-18 | Oct-17 | Jul-17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| pH | | 6 to 9 | 7.1 | 7.7 | 7.4 | | | | | | | 7.4 | 7.4 | 7.7 | 6.9 | 6.9 | 7.2 | 6.9 | 7.0 | 7.0 | 7.1 | 7.3 |
| Suspended Solids | mg/l | | 225.0 | 1150.0 | 88 | | | | | | | 536 | 59 | 88 | 225 | 353 | 254 | 688 | 110 | 1150 | 224 | 69 |
| Conductivity | mS/m | | 247.0 | 283.0 | 253 | | | | | | | 261 | 253 | 222 | 283 | 271 | 212 | 243 | 240 | 277 | 247 | 237 |
| COD | mg/L | | 329.0 | 748.0 | 346 | | | | | | | 346 | 494 | 153 | 748 | 329 | 228 | 451 | 283 | 578 | 140 | 139 |
| BOD (scBOD frm Apr'20) | mg/L | | 56.0 | 264.0 | 56 | | | | | | | 56 | 14 | 264 | 64 | 61 | 87 | 80 | 8 | 45 | 31 | *1.5* |
| Faecal C (Ecoli frm Apr'20) | col/100ml | 100 | 150.0 | 23000.0 | 100 | | | | | | | 200 | 69 | 100 | 23000 | | | | | | | |
| Chloride | mg/L | | 229.0 | 463.0 | 227 | | | | | | | 215 | 243 | 227 | 463 | 239 | 229 | 230 | 218 | 233 | 228 | 211 |
| Nitrate-N | mg/L | 90.3 | 0.7 | 3.1 | 2.06 | | | | | | | 3.08 | 2.06 | 0.12 | 0.65 | 1.80 | 2.44 | 0.15 | *0.05* | 0.13 | 2.26 | 0.21 |
| Ammonia-N | mg/L | | 92.6 | 111.0 | 96.8 | | | | | | | 100 | 96.8 | 77.4 | 82.0 | 110 | 73.2 | 94.8 | 92.6 | 111 | 83.3 | 84.1 |
| Iron | mg/L | | 1.1 | 1.7 | 0.50 | | | | | | | 0.30 | 0.50 | 1.65 | 0.89 | 1.07 | 0.74 | 1.65 | 1.21 | 1.05 | 1.24 | 0.96 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Manganese | mg/L | | 1.0 | 1.2 | 0.965 | 0.998 | 0.806 | 0.965 | 0.409 | 0.969 | 0.586 | 0.928 | 1.10 | 0.969 | 1.16 | 1.15 |
| TKN | mg/L | | 93.8 | 119.0 | 96.2 | 111 | 96.2 | 77.6 | 91.9 | 119 | 77.4 | 93.9 | 91.3 | 116 | 93.8 | 87.9 |
| Nitrite-N | mg/L | | 0.1 | 0.2 | 0.14 | 0.15 | 0.14 | 0.03 | 0.20 | 0.15 | 0.16 | 0.01 | *0.005* | 0.02 | 0.09 | 0.02 |
| Total Nitrogen | mg/L | | 96.5 | 119.0 | 98.2 | 100 | 98.2 | 81.2 | 88.9 | 119 | 82.2 | 99.3 | 96.5 | 111 | 89.5 | 88.5 |

**Tatana extra sampling SW2 (discontinued since Apr 2020)**

| Determinand | | ANZECC STOCK | Median | Maximum | Annual Median | Jan-21 | Dec-20 | Nov-20 | Oct-20 | | Apr-20 | Jan-20 | Oct-19 | Jul-19 | Apr-19 | Jan-19 | Oct-18 | Jul-18 | Apr-18 | Jan-18 | Oct-17 | Jul-17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| pH | | 6 to 9 | 7.5 | 74.0 | 7.6 | | | | | | | 7.6 | 7.9 | 7.4 | 74.0 | 7.5 | 8.0 | 7.3 | 7.3 | 7.6 | 7.4 | 7.4 |
| Faecal C (Ecoli frm Apr'20) | col/100ml | 100 | 1595.0 | 71800.0 | 690 | | | | | | | 71800 | 690 | 54 | 2500 | | | | | | | |
| Suspended Solids | mg/l | | 42.0 | 383.0 | 15 | | | | | | | 383 | 15 | 14 | 49 | 11 | 26 | 65 | 53 | 58 | 42 | 18 |
| Conductivity | mS/m | | 168.0 | 228.0 | 161 | | | | | | | 176 | 161 | 120 | 168 | 178 | 155 | 173 | 213 | 228 | 153 | 148 |
| COD | mg/L | | 142.0 | 393.0 | 142 | | | | | | | 393 | 142 | 96 | 230 | 136 | 186 | 105 | 261 | 322 | 99 | 109 |
| TKN | mg/L | | 38.9 | 78.7 | 38.9 | | | | | | | 62.6 | 38.9 | 24.0 | 23.3 | 50.8 | 30.1 | 43.8 | 70.0 | 78.7 | 36.9 | 33.8 |
| BOD (scBOD frm Apr'20) | mg/L | | 17.0 | 191.0 | 9 | | | | | | | 191 | 9 | 6 | 23 | 34 | 17 | 58 | 10 | 10 | 21 | *1.5* |
| Chloride | mg/L | | 177.0 | 281.0 | 159 | | | | | | | 174 | 159 | 126 | 281 | 180 | 177 | 195 | 219 | 193 | 164 | 160 |
| Nitrite-N | mg/L | | 0.1 | 0.5 | 0.28 | | | | | | | 0.53 | 0.28 | 0.09 | 0.12 | 0.54 | 0.43 | 0.05 | 0.03 | 0.22 | 0.03 | 0.14 |
| Nitrate-N | mg/L | 90.3 | 3.9 | 8.7 | 2.77 | | | | | | | 1.96 | 5.40 | 2.77 | 1.65 | 5.20 | 8.67 | 3.88 | 0.49 | 0.56 | 7.28 | 5.64 |
| Ammonia-N | mg/L | | 36.8 | 74.3 | 36.8 | | | | | | | 50.1 | 36.8 | 22.0 | 18.2 | 46.8 | 27.1 | 43.5 | 68.7 | 74.3 | 33.1 | 30.7 |
| Total Nitrogen | mg/L | | 45.3 | 81.5 | 45.3 | | | | | | | 60.3 | 45.3 | 27.3 | 24.8 | 54.2 | 41.2 | 50.6 | 72.9 | 81.5 | 44.6 | 38.9 |
| Iron | mg/L | | 0.4 | 1.1 | 0.43 | | | | | | | 0.43 | 0.37 | 0.66 | 1.05 | 0.25 | 0.47 | 0.40 | 0.28 | 0.47 | 0.68 | 0.36 |
| Manganese | mg/L | | 0.7 | 1.4 | 0.606 | | | | | | | 0.879 | 0.606 | 0.522 | 0.373 | 0.691 | 0.532 | 0.746 | 1.35 | 0.986 | 0.946 | 0.705 |

**Tatana extra sampling TD1 (Formerly SW3 prior to Apr 2020)**

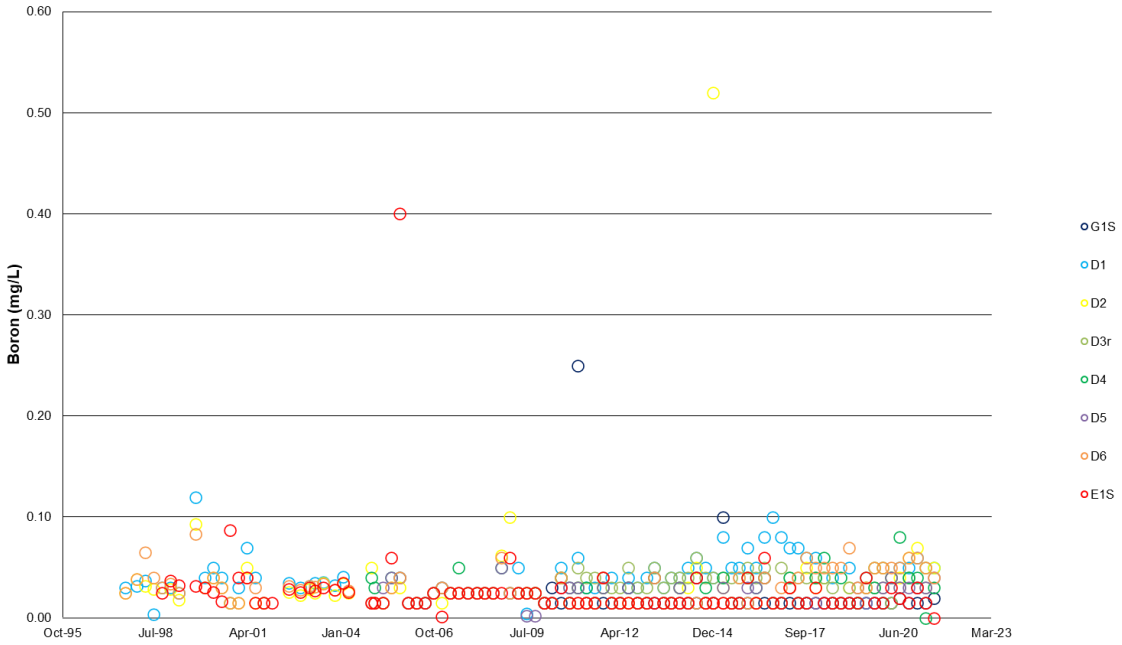
| Determinand | | ANZECC STOCK | Median | Maximum | Annual Median | Jun-21 | May-21 | Apr-21 | Mar-21 | Feb-21 | Jan-21 | Dec-20 | Nov-20 | Oct-20 | Jul-20 | Apr-20 | Jan-20 | Oct-19 | Jul-19 | Apr-19 | Jan-19 | Oct-18 | Jul-18 | Apr-18 | Jan-18 | Oct-17 | Jul-17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| pH | | 6 to 9 | 7.350 | 7.8000 | 7.3000 | | | 7.200 | 7.600 | | | | | 7.4 | 7.0 | 7.1 | 7.7 | 7.8 | 7.2 | 7.3 | 7.2 | 7.4 | 7.2 | 7.4 | 7.4 | 7.5 | 7.2 |
| Suspended Solids | mg/l | | 16.500 | 2160.0000 | 63.5000 | | | 61 | | | | | | 66 | | 284 | 14 | 131 | 19 | 6 | 26 | 8 | *3* | 8 | 2160 | *3* | *3* |
| Phenol | mg/L | | 0.025 | 0.0250 | 0.0250 | | | *0.025* | | | | | | *0.025* | | *0.025* | | | | | | | | | | | |
| VFA | mg/L | | 6.000 | 6.0000 | 4.2500 | | | *2.500* | | | | | | 6.000 | | 6 | | | | | | | | | | | |
| TOC | mg/L | | 25.500 | 44.5000 | 35.0000 | | | 25.500 | | | | | | 44.500 | | 23.8 | | | | | | | | | | | |
| Alkalinity | mg CaCO3/L | | 154.000 | 684.0000 | 419.0000 | | | 154.000 | | | | | | 684.000 | | 151 | | | | | | | | | | | |
| Conductivity | mS/m | | 84.200 | 192.0000 | 123.5500 | | | 63.100 | 53.700 | | | | | 192 | 184 | 55.7 | 91.1 | 63.3 | 52.4 | 93.2 | 73.7 | 83.1 | 85.3 | 89 | 103 | 87.0 | 31.9 |
| COD | mg/L | | 87.500 | 889.0000 | 202.0000 | | | 50.000 | 39.000 | | | | | 354 | 562 | 75 | 92 | 124 | 109 | 271 | 43 | 152 | 49 | 28 | 889 | 70 | 83 |
| BOD (scBOD frm Apr'20) | mg/L | | 3.000 | 41.0000 | 2.2500 | | | *3.000* | *1.500* | | | | | 1 | *3* | *3* | 21 | 17 | *3* | *3* | *3* | 12 | 8 | 9 | 41 | *3* | *1.5* |
| Faecal C (Ecoli frm Apr'20) | col/100ml | 100 | 250.000 | 7500.0000 | 39.0000 | | | 38.000 | 24.000 | | | | | 40 | 7500 | 140 | 380 | 250 | 380 | 2000 | | | | | | | |
| Chloride | mg/L | | 102.000 | 321.0000 | 127.1500 | | | 77.300 | 57.400 | | | | | 177 | 321 | 69.3 | 101 | 72.3 | 69.2 | 172 | 79.3 | 103 | 119 | 112 | 105 | 111 | 42.1 |
| Nitrate-N | mg/L | 90.3 | 0.555 | 5.9900 | 0.8750 | | | 3.800 | 0.540 | | | | | 0.24 | 1.21 | *0.0050* | 5.99 | 0.26 | 0.19 | 0.57 | 0.65 | 3.63 | 4.58 | 0.54 | 0.24 | 1.59 | 0.27 |
| Sulphate | mg/L | 1000 | 6.260 | 6.7100 | 3.4400 | | | 6.260 | | | | | | 0.62 | | 6.71 | | | | | | | | | | | |
| Ammonia-N | mg/L | | 7.800 | 57.8000 | 21.6200 | | | 0.040 | 0.010 | | | | | 57.8 | 43.2 | 4.61 | 10.9 | 6.4 | 3.6 | 4.2 | 10.3 | 7.6 | 8.0 | 12.3 | 19.1 | 11.2 | 1.2 |
| Hardness | mg CaCO3/L | | 137.000 | 405.0000 | 271.0000 | | | 137.000 | | | | | | 405 | | 115 | | | | | | | | | | | |
| Calcium | mg/L | 1000 | 26.200 | 81.6000 | 53.9000 | | | 26.200 | | | | | | 81.6 | | 21.1 | | | | | | | | | | | |
| Magnesium | mg/L | | 17.300 | 48.7000 | 33.0000 | | | 17.300 | | | | | | 48.7 | | 15.0 | | | | | | | | | | | |
| Potassium | mg/L | | 22.000 | 49.2000 | 35.6000 | | | 22.000 | | | | | | 49.2 | | 15.5 | | | | | | | | | | | |
| Sodium | mg/L | | 57.600 | 134.0000 | 95.8000 | | | 57.600 | | | | | | 134 | | 51.3 | | | | | | | | | | | |
| D.R. Phosphorus | mg/L | | 0.024 | 0.0440 | 0.0290 | | | 0.044 | | | | | | 0.014 | | 0.024 | | | | | | | | | | | |
| Aluminium | mg/L | 5 | 0.009 | 0.0220 | 0.0095 | | | 0.010 | 0.009 | | | | | 0.009 | 0.022 | 0.009 | | | | | | | | | | | |
| Arsenic | mg/L | 0.5 | 0.001 | 0.0010 | 0.0008 | | | *0.0005* | | | | | | 0.001 | | 0.001 | | | | | | | | | | | |
| Boron | mg/L | 5 | 0.270 | 1.3500 | 0.5400 | | | 0.270 | 0.220 | | | | | 1.35 | 0.810 | 0.18 | | | | | | | | | | | |
| Cadmium | mg/L | 0.01 | 0.000 | 0.0001 | 0.0001 | | | *0.0001* | | | | | | *0.0001* | | *0.0001* | | | | | | | | | | | |
| Chromium | mg/L | 1 | 0.001 | 0.0010 | 0.0008 | | | *0.0005* | | | | | | 0.001 | | *0.0005* | | | | | | | | | | | |
| Copper | mg/L | 0.4 | 0.000 | 0.0009 | 0.0006 | | | *0.00025* | | | | | | 0.0009 | | *0.00025* | | | | | | | | | | | |
| Iron | mg/L | | 0.535 | 1.4900 | 0.2350 | | | 0.158 | | | | | | 0.312 | | 1.26 | 0.26 | 1.12 | 1.49 | 0.57 | 0.50 | 0.45 | 0.28 | 0.37 | 1.14 | 1.16 | 0.91 |
| Lead | mg/L | 0.1 | 0.000 | 0.0003 | 0.0003 | | | *0.00025* | *0.00025* | | | | | *0.00025* | *0.00025* | *0.00025* | | | | | | | | | | | |
| Manganese | mg/L | | 0.190 | 0.9360 | 0.1905 | | | 0.0168 | 0.021 | | | | | 0.936 | 0.36 | 0.200 | 0.179 | 0.446 | 0.117 | 0.0295 | 0.104 | 0.284 | 0.120 | 0.506 | 0.378 | 0.493 | 0.0564 |
| Mercury | mg/L | | 0.000 | 0.0003 | 0.0003 | | | *0.00025* | *0.00025* | | | | | *0.00025* | *0.00025* | *0.00025* | | | | | | | | | | | |
| Nickel | mg/L | 1 | 0.002 | 0.0039 | 0.0024 | | | 0.0015 | 0.0015 | | | | | 0.0039 | 0.0032 | 0.0009 | | | | | | | | | | | |
| Zinc | mg/L | 20 | 0.001 | 0.0030 | 0.0020 | | | *0.001* | | | | | | 0.003 | | *0.001* | | | | | | | | | | | |
| TKN | mg/L | | 12.300 | 36.0000 | #NUM! | | | | | | | | | | | | 14.4 | 10.0 | 6.0 | 7.2 | 12.9 | 9.5 | 12.3 | 15.7 | 36.0 | 12.5 | 3.1 |
| Nitrite-N | mg/L | | 0.080 | 0.5900 | #NUM! | | | | | | | | | | | | 0.59 | 0.03 | 0.03 | 0.07 | 0.11 | 0.25 | 0.08 | 0.05 | 0.16 | 0.09 | 0.02 |
| Total Nitrogen | mg/L | | 13.100 | 31.2000 | #NUM! | | | | | | | | | | | | 18.80 | 8.79 | 6.70 | 7.49 | 11.8 | 13.1 | 13.4 | 14.2 | 31.2 | 14.8 | 3.3 |

**Tatana extra sampling SW4 (discontinued since Apr 2020)**

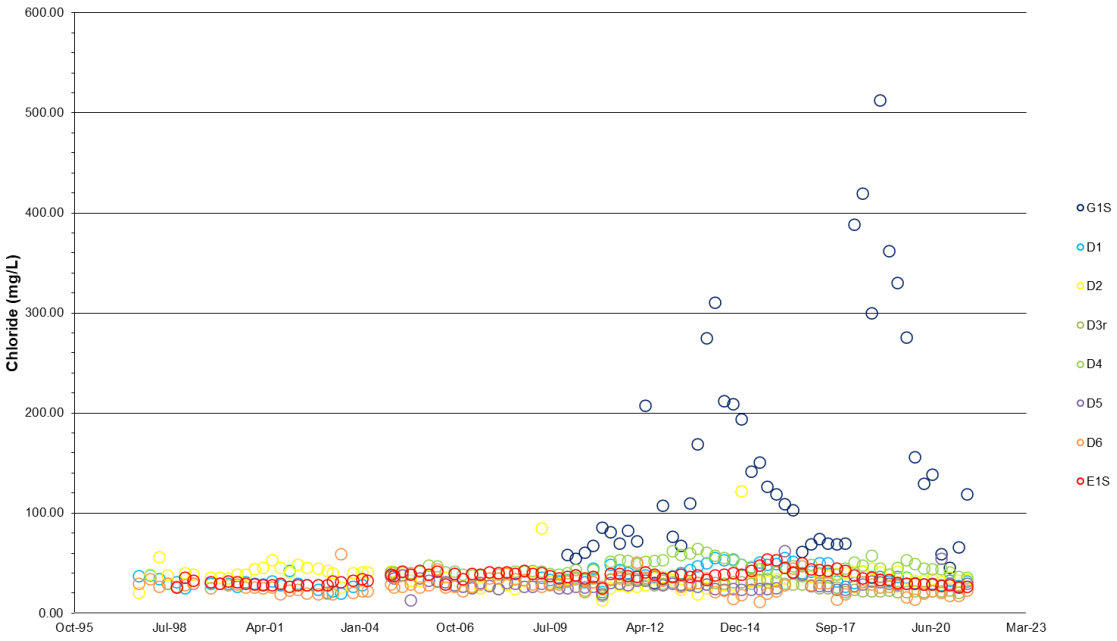
| Determinand | | ANZECC STOCK | Median | Maximum | Annual Median | Jan-21 | Dec-20 | Nov-20 | Oct-20 | | Apr-20 | Jan-20 | Oct-19 | Jul-19 | Apr-19 | Jan-19 | Oct-18 | Jul-18 | Apr-18 | Jan-18 | Oct-17 | Jul-17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| pH | | 6 to 9 | 7.4 | 8.0 | 7.7 | | | | | | | 8 | 7.7 | 7.3 | 7.3 | 7.4 | 7.4 | 7.3 | 7.4 | 7.4 | 7.4 | 7.6 |
| Faecal C (Ecoli frm Apr'20) | col/100ml | 100 | 2625.0 | 4800.0 | 650 | | | | | | | 4600 | 650 | 44 | 4800 | | | | | | | |
| Suspended Solids | mg/l | | 12.0 | 102.0 | 11 | | | | | | | 50 | 11 | *3* | 21 | 12 | 13 | *3* | 102 | 10 | 12 | 8 |
| Conductivity | mS/m | | 83.4 | 161.0 | 83 | | | | | | | 103.0 | 82.9 | 58.1 | 84.6 | 77.3 | 78.3 | 83.4 | 85.1 | 161 | 93.2 | 64.3 |
| COD | mg/L | | 78.0 | 151.0 | 73 | | | | | | | 117 | 73 | 64 | 138 | 64 | 140 | 52 | 151 | 78 | 84 | 70 |
| TKN | mg/L | | 10.4 | 17.1 | 10.4 | | | | | | | 12.1 | 10.4 | 5.8 | 9.6 | 12.5 | 8.4 | 7.4 | 12.2 | 17.1 | 13.8 | 8.3 |
| BOD (scBOD frm Apr'20) | mg/L | | 3.0 | 22.0 | 3 | | | | | | | *22* | *3* | *3* | 11 | *3* | *3* | *3* | 9 | *3* | 7 | *1.5* |
| Chloride | mg/L | | 97.9 | 141.0 | 88 | | | | | | | 97.9 | 88.1 | 65.7 | 98.4 | 81.7 | 93.3 | 116 | 98.6 | 141 | 123 | 75.3 |
| Nitrite-N | mg/L | | 0.1 | 0.2 | 0.04 | | | | | | | 0.20 | 0.04 | 0.04 | 0.10 | 0.09 | 0.12 | 0.12 | 0.04 | 0.02 | 0.07 | 0.07 |
| Nitrate-N | mg/L | 90.3 | 0.4 | 3.6 | 0.40 | | | | | | | 1.02 | 0.40 | 0.18 | 0.21 | 0.16 | 1.89 | 3.64 | 0.27 | *0.05* | 0.57 | 0.42 |
| Ammonia-N | mg/L | | 6.7 | 15.8 | 6.5 | | | | | | | 6.5 | 10.5 | 4.7 | 6.7 | 9.7 | 6.4 | 6.7 | 8.6 | 15.8 | 11.4 | 5.3 |
| Total Nitrogen | mg/L | | 11.3 | 17.6 | 11.4 | | | | | | | 11.40 | 11.60 | 6.58 | 10.3 | 10.8 | 9.71 | 11.3 | 11.4 | 17.6 | 14.2 | 7.84 |
| Iron | mg/L | | 0.4 | 0.9 | 0.46 | | | | | | | 0.19 | 0.46 | 0.90 | 0.43 | 0.29 | 0.43 | 0.38 | 0.56 | 0.27 | 0.43 | 0.46 |
| Manganese | mg/L | | 0.5 | 1.7 | 0.518 | | | | | | | 0.834 | 0.518 | 0.107 | 0.639 | 0.225 | 0.528 | 0.234 | 0.519 | 1.74 | 0.926 | 0.156 |

# **Appendix F** Leachate indicator graphs

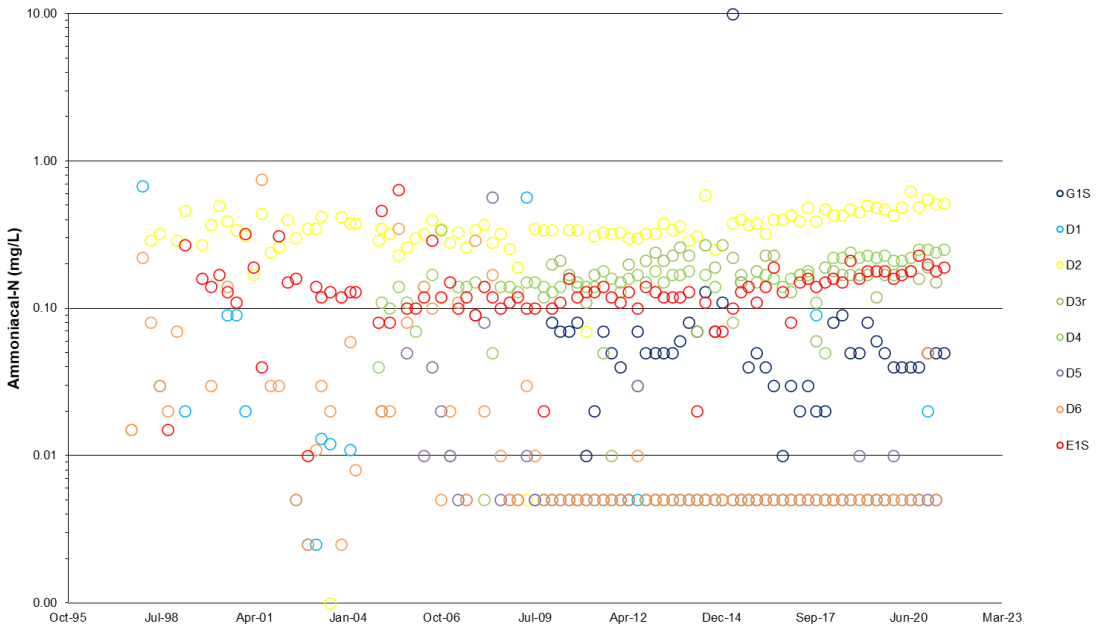
## Sand Aquifer Downgrade of New Landfill - Boron Concentrations



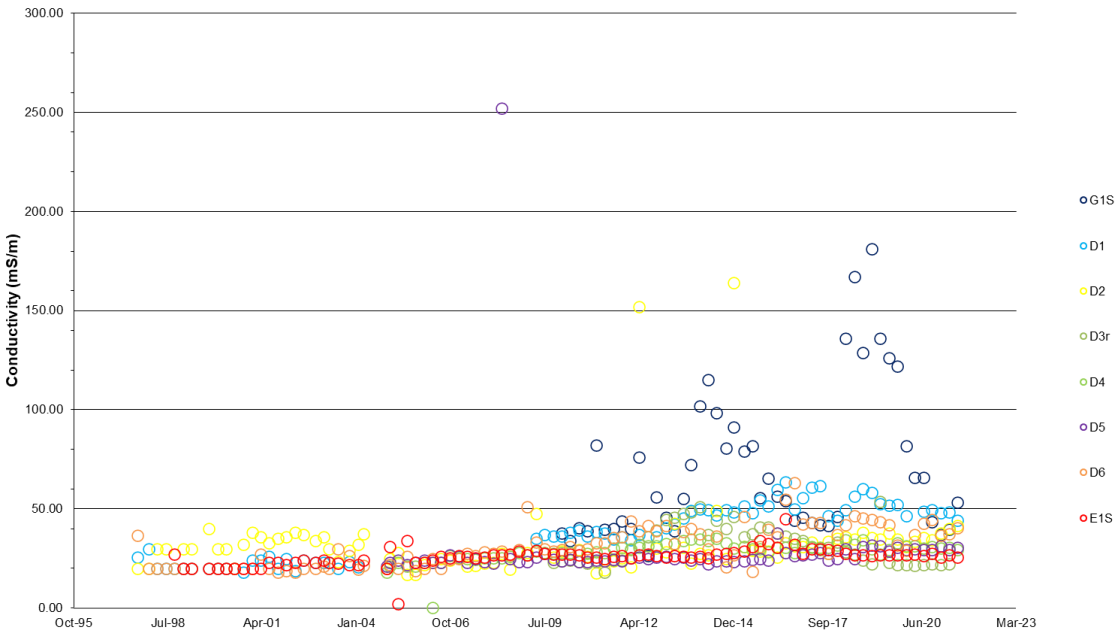

## Sand Aquifer Downgrade of New Landfill - Chloride Concentrations

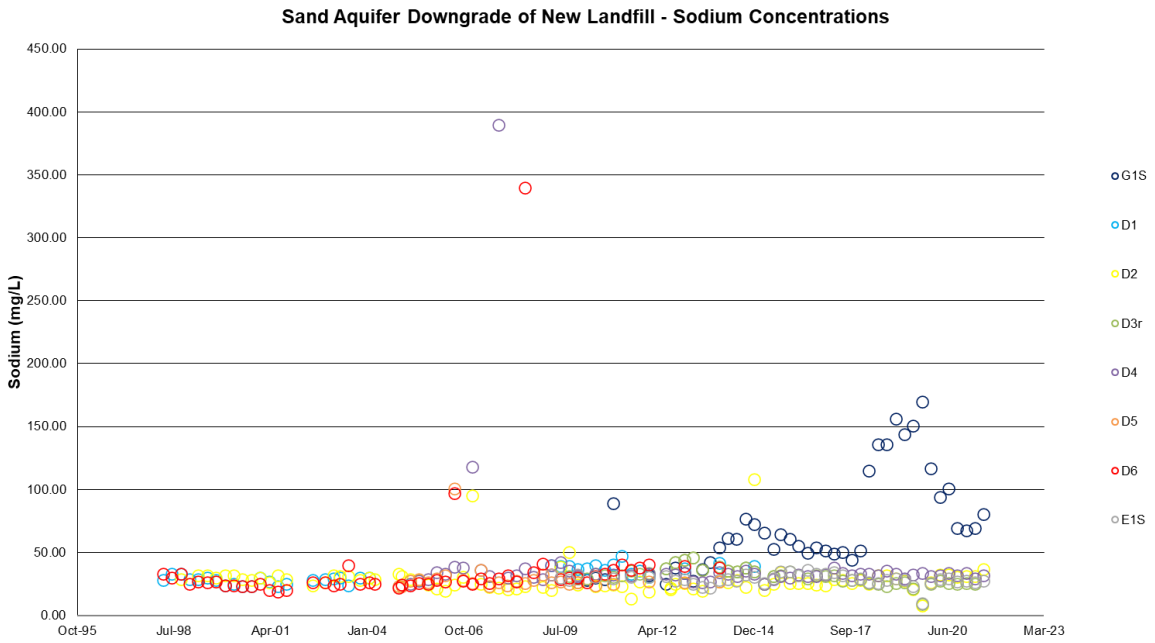


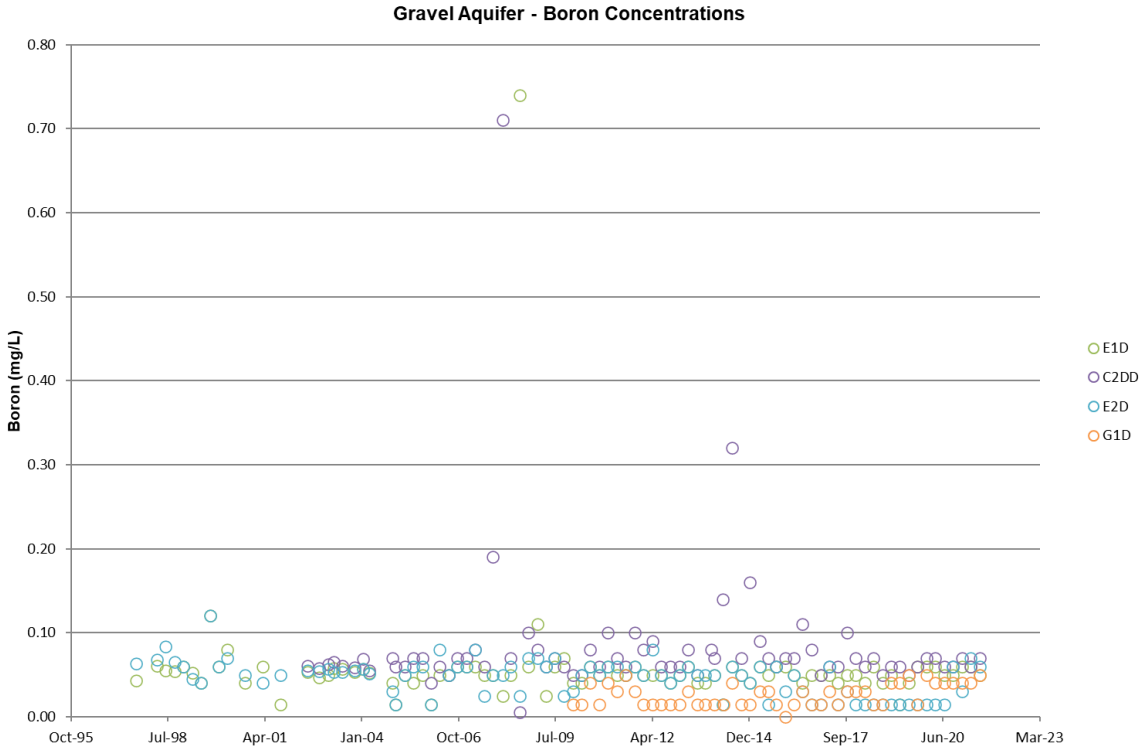
## Sand Aquifer Downgrade of New Landfill - Ammoniacal-Nitrogen Concentrations

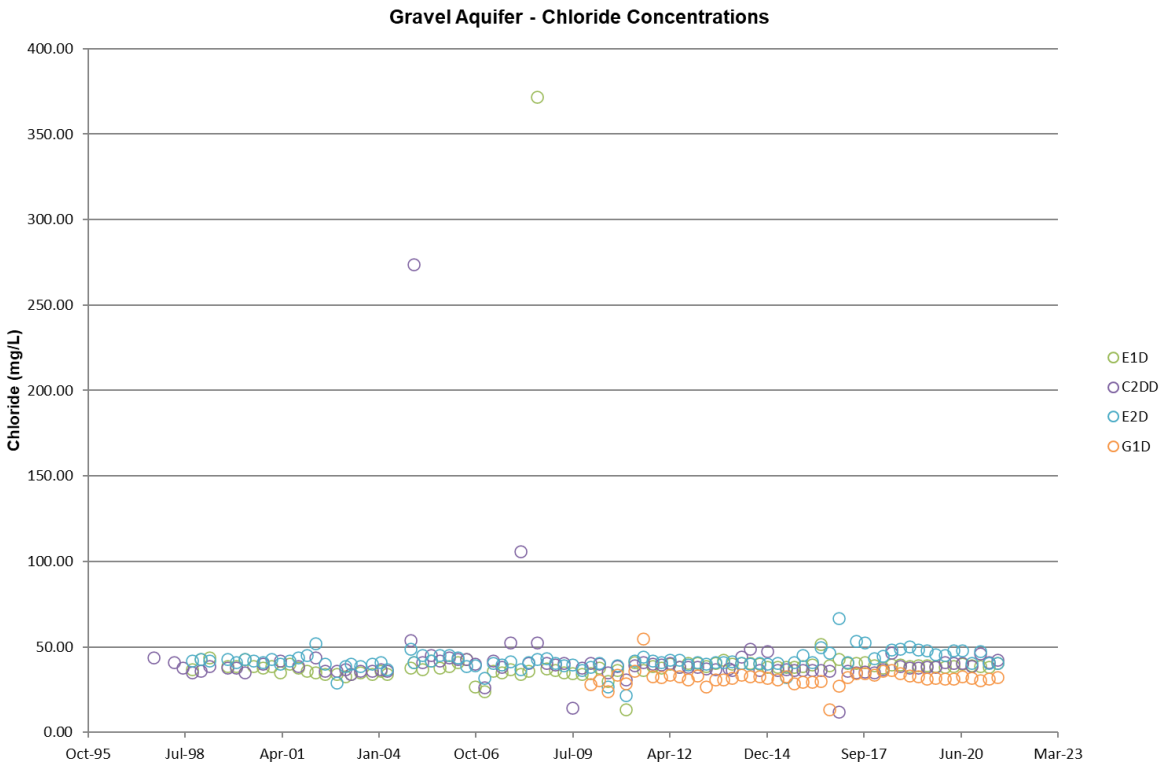


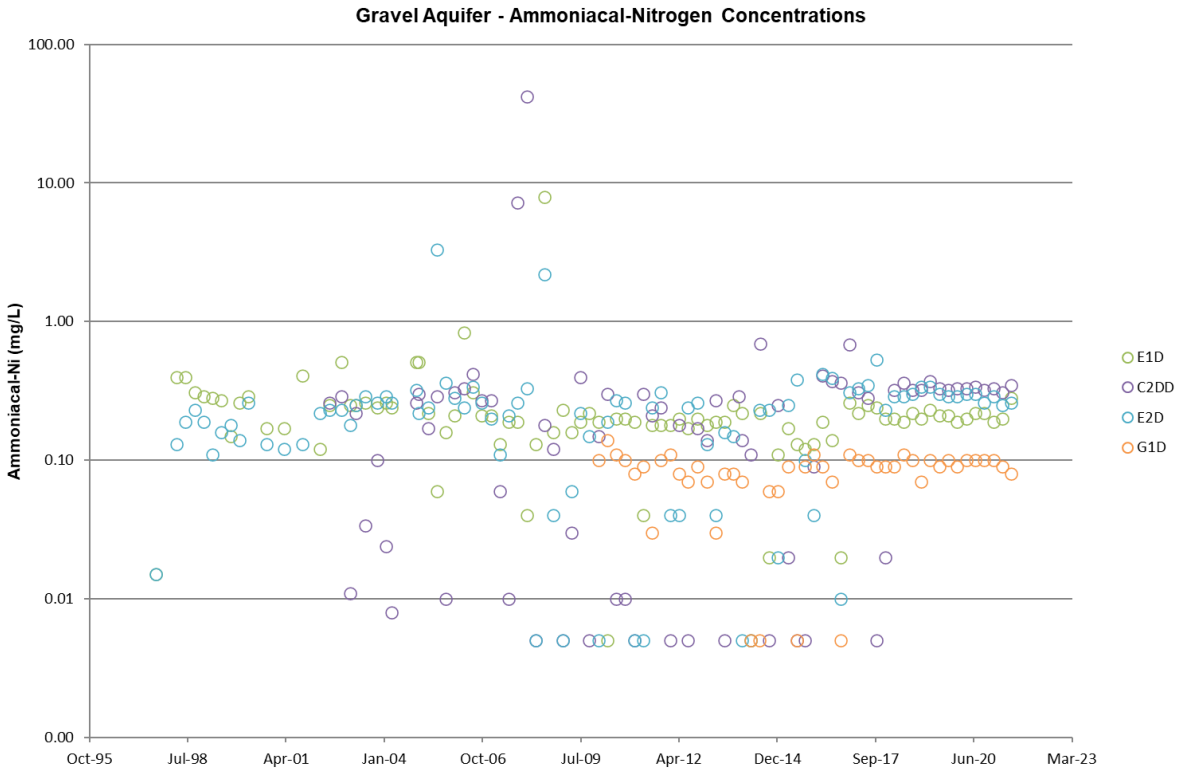

## Sand Aquifer Downgrade of New Landfill - Conductivity Levels

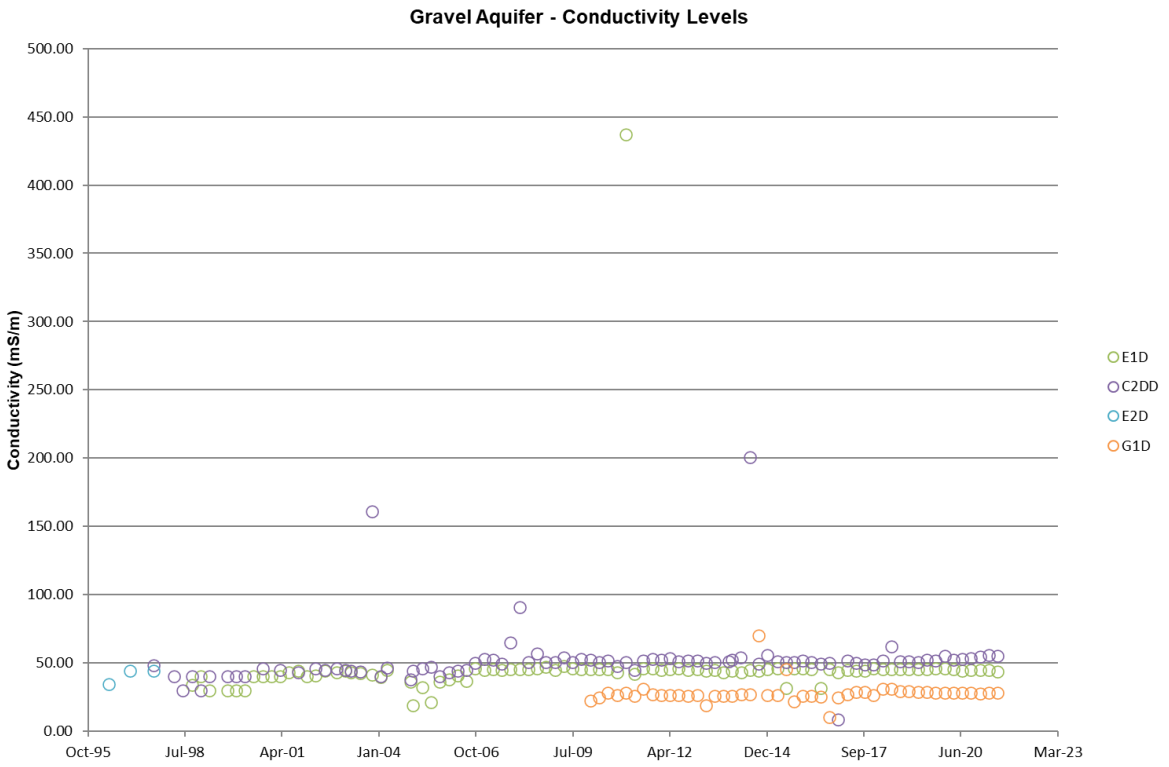


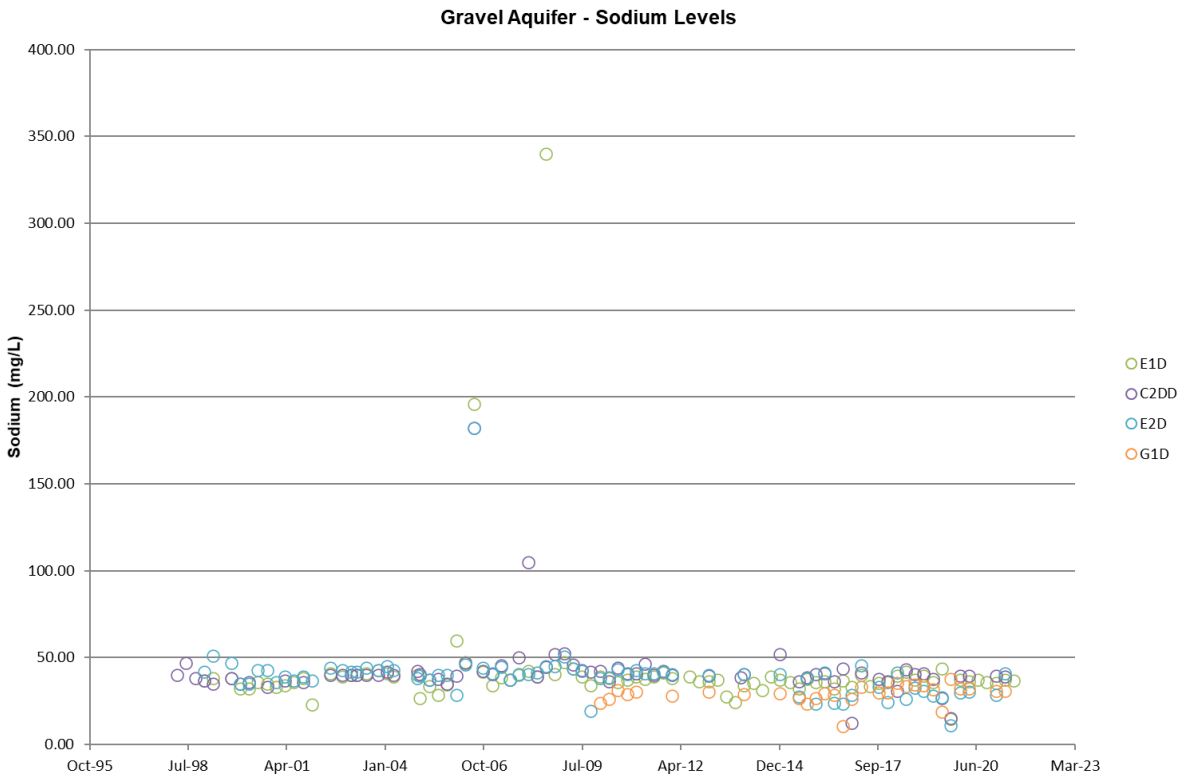

Sand Aquifer Downgrade of New Landfill - Sodium Concentrations
Sodium (mg/L)
450.00
400.00
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
G1S
D1
D2
D3r
D4
D5
D6
E1S

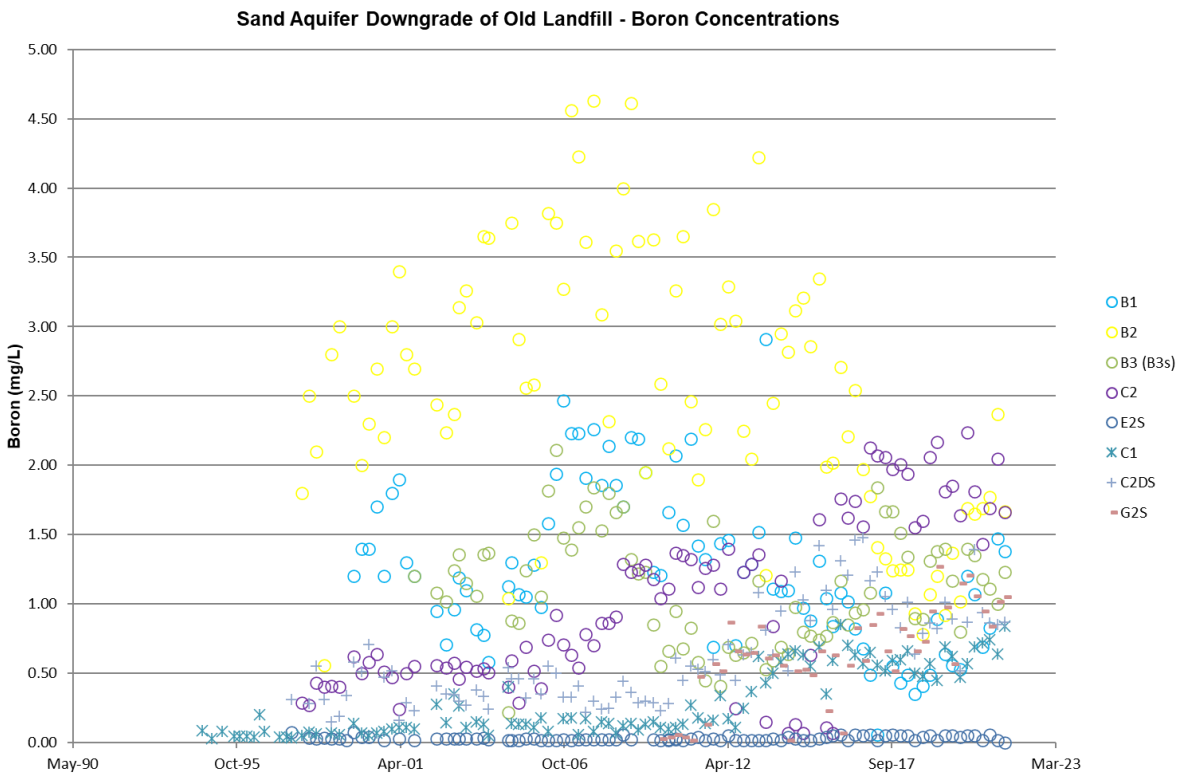

Gravel Aquifer - Boron Concentrations
Boron (mg/L)
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
E1D
C2DD
E2D
G1D

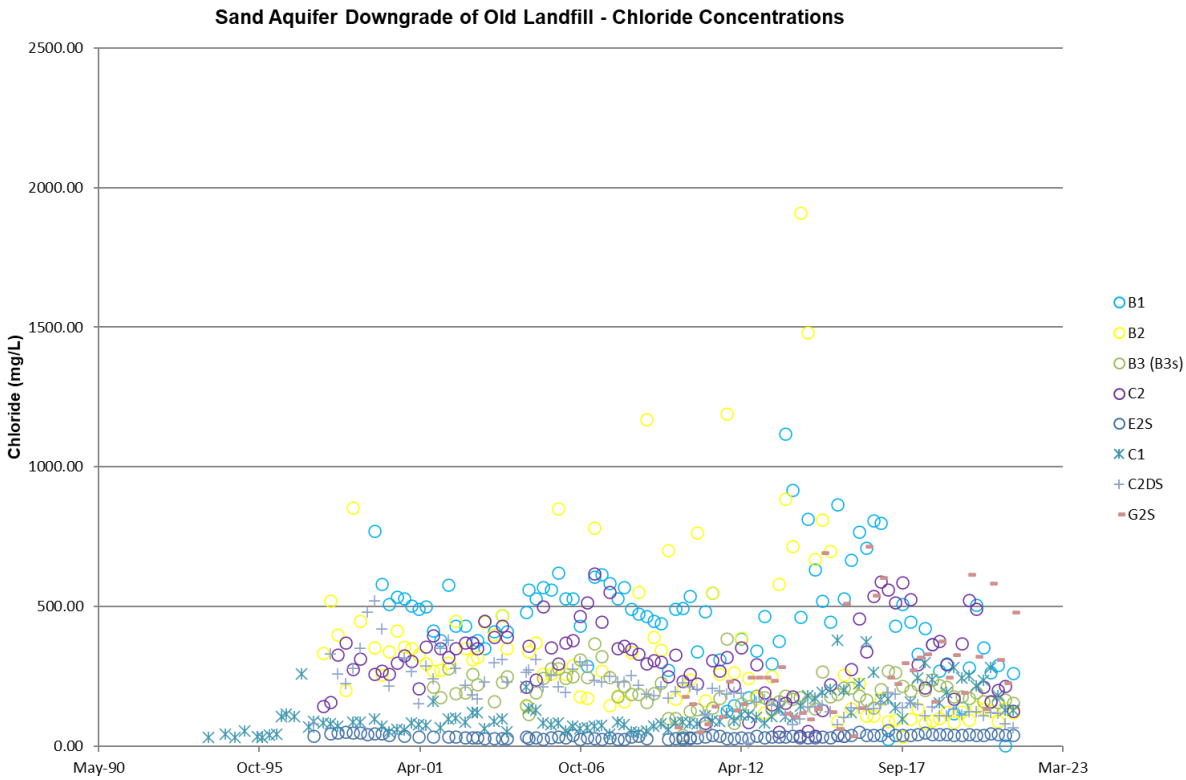

Gravel Aquifer - Chloride Concentrations
Chloride (mg/L)
400.00
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
E1D
C2DD
E2D
G1D

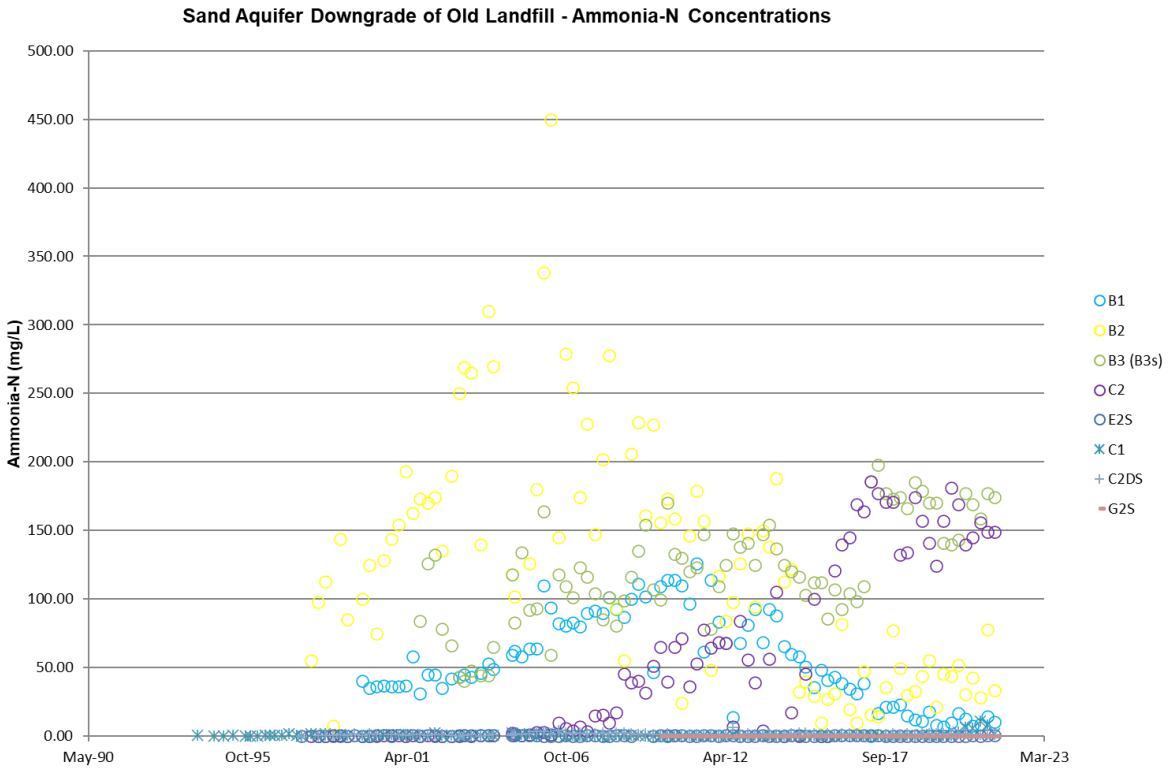

Gravel Aquifer - Ammoniacal-Nitrogen Concentrations
Ammoniacal-Ni (mg/L)
100.00
10.00
1.00
0.10
0.01
0.00
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
E1D
C2DD
E2D
G1D

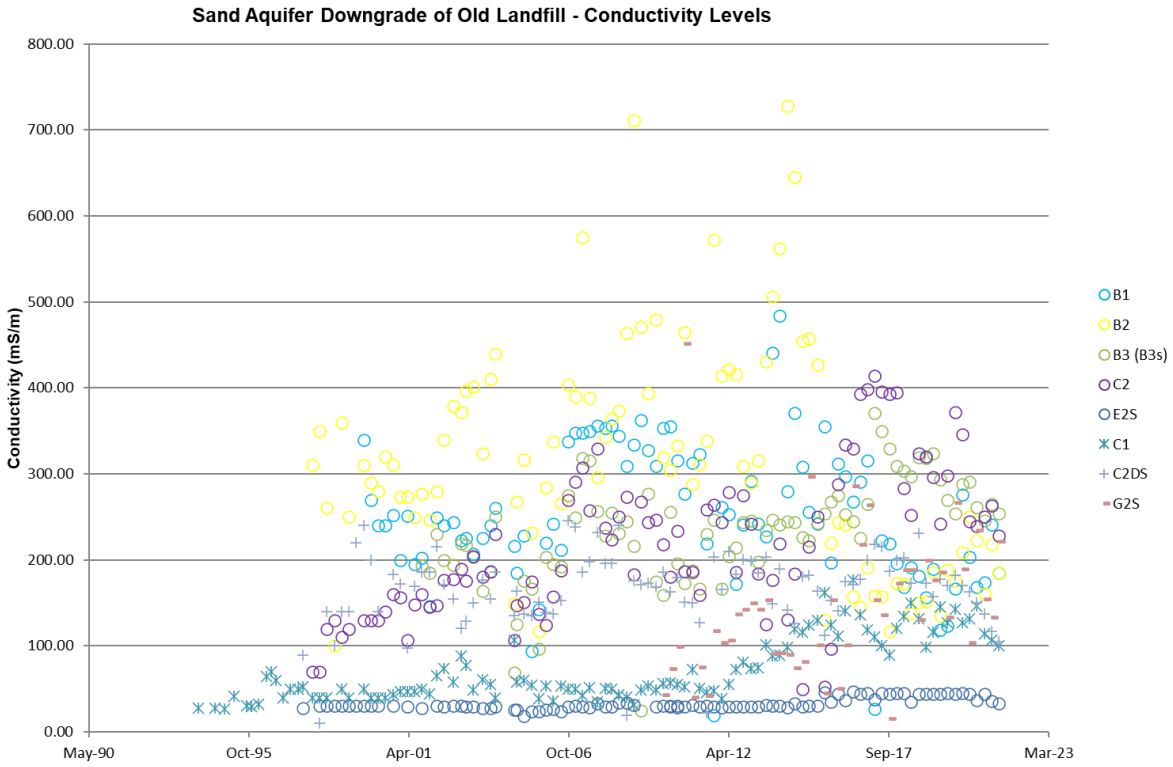

Gravel Aquifer - Conductivity Levels
Conductivity (mS/m)
500.00
450.00
400.00
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
E1D
C2DD
E2D
G1D

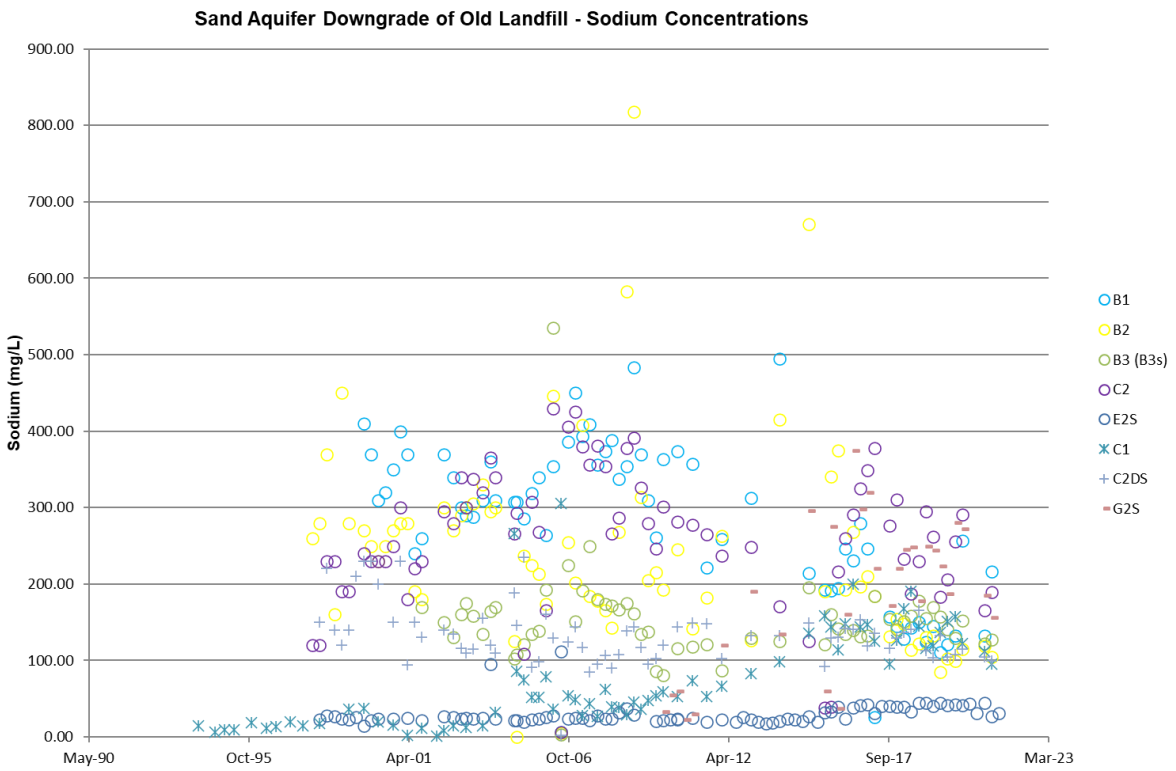

Gravel Aquifer - Sodium Levels
Sodium (mg/L)
400.00
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
E1D
C2DD
E2D
G1D

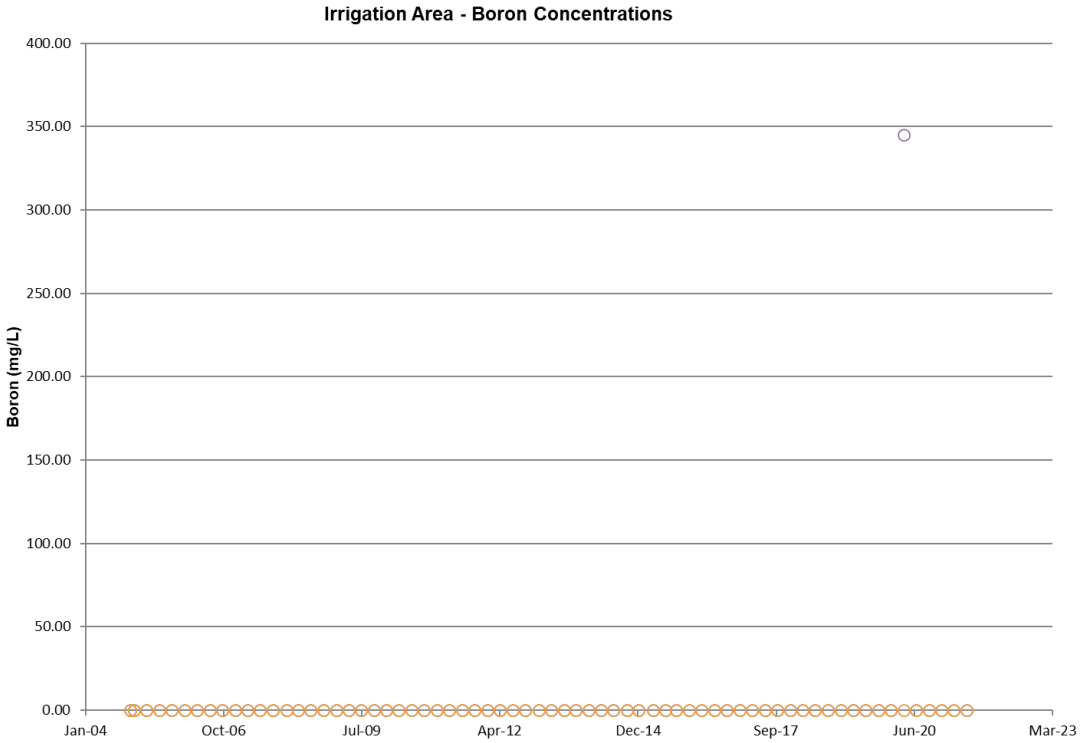

Sand Aquifer Downgrade of Old Landfill - Boron Concentrations
Boron (mg/L)
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
May-90
Oct-95
Apr-01
Oct-06
Apr-12
Sep-17
Mar-23
B1
B2
B3 (B3s)
C2
E2S
C1
C2DS
G2S

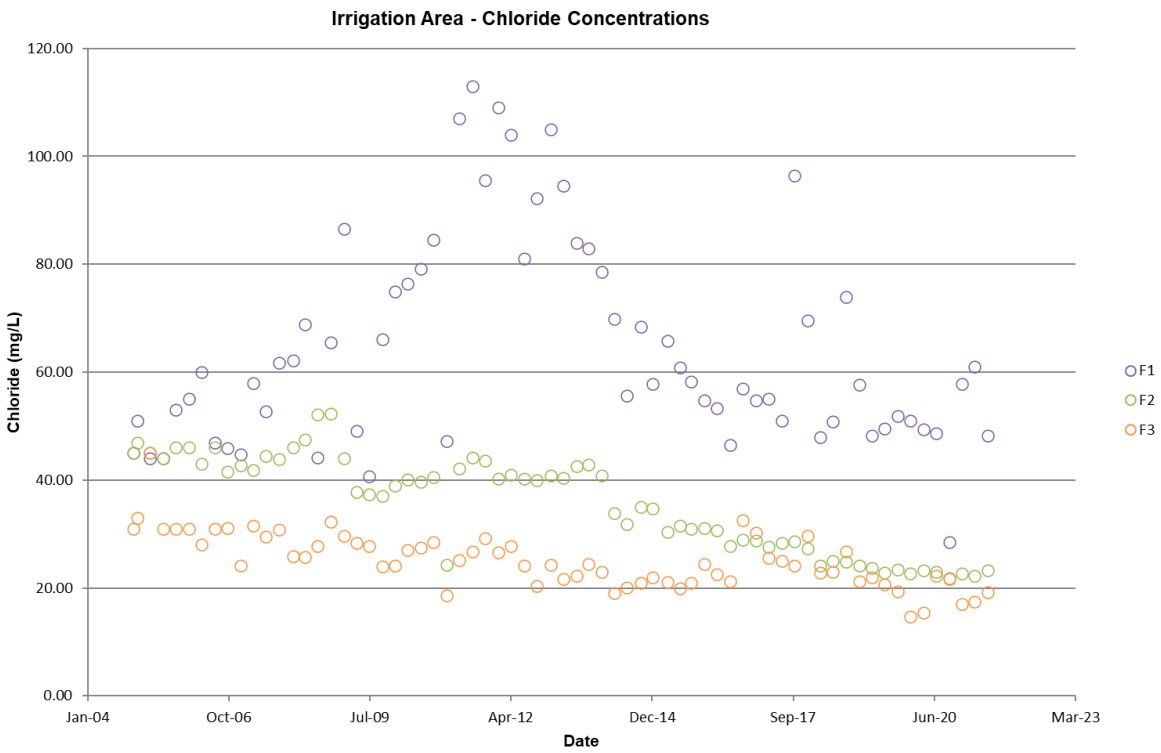

Sand Aquifer Downgrade of Old Landfill - Chloride Concentrations
Chloride (mg/L)
2500.00
2000.00
1500.00
1000.00
500.00
0.00
May-90
Oct-95
Apr-01
Oct-06
Apr-12
Sep-17
Mar-23
B1
B2
B3 (B3s)
C2
E2S
C1
C2DS
G2S

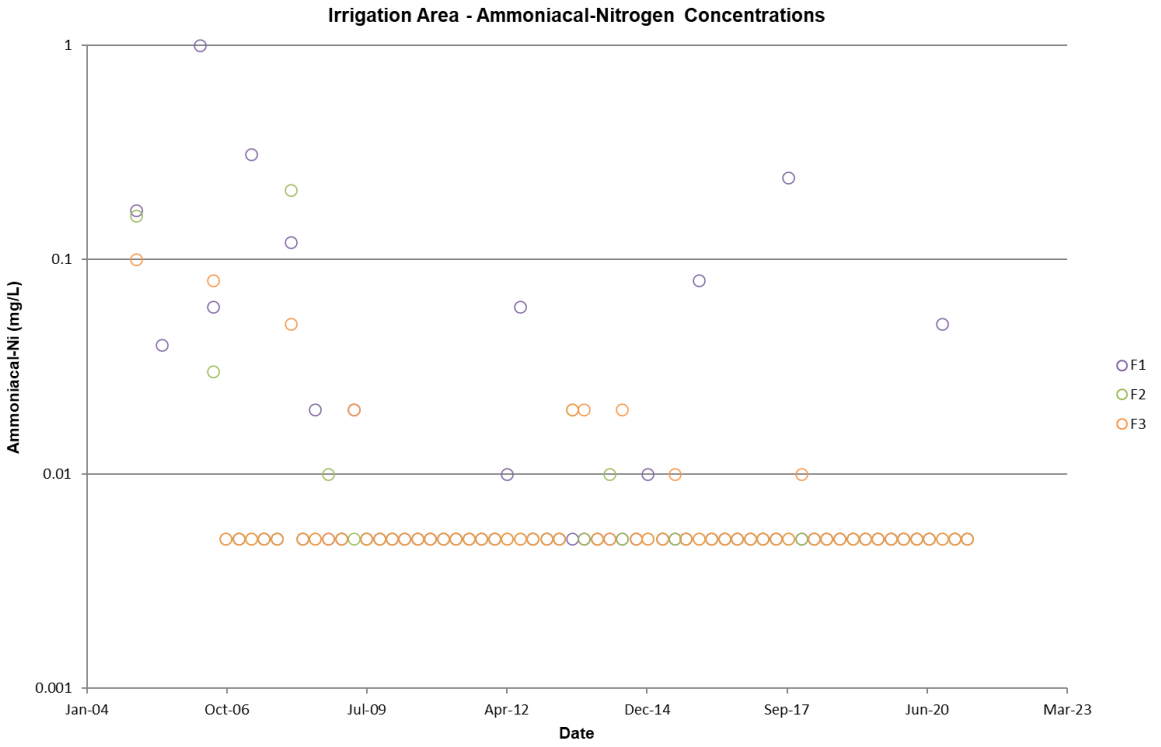

Sand Aquifer Downgrade of Old Landfill - Ammonia-N Concentrations
Ammonia-N (mg/L)
500.00
450.00
400.00
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
May-90
Oct-95
Apr-01
Oct-06
Apr-12
Sep-17
Mar-23
B1
B2
B3 (B3s)
C2
E2S
C1
C2DS
G2S

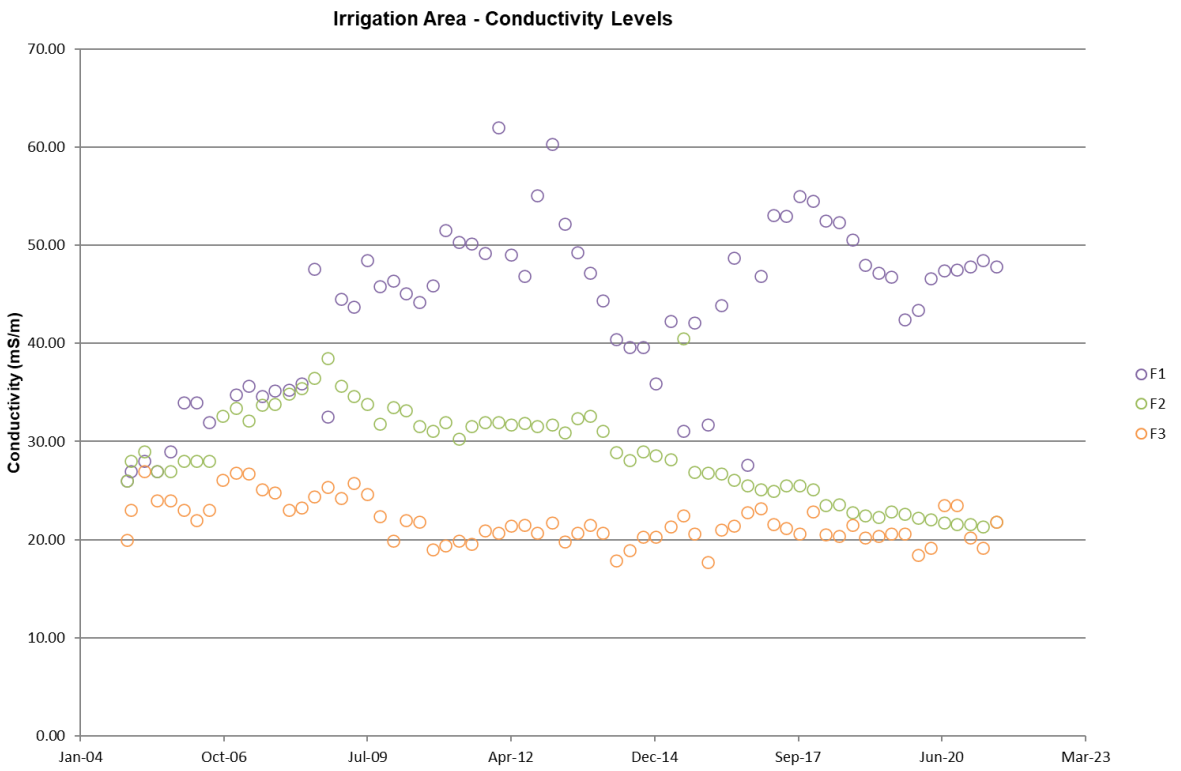

Sand Aquifer Downgrade of Old Landfill - Conductivity Levels
Conductivity (mS/m)
800.00
700.00
600.00
500.00
400.00
300.00
200.00
100.00
0.00
May-90
Oct-95
Apr-01
Oct-06
Apr-12
Sep-17
Mar-23
B1
B2
B3 (B3s)
C2
E2S
C1
C2DS
G2S

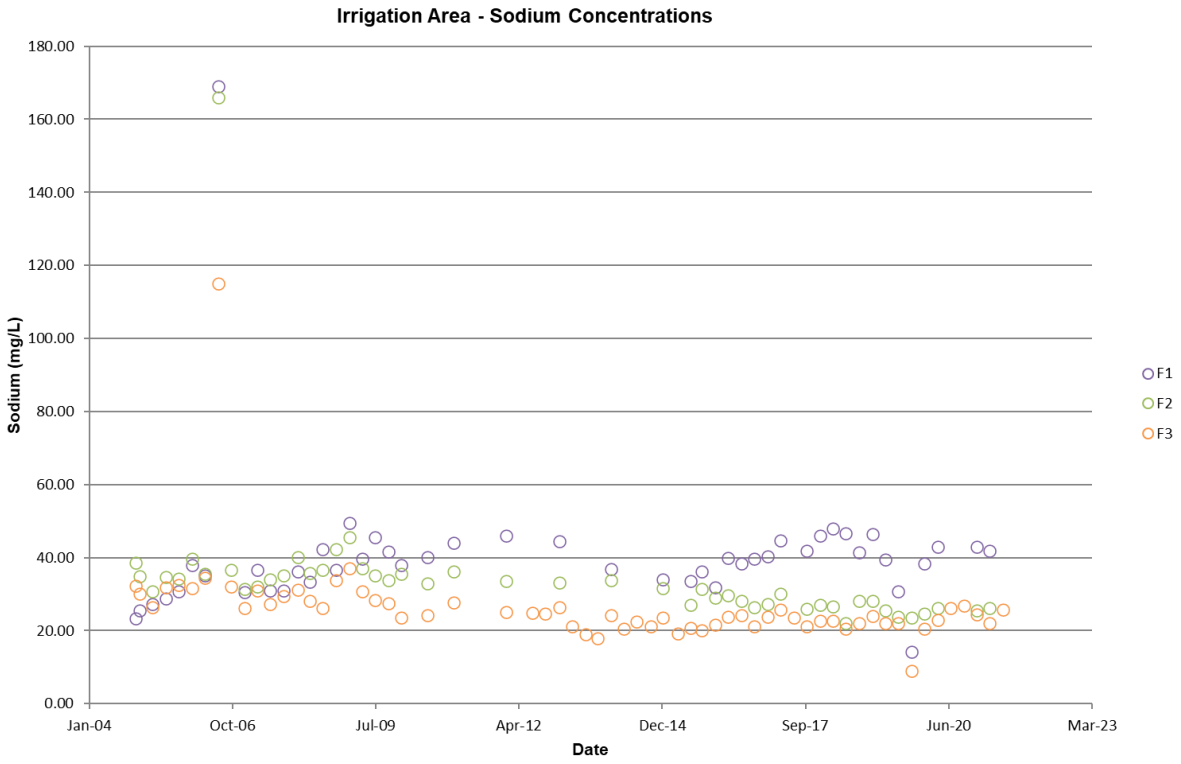

Sand Aquifer Downgrade of Old Landfill - Sodium Concentrations
Sodium (mg/L)
900.00
800.00
700.00
600.00
500.00
400.00
300.00
200.00
100.00
0.00
May-90
Oct-95
Apr-01
Oct-06
Apr-12
Sep-17
Mar-23
B1
B2
B3 (B3s)
C2
E2S
C1
C2DS
G2S

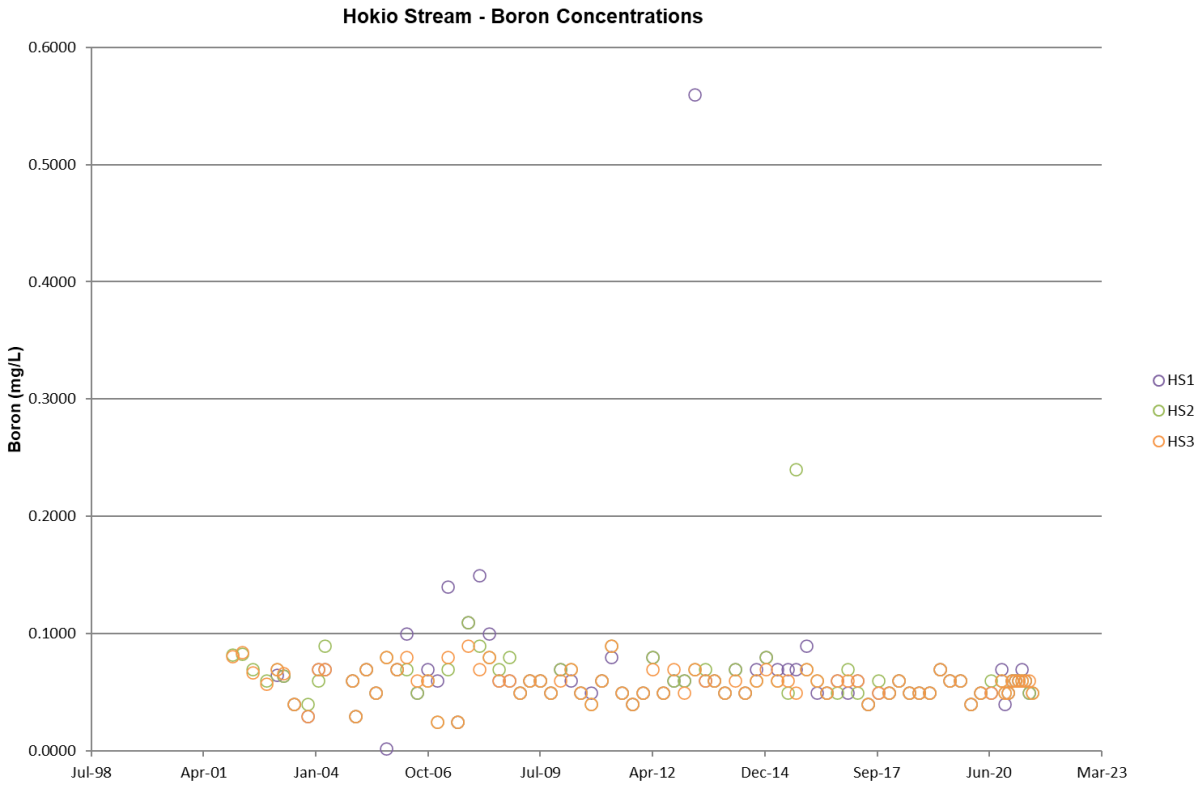

Irrigation Area - Boron Concentrations
Boron (mg/L)
400.00
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
F1
F2
F3

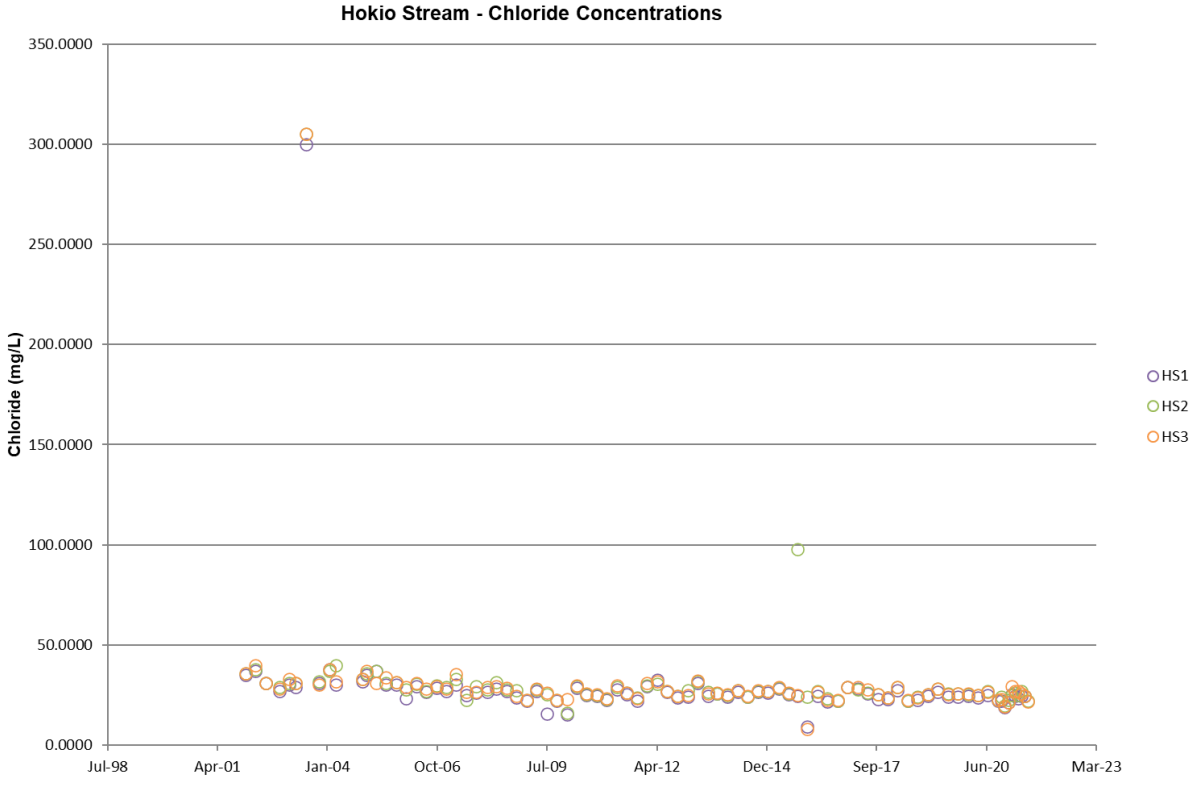

Irrigation Area - Chloride Concentrations
120.00
100.00
80.00
60.00
40.00
20.00
0.00
Chloride (mg/L)
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
Date
F1
F2
F3

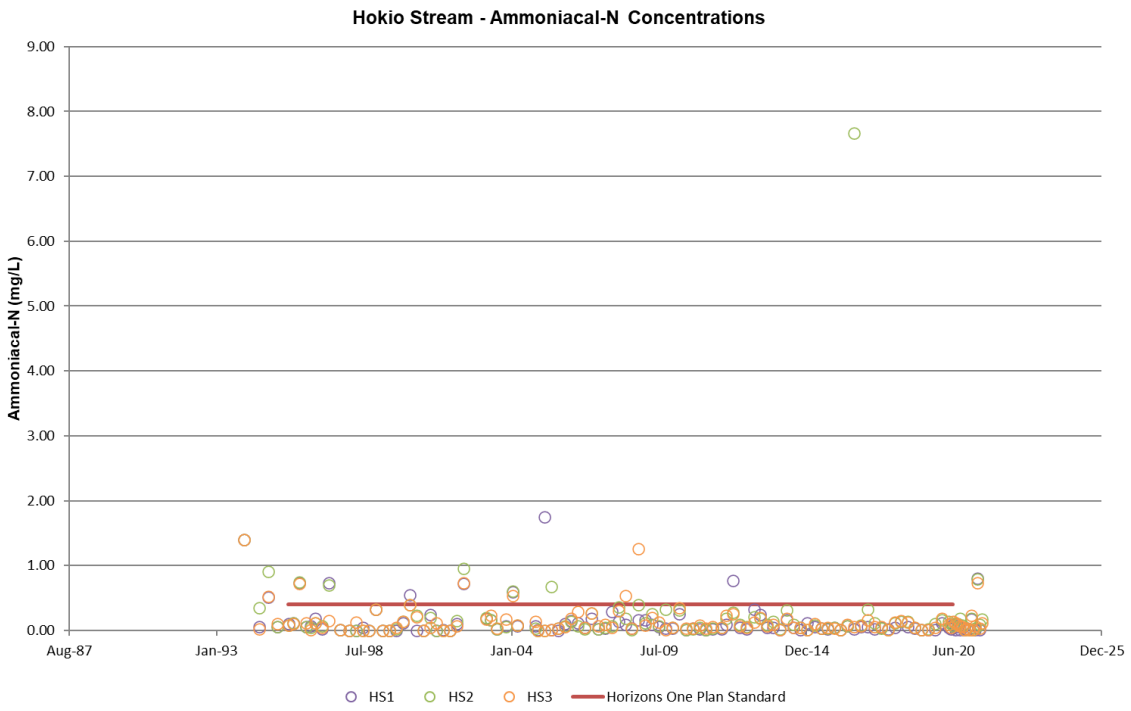

Irrigation Area - Ammoniacal-Nitrogen Concentrations
1
0.1
0.01
0.001
Ammoniacal-Ni (mg/L)
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
Date
F1
F2
F3

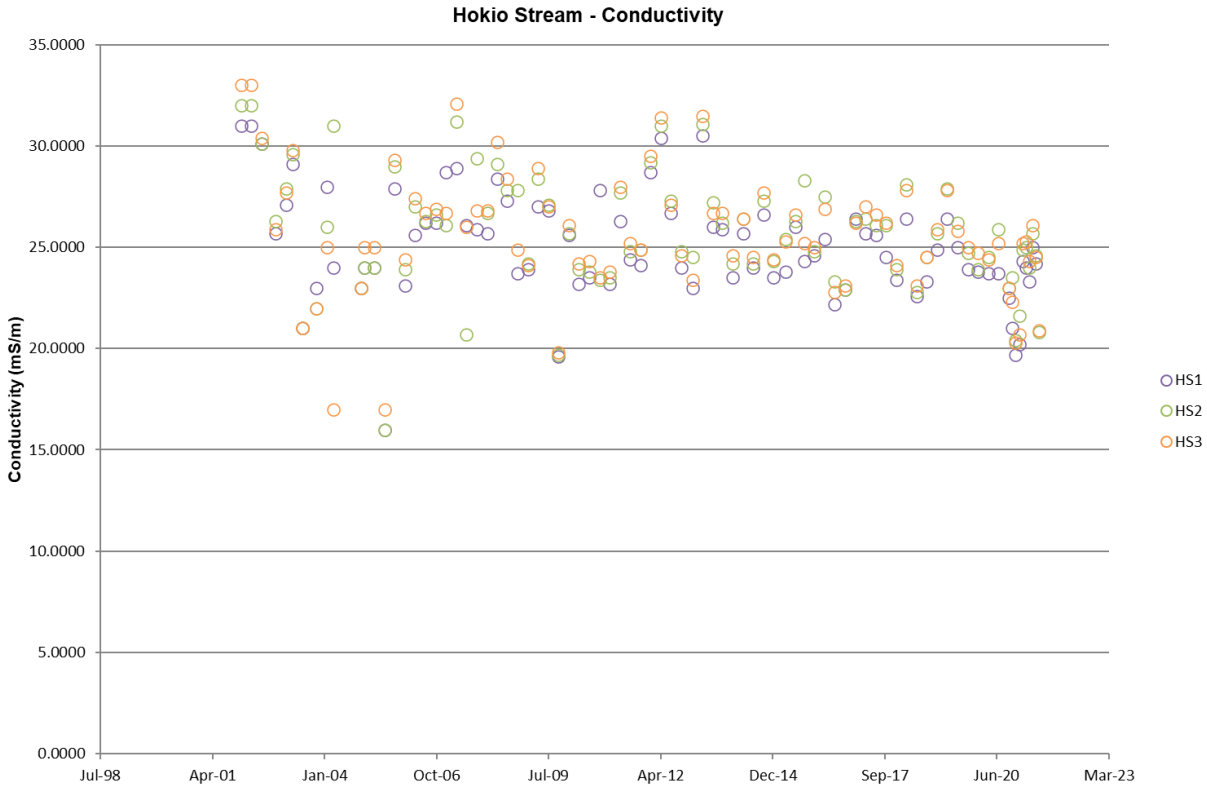

Irrigation Area - Conductivity Levels
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Conductivity (mS/m)
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
F1
F2
F3

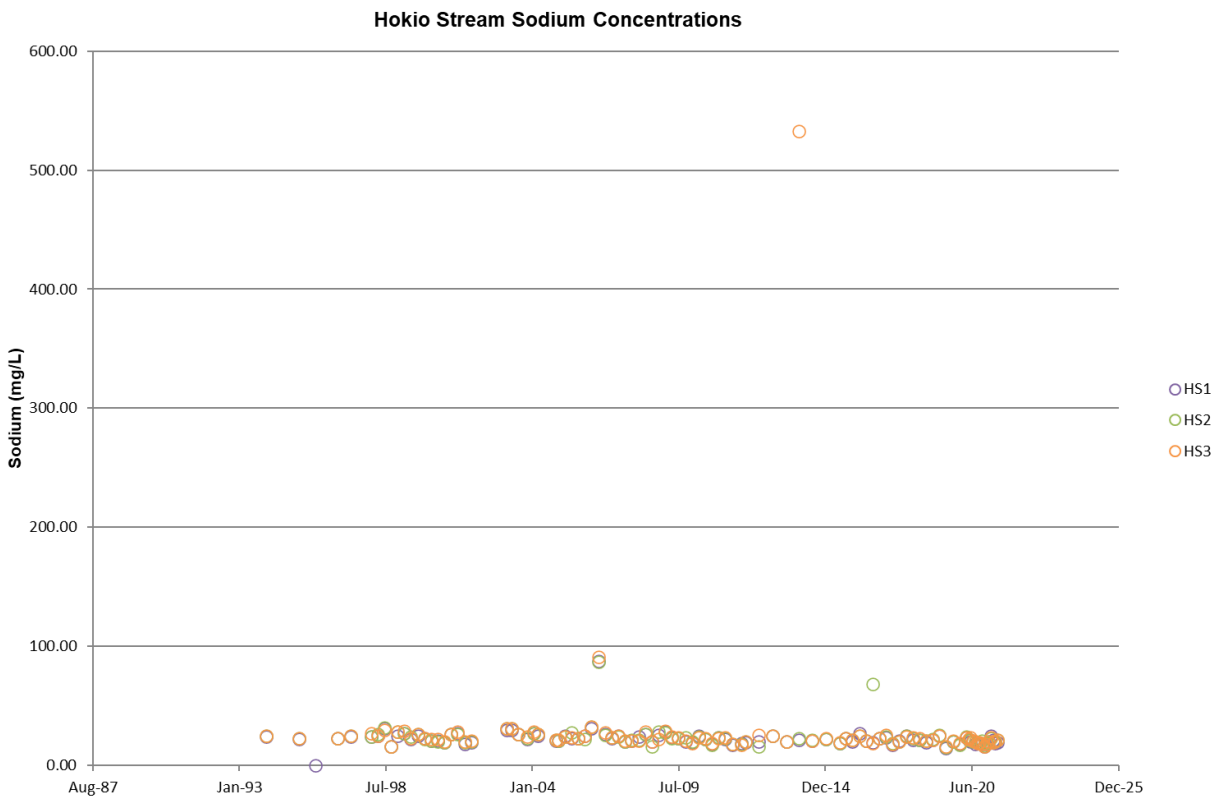

Irrigation Area - Sodium Concentrations
180.00
160.00
140.00
120.00
100.00
80.00
60.00
40.00
20.00
0.00
Sodium (mg/L)
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
Date
F1
F2
F3


Hokio Stream - Boron Concentrations
Boron (mg/L)
0.6000
0.5000
0.4000
0.3000
0.2000
0.1000
0.0000
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
HS1
HS2
HS3


Hokio Stream - Chloride Concentrations
Chloride (mg/L)
350.0000
300.0000
250.0000
200.0000
150.0000
100.0000
50.0000
0.0000
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
HS1
HS2
HS3


Hokio Stream - Ammoniacal-N Concentrations
Ammoniacal-N (mg/L)
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Aug-87
Jan-93
Jul-98
Jan-04
Jul-09
Dec-14
Jun-20
Dec-25
HS1
HS2
HS3
Horizons One Plan Standard


Hokio Stream - Conductivity
Conductivity (mS/m)
35.0000
30.0000
25.0000
20.0000
15.0000
10.0000
5.0000
0.0000
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
HS1
HS2
HS3


Hokio Stream Sodium Concentrations
Sodium (mg/L)
600.00
500.00
400.00
300.00
200.00
100.00
0.00
Aug-87
Jan-93
Jul-98
Jan-04
Jul-09
Dec-14
Jun-20
Dec-25
HS1
HS2
HS3

# **Appendix G** Mass contaminant load calculations

# LEVIN LANDFILL MASS CONTAMINANT LOAD CALCULATIONS

**DOWN-GRADIENT BORES**

**C1, C2, C2DS, G2S, B2, B3**

Aquifer Thickness x Depth (W x D)

| Width (m | | Thickness (m) 5 | 10 | 15 |
|---|---|---|---|---|
| | **300** | 1500 | 3000 | 4500 |
| | **400** | 2000 | 4000 | 6000 |
| | **500** | 2500 | 5000 | 7500 |

Hydraulic Conductivity (K)

0.00002 m/s = 1.73 m/day Assume range from 0.5 to 2m/day

0.5 1 2 Based on field data collected July 2012

Hydraulic Gradient (i)

Assume = 0.0059

Concentration of Analytes in g/m3 (=C from C1, C2, C2DS, G2S, B2 and B3) - **including background**

| | NH4 - N | Boron | Chloride | Sodium | Nitrate - N | DRP |
|---|---|---|---|---|---|---|
| **Average of max. values last 5 years** | 79.03 | 1.685 | 385.0 | 261.8 | 26.0033 | 0.0518 |
| **Average of median values last 5 years** | 61.33 | 1.141 | 222.9 | 173.8 | 2.8517 | 0.0270 |

Discharge Volume ( Q = W x D x K X i) in m3/day

| W x D ↓ | | K→ 0.5 | 1 | 2 |
|---|---|---|---|---|
| 1500 | | 4.4 | 8.9 | 17.7 |
| 4000 | | 11.8 | 23.6 | 47.2 |
| 7500 | | 22.1 | 44.3 | 88.5 |

Mass Load (Q x C) in kg/day

| | W x D | C | | | | |
|---|---|---|---|---|---|---|
| NH4-N | 1500 | 79.03 | Max. | 0.35 | 0.70 | 1.40 |
| | | 61.33 | Med. | 0.27 | 0.54 | 1.09 |
| | 4000 | 79.03 | Max. | 0.93 | 1.86 | 3.73 |
| | | 61.33 | Med. | 0.72 | 1.45 | 2.89 |
| | 7500 | 79.03 | Max. | 1.75 | 3.50 | 6.99 |
| | | 61.33 | Med. | 1.36 | 2.71 | 5.43 |
| | | | | | | |
| Boron | 1500 | 1.685 | Max. | 0.007 | 0.015 | 0.030 |
| | | 1.141 | Med. | 0.005 | 0.010 | 0.020 |
| | 4000 | 1.685 | Max. | 0.020 | 0.040 | 0.080 |
| | | 1.141 | Med. | 0.013 | 0.027 | 0.054 |
| | 7500 | 1.685 | Max. | 0.037 | 0.075 | 0.149 |
| | | 1.141 | Med. | 0.025 | 0.050 | 0.101 |
| | | | | | | |
| Chloride | 1500 | 385.0 | Max. | 1.70 | 3.41 | 6.81 |
| | | 222.9 | Med. | 0.99 | 1.97 | 3.95 |
| | 4000 | 385.0 | Max. | 4.54 | 9.09 | 18.17 |
| | | 222.9 | Med. | 2.63 | 5.26 | 10.52 |
| | 7500 | 385.0 | Max. | 8.52 | 17.04 | 34.07 |
| | | 222.9 | Med. | 4.93 | 9.86 | 19.73 |
| | | | | | | |
| Sodium | 1500 | 261.8 | Max. | 1.16 | 2.32 | 4.63 |
| | | 173.8 | Med. | 0.77 | 1.54 | 3.08 |
| | 4000 | 261.8 | Max. | 3.09 | 6.18 | 12.36 |
| | | 173.8 | Med. | 2.05 | 4.10 | 8.20 |
| | 7500 | 261.8 | Max. | 5.79 | 11.59 | 23.17 |
| | | 173.8 | Med. | 3.85 | 7.69 | 15.38 |
| | | | | | | |
| Nitrate N | 1500 | 26.0033 | Max. | 0.12 | 0.23 | 0.46 |
| | | 2.8517 | Med. | 0.01 | 0.03 | 0.05 |
| | 4000 | 26.0033 | Max. | 0.31 | 0.61 | 1.23 |
| | | 2.8517 | Med. | 0.03 | 0.07 | 0.13 |
| | 7500 | 26.0033 | Max. | 0.58 | 1.15 | 2.30 |
| | | 2.8517 | Med. | 0.06 | 0.13 | 0.25 |
| | | | | | | |
| DRP | 1500 | 0.052 | Max. | 0.000 | 0.000 | 0.001 |
| | | 0.027 | Med. | 0.000 | 0.000 | 0.000 |
| | 4000 | 0.052 | Max. | 0.001 | 0.001 | 0.002 |
| | | 0.027 | Med. | 0.000 | 0.001 | 0.001 |
| | 7500 | 0.052 | Max. | 0.001 | 0.002 | 0.005 |
| | | 0.027 | Med. | 0.001 | 0.001 | 0.002 |

**SURFACE WATER (HOKIO STREAM)** **Includes background**
**HS1, HS2 and HS3**

**HS1 (values in g/m3)**

| | NH4 - N | Boron | Chloride | Sodium | Nitrate N | DRP |
|---|---|---|---|---|---|---|
| **max. values last 5 years** | 0.80 | 0.090 | 29.1 | 24.9 | 2.7400 | 0.388 |
| **median values last 5 years** | 0.030 | 0.055 | 24.4 | 19.8 | 0.4150 | 0.016 |

**HS3 (values in g/m3)**

| | NH4 - N | Boron | Chloride | Sodium | Nitrate N | DRP |
|---|---|---|---|---|---|---|
| **max. values last 5 years** | 0.73 | 0.070 | 29.3 | 25.5 | 2.6900 | 0.391 |
| **median values last 5 years** | 0.06 | 0.060 | 25.5 | 20.5 | 0.4550 | 0.0165 |

Hokio Stream Characteristics

Minimum flow = **q** = 174 L/s = 15034 m3/day

| | Conc (upstream = u/s) | **q** x **C** (u/s) in kg/day |
|---|---|---|
| NH4-N | 0.03 | 0.45 |
| Boron | 0.055 | 0.83 |
| Chloride | 24.4 | 366.82 |
| Sodium | 19.8 | 297.67 |
| Nitrate N | 0.415 | 6.24 |
| DRP | 0.016 | 0.24 |

Q + q = Combined Flow (m3/day)

K→

| W x D ↓ | | 0.5 | 1 | 2 |
|---|---|---|---|---|
| 1500 | | 15038.0 | 15042.5 | 15051.3 |
| 4000 | | 15045.4 | 15057.2 | 15080.8 |
| 7500 | | 15055.7 | 15077.9 | 15122.1 |

Calculated Concentration Downstream, in Hokio Stream
**Accounting for background**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| NH4-N | 1500 | 79.03 | | 0.05 | 0.08 | 0.12 | | |
| | | 61.33 | | 0.05 | 0.07 | 0.10 | Min | 0.05 |
| | 4000 | 79.03 | | 0.09 | 0.15 | 0.28 | Max | 0.49 |
| | | 61.33 | | 0.08 | 0.13 | 0.22 | | |
| | 7500 | 79.03 | | 0.15 | 0.26 | 0.49 | | |
| | | 61.33 | | 0.12 | 0.21 | 0.39 | | |
| | | | | | | | | |
| Boron | 1500 | 1.685 | | 0.06 | 0.06 | 0.06 | | |
| | | 1.141 | | 0.06 | 0.06 | 0.06 | Min | 0.06 |
| | 4000 | 1.685 | | 0.06 | 0.06 | 0.06 | Max | 0.06 |
| | | 1.141 | | 0.06 | 0.06 | 0.06 | | |
| | 7500 | 1.685 | | 0.06 | 0.06 | 0.06 | | |
| | | 1.141 | | 0.06 | 0.06 | 0.06 | | |
| | | | | | | | | |
| Chloride | 1500 | 385.0 | | 24.51 | 24.61 | 24.82 | | |
| | | 222.9 | | 24.46 | 24.52 | 24.63 | Min | 24.46 |
| | 4000 | 385.0 | | 24.68 | 24.97 | 25.53 | Max | 26.51 |
| | | 222.9 | | 24.56 | 24.71 | 25.02 | | |
| | 7500 | 385.0 | | 24.93 | 25.46 | 26.51 | | |
| | | 222.9 | | 24.69 | 24.98 | 25.56 | | |
| | | | | | | | | |
| Sodium | 1500 | 261.8 | | 19.87 | 19.94 | 20.08 | | |
| | | 173.8 | | 19.85 | 19.89 | 19.98 | Min | 19.85 |
| | 4000 | 261.8 | | 19.99 | 20.18 | 20.56 | Max | 21.22 |
| | | 173.8 | | 19.92 | 20.04 | 20.28 | | |
| | 7500 | 261.8 | | 20.16 | 20.51 | 21.22 | | |
| | | 173.8 | | 20.03 | 20.25 | 20.70 | | |
| | | | | | | | | |
| Nitrate N | 1500 | 26.0033 | | 0.42 | 0.43 | 0.45 | | |
| | | 2.8517 | | 0.42 | 0.42 | 0.42 | Min | 0.42 |
| | 4000 | 26.0033 | | 0.44 | 0.46 | 0.50 | Max | 0.56 |
| | | 2.8517 | | 0.42 | 0.42 | 0.42 | | |
| | 7500 | 26.0033 | | 0.45 | 0.49 | 0.56 | | |
| | | 2.8517 | | 0.42 | 0.42 | 0.43 | | |
| | | | | | | | | |
| DRP | 1500 | 0.0518 | | 0.016 | 0.016 | 0.016 | | |
| | | 0.0270 | | 0.016 | 0.016 | 0.016 | Min | 0.016 |
| | 4000 | 0.0518 | | 0.016 | 0.016 | 0.016 | Max | 0.016 |
| | | 0.0270 | | 0.016 | 0.016 | 0.016 | | |
| | 7500 | 0.0518 | | 0.016 | 0.016 | 0.016 | | |
| | | 0.0270 | | 0.016 | 0.016 | 0.016 | | |

# LEVIN LANDFILL MASS CONTAMINANT LOAD CALCULATIONS

**DOWN-GRADIENT BORES**
**C1, C2, C2DS, G2S, B2 and B3**

Aquifer Thickness x Depth (W x D)

| | | Thickness (m) | | |
|---|---|---|---|---|
| | | 5 | 10 | 15 |
| Width (m | 300 | 1500 | 3000 | 4500 |
| | 400 | 2000 | 4000 | 6000 |
| | 500 | 2500 | 5000 | 7500 |

Hydraulic Conductivity (K)

| | | | | |
|---|---|---|---|---|
| 0.00002 | m/s = | 1.73 | m/day | Assume range from 0.5 to 2m/day |
| | 0.5 | 1 | 2 | Based on field data collected July 2012 |

Hydraulic Gradient (i)

Assume = 0.0059

Concentration of Analytes in g/m3 (=C from C1, C2, C2DS, G2S, B2 and B3) - **excludes background**

| | NH4 - N | Boron | Chloride | Sodium | Nitrate - N | DRP |
|---|---|---|---|---|---|---|
| **Average of max. values last 5 years** | 79.02 | 1.648 | 346.3 | 230.6 | 23.0867 | -0.095 |
| **Average of median values last 5 years** | 61.33 | 1.118 | 197.7 | 148.1 | 1.70 | -0.100 |

Discharge Volume ( Q = W x D x K X i) in m3/day

| W x D ↓ | | K→ 0.5 | 1 | 2 |
|---|---|---|---|---|
| 1500 | | 4.4 | 8.9 | 17.7 |
| 4000 | | 11.8 | 23.6 | 47.2 |
| 7500 | | 22.1 | 44.3 | 88.5 |

Mass Load (Q x C) in kg/day

| | W x D | C | | | | |
|---|---|---|---|---|---|---|
| NH4-N | 1500 | 79.02 | | 0.35 | 0.70 | 1.40 |
| | | 61.33 | | 0.27 | 0.54 | 1.09 |
| | 4000 | 79.02 | | 0.93 | 1.86 | 3.73 |
| | | 61.33 | | 0.72 | 1.45 | 2.89 |
| | 7500 | 79.02 | | 1.75 | 3.50 | 6.99 |
| | | 61.33 | | 1.36 | 2.71 | 5.43 |
| | | | | | | |
| Boron | 1500 | 1.648 | | 0.007 | 0.015 | 0.029 |
| | | 1.118 | | 0.005 | 0.010 | 0.020 |
| | 4000 | 1.648 | | 0.019 | 0.039 | 0.078 |
| | | 1.118 | | 0.013 | 0.026 | 0.053 |
| | 7500 | 1.648 | | 0.036 | 0.073 | 0.146 |
| | | 1.118 | | 0.025 | 0.049 | 0.099 |
| | | | | | | |
| Chloride | 1500 | 346.3 | | 1.53 | 3.06 | 6.13 |
| | | 197.7 | | 0.87 | 1.75 | 3.50 |
| | 4000 | 346.3 | | 4.09 | 8.17 | 16.34 |
| | | 197.7 | | 2.33 | 4.67 | 9.33 |
| | 7500 | 346.3 | | 7.66 | 15.32 | 30.64 |
| | | 197.7 | | 4.37 | 8.75 | 17.50 |
| | | | | | | |
| Sodium | 1500 | 230.6 | | 1.02 | 2.04 | 4.08 |
| | | 148.1 | | 0.66 | 1.31 | 2.62 |
| | 4000 | 230.6 | | 2.72 | 5.44 | 10.88 |
| | | 148.1 | | 1.75 | 3.49 | 6.99 |
| | 7500 | 230.6 | | 5.10 | 10.20 | 20.41 |
| | | 148.1 | | 3.28 | 6.55 | 13.10 |
| | | | | | | |
| Nitrate N | 1500 | 23.0867 | | 0.10 | 0.20 | 0.41 |
| | | 1.7017 | | 0.0075 | 0.0151 | 0.0301 |
| | 4000 | 23.0867 | | 0.27 | 0.54 | 1.09 |
| | | 1.7017 | | 0.0201 | 0.0402 | 0.0803 |
| | 7500 | 23.0867 | | 0.51 | 1.02 | 2.04 |
| | | 1.701667 | | 0.038 | 0.075 | 0.151 |
| | | | | | | |
| DRP | 1500 | -0.095 | | -0.0004 | -0.0008 | -0.0017 |
| | | -0.100 | | -0.0004 | -0.0009 | -0.0018 |
| | 4000 | -0.095 | | -0.0011 | -0.0022 | -0.0045 |
| | | -0.100 | | -0.0012 | -0.0024 | -0.0047 |
| | 7500 | -0.095 | | -0.0021 | -0.0042 | -0.0084 |
| | | -0.100 | | -0.0022 | -0.0044 | -0.0089 |

**DOWN-GRADIENT BORES**
**C1, C2, C2DS, G2S, B2 and B3**
**Excludes background**

**SURFACE WATER (HOKIO STREAM)** **Without Background**
**HS1, HS2 and HS3**

From Results data spreadsheet

**HS1**

| | NH4 - N | Boron | Chloride | Sodium | Nitrate N | DRP |
|---|---|---|---|---|---|---|
| **max. values last 5 years** | 0.80 | 0.090 | 29.1 | 24.9 | 2.7400 | 0.388 |
| **median values last 5 years** | 0.03 | 0.055 | 24.4 | 19.8 | 0.4150 | 0.016 |

**HS3**

| | NH4 - N | Boron | Chloride | Sodium | Nitrate N | DRP |
|---|---|---|---|---|---|---|
| **max. values last 5 years** | 0.73 | 0.070 | 29.3 | 25.5 | 2.6900 | 0.391 |
| **median values last 5 years** | 0.06 | 0.060 | 25.5 | 20.5 | 0.4550 | 0.017 |

Hokio Stream Characteristics

| Minimum flow = **q** = | 174 | L/s | = | 15034 | m3/day |
|---|---|---|---|---|---|
| | Conc (u/s) | **q** x **C** (u/s) | | | |
| NH4-N | 0.03 | 0.45 | | | |
| Boron | 0.055 | 0.83 | | | |
| Chloride | 24.4 | 366.82 | | | |
| Sodium | 19.8 | 297.67 | | | |
| Nitrate N | 0.415 | 6.24 | | | |
| DRP | 0.016 | 0.24 | | | |

Q + q = Combined Flow

K→

| W x D ↓ | | 0.5 | 1 | 2 |
|---|---|---|---|---|
| 1500 | | 15038.0 | 15042.5 | 15051.3 |
| 4000 | | 15045.4 | 15057.2 | 15080.8 |
| 7500 | | 15055.7 | 15077.9 | 15122.1 |

Calculated Concentration Downstream, in Hokio Stream
**Without background**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| NH4-N | 1500 | 79.02 | | 0.05 | 0.08 | 0.12 | Min | 0.05 |
| | | 61.33 | | 0.05 | 0.07 | 0.10 | Max | 0.49 |
| | 4000 | 79.02 | | 0.09 | 0.15 | 0.28 | | |
| | | 61.33 | | 0.08 | 0.13 | 0.22 | | |
| | 7500 | 79.02 | | 0.15 | 0.26 | 0.49 | | |
| | | 61.33 | | 0.12 | 0.21 | 0.39 | | |
| | | | | | | | | |
| Boron | 1500 | 1.648 | | 0.06 | 0.06 | 0.06 | | |
| | | 1.118 | | 0.06 | 0.06 | 0.06 | Min | 0.06 |
| | 4000 | 1.648 | | 0.06 | 0.06 | 0.06 | Max | 0.06 |
| | | 1.118 | | 0.06 | 0.06 | 0.06 | | |
| | 7500 | 1.648 | | 0.06 | 0.06 | 0.06 | | |
| | | 1.1175 | | 0.06 | 0.06 | 0.06 | | |
| | | | | | | | | |
| Chloride | 1500 | 346.3 | | 24.49 | 24.59 | 24.78 | | |
| | | 197.7 | | 24.45 | 24.50 | 24.60 | Min | 24.45 |
| | 4000 | 346.3 | | 24.65 | 24.90 | 25.41 | Max | 26.28 |
| | | 197.7 | | 24.54 | 24.67 | 24.94 | | |
| | 7500 | 346.3 | | 24.87 | 25.34 | 26.28 | | |
| | | 197.7 | | 24.65 | 24.91 | 25.41 | | |
| | | | | | | | | |
| Sodium | 1500 | 230.6 | | 19.86 | 19.92 | 20.05 | | |
| | | 148.1 | | 19.84 | 19.88 | 19.95 | Min | 19.84 |
| | 4000 | 230.6 | | 19.97 | 20.13 | 20.46 | Max | 21.03 |
| | | 148.1 | | 19.90 | 20.00 | 20.20 | | |
| | 7500 | 230.6 | | 20.11 | 20.42 | 21.03 | | |
| | | 148.1 | | 19.99 | 20.18 | 20.55 | | |
| | | | | | | | | |
| Nitrate N | 1500 | 23.0867 | | 0.42 | 0.43 | 0.44 | | |
| | | 1.7017 | | 0.42 | 0.42 | 0.42 | Min | 0.42 |
| | 4000 | 23.0867 | | 0.43 | 0.45 | 0.49 | Max | 0.55 |
| | | 1.7017 | | 0.42 | 0.42 | 0.42 | | |
| | 7500 | 23.0867 | | 0.45 | 0.48 | 0.55 | | |
| | | 1.7017 | | 0.42 | 0.42 | 0.42 | | |
| | | | | | | | | |
| DRP | 1500 | -0.095 | | 0.016 | 0.016 | 0.016 | | |
| | | -0.100 | | 0.016 | 0.016 | 0.016 | Min | 0.015 |
| | 4000 | -0.095 | | 0.016 | 0.016 | 0.016 | Max | 0.016 |
| | | -0.100 | | 0.016 | 0.016 | 0.016 | | |
| | 7500 | -0.095 | | 0.016 | 0.016 | 0.015 | | |
| | | -0.100 | | 0.016 | 0.016 | 0.015 | | |

# **Appendix H** Odour assessments

| Created | Entry Number | User | Gps Coordinates | Location - Wind direction | Reason for investigation | Wind speed | Cloud cover | Temperature | Odour detection | Odour intensity | Odour character | General hedonic tone |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17-07-20 13:54 | 104409 | Yvette Falloon | -40.610932, 175.21711 | E - From NW | Proactive | 1 - Light air | 4 - Half the sky is covered in cloud | 3 - Cool | Yes | 1 - Very weak | 10 - Faecal, manure, sewer | -1 - A bit unpleasant |
| 24-07-20 13:39 | 104630 | Dorothy Zeng | -40.610697, 175.216023 | E - From NW | Proactive | 4 - Moderate breeze | 3 | 4 - Cold | No | 0 - No odour | | |
| 24-07-20 13:53 | 104631 | Yvette Falloon | -40.609779, 175.216598 | D - From W | Proactive | 4 - Moderate breeze | 3 | 4 - Cold | Yes | 1 - Very weak | 20 - Fresh rubbish | -1 - A bit unpleasant |
| 03-08-20 9:28 | 104911 | Yvette Falloon | -40.610279, 175.210901 | G - From NE | Proactive | 2 - Light breeze | 6 - Mostly cloudy | 4 - Cold | Yes | 2 - Weak | 20 - Fresh rubbish | -1 - A bit unpleasant |
| 03-08-20 9:42 | 104914 | Yvette Falloon | -40.608197, 175.20699 | H - From E | Proactive | 1 - Light air | 6 - Mostly cloudy | 4 - Cold | Yes | 1 - Very weak | 17 - Bark/soil | 0 - Neutral |
| 31-08-20 9:54 | 105906 | Yvette Falloon | -40.611193, 175.214232 | E - From NW | Proactive | 2 - Light breeze | 7 - Considerable cloudiness | 3 - Cool | Yes | 2 - Weak | 20 - Fresh rubbish | -1 - A bit unpleasant |
| 09-09-20 13:58 | 106325 | Yvette Falloon | -40.611057, 175.2141 | E - From NW | Proactive | 3 - Gently breeze | 8 - Overcast | 4 - Cold | Yes | 3 - Distinct | 20 - Fresh rubbish | -2 - unpleasant |
| 09-09-20 14:47 | 106333 | Yvette Falloon | -40.609737, 175.216688 | D - From W | Proactive | 2 - Light breeze | 8 - Overcast | 4 - Cold | Yes | 3 - Distinct | 20 - Fresh rubbish | -2 - unpleasant |
| 25-09-20 9:29 | 107555 | Yvette Falloon | -40.61081, 175.2131 | F - From N | Proactive | 2 - Light breeze | 3 | 2 - Mild | Yes | 1 - Very weak | 20 - Fresh rubbish | -1 - A bit unpleasant |
| 08-10-20 14:25 | 110305 | Dorothy Zeng | -40.607582, 175.216053 | C - From SW | Proactive | 1 - Light air | 4 - Half the sky is covered in cloud | 2 - Mild | Yes | 1 - Very weak | 4 - Herbal, green, cut grass | 1 - A bit pleasant |
| 06-11-20 12:15 | 111526 | Dorothy Zeng | -40.611006, 175.217149 | E - From NW | Proactive | 3 - Gently breeze | 5 | 1 - Warm | Yes | 2 - Weak | 20 - Fresh rubbish | -1 - A bit unpleasant |
| 13-11-20 14:30 | 111886 | Yvette Falloon | -40.611149, 175.214212 | E - From NW | Proactive | 2 - Light breeze | 6 - Mostly cloudy | 2 - Mild | Yes | 2 - Weak | 4 - Herbal, green, cut grass | 0 - Neutral |
| 18-12-20 13:39 | 113001 | Yvette Falloon | -40.610756, 175.21667 | E - From NW | Proactive | 3 - Gently breeze | 3 | 1 - Warm | Yes | 1 - Very weak | 17 - Bark/soil | 0 - Neutral |
| 12-01-21 9:04 | 113650 | Yvette Falloon | -40.609327, 175.211509 | G - From NE | Proactive | 1 - Light air | 4 - Half the sky is covered in cloud | 2 - Mild | Yes | 2 - Weak | 20 - Fresh rubbish | -2 - unpleasant |
| 12-02-21 11:23 | 114627 | Yvette Falloon | -40.609763, 175.216599 | D - From W | Proactive | 2 - Light breeze | 5 | 2 - Mild | Yes | 2 - Weak | 20 - Fresh rubbish | -1 - A bit unpleasant |
| 12-03-21 11:38 | 115606 | Dorothy Zeng | -40.60763, 175.216182 | C - From SW | Proactive | 1 - Light air | 1 - Sunny | 2 - Mild | Yes | 1 - Very weak | 16 - Musty, earthy, mouldy | 0 - Neutral |
| 26-03-21 14:25 | 116270 | Yvette Falloon | -40.610727, 175.216761 | E - From NW | Proactive | 3 - Gently breeze | 1 - Sunny | 1 - Warm | Yes | 0 - No odour | | |
| 09-04-21 11:16 | 116722 | Yvette Falloon | -40.610436, 175.21066 | G - From NE | Proactive | 2 - Light breeze | 6 - Mostly cloudy | 2 - Mild | Yes | 3 - Distinct | 20 - Fresh rubbish | -2 - unpleasant |
| 16-04-21 9:47 | 117136 | Dorothy Zeng | -40.60853, 175.215834 | D - From W | Proactive | 2 - Light breeze | 1 - Sunny | 2 - Mild | Yes | 2 - Weak | 20 - Fresh rubbish | -1 - A bit unpleasant |
| 13-05-21 11:10 | 118132 | Yvette Falloon | -40.609831, 175.216539 | D - From W | Proactive | 1 - Light air | 2 - Mostly sunny | 4 - Cold | Yes | 1 - Very weak | 16 - Musty, earthy, mouldy | 0 - Neutral |
| 08-06-21 8:56 | 119020 | Yvette Falloon | -40.610248, 175.21058 | G - From NE | Proactive | 2 - Light breeze | 3 | 3 - Cool | Yes | 2 - Weak | 4 - Herbal, green, cut grass | 0 - Neutral |

| Created | Apparent source of odour | Further Details | Conclusion | Action undertaken | Problem status | By (name) | Time assessment f | Picture |
|---|---|---|---|---|---|---|---|---|
| 17-07-20 13:54 | Cow manure in next door paddock | | I did detect odour and consider it would not be objectionable at any location for any duration or frequency | N/A | Not applicable | Yvette Falloon + Xi Zeng | 14:00 | 104409_Picture_156998_20200717-1354.jpg |
| 24-07-20 13:39 | N/A | | I did not detect any odour | N/A | Not applicable | Yvette & Dorothy | 13:45 | 104630_Picture_156998_20200724-1339.jpg |
| 24-07-20 13:53 | Either tip face or decaying wood. Hard to tell character as very weak | | I did detect odour and consider it would not be objectionable at any location for any duration or frequency | N/A | Not applicable | Xi Zeng + Yvette Falloon | 14:00 | 104631_Picture_156998_20200724-1353.jpg |
| 03-08-20 9:28 | I believe the source of odour is the tip face. However odour is weak and also has an earthy character | | I did detect odour and consider it would not be objectionable, UNLESS it became continuous | N/A | Not applicable | Y Falloon | 9:33 AM | 104911_Picture_156998_20200803-0928.jpg |
| 03-08-20 9:42 | Surrounding trees and grass | | I did detect odour and consider it would not be objectionable at any location for any duration or frequency | N/A | Not applicable | Y Falloon | 9:47 AM | 104914_Picture_156998_20200803-0942.jpg |
| 31-08-20 9:54 | Tip face (mostly weak, with some moments brief of distinct odour) | | I did detect odour and consider it would not be objectionable, UNLESS it became continuous | N/A | Not applicable | Y Falloon | 10:02am | 105906_Picture_156998_20200831-0954.jpg |
| 09-09-20 13:58 | Intermittent distinct odour seemingly originating from tip face. Majority of time very weak to no odour. | | I did detect odour and consider it would not be objectionable, UNLESS it became continuous | N/A | Not applicable | Y Falloon | 14:04 | 106325_Picture_156998_20200909-1358.jpg |
| 09-09-20 14:47 | Tip face - consistent smell at fence line. | | I did detect odour and consider it would not be objectionable, UNLESS it became continuous | N/A | Not applicable | Y Falloon | 14:52 | 106333_Picture_156998_20200909-1447.jpg |
| 25-09-20 9:29 | Tip | Could only just smell the fresh rubbish in very small bursts | I did detect odour and consider it would not be objectionable, UNLESS it became continuous | N/A | Not applicable | Y Falloon | 9:38 | 107555_Picture_156998_20200925-0929.jpg |
| 08-10-20 14:25 | Pipe trees & grass | N/A | I did detect odour and consider it would not be objectionable at any location for any duration or frequency | | Not applicable | YF & DZ | 14:32 | 110305_Picture_156998_20201008-1425.jpg |
| 06-11-20 12:15 | Landfill Tip face | Flare is off at present | I did detect odour and consider it would not be objectionable, UNLESS it became continuous | Ongoing proactive odour assessment. | Not applicable | Dorothy Z | 12:21 | 111526_Picture_156998_20201106-1215.jpg |
| 13-11-20 14:30 | Long grass | Flare was off for extended period last week | I did detect odour and consider it would not be objectionable at any location for any duration or frequency | N/A | Not applicable | Y Falloon and D Zeng | 14:37 | 111886_Picture_156998_20201113-1430.jpg |
| 18-12-20 13:39 | Pine trees and grass etc | Mix of grass and soil + trees | I did detect odour and consider it would not be objectionable at any location for any duration or frequency | N/A | Not applicable | X Zeng and Y Falloon | 13:54 | 113001_Picture_156998_20201218-1339.jpg |
| 12-01-21 9:04 | Tip face | Cannot smell the tip face consistently, but smelt it intermittently over assessment. May be due to the location of current tipping area being close to southern boundary. | I did detect odour and consider it would not be objectionable, UNLESS it became continuous | | Not applicable | Y Falloon | 9:17 | |
| 12-02-21 11:23 | Tip face | Odour not very strong but can be distinguished as fresh rubbish. Would not be issue unless it became continuous | I did detect odour and consider it would not be objectionable, UNLESS it became continuous | N/A | Not applicable | Y Falloon, X Zeng | 11:30am | 114627_Picture_156998_20210212-1123.jpg |
| 12-03-21 11:38 | Musty woods and leaves | N/A | I did detect odour and consider it would not be objectionable at any location for any duration or frequency | N/A | Not applicable | Y Falloon & D Zeng | 11:44 | 115606_Picture_156998_20210312-1138.jpg |
| 26-03-21 14:25 | N/A | Complaint was made Tuesday 23rd. Do not have full details as was called through the pollution hotline. Horizons attended later that morning and did not detect odour | I did not detect any odour | N/A | Not applicable | Y Falloon, X Zeng | 14:30 | 116270_Picture_156998_20210326-1425.jpg |
| 09-04-21 11:16 | Tip face | Can smell rubbish from tip face at gate, relatively weak and somewhat intermittent. This boundary backs on to farmland, so some distance from residential households | I did detect odour and consider it would not be objectionable, UNLESS it became continuous | | Not applicable | Y Falloon and X Zeng | 11:22 AM | 116722_Picture_156998_20210409-1116.jpg |
| 16-04-21 9:47 | Tip face fresh rubbish. | Flare was off for extended period last weekend. | I did detect odour and consider it would not be objectionable, UNLESS it became continuous | N/A | Not applicable | DZ | 9:52 AM | 117136_Picture_156998_20210416-0947.png |
| 13-05-21 11:10 | Pine trees and greenery in the area | No odour detected related to landfill at this location | I did detect odour and consider it would not be objectionable at any location for any duration or frequency | N/A | Not applicable | Y Fallon ,X Zeng | 11:15 | 118132_Picture_156998_20210513-1110.jpg |
| 08-06-21 8:56 | Long grass + paddock next door | Flare was off for just under 2 days and was restarted this morning. Mulching occuring on the side of landfill, so mulch odour on site. Not noticeable at boundary. | I did detect odour and consider it would not be objectionable at any location for any duration or frequency | N/A | Not applicable | Y Falloon | 9:05 AM | 119020_Picture_156998_20210608-0856.jpg |

# **Appendix I** Gas sampling

| Created | Entry Number | User | Gps Coordinates | Borehole | Methane (CH4) | Carbon Dioxide (CO2) | Hydrogen Sulphide (H2S) | Oxygen (O2) | Gas flow rate | Nitrogen | Carbon Monoxide (CO) | Gas pressure | Barometric pressure | Temperature | Weather conditions | Wind speed m/sec | Air temperature Â°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15/10/2015 14:03 | 840 | Peter Giddins | | Levin Landfill: Levin B1 | 0 | 0 | 0 | 20.5 | | | | | | | Breeze | 1.3 | 15 |
| 15/10/2015 14:03 | 841 | Peter Giddins | | Levin Landfill: Levin B2 | 0 | 0 | 0 | 20.4 | | | | | | | | | |
| 15/10/2015 14:03 | 842 | Peter Giddins | | Levin Landfill: Levin B3s | 0 | 0 | 0 | 20.3 | | | | | | | | | |
| 15/10/2015 14:03 | 843 | Peter Giddins | | Levin Landfill: Levin C1 | 0 | 0 | 0 | 20.5 | | | | | | | | | |
| 15/10/2015 14:03 | 844 | Peter Giddins | | Levin Landfill: Levin C2 | 0 | 0 | 0 | 20.4 | | | | | | | | | |
| 15/10/2015 14:03 | 845 | Peter Giddins | | Levin Landfill: Levin C2dd | 0 | 0 | 0 | 20.5 | | | | | | | | | |
| 15/10/2015 14:03 | 846 | Peter Giddins | | Levin Landfill: Levin C2ds | 0 | 0 | 0 | 20.3 | | | | | | | | | |
| 15/10/2015 14:03 | 847 | Peter Giddins | | Levin Landfill: Levin D1 | 0 | 0 | 0 | 20.4 | | | | | | | | | |
| 15/10/2015 14:03 | 848 | Peter Giddins | | Levin Landfill: Levin D2 | 0 | 0 | 0 | 20.3 | | | | | | | | | |
| 15/10/2015 14:03 | 849 | Peter Giddins | | Levin Landfill: Levin D3 | 0 | 0 | 0 | 20.5 | | | | | | | | | |
| 15/10/2015 14:03 | 850 | Peter Giddins | | Levin Landfill: Levin D4 | 0 | 0 | 0 | 20.4 | | | | | | | | | |
| 15/10/2015 14:03 | 851 | Peter Giddins | | Levin Landfill: Levin D5 | 0 | 0 | 0 | 20.3 | | | | | | | | | |
| 15/10/2015 14:03 | 852 | Peter Giddins | | Levin Landfill: Levin D6 | 0 | 0 | 0 | 20.4 | | | | | | | | | |
| 15/10/2015 14:03 | 853 | Peter Giddins | | Levin Landfill: Levin E1d | 0 | 0 | 0 | 20.3 | | | | | | | | | |
| 15/10/2015 14:03 | 854 | Peter Giddins | | Levin Landfill: Levin E1s | 0 | 0 | 0 | 20.4 | | | | | | | | | |
| 15/10/2015 14:03 | 855 | Peter Giddins | | Levin Landfill: Levin E2d | 0 | 0 | 0 | 20.4 | | | | | | | | | |
| 15/10/2015 14:03 | 856 | Peter Giddins | | Levin Landfill: Levin E2s | 0 | 0 | 0 | 20.4 | | | | | | | | | |
| 15/10/2015 14:03 | 857 | Peter Giddins | | Levin Landfill: Levin F1 | 0 | 0 | 0 | 20.4 | | | | | | | | | |
| 15/10/2015 14:03 | 858 | Peter Giddins | | Levin Landfill: Levin F2 | 0 | 0 | 0 | 20.3 | | | | | | | | | |
| 15/10/2015 14:03 | 859 | Peter Giddins | | Levin Landfill: Levin F3 | 0 | 0 | 0 | 20.5 | | | | | | | | | |
| 15/10/2015 14:03 | 860 | Peter Giddins | | Levin Landfill: Levin G1d | 0 | 0 | 0 | 20.3 | | | | | | | | | |
| 15/10/2015 14:03 | 861 | Peter Giddins | | Levin Landfill: Levin G1s | 0 | 0 | 0 | 20.4 | | | | | | | | | |
| 15/10/2015 14:03 | 862 | Peter Giddins | | Levin Landfill: Levin G2s | 0 | 0 | 0 | 20.5 | | | | | | | | | |

| Created | Entry Number | User | Gps Coordinates | Borehole | Methane (CH4) | Carbon Dioxide (CO2) | Hydrogen Sulphide (H2S) | Oxygen (O2) | Gas flow rate | Nitrogen | Carbon Monoxide (CO) | Gas pressure | Barometric pressure | Temperature | Weather conditions | Wind speed m/sec | Air temperature Â°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 28/01/2016 8:22 | 25636 | Marcus Coley | | Levin Landfill: Levin B1 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 28/01/2016 8:22 | 25637 | Marcus Coley | | Levin Landfill: Levin B2 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 28/01/2016 8:22 | 25638 | Marcus Coley | | Levin Landfill: Levin B3s | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 28/01/2016 8:22 | 25639 | Marcus Coley | | Levin Landfill: Levin C1 | 0 | 0 | 0 | 20.7 | | | | | | | | | |
| 28/01/2016 8:22 | 25640 | Marcus Coley | | Levin Landfill: Levin C2 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 28/01/2016 8:22 | 25641 | Marcus Coley | | Levin Landfill: Levin C2dd | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 28/01/2016 8:22 | 25642 | Marcus Coley | | Levin Landfill: Levin C2ds | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 28/01/2016 8:22 | 25643 | Marcus Coley | | Levin Landfill: Levin C3 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 28/01/2016 8:22 | 25644 | Marcus Coley | | Levin Landfill: Levin D1 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 28/01/2016 8:22 | 25645 | Marcus Coley | | Levin Landfill: Levin D2 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 28/01/2016 8:22 | 25646 | Marcus Coley | | Levin Landfill: Levin D2 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 28/01/2016 8:22 | 25647 | Marcus Coley | | Levin Landfill: Levin D3 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 28/01/2016 8:22 | 25648 | Marcus Coley | | Levin Landfill: Levin D3r | 0 | 0 | 0 | 20.5 | | | | | | | | | |
| 28/01/2016 8:22 | 25649 | Marcus Coley | | Levin Landfill: Levin D4 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 28/01/2016 8:22 | 25650 | Marcus Coley | | Levin Landfill: Levin D5 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 28/01/2016 8:22 | 25651 | Marcus Coley | | Levin Landfill: Levin D6 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 28/01/2016 8:22 | 25652 | Marcus Coley | | Levin Landfill: Levin E1d | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 28/01/2016 8:22 | 25653 | Marcus Coley | | Levin Landfill: Levin E1s | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 28/01/2016 8:22 | 25654 | Marcus Coley | | Levin Landfill: Levin E2d | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 28/01/2016 8:22 | 25655 | Marcus Coley | | Levin Landfill: Levin E2s | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 28/01/2016 8:22 | 25656 | Marcus Coley | | Levin Landfill: Levin F1 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 28/01/2016 8:22 | 25657 | Marcus Coley | | Levin Landfill: Levin F2 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 28/01/2016 8:22 | 25658 | Marcus Coley | | Levin Landfill: Levin F3 | 0 | 0 | 0 | 20.9 | | | | | | | | | |

| Created | Entry Number | User | Gps Coordinates | Borehole | Methane (CH4) | Carbon Dioxide (CO2) | Hydrogen Sulphide (H2S) | Oxygen (O2) | Gas flow rate | Nitrogen | Carbon Monoxide (CO) | Gas pressure | Barometric pressure | Temperature | Weather conditions | Wind speed m/sec | Air temperature Â°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 28/01/2016 8:22 | 25659 | Marcus Coley | | Levin Landfill: Levin G1d | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 28/01/2016 8:22 | 25660 | Marcus Coley | | Levin Landfill: Levin G1s | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 28/01/2016 8:22 | 25661 | Marcus Coley | | Levin Landfill: Levin G2s | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 19/04/2016 14:59 | 18651 | Adrian Parkes | | Levin Landfill: Levin B1 | 0 | 0 | 0 | 21 | | | | | | | | | |
| 19/04/2016 15:01 | 18652 | Adrian Parkes | | Levin Landfill: Levin B2 | 0 | 0 | 0 | 21 | | | | | | | | | |
| 19/04/2016 15:01 | 18653 | Adrian Parkes | | Levin Landfill: Levin B3s | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 19/04/2016 15:03 | 18654 | Adrian Parkes | | Levin Landfill: Levin C1 | 0 | 0 | 0 | 21.1 | | | | | | | | | |
| 19/04/2016 15:04 | 18655 | Adrian Parkes | | Levin Landfill: Levin C2 | 0 | 0 | 0 | 21 | | | | | | | | | |
| 19/04/2016 15:05 | 18656 | Adrian Parkes | | Levin Landfill: Levin C2dd | 0 | 0 | 0 | 21.1 | | | | | | | | | |
| 19/04/2016 15:05 | 18657 | Adrian Parkes | | Levin Landfill: Levin C2ds | 0 | 0 | 0 | 21 | | | | | | | | | |
| 19/04/2016 15:06 | 18658 | Adrian Parkes | | Levin Landfill: Levin D1 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 19/04/2016 15:10 | 18659 | Adrian Parkes | | Levin Landfill: Levin D2 | 0 | 0 | 0 | 21 | | | | | | | | | |
| 19/04/2016 15:11 | 18660 | Adrian Parkes | | Levin Landfill: Levin D3r | 0 | 0 | 0 | 21 | | | | | | | | | |
| 19/04/2016 15:12 | 18661 | Adrian Parkes | | Levin Landfill: Levin D4 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 19/04/2016 15:12 | 18662 | Adrian Parkes | | Levin Landfill: Levin D5 | 0 | 0 | 0 | 21 | | | | | | | | | |
| 19/04/2016 15:13 | 18663 | Adrian Parkes | | Levin Landfill: Levin D6 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 19/04/2016 15:14 | 18664 | Adrian Parkes | | Levin Landfill: Levin E1d | 0 | 0 | 0 | 21 | | | | | | | | | |
| 19/04/2016 15:14 | 18665 | Adrian Parkes | | Levin Landfill: Levin E1s | 0 | 0 | 0 | 21 | | | | | | | | | |
| 19/04/2016 15:17 | 18666 | Adrian Parkes | | Levin Landfill: Levin E2s | 0 | 0 | 0 | 21 | | | | | | | | | |
| 19/04/2016 15:18 | 18667 | Adrian Parkes | | Levin Landfill: Levin E2d | 0 | 0 | 0 | 21 | | | | | | | | | |
| 19/04/2016 15:36 | 18670 | Adrian Parkes | | Levin Landfill: Levin F1 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 19/04/2016 15:37 | 18672 | Adrian Parkes | | Levin Landfill: Levin F2 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 19/04/2016 15:37 | 18673 | Adrian Parkes | | Levin Landfill: Levin F3 | 0 | 0 | 0 | 20.9 | | | | | | | | | |

| Created | Entry Number | User | Gps Coordinates | Borehole | Methane (CH4) | Carbon Dioxide (CO2) | Hydrogen Sulphide (H2S) | Oxygen (O2) | Gas flow rate | Nitrogen | Carbon Monoxide (CO) | Gas pressure | Barometric pressure | Temperature | Weather conditions | Wind speed m/sec | Air temperature Â°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19/04/2016 15:42 | 18678 | Adrian Parkes | | Levin Landfill: Levin G1d | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 19/04/2016 15:43 | 18680 | Adrian Parkes | | Levin Landfill: Levin G1s | 0 | 0 | 0 | 21 | | | | | | | | | |
| 19/04/2016 15:44 | 18682 | Adrian Parkes | | Levin Landfill: Levin G2s | 0 | 0 | 0 | 21.1 | | | | | | | | | |
| 20/07/2016 13:25 | 25561 | Marcus Coley | | Levin Landfill: Levin B1 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 20/07/2016 13:25 | 25562 | Marcus Coley | | Levin Landfill: Levin B2 | 0 | 0 | 0 | 19.9 | | | | | | | | | |
| 20/07/2016 13:25 | 25563 | Marcus Coley | | Levin Landfill: Levin B3s | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 20/07/2016 13:25 | 25564 | Marcus Coley | | Levin Landfill: Levin C1 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 20/07/2016 13:25 | 25565 | Marcus Coley | | Levin Landfill: Levin C2 | 0 | 0 | 0 | 20.8 | | | | | | | | | |
| 20/07/2016 13:25 | 25566 | Marcus Coley | | Levin Landfill: Levin C2dd | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 20/07/2016 13:25 | 25567 | Marcus Coley | | Levin Landfill: Levin C2ds | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 20/07/2016 13:25 | 25568 | Marcus Coley | | Levin Landfill: Levin C3 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 20/07/2016 13:25 | 25569 | Marcus Coley | | Levin Landfill: Levin D1 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 20/07/2016 13:25 | 25570 | Marcus Coley | | Levin Landfill: Levin D2 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 20/07/2016 13:25 | 25571 | Marcus Coley | | Levin Landfill: Levin D3 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 20/07/2016 13:25 | 25572 | Marcus Coley | | Levin Landfill: Levin D3r | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 20/07/2016 13:25 | 25573 | Marcus Coley | | Levin Landfill: Levin D4 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 20/07/2016 13:25 | 25574 | Marcus Coley | | Levin Landfill: Levin D5 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 20/07/2016 13:25 | 25575 | Marcus Coley | | Levin Landfill: Levin D6 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 20/07/2016 13:25 | 25576 | Marcus Coley | | Levin Landfill: Levin E1d | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 20/07/2016 13:25 | 25577 | Marcus Coley | | Levin Landfill: Levin E1s | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 20/07/2016 13:25 | 25578 | Marcus Coley | | Levin Landfill: Levin E2d | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 20/07/2016 13:25 | 25579 | Marcus Coley | | Levin Landfill: Levin E2s | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 20/07/2016 13:25 | 25580 | Marcus Coley | | Levin Landfill: Levin F1 | 0 | 0 | 0 | 20.9 | | | | | | | | | |

| Created | Entry Number | User | Gps Coordinates | Borehole | Methane (CH4) | Carbon Dioxide (CO2) | Hydrogen Sulphide (H2S) | Oxygen (O2) | Gas flow rate | Nitrogen | Carbon Monoxide (CO) | Gas pressure | Barometric pressure | Temperature | Weather conditions | Wind speed m/sec | Air temperature Â°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20/07/2016 13:25 | 25581 | Marcus Coley | | Levin Landfill: Levin F2 | 0 | 0 | 0 | 20.7 | | | | | | | | | |
| 20/07/2016 13:25 | 25582 | Marcus Coley | | Levin Landfill: Levin F3 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 20/07/2016 13:25 | 25583 | Marcus Coley | | Levin Landfill: Levin G1d | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 20/07/2016 13:25 | 25584 | Marcus Coley | | Levin Landfill: Levin G1s | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 20/07/2016 13:25 | 25585 | Marcus Coley | | Levin Landfill: Levin G2s | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 19/10/2016 15:23 | 31437 | Marcus Coley | | Levin Landfill: Levin B1 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 19/10/2016 15:23 | 31438 | Marcus Coley | | Levin Landfill: Levin B3s | 3 | 0 | 0 | 5.1 | | | | | | | | | |
| 19/10/2016 15:23 | 31439 | Marcus Coley | | Levin Landfill: Levin B2 | 3 | 0 | 0 | 5.1 | | | | | | | | | |
| 19/10/2016 15:23 | 31440 | Marcus Coley | | Levin Landfill: Levin B3s | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 19/10/2016 15:23 | 31441 | Marcus Coley | | Levin Landfill: Levin C1 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 19/10/2016 15:23 | 31442 | Marcus Coley | | Levin Landfill: Levin C2 | 3 | 0 | 0 | 19.8 | | | | | | | | | |
| 19/10/2016 15:23 | 31443 | Marcus Coley | | Levin Landfill: Levin C2dd | 0 | 0 | 0 | 20.6 | | | | | | | | | |
| 19/10/2016 15:23 | 31444 | Marcus Coley | | Levin Landfill: Levin C2ds | 0 | 0 | 0 | 20.6 | | | | | | | | | |
| 19/10/2016 15:23 | 31445 | Marcus Coley | | Levin Landfill: Levin D1 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 19/10/2016 15:23 | 31446 | Marcus Coley | | Levin Landfill: Levin D2 | 0 | 0 | 0 | 20.5 | | | | | | | | | |
| 19/10/2016 15:23 | 31447 | Marcus Coley | | Levin Landfill: Levin D3 | 1 | 0 | 0 | 20.4 | | | | | | | | | |
| 19/10/2016 15:23 | 31448 | Marcus Coley | | Levin Landfill: Levin D4 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 19/10/2016 15:23 | 31449 | Marcus Coley | | Levin Landfill: Levin D5 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 19/10/2016 15:23 | 31450 | Marcus Coley | | Levin Landfill: Levin D6 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 19/10/2016 15:23 | 31451 | Marcus Coley | | Levin Landfill: Levin E1d | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 19/10/2016 15:23 | 31452 | Marcus Coley | | Levin Landfill: Levin E1s | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 19/10/2016 15:23 | 31453 | Marcus Coley | | Levin Landfill: Levin E2d | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 19/10/2016 15:23 | 31454 | Marcus Coley | | Levin Landfill: Levin E2s | 0 | 0 | 0 | 20.9 | | | | | | | | | |

| Created | Entry Number | User | Gps Coordinates | Borehole | Methane (CH4) | Carbon Dioxide (CO2) | Hydrogen Sulphide (H2S) | Oxygen (O2) | Gas flow rate | Nitrogen | Carbon Monoxide (CO) | Gas pressure | Barometric pressure | Temperature | Weather conditions | Wind speed m/sec | Air temperature Â°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19/10/2016 15:23 | 31455 | Marcus Coley | | Levin Landfill: Levin F1 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 19/10/2016 15:23 | 31456 | Marcus Coley | | Levin Landfill: Levin F1 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 19/10/2016 15:23 | 31457 | Marcus Coley | | Levin Landfill: Levin F2 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 19/10/2016 15:23 | 31458 | Marcus Coley | | Levin Landfill: Levin F3 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 19/10/2016 15:23 | 31459 | Marcus Coley | | Levin Landfill: Levin G1d | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 19/10/2016 15:23 | 31460 | Marcus Coley | | Levin Landfill: Levin G2s | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 19/10/2016 15:23 | 31461 | Marcus Coley | | Levin Landfill: Levin G2s | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 24/01/2017 14:58 | 36748 | Mal Rolston | | Levin Landfill: Levin B1 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 24/01/2017 14:58 | 36749 | Mal Rolston | | Levin Landfill: Levin B2 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 24/01/2017 14:58 | 36750 | Mal Rolston | | Levin Landfill: Levin B3s | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 24/01/2017 14:58 | 36751 | Mal Rolston | | Levin Landfill: Levin C1 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 24/01/2017 14:58 | 36752 | Mal Rolston | | Levin Landfill: Levin C2 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 24/01/2017 15:00 | 36753 | Mal Rolston | | Levin Landfill: Levin C2dd | 0 | 0 | 0 | 20.7 | | | | | | | | | |
| 24/01/2017 15:00 | 36754 | Mal Rolston | | Levin Landfill: Levin C2ds | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 24/01/2017 15:00 | 36755 | Mal Rolston | | Levin Landfill: Levin D1 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 24/01/2017 15:00 | 36756 | Mal Rolston | | | 0 | 0 | 0 | 20.7 | | | | | | | | | |
| 24/01/2017 15:00 | 36757 | Mal Rolston | | Levin Landfill: Levin D3 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 24/01/2017 15:00 | 36758 | Mal Rolston | | Levin Landfill: Levin D4 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 24/01/2017 15:05 | 36759 | Mal Rolston | | Levin Landfill: Levin D5 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 24/01/2017 15:05 | 36760 | Mal Rolston | | Levin Landfill: Levin D6 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 24/01/2017 15:05 | 36761 | Mal Rolston | | Levin Landfill: Levin D6 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 24/01/2017 15:05 | 36762 | Mal Rolston | | Levin Landfill: Levin E1d | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 24/01/2017 15:05 | 36763 | Mal Rolston | | Levin Landfill: Levin E1s | 0 | 0 | 0 | 20.9 | | | | | | | | | |

| Created | Entry Number | User | Gps Coordinates | Borehole | Methane (CH4) | Carbon Dioxide (CO2) | Hydrogen Sulphide (H2S) | Oxygen (O2) | Gas flow rate | Nitrogen | Carbon Monoxide (CO) | Gas pressure | Barometric pressure | Temperature | Weather conditions | Wind speed m/sec | Air temperature Â°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24/01/2017 15:05 | 36764 | Mal Rolston | | Levin Landfill: Levin E2s | 0 | 0 | 0 | 20.8 | | | | | | | | | |
| 24/01/2017 15:05 | 36765 | Mal Rolston | | Levin Landfill: Levin E2d | 0 | 0 | 0 | 20.7 | | | | | | | | | |
| 24/01/2017 15:05 | 36766 | Mal Rolston | | Levin Landfill: Levin F1 | 0 | 0 | 0 | 20.7 | | | | | | | | | |
| 24/01/2017 15:05 | 36767 | Mal Rolston | | Levin Landfill: Levin F2 | 0 | 0 | 0 | 20.8 | | | | | | | | | |
| 24/01/2017 15:05 | 36768 | Mal Rolston | | Levin Landfill: Levin G1d | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 24/01/2017 15:05 | 36769 | Mal Rolston | | Levin Landfill: Levin G1s | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 24/01/2017 15:05 | 36770 | Mal Rolston | | Levin Landfill: Levin G2s | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 19/05/2017 15:07 | 45413 | Jonathon Sinclair | | Levin Landfill: Levin B1 | 0 | 20.9 | 0 | 0 | | | | | | | | | |
| 19/05/2017 15:07 | 45414 | Jonathon Sinclair | | Levin Landfill: Levin B2 | 0 | 20.9 | 0 | 0 | | | | | | | | | |
| 19/05/2017 15:07 | 45415 | Jonathon Sinclair | | Levin Landfill: Levin B3s | 0 | 20.9 | 0 | 0 | | | | | | | | | |
| 19/05/2017 15:07 | 45416 | Jonathon Sinclair | | Levin Landfill: Levin C1 | 0 | 20.9 | 0 | 0 | | | | | | | | | |
| 19/05/2017 15:07 | 45417 | Jonathon Sinclair | | Levin Landfill: Levin C2 | 0 | 20.8 | 0 | 0 | | | | | | | | | |
| 19/05/2017 15:07 | 45418 | Jonathon Sinclair | | Levin Landfill: Levin C2dd | 0 | 20.6 | 0 | 0 | | | | | | | | | |
| 19/05/2017 15:07 | 45419 | Jonathon Sinclair | | Levin Landfill: Levin C2ds | 0 | 20.9 | 0 | 0 | | | | | | | | | |
| 19/05/2017 15:07 | 45420 | Jonathon Sinclair | | Levin Landfill: Levin C2ds | 0 | 20.9 | 0 | 0 | | | | | | | | | |
| 19/05/2017 15:07 | 45421 | Jonathon Sinclair | | Levin Landfill: Levin D1 | 0 | 20.9 | 0 | 0 | | | | | | | | | |
| 19/05/2017 15:07 | 45422 | Jonathon Sinclair | | Levin Landfill: Levin D2 | 0 | 20.9 | 0 | 0 | | | | | | | | | |
| 19/05/2017 15:07 | 45423 | Jonathon Sinclair | | Levin Landfill: Levin D3 | 0 | 20.9 | 0 | 0 | | | | | | | | | |
| 19/05/2017 15:07 | 45424 | Jonathon Sinclair | | Levin Landfill: Levin D4 | 0 | 20.8 | 0 | 0 | | | | | | | | | |
| 19/05/2017 15:07 | 45425 | Jonathon Sinclair | | Levin Landfill: Levin D5 | 0 | 20.9 | 0 | 0 | | | | | | | | | |
| 19/05/2017 15:07 | 45426 | Jonathon Sinclair | | Levin Landfill: Levin D6 | 0 | 20.9 | 0 | 0 | | | | | | | | | |
| 19/05/2017 15:07 | 45427 | Jonathon Sinclair | | Levin Landfill: Levin E1d | 0 | 20.9 | 0 | 0 | | | | | | | | | |
| 19/05/2017 15:07 | 45428 | Jonathon Sinclair | | Levin Landfill: Levin E1s | 0 | 20.9 | 0 | 0 | | | | | | | | | |

| Created | Entry Number | User | Gps Coordinates | Borehole | Methane (CH4) | Carbon Dioxide (CO2) | Hydrogen Sulphide (H2S) | Oxygen (O2) | Gas flow rate | Nitrogen | Carbon Monoxide (CO) | Gas pressure | Barometric pressure | Temperature | Weather conditions | Wind speed m/sec | Air temperature Â°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19/05/2017 15:07 | 45429 | Jonathon Sinclair | | Levin Landfill: Levin E2s | 0 | 20.7 | 0 | 0 | | | | | | | | | |
| 19/05/2017 15:07 | 45430 | Jonathon Sinclair | | Levin Landfill: Levin E2d | 0 | 20.9 | 0 | 0 | | | | | | | | | |
| 19/05/2017 15:07 | 45431 | Jonathon Sinclair | | Levin Landfill: Levin F1 | 0 | 20.9 | 0 | 0 | | | | | | | | | |
| 19/05/2017 15:07 | 45432 | Jonathon Sinclair | | Levin Landfill: Levin F1 | 0 | 20.9 | 0 | 0 | | | | | | | | | |
| 19/05/2017 15:07 | 45433 | Jonathon Sinclair | | Levin Landfill: Levin F2 | 0 | 20.6 | 0 | 0 | | | | | | | | | |
| 19/05/2017 15:07 | 45434 | Jonathon Sinclair | | Levin Landfill: Levin F3 | 0 | 20.8 | 0 | 0 | | | | | | | | | |
| 19/05/2017 15:07 | 45435 | Jonathon Sinclair | | Levin Landfill: Levin G1d | 0 | 20.9 | 0 | 0 | | | | | | | | | |
| 19/05/2017 15:07 | 45436 | Jonathon Sinclair | | Levin Landfill: Levin G1s | 0 | 20.9 | 0 | 0 | | | | | | | | | |
| 19/05/2017 15:07 | 45437 | Jonathon Sinclair | | Levin Landfill: Levin G2s | 0 | 20.9 | 0 | 0 | | | | | | | | | |
| 17/10/2017 12:06 | 58320 | Paul Hayward | | Levin Landfill: Levin G1d | 0 | 0 | 0 | 20.8 | | | | | | | | | |
| 17/10/2017 12:10 | 58322 | Paul Hayward | | Levin Landfill: Levin G1s | 0 | 0 | 0 | 20.8 | | | | | | | | | |
| 17/10/2017 12:23 | 58324 | Paul Hayward | | Levin Landfill: Levin F1 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 17/10/2017 12:30 | 58315 | Paul Hayward | | Levin Landfill: Levin D6 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 17/10/2017 12:39 | 58319 | Paul Hayward | | Levin Landfill: Levin E2s | 0 | 0 | 0 | 20.8 | | | | | | | | | |
| 17/10/2017 12:44 | 58318 | Paul Hayward | | Levin Landfill: Levin E2d | 0 | 0 | 0 | 20.8 | | | | | | | | | |
| 17/10/2017 12:47 | 58307 | Paul Hayward | | Levin Landfill: Levin C2ds | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 17/10/2017 12:48 | 58304 | Paul Hayward | | Levin Landfill: Levin C1 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 17/10/2017 12:49 | 58306 | Paul Hayward | | Levin Landfill: Levin C2dd | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 17/10/2017 12:52 | 58305 | Paul Hayward | | Levin Landfill: Levin C2 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 17/10/2017 12:55 | 58302 | Paul Hayward | | Levin Landfill: Levin B2 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 17/10/2017 13:00 | 58323 | Paul Hayward | | Levin Landfill: Levin G2s | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 17/10/2017 13:02 | 58303 | Paul Hayward | | Levin Landfill: Levin B3s | 0 | 0 | 0 | 20.8 | | | | | | | | | |
| 17/10/2017 13:05 | 58301 | Paul Hayward | | Levin Landfill: Levin B1 | 0 | 0 | 0 | 20.9 | | | | | | | | | |

| Created | Entry Number | User | Gps Coordinates | Borehole | Methane (CH4) | Carbon Dioxide (CO2) | Hydrogen Sulphide (H2S) | Oxygen (O2) | Gas flow rate | Nitrogen | Carbon Monoxide (CO) | Gas pressure | Barometric pressure | Temperature | Weather conditions | Wind speed m/sec | Air temperature Â°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17/10/2017 22:35 | 58316 | Paul Hayward | | Levin Landfill: Levin E1d | 0 | 0 | 0 | 20.8 | | | | | | | | | |
| 17/10/2017 22:37 | 58317 | Paul Hayward | | Levin Landfill: Levin E1s | 0 | 0 | 0 | 20.8 | | | | | | | | | |
| 17/10/2017 22:41 | 58314 | Paul Hayward | | Levin Landfill: Levin D4 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 17/10/2017 22:59 | 58327 | Paul Hayward | | Levin Landfill: Levin D5 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 17/10/2017 23:12 | 58313 | Paul Hayward | | Levin Landfill: Levin D3 | 0 | 0 | 0 | 20.8 | | | | | | | | | |
| 17/10/2017 23:26 | 58325 | Paul Hayward | | Levin Landfill: Levin F3 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 17/10/2017 23:35 | 58326 | Paul Hayward | | Levin Landfill: Levin F2 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 17/10/2017 23:50 | 58311 | Paul Hayward | | Levin Landfill: Levin D2 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 17/10/2017 23:57 | 58309 | Paul Hayward | | Levin Landfill: Levin D1 | 0 | 0 | 0 | 20.9 | | | | | | | | | |
| 16/01/2018 11:05 | 62371 | Jonathon Sinclair | | Levin Landfill: Levin B1 | 0 | 21 | 0 | 0 | | | | | | | | | |
| 16/01/2018 11:05 | 62372 | Jonathon Sinclair | | Levin Landfill: Levin B2 | 0 | 20.9 | 0 | 0 | | | | | | | | | |
| 16/01/2018 11:05 | 62373 | Jonathon Sinclair | | Levin Landfill: Levin B3s | 0 | 20.9 | 0 | 0 | | | | | | | | | |
| 16/01/2018 11:05 | 62374 | Jonathon Sinclair | | Levin Landfill: Levin C1 | 0 | 20.8 | 0 | 0 | | | | | | | | | |
| 16/01/2018 11:05 | 62375 | Jonathon Sinclair | | Levin Landfill: Levin C2 | 0 | 21 | 0 | 0 | | | | | | | | | |
| 16/01/2018 11:05 | 62377 | Jonathon Sinclair | | Levin Landfill: Levin C2dd | 0 | 21 | 0 | 0 | | | | | | | | | |
| 16/01/2018 11:05 | 62378 | Jonathon Sinclair | | Levin Landfill: Levin C2ds | 0 | 20.9 | 0 | 0 | | | | | | | | | |
| 16/01/2018 11:05 | 62379 | Jonathon Sinclair | | Levin Landfill: Levin D1 | 0 | 20.9 | 0 | 0 | | | | | | | | | |
| 16/01/2018 11:05 | 62380 | Jonathon Sinclair | | Levin Landfill: Levin D2 | 0 | 20.9 | 0 | 0 | | | | | | | | | |
| 16/01/2018 11:05 | 62381 | Jonathon Sinclair | | Levin Landfill: Levin D3 | 0 | 20.9 | 0 | 0 | | | | | | | | | |
| 16/01/2018 11:05 | 62382 | Jonathon Sinclair | | Levin Landfill: Levin D3r | 0 | 20.9 | 0 | 0 | | | | | | | | | |
| 16/01/2018 11:05 | 62383 | Jonathon Sinclair | | Levin Landfill: Levin D4 | 0 | 20.9 | 0 | 0 | | | | | | | | | |
| 16/01/2018 11:05 | 62384 | Jonathon Sinclair | | Levin Landfill: Levin D5 | 0 | 20.9 | 0 | 0 | | | | | | | | | |
| 16/01/2018 11:05 | 62385 | Jonathon Sinclair | | Levin Landfill: Levin D6 | 0 | 20.8 | 0 | 0 | | | | | | | | | |

| Created | Entry Number | User | Gps Coordinates | Borehole | Methane (CH4) | Carbon Dioxide (CO2) | Hydrogen Sulphide (H2S) | Oxygen (O2) | Gas flow rate | Nitrogen | Carbon Monoxide (CO) | Gas pressure | Barometric pressure | Temperature | Weather conditions | Wind speed m/sec | Air temperature Â°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16/01/2018 11:05 | 62386 | Jonathon Sinclair | | Levin Landfill: Levin E1d | 0 | 20.8 | 0 | 0 | | | | | | | | | |
| 16/01/2018 11:05 | 62387 | Jonathon Sinclair | | Levin Landfill: Levin E1s | 0 | 20.8 | 0 | 0 | | | | | | | | | |
| 16/01/2018 11:05 | 62395 | Jonathon Sinclair | | Levin Landfill: Levin E2s | 0 | 20.9 | 0 | 0 | | | | | | | | | |
| 16/01/2018 11:16 | 62396 | Jonathon Sinclair | | Levin Landfill: Levin E2d | 0 | 20.9 | 0 | 0 | | | | | | | | | |
| 16/01/2018 11:16 | 62397 | Jonathon Sinclair | | Levin Landfill: Levin F1 | 0 | 20.9 | 0 | 0 | | | | | | | | | |
| 16/01/2018 11:16 | 62398 | Jonathon Sinclair | | Levin Landfill: Levin F2 | 0 | 20.8 | 0 | 0 | | | | | | | | | |
| 16/01/2018 11:16 | 62399 | Jonathon Sinclair | | Levin Landfill: Levin F3 | 0 | 20.9 | 0 | 0 | | | | | | | | | |
| 16/01/2018 11:16 | 62401 | Jonathon Sinclair | | Levin Landfill: Levin G1d | 0 | 20.9 | 0 | 0 | | | | | | | | | |
| 16/01/2018 11:16 | 62402 | Jonathon Sinclair | | Levin Landfill: Levin G1s | 0 | 20.9 | 0 | 0 | | | | | | | | | |
| 16/01/2018 11:16 | 62403 | Jonathon Sinclair | | Levin Landfill: Levin G2s | 0 | 20.9 | 0 | 0 | | | | | | | | | |
| 12/04/2018 10:00 | 66150 | Paul Hayward | | Levin Landfill: Levin G1d | 0 | 0 | 0 | 20.9 | | | | | | | Sunny Breeze Wind Direction North East | 1.45 | 15.7 |
| 12/04/2018 10:10 | 66151 | Paul Hayward | | Levin Landfill: Levin G1s | 0 | 0 | 0 | 20.4 | | | | | | | Sunny Breeze Wind Direction North East | 1.45 | 15.7 |
| 12/04/2018 10:30 | 66147 | Paul Hayward | | Levin Landfill: Levin F1 | 0 | 0 | 0 | 20.4 | | | | | | | Sunny Breeze Wind Direction North East | 1 | 15 |
| 12/04/2018 10:45 | 66137 | Paul Hayward | | Levin Landfill: Levin D1 | 0 | 0 | 0 | 20.9 | | | | | | | Sunny ,Breeze Wind North East | 1.25 | 20 |

| Created | Entry Number | User | Gps Coordinates | Borehole | Methane (CH4) | Carbon Dioxide (CO2) | Hydrogen Sulphide (H2S) | Oxygen (O2) | Gas flow rate | Nitrogen | Carbon Monoxide (CO) | Gas pressure | Barometric pressure | Temperature | Weather conditions | Wind speed m/sec | Air temperature Â°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12/04/2018 10:55 | 66138 | Paul Hayward | | Levin Landfill: Levin D2 | 0 | 0 | 0 | 20.7 | | | | | | | Overcast ,Breeze Wind North East | 2.34 | 17.9 |
| 12/04/2018 11:15 | 66142 | Paul Hayward | | Levin Landfill: Levin D6 | 0 | 0 | 0 | 20.1 | | | | | | | Overcast ,Breeze Wind Direction North East | 0.85 | 19.3 |
| 12/04/2018 11:25 | 66139 | Paul Hayward | | Levin Landfill: Levin D3 | 0 | 0 | 0 | 20.9 | | | | | | | Overcast ,Still | 0 | 19.1 |
| 12/04/2018 11:35 | 66148 | Paul Hayward | | Levin Landfill: Levin F3 | 0 | 0 | 0 | 20.1 | | | | | | | Overcast Still | 0 | 16.5 |
| 12/04/2018 11:45 | 66149 | Paul Hayward | | Levin Landfill: Levin F2 | 0 | 0 | 0 | 20.9 | | | | | | | Overcast Still | 0 | 15 |
| 12/04/2018 12:05 | 66140 | Paul Hayward | | Levin Landfill: Levin D4 | 0 | 0 | 0 | 21 | | | | | | | Overcast ,Breeze Wind Direction North East | 1.54 | 15.5 |
| 12/04/2018 12:05 | 66146 | Paul Hayward | | Levin Landfill: Levin E2d | 0 | 0 | 0 | 20.9 | | | | | | | Overcast ,Still | 0 | 15.5 |
| 12/04/2018 12:10 | 66145 | Paul Hayward | | Levin Landfill: Levin E2s | 0 | 0 | 0 | 20.9 | | | | | | | Overcast ,Still | 0 | 15.5 |
| 12/04/2018 12:15 | 66143 | Paul Hayward | | Levin Landfill: Levin E1d | 0 | 0 | 0 | 20.9 | | | | | | | Overcast ,Still | 0 | 15 |
| 12/04/2018 12:20 | 66144 | Paul Hayward | | Levin Landfill: Levin E1s | 0 | 0 | 0 | 21 | | | | | | | Overcast ,Still | 0 | 15 |
| 12/04/2018 12:55 | 66125 | Paul Hayward | | Levin Landfill: Levin B2 | 0 | 0 | 0 | 17.5 | | | | | | | Overcast. Breeze . Wind direction West | 1.55 | 16.9 |
| 12/04/2018 13:15 | 66126 | Paul Hayward | | Levin Landfill: Levin B3s | 0 | 0 | 0 | 21 | | | | | | | Overcast. Still. No Wind | 0 | 14.9 |
| 12/04/2018 13:25 | 66129 | Paul Hayward | | Levin Landfill: Levin C2 | 0 | 0 | 0 | 15.4 | | | | | | | Overcast. Breeze. Wind Direction North West | 1.3 | 15.9 |

| Created | Entry Number | User | Gps Coordinates | Borehole | Methane (CH4) | Carbon Dioxide (CO2) | Hydrogen Sulphide (H2S) | Oxygen (O2) | Gas flow rate | Nitrogen | Carbon Monoxide (CO) | Gas pressure | Barometric pressure | Temperature | Weather conditions | Wind speed m/sec | Air temperature Â°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12/04/2018 13:30 | 66135 | Paul Hayward | | Levin Landfill: Levin C2dd | 0 | 0 | 0 | 20.8 | | | | | | | Overcast. Still . | 0 | 15.4 |
| 12/04/2018 13:35 | 66136 | Paul Hayward | | Levin Landfill: Levin C2ds | 0 | 0 | 0 | 20.9 | | | | | | | Overcast Still | 0 | 14.8 |
| 12/04/2018 13:45 | 66124 | Paul Hayward | | Levin Landfill: Levin B1 | 0 | 0 | 0 | 20.5 | | | | | | | Overcast. Breeze . Wind direction West | 1.3 | 15 |
| 12/04/2018 14:05 | 66152 | Paul Hayward | | Levin Landfill: Levin G2s | 0 | 0 | 0 | 20.7 | | | | | | | Cloudy Breeze Wind Direction West | 4.27 | 15.4 |
| 12/04/2018 14:15 | 66127 | Paul Hayward | | Levin Landfill: Levin C1 | 0 | 0 | 0 | 18.2 | | | | | | | Overcast. Breeze. Wind Direction West | 1.27 | 15.5 |
| 12/04/2018 14:30 | 66141 | Paul Hayward | | Levin Landfill: Levin D5 | 0 | 0 | 0 | 20.9 | | | | | | | Overcast ,Breeze Wind Direction North East | 2.6 | 19 |
| 3/07/2018 12:40 | 70316 | Craig Columb | | Levin Landfill: Levin G1s | 0 | 0 | 0 | 21.1 | | | | | 1024 | | Fine | 0.9 | 11.8 |
| 3/07/2018 12:45 | 70305 | Craig Columb | | Levin Landfill: Levin G1d | 0 | 0 | 0 | 21 | | | | | 1024 | | Fine | 0.9 | 11.8 |
| 3/07/2018 13:25 | 70226 | Craig Columb | | Levin Landfill: Levin F1 | 0 | 0 | 0 | 21 | | | | | 1024 | | Fine | 0 | 11.9 |
| 3/07/2018 13:35 | 70215 | Craig Columb | | Levin Landfill: Levin D1 | 0 | 0 | 0 | 21.1 | | | | | 1024 | | Fine | 0.3 | 13.2 |
| 3/07/2018 13:40 | 70216 | Craig Columb | | Levin Landfill: Levin D2 | 0 | 0 | 0 | 20.9 | | | | | 1024 | | Fine | 0.5 | 13 |
| 3/07/2018 14:00 | 70221 | Craig Columb | | Levin Landfill: Levin D6 | 0 | 0 | 0 | 20.9 | | | | | 1024 | | Fine | 0 | 13.4 |
| 3/07/2018 14:15 | 70301 | Craig Columb | | Levin Landfill: Levin F3 | 0 | 0 | 0 | 21 | | | | | 1024 | | Fine | 0 | 11.8 |
| 3/07/2018 14:20 | 70297 | Craig Columb | | Levin Landfill: Levin F2 | 0 | 0 | 0 | 20.5 | | | | | 1024 | | Fine | 0.1 | 12.2 |
| 3/07/2018 14:45 | 70217 | Craig Columb | | Levin Landfill: Levin D3r | 0 | 0 | 0 | 20.9 | | | | | 1024 | | Fine | 0 | 12 |
| 3/07/2018 15:00 | 70209 | Craig Columb | | Levin Landfill: Levin B1 | 0 | 0 | 0 | 20.3 | | | | | 1024 | | Fine | 0.4 | 12 |

| Created | Entry Number | User | Gps Coordinates | Borehole | Methane (CH4) | Carbon Dioxide (CO2) | Hydrogen Sulphide (H2S) | Oxygen (O2) | Gas flow rate | Nitrogen | Carbon Monoxide (CO) | Gas pressure | Barometric pressure | Temperature | Weather conditions | Wind speed m/sec | Air temperature Â°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4/07/2018 14:25 | 70220 | Craig Columb | | Levin Landfill: Levin D5 | 0 | 0 | 0 | 20.9 | | | | | 1024 | | Fine | 0.3 | 13 |
| 4/07/2018 14:40 | 70218 | Craig Columb | | Levin Landfill: Levin D4 | 0 | 0 | 0 | 20.9 | | | | | 1024 | | Fine | 0 | 13.1 |
| 4/07/2018 14:45 | 70222 | Craig Columb | | Levin Landfill: Levin E1d | 0 | 0 | 0 | 20.9 | | | | | 1024 | | Fine | 0 | 12.3 |
| 4/07/2018 14:50 | 70223 | Craig Columb | | Levin Landfill: Levin E1s | 0 | 0 | 0 | 20.9 | | | | | 1024 | | Fine | 0 | 12.3 |
| 4/07/2018 15:00 | 70211 | Craig Columb | | Levin Landfill: Levin C1 | 0 | 0 | 0 | 18.9 | | | | | 1024 | | Fine | 0.8 | 11.7 |
| 4/07/2018 15:10 | 70317 | Craig Columb | | Levin Landfill: Levin G2s | 0 | 0 | 0 | 20.9 | | | | | 1024 | | Fine | 2.6 | 13 |
| 5/07/2018 9:00 | 70225 | Craig Columb | | Levin Landfill: Levin E2d | 0 | 0 | 0 | 21 | | | | | 1024 | | Fine | 0.2 | 7.8 |
| 5/07/2018 9:05 | 70224 | Craig Columb | | Levin Landfill: Levin E2s | 0 | 0 | 0 | 20.9 | | | | | 1024 | | Fine | 0.2 | 7.8 |
| 5/07/2018 9:25 | 70210 | Craig Columb | | Levin Landfill: Levin B3s | 0 | 0 | 0 | 21.2 | | | | | 1024 | | Fine | 0 | 6 |
| 5/07/2018 9:35 | 70214 | Craig Columb | | Levin Landfill: Levin C2ds | 0 | 0 | 0 | 20.9 | | | | | 1024 | | Fine | 0 | 5.7 |
| 5/07/2018 9:40 | 70213 | Craig Columb | | Levin Landfill: Levin C2dd | 0 | 0 | 0 | 20.9 | | | | | 1024 | | Fine | 0 | 5.7 |
| 5/07/2018 9:50 | 70212 | Craig Columb | | Levin Landfill: Levin C2 | 0 | 0 | 0 | 19 | | | | | 1024 | | Fine | 0.5 | 7.7 |
| 8/10/2018 8:15 | 74612 | Peter Giddins | | Levin Landfill: Levin Landfill | 0 | 0 | 0 | 20.6 | | | | | | | Fine,no wind | | 9 |
| 8/10/2018 8:30 | 74603 | Peter Giddins | | Levin Landfill: Levin D6 | 0.05 | 0.06 | 0 | 20.4 | | | | | | | Fine,no wind | | |
| 8/10/2018 8:50 | 74599 | Peter Giddins | | Levin Landfill: Levin D2 | 0 | 0.16 | 0 | 19.6 | | | | | | | Fine,no wind | | 10 |
| 8/10/2018 9:05 | 74598 | Peter Giddins | | Levin Landfill: Levin D1 | 0 | 0.08 | 0 | 20.9 | | | | | | | Fine,no wind | | 10 |
| 8/10/2018 9:25 | 74615 | Peter Giddins | | Levin Landfill: Levin G1s | 0 | 0.06 | 0 | 20.9 | | | | | | | Fine,light north easterly | | 10 |
| 8/10/2018 9:40 | 74613 | Peter Giddins | | Levin Landfill: Levin G1d | 0.07 | 0.05 | 0 | 20.6 | | | | | | | Fine,light north easterly | | 10 |
| 8/10/2018 9:55 | 74609 | Peter Giddins | | Levin Landfill: Levin F1 | 0.01 | 0.05 | 0 | 20.7 | | | | | | | Fine,no wind | | 11.5 |
| 8/10/2018 10:50 | 74611 | Peter Giddins | | Levin Landfill: Levin F2 | 0 | 0.45 | 0 | 19.5 | | | | | | | Fine,no wind | | 10 |
| 8/10/2018 11:10 | 74610 | Peter Giddins | | Levin Landfill: Levin F3 | 0 | 0.04 | 0 | 21 | | | | | | | Fine,no wind | | 11.5 |

| Created | Entry Number | User | Gps Coordinates | Borehole | Methane (CH4) | Carbon Dioxide (CO2) | Hydrogen Sulphide (H2S) | Oxygen (O2) | Gas flow rate | Nitrogen | Carbon Monoxide (CO) | Gas pressure | Barometric pressure | Temperature | Weather conditions | Wind speed m/sec | Air temperature Â°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8/10/2018 11:25 | 74600 | Peter Giddins | | Levin Landfill: Levin D3 | 0 | 0.7 | 0 | 19.1 | | | | | | | Fine,light north easterly | | 12 |
| 8/10/2018 11:40 | 74602 | Peter Giddins | | Levin Landfill: Levin D5 | 0 | 0.04 | 0 | 21.1 | | | | | | | Fine,no wind | | 14 |
| 8/10/2018 12:00 | 74601 | Peter Giddins | | Levin Landfill: Levin D4 | 0 | 0.08 | 0 | 21 | | | | | | | Fine,light north easterly | | 14.5 |
| 8/10/2018 12:15 | 74604 | Peter Giddins | | Levin Landfill: Levin E1d | 0.02 | 0.08 | 0 | 20.9 | | | | | | | Fine,light north easterly | | 14 |
| 8/10/2018 12:25 | 74605 | Peter Giddins | | Levin Landfill: Levin E1s | 0 | 0.05 | 0 | 21 | | | | | | | Fine,light north easterly | | 14 |
| 8/10/2018 12:30 | 74607 | Peter Giddins | | Levin Landfill: Levin E2d | 0.04 | 0.07 | 0 | 20 | | | | | | | Fine,light north easterly | | 14.5 |
| 8/10/2018 12:40 | 74606 | Peter Giddins | | Levin Landfill: Levin E2s | 0 | 0.07 | 0 | 21.1 | | | | | | | Fine,light north easterly | | 14 |
| 8/10/2018 13:10 | 74593 | Peter Giddins | | Levin Landfill: Levin B3s | 0 | 0.03 | 0 | | | | | | | | Fine,no wind | | 16 |
| 8/10/2018 13:25 | 74595 | Peter Giddins | | Levin Landfill: Levin C2 | 0 | 0.23 | 0 | 19.7 | | | | | | | Fine,light westerly | | 16.5 |
| 8/10/2018 13:35 | 74596 | Peter Giddins | | Levin Landfill: Levin C2dd | 0 | 0.12 | 0 | 21 | | | | | | | Fine,light westerly | | 16 |
| 8/10/2018 13:45 | 74597 | Peter Giddins | | Levin Landfill: Levin C2ds | 0 | 0.26 | 0 | 21 | | | | | | | Fine,light westerly | | 16.5 |
| 8/10/2018 13:50 | 74592 | Peter Giddins | | Levin Landfill: Levin B2 | 0 | 0.3 | 0 | 20.4 | | | | | | | Fine,no wind | | 15.5 |
| 8/10/2018 14:00 | 74591 | Peter Giddins | | Levin Landfill: Levin B1 | 0.04 | 0.78 | 0 | 20.4 | | | | | | | Fine | | 15 |
| 8/10/2018 14:20 | 74594 | Peter Giddins | | Levin Landfill: Levin C1 | 0.03 | 0.05 | 0 | 19.6 | | | | | | | Fine,no wind | | 16.5 |
| 8/10/2018 14:35 | 74616 | Peter Giddins | | Levin Landfill: Levin G2s | 0.01 | 0.19 | 0 | 20.4 | | | | | | | Fine,light westerly | | 17 |
| 7/01/2019 0:00 | 81009 | Paul Hayward | | Levin Landfill: Levin C1 | 0 | 0.02 | 0 | 19.8 | | | | | | | cloudy and still | | 20 |
| 7/01/2019 0:10 | 81029 | Paul Hayward | | Levin Landfill: Levin G2s | 0.01 | 0.16 | 0 | 19.3 | | | | | | | sunny and still | | 21 |
| 7/01/2019 8:10 | 81026 | Paul Hayward | | Levin Landfill: Levin Landfill | 0 | 0.01 | 0 | 20.4 | | | | | | | overcast and still | | 18 |

| Created | Entry Number | User | Gps Coordinates | Borehole | Methane (CH4) | Carbon Dioxide (CO2) | Hydrogen Sulphide (H2S) | Oxygen (O2) | Gas flow rate | Nitrogen | Carbon Monoxide (CO) | Gas pressure | Barometric pressure | Temperature | Weather conditions | Wind speed m/sec | Air temperature Â°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7/01/2019 8:25 | 81018 | Paul Hayward | | Levin Landfill: Levin D6 | 0 | 0.002 | 0 | 20.3 | | | | | | | cloudy and light north west breeze | | 18 |
| 7/01/2019 8:40 | 81027 | Paul Hayward | | Levin Landfill: Levin G1d | 0 | 0 | 0 | 20.5 | | | | | | | overcast and light easterly | | 17 |
| 7/01/2019 8:45 | 81028 | Paul Hayward | | Levin Landfill: Levin G1s | 0 | 0 | 0 | 20.8 | | | | | | | overcast and light easterly | | 17 |
| 7/01/2019 9:00 | 81023 | Paul Hayward | | Levin Landfill: Levin F1 | 0 | 0.01 | 0 | 20.8 | | | | | | | overcast and still | | 19 |
| 7/01/2019 9:05 | 81024 | Paul Hayward | | Levin Landfill: Levin F3 | 0 | 0 | 0 | 20.2 | | | | | | | overcast and still | | 19 |
| 7/01/2019 9:10 | 81013 | Paul Hayward | | Levin Landfill: Levin D1 | 0 | 0.05 | 0 | 20.1 | | | | | | | cloudy and still | | 20 |
| 7/01/2019 9:25 | 81014 | Paul Hayward | | Levin Landfill: Levin D2 | 0 | 0.17 | 0 | 19.9 | | | | | | | cloudy and still | | 20 |
| 7/01/2019 9:50 | 81025 | Paul Hayward | | Levin Landfill: Levin F2 | 0 | 0.01 | 0 | 20.3 | | | | | | | overcast and still | | 20 |
| 7/01/2019 10:40 | 81015 | Paul Hayward | | Levin Landfill: Levin D3 | 0 | 0 | 0 | 20.5 | | | | | | | cloudy and still | | 20 |
| 7/01/2019 11:00 | 81017 | Paul Hayward | | Levin Landfill: Levin D5 | 0 | 0.002 | 0 | 20.4 | | | | | | | cloudy and light north west breeze | | 20 |
| 7/01/2019 11:20 | 81016 | Paul Hayward | | Levin Landfill: Levin D4 | 0 | 0 | 0 | 20.6 | | | | | | | cloudy and still | | 20 |
| 7/01/2019 11:30 | 81020 | Paul Hayward | | Levin Landfill: Levin E1s | 0 | 0.02 | 0 | 20.8 | | | | | | | cloudy and light north west breeze | | 20 |
| 7/01/2019 11:40 | 81019 | Paul Hayward | | Levin Landfill: Levin E1d | 0 | 0.01 | 0 | 20.7 | | | | | | | cloudy and light north west breeze | | 20 |
| 7/01/2019 11:50 | 80986 | Paul Hayward | | Levin Landfill: Levin B1 | 0.03 | 0.7 | 0 | 20 | | | | | | | Cloudy , dry and still | | 20 |
| 7/01/2019 13:15 | 81022 | Paul Hayward | | Levin Landfill: Levin E2d | 0 | 0.04 | 0 | 20.4 | | | | | | | sunny and still | | 21 |

| Created | Entry Number | User | Gps Coordinates | Borehole | Methane (CH4) | Carbon Dioxide (CO2) | Hydrogen Sulphide (H2S) | Oxygen (O2) | Gas flow rate | Nitrogen | Carbon Monoxide (CO) | Gas pressure | Barometric pressure | Temperature | Weather conditions | Wind speed m/sec | Air temperature Â°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7/01/2019 13:24 | 81021 | Paul Hayward | | Levin Landfill: Levin E2s | 0 | 0.05 | 0 | 20.4 | | | | | | | sunny and still | | 21 |
| 7/01/2019 13:35 | 81008 | Paul Hayward | | Levin Landfill: Levin B3s | 0 | 0.02 | 0 | 19.8 | | | | | | | sunny , breeze | | 20 |
| 7/01/2019 13:45 | 81010 | Paul Hayward | | Levin Landfill: Levin C2 | 0 | 0.07 | 0 | 20.3 | | | | | | | sunny and still | | 21 |
| 7/01/2019 13:55 | 81011 | Paul Hayward | | Levin Landfill: Levin C2dd | 0 | 0.05 | 0 | 20.5 | | | | | | | sunny and noth east breeze | | 20 |
| 7/01/2019 14:05 | 81012 | Paul Hayward | | Levin Landfill: Levin C2ds | 0 | 0.2 | 0 | 20.6 | | | | | | | sunny and no breeze | | 20 |
| 7/01/2019 14:15 | 81007 | Paul Hayward | | Levin Landfill: Levin B2 | 0.02 | 0.28 | 0 | 20 | | | | | | | sunny , north east breeze | | 20 |
| 14/03/2019 9:21 | 82156 | Peter Giddins | | | 67 | 32 | 2960 | 0 | | | | | | | | | |
| 3/04/2019 8:10 | 82940 | Peter Giddins | | Levin Landfill: Levin Landfill | 0.02 | 0.03 | 0 | 21 | | | | | | | Fine,no wind | | 15 |
| 3/04/2019 8:20 | 82931 | Peter Giddins | | Levin Landfill: Levin D6 | 0.01 | 0.04 | 0 | 21.2 | | | | | | | Fine,no wind | | 15 |
| 3/04/2019 8:26 | 82929 | Peter Giddins | | Levin Landfill: Levin D4 | 0 | 0.07 | 0 | 20.8 | | | | | | | Sunny,no wind | | 16 |
| 3/04/2019 8:30 | 82942 | Peter Giddins | | Levin Landfill: Levin G1s | 0 | 0.05 | 0 | 21.1 | | | | | | | Sunny,light N/E | | 15 |
| 3/04/2019 8:35 | 82941 | Peter Giddins | | Levin Landfill: Levin G1d | 0.02 | 0.04 | 0 | 20.8 | | | | | | | Sunny,light N/E | | 15 |
| 3/04/2019 8:50 | 82937 | Peter Giddins | | Levin Landfill: Levin F1 | 0 | 0.01 | 0 | 20.9 | | | | | | | Fine,no wind | | 15 |
| 3/04/2019 9:05 | 82925 | Peter Giddins | | Levin Landfill: Levin D1 | 0 | 0.11 | 0 | 21 | | | | | | | Sunny,light easterly | | 15 |
| 3/04/2019 9:15 | 82927 | Peter Giddins | | Levin Landfill: Levin D2 | 0 | 0.18 | 0 | 20.9 | | | | | | | Sunny,no wind | | 16 |
| 3/04/2019 9:25 | 82928 | Peter Giddins | | Levin Landfill: Levin D3 | 0.02 | 0.05 | 0 | 20.2 | | | | | | | Sunny,no wind | | 16 |
| 3/04/2019 10:00 | 82938 | Peter Giddins | | Levin Landfill: Levin F3 | 0 | 0.1 | 0 | 28.8 | | | | | | | Overcast, no wind | | 15 |
| 3/04/2019 10:20 | 82939 | Peter Giddins | | Levin Landfill: Levin F2 | 0 | 0.1 | 0 | 20.6 | | | | | | | Overcast, no wind | | 15 |
| 3/04/2019 10:45 | 82930 | Peter Giddins | | Levin Landfill: Levin D5 | 0 | 0.08 | 0 | 20.8 | | | | | | | Overcast, no wind | | 15 |
| 3/04/2019 11:10 | 82933 | Peter Giddins | | Levin Landfill: Levin E1s | 0 | 0.05 | 0 | 20.7 | | | | | | | Overcast, no wind | | 16 |

| Created | Entry Number | User | Gps Coordinates | Borehole | Methane (CH4) | Carbon Dioxide (CO2) | Hydrogen Sulphide (H2S) | Oxygen (O2) | Gas flow rate | Nitrogen | Carbon Monoxide (CO) | Gas pressure | Barometric pressure | Temperature | Weather conditions | Wind speed m/sec | Air temperature Â°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3/04/2019 11:20 | 82932 | Peter Giddins | | Levin Landfill: Levin E1d | 0 | 0.04 | 0 | 20.8 | | | | | | | Overcast, no wind | | 16 |
| 3/04/2019 12:00 | 82909 | Peter Giddins | | Levin Landfill: Levin B1 | 0 | 0.25 | 0 | 19.8 | | | | | | | Overcast, no wind | | 19 |
| 3/04/2019 12:10 | 82919 | Peter Giddins | | Levin Landfill: Levin C1 | 0 | 0.07 | 0 | 19.8 | | | | | | | Overcast, no wind | | 19 |
| 3/04/2019 12:55 | 82936 | Peter Giddins | | Levin Landfill: Levin E2d | 0 | 0.1 | 0 | 20.3 | | | | | | | Overcast, no wind | | 19 |
| 3/04/2019 13:04 | 82934 | Peter Giddins | | Levin Landfill: Levin E2s | 0 | 0.06 | 0 | 20.4 | | | | | | | Overcast, no wind | | 19 |
| 3/04/2019 13:15 | 82924 | Peter Giddins | | Levin Landfill: Levin C2ds | 0 | 0.14 | 0 | 20.4 | | | | | | | Overcast, no wind | | 19 |
| 3/04/2019 13:25 | 82923 | Peter Giddins | | | 0 | 0.12 | 0 | 20.5 | | | | | | | Overcast, no wind | | 19 |
| 3/04/2019 13:35 | 82922 | Peter Giddins | | Levin Landfill: Levin C2 | 0 | 0.28 | 0 | 20.4 | | | | | | | Overcast, no wind | | 19 |
| 3/04/2019 13:50 | 82913 | Peter Giddins | | Levin Landfill: Levin B3s | 0 | 0.04 | 0 | 20.5 | | | | | | | Overcast, no wind | | 19 |
| 3/04/2019 14:00 | 82911 | Peter Giddins | | Levin Landfill: Levin B2 | 0 | 2.35 | 0 | 18.1 | | | | | | | Overcast, no wind | | 19 |
| 3/04/2019 14:10 | 82943 | Peter Giddins | | Levin Landfill: Levin G2s | 0 | 0.07 | 0 | 19.9 | | | | | | | Overcast, no wind | | 19 |
| 11/07/2019 0:10 | 87619 | Peter Giddins | | Levin Landfill: Levin D4 | 0 | 0.05 | 0 | 20.5 | | | | | | | Overcast, dry and still | | 15 |
| 11/07/2019 9:00 | 87627 | Peter Giddins | | Levin Landfill: Levin F1 | 0.06 | 0.05 | 0 | 20.9 | | | | | | | Overcast, dry and still | | 12 |
| 11/07/2019 9:20 | 87635 | Peter Giddins | | Levin Landfill: Levin G1s | 0.01 | 0.04 | 0 | 20.5 | | | | | | | Overcast, dry and still | | 12 |
| 11/07/2019 9:25 | 87634 | Peter Giddins | | Levin Landfill: Levin G1d | 0.09 | 0.04 | 0 | 20.4 | | | | | | | Overcast, dry and still | | 12 |
| 11/07/2019 9:45 | 87616 | Peter Giddins | | Levin Landfill: Levin D1 | 0 | 0.09 | 0 | 20.1 | | | | | | | Overcast, dry and still | | 12 |
| 11/07/2019 9:55 | 87617 | Peter Giddins | | Levin Landfill: Levin D2 | 0 | 0.19 | 0 | 20 | | | | | | | overcast, dry and still | | 12 |
| 11/07/2019 10:10 | 87621 | Peter Giddins | | Levin Landfill: Levin D6 | 0 | 0.04 | 0 | 20.2 | | | | | | | Overcast, dry and still | | 13 |
| 11/07/2019 10:15 | 87633 | Peter Giddins | | | 0.01 | 0.02 | 0 | 21.2 | | | | | | | Overcast, dry and still | | 13 |

| Created | Entry Number | User | Gps Coordinates | Borehole | Methane (CH4) | Carbon Dioxide (CO2) | Hydrogen Sulphide (H2S) | Oxygen (O2) | Gas flow rate | Nitrogen | Carbon Monoxide (CO) | Gas pressure | Barometric pressure | Temperature | Weather conditions | Wind speed m/sec | Air temperature Â°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11/07/2019 11:10 | 87630 | Peter Giddins | | Levin Landfill: Levin F3 | 0 | 0.05 | 0 | 20.1 | | | | | | | Overcast, dry and still | | 14 |
| 11/07/2019 11:20 | 87618 | Peter Giddins | | Levin Landfill: Levin D3 | 0 | 0.09 | 0 | 20.2 | | | | | | | Overcast, dry and still | | 14 |
| 11/07/2019 11:50 | 87620 | Peter Giddins | | Levin Landfill: Levin D5 | 0 | 0.07 | 0 | 20 | | | | | | | Overcast, dry and still | | 14 |
| 11/07/2019 12:20 | 87623 | Peter Giddins | | Levin Landfill: Levin E1s | 0 | 0.04 | 0 | 20.1 | | | | | | | Overcast, dry and still | | 15 |
| 11/07/2019 12:35 | 87622 | Peter Giddins | | Levin Landfill: Levin E1d | 0 | 0.06 | 0 | 20.1 | | | | | | | Overcast, dry and still | | 15 |
| 11/07/2019 13:05 | 87607 | Peter Giddins | | Levin Landfill: Levin B1 | 0 | 0.28 | 0 | 19.8 | | | | | | | | | |
| 11/07/2019 13:15 | 87626 | Peter Giddins | | Levin Landfill: Levin E2d | 0 | 0.12 | 0 | 20 | | | | | | | Overcast, dry and still | | 14 |
| 11/07/2019 13:20 | 87624 | Peter Giddins | | Levin Landfill: Levin E2s | 0 | 0.07 | 0 | 20 | | | | | | | Overcast, dry and still | | 15 |
| 11/07/2019 13:35 | 87615 | Peter Giddins | | Levin Landfill: Levin C2ds | 0 | 0.2 | 0 | 19.7 | | | | | | | Overcast, dry and still | | 15 |
| 11/07/2019 13:40 | 87614 | Peter Giddins | | Levin Landfill: Levin C2dd | 0 | 0.13 | 0 | 19.8 | | | | | | | Overcast, dry and still | | 15 |
| 11/07/2019 13:45 | 87612 | Peter Giddins | | Levin Landfill: Levin C2 | 0 | 0.11 | 0 | 19.7 | | | | | | | Overcast, dry and still | | 15 |
| 11/07/2019 13:50 | 87610 | Peter Giddins | | Levin Landfill: Levin B3s | 0 | 0.05 | 0 | 20 | | | | | | | Overcast, dry and still | | 15 |
| 11/07/2019 13:55 | 87609 | Peter Giddins | | Levin Landfill: Levin B2 | 0.01 | 2.68 | 0 | 19 | | | | | | | Overcast, dry and still | | 12 |
| 11/07/2019 14:10 | 87611 | Peter Giddins | | Levin Landfill: Levin C1 | 0 | 0.05 | 0 | 19.9 | | | | | | | Overcast, dry and still | | 15 |
| 11/07/2019 14:40 | 87637 | Peter Giddins | | Levin Landfill: Levin G2s | 0.02 | 0.31 | 0 | 19.4 | | | | | | | Overcast, dry and still | | 15 |

| Created | Entry Number | User | Gps Coordinates | Borehole | Methane (CH4) | Carbon Dioxide (CO2) | Hydrogen Sulphide (H2S) | Oxygen (O2) | Gas flow rate | Nitrogen | Carbon Monoxide (CO) | Gas pressure | Barometric pressure | Temperature | Weather conditions | Wind speed m/sec | Air temperature Â°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11/07/2019 22:55 | 87628 | Peter Giddins | | Levin Landfill: Levin F2 | 0 | 0.05 | 0 | 20.1 | | | | | | | Overcast, dry and still | | 14 |
| 3/10/2019 8:10 | 94186 | Peter Giddins | | Levin Landfill: Levin F1 | 0 | 0 | 0 | 21 | | | | | | | Fine and sunny | | 13 |
| 3/10/2019 8:20 | 94191 | Peter Giddins | | Levin Landfill: Levin G1d | 0 | 0 | 0 | 21.1 | | | | | | | Fine and sunny | | 13 |
| 3/10/2019 8:30 | 94192 | Peter Giddins | | Levin Landfill: Levin G1s | 0 | 0 | 0 | 21.1 | | | | | | | Fine and sunny | | 13 |
| 3/10/2019 8:45 | 94174 | Peter Giddins | | Levin Landfill: Levin D2 | 0.01 | 0 | 0 | 20.9 | | | | | | | Fine and sunny | | 13 |
| 3/10/2019 9:00 | 94173 | Peter Giddins | | Levin Landfill: Levin D1 | 0 | 0 | 0 | 21 | | | | | | | Fine and sunny | | 13 |
| 3/10/2019 9:10 | 94190 | Peter Giddins | | Levin Landfill: Levin Landfill | 0 | 0 | 0 | 21.1 | | | | | | | Fine and sunny | | 13 |
| 3/10/2019 9:15 | 94178 | Peter Giddins | | Levin Landfill: Levin D6 | 0 | 0 | 0 | 21.1 | | | | | | | Fine and sunny | | 13 |
| 3/10/2019 9:25 | 94188 | Peter Giddins | | Levin Landfill: Levin F2 | 0 | 0 | 0 | 20.9 | | | | | | | Fine and sunny | | 13 |
| 3/10/2019 9:40 | 94187 | Peter Giddins | | Levin Landfill: Levin F3 | 0 | 0 | 0 | 21.1 | | | | | | | Fine and sunny | | 13 |
| 3/10/2019 10:20 | 94175 | Peter Giddins | | Levin Landfill: Levin D3 | 0.02 | 0 | 0 | 20.3 | | | | | | | Fine and sunny | | 14 |
| 3/10/2019 10:45 | 94177 | Peter Giddins | | Levin Landfill: Levin D5 | 0.01 | 0 | 0 | 21.1 | | | | | | | Fine and sunny | | 13 |
| 3/10/2019 11:05 | 94176 | Peter Giddins | | Levin Landfill: Levin D4 | 0 | 0 | 0 | 20.9 | | | | | | | Fine and sunny | | 14 |
| 3/10/2019 11:10 | 94181 | Peter Giddins | | Levin Landfill: Levin E1s | 0 | 0 | 0 | 20.9 | | | | | | | Fine and sunny | | 14 |
| 3/10/2019 11:15 | 94180 | Peter Giddins | | Levin Landfill: Levin E1d | 0 | 0 | 0 | 20.9 | | | | | | | Fine and sunny | | 14 |
| 3/10/2019 11:30 | 94163 | Peter Giddins | | Levin Landfill: Levin B1 | 0.01 | 0 | 0 | 20.6 | | | | | | | Fine and sunny | | 14 |
| 3/10/2019 11:35 | 94169 | Peter Giddins | | Levin Landfill: Levin C1 | 0 | 0 | 0 | 0 | | | | | | | Fine and sunny. Bore full to top of pipe. | | 15 |
| 3/10/2019 11:40 | 94193 | Peter Giddins | | Levin Landfill: Levin G2s | 0.02 | 0 | 0 | 20.7 | | | | | | | Fine and sunny | | 14 |
| 3/10/2019 12:45 | 94170 | Peter Giddins | | Levin Landfill: Levin C2 | 0.07 | 0 | 0 | 15.9 | | | | | | | Fine and sunny | | 14 |
| 3/10/2019 12:50 | 94171 | Peter Giddins | | Levin Landfill: Levin C2dd | 0.02 | 0 | 0 | 20.6 | | | | | | | Fine and sunny | | 15 |
| 3/10/2019 12:55 | 94172 | Peter Giddins | | Levin Landfill: Levin C2ds | 0.02 | 0 | 0 | 20.7 | | | | | | | Fine and sunny | | 15 |

| Created | Entry Number | User | Gps Coordinates | Borehole | Methane (CH4) | Carbon Dioxide (CO2) | Hydrogen Sulphide (H2S) | Oxygen (O2) | Gas flow rate | Nitrogen | Carbon Monoxide (CO) | Gas pressure | Barometric pressure | Temperature | Weather conditions | Wind speed m/sec | Air temperature Â°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3/10/2019 13:00 | 94185 | Peter Giddins | | Levin Landfill: Levin E2d | 0 | 0 | 0 | 21 | | | | | | | Fine and sunny | | 15 |
| 3/10/2019 13:05 | 94183 | Peter Giddins | | Levin Landfill: Levin E2s | 0 | 0 | 0 | 20.9 | | | | | | | Fine and sunny | | 15 |
| 3/10/2019 13:10 | 94167 | Peter Giddins | | Levin Landfill: Levin B3s | 0.02 | 0 | 0 | 19.8 | | | | | | | Fine and sunny | | 15 |
| 3/10/2019 13:20 | 94165 | Peter Giddins | | Levin Landfill: Levin B2 | 0.03 | 0 | 0 | 19 | | | | | | | Fine and sunny | | 15 |
| 3/10/2019 23:40 | 94194 | Peter Giddins | | Levin Landfill: Levin G2s | | | | 20.7 | | | | | | | | | |
| 7/01/2020 8:08 | 97362 | Paul Hayward | | Levin Landfill: Levin G2s | 0 | 0.06 | 0 | 21 | | | | | | 16 | fine , still | | |
| 7/01/2020 8:20 | 97363 | Paul Hayward | | Levin Landfill: Levin C1 | 0 | 0.05 | 0 | 21 | | | | | | | Fine , Still | | 16 |
| 7/01/2020 8:35 | 97364 | Paul Hayward | | Levin Landfill: Levin E2d | 0 | 0.05 | 0 | 20.8 | | | | | | | Fine , Still | | 17 |
| 7/01/2020 8:35 | 97365 | Paul Hayward | | Levin Landfill: Levin E2s | 0 | 0.06 | 0 | 20.7 | | | | | | | Fine , Still | | 17 |
| 7/01/2020 8:57 | 97366 | Paul Hayward | | Levin Landfill: Levin C2 | 0 | 0.06 | 0 | 20.5 | | | | | | | Fine , Still | | 17 |
| 7/01/2020 9:00 | 97367 | Paul Hayward | | Levin Landfill: Levin C2dd | 0 | 0.15 | 0 | 20.7 | | | | | | | Fine , Still | | 17 |
| 7/01/2020 9:10 | 97368 | Paul Hayward | | Levin Landfill: Levin C2dd | 0 | 0.1 | 0 | 20.9 | | | | | | | Fine , Still | | 17 |
| 7/01/2020 9:23 | 97369 | Paul Hayward | | Levin Landfill: Levin B3s | 0 | 0.03 | 0 | 20.9 | | | | | | | Fine , Still | | 17 |
| 7/01/2020 9:28 | 97370 | Paul Hayward | | Levin Landfill: Levin B2 | 0 | 0.07 | 0 | 20.8 | | | | | | | Fine , Still | | 17 |
| 7/01/2020 9:28 | 97371 | Paul Hayward | | Levin Landfill: Levin B1 | 0 | 0.13 | 0 | 20.6 | | | | | | | Fine , Still | | 17 |
| 7/01/2020 10:10 | 97372 | Paul Hayward | | Levin Landfill: Levin E1d | 0 | 0.03 | 0 | 20.6 | | | | | | | Fine , Still | | 17 |
| 7/01/2020 10:12 | 97373 | Paul Hayward | | Levin Landfill: Levin E1s | 0.01 | 0.03 | 0 | 20.6 | | | | | | | Fine , Still | | 17 |
| 7/01/2020 10:23 | 97375 | Paul Hayward | | Levin Landfill: Levin D4 | 0.08 | 0.03 | 0 | 20.8 | | | | | | | Fine , Still | | 17 |
| 7/01/2020 10:23 | 97376 | Paul Hayward | | Levin Landfill: Levin D5 | 0 | 0.04 | 0 | 20.9 | | | | | | | Fine , Still | | 17 |
| 7/01/2020 10:42 | 97377 | Paul Hayward | | Levin Landfill: Levin D3r | 0.08 | 0.01 | 0 | 20.1 | | | | | | | Fine , Still | | 17 |
| 7/01/2020 10:50 | 97378 | Paul Hayward | | Levin Landfill: Levin F3 | 0 | 0.05 | 0 | 21.08 | | | | | | | Fine , Still | | 17 |
| 7/01/2020 11:06 | 97379 | Paul Hayward | | Levin Landfill: Levin F2 | 0 | 0.05 | 0 | 22 | | | | | | | Fine , Still | | 17 |
| 7/01/2020 11:06 | 97380 | Paul Hayward | | Levin Landfill: Levin F2 | 0 | 0.05 | 0 | 22 | | | | | | | Fine , Still | | 17 |

| Created | Entry Number | User | Gps Coordinates | Borehole | Methane (CH4) | Carbon Dioxide (CO2) | Hydrogen Sulphide (H2S) | Oxygen (O2) | Gas flow rate | Nitrogen | Carbon Monoxide (CO) | Gas pressure | Barometric pressure | Temperature | Weather conditions | Wind speed m/sec | Air temperature Â°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7/01/2020 11:15 | 97381 | Paul Hayward | | Levin Landfill: Levin F1 | 0 | 0.02 | 0 | 21.1 | | | | | | | Fine , Still | | 17 |
| 7/01/2020 11:28 | 97382 | Paul Hayward | | Levin Landfill: Levin D2 | 0.05 | 0.11 | 0 | 20.6 | | | | | | | Fine , Still | | 17 |
| 7/01/2020 11:40 | 97383 | Paul Hayward | | Levin Landfill: Levin D1 | 0 | 0.04 | 0 | 20.8 | | | | | | | Fine , Still | | 17 |
| 7/01/2020 11:40 | 97384 | Paul Hayward | | Levin Landfill: Levin D6 | 0 | 0.03 | 0 | 20.7 | | | | | | | Fine , Still | | 17 |
| 7/01/2020 12:35 | 97385 | Paul Hayward | | Levin Landfill: Levin G1s | 0 | 0.04 | 0 | 21.2 | | | | | | | Fine , Still | | 17 |
| 7/01/2020 12:40 | 97386 | Paul Hayward | | Levin Landfill: Levin G1d | 0 | 0.05 | 0 | 21 | | | | | | | Fine , Still | | 17 |
| 31/03/2020 8:44 | 100301 | Paul Hayward | | Levin Landfill: Levin G1d | 0 | 0.03 | 0 | 20.9 | | | | | | | sunny , dry | | 15 |
| 31/03/2020 8:48 | 100302 | Paul Hayward | | Levin Landfill: Levin G1s | 0 | 0.05 | 0 | 21 | | | | | | | sunny , dry | | 15 |
| 31/03/2020 9:00 | 100298 | Paul Hayward | | Levin Landfill: Levin F1 | 0 | 0.03 | 0 | 21.2 | | | | | | | sunny , dry | | 15 |
| 31/03/2020 9:12 | 100287 | Paul Hayward | | Levin Landfill: Levin D2 | 0 | 0.07 | 0 | 20.9 | | | | | | | sunny , dry | | 16 |
| 31/03/2020 9:25 | 100286 | Paul Hayward | | Levin Landfill: Levin D1 | 0 | 0.08 | 0 | 20.7 | | | | | | | sunny , dry | | 16 |
| 31/03/2020 9:32 | 100292 | Paul Hayward | | Levin Landfill: Levin D6 | 0 | 0.04 | 0 | 20.6 | | | | | | | sunny , dry | | 16 |
| 31/03/2020 9:45 | 100288 | Paul Hayward | | Levin Landfill: Levin D3 | 0 | 0.03 | 0 | 20.7 | | | | | | | sunny , dry | | 16 |
| 31/03/2020 9:50 | 100299 | Paul Hayward | | Levin Landfill: Levin F3 | 0 | 0.02 | 0 | 21 | | | | | | | sunny , dry | | 16 |
| 31/03/2020 10:00 | 100300 | Paul Hayward | | Levin Landfill: Levin F2 | 0 | 0.05 | 0 | 21.3 | | | | | | | sunny , dry | | 16 |
| 31/03/2020 10:10 | 100293 | Paul Hayward | | Levin Landfill: Levin E1d | 0 | 0.04 | 0 | 21.5 | | | | | | | sunny , dry | | 16 |
| 31/03/2020 10:15 | 100294 | Paul Hayward | | Levin Landfill: Levin E1s | 0 | 0.03 | 0 | 21.6 | | | | | | | sunny , dry | | 16 |
| 31/03/2020 10:22 | 100290 | Paul Hayward | | Levin Landfill: Levin D4 | 0 | 0.08 | 0 | 21.6 | | | | | | | sunny , dry | | 16 |
| 31/03/2020 10:35 | 100291 | Paul Hayward | | Levin Landfill: Levin D5 | 0 | 0.06 | 0 | 21.5 | | | | | | | sunny , dry | | 16 |
| 31/03/2020 11:25 | 100296 | Paul Hayward | | Levin Landfill: Levin E2d | 0 | 0.04 | 0 | 21.1 | | | | | | | sunny , dry | | 17 |
| 31/03/2020 11:30 | 100295 | Paul Hayward | | Levin Landfill: Levin E2s | 0 | 0.04 | 0 | 21.2 | | | | | | | sunny , dry | | 16 |
| 31/03/2020 11:40 | 100281 | Paul Hayward | | Levin Landfill: Levin B3s | 0 | 0.04 | 0 | 21.5 | | | | | | | sunny , dry | | 17 |
| 31/03/2020 11:55 | 100283 | Paul Hayward | | Levin Landfill: Levin C2 | 0 | 0.05 | 0 | 21.5 | | | | | | | sunny , dry | | 17 |

| Created | Entry Number | User | Gps Coordinates | Borehole | Methane (CH4) | Carbon Dioxide (CO2) | Hydrogen Sulphide (H2S) | Oxygen (O2) | Gas flow rate | Nitrogen | Carbon Monoxide (CO) | Gas pressure | Barometric pressure | Temperature | Weather conditions | Wind speed m/sec | Air temperature Â°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 31/03/2020 12:00 | 100284 | Paul Hayward | | Levin Landfill: Levin C2dd | 0 | 0.08 | 0 | 21.4 | | | | | | | sunny , dry | | 17 |
| 31/03/2020 12:10 | 100285 | Paul Hayward | | Levin Landfill: Levin C2ds | 0 | 0.18 | 0 | 21.2 | | | | | | | sunny , dry | | 17 |
| 31/03/2020 12:15 | 100280 | Paul Hayward | | Levin Landfill: Levin B2 | 0 | 0.13 | 0 | 21.3 | | | | | | | sunny , dry | | 17 |
| 31/03/2020 12:25 | 100279 | Paul Hayward | | Levin Landfill: Levin B1 | 0 | 0.08 | 0 | 21.2 | | | | | | 17 | sunny , dry | | |
| 31/03/2020 12:35 | 100282 | Paul Hayward | | Levin Landfill: Levin C1 | 0 | 0.07 | 0 | 20.7 | | | | | | | sunny , dry | | 17 |
| 31/03/2020 12:44 | 100303 | Paul Hayward | | Levin Landfill: Levin G2s | 0 | 0.03 | 0 | 20.6 | | | | | | | sunny , dry | | 15 |
| 6/07/2020 14:20 | 103962 | Peter Giddins | | Levin Landfill: Levin B1 | 0 | 0.73 | 0 | 20.3 | | | | | | | wet | | |
| 6/07/2020 14:24 | 103963 | Peter Giddins | | Levin Landfill: Levin B2 | 0 | 0.29 | 0 | 20.8 | | | | | | | wet | | |
| 6/07/2020 14:25 | 103964 | Peter Giddins | | Levin Landfill: Levin B3s | 0 | 0 | 0 | 20.3 | | | | | | | cloudy | | |
| 6/07/2020 14:26 | 103965 | Peter Giddins | | Levin Landfill: Levin C1 | 0 | 1.28 | 0 | 20.5 | | | | | | | wet | | |
| 6/07/2020 14:27 | 103966 | Peter Giddins | | Levin Landfill: Levin C2 | 0 | 0 | 0 | 21.2 | | | | | | | cloudy | | |
| 6/07/2020 14:27 | 103967 | Peter Giddins | | Levin Landfill: Levin C2dd | 0 | 0.08 | 0 | 21.2 | | | | | | | cloudy | | |
| 6/07/2020 14:28 | 103968 | Peter Giddins | | Levin Landfill: Levin C2ds | 0 | 0.41 | 0 | 21 | | | | | | | cloudy | | |
| 6/07/2020 14:29 | 103969 | Peter Giddins | | Levin Landfill: Levin D1 | 0 | 0.12 | 0 | 21 | | | | | | | cloudy | | |
| 6/07/2020 14:30 | 103970 | Peter Giddins | | Levin Landfill: Levin D2 | 0 | 0.19 | 0 | 20.9 | | | | | | | cloudy | | |
| 6/07/2020 14:31 | 103971 | Peter Giddins | | Levin Landfill: Levin D3 | 0.01 | 0.03 | 0 | 20.9 | | | | | | | cloudy | | |
| 6/07/2020 14:32 | 103972 | Peter Giddins | | Levin Landfill: Levin D4 | 0.07 | 0.09 | 0 | 20.8 | | | | | | | cloudy | | |
| 6/07/2020 14:33 | 103973 | Peter Giddins | | Levin Landfill: Levin D5 | 0.05 | 0.09 | 0 | 20.8 | | | | | | | sunny | | |
| 6/07/2020 14:33 | 103975 | Peter Giddins | | Levin Landfill: Levin D6 | 0 | 0.08 | 0 | 21.1 | | | | | | | sunny | | |
| 6/07/2020 14:34 | 103976 | Peter Giddins | | Levin Landfill: Levin E1d | 0.02 | 0 | 5 | 0 | 20.8 | | | | | | sunny | | |
| 6/07/2020 14:34 | 103977 | Peter Giddins | | Levin Landfill: Levin E1s | 0.07 | 0.06 | 0 | 20.8 | | | | | | | cloudy | | |
| 6/07/2020 14:38 | 103978 | Peter Giddins | | Levin Landfill: Levin E2d | 0 | 0.06 | 0 | 21.3 | | | | | | | sunny | | |
| 6/07/2020 14:40 | 103979 | Peter Giddins | | Levin Landfill: Levin E2s | 0 | 0.02 | 0 | 21 | | | | | | | sunny | | |

| Created | Entry Number | User | Gps Coordinates | Borehole | Methane (CH4) | Carbon Dioxide (CO2) | Hydrogen Sulphide (H2S) | Oxygen (O2) | Gas flow rate | Nitrogen | Carbon Monoxide (CO) | Gas pressure | Barometric pressure | Temperature | Weather conditions | Wind speed m/sec | Air temperature Â°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6/07/2020 14:41 | 103980 | Peter Giddins | | Levin Landfill: Levin F1 | 0 | 0.03 | 0 | 21 | | | | | | | sunny | | |
| 6/07/2020 14:42 | 103981 | Peter Giddins | | Levin Landfill: Levin F3 | 0.1 | 0.04 | 0 | 20.9 | | | | | | | sunny | | |
| 6/07/2020 14:43 | 103982 | Peter Giddins | | Levin Landfill: Levin F2 | 0.03 | 0.05 | 0 | 20.9 | | | | | | | sunny | | |
| 6/07/2020 14:44 | 103983 | Peter Giddins | | Levin Landfill: Levin G1d | 0.06 | 0.03 | 0 | 20.9 | | | | | | | raining | | |
| 6/07/2020 14:44 | 103984 | Peter Giddins | | Levin Landfill: Levin G1s | 0.13 | 0.03 | 0 | 20.9 | | | | | | | raining | | |
| 6/07/2020 14:45 | 103985 | Peter Giddins | | Levin Landfill: Levin G2s | 0.01 | 0.01 | 0 | 21 | | | | | | | raining | | |
| 1/10/2020 13:34 | 110046 | Bianca Mella | | Levin Landfill: Levin B1 | 0.06 | 0 | 0 | 20.7 | | | | | | | sunny | | |
| 1/10/2020 13:35 | 110047 | Bianca Mella | | Levin Landfill: Levin B2 | 0.04 | 0.67 | 0 | 19.4 | | | | | | | sunny | | |
| 1/10/2020 13:36 | 110048 | Bianca Mella | | Levin Landfill: Levin B3s | 0.07 | 0 | 0 | 20.9 | | | | | | | sunny | | |
| 1/10/2020 13:37 | 110049 | Bianca Mella | | Levin Landfill: Levin C1 | 0.02 | 0 | 0 | 20.9 | | | | | | | sunny | | |
| 1/10/2020 13:37 | 110050 | Bianca Mella | | Levin Landfill: Levin C2 | 0.01 | 0.04 | 0 | 21 | | | | | | | sunny | | |
| 1/10/2020 13:40 | 110051 | Bianca Mella | | Levin Landfill: Levin C2dd | 0 | 0.15 | 0 | 20.9 | | | | | | | sunny | | |
| 1/10/2020 13:41 | 110052 | Bianca Mella | | Levin Landfill: Levin C2ds | 0.03 | 0.08 | 0 | 20.7 | | | | | | | sunny | | |
| 1/10/2020 13:42 | 110054 | Bianca Mella | | Levin Landfill: Levin D1 | 0 | 0.16 | 0 | 20.2 | | | | | | | sunny | | |
| 1/10/2020 13:44 | 110055 | Bianca Mella | | Levin Landfill: Levin D2 | 0 | 0.3 | 0 | 20.3 | | | | | | | sunny | | |
| 1/10/2020 13:44 | 110056 | Bianca Mella | | Levin Landfill: Levin D3 | 0 | 0.33 | 0 | 20.4 | | | | | | | sunny | | |
| 1/10/2020 13:45 | 110057 | Bianca Mella | | Levin Landfill: Levin D4 | 0.04 | 0 | 0 | 21.3 | | | | | | | sunny | | |
| 1/10/2020 13:46 | 110058 | Bianca Mella | | Levin Landfill: Levin D5 | 0 | 0.12 | 0 | 20.6 | | | | | | | sunny | | |
| 1/10/2020 13:46 | 110059 | Bianca Mella | | Levin Landfill: Levin D6 | 0 | 0.12 | 0 | 20.3 | | | | | | | sunny | | |
| 1/10/2020 13:47 | 110060 | Bianca Mella | | Levin Landfill: Levin E1d | 0 | 0 | 0 | 21.6 | | | | | | | sunny | | |
| 1/10/2020 13:47 | 110061 | Bianca Mella | | Levin Landfill: Levin E1s | 0 | 0 | 0 | 21.5 | | | | | | | sunny | | |
| 1/10/2020 13:48 | 110062 | Bianca Mella | | Levin Landfill: Levin E2s | 0.01 | 0 | 0 | 20.5 | | | | | | | sunny | | |
| 1/10/2020 13:49 | 110063 | Bianca Mella | | Levin Landfill: Levin E2d | 0.08 | 0 | 0 | 20.3 | | | | | | | sunny | | |

| Created | Entry Number | User | Gps Coordinates | Borehole | Methane (CH4) | Carbon Dioxide (CO2) | Hydrogen Sulphide (H2S) | Oxygen (O2) | Gas flow rate | Nitrogen | Carbon Monoxide (CO) | Gas pressure | Barometric pressure | Temperature | Weather conditions | Wind speed m/sec | Air temperature Â°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/10/2020 13:49 | 110064 | Bianca Mella | | Levin Landfill: Levin F1 | 0 | 0.07 | 0 | 21.2 | | | | | | | sunny | | |
| 1/10/2020 13:50 | 110065 | Bianca Mella | | Levin Landfill: Levin F3 | 0 | 0.11 | 0 | 20.6 | | | | | | | sunny | | |
| 1/10/2020 13:51 | 110066 | Bianca Mella | | Levin Landfill: Levin F2 | 0 | 0.09 | 0 | 20.9 | | | | | | | sunny | | |
| 1/10/2020 13:52 | 110067 | Bianca Mella | | Levin Landfill: Levin G1d | 0 | 0.03 | 0 | 20.8 | | | | | | | sunny | | |
| 1/10/2020 13:52 | 110068 | Bianca Mella | | Levin Landfill: Levin G1s | 0 | 0.04 | 0 | 20.6 | | | | | | | sunny | | |
| 1/10/2020 13:53 | 110069 | Bianca Mella | | Levin Landfill: Levin G2s | 0.07 | 0.03 | 0 | 19.9 | | | | | | | sunny | | |
| 5/01/2021 19:46 | 113433 | Elysia Kinross | | Levin Landfill: Levin B1 | 0.62 | 0.13 | 0 | 20.6 | | | | | | | Sunny | | 18 |
| 5/01/2021 19:50 | 113434 | Elysia Kinross | | Levin Landfill: Levin B2 | 0.71 | 0.16 | 0 | 20.4 | | | | | | | Sunny | | 18 |
| 5/01/2021 19:51 | 113435 | Elysia Kinross | | Levin Landfill: Levin B3s | 0.09 | 0.03 | 0 | 21 | | | | | | | Sunny | | 18 |
| 5/01/2021 19:52 | 113436 | Elysia Kinross | | Levin Landfill: Levin C1 | 0.08 | 0.23 | 0 | 20.8 | | | | | | | Sunny | | 18 |
| 5/01/2021 19:53 | 113437 | Elysia Kinross | | Levin Landfill: Levin C2 | 0.73 | 21.5 | 0 | 21.5 | | | | | | | Sunny | | 18 |
| 5/01/2021 19:54 | 113438 | Elysia Kinross | | Levin Landfill: Levin C2dd | 0.16 | 0.1 | 0 | 21.3 | | | | | | | Sunny | | 18 |
| 5/01/2021 19:55 | 113439 | Elysia Kinross | | Levin Landfill: Levin C2ds | 0.17 | 0.08 | 0 | 21.1 | | | | | | | Sunny | | 18 |
| 5/01/2021 19:56 | 113440 | Elysia Kinross | | Levin Landfill: Levin D1 | 0.65 | 0 | 0 | 20.5 | | | | | | | Sunnny | | 21 |
| 5/01/2021 19:57 | 113441 | Elysia Kinross | | Levin Landfill: Levin D2 | 0 | 0.28 | 0 | 21 | | | | | | | Sunny | | 21 |
| 5/01/2021 19:58 | 113442 | Elysia Kinross | | Levin Landfill: Levin D3 | 0.94 | 0.03 | 0 | 203 | | | | | | | Sunny | | 21 |
| 5/01/2021 19:59 | 113443 | Elysia Kinross | | Levin Landfill: Levin D4 | 0.95 | 0.04 | 0 | 20.9 | | | | | | | Sunny | | 21 |
| 5/01/2021 20:00 | 113444 | Elysia Kinross | | Levin Landfill: Levin D5 | 0.04 | 0.04 | 0 | 20.9 | | | | | | | Sunny | | 21 |
| 5/01/2021 20:01 | 113445 | Elysia Kinross | | Levin Landfill: Levin D6 | 0.7 | 0.6 | 0 | 21.1 | | | | | | | Sunny | | 21 |
| 5/01/2021 20:03 | 113446 | Elysia Kinross | | Levin Landfill: Levin E1d | 0.69 | 0.04 | 0 | 21.1 | | | | | | | Sunnny | | 21 |
| 5/01/2021 20:04 | 113447 | Elysia Kinross | | Levin Landfill: Levin E1s | 0.84 | 0.05 | 0 | 21.1 | | | | | | | Sunny | | 21 |
| 5/01/2021 20:05 | 113448 | Elysia Kinross | | Levin Landfill: Levin E2s | 0 | 0.09 | 0 | 21 | | | | | | | Sunny | | 18 |
| 5/01/2021 20:06 | 113449 | Elysia Kinross | | Levin Landfill: Levin E2d | 0 | 0.14 | 0 | 20.4 | | | | | | | Sunny | | 18 |

| Created | Entry Number | User | Gps Coordinates | Borehole | Methane (CH4) | Carbon Dioxide (CO2) | Hydrogen Sulphide (H2S) | Oxygen (O2) | Gas flow rate | Nitrogen | Carbon Monoxide (CO) | Gas pressure | Barometric pressure | Temperature | Weather conditions | Wind speed m/sec | Air temperature Â°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5/01/2021 20:07 | 113450 | Elysia Kinross | | Levin Landfill: Levin F1 | 0.75 | 0 | 0 | 20.7 | | | | | | | Sunny | | 21 |
| 5/01/2021 20:08 | 113451 | Elysia Kinross | | Levin Landfill: Levin F2 | 0.45 | 0.02 | 0 | 20.6 | | | | | | | Sunny | | 21 |
| 5/01/2021 20:09 | 113452 | Elysia Kinross | | Levin Landfill: Levin F3 | 0.91 | 0.02 | 0 | 20.5 | | | | | | | Sunny | | 21 |
| 5/01/2021 20:11 | 113453 | Elysia Kinross | | Levin Landfill: Levin G1d | 0.24 | 0.07 | 0 | 20.9 | | | | | | | Sunny | | 21 |
| 5/01/2021 20:12 | 113454 | Elysia Kinross | | Levin Landfill: Levin G1s | 0.49 | 0.07 | 0 | 20.9 | | | | | | | Sunny | | 21 |
| 5/01/2021 20:12 | 113455 | Elysia Kinross | | Levin Landfill: Levin G2s | 0.09 | 0.6 | 0 | 20.7 | | | | | | | Sunny | | 18 |
| 2/03/2021 7:53 | 115271 | Peter Giddins | | Levin Landfill: Levin Xd1 | 0 | 0.06 | 0 | 20.8 | | | | | | 17 | | | |
| 2/03/2021 9:21 | 115272 | Peter Giddins | | Levin Landfill: Levin Xs2 | 0 | 0.03 | 0 | 20.9 | | | | | | | | | 17 |
| 2/03/2021 10:10 | 115273 | Peter Giddins | | Levin Landfill: Levin Xs1 | 0.04 | 0.08 | 0 | 21 | | | | | | | | | 19 |
| 8/04/2021 11:30 | 118950 | Elysia Kinross | | Levin Landfill: Levin G2s | 0 | 0.03 | 0 | 20.8 | | | | | | | | | 20 |
| 8/04/2021 11:42 | 118915 | Elysia Kinross | | Levin Landfill: Levin B1 | 0 | 0.11 | 0 | 20.5 | | | | | | | | | 19 |
| 8/04/2021 11:52 | 118946 | Elysia Kinross | | Levin Landfill: Levin Landfill | 0 | 0.05 | 0 | 20.7 | | | | | | | | | 20 |
| 8/04/2021 12:00 | 118929 | Elysia Kinross | | Levin Landfill: Levin D6 | 0 | 0.1 | 0 | 20.3 | | | | | | | | | 20 |
| 8/04/2021 12:28 | 118943 | Elysia Kinross | | Levin Landfill: Levin F1 | 0 | 0.05 | 0 | 21 | | | | | | | | | 18 |
| 8/04/2021 12:55 | 118947 | Elysia Kinross | | Levin Landfill: Levin G1d | 0 | 0.05 | 0 | 20.4 | | | | | | | | | 18 |
| 8/04/2021 13:00 | 118949 | Elysia Kinross | | Levin Landfill: Levin G1s | 0 | 0.13 | 0 | 20.5 | | | | | | | | | 18 |
| 8/04/2021 13:12 | 118922 | Elysia Kinross | | Levin Landfill: Levin D1 | 0 | 0.15 | 0 | 20.1 | | | | | | | | | 20 |
| 8/04/2021 13:20 | 118923 | Elysia Kinross | | Levin Landfill: Levin D2 | 0.02 | 0.36 | 0 | 19.3 | | | | | | | | | 19 |
| 8/04/2021 13:40 | 118945 | Elysia Kinross | | Levin Landfill: Levin F2 | 0 | 0.45 | 0 | 20.2 | | | | | | | | | 19 |
| 8/04/2021 13:50 | 118944 | Elysia Kinross | | Levin Landfill: Levin F3 | 0 | 0.08 | 0 | 20.8 | | | | | | | | | 19 |
| 8/04/2021 14:00 | 118925 | Elysia Kinross | | Levin Landfill: Levin D3 | 0 | 0.06 | 0 | 20.8 | | | | | | | | | 19 |
| 8/04/2021 14:20 | 118927 | Elysia Kinross | | Levin Landfill: Levin D5 | 0 | 0.14 | 0 | 20.8 | | | | | | | | | 19 |
| 8/04/2021 14:30 | 118926 | Elysia Kinross | | Levin Landfill: Levin D4 | 0 | 0.09 | 0 | 20.8 | | | | | | | | | 19 |

| Created | Entry Number | User | Gps Coordinates | Borehole | Methane (CH4) | Carbon Dioxide (CO2) | Hydrogen Sulphide (H2S) | Oxygen (O2) | Gas flow rate | Nitrogen | Carbon Monoxide (CO) | Gas pressure | Barometric pressure | Temperature | Weather conditions | Wind speed m/sec | Air temperature Â°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8/04/2021 14:35 | 118939 | Elysia Kinross | | Levin Landfill: Levin E1s | 0 | 0.06 | 0 | 20.9 | | | | | | | | | 19 |
| 8/04/2021 14:45 | 118930 | Elysia Kinross | | Levin Landfill: Levin E1d | 0 | 0.12 | 0 | 20.8 | | | | | | | | | 19 |
| 8/04/2021 14:55 | 118918 | Elysia Kinross | | Levin Landfill: Levin C1 | 0 | 0.71 | 0 | 20.3 | | | | | | | | | 21 |
| 9/04/2021 12:50 | 118942 | Elysia Kinross | | Levin Landfill: Levin E2d | 0 | 0.02 | 0 | 20.8 | | | | | | | | | 20 |
| 9/04/2021 13:15 | 118921 | Elysia Kinross | | Levin Landfill: Levin C2ds | 0 | 0.13 | 0 | 20.4 | | | | | | | | | 20 |
| 9/04/2021 13:20 | 118920 | Elysia Kinross | | Levin Landfill: Levin C2dd | 0 | 0.08 | 0 | 20.5 | | | | | | | | | 20 |
| 9/04/2021 13:25 | 118919 | Elysia Kinross | | Levin Landfill: Levin C2 | 0 | 0 | 0 | 20.5 | | | | | | | | | 21 |
| 9/04/2021 13:35 | 118916 | Elysia Kinross | | Levin Landfill: Levin B2 | 0 | 4.24 | 0 | 14.5 | | | | | | | | | 20 |
| 9/04/2021 14:55 | 118940 | Elysia Kinross | | Levin Landfill: Levin E2s | 0 | 0.03 | 0 | 20.8 | | | | | | | | | 20 |
| 12/04/2021 8:25 | 118953 | Elysia Kinross | | Levin Landfill: Levin Xs2 | 0 | 0.05 | 0 | 20.7 | | | | | | | | | 18 |
| 12/04/2021 9:05 | 118951 | Elysia Kinross | | Levin Landfill: Levin Xs1 | 0 | 0.02 | 0 | 20.9 | | | | | | | | | 19 |
| 12/04/2021 10:30 | 118954 | Elysia Kinross | | Levin Landfill: Levin Xd1 | 0 | 0 | 0 | 20.8 | | | | | | | | | 18 |
| 9/06/2021 13:05 | 118917 | Elysia Kinross | | Levin Landfill: Levin B3s | 0 | 0 | 0 | 20.6 | | | | | | | | | 20 |
| 13/07/2021 9:34 | 121548 | Adrian Parkes | | Levin Landfill: Levin B1 | 0.21 | 0.13 | 0 | 20.6 | | | | | | 7 | | | |
| 13/07/2021 9:36 | 121549 | Adrian Parkes | | Levin Landfill: Levin B2 | 0 | 0.08 | 0 | 17.7 | | | | | | | | | 7 |
| 13/07/2021 9:38 | 121550 | Adrian Parkes | | Levin Landfill: Levin B3s | 0.1 | 0.05 | 0 | 21 | | | | | | | | | 7 |
| 13/07/2021 9:39 | 121551 | Adrian Parkes | | Levin Landfill: Levin C1 | 0.19 | 0.07 | 0 | 18.9 | | | | | | | | | 10 |
| 13/07/2021 9:41 | 121553 | Adrian Parkes | | Levin Landfill: Levin C2 | 0.11 | 0.05 | 0 | 21 | | | | | | | | | 7 |
| 13/07/2021 9:42 | 121555 | Adrian Parkes | | Levin Landfill: Levin C2dd | 0.03 | 0.04 | 0 | 20.7 | | | | | | | | | 7 |
| 13/07/2021 9:43 | 121556 | Adrian Parkes | | Levin Landfill: Levin C2ds | 0 | 0.06 | 0 | 20.7 | | | | | | | | | 7 |
| 13/07/2021 9:44 | 121557 | Adrian Parkes | | Levin Landfill: Levin D1 | 0.1 | 0.06 | 0 | 21.3 | | | | | | | | | 11 |
| 13/07/2021 9:46 | 121558 | Adrian Parkes | | Levin Landfill: Levin D2 | 0.03 | 0.05 | 0 | 20.9 | | | | | | | | | 10 |
| 13/07/2021 9:48 | 121559 | Adrian Parkes | | Levin Landfill: Levin D3 | | | | | | | | | | | Concreted. | | |

| Created | Entry Number | User | Gps Coordinates | Borehole | Methane (CH4) | Carbon Dioxide (CO2) | Hydrogen Sulphide (H2S) | Oxygen (O2) | Gas flow rate | Nitrogen | Carbon Monoxide (CO) | Gas pressure | Barometric pressure | Temperature | Weather conditions | Wind speed m/sec | Air temperature Â°C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13/07/2021 9:51 | 121562 | Adrian Parkes | | Levin Landfill: Levin D6 | 0.55 | 0 | 0 | 20.4 | | | | | | | | | 10 |
| 13/07/2021 9:55 | 121567 | Adrian Parkes | | Levin Landfill: Levin E2s | 0.05 | 0.11 | 0 | 20.9 | | | | | | | | | 6 |
| 13/07/2021 9:59 | 121569 | Adrian Parkes | | Levin Landfill: Levin E2s | 0.05 | 0.11 | 0 | 20.9 | | | | | | | | | 6 |
| 13/07/2021 10:00 | 121570 | Adrian Parkes | | Levin Landfill: Levin E2d | 0.05 | 0.11 | 0 | 20.9 | | | | | | | | | 6 |
| 13/07/2021 10:01 | 121571 | Adrian Parkes | | Levin Landfill: Levin F3 | 0.03 | 0 | 0 | 21 | | | | | | | | | 10 |
| 13/07/2021 10:12 | 121576 | Adrian Parkes | | Levin Landfill: Levin G2s | 0.44 | 0.13 | 0 | 20.9 | | | | | | | | | 10 |
| 14/07/2021 9:49 | 121560 | Adrian Parkes | | Levin Landfill: Levin D4 | 0 | 0.08 | 0 | 21 | | | | | | | | | 5 |
| 14/07/2021 9:50 | 121561 | Adrian Parkes | | Levin Landfill: Levin D5 | 0 | 0 | 0.05 | 21.2 | | | | | | | | | 7 |
| 14/07/2021 9:53 | 121563 | Adrian Parkes | | Levin Landfill: Levin E1d | 0 | 0.02 | 0 | 20.1 | | | | | | | | | 5 |
| 14/07/2021 9:54 | 121564 | Adrian Parkes | | Levin Landfill: Levin E1s | 0 | 0.03 | 0 | 20.2 | | | | | | | | | 5 |
| 14/07/2021 10:05 | 121572 | Adrian Parkes | | Levin Landfill: Levin F1 | 0 | 0.03 | 0 | 21.1 | | | | | | | | | 10 |
| 14/07/2021 10:07 | 121573 | Adrian Parkes | | Levin Landfill: Levin F2 | 0 | 0.05 | 0 | 20.9 | | | | | | | | | 7 |
| 14/07/2021 10:09 | 121574 | Adrian Parkes | | Levin Landfill: Levin G1d | 0 | 0.02 | 0 | 20.7 | | | | | | | | | 5 |
| 14/07/2021 10:11 | 121575 | Adrian Parkes | | Levin Landfill: Levin G1s | 0 | 0.02 | 0 | 20.9 | | | | | | | | | 5 |
| 14/07/2021 10:14 | 121577 | Adrian Parkes | | Levin Landfill: Levin Xs1 | 0 | 0.11 | 0 | 20.6 | | | | | | | | | 10 |
| 14/07/2021 10:15 | 121578 | Adrian Parkes | | Levin Landfill: Levin Xs2 | 0.19 | 0.22 | 0 | 20.1 | | | | | | | | | 10 |
| 14/07/2021 10:16 | 121579 | Adrian Parkes | | Levin Landfill: Levin Xd1 | 0 | 0.06 | 0 | 20.6 | | | | | | | | | 10 |

# **Appendix J** Surface emissions reports

# LEVIN LANDFILL

# SURFACE EMISSIONS MONITORING REPORT

**Quality Information**

| | |
|---|---|
| Project Name Title: | Surface Emission Monitoring – March 2021 |
| Subtitle: | Levin Landfill |
| Date: | 18Th March 2021 |
| Monitored and authored by: | Darnelle Nugent-O'Leary |
| Reviewed: | Michael McDonnell |

Authorised for issue by: Michael McDonnell

**Michael McDonnell**
Landfill Manager

## Contents

**1.0 Procedure** ..... 3

**2.0 Details of this survey** ..... 3

**3.0 Climate** ..... 3

**Table 1:** Guidelines, resource consent requirements and the actual survey conditions. ..... 3

**4.0 Results** ..... 4

**5.0 Attachments** ..... 4

**6.0 Methane readings and locations** ..... 5

**Table 2:** Highest Methane readings recorded at localised survey area ..... 5

**Purpose**
To monitor landfill surface emissions in compliance with Air Discharge Permit 330/1 Condition 5. This survey provides a qualitative assessment of landfill gas emissions from the landfill surface.

## 1.0 Procedure

A Gas-Rover detector by Bascom-Turner was used by EnviroWaste Services Limited to assess levels of emissions of methane. The instantaneous surface emission monitoring was done in accordance with the EnviroWaste standard operating procedure for all Landfills.

## 2.0 Details of this survey

The monitoring was carried out on the 18th March starting at 9am. Table 2 below details the readings from the survey.

## 3.0 Climate

The weather conditions prior to and during the survey are summarised and recorded in Table 1 comparing the resource consent requirements and the EnviroWaste standard operating procedure (SOP).

**Table 1:** Guidelines, resource consent requirements and the actual survey conditions.

| | **Resource consent requirements None** *****Note: *Favourable weather conditions* | **SOP Guidelines** | **Actual** | **Comments** |
|---|---|---|---|---|
| Average wind speed | *Less than 25km/h, ideally 5-10km/h | Less than 15km/h ideally less than10km/h. | Average wind speed during the survey was 2.6km/h | - |
| Rainfall | *0.5mm in 48hours | Less than 0.5mm having fallen in 2 days prior. | There was 3.05mm of rain on the 16th March ending at 2.19pm, 42 hours before the survey. | - |
| Landfill surface grass height | - | Less than 100 mm | Patches of grass greater than 100mm across some area. | Weed-eating and mowing grass is recommended for a more accurate survey |
| Landfill surface | - | Relatively dry. | Relatively dry. | - |
| Atmospheric pressure | - | Ideally declining atmospheric pressure after several days of high pressure. | Pressure inclining in the days before the survey. | - |

## 4.0 Results

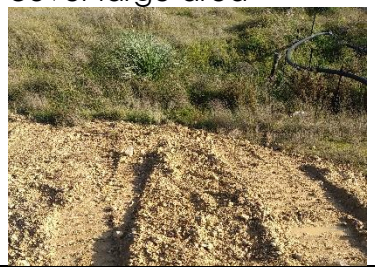
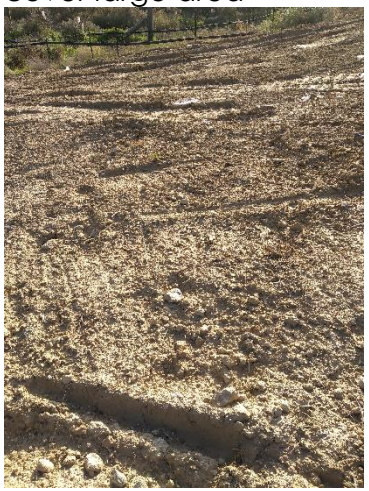
The results of the survey are plotted on the attached drawing. Details of readings above 500ppm are in Table 2.

## 5.0 Attachments

- Tables 1 and 2 of results.
- Site plan showing locations of notable results before and after remediation.
- Appendices 1 and 2 Climate conditions – graphical format.

## 6.0 Methane readings and locations

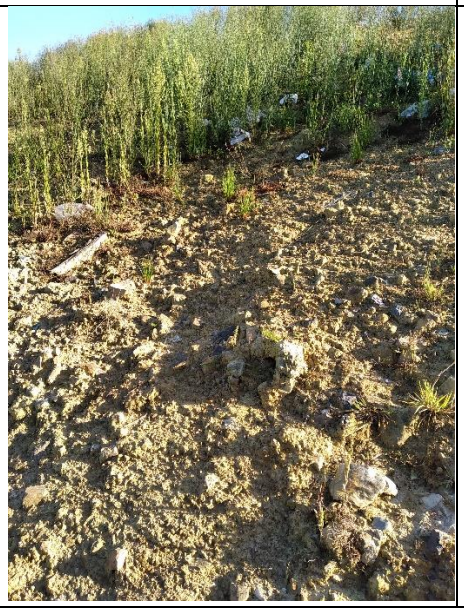
**Table 2:** Highest Methane readings recorded at localised survey area

| Marker | > 500 ppm | Site Photographs | Comments, location and description | Action Required | Close Out Comments | Retest result |
|---|---|---|---|---|---|---|
| 1 | 1944ppm | | Cracks in clay cover, area of no vegetation | Clay cover | Remediated using clay cover large area  | 194ppm |
| 2 | 1268ppm | | Same area next to marker 1, opposite flare, clay cracks on southern edge. | Clay cover | Remediated using clay cover large area  | 0ppm |

| | | | | | | |
|---|---|---|---|---|---|---|
| 3 | 925ppm | | Bare dirt clay, patch of thin clay cover base stage 2/3. | Clay cover | Remediated using clay cover large area | 0ppm |
| 4 | 954ppm | | South clay cover emissions. | Clay cover | Remediated using clay cover large area | 0ppm |

| | | | | | | |
|---|---|---|---|---|---|---|
| 5 | 2016ppm | | Crack in bare cover | Clay cover | Remediated using clay cover large area | 11ppm |
| 6 | 2286ppm | | Discolouration of dirt area of emissions | Clay cover | Remediated using clay cover large area | 0ppm |

| | | | | | | |
|---|---|---|---|---|---|---|
| 7 | 4395ppm | | Clay cover cracks | Clay cover | Remediated using clay cover large area | 0ppm |
| 8 | 906ppm | | Crack in cover. | Clay cover | Remediated using clay cover large area | 42ppm |

| | | | | | | |
|---|---|---|---|---|---|---|
| 9 | 1069ppm | | Non compacted area of rotten rock cover | Clay cover | Remediated using clay cover large area | 14ppm |
| 10 | 1591ppm |  | Rotten rock cover batter slope emissions from gaps through cover | Clay cover | Remediated using clay cover large area | 16ppm |

| | | | | | | |
|---|---|---|---|---|---|---|
| A | 319ppm | | North eastern clay cover, dead vegetation. | Bentonite and water | One bag bentonite and water | Retest result 0ppm |
| B | 333ppm | | Clay cover darkened patch dirt. | Bentonite and water | One bag bentonite and water | Retest result 42ppm |

| | | | | | | |
|---|---|---|---|---|---|---|
| C | 470ppm | | Rill on the clay cover | Bentonite and water | One bag bentonite and water | Retest result 52ppm |
| D | 427ppm | | Interface clay edge. | Bentonite and water | Three bags bentonite and water | Retest result 59ppm |

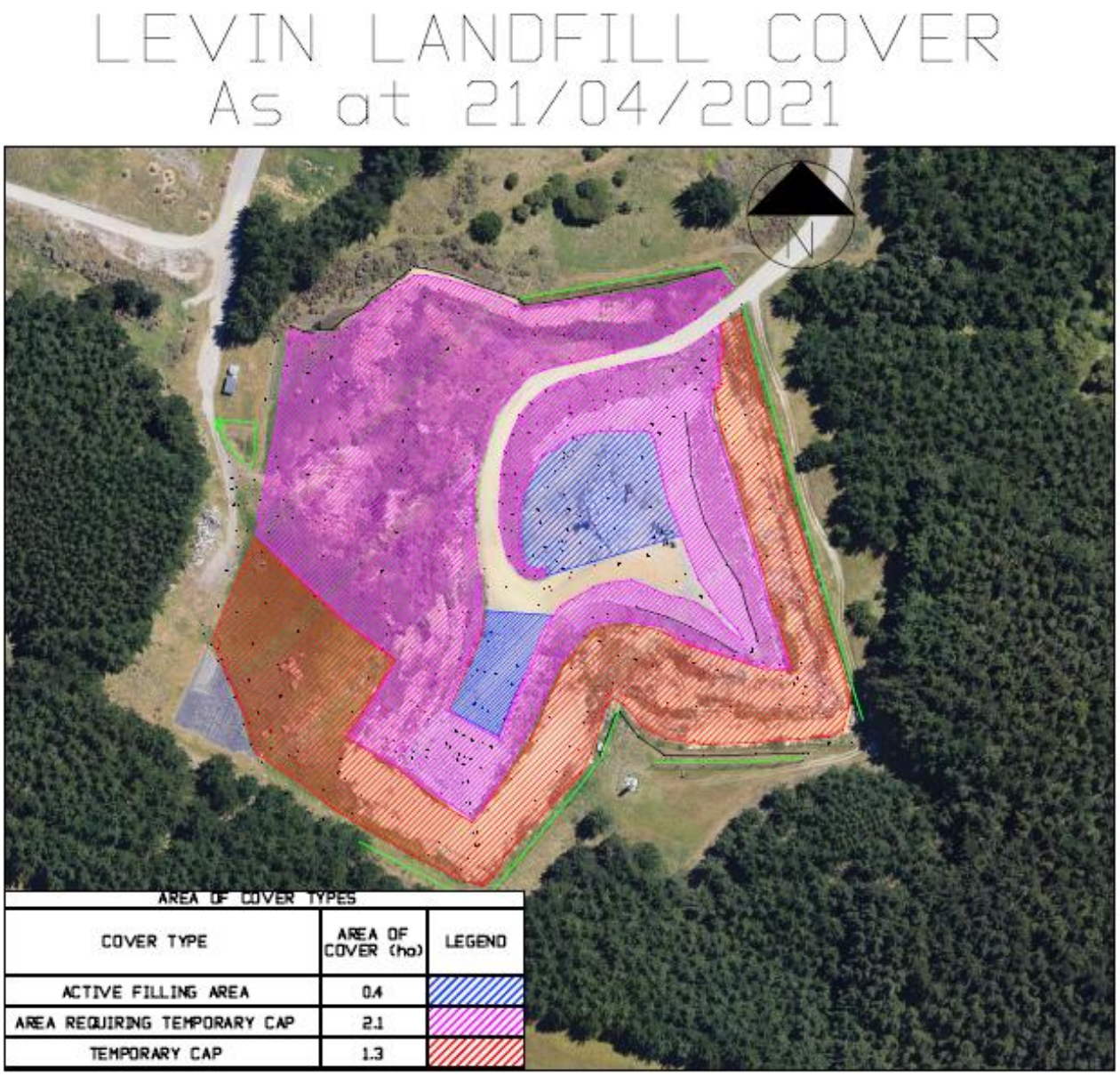



Figure 1: Map of Levin Landfill showing areas with temporary capping. (Aerial photo Feb 2021).

Surface Emissions Map for temporary cover areas

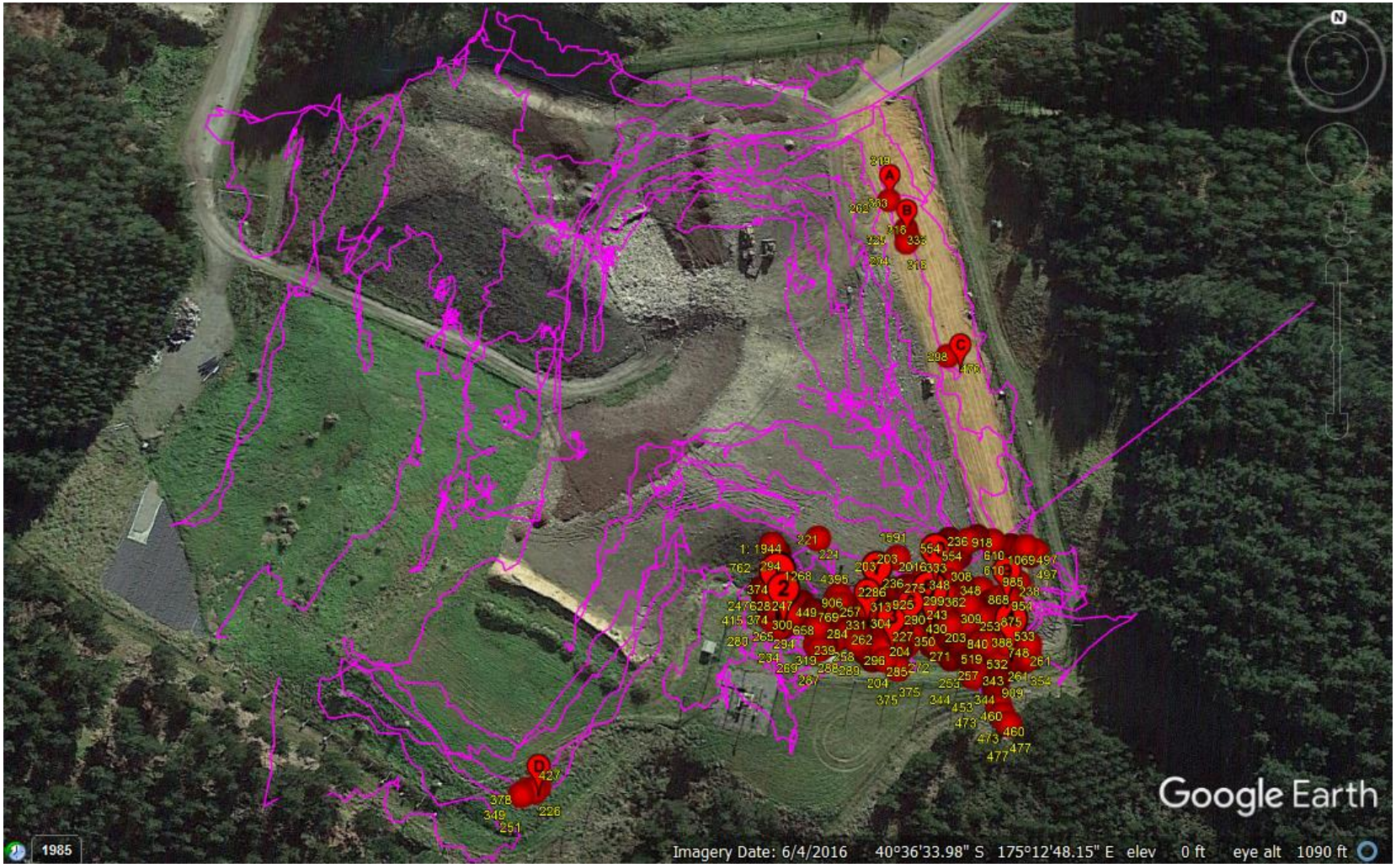



Figure 2: Levin Landfill surface emissions survey 18th March 2021, areas in red> 201ppm requiring remediation.

Surface Emissions Map for temporary cover areas

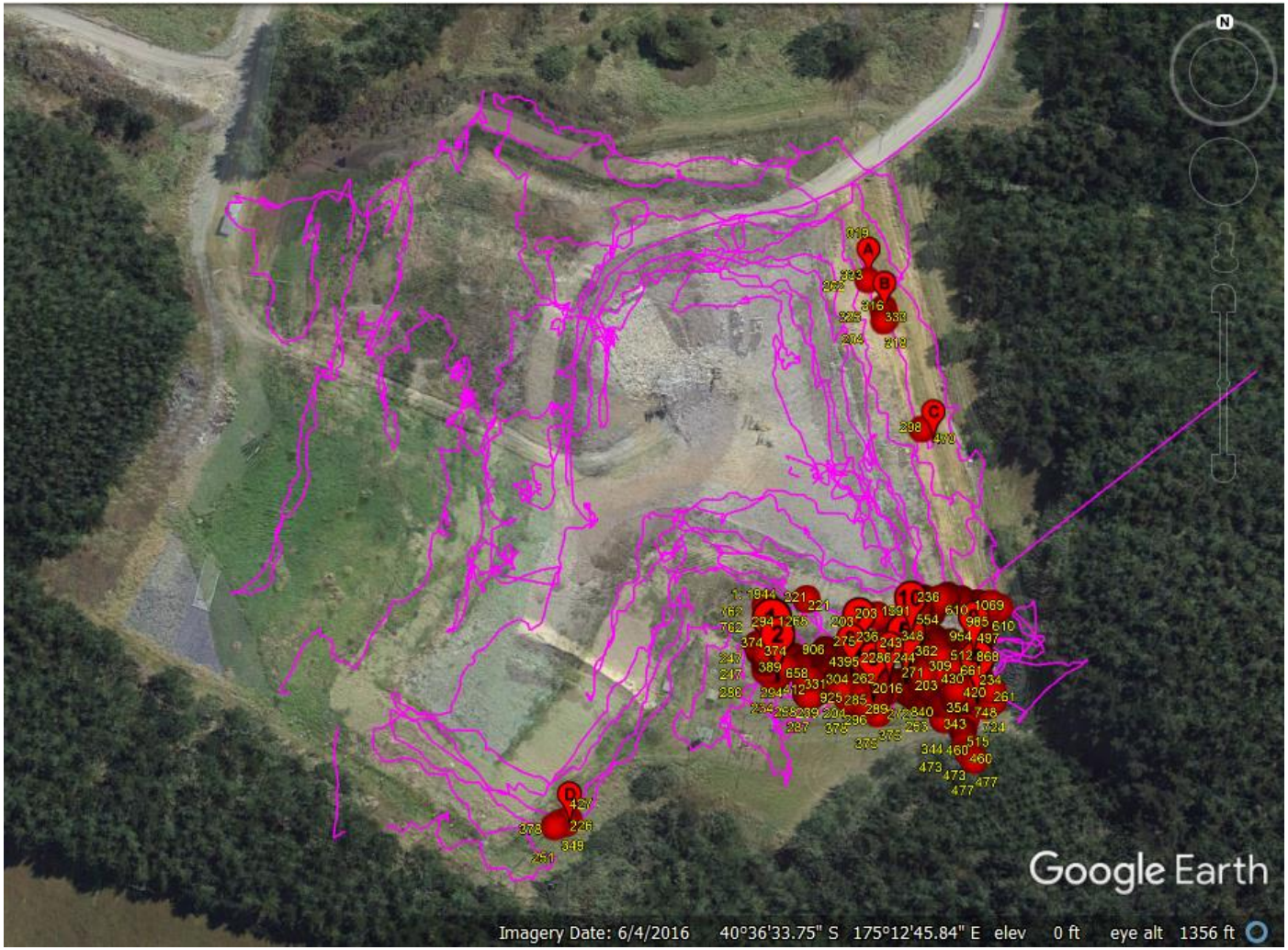



Figure 3: Levin Landfill surface emissions survey 18th March 2021, areas in red> 201ppm requiring remediation. Photo 5/2/21 overlay 50% transparency.

Surface Emissions Map close up southern edge for temporary cover areas

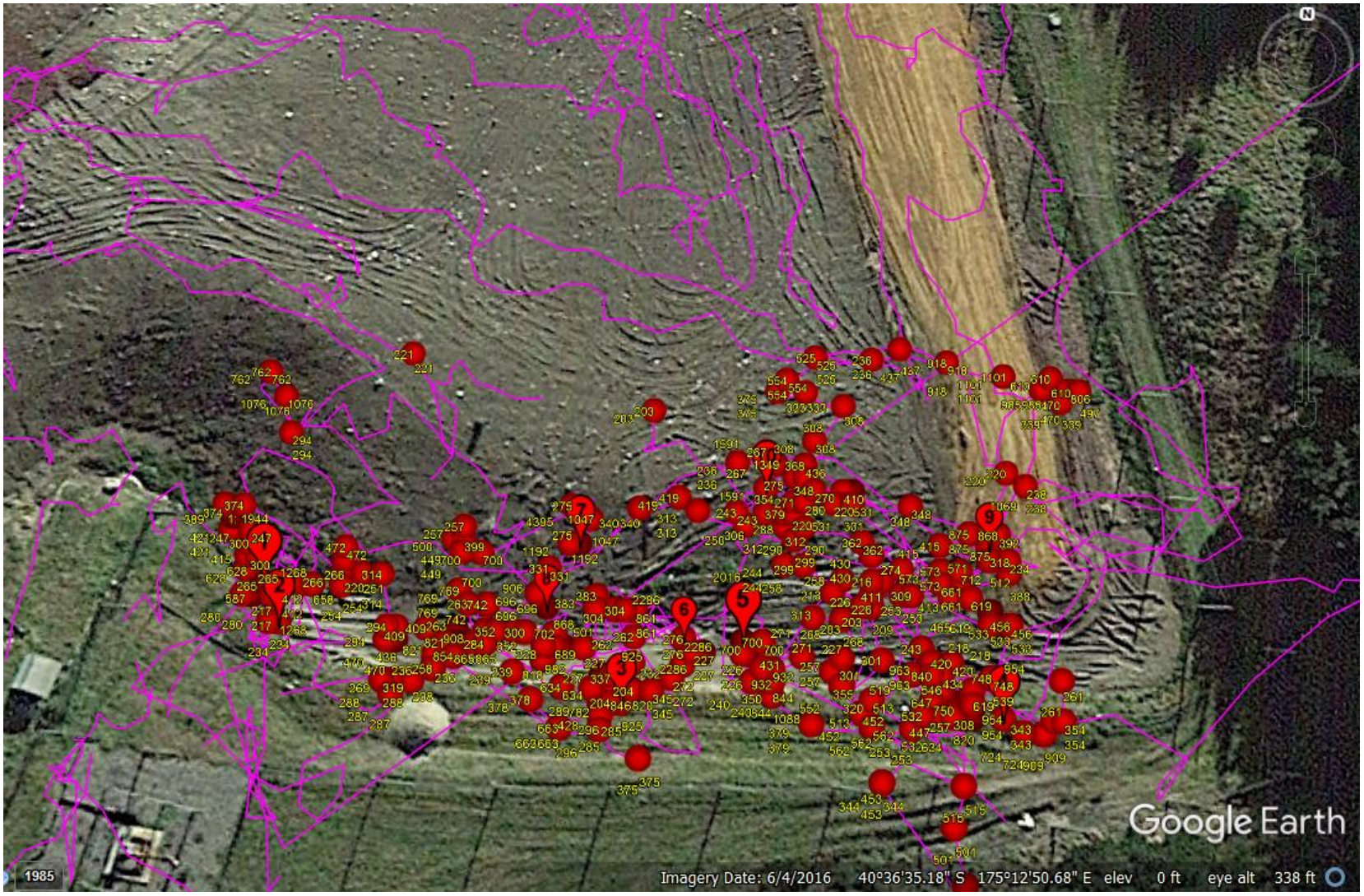


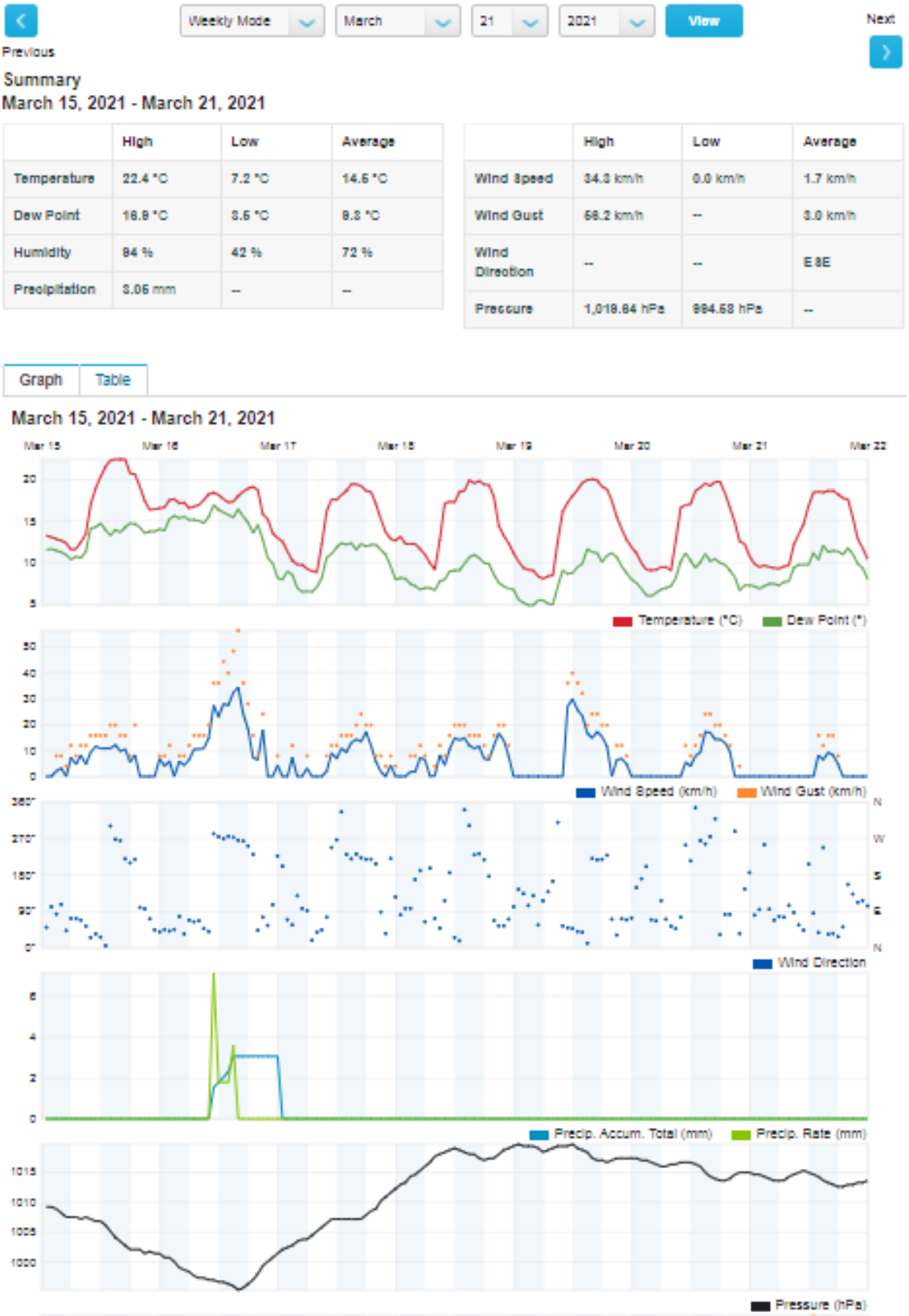

Figure 4: Levin Landfill surface emissions survey 18th March 2021, areas in red> 201ppm requiring remediation (Markers 1-10).

**Instantaneous surface emission readings retest map**

Figure 5: Surface emission readings after remediation works. No areas above 200ppm, Yellow>50ppm, Green 0-50ppm.

**Appendix 1: Weather conditions preceding the survey.**

The last rain recorded by a Levin weather station was 3.05mm on the 16th March, 42 hours before the survey. Graph retrieved April 20, 2021 from https://www.wunderground.com/dashboard/pws/ILEVIN22/graph/2021-03-15/2021-03-15/weekly




| | High | Low | Average |
|---|---|---|---|
| Temperature | 22.4 °C | 7.2 °C | 14.6 °C |
| Dew Point | 16.8 °C | 3.6 °C | 9.3 °C |
| Humidity | 84 % | 42 % | 72 % |
| Precipitation | 3.05 mm | -- | -- |

| | High | Low | Average |
|---|---|---|---|
| Wind Speed | 34.3 km/h | 0.0 km/h | 1.7 km/h |
| Wind Gust | 58.2 km/h | -- | 3.0 km/h |
| Wind Direction | -- | -- | E 8E |
| Pressure | 1,018.84 hPa | 994.58 hPa | -- |

**Appendix 2:**

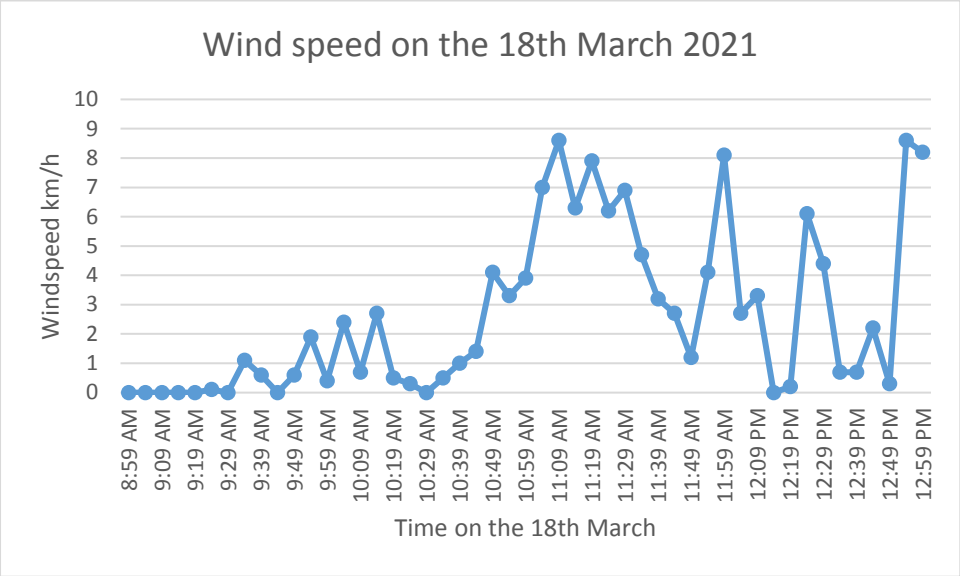
Weather conditions during the days of survey on the 18th March displayed below. There was no rainfall during the survey. Graph retrieved April 20, 2021 from [https://www.wunderground.com/dashboard/pws/ILEVIN22/graph/2021-03-18/2021-03-18/daily](https://www.wunderground.com/dashboard/pws/ILEVIN22/graph/2021-03-18/2021-03-18/daily)

| | High | Low | Average |
|---|---|---|---|
| Temperature | 18.8 °C | 8.6 °C | 14.4 °C |
| Dew Point | 10.8 °C | 6.0 °C | 7.1 °C |
| Humidity | 86 % | 43 % | 63 % |
| Precipitation | 0.00 mm | -- | -- |

| | High | Low | Average |
|---|---|---|---|
| Wind Speed | 16.8 km/h | 0.0 km/h | 1.7 km/h |
| Wind Gust | 18.8 km/h | -- | 3.2 km/h |
| Wind Direction | -- | -- | NE |
| Pressure | 1,018.80 hPa | 1,011.85 hPa | -- |

**Appendix 3:**

Wind conditions during the survey on the 18th March displayed below. The average wind speed was 2.6km/h. Data retrieved April 20, 2021 from https://www.wunderground.com/dashboard/pws/ILEVIN22/table/2021-03-18/2021-03-18/daily



# SURFACE EMISSIONS MONITORING REPORT

## Quality Information

| | |
|---|---|
| Project Name Title: | Surface Emission Monitoring – April 2021 |
| Subtitle: | Levin Landfill |
| Date: | 22nd April 2021 |
| Monitored and authored by: | Darnelle Nugent-O'Leary |
| Reviewed: | Michael McDonnell |

Authorised for issue by: Michael McDonnell

**Michael McDonnell**
Landfill Manager

## Contents

**1.0 Procedure** ..... 3

**2.0 Details of this survey** ..... 3

**3.0 Climate** ..... 3

**Table 1:** Guidelines, resource consent requirements and the actual survey conditions. ..... 3

**4.0 Results** ..... 4

**5.0 Attachments** ..... 4

**6.0 Methane readings and locations** ..... 5

**Table 2:** Highest Methane readings recorded at localised survey area ..... 5

**Purpose**

To monitor landfill surface emissions in compliance with Air Discharge Permit 330/1 Condition 5. This survey provides a qualitative assessment of landfill gas emissions from the landfill surface.

## 1.0 Procedure

A Gas-Rover detector by Bascom-Turner was used by EnviroWaste Services Limited to assess levels of emissions of methane. The instantaneous surface emission monitoring was done in accordance with the EnviroWaste standard operating procedure for all Landfills.

## 2.0 Details of this survey

The monitoring was carried out on the 22nd April starting at 9.50am. Table 2 below details the readings from the survey.

## 3.0 Climate

The weather conditions prior to and during the survey are summarised and recorded in Table 1 comparing the resource consent requirements and the EnviroWaste standard operating procedure (SOP).

**Table 1:** Guidelines, resource consent requirements and the actual survey conditions.

| | **Resource consent requirements None** ***Note:** *Favourable weather conditions* | **SOP Guidelines** | **Actual** | **Comments** |
|---|---|---|---|---|
| Average wind speed | *Less than 25km/h, ideally 5-10km/h | Less than 15km/h ideally less than10km/h. | Average wind speed during the survey was 5km/h | - |
| Rainfall | *0.5mm in 48hours | Less than 0.5mm having fallen in 2 days prior. | There was 1.78mm of rain on the 21st April at 9.44am 24 hours before the survey. | - |
| Landfill surface grass height | - | Less than 100 mm | Patches of grass greater than 400mm across stage 1 area. | Weed-eating and mowing grass is recommended for a more accurate survey |
| Landfill surface | - | Relatively dry. | Relatively dry. | - |
| Atmospheric pressure | - | Ideally declining atmospheric pressure after several days of high pressure. | Pressure inclining during the survey on the 22nd. Saturday 17th - Tuesday 20th high pressure, declining Tuesday 20th – Wednesday 21st. | - |

## 4.0 Results

The results of the survey are plotted on the attached drawing. Details of readings above 500ppm are in Table 2.

## 5.0 Attachments

- Tables 1 and 2 of results.
- Site plan showing locations of notable results before and after remediation.
- Appendices 1 and 2 Climate conditions – graphical format.

## 6.0 Methane readings and locations

**Table 2:** Highest Methane readings recorded at localised survey area

| Marker | > 200 ppm | Site Photographs | Comments, location and description | Action Required | Close Out Comments | Retest result |
|---|---|---|---|---|---|---|
| 1 | 1278ppm | | Lower edge moss covering ground. Opposite old flare skid | Bentonite cover | Remediated using 1.5 bags bentonite | 73ppm |

| | | | | | | |
|---|---|---|---|---|---|---|
| 2 | 217ppm | | Holes in clay cover | Bentonite cover | Remediated using 1 bag bentonite and water | 40ppm |
| 3 | 876ppm | | Soft clay not compacted/rolled . | Bentonite | Remediated using 1 bag of bentonite and water | 13ppm |

| | | | | | | |
|---|---|---|---|---|---|---|
| 4 | 700ppm | | Area near the edge of the track rolled cover. | Bentonite cover | Remediated using 1.5 bags bentonite | 71ppm |
| 5 | 548ppm | | Edge of the track rolled ridge. | Bentonite | Remediated using 2 bags bentonite | 23ppm |

| | | | | | | |
|---|---|---|---|---|---|---|
| 6 | 271ppm | | Corner loose gravel/metal stage 1 overlay at the edge. | Bentonite | Remediated using 1 bag bentonite | 117ppm |
| 7 | 208ppm | | Corner stage 1 overlay, hollow in ground and loose rock. | Bentonite | Remediated using 1 bag bentonite readings were still over 200pp. Excavator applied bucket of clay over the area. | 155ppm |
| - | The bio filter showed no emissions 0ppm for the area, the GPS was not recording for the bio filter inspection. | | | | | |

**Levin Landfill temporary cap**

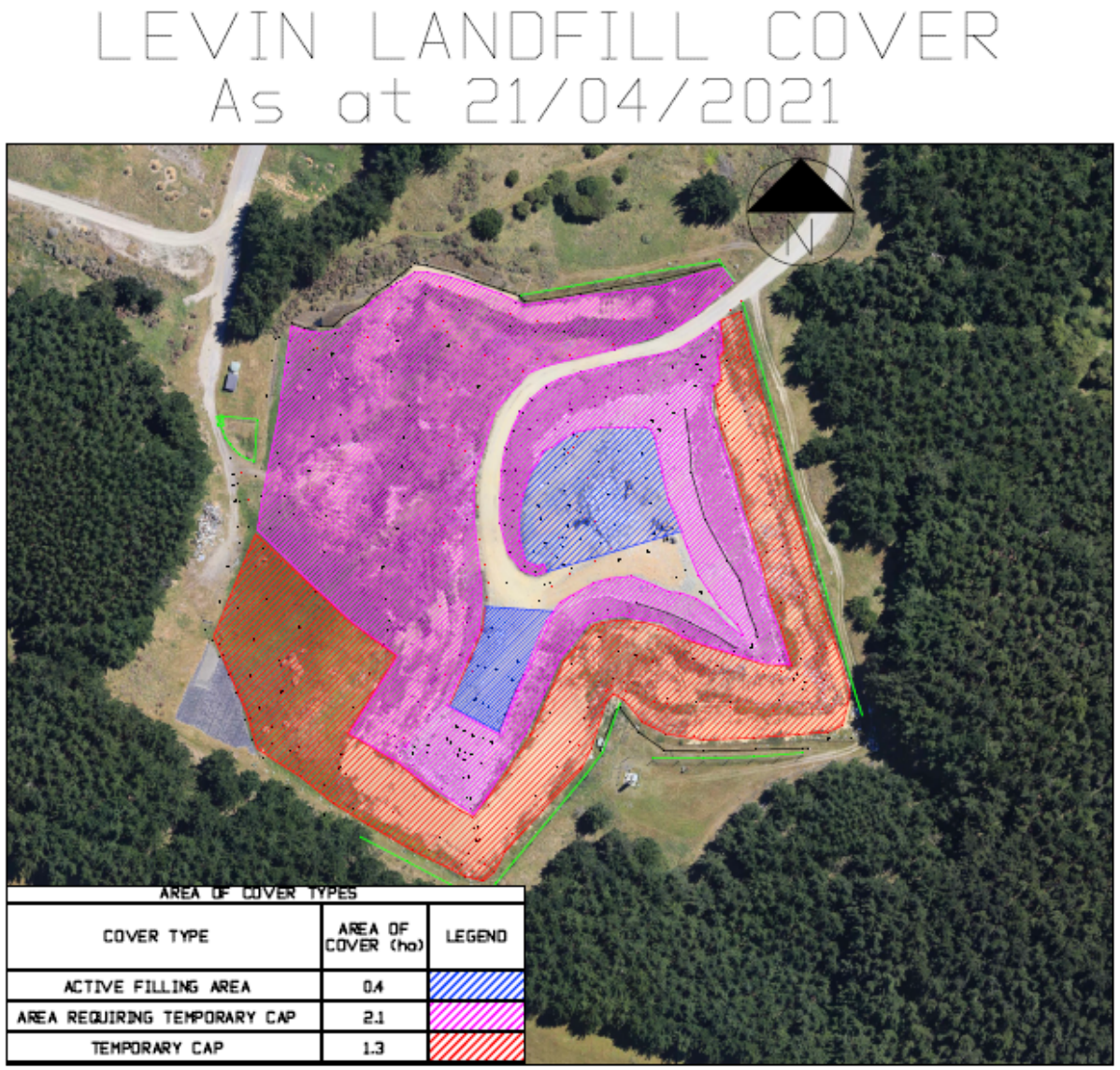



Figure 1: Map of Levin Landfill showing areas with temporary capping. (Aerial photo Feb 2021).

Surface Emissions Map for temporary cover areas

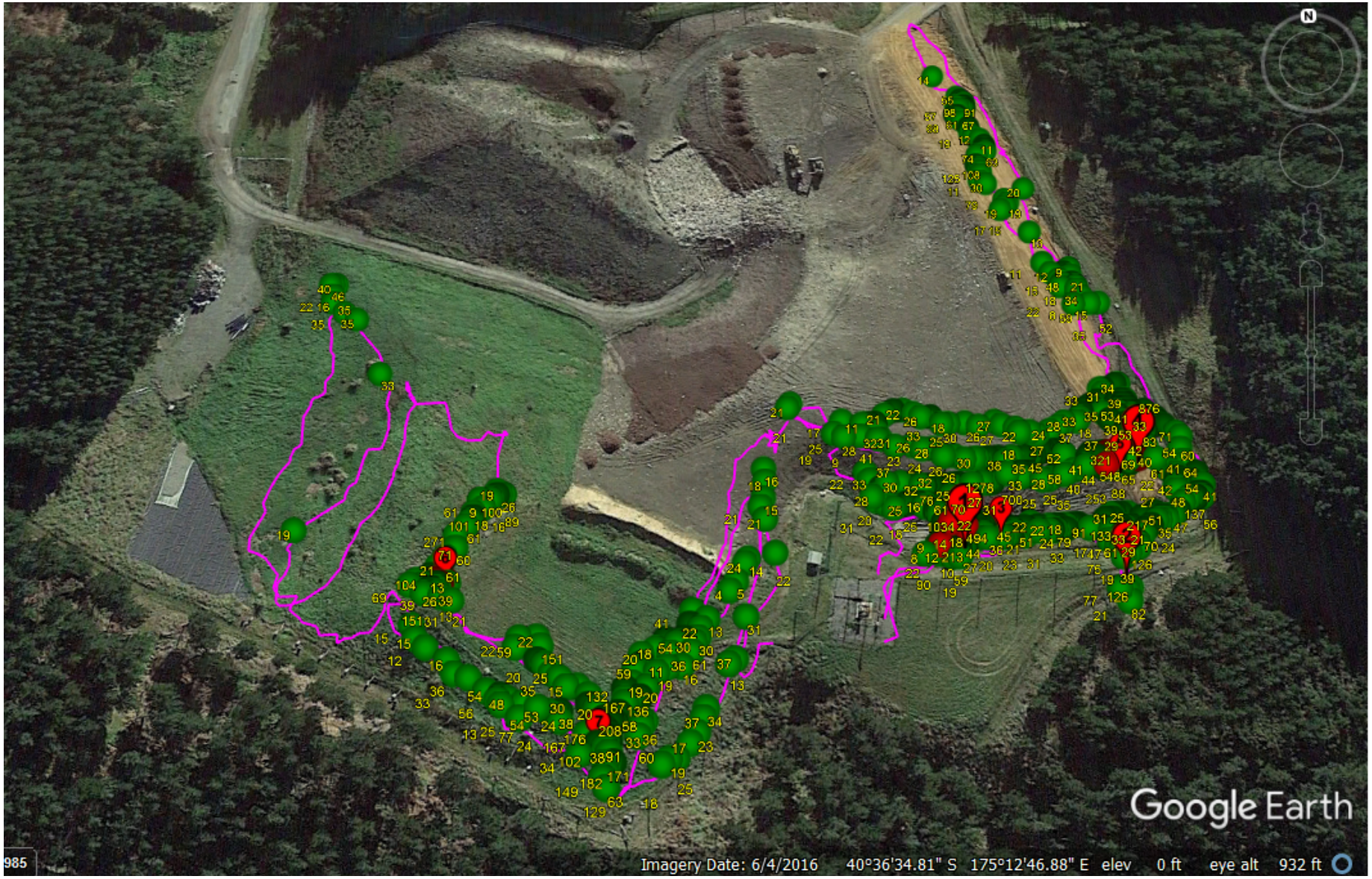
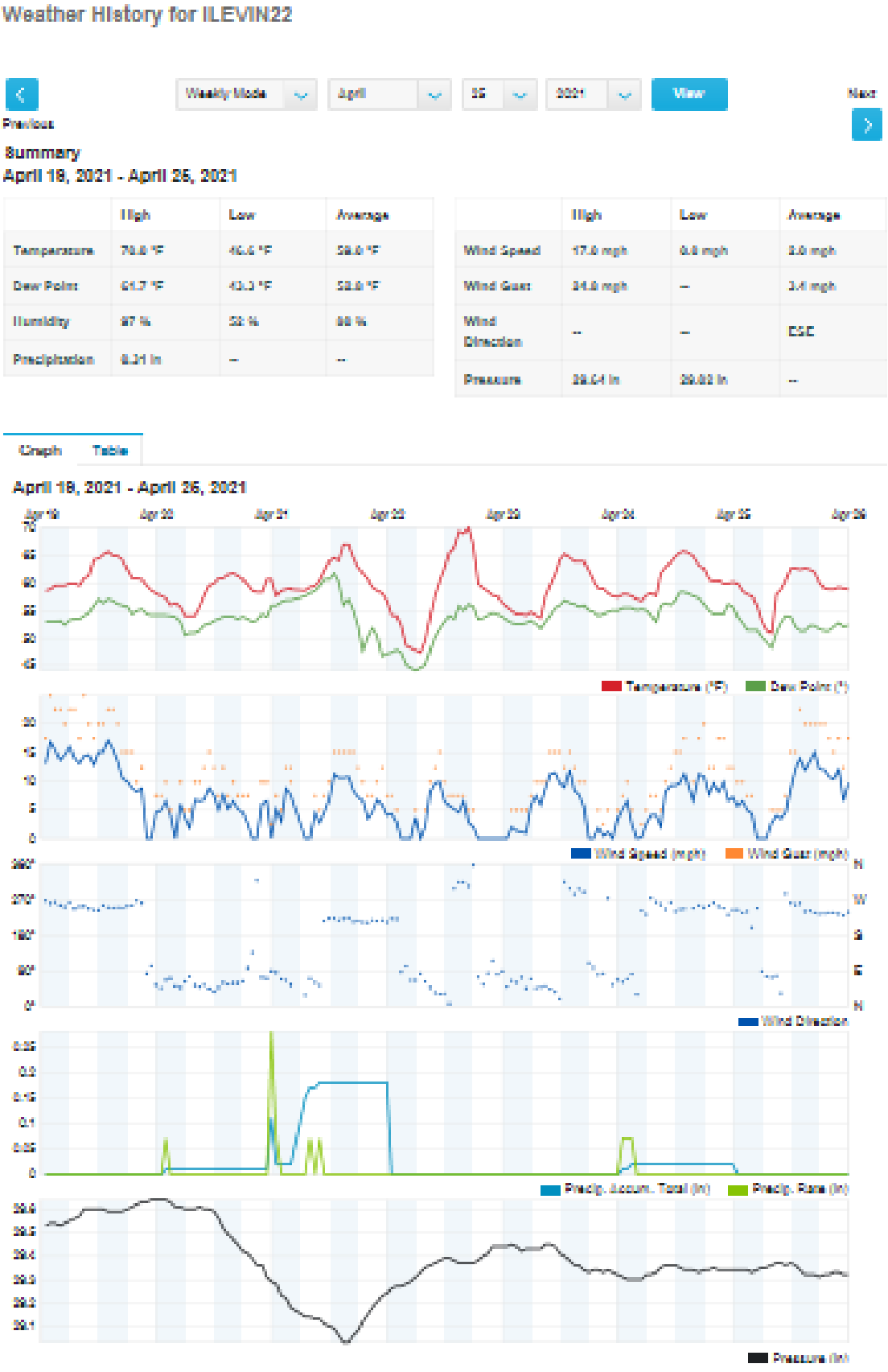



Figure 2: Levin Landfill surface emissions survey 22nd April 2021, areas in red> 200ppm requiring remediation.

**Appendix 1: Weather conditions preceding the survey.**

The last rain recorded by a Levin weather station was 1.8mm on the 21st April at 9.44am, 24 hours before the survey. Graph retrieved April 20, 2021 from https://www.wunderground.com/dashboard/pws/ILEVIN22/graph/2021-04-25/2021-04-25/weekly



**Appendix 2:**

Weather conditions during the days of survey on the 22th April displayed below. There was no rainfall during the survey. Graph retrieved April 27, 2021 from https://www.wunderground.com/dashboard/pws/ILEVIN22/graph/2021-04-22/2021-04-22/daily

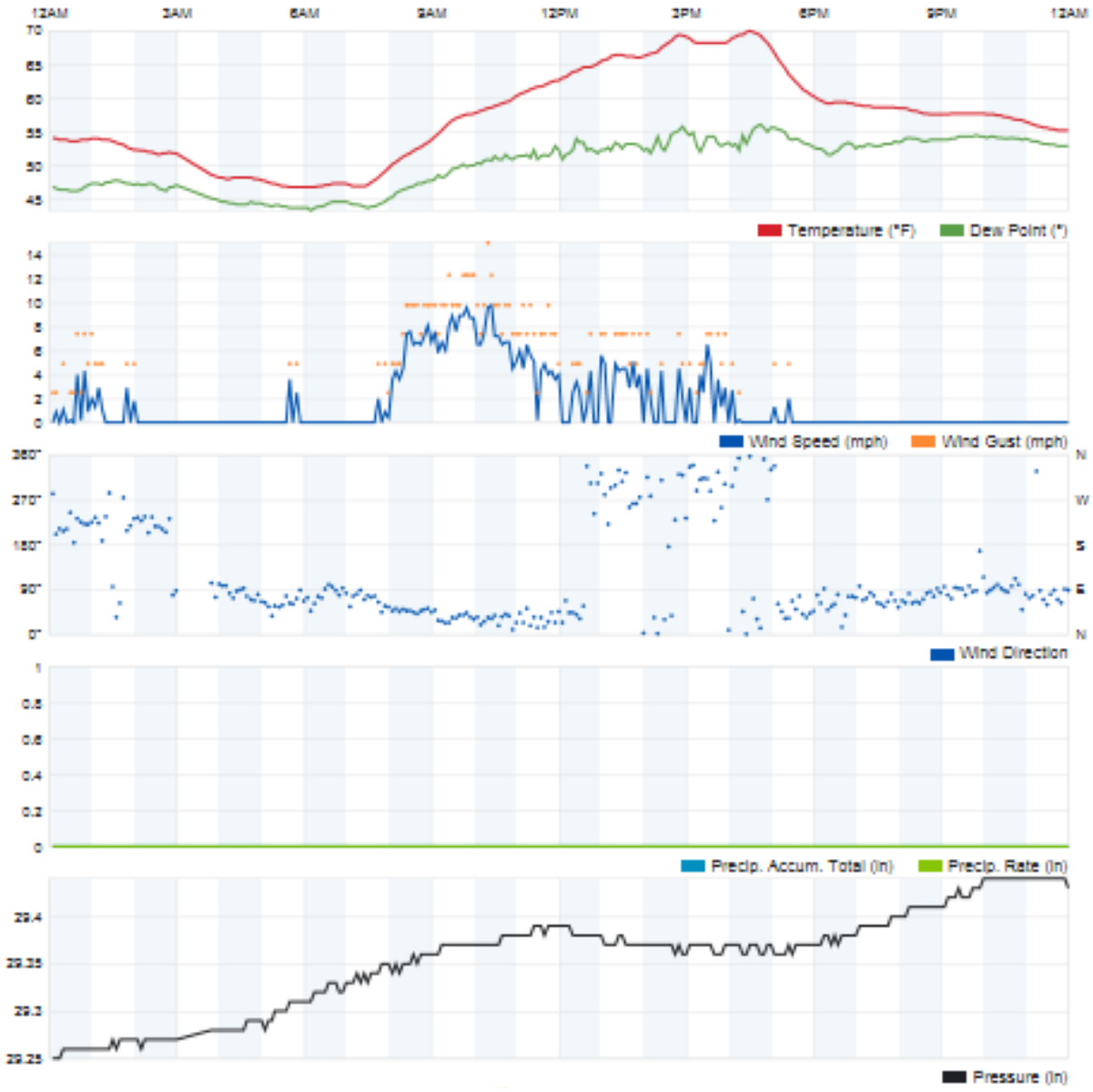
Summary
April 22, 2021

| | High | Low | Average |
|---|---|---|---|
| Temperature | 70.0 °F | 48.8 °F | 57.4 °F |
| Dew Point | 58.1 °F | 43.3 °F | 48.9 °F |
| Humidity | 82 % | 52 % | 77 % |
| Precipitation | 0.00 in | -- | -- |

| | High | Low | Average |
|---|---|---|---|
| Wind Speed | 9.8 mph | 0.0 mph | 0.8 mph |
| Wind Gust | 15.0 mph | -- | 1.3 mph |
| Wind Direction | -- | -- | NE |
| Pressure | 29.44 in | 29.23 in | -- |

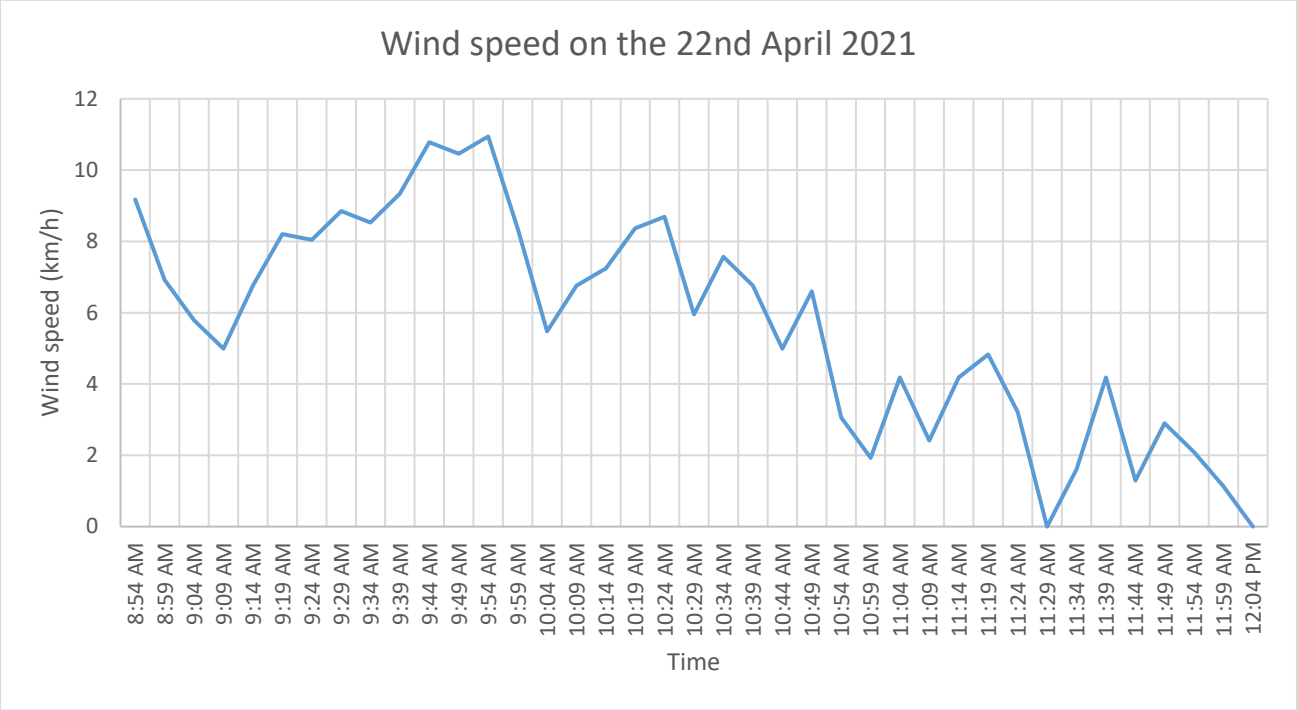
Graph Table

April 22, 2021



**Appendix 3:**

Wind conditions during the survey on the 22nd April displayed below. The average wind speed was 5km/h. Data retrieved April 27, 2021 from https://www.wunderground.com/dashboard/pws/ILEVIN22/table/2021-04-22/2021-04-22/daily



# SURFACE EMISSIONS MONITORING REPORT

## Quality Information

| | |
|---|---|
| Project Name Title: | Surface Emission Monitoring –May 2021 |
| Subtitle: | Levin Landfill |
| Date: | 27th May 2021 |
| Monitored and authored by: | Darnelle Nugent-O'Leary |
| Reviewed: | Michael McDonnell |

Authorised for issue by Michael McDonnell

**Michael McDonnell**
Landfill Manager

## Contents

**1.0 Procedure** ..... 3

**2.0 Details of this survey** ..... 3

**3.0 Climate** ..... 3

**Table 1:** Guidelines, resource consent requirements and the actual survey conditions. ..... 3

**4.0 Results** ..... 3

**5.0 Attachments** ..... 4

**6.0 Methane readings and locations** ..... 5

**Table 2:** Highest Methane readings recorded at localised survey area ..... 5

**Purpose**

To monitor landfill surface emissions in compliance with Air Discharge Permit 330/1 Condition 5. This survey provides a qualitative assessment of landfill gas emissions from the landfill surface.

## 1.0 Procedure

A Gas-Rover detector by Bascom-Turner was used by EnviroWaste Services Limited to assess levels of emissions of methane. The instantaneous surface emission monitoring was done in accordance with the EnviroWaste standard operating procedure for all Landfills.

## 2.0 Details of this survey

The monitoring was carried out on the 27th May starting at 12.28pm-15.40pm. Table 2 below details the readings from the survey.

## 3.0 Climate

The weather conditions prior to and during the survey are summarised and recorded in Table 1 comparing the resource consent requirements and the EnviroWaste standard operating procedure (SOP).

**Table 1:** Guidelines, resource consent requirements and the actual survey conditions.

| | **Resource consent requirements None** ***Note:** *Favourable weather conditions* | **SOP Guidelines** | **Actual** | **Comments** |
|---|---|---|---|---|
| Average wind speed | *Less than 25km/h, ideally 5-10km/h | Less than 15km/h ideally less than10km/h. | Average wind speed during the survey was 2.2km/h | - |
| Rainfall | *0.5mm in 48hours | Less than 0.5mm having fallen in 2 days prior. | There was 0.4mm of rain on the 24th May at 10pm, 62 hours before the survey. | - |
| Landfill surface grass height | - | Less than 100 mm | Patches of grass greater than 700mm across stage 1 area. | Weed-eating and mowing grass is recommended for a more accurate survey |
| Landfill surface | - | Relatively dry. | Relatively dry. | - |

## 4.0 Results

The results of the survey are plotted on the attached drawing. Details of readings above 200ppm are in Table 2.

## 5.0 Attachments

- Tables 1 and 2 of results.
- Site plan showing locations of notable results before and after remediation.
- Appendices 1 and 2 Climate conditions – graphical format.

## 6.0 Methane readings and locations

**Table 2:** Highest Methane readings recorded at localised survey area

| Marker | > 200 ppm | Site Photographs | Comments, location and description | Action Required | Close Out Comments | Retest result |
|---|---|---|---|---|---|---|
| 1 | 531ppm | | Edge of cover opposite old flare and next to previous bentonite cover applied for high emissions last survey. | Patch area with clay | Area received additional clay cover | 64ppm |

| | | | | | | |
|---|---|---|---|---|---|---|
| 2 | 468ppm | | Next to bentonite patch, edge of cover/grass | Clay cover | Clay cover | 38ppm |
| 3 | 307ppm | | Rill through clay cover, sparse vegetation. | Clay cover | Clay was put on this area, retest result remained over 500ppm. Added 1 bag bentonite/water over the area. | 59ppm |

| | | | | | | |
|---|---|---|---|---|---|---|
| 4 | 746ppm | | Edge of clay bund four holes through the capping. Sparse vegetation. | Bentonite and water | Bentonite and water | 93ppm |
| 5 | 613ppm | | Near location 4, same clay bund edge with holes through capping. | Bentonite and water | Bentonite and water | 34ppm |

| | | | | | | |
|---|---|---|---|---|---|---|
| 6 | 626ppm | | Holes through clay on batter, sparse vegetation. | Clay cover | Clay cover | 186ppm |
| 7 | 736ppm | | Uneven clay/dirt hollow area. | Clay cover | Covered with clay.<br>Retest remained over 500ppm, bentonite and water applied. | 93ppm |

| | | | | | | |
|---|---|---|---|---|---|---|
| 8 | 437ppm | | Edge bentonite from previous survey. Clay spongy. | Clay cover | Clay applied over the area | 183ppm |
| 9 | 531ppm | | Clay holes, edge of cover. | Clay cover | Clay cover and track rolled. | 98ppm |

| | | | | | | |
|---|---|---|---|---|---|---|
| 10 | 242ppm | | Next to previous bentonite area, on clay bund of stage 2. | Bentonite and water | Two bags of bentonite and water. | 49ppm |
| 11 | 645ppm | | Edge batter clay, metal-rock through clay. | Bentonite and water | One bag bentonite and water | 99ppm |

| | | | | | | |
|---|---|---|---|---|---|---|
| 12 | 465ppm | | Rill on clay slope | Bentonite and water | Bentonite and water, retest was still over 500ppm.<br> <br>Added 2 bags of bentonite and water<br> | 122ppm |

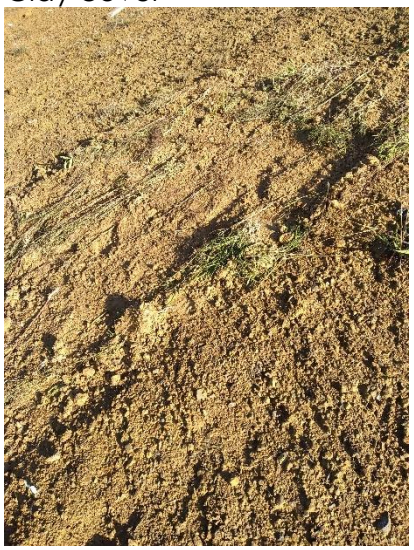
| | | | | | | |
|---|---|---|---|---|---|---|
| 13 | 294ppm | | Rill on clay slope | Bentonite and water | One bag of bentonite and water applied to rill of clay batter slope.<br> <br>>397ppm<br>Added two bags of bentonite and water.<br> | 55ppm |

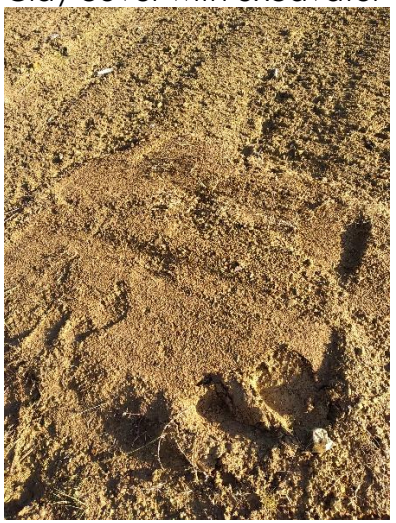
| | | | | | | |
|---|---|---|---|---|---|---|
| 14 | 302ppm | | Rill on clay slope | Bentonite and water | One bag bentonite and water.<br> <br>>402ppm<br>Added another bag of bentonite and water<br> | 177ppm |

| | | | | | | |
|---|---|---|---|---|---|---|
| 15 | 224ppm | | Rill on clay slope | Bentonite and water | Bentonite and water<br> <br>Retest: 299ppm<br>Added another bag of bentonite and water<br> | 185ppm |

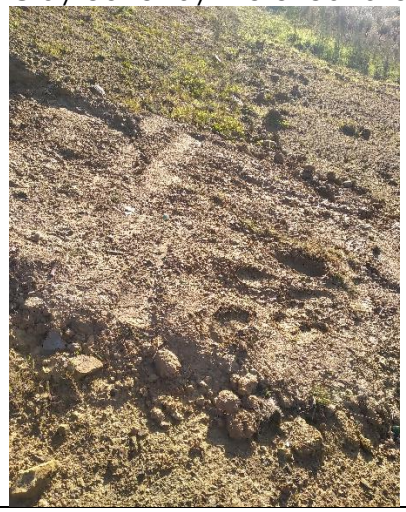
| | | | | | | |
|---|---|---|---|---|---|---|
| 16 | 491ppm | | Large rill full of litter, eastern cover. | Removed litter to find cover deficiency, added bentonite and water. | One bag of bentonite and water | 39ppm |
| 17 | 305ppm | | Cracking of recent clay that hadn't been track rolled yet. Emissions were from the edge of the cover with the mulch covered refuse. | Too close to current fill mulched area no requirement to remediate, since it is not part of the temporary final cover. | N/A | N/A |

| | | | | | | |
|---|---|---|---|---|---|---|
| 18 | 800ppm | | Near the shed near the flare. Rill down clay batter, dead vegetation. | Bentonite and water | One bag of bentonite and water. | 9ppm |
| 19 | 211ppm | | Rill through clay cover, stage 1 overlay of the cover on the eastern slope. | Clay cover | Excavator covered rill with clay | 157ppm |

| | | | | | | |
|---|---|---|---|---|---|---|
| 20 | 291ppm | | Rill through clay cover on the eastern slope of stage 1 overlay. No vegetation to prevent erosion. | Clay cover with excavator. | Clay cover  | 46ppm |
| 21 | 587ppm | | Rill through clay cover on the eastern slope of stage 1 overlay. No vegetation to prevent erosion. | Clay cover | Clay cover | 44ppm |

| | | | | | | |
|---|---|---|---|---|---|---|
| 22 | 522ppm | | Emissions from clay cover on the eastern slope of stage 1 overlay. | Clay cover | Clay cover with excavator  | 26ppm |
| 23 | 519ppm | | Clay cover on eastern slope of stage 1 overlay. Discoloured patch. | Clay cover | Clay cover, bentonite and water to remediate. | 31ppm |

| | | | | | | |
|---|---|---|---|---|---|---|
| 24 | 511ppm | | Clay cover on the corner of the eastern slope of stage 1 overlay. | Clay cover | Clay cover, bentonite and water. | 125ppm |
| 25 | 252ppm | | Emissions from cover on the western side of stage 1 overlay. | Compact clay and check source. | Patched clay and retested ok. | 39ppm |

| | | | | | | |
|---|---|---|---|---|---|---|
| 26 | 235ppm | | Stage 3 near top corner of clay cover. | Bentonite and water | One bag bentonite and water. | 98ppm |
| 27 | 219ppm | | Rill on side of the batter slope. | Clay covered | Clay cover by the excavator  | 65ppm |

| | | | | | | |
|---|---|---|---|---|---|---|
| 28 | 340ppm | | Rill on clay covered slope, interface between clay bund and slope of stage 3. | Clay cover | Clay covered patch with excavator | 84ppm |
| 29 | 610ppm | | Clay interface between clay bund and cover of stage 3. Next to bentonite cover from last survey | Clay cover | Clay cover with excavator | 98ppm |
| - | The bio filter showed no emissions 0ppm for the area, the GPS was not recording for the bio filter inspection. | | | | | |

**Levin Landfill temporary cap**

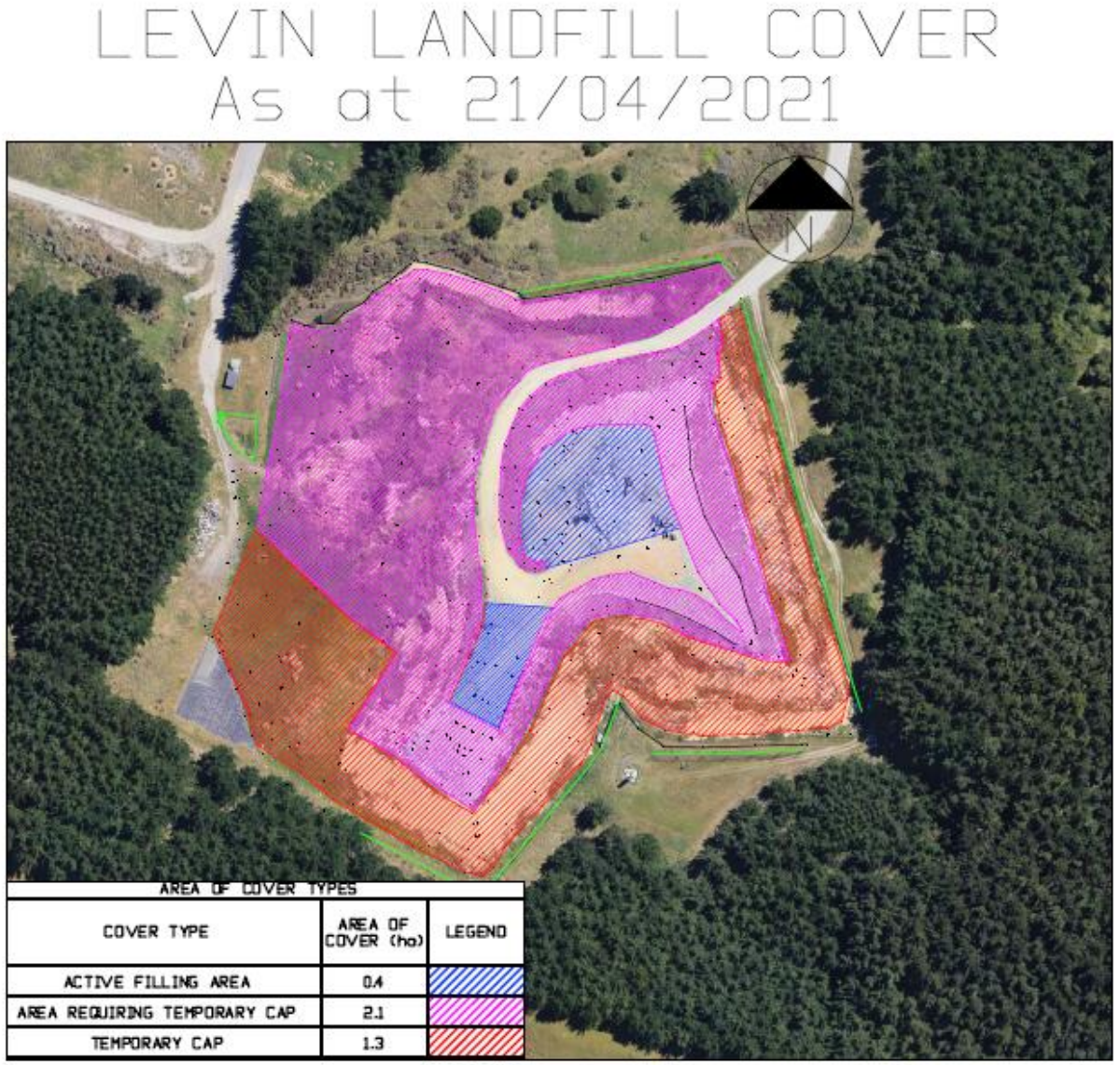



Figure 1: Map of Levin Landfill showing areas with temporary capping. (Aerial photo Feb 2021).

Surface Emissions Map for temporary cover

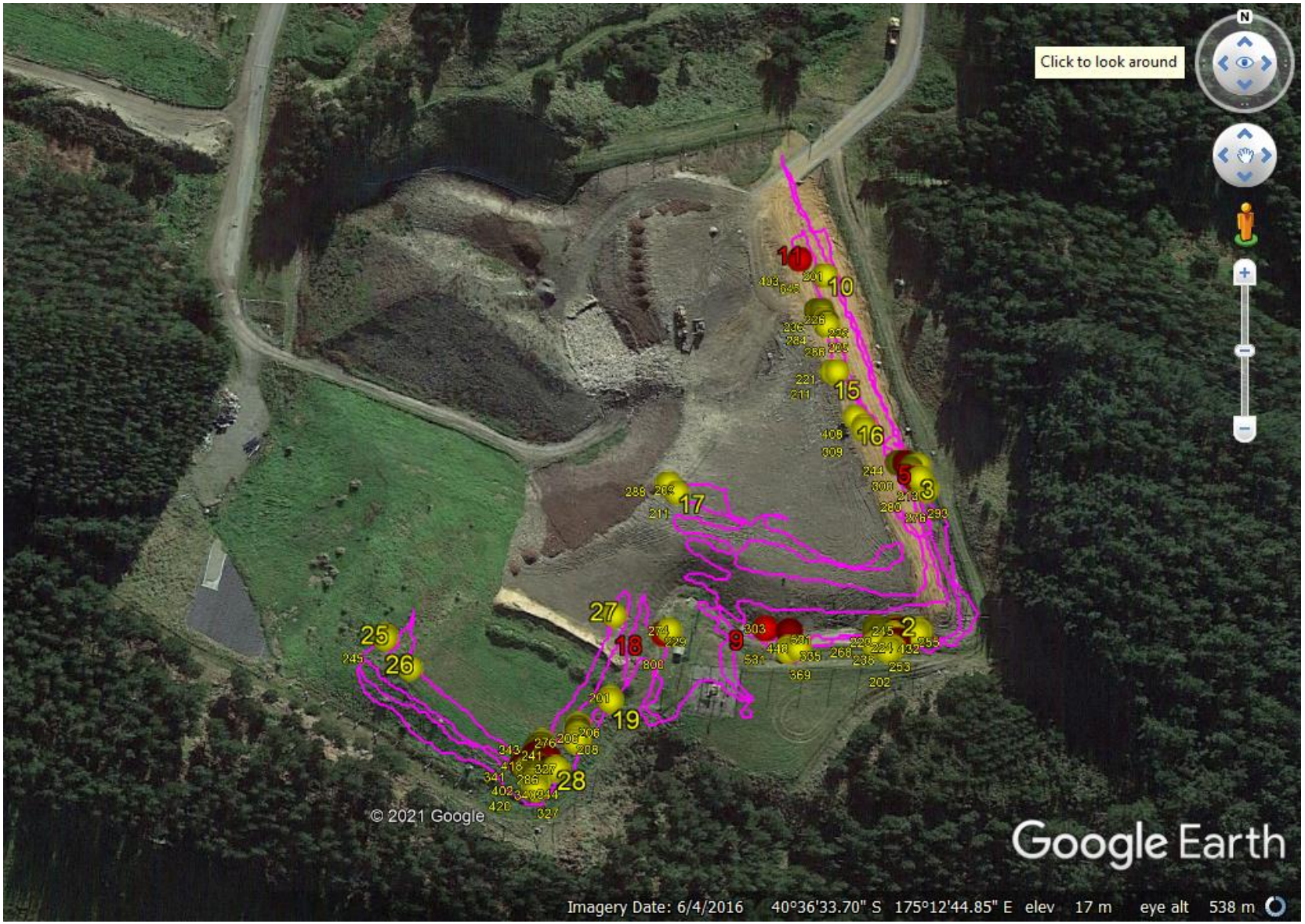



Figure 1: Map showing Levin Landfill surface emissions survey 27th May 2021, areas in red> 500ppm, areas in yellow >200ppm.

Surface Emissions Map for temporary cover

Figure 2: Map showing closer view of Levin Landfill surface emissions survey 27th May 2021, areas in red> 500ppm, areas in yellow >200ppm.

Surface Emissions Map for temporary cover

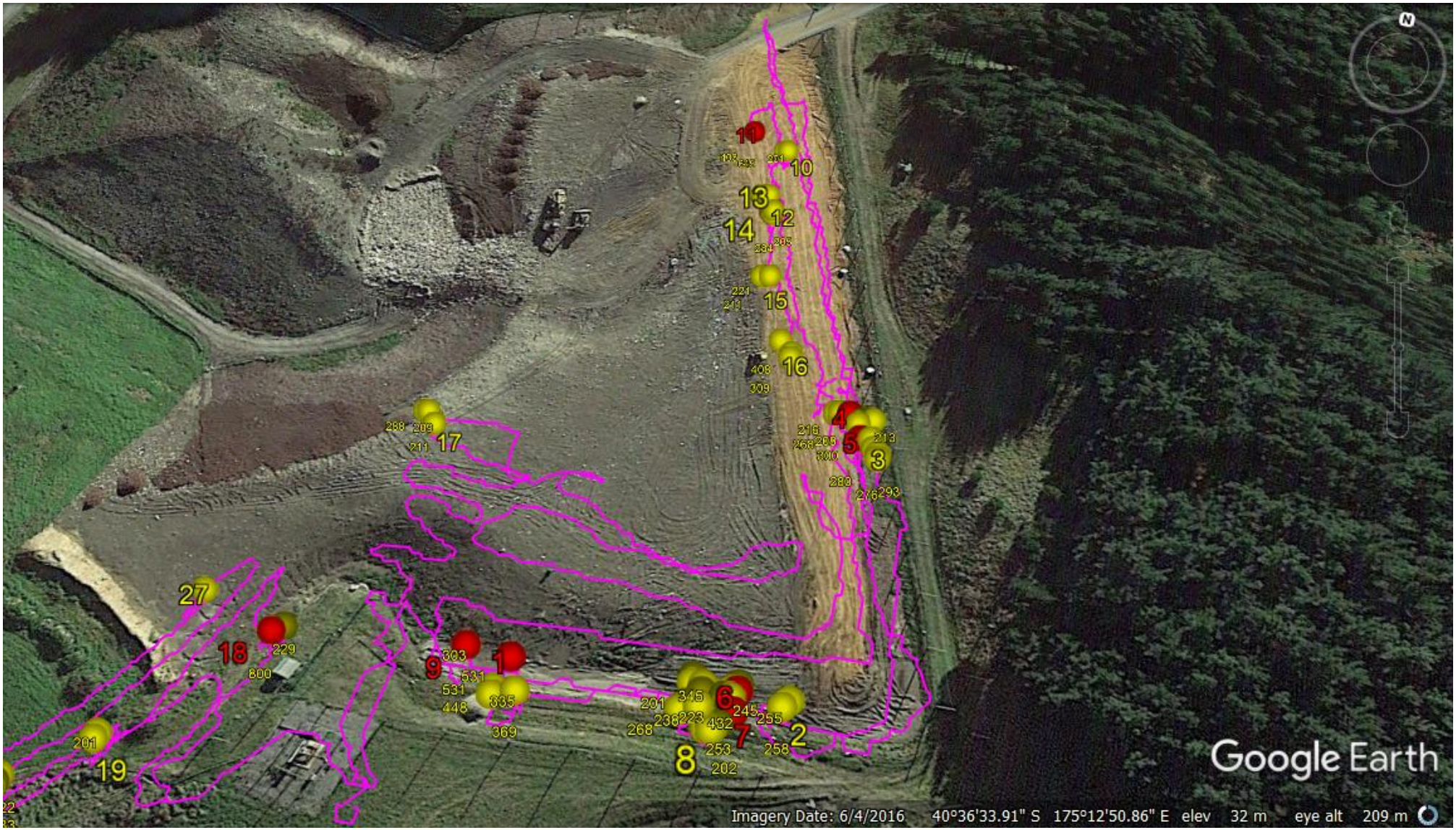
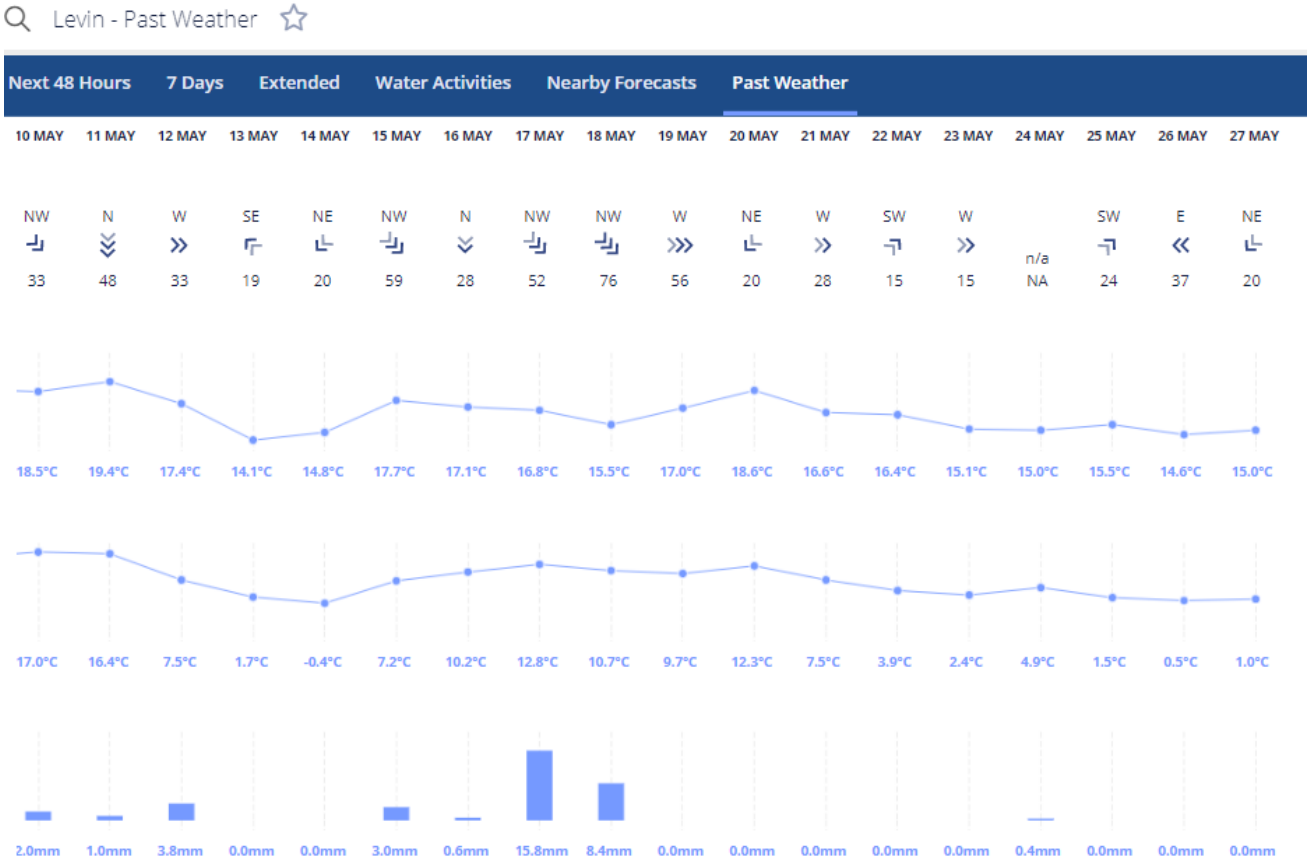



Figure 3: Map showing closer view of Levin Landfill surface emissions survey 27th May, areas in red> 500ppm, areas in yellow >200ppm.

**Appendix 1: Weather conditions preceding the survey.**

The last rain recorded by a Levin weather station was 0.4mm ending at 10pm on the 24th May according to website (retrieved June 3rd, 2021 https://www.wunderground.com/dashboard/pws/ILEVIN22/table/2021-05-24/2021-05-24/daily, 62 hours before the survey, according to the metservice historical data for Levin. Graph retrieved May 28th, 2021 from https://www.metservice.com/towns-cities/locations/levin/past-weather

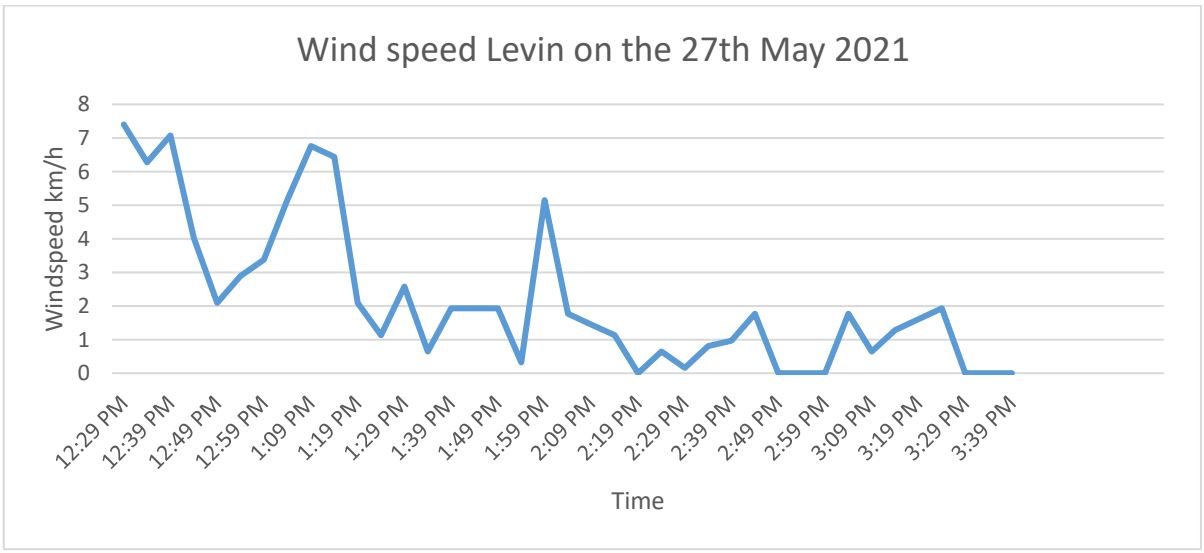


## Appendix 2:

Weather conditions during the days of survey on the 27th May displayed below. There was no rainfall during the survey. Graph retrieved May 28th, 2021 from https://www.metservice.com/towns-cities/locations/levin/past-weather

## Appendix 3:

Wind conditions during the survey on the 27th May displayed below. The average wind speed was approximately 2.2km/h. Data retrieved June 3rd, 2021 from https://www.wunderground.com/dashboard/pws/ILEVIN22/table/2021-05-27/2021-05-27/daily



# SURFACE EMISSIONS MONITORING REPORT

**Quality Information**

| | |
|---|---|
| Project Name Title: | Surface Emission Monitoring –June 2021 |
| Subtitle: | Levin Landfill |
| Date: | 11th June 2021 |
| Monitored and authored by: | Shanka Samarathunge |
| Reviewed: | Michael McDonnell |

Authorised for issue by Michael McDonnell

**Michael McDonnell**
Landfill Manager

## Contents

**1.0 Procedure** ..... 3

**2.0 Details of this survey** ..... 3

**3.0 Climate** ..... 3

**Table 1:** Guidelines, resource consent requirements and the actual survey conditions. ..... 3

**4.0 Results** ..... 4

**5.0 Attachments** ..... 4

**6.0 Methane readings and locations** ..... 5

**Table 2:** Highest Methane readings recorded at localised survey area ..... 5

**Purpose**

To monitor landfill surface emissions in compliance with Air Discharge Permit 330/1 Condition 5. This survey provides a qualitative assessment of landfill gas emissions from the landfill surface.

## 1.0 Procedure

A Gas-Rover detector by Bascom-Turner was used by EnviroWaste Services Limited to assess levels of emissions of methane. The instantaneous surface emission monitoring was done in accordance with the EnviroWaste standard operating procedure for all Landfills.

## 2.0 Details of this survey

The monitoring was carried out on the 11th June starting at 09.30 a.m. Table 2 below details the readings from the survey.

## 3.0 Climate

The weather conditions prior to and during the survey are summarised and recorded in Table 1 comparing the resource consent requirements and the EnviroWaste standard operating procedure (SOP).

**Table 1:** Guidelines, resource consent requirements and the actual survey conditions.

| | **Resource consent requirements None** ***Note:** *Favourable weather conditions* | **SOP Guidelines** | **Actual** | **Comments** |
|---|---|---|---|---|
| Average wind speed | *Less than 25km/h, ideally 5-10km/h | Less than 15km/h ideally less than10km/h. | Average wind speed during the survey was 4.5km/h | - |
| Rainfall | *0.5mm in 48hours | Less than 0.5mm having fallen in 2 days prior. | 0.04 mm rainfall in between 12.44am and 12.54am on 11th June 2021 | - |
| Landfill surface grass height | - | Less than 100 mm | Patches of grass greater than 400mm across North Eastern face in temporary cover. | Weed-eating and mowing grass is recommended for a more accurate survey |
| Landfill surface | - | Relatively dry. | Relatively dry | - |
| Atmospheric pressure | - | Ideally declining atmospheric pressure after several days of high pressure. | Pressure inclined within 9.00 a.m. to 11.20 a.m. (from 30.04 in to 30.07 in) and declined during the rest of the survey on the 11th (up to 30.02 in) | Pressure inclined several days prior to the survey date |

## 4.0 Results

The results of the survey are plotted on the attached drawing. Details of readings above 200ppm are in Table 2.

## 5.0 Attachments

- Tables 1 of results.
- Site plan showing locations of notable results before remediation.
- Appendices 1 and 2 Climate conditions – graphical format.

## 6.0 Methane readings and locations

**Table 2:** Highest Methane readings recorded at localised survey area

| Marker | > 200 ppm | Site Photographs | Comments, location and description | Action Required | Close Out Comments | Retest result |
|---|---|---|---|---|---|---|
| 1 | 224ppm | | bare soil cover, closer to mulch / temporary cover in North Eastern face | Bentonite and water | 1 bag of Bentonite and water | 80ppm |
| 2 | 516ppm | | Closer to mulch / temporary cover and in bare soil cover | Bentonite and water | 2 bags of Bentonite and water | 115ppm |

| | | | | | | |
|---|---|---|---|---|---|---|
| 3 | 264ppm | | In previous bentonite remediation | Bentonite and water | 1 bag of Bentonite and water | 170ppm |
| 4 | 516ppm | | Bare soil cover | Bentonite and water | 4 bags of Bentonite and water | 93ppm |

| | | | | | | |
|---|---|---|---|---|---|---|
| 5 | 516ppm | | Bare soil cover in North Eastern face | Bentonite and water | 2 bags of Bentonite and water | 90ppm |
| 6 | 227ppm | | Clay/dried grass cover in North Eastern face. | Bentonite and water | 1 bag of Bentonite and water | 115ppm |

| | | | | | | |
|---|---|---|---|---|---|---|
| 7 | 319ppm | | Clay/dry grass cover in North Eastern face | Bentonite and water | 1 bag of Bentonite and water | 115ppm |
| 8 | 307ppm | | Clay cover at the edge of the North Eastern face | Bentonite and water | 1 bag of Bentonite and water | 45ppm |

| | | | | | | |
|---|---|---|---|---|---|---|
| 9 | 322ppm | | Clay cover, closer to south eastern faces clay bund | Bentonite and water | 1 bag of Bentonite and water | 42ppm |
| 10 | 368ppm | | Next to previous bentonite area, closer to clay bund in south eastern face | Bentonite and water | 1 bag of bentonite and water. | 112ppm |

| | | | | | | |
|---|---|---|---|---|---|---|
| 11 | 325ppm | | Clay cover and previous bentonite cover, edge of South western face and South Eastern face | Bentonite and water | 1 bag of bentonite and water | 60ppm |
| 12 | 600ppm | | Clay cover in the middle of South Eastern face | Bentonite and water | Added 2 bags of bentonite and water | 80ppm |

| | | | | | | |
|---|---|---|---|---|---|---|
| 13 | 329ppm | | Clay cover in upper Western face, closer to clay bund | Bentonite and water | 1bags of bentonite and water. | 40ppm |
| 14 | 329ppm | | Clay cover at the edge of the Western face clay bund | Bentonite and water | 1 bag of bentonite and water | 115ppm |

| | | | | | | |
|---|---|---|---|---|---|---|
| 15 | 340ppm | | Clay cover in upper Western face, closer to clay bund | Bentonite and water | 1 bag of bentonite and water | 185ppm |
| - | The bio filter showed no emissions 0ppm for the area, the GPS was not recording for the bio filter inspection. | | | | | |

**Levin Landfill temporary cap**

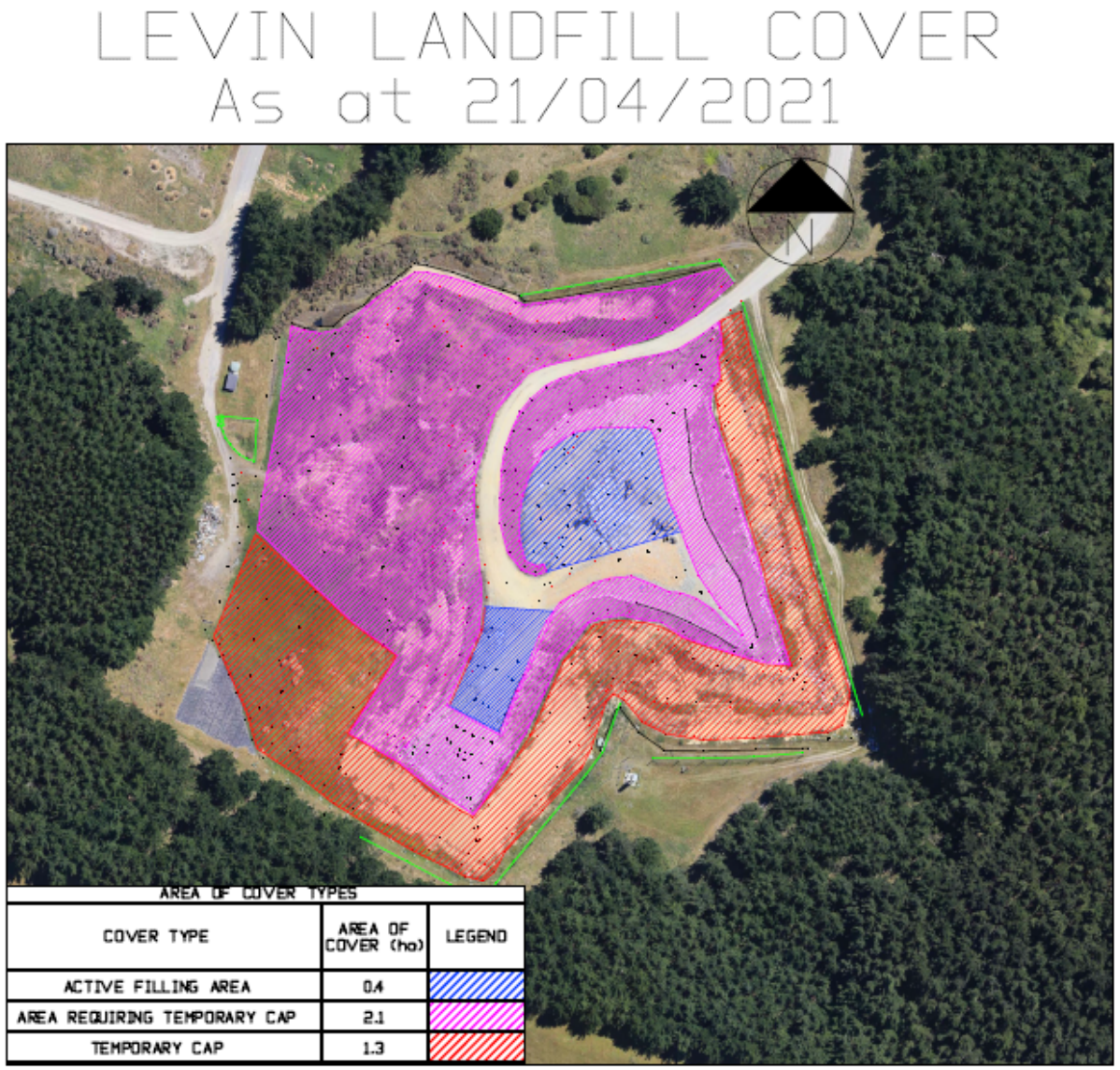


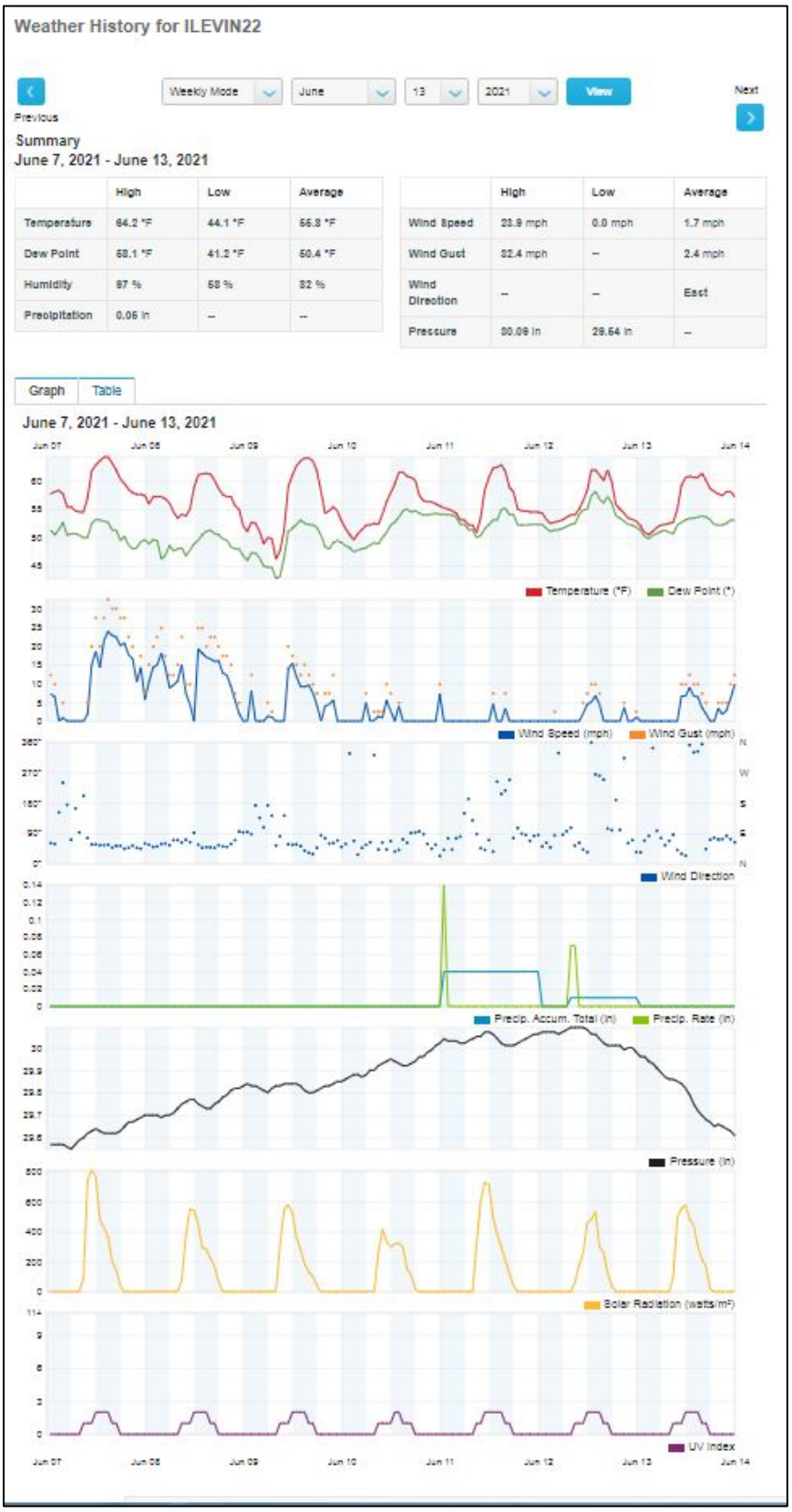

Figure 1: Map of Levin Landfill showing areas with temporary capping. (Aerial photo Feb 2021).

**Surface Emissions Map for temporary cover**

Figure 1: Map showing Levin Landfill surface emissions survey 11th June 2021, areas in red> 500ppm, areas in yellow >200ppm.

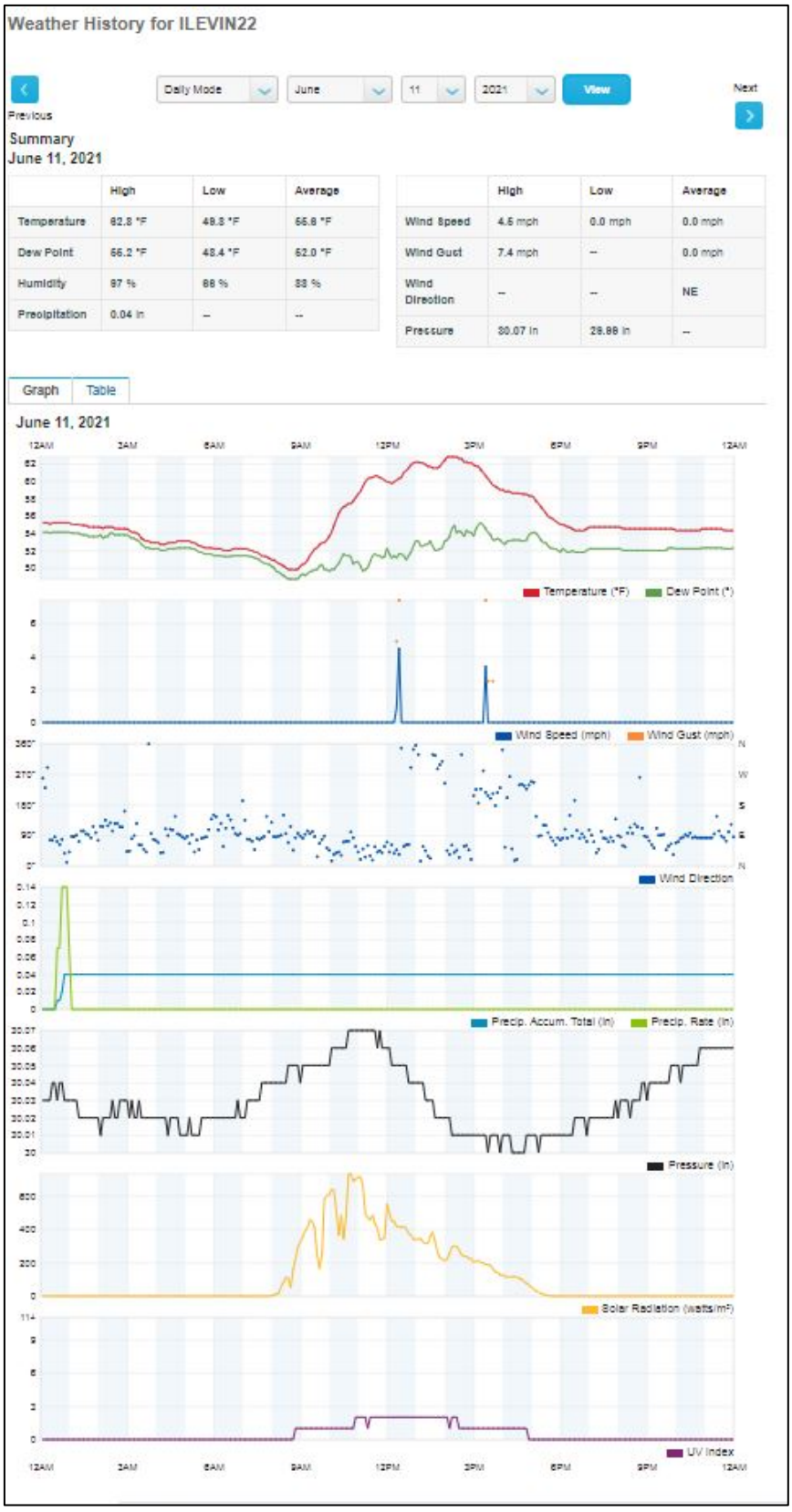
**Appendix 1: Weather conditions preceding the survey.**

The last rain recorded by a Levin weather station was 0.04mm ending at 12.54 a.m. on the 11th June, 8 hours and 46 minutes before the survey according to website (retrieved July 21st, 2021, https://www.wunderground.com/dashboard/pws/ILEVIN22/graph/2021-06-11/2021-06-11/daily,

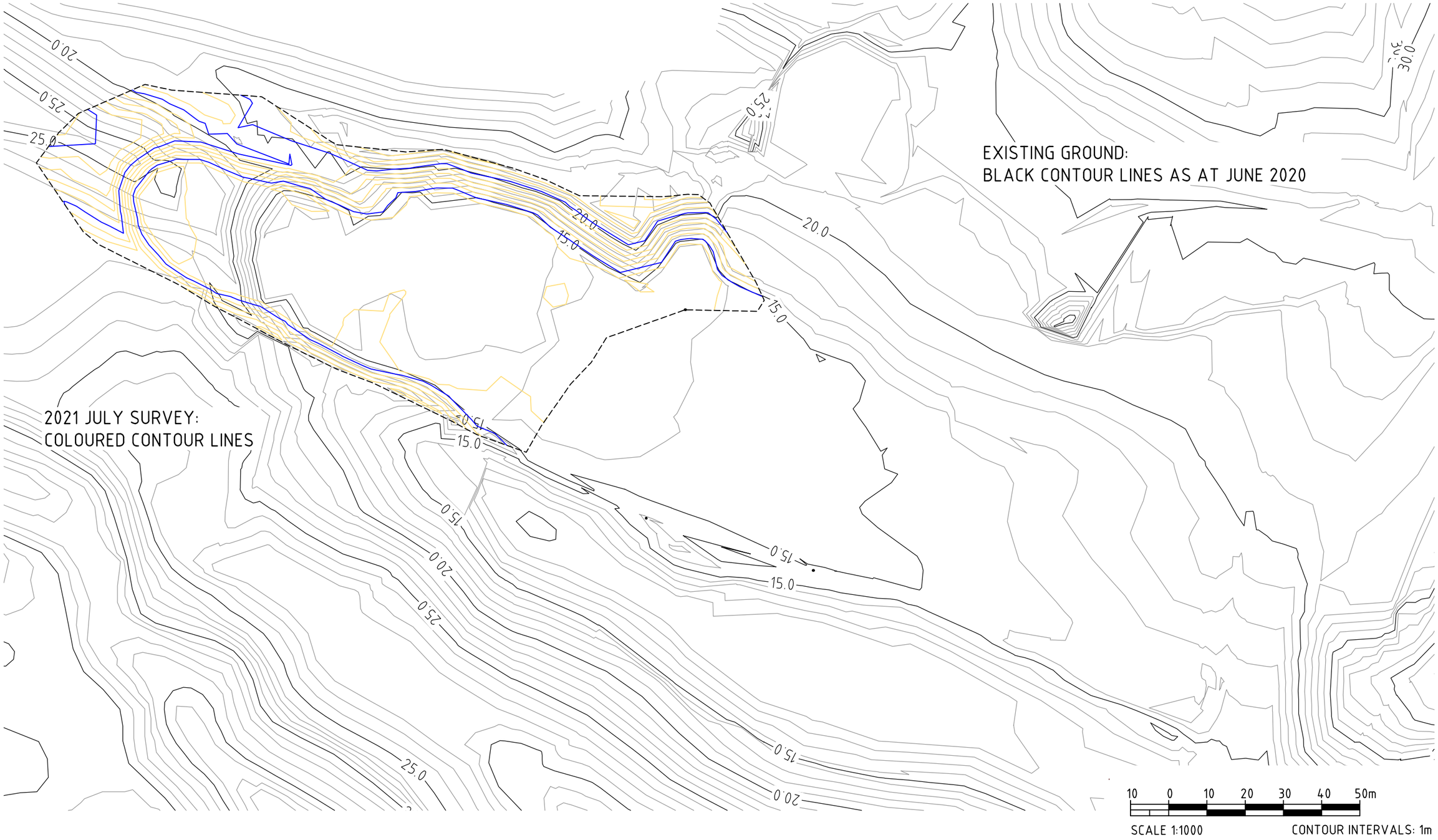


**Appendix 2:**

Weather conditions during the survey on the 11th June displayed below. There was no rainfall during the survey. Graph retrieved June 21th, 2021 from https://www.wunderground.com/dashboard/pws/ILEVIN22/graph/2021-06-11/2021-06-11/weekly



# **Appendix K** Survey plan

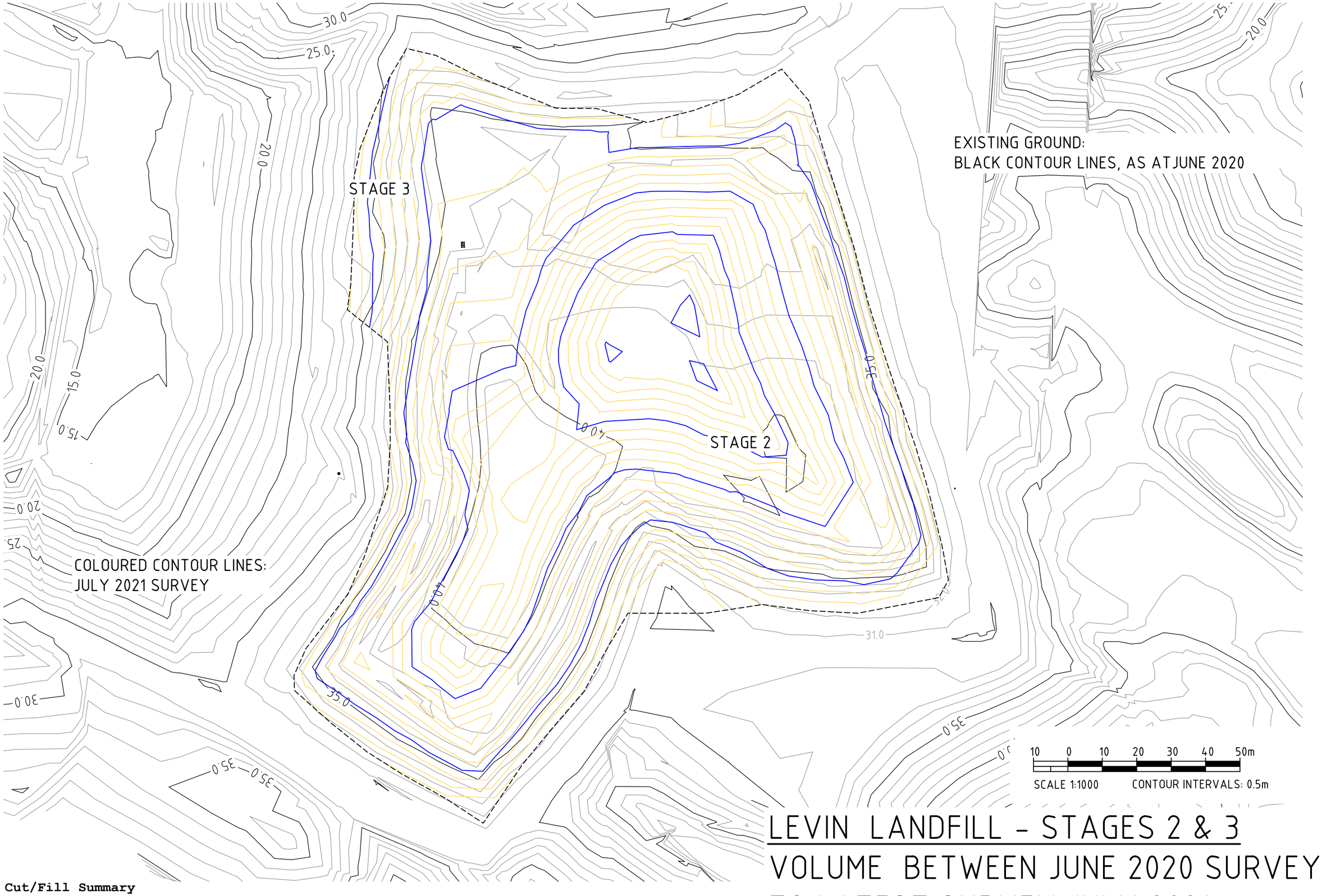



**Cut/Fill Summary**

| Name | Cut Factor | Fill Factor | 2d Area | Cut | Fill | Net |
|---|---|---|---|---|---|---|
| _Borrow Area June 2020 v July 2021 | **1.00** | **1.00** | 9243.7sq.m | 12122 Cu. M. | 548 Cu. M. | 11574 Cu. M.<Cut> |
| Totals | | | 9243.7sq.m | 12122 Cu. M. | 548 Cu. M. | 11574 Cu. M.<Cut> |

# LEVIN LANDFILL - BORROW AREA

## VOLUME EXTRACTED FROM BORROW AREA BETWEEN JUNE 2020 SURVEY TO LATEST SURVEY JULY 2021




# LEVIN LANDFILL - STAGES 2 & 3

## VOLUME BETWEEN JUNE 2020 SURVEY TO LATEST SURVEY JULY 2021

**Cut/Fill Summary**

| Name | Cut Factor | Fill Factor | 2d Area | Cut | Fill | Net |
|---|---|---|---|---|---|---|
| _Landfill June 2020 v Landfill July 2021 | **1.00** | **1.00** | 26153.3sq.m | 5354 Cu. M. | 47693 Cu. M. | 42340 Cu. M.<Fill> |
| Totals | | | 26153.3sq.m | 5354 Cu. M. | 47693 Cu. M. | 42340 Cu. M.<Fill> |

# **Appendix L** Settlement monitoring points

DO NOT SCALE - IF IN DOUBT, ASK

ORIGINAL SIZE A3

IT 1

OIT

IT 3

IT 2

IT 4

IT 5

OIR

IT 6 - Destroyed in 2021

IT 8 - Not visible in 2021

IT 7

IT 9

IT 10

Notes:
1. IT denotes Iron Tube buried approx. 0.2 - 0.3m on capped surface
2. OIR denotes Iron Rod buried approx. 0.2m outside capped surface
3. OIT denotes Iron Tube +0.5m outside capped surface
4. OIR and OIT are assumed stable
5. IT6 is on a mound and flush.
6. Survey carried out by total station
7. Estimated vertical accuracy +/- 10mm
8. A negative sign in the table above denotes downwards movement

0 50 100

CAD Ref :
Old Levin Landfill 30 June 2015 - Settlement Plan

COPYRIGHT © MWH NZ LTD

| REV | AMENDMENTS | DATE | INIT |
|---|---|---|---|
| | | | |

| | | |
|---|---|---|
| SCALES | 1:1000 | |
| FIELDBOOK | | |
| | BY | DATE |
| SURVEYED | RLB | 14-15 |
| DESIGNED | | |
| DRAWN | RLB | 7/15 |
| CHECKED | | |
| APPROVED | | |

MWH

# OLD LEVIN LANDFILL SETTLEMENT MONITORING

Status Stamp: FOR REVIEW

Date Stamp: 11/08/2016

| Job No. | Sheet No. | Rev. |
|---|---|---|
| 80500724 | 1 of 1 | 0 |

**CLOSED LANDFILL MONITORING POINTS : July 2014 - June 2021**

**01-07-14**

| | | | |
|---|---|---|---|
| 276456.677 | 659519.166 | 99.545 | IT 1 |
| 276481.279 | 659438.353 | 99.473 | IT 2 |
| 276508.959 | 659468.520 | 101.087 | IT 3 |
| 276564.804 | 659423.807 | 102.079 | IT 4 |
| 276519.814 | 659408.359 | 100.738 | IT 5 |
| 276571.031 | 659387.368 | 104.176 | IT 6 |
| 276564.514 | 659353.123 | 101.346 | IT 7 |
| 276606.806 | 659365.397 | 102.689 | IT 8 |
| 276566.047 | 659298.621 | 101.190 | IT 9 |
| 276608.720 | 659286.741 | 101.843 | IT 10 |
| 276501.879 | 659385.207 | 100.000 | OIR |
| 276412.147 | 659498.175 | 105.026 | OIT |

**30-06-15**

| | | | |
|---|---|---|---|
| 276456.676 | 659519.163 | 99.530 | IT 1 |
| 276481.284 | 659438.344 | 99.461 | IT 2 |
| 276508.958 | 659468.520 | 101.063 | IT 3 |
| 276564.806 | 659423.787 | 102.053 | IT 4 |
| 276519.828 | 659408.358 | 100.722 | IT 5 |
| 276571.031 | 659387.368 | 104.106 | IT 6 |
| 276564.517 | 659353.127 | 101.304 | IT 7 |
| 276606.804 | 659365.397 | 102.671 | IT 8 |
| 276566.051 | 659298.632 | 101.159 | IT 9 |
| 276608.740 | 659286.750 | 101.813 | IT 10 |
| 276501.884 | 659385.209 | 100.000 | OIR |
| 276412.129 | 659498.162 | 105.031 | OIT |

**Movement: 30/06/2015 - 1/7/2014**

| dmE | dmN | dmZ | Code | Notes |
|---|---|---|---|---|
| -0.001 | -0.003 | -0.015 | IT 1 | |
| 0.005 | -0.009 | -0.012 | IT 2 | |
| -0.001 | 0.000 | -0.024 | IT 3 | |
| 0.002 | -0.020 | -0.027 | IT 4 | |
| 0.014 | -0.001 | -0.017 | IT 5 | |
| 0.000 | 0.000 | -0.070 | IT 6 | On mound |
| 0.003 | 0.004 | -0.042 | IT 7 | |
| -0.002 | 0.000 | -0.018 | IT 8 | |
| 0.004 | 0.011 | -0.031 | IT 9 | |
| 0.020 | 0.009 | -0.031 | IT 10 | |
| 0.005 | 0.002 | 0.000 | OIR | Fixed |
| -0.018 | -0.013 | 0.004 | OIT | Check |

**10-08-16**

| | | | |
|---|---|---|---|
| 276456.669 | 659519.151 | 99.511 | IT 1 |
| 276481.288 | 659438.342 | 99.444 | IT 2 |
| 276508.955 | 659468.512 | 101.035 | IT 3 |
| 276564.806 | 659423.784 | 102.021 | IT 4 |
| 276519.829 | 659408.352 | 100.700 | IT 5 |
| 276571.031 | 659387.368 | 104.062 | IT 6 |
| 276564.517 | 659353.135 | 101.253 | IT 7 |
| 276606.804 | 659365.401 | 102.639 | IT 8 |
| 276566.071 | 659298.642 | 101.125 | IT 9 |
| 276608.755 | 659286.756 | 101.770 | IT 10 |
| 276501.891 | 659385.209 | 100.000 | OIR |
| 276412.131 | 659498.158 | 105.021 | OIT |

**Movement: 10/08/2016 - 30/06/2015**

| dmE | dmN | dmZ | Code | Notes |
|---|---|---|---|---|
| -0.007 | -0.012 | -0.018 | IT 1 | |
| 0.004 | -0.002 | -0.016 | IT 2 | |
| -0.003 | -0.008 | -0.028 | IT 3 | |
| 0.000 | -0.003 | -0.031 | IT 4 | |
| 0.001 | -0.006 | -0.021 | IT 5 | |
| 0.000 | 0.000 | -0.044 | IT 6 | On mound |
| 0.000 | 0.008 | -0.051 | IT 7 | |
| 0.000 | 0.004 | -0.031 | IT 8 | |
| 0.020 | 0.010 | -0.034 | IT 9 | |
| 0.015 | 0.006 | -0.043 | IT 10 | |
| 0.007 | 0.000 | 0.000 | OIR | Fixed |
| 0.002 | -0.004 | -0.009 | OIT | Check |

Note: Vertical Accuracy approximately +/- 10mm

**Movement: 10/08/2016 - 01/07/2014**

| dmE | dmN | dmZ | Code | Notes |
|---|---|---|---|---|
| -0.008 | -0.015 | -0.033 | IT 1 | |
| 0.009 | -0.011 | -0.029 | IT 2 | |
| -0.004 | -0.008 | -0.052 | IT 3 | |
| 0.002 | -0.023 | -0.058 | IT 4 | |
| 0.015 | -0.007 | -0.038 | IT 5 | |
| 0.000 | 0.000 | -0.114 | IT 6 | On mound |
| 0.003 | 0.012 | -0.093 | IT 7 | |
| -0.002 | 0.004 | -0.049 | IT 8 | |
| 0.024 | 0.021 | -0.065 | IT 9 | |
| 0.035 | 0.015 | -0.073 | IT 10 | |
| 0.012 | 0.002 | 0.000 | OIR | Fixed |
| -0.016 | -0.017 | -0.005 | OIT | Check |

Note: Vertical Accuracy approximately +/- 10mm

**22-05-17**

| | | | |
|---|---|---|---|
| 276456.685 | 659519.175 | 99.5 | IT 1 |
| 276481.294 | 659438.36 | 99.433 | IT 2 |
| 276508.961 | 659468.522 | 101.012 | IT 3 |
| 276564.814 | 659423.795 | 101.999 | IT 4 |
| 276519.833 | 659408.369 | 100.684 | IT 5 |
| 276571.031 | 659387.368 | 104.026 | IT 6 |
| 276564.515 | 659353.121 | 101.225 | IT 7 |
| 276606.802 | 659365.4 | 102.627 | IT 8 |
| 276566.06 | 659298.634 | 101.094 | IT 9 |
| 276608.748 | 659286.734 | 101.743 | IT 10 |
| 276501.902 | 659385.216 | 100 | OIR |
| 276412.172 | 659498.185 | 105.03 | OIT |

**Movement: 22/05/2017 - 10/08/2016**

| dmE | dmN | dmZ | Code | Notes |
|---|---|---|---|---|
| -0.016 | -0.024 | -0.011 | IT 1 | |
| -0.006 | -0.018 | -0.011 | IT 2 | |
| -0.006 | -0.010 | -0.023 | IT 3 | |
| -0.008 | -0.011 | -0.022 | IT 4 | |
| -0.004 | -0.017 | -0.016 | IT 5 | |
| 0.000 | 0.000 | -0.036 | IT 6 | On mound |
| 0.002 | 0.014 | -0.028 | IT 7 | |
| 0.002 | 0.001 | -0.012 | IT 8 | |
| 0.011 | 0.008 | -0.031 | IT 9 | |
| 0.007 | 0.022 | -0.027 | IT 10 | |
| -0.011 | -0.007 | 0.000 | OIR | Fixed |
| -0.041 | -0.027 | 0.009 | OIT | Check |

Note: Vertical Accuracy approximately +/- 10mm

**Movement: 22/05/2017 - 01/07/2014**

| dmE | dmN | dmZ | Code | Notes |
|---|---|---|---|---|
| 0.008 | 0.009 | -0.045 | IT 1 | |
| 0.015 | 0.007 | -0.040 | IT 2 | |
| 0.002 | 0.002 | -0.075 | IT 3 | |
| 0.010 | -0.012 | -0.080 | IT 4 | |
| 0.019 | 0.010 | -0.054 | IT 5 | |
| 0.000 | 0.000 | -0.150 | IT 6 | On mound |
| 0.001 | -0.002 | -0.121 | IT 7 | |
| -0.004 | 0.003 | -0.062 | IT 8 | |
| 0.013 | 0.013 | -0.096 | IT 9 | |
| 0.028 | -0.007 | -0.100 | IT 10 | |
| 0.023 | 0.009 | 0.000 | OIR | Fixed |
| 0.025 | 0.010 | 0.004 | OIT | Check |

Note: Vertical Accuracy approximately +/- 10mm

**04-07-18**

| | | | |
|---|---|---|---|
| 276456.6931 | 659519.173 | 99.4892 | IT 1 |
| 276481.2812 | 659438.351 | 99.4209 | IT 2 |
| 276508.9587 | 659468.515 | 100.9909 | IT 3 |
| 276564.8021 | 659423.781 | 101.9763 | IT 4 |
| 276519.82 | 659408.359 | 100.6719 | IT 5 |
| 276571.0249 | 659387.36 | 103.9822 | IT 6 |
| 276564.5037 | 659353.119 | 101.1788 | IT 7 |
| 276606.7903 | 659365.392 | 102.5772 | IT 8 |
| 276566.0485 | 659298.638 | 101.0667 | IT 9 |
| 276608.7314 | 659286.738 | 101.7143 | IT 10 |
| | | | OIR |
| 276412.1367 | 659498.17 | 105.035 | OIT |

**Movement: 04/07/2018 - 22/05/2017**

| dmE | dmN | dmZ | Code | Notes |
|---|---|---|---|---|
| -0.008 | 0.003 | -0.011 | IT 1 | |
| 0.013 | 0.009 | -0.012 | IT 2 | |
| 0.002 | 0.007 | -0.021 | IT 3 | |
| 0.012 | 0.015 | -0.023 | IT 4 | |
| 0.013 | 0.010 | -0.012 | IT 5 | |
| 0.006 | 0.008 | -0.044 | IT 6 | On mound |
| 0.011 | 0.002 | -0.046 | IT 7 | |
| 0.012 | 0.008 | -0.050 | IT 8 | In Puddle |
| 0.012 | -0.003 | -0.027 | IT 9 | |
| 0.017 | -0.004 | -0.029 | IT 10 | |
| | | | OIR | Setup point |
| 0.035 | 0.015 | 0.005 | OIT | Check |

Note: Vertical Accuracy approximately +/- 10mm

**Movement: 04/07/2018 - 01/07/2014**

| dmE | dmN | dmZ | Code | Notes |
|---|---|---|---|---|
| 0.016 | 0.007 | -0.056 | IT 1 | |
| 0.002 | -0.002 | -0.052 | IT 2 | |
| 0.000 | -0.005 | -0.096 | IT 3 | |
| -0.002 | -0.027 | -0.103 | IT 4 | |
| 0.006 | 0.000 | -0.066 | IT 5 | |
| -0.006 | -0.008 | -0.194 | IT 6 | On mound |
| -0.010 | -0.004 | -0.167 | IT 7 | |
| -0.016 | -0.005 | -0.112 | IT 8 | |
| 0.001 | 0.016 | -0.123 | IT 9 | |
| 0.011 | -0.003 | -0.129 | IT 10 | |
| | | | OIR | Setup point |
| -0.010 | -0.005 | 0.009 | OIT | Check |

Note: Vertical Accuracy approximately +/- 10mm

Notes 04-07-2018

Heights surveyed by Total station

Position of monitoring points surveyed by Total Station (OIR - Setup Point)

**30-04-19**

| | | | |
|---|---|---|---|
| 276456.681 | 659519.172 | 99.497 | IT 1 |
| 276481.279 | 659438.353 | 99.424 | IT 2 |
| 276508.953 | 659468.517 | 100.989 | IT 3 |
| 276564.803 | 659423.781 | 101.975 | IT 4 |
| 276519.821 | 659408.362 | 100.669 | IT 5 |
| 276571.026 | 659387.357 | 103.965 | IT 6 |
| 276564.506 | 659353.111 | 101.16 | IT 7 |
| 276606.8 | 659365.362 | 102.554 | IT 8 |
| 276566.046 | 659298.625 | 101.061 | IT 9 |
| 276608.717 | 659286.742 | 101.693 | IT 10 |
| | | | OIR |
| 276412.124 | 659498.171 | 105.042 | OIT |

**Movement: 30/05/2019 - 04/07/2018**

| dmE | dmN | dmZ | Code | Notes |
|---|---|---|---|---|
| -0.012 | 0.000 | 0.008 | IT 1 | |
| -0.002 | 0.002 | 0.003 | IT 2 | |
| -0.006 | 0.002 | -0.002 | IT 3 | |
| 0.001 | 0.000 | -0.001 | IT 4 | |
| 0.001 | 0.003 | -0.003 | IT 5 | |
| 0.001 | -0.003 | -0.017 | IT 6 | On mound |
| 0.002 | -0.008 | -0.019 | IT 7 | |
| 0.010 | -0.030 | -0.023 | IT 8 | In Puddle |
| -0.003 | -0.012 | -0.006 | IT 9 | |
| -0.014 | 0.004 | -0.021 | IT 10 | |
| | | | OIR | Setup point |
| -0.013 | 0.001 | 0.007 | OIT | Check |

Note: Vertical Accuracy approximately +/- 10mm

**Movement: 30/05/2019 - 01/07/2014**

| dmE | dmN | dmZ | Code | Notes |
|---|---|---|---|---|
| 0.004 | 0.006 | -0.048 | IT 1 | |
| 0.000 | 0.000 | -0.049 | IT 2 | |
| -0.006 | -0.003 | -0.098 | IT 3 | |
| -0.001 | -0.026 | -0.104 | IT 4 | |
| 0.007 | 0.003 | -0.069 | IT 5 | |
| -0.005 | -0.011 | -0.211 | IT 6 | On mound |
| -0.008 | -0.012 | -0.186 | IT 7 | |
| -0.006 | -0.035 | -0.135 | IT 8 | |
| -0.001 | 0.004 | -0.129 | IT 9 | |
| -0.003 | 0.001 | -0.150 | IT 10 | |
| | | | OIR | Setup point |
| -0.023 | -0.004 | 0.016 | OIT | Check |

Note: Vertical Accuracy approximately +/- 10mm

Notes 30-05-2019

Heights surveyed by Total station

Position of monitoring points surveyed by Total Station (OIR - Setup Point)

**30-06-20**

| | | | |
|---|---|---|---|
| 276456.653 | 659519.157 | 99.483 | IT 1 |
| 276481.274 | 659438.347 | 99.41 | IT 2 |
| 276508.943 | 659468.512 | 100.963 | IT 3 |
| 276564.782 | 659423.79 | 101.95 | IT 4 |
| 276519.824 | 659408.362 | 100.654 | IT 5 |
| 276571.022 | 659387.363 | 103.934 | IT 6 |
| 276564.504 | 659353.117 | 101.132 | IT 7 |
| 276606.788 | 659365.387 | 102.506 | IT 8 |
| 276566.051 | 659298.643 | 101.035 | IT 9 |
| 276608.742 | 659286.75 | 101.668 | IT 10 |
| | | | OIR |
| 276412.113 | 659498.15 | 105.042 | OIT |

**Movement: 30/06/2020 - 30/05/2019**

| dmE | dmN | dmZ | Code | Notes |
|---|---|---|---|---|
| -0.028 | -0.015 | -0.014 | IT 1 | |
| -0.005 | -0.006 | -0.014 | IT 2 | |
| -0.010 | -0.005 | -0.026 | IT 3 | |
| -0.021 | 0.009 | -0.025 | IT 4 | |
| 0.003 | 0.000 | -0.015 | IT 5 | |
| -0.004 | 0.006 | -0.031 | IT 6 | On mound |
| -0.002 | 0.006 | -0.028 | IT 7 | |
| -0.012 | 0.025 | -0.048 | IT 8 | In Puddle |
| 0.005 | 0.018 | -0.026 | IT 9 | |
| 0.025 | 0.008 | -0.025 | IT 10 | |
| | | | OIR | Setup point |
| -0.011 | -0.021 | 0.000 | OIT | Check |

Note: Vertical Accuracy approximately +/- 10mm

**Movement: 30/06/2020 - 01/07/2014**

| dmE | dmN | dmZ | Code | Notes |
|---|---|---|---|---|
| -0.024 | -0.009 | -0.062 | IT 1 | |
| -0.005 | -0.006 | -0.063 | IT 2 | |
| -0.016 | -0.008 | -0.124 | IT 3 | |
| -0.022 | -0.017 | -0.129 | IT 4 | |
| 0.010 | 0.003 | -0.084 | IT 5 | |
| -0.009 | -0.005 | -0.242 | IT 6 | On mound |
| -0.010 | -0.006 | -0.214 | IT 7 | |
| -0.018 | -0.010 | -0.183 | IT 8 | |
| 0.004 | 0.022 | -0.155 | IT 9 | |
| 0.022 | 0.009 | -0.175 | IT 10 | |
| | | | OIR | Setup point |
| -0.034 | -0.025 | 0.016 | OIT | Check |

Note: Vertical Accuracy approximately +/- 10mm

Notes 30-05-2019

Heights surveyed by Total station

Position of monitoring points surveyed by Total Station (OIR - Setup Point)

**26-07-21**

| | | | |
|---|---|---|---|
| 276456.622 | 659519.171 | 99.483 | IT 1 |
| 276481.264 | 659438.342 | 99.407 | IT 2 |
| 276508.923 | 659468.516 | 100.956 | IT 3 |
| 276564.782 | 659423.803 | 101.944 | IT 4 |
| 276519.82 | 659408.37 | 100.647 | IT 5 |
| | | | IT 6 |
| 276564.514 | 659353.13 | 101.087 | IT 7 |
| | | | IT 8 |
| 276566.067 | 659298.661 | 101.017 | IT 9 |
| 276608.758 | 659286.755 | 101.615 | IT 10 |
| | | | OIR |
| | | | OIT |

**Movement: 26/07/2021 - 30/06/2020**

| dmE | dmN | dmZ | Code | Notes |
|---|---|---|---|---|
| -0.031 | 0.014 | 0.000 | IT 1 | |
| -0.010 | -0.005 | -0.003 | IT 2 | |
| -0.020 | 0.004 | -0.007 | IT 3 | |
| 0.000 | 0.013 | -0.006 | IT 4 | |
| -0.004 | 0.008 | -0.007 | IT 5 | |
| | | | IT 6 | Destroyed |
| 0.010 | 0.013 | -0.045 | IT 7 | |
| | | | IT 8 | Not intervisible |
| 0.016 | 0.018 | -0.018 | IT 9 | |
| 0.016 | 0.005 | -0.053 | IT 10 | |
| | | | OIR | Setup point |
| | | | OIT | Check |

Note: Vertical Accuracy approximately +/- 10mm

**Movement: 26/07/2021 - 01/07/2014**

| dmE | dmN | dmZ | Code | Notes |
|---|---|---|---|---|
| -0.055 | 0.005 | -0.062 | IT 1 | |
| -0.015 | -0.011 | -0.066 | IT 2 | |
| -0.036 | -0.004 | -0.131 | IT 3 | |
| -0.022 | -0.004 | -0.135 | IT 4 | |
| 0.006 | 0.011 | -0.091 | IT 5 | |
| | | | IT 6 | Destroyed |
| 0.000 | 0.007 | -0.259 | IT 7 | |
| | | | IT 8 | |
| 0.020 | 0.040 | -0.173 | IT 9 | |
| 0.038 | 0.014 | -0.228 | IT 10 | |
| | | | OIR | Setup point |
| | | | OIT | Check |

Note: Vertical Accuracy approximately +/- 10mm

Notes 26-07-2021

Heights surveyed by Total station

Position of monitoring points surveyed by Total Station (OIR - Setup Point)

# **Appendix M** Special waste log

| REF | Date Received | Type of Waste | Source of Waste | Volume of Waste | RM8 Ref | RM8 Link |
|---|---|---|---|---|---|---|
| 1607202020 | 17-07-20 | Packaged Licorice | RJs Licorice | 25 Pallets in 30m³ Hook Bin | D20/112825 | Waste Management - Solid Waste - Levin Landfill - Special Waste Permit - Waste Management - RJ's Licorice - Kopu Malu - Caroline Wheeler - 16 July 2020 |
| 1607202020 | 20-07-20 | Packaged Licorice | RJs Licorice | 25 Pallets in 30m³ Hook Bin | D20/112825 | Waste Management - Solid Waste - Levin Landfill - Special Waste Permit - Waste Management - RJ's Licorice - Kopu Malu - Caroline Wheeler - 16 July 2020 |
| N/A | 23-07-20 | Meth Contaminated Waste | Fresh Living | 9m³ | N/A | No permit processed due to internal error. Waste was disposed of to landfill without permit/permission. |
| 29072020 | 29-07-20 | Redundant Film | RJs Licorice | 19 pallets in 30m³ hook bin | D20/118161 | Waste Management - Solid Waste - Levin Landfill - Special Waste Permit - Waste Management - RJ's Licorice - Redundant Film - Kopu Malu - Joe Murphy - 4 August 2020 |
| 17092020 | 17-09-20 | Dead frozen chickens | Tegal Foods | 4.4m³ | D20/149285 | Waste Management - Solid Waste - Levin Landfill - Special Waste Permit - Envirowaste - Dead Chickens - Richard Darton - 17 September 2020 |
| 21092020 | 21-09-20 | Finished Licorice | RJs Licorice | 14 pallets in 30m³ hook bin | D20/150362 | Waste Management - Solid Waste - Levin Landfill - Special Waste Permit - Waste Management - RJ's Licorice - Redundant Product - Jessica Kairau - 21 September 2020 |
| 20102020 | 22-10-20 | Cooked whole eggs and egg spread | Zeagold Foods | 2 pallets, 30 ctn spread, 67 ctn whole eggs | D20/166146 | Waste Management - Solid Waste - Levin Landfill - Special Waste Permit - Waste Management - Zeagold Foods - Whole Eggs and Egg Spread - Kylie Cribb - John Tatterson - 22 October 2020 |
| 4112020 | 06-11-20 | Finished/packed licorice | RJs Licorice | 15 Pallets in 30m³ hook bin | D20/174070 | Waste Management - Solid Waste - Levin Landfill - Special Waste Permit - Waste Management - RJs Licorice - Kylie Cribb - 6 November 2020 |
| 23112020 | 24-11-20 | Meth Contaminated Waste | Fresh Living | 9m³ | D20/181816 | Waste Management - Solid Waste - Levin Landfill - Special Waste Permit - Envirowaste - Meth Contaminated Waste - Richard Darton - 24 November 2020 |
| 25112020 | 26-11-20 | Fibre Optic Cables | Chorus | 7.5m³ | D20/182824 | Waste Management - Solid Waste - Levin Landfill - Special Waste Permit - Waste Management - Chorus - Fibre Optic Cables - 26 November 2020 |
| N/A | 27-01-21 | Dead cow | Hit by Car | Dead Cow | N/A | N/A |
| 150221 | 15-02-21 | Mouldy Imported/NZ Maize | Mainfeeds Levin | 10m³ | D21/17234 | Waste Management - Solid Waste - Levin Landfill - Special Waste Permit - Imported Maize - JB's Environmental - Scott Tate - 17 February 2021 |
| 25022021 | 25-02-21 | Expired finished product and redundant film | RJs Licorice | 16 pallets total in 30 m³ hook bin | D21/22132 | Waste Management - Solid Waste - Levin Landfill - Special Waste Permit - RJs Licorice - Waste Management - Kopu Malu - 26 February 2021 |
| 17032021 | 09-03-21 | Dead Chickens | Tegel | 4.5 m³ | D21/30138 | Waste Management - Solid Waste - Levin Landfill - Special Waste Permit - Envirowaste - Dead Chickens - Richard Darton - 17 March 2021 |
| 24032021 | 09-03-21 | Dead Chickens | Tegel | 4.5 m³ | D21/30141 | Waste Management - Solid Waste - Levin Landfill - Special Waste Permit - Envirowaste - Dead Chickens - Richard Darton - 24 March 2021 |
| 11032021 | 09-03-21 | Boiled eggs (Not fit for human consumption) | Zeagold Foods | 3 pallets | D21/30145 | Waste Management - Solid Waste - Levin Landfill - Special Waste Permit - Waste Management - Zeagold Foods - Boiled Eggs - Kopu Malu - 11 March 2021 |
| 29032021 | 29-03-21 | Overcooked Licorice | RJs Licorice | Approx 15 Pallets in 30 m³ hook bin | D21/40864 | Waste Management - Solid Waste - Levin Landfill Operations - Special Waste Permit - Waste Management - RJ's Licorice - Overcooked Licorice - Kopu Malu - 29 March 2021 |
| 22062021 | 21-06-21 | Mixed food products within cardboard or plastic packaging (e.g. microwave meals) | Halls Refrigerated Transport | 5-6 tonne in 7.5 m³ skip | D21/128789 | Waste Management - Solid Waste - Levin Landfill Operations - Special Waste Permit 22062021 - Frozen Food Products - Halls Transport - Waste Management Ltd - 23 June 2021 |
| 25062021 | 25-06-21 | Rejected Wrapped Licorice and Rejected Flour Bags | RJ's Licorice | Approx 10 Tonne | D21/128868 | Waste Management - Solid Waste - Levin Landfill Operations - Special Waste Permit 25062021 - Rejected Licorice and Flour - RJ's Licorice - For Disposal 28 June 2021 |
| 29062021 | 28-06-21 | Redundant Packaging | RJ's Licorice | 10 Tonne per load (2 loads 29/06, 30/06) | D21/128869 | Waste Management - Solid Waste - Levin Landfill Operations - Special Waster Permit 29062021 - Redundant Packaging - RJs Licorice - For Disposal 29 June 2021 and 30 June 2021 |

# CREATING COMMUNITIES

Communities are fundamental. Whether around the corner or across the globe, they provide a foundation, a sense of belonging. That's why at Stantec, we always **design with community in mind**.

We care about the communities we serve—because they're our communities too. We're designers, engineers, scientists, and project managers, innovating together at the intersection of community, creativity, and client relationships. Balancing these priorities results in projects that advance the quality of life in communities across the globe.

**New Zealand offices:**
Alexandra, Auckland, Balclutha, Christchurch, Dunedin, Gisborne, Greymouth, Hamilton, Hastings, Napier, Nelson, Palmerston North, Queenstown, Tauranga, Wellington, Whangārei

Stantec Building, Level 15, 10 Brandon Street, Wellington, 6011
PO Box 13-052, Armagh, Christchurch, 8141
New Zealand: +64 4 381 6700 | www.stantec.com