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
2	28/10/21	Final – with section alteration	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 around the new landfill and within the old leachate 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 around the new landfill and within the leachate 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

List of Tables

List of Figures

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 5(a) and 8	Landfill gas monitoring in groundwater monitoring wells	Section 8
DP 6011 – condition 5(e), 5(g) and 8	Monthly methane surface monitoring of capped areas and bio-filter	Section 8
DP 6011 – condition 5(j)	Measure and record bio-filter parameters and maintain it	Section 8
DP 6011 – condition 5(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.

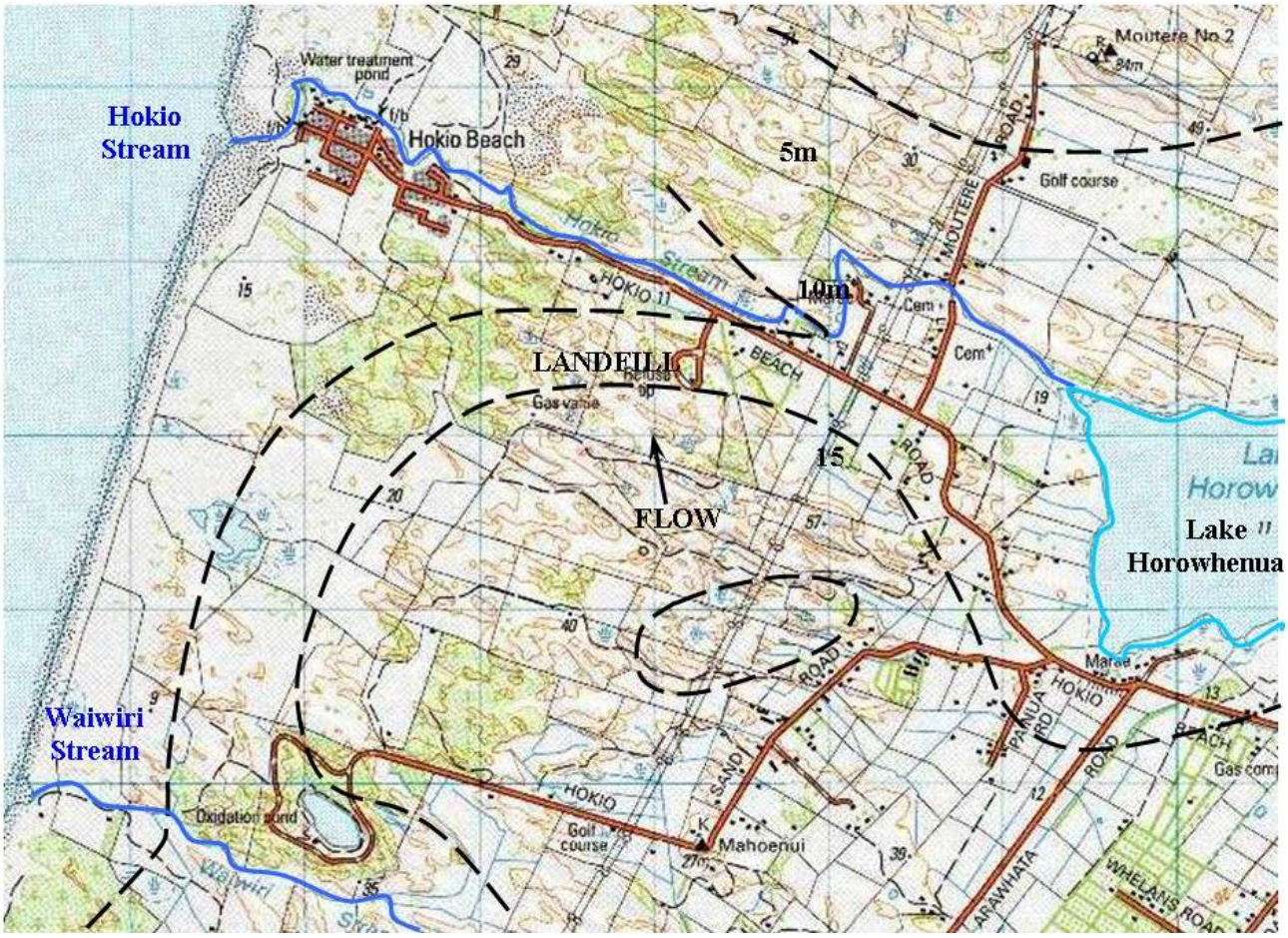


Figure 2-1 Shallow Groundwater Flow Direction

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 Landfill

Water sampling was carried out to characterise the groundwater quality in a series of shallow bores situated hydraulically down-gradient of the old landfill.

Results for all parameters were below the ANZECC Livestock Drinking Water trigger values in the 2020-2021 monitoring period, and therefore the hydraulically down-gradient bores **complied with the resource consent conditions**. Results for key indicators in Table 4-4 have been coloured to highlight more elevated values (with colour intensity increasing with concentration), to assist in identifying areas with elevated contaminant concentrations indicating the presence of the leachate plume from the old landfill spatially across the site (i.e., west to east). Elevated concentrations were observed as follows:

- Leachate indicators (boron, chloride, ammoniacal-N and conductivity) were more elevated in the western-most down-gradient bores (B1, B2, B3, C2, and G2S) but not in bore E2S.
- The concentrations often varied significantly between the bores, though bores E2S and G1S were consistently lower than the other results. This indicates the leachate plume is not moving directly towards the nearest houses downstream of the site.

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. None of the contaminants exceeded the guideline value. The range of concentrations detected above laboratory detection limits at each location are detailed in Table 4-5.

Table 4-4: Median or singular result for hydraulically down-gradient groundwater monitoring bores (2020-2021 monitoring period) – *bores listed L to R (west to east)*

Determinant		Units	ANZECC LDW	E2S	B3	XS1	C2	C2DS	B2	C1	B1	G2S	G1S	XS2
Leachate indicators														
Ammoniacal-N	mg/L			0.305	173	3.155	147	1.315	36.7	7.17	10.49	0.02	0.045	0.02
Boron	mg/L	5		0.0325	1.145	0.55	1.75	0.9	1.73	0.705	0.95	0.985	0.015	0.04
Chloride	mg/L			42.5	160.5	118.5	206.5	113.5	130	209	277.5	269	62.7	21.25
Conductivity	mS/m			40.15	263	137	247.5	143.5	220.5	123	188.5	144	41.55	21.6
Faecal coliforms	CFU/100mL	100		2	26	2	3	2	5	2	3	2	2	9
pH	-	6 to 9		7.6	7.05	6.95	6.95	6.8	6.65	6.7	6.75	7.2	6.65	6.9
Suspended Solids	mg/l			2.5	81	62.5	221.5	98.5	16	258.5	3	2.75	45	12.5
Phenol	mg/l			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	52	2.5	2.5	2.5
TOC	mg/L			3.1	57.3	13.6	42.1	25.45	32.4	15.8	21.55	6.15	39.05	13.7
Alkalinity	mg CaCO3/L			115	994.5	532	885	497.5	649.5	284	537	281.5	80	33
COD	mg/l			11.75	174	78.5	132	99.5	101	68.5	88.5	53	98	40.25
BOD	mg/L			0.5	3	3	4.45	2	0.5	0.5	0.5	0.5	1.75	1.5
Nitrate-N	mg/L	90.3		0.005	0.05	0.0275	0.05	0.05	66	0.005	8.9	0.0275	0.04	0.495
Sulphate	mg/L	1000		7.055	0.025	3.88	5.5	0.01	8.11	31	3.86	4.495	4.785	13.25
Hardness	mg CaCO3/L			112	264.5	446	225	435.5	482.5	231.5	522	248.5	40	53
Calcium	mg/L	1000		28.75	51.75	91.9	47.25	114.5	107.8	44	98.5	48.05	7.565	11
Magnesium	mg/L			9.84	32.7	52.55	25.95	36.25	51.6	29.5	67.05	31.1	5.115	6.265
Potassium	mg/L			5.895	105.5	21.3	84.1	12.7	51.55	22.05	21.35	20.75	3.94	3.91

Determinant		Units	ANZECC LDW	E2S	B3	XS1	C2	C2DS	B2	C1	B1	G2S	G1S	XS2
Sodium	mg/L			37.4	124.5	97.2	177.5	102.3	112	103.5	174	170.5	69.6	17.6
DRP	mg/L			0.424	0.0325	0.093	0.021	0.027	0.033	0.014	0.107	0.0175	0.0715	0.0205
Aluminum	mg/L	5		0.001	0.006	0.0035	0.0155	0.0015	0.0125	0.01	0.0045	0.003	0.1475	0.0075
Arsenic	mg/L	0.1		0.00075	0.0265	0.0005	0.002	0.0025	0.0025	0.0025	0.00075	0.0005	0.002	0.0005
Cadmium	mg/L	0.01		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	1		0.0005	0.004	0.001	0.002	0.0005	0.00075	0.0005	0.00075	0.0005	0.0025	0.0005
Copper	mg/L	0.4		0.00025	0.005	0.000575	0.0006	0.00025	0.0032	0.000525	0.0081	0.0052	0.00965	0.00115
Iron	mg/L			0.045	0.623	9.015	1.3345	9.455	0.199	1.1805	0.0515	0.1015	3.505	0.165
Lead	mg/L	0.1		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			0.311	2.85	0.8575	0.0472	2.195	3.965	0.3905	10.27	0.1395	0.06945	0.1185
Mercury	mg/L			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	1		0.00025	0.0094	0.00245	0.004	0.00225	0.0026	0.00085	0.00255	0.00325	0.0016	0.000525
Zinc	mg/L	20		0.0015	0.0015	0.0025	0.0065	0.001	0.0055	0.001	0.0065	0.0015	0.0015	0.005

Table 4-5 SVOCs and VOCs detected in samples from down-gradient groundwater bores, 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)
				B3	C2	G2s	B2	B1	XS1	
8/01/2021	SVOC-072 Bis(2-ethylhexyl)adipate	0.0001	Not defined	ND	0.0001	ND	0.0002	0.0001	ND	Not available
15/04/2021	VOC-016 Toluene	0.0005	0.18	0.0007	ND	ND	ND	0.0008	ND	Hydrocarbon; fuel additives (vehicles)
13/04/2021				ND	ND	0.0009	ND	ND	ND	
12/4/2021				ND	ND	ND	ND	ND	0.0009	

4.4.3 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 4-6.

Results for the background deep-bore G1D have also been included in Table 4-6 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 4-6: 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 4-7).

Table 4-7: 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

Determinant	Units	Typical Leachate Characteristics*	Leachate
Manganese	mg/L	0.03 – 45***	1.115
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 4-8 below. Of these 12 results, only two results exceeded the guideline values. These exceedances occurred for carbofuran which showed an exceedance of the 99th, 95th, and 90th percentile in the October 2020 sample, and for Naphthalene which also exceeded the guideline in the April 2021 sample, with an exceedance of the 99th percentile.

Table 4-8 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 (99th percentile) 0.0012 (95th percentile) 0.004 (90th percentile) 0.015 (80th percentile)	Insecticides applied to fruit, vegetable, and cereal crops.
15/10/2020	SVOC-062 Naphthalene	0.0013	0.0025 (99th percentile) 0.016 (95th percentile) 0.037 (90th percentile) 0.085 (80th 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 (99th percentile) 0.016 (95th percentile) 0.037 (90th percentile) 0.085 (80th 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 (99th percentile) 0.35 (95th percentile) 0.47 (90th percentile) 0.64 (80th 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

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)
12/04/2021	VOC-007 Naphthalene	**0.0046**	0.0025 (99th percentile) 0.016 (95th percentile) 0.037 (90th percentile) 0.085 (80th percentile)	A Polycyclic Aromatic Hydrocarbon (PAH) found in runoff from road surfaces; generally produced from anthropogenic combustion processes
12/04/2021	VOC-010 o-Xylene	0.0165	0.2 (99th percentile) 0.35 (95th percentile) 0.47 (90th percentile) 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 4-9). 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 4-9: 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							
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.

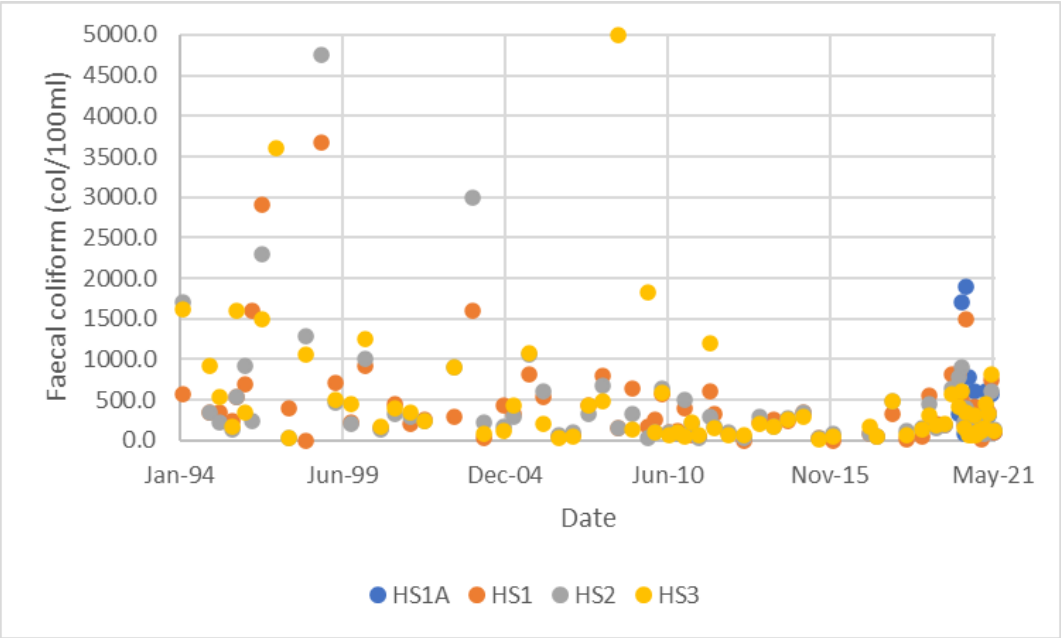


Figure 5-2: Hokio Stream Faecal Coliform Counts, since 1994

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.

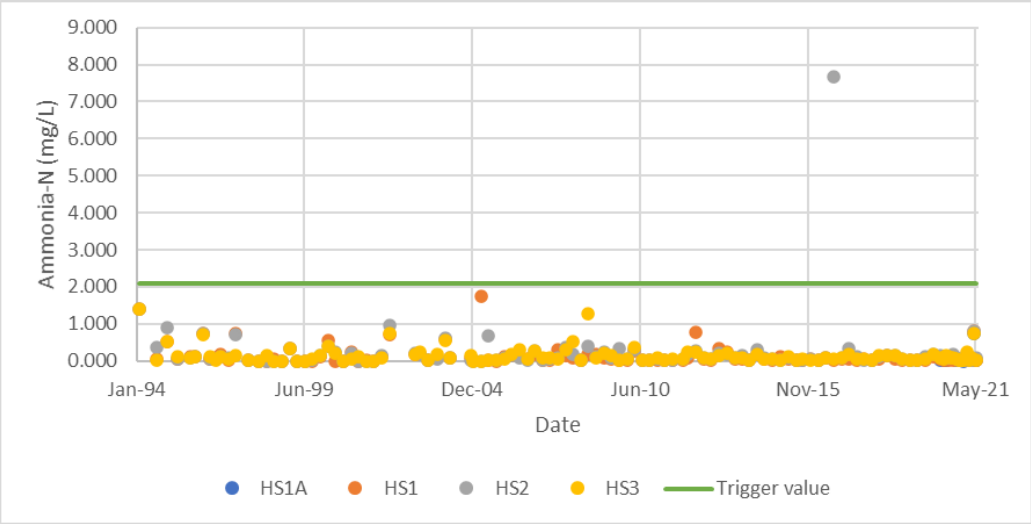


Figure 5-3: Ammoniacal-Nitrogen Concentrations measured in Hokio Stream, since 1994. With the ANZECC AE (95%) trigger value depicted by a green line.

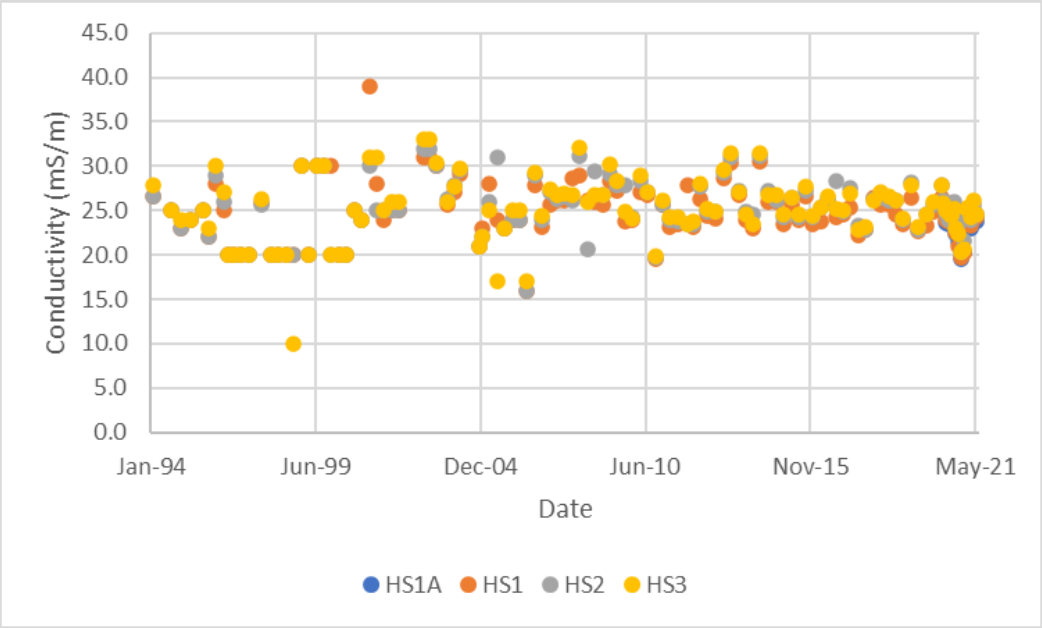


Figure 5-4 Conductivity measured in Hokio Stream since 1994

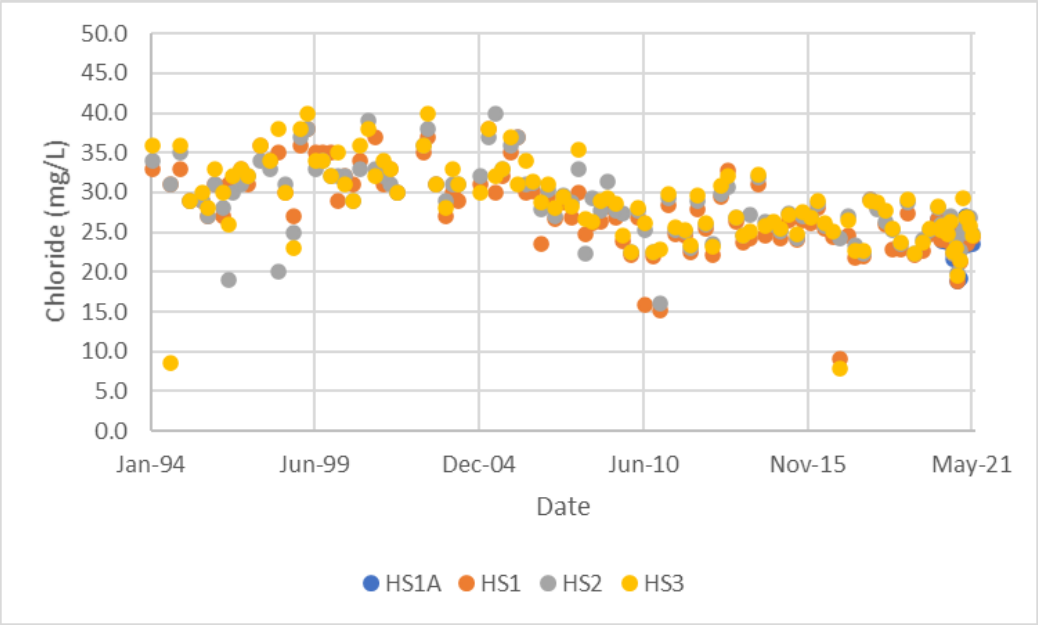


Figure 5-5 Chloride measured in Hokio Stream since 1994

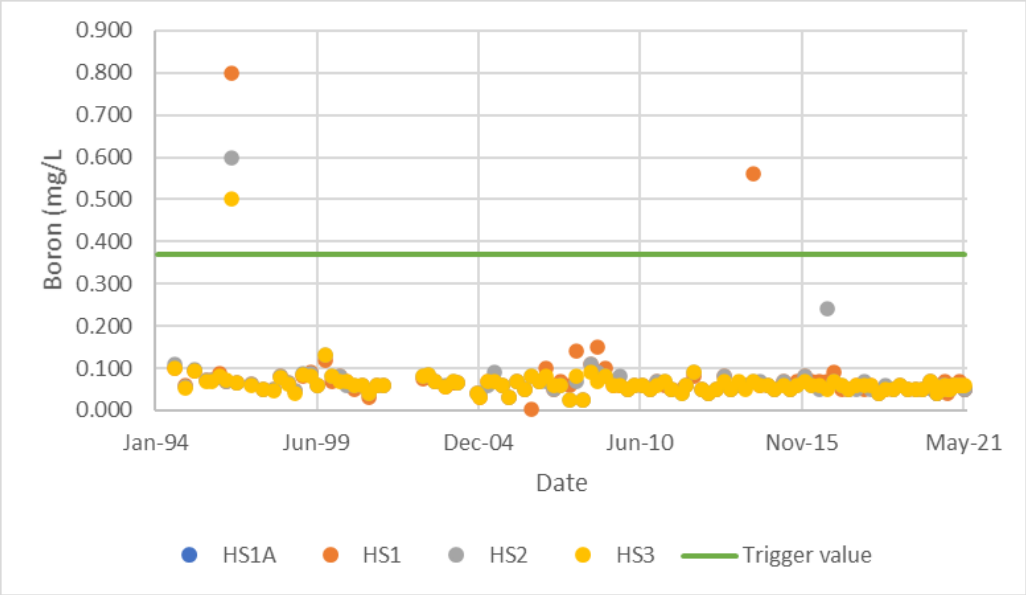


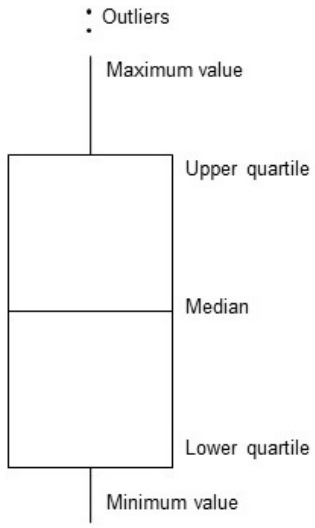
Figure 5-6 Boron measured in Hokio Stream since 1994. With the ANZECC AE (95%) trigger value depicted by a green line.

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]



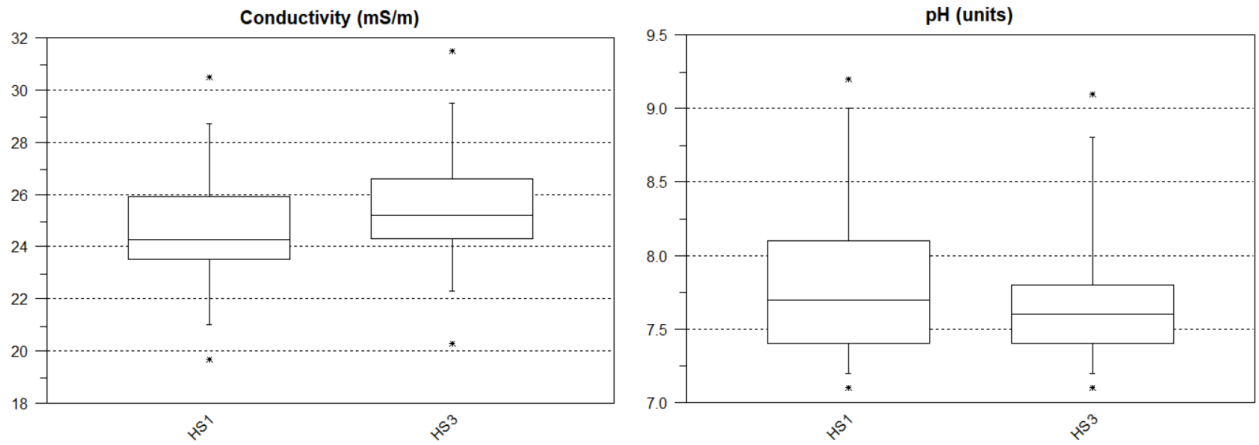


Figure 5-7 Box plots of paired water quality results (Conductivity and pH) for Hokio Stream sites HS1 and HS3, 2011 – 2021; n = 50 (for both parameters).

[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.

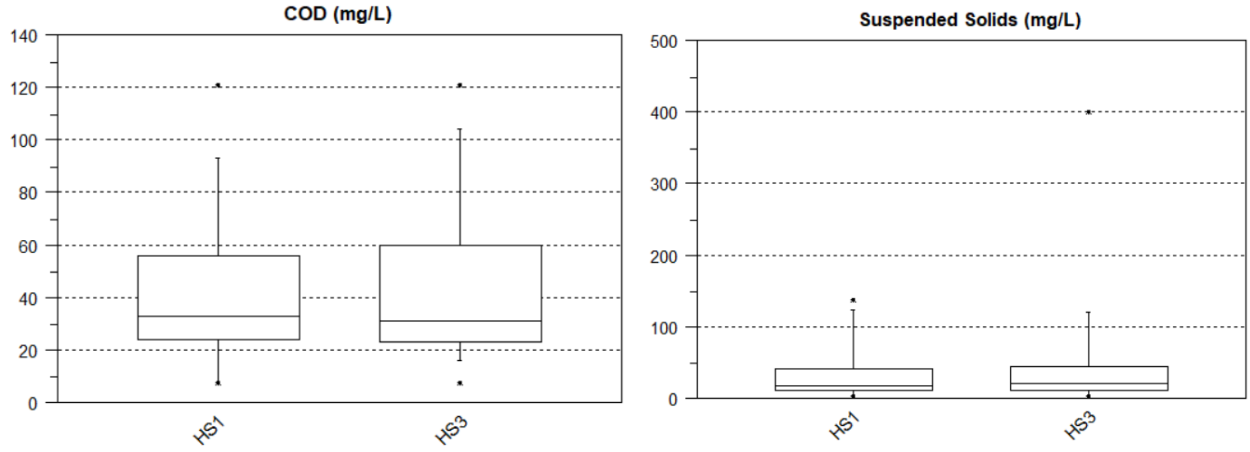


Figure 5-8 Box plots of paired water quality results (Chemical Oxygen Demand and Total Suspended Solids) for Hokio Stream sites HS1 and HS3, 2011 – 2021; *n* = 50 (for both parameters).

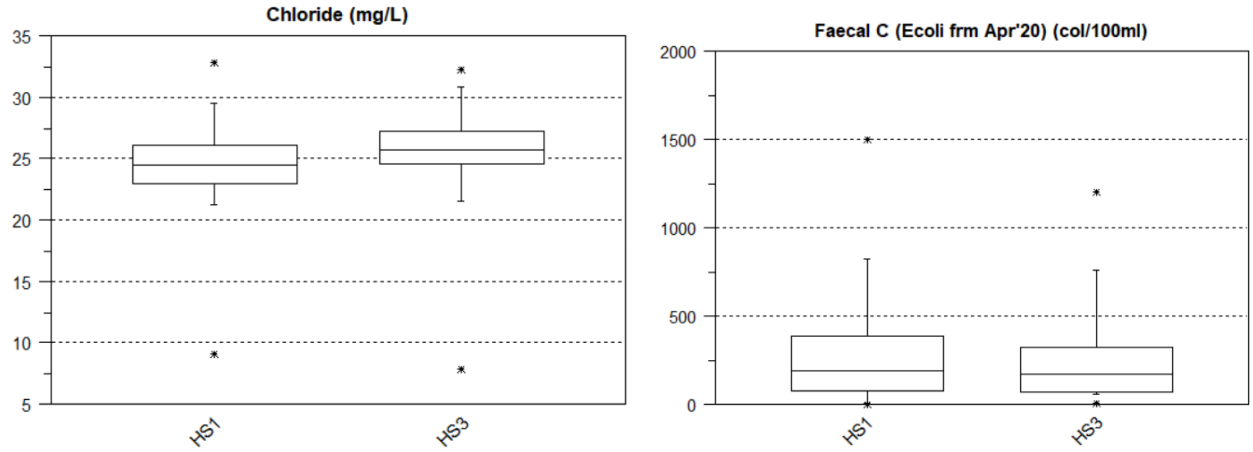


Figure 5-9 Box plots of paired water quality results (Chloride and Faecal Coliforms) for Hokio Stream sites HS1 and HS3, 2011 - 2021; *n* = 50 (for both parameters).

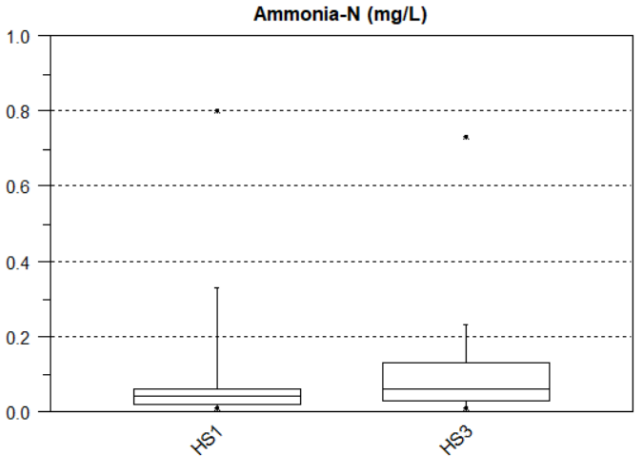


Figure 5-10 Box plots of paired water quality results (Ammoniacal-nitrogen) for Hokio Stream sites HS1 and HS3, 2011 – 2020; *n* = 50

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

Determinant	Units	No. of samples per site	ANZECC AE (95%)	SW3 (now TD1)
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
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 4.4.2.

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

Site	Ammoniacal-N g/m³	Boron g/m³	Chloride g/m³	Sodium g/m³	Nitrate-N g/m³	DRP g/m³
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 95th 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 95th percentile species protection. Concentrations of DRP also exceeded ANZECC Lowland River DGV for 95th 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 5(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.

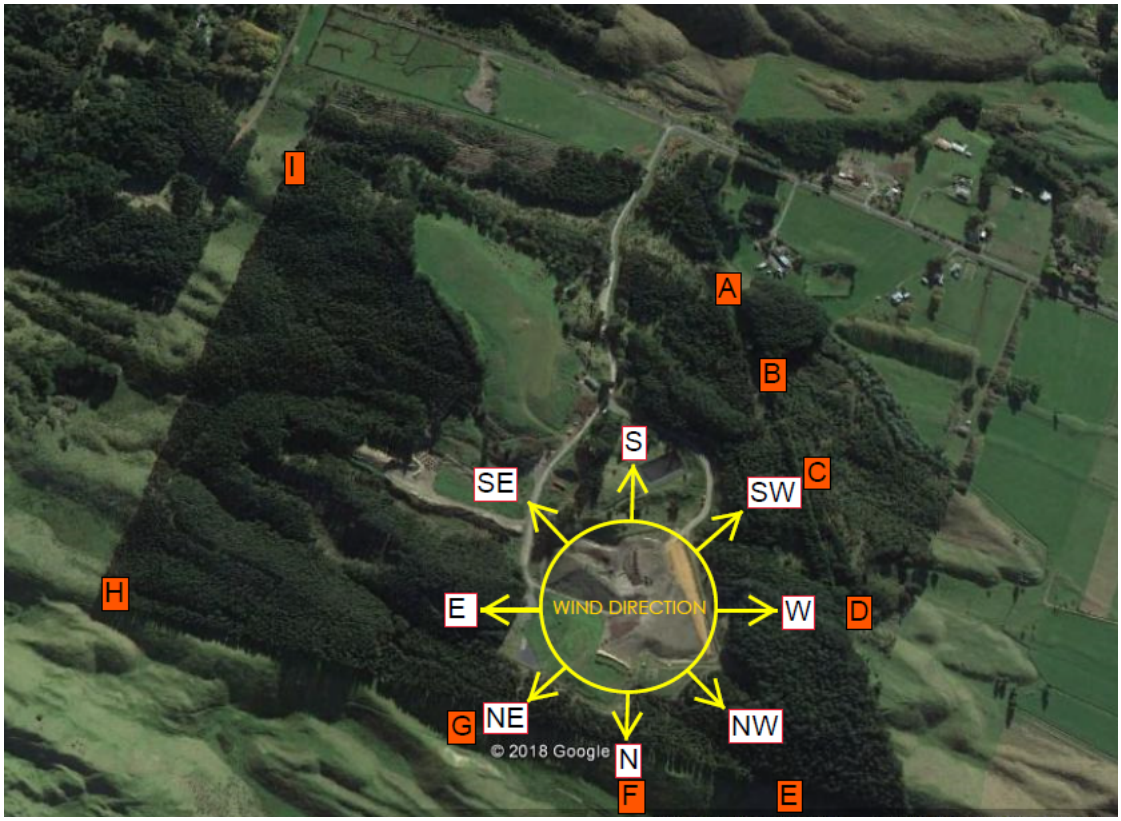


Figure 8-1 Location of Landfill Boundary Odour Assessments (Source: Figure 5.1 of the Odour Management Plan)

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 5(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 5(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 5(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 5(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 5(p) of Discharge Permit 6011 requires the Permit Holder to collect meteorological data from an on-site weather station. Condition 5(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 99th, 95th, and 90th 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 5 (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 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	Monthly Compre. To 03/2022	Monthly Compre. To 03/2022	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

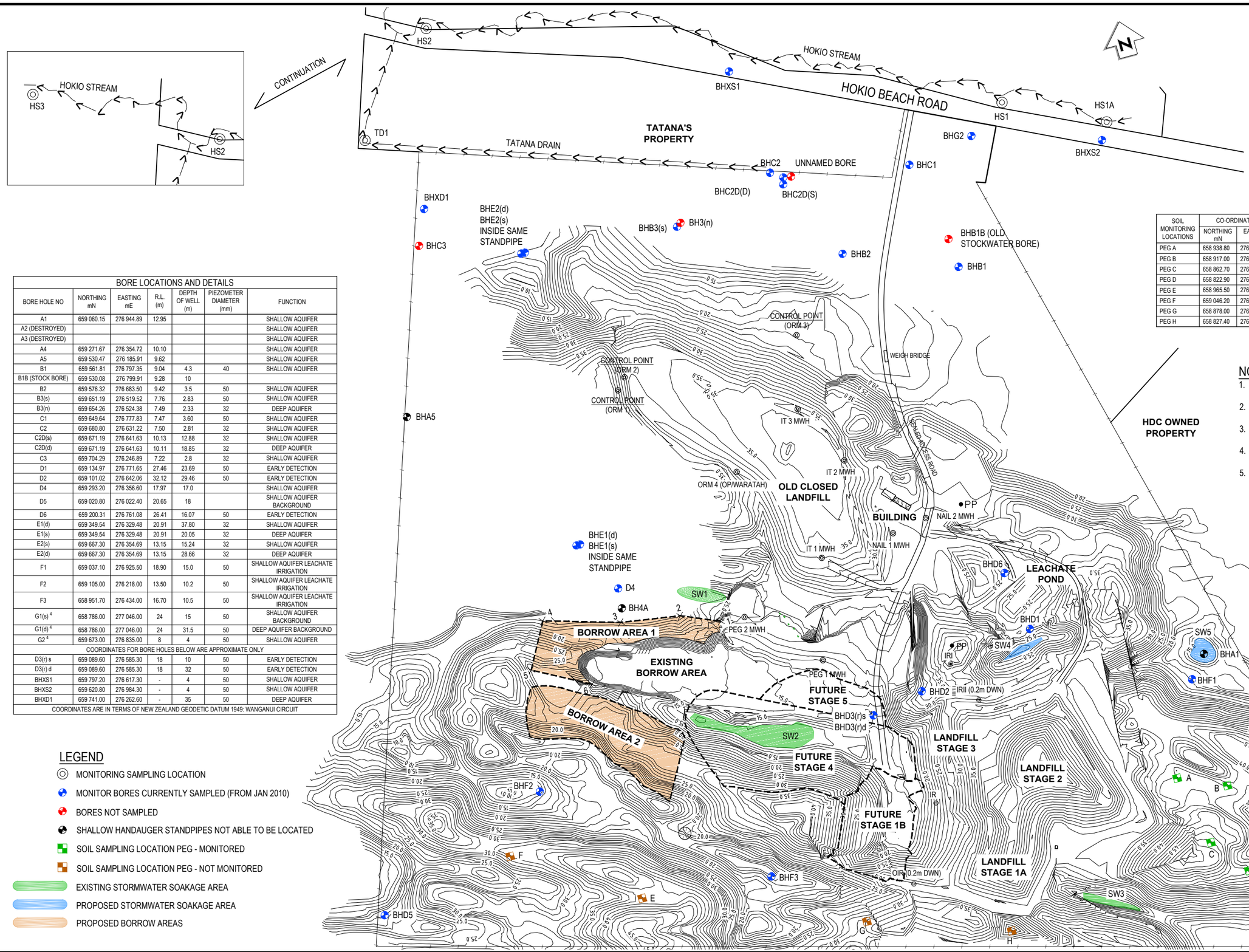
INDICATOR PARAMETER LIST (Table F, Condition 3, DP 6010)

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						

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

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

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.

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)

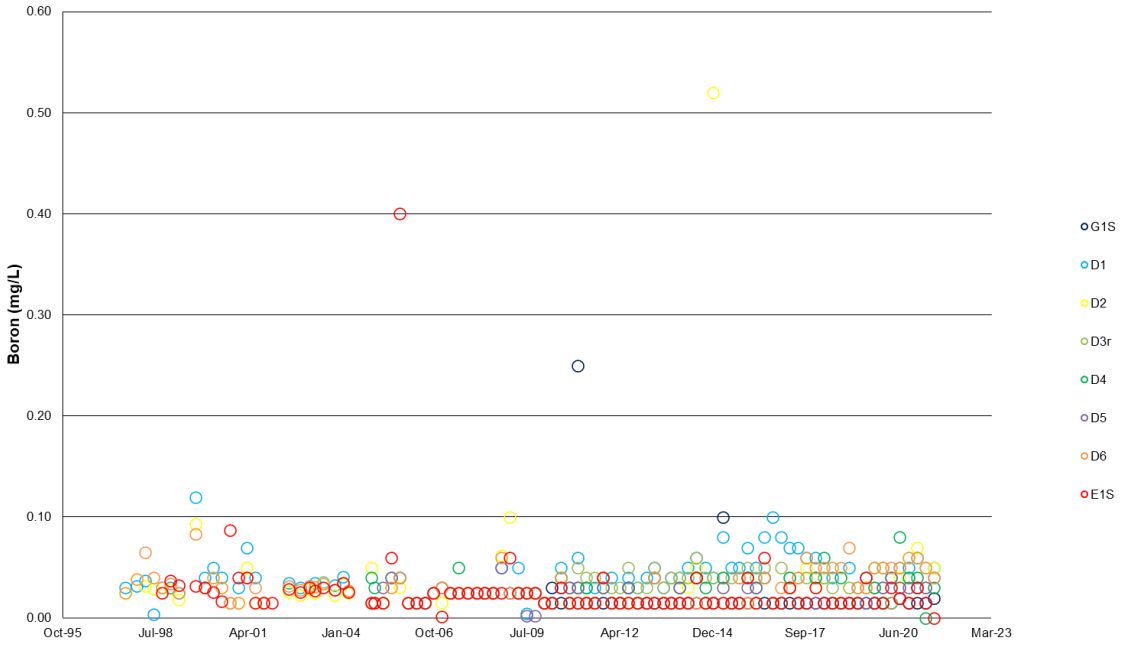
Determinand		ANZECC STOCK	Median	Maximum	Annual Median	Jun-21	May-21	Apr-21	Mar-21	Feb-21	Jan-21	Dec-20	Nov-20	Oct-20	Jul-20	Apr-20	Jan-20	Oct-19	Jul-19	Apr-19	Jan-19	Oct-18	Jul-18	Apr-18	Jan-18	Oct-17	Jul-17
pH		6 to 9	7.350	7.8000	7.3000			7.200	7.600					7.4	7.0	7.1	7.7	7.8	7.2	7.3	7.2	7.4	7.2	7.4	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)

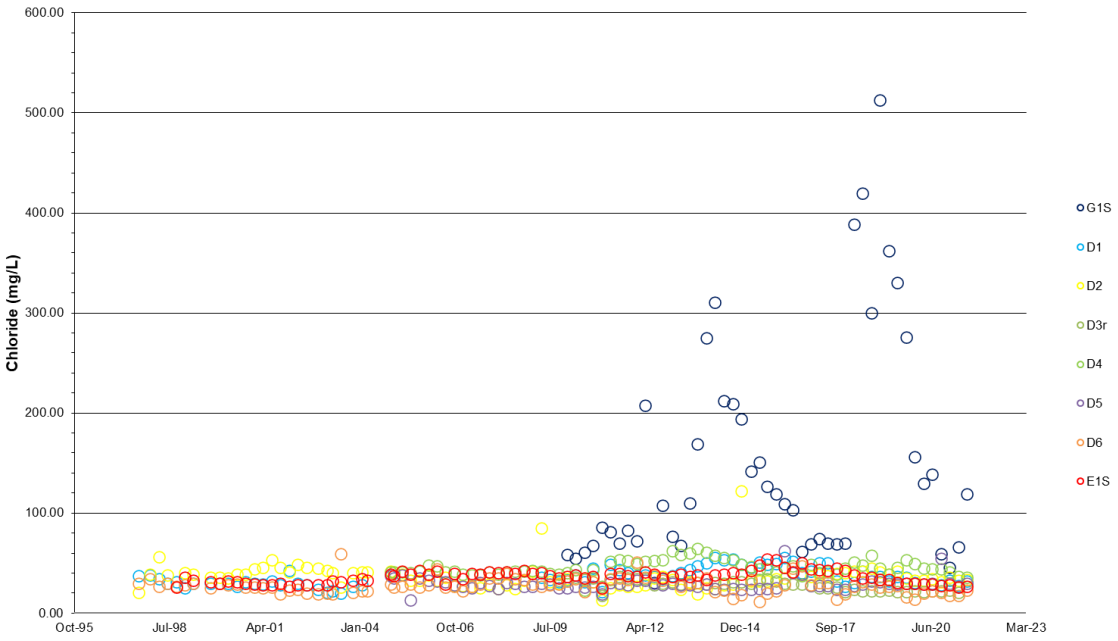
Determinand		ANZECC STOCK	Median	Maximum	Annual Median	Jan-21	Dec-20	Nov-20	Oct-20		Apr-20	Jan-20	Oct-19	Jul-19	Apr-19	Jan-19	Oct-18	Jul-18	Apr-18	Jan-18	Oct-17	Jul-17
pH		6 to 9	7.4	8.0	7.7							8	7.7	7.3	7.3	7.4	7.4	7.3	7.4	7.4	7.4	7.6
Faecal C (Ecoli frm Apr'20)	col/100ml	100	2625.0	4800.0	650							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

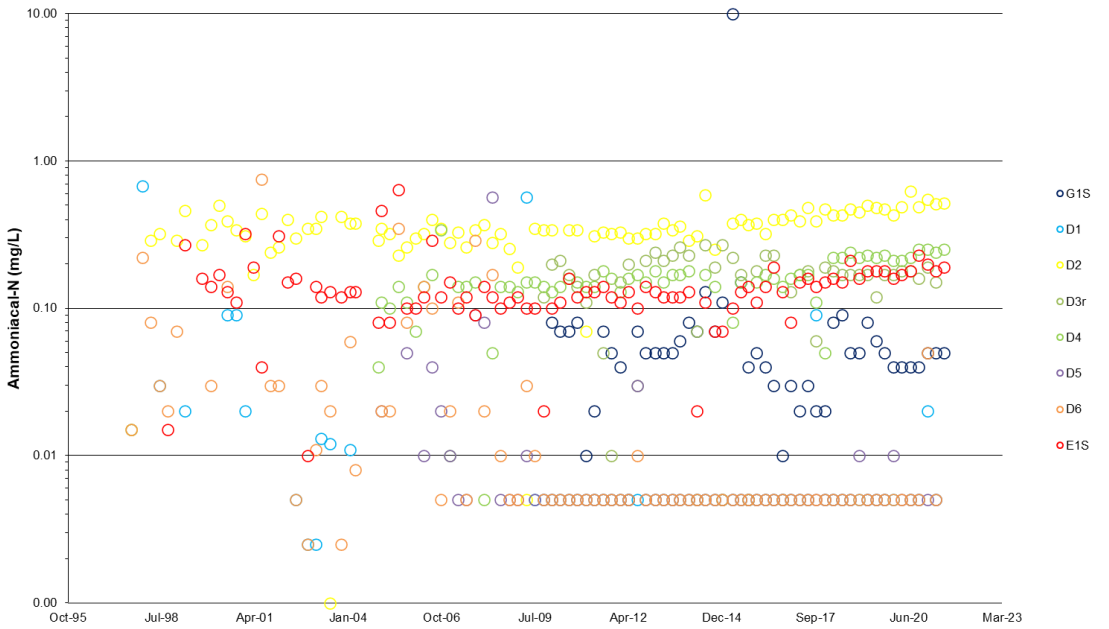
Sand Aquifer Downgrade of New Landfill - Boron Concentrations



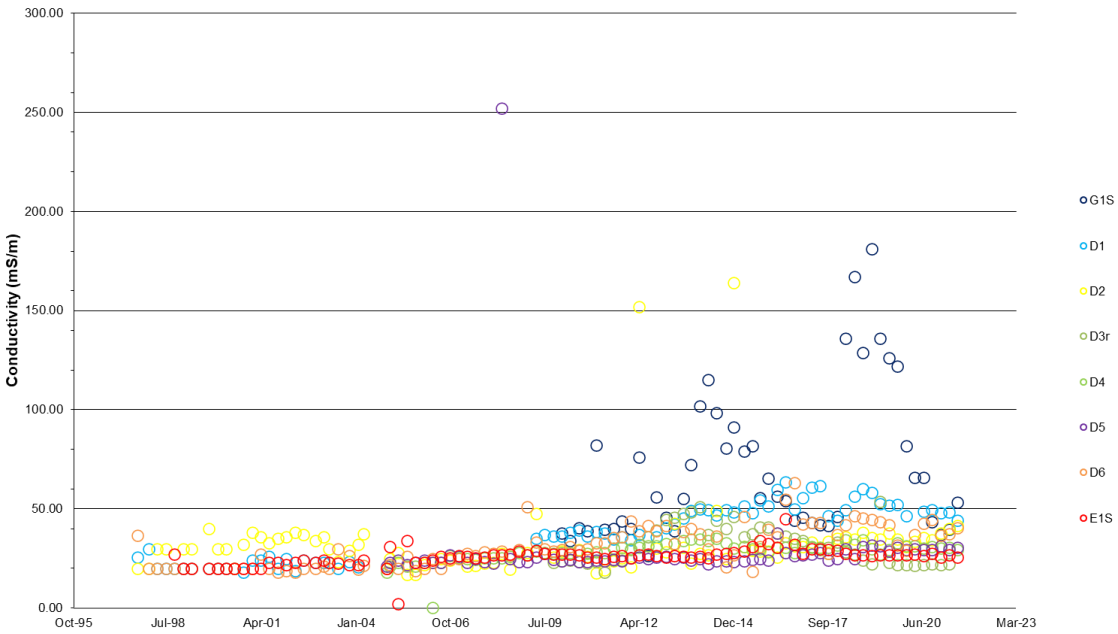
Sand Aquifer Downgrade of New Landfill - Chloride Concentrations

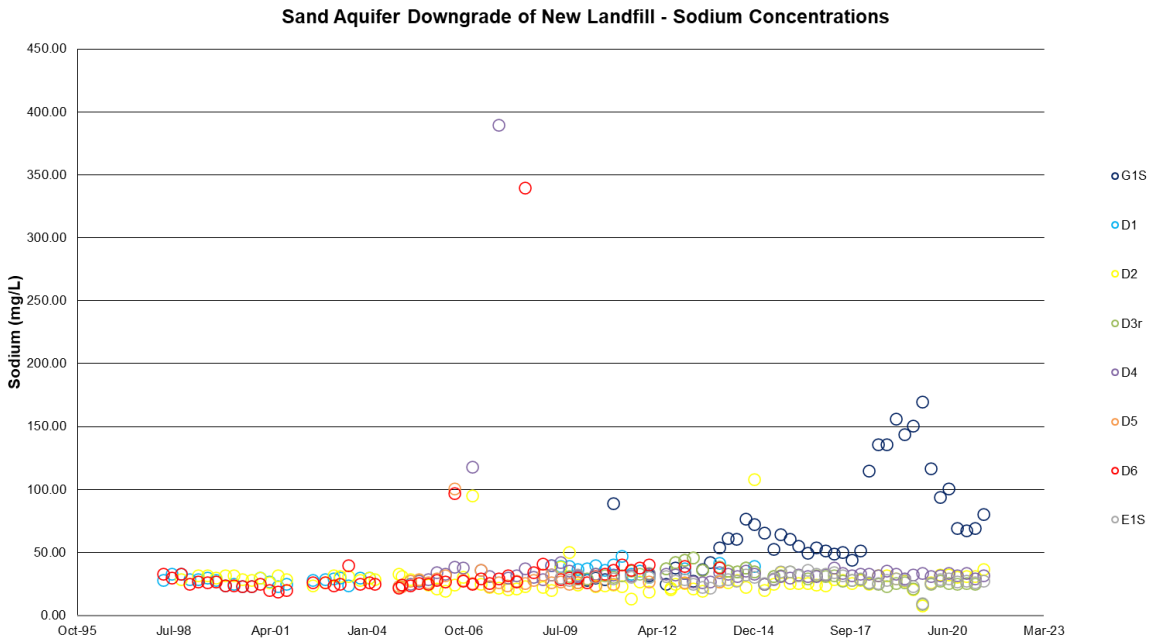


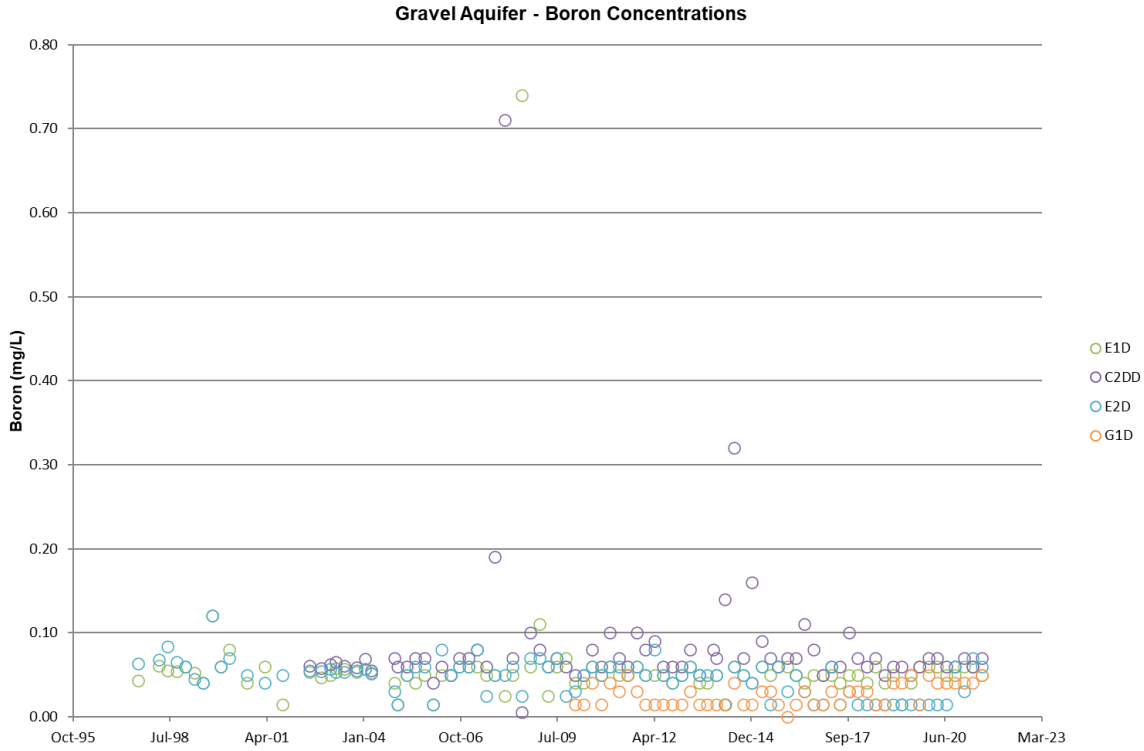
Sand Aquifer Downgrade of New Landfill - Ammoniacal-Nitrogen Concentrations

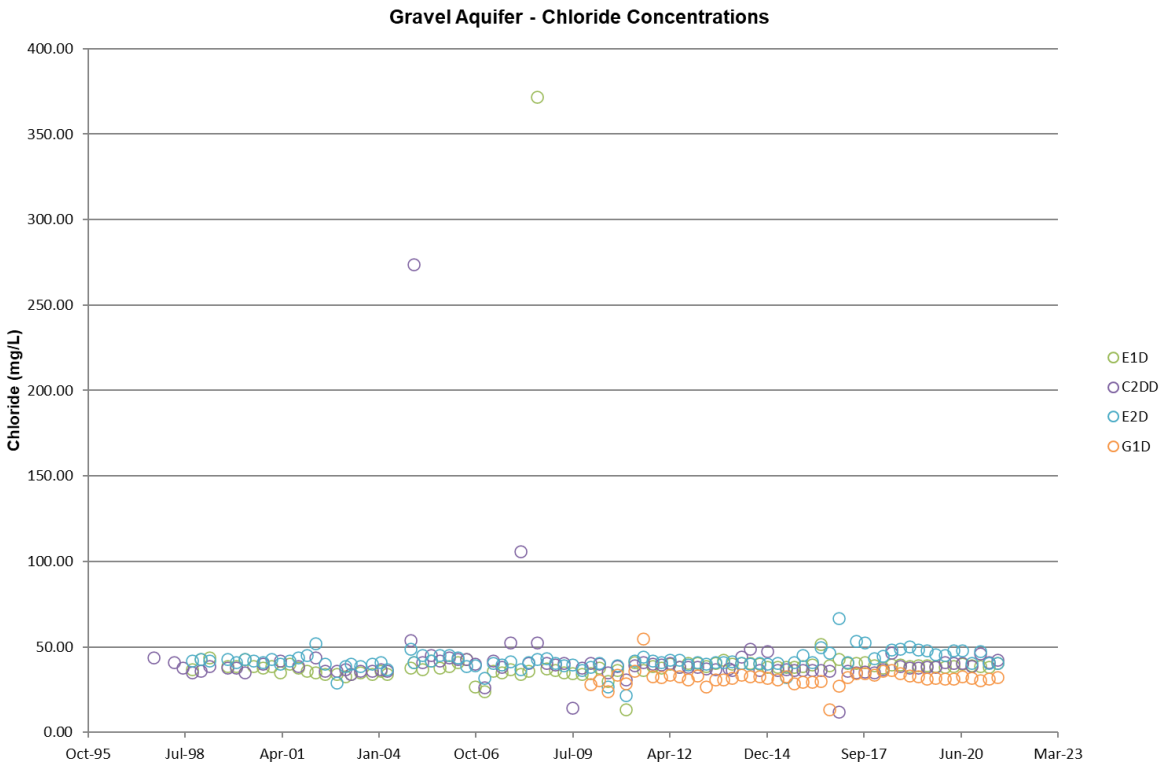


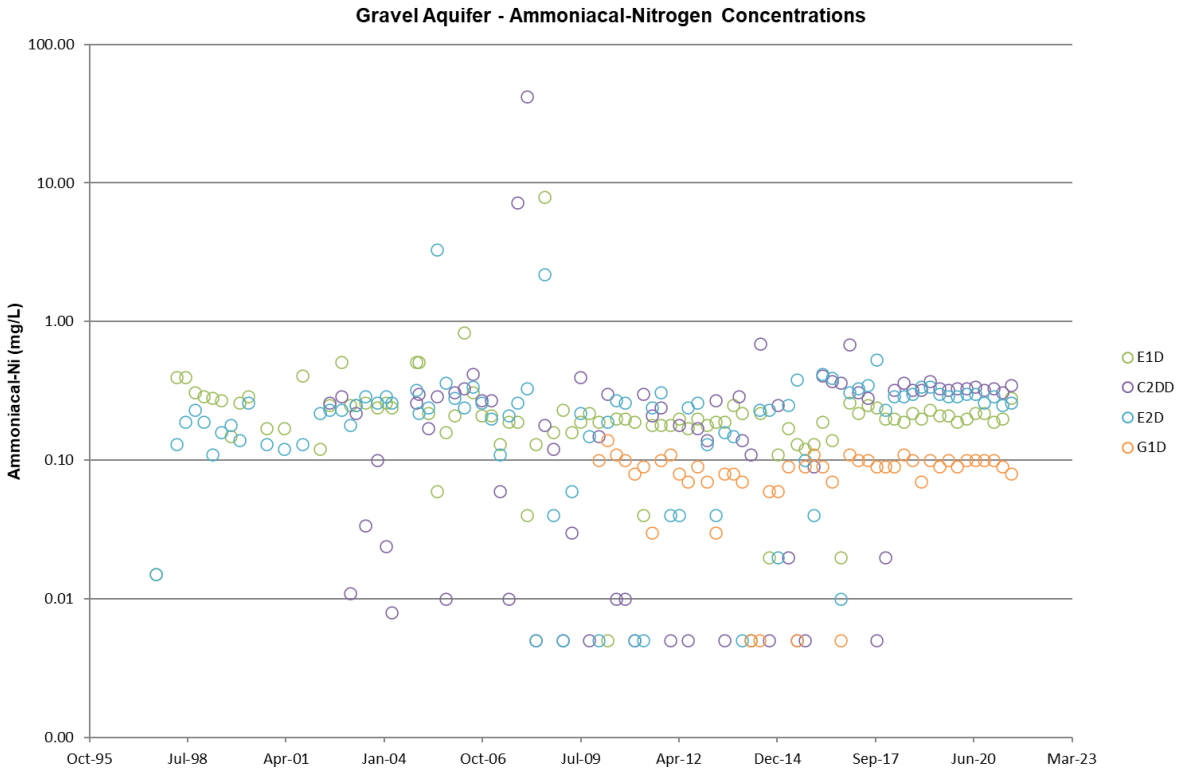
Sand Aquifer Downgrade of New Landfill - Conductivity Levels

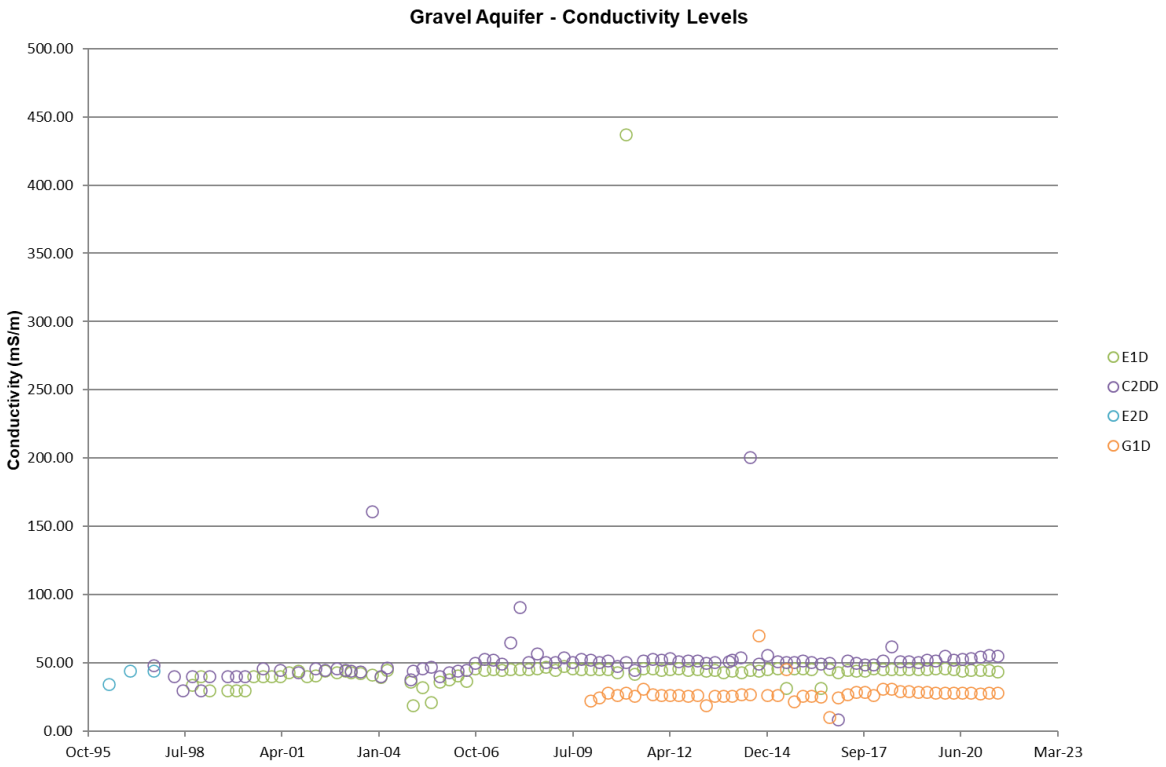


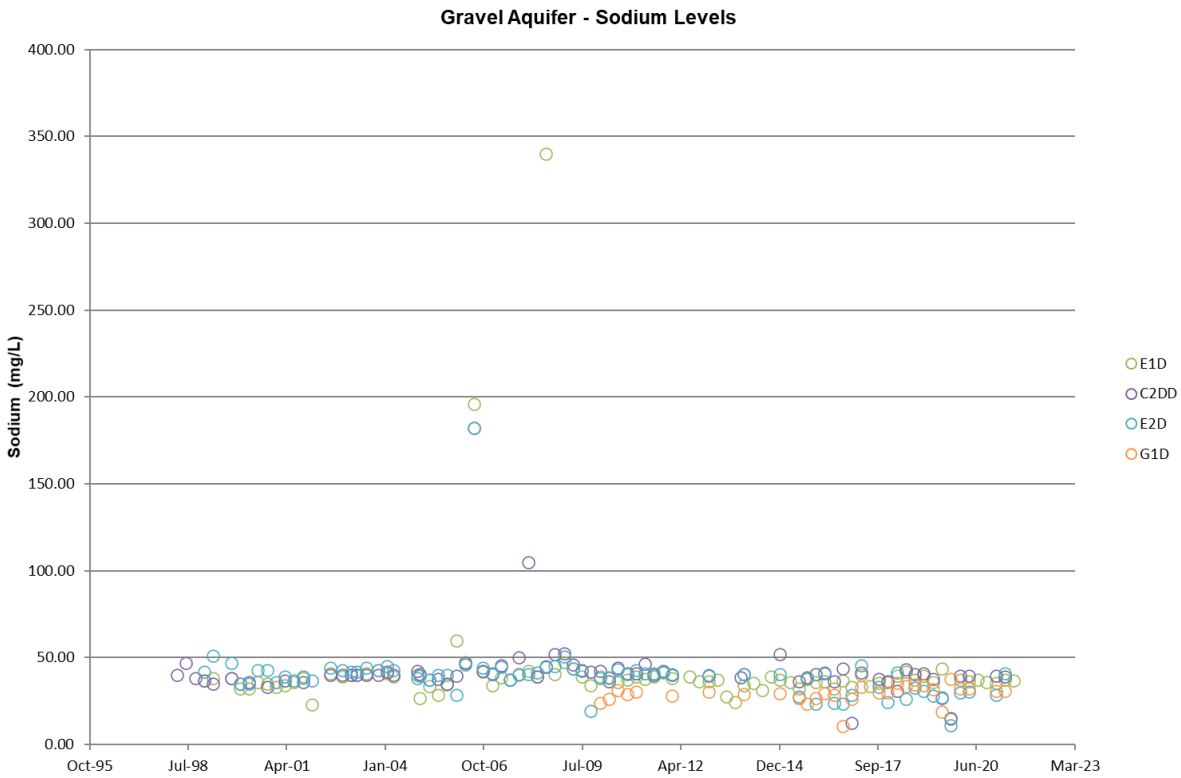

Sand Aquifer Downgrade of New Landfill - Sodium Concentrations
Sodium (mg/L)
450.00
400.00
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
G1S
D1
D2
D3r
D4
D5
D6
E1S

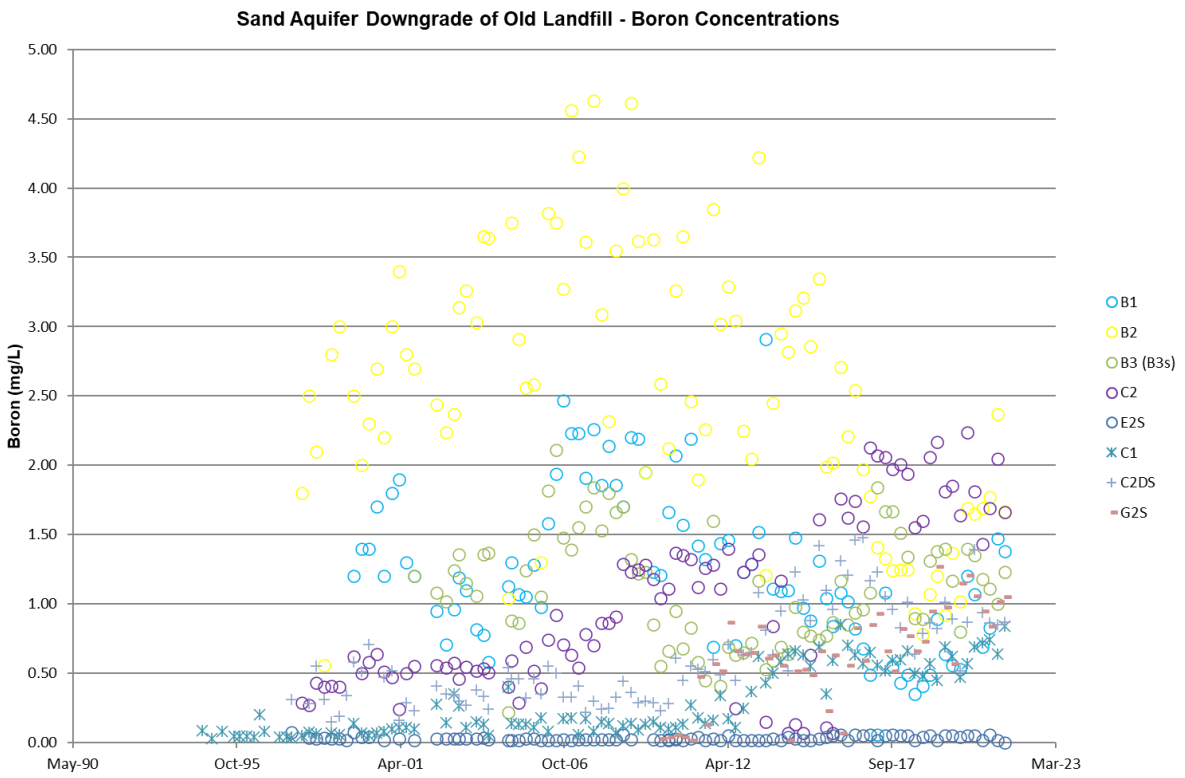

Gravel Aquifer - Boron Concentrations
Boron (mg/L)
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
E1D
C2DD
E2D
G1D

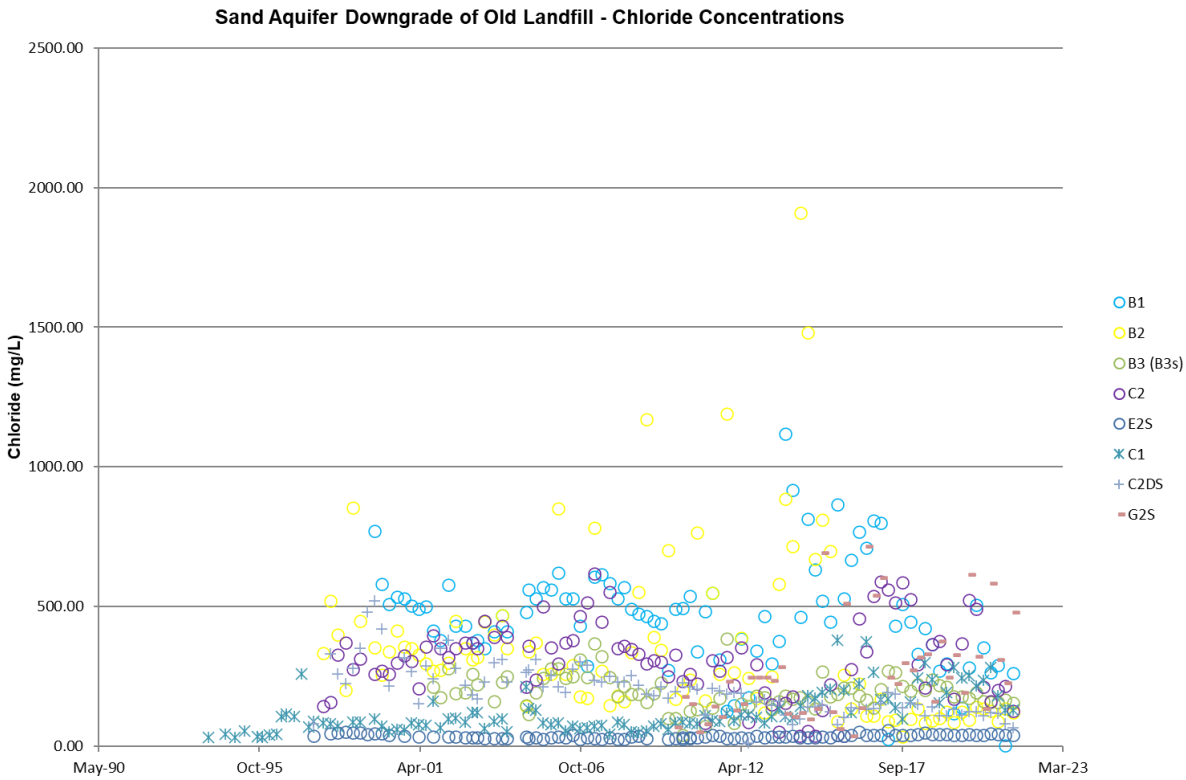

Gravel Aquifer - Chloride Concentrations
Chloride (mg/L)
400.00
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
E1D
C2DD
E2D
G1D

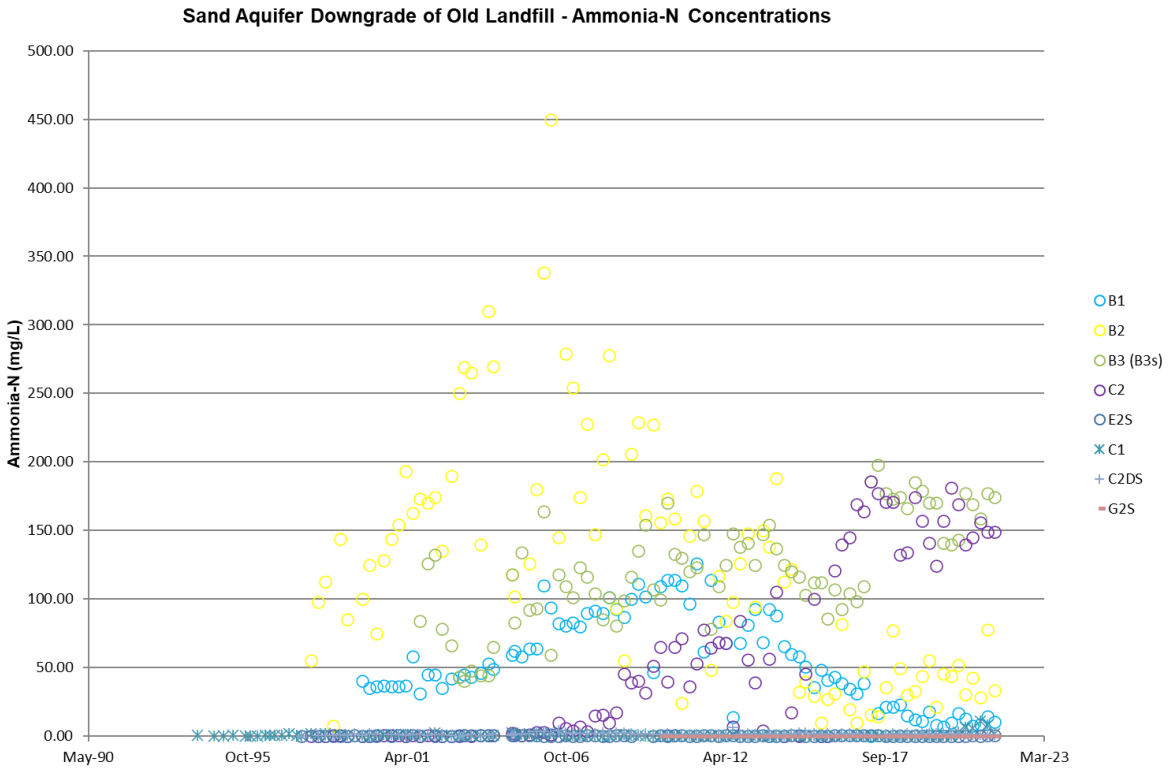

Gravel Aquifer - Ammoniacal-Nitrogen Concentrations
Ammoniacal-Ni (mg/L)
100.00
10.00
1.00
0.10
0.01
0.00
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
E1D
C2DD
E2D
G1D

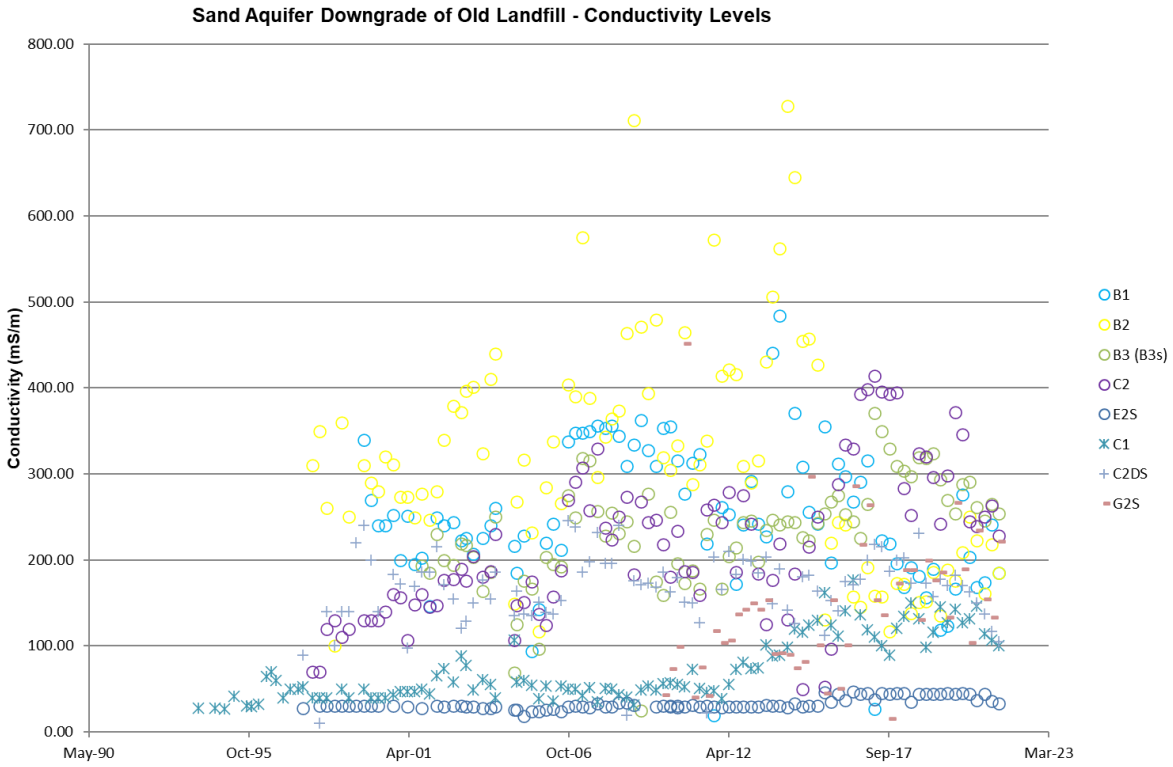

Gravel Aquifer - Conductivity Levels
Conductivity (mS/m)
500.00
450.00
400.00
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
E1D
C2DD
E2D
G1D

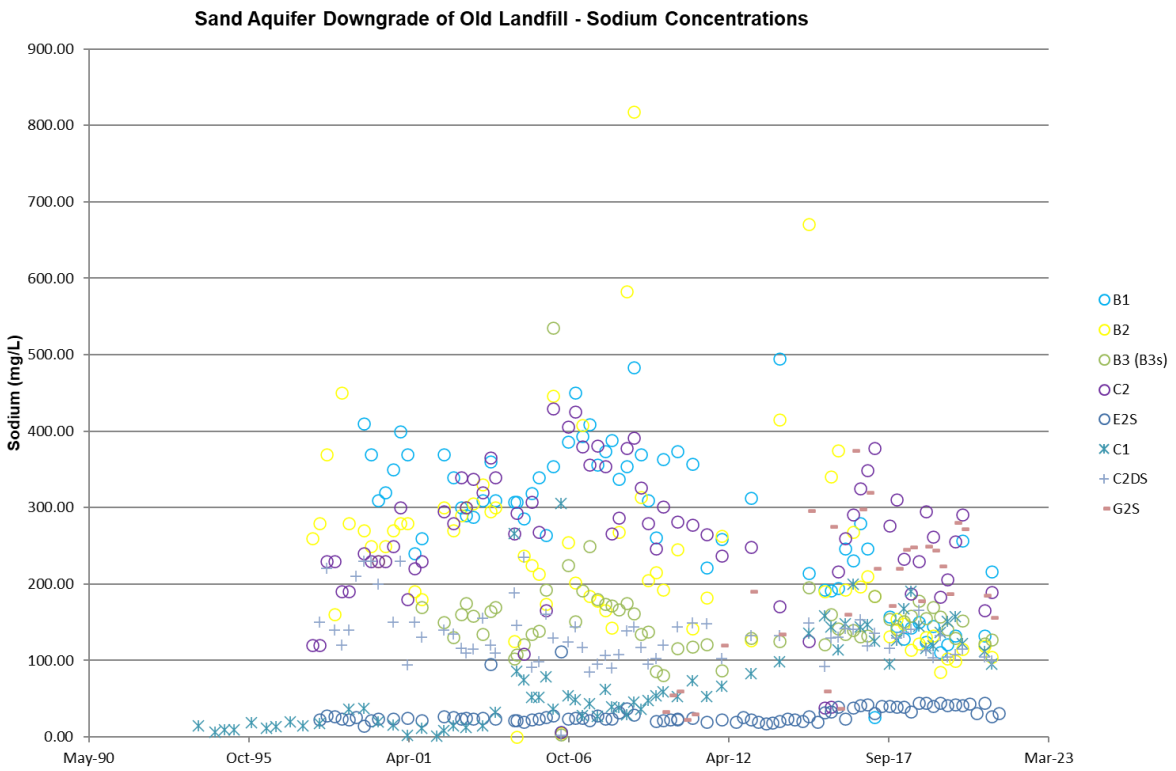

Gravel Aquifer - Sodium Levels
Sodium (mg/L)
400.00
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
E1D
C2DD
E2D
G1D

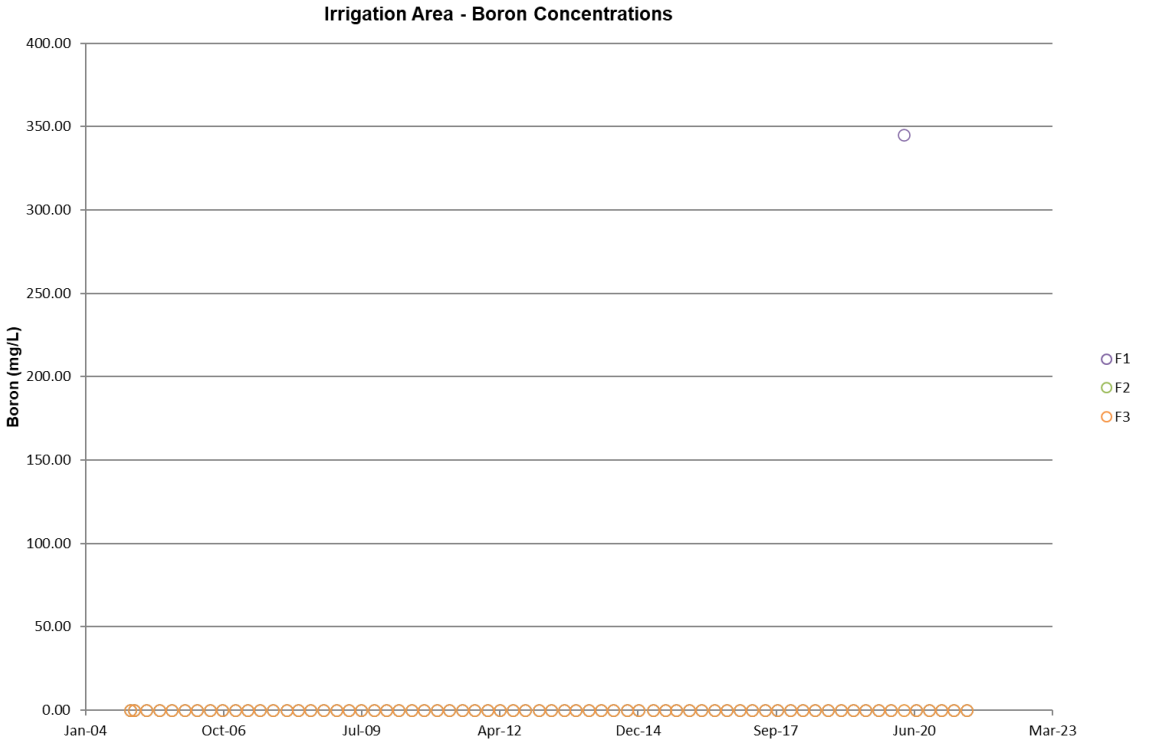

Sand Aquifer Downgrade of Old Landfill - Boron Concentrations
Boron (mg/L)
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
May-90
Oct-95
Apr-01
Oct-06
Apr-12
Sep-17
Mar-23
B1
B2
B3 (B3s)
C2
E2S
C1
C2DS
G2S

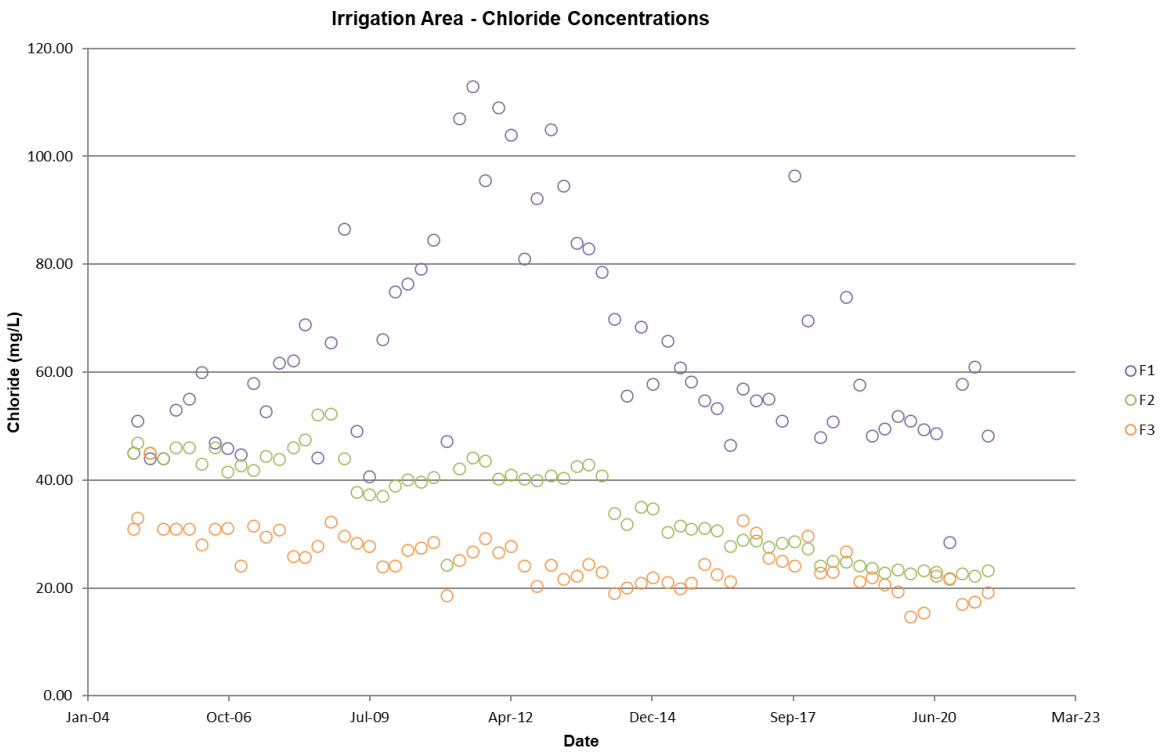

Sand Aquifer Downgrade of Old Landfill - Chloride Concentrations
Chloride (mg/L)
2500.00
2000.00
1500.00
1000.00
500.00
0.00
May-90
Oct-95
Apr-01
Oct-06
Apr-12
Sep-17
Mar-23
B1
B2
B3 (B3s)
C2
E2S
C1
C2DS
G2S

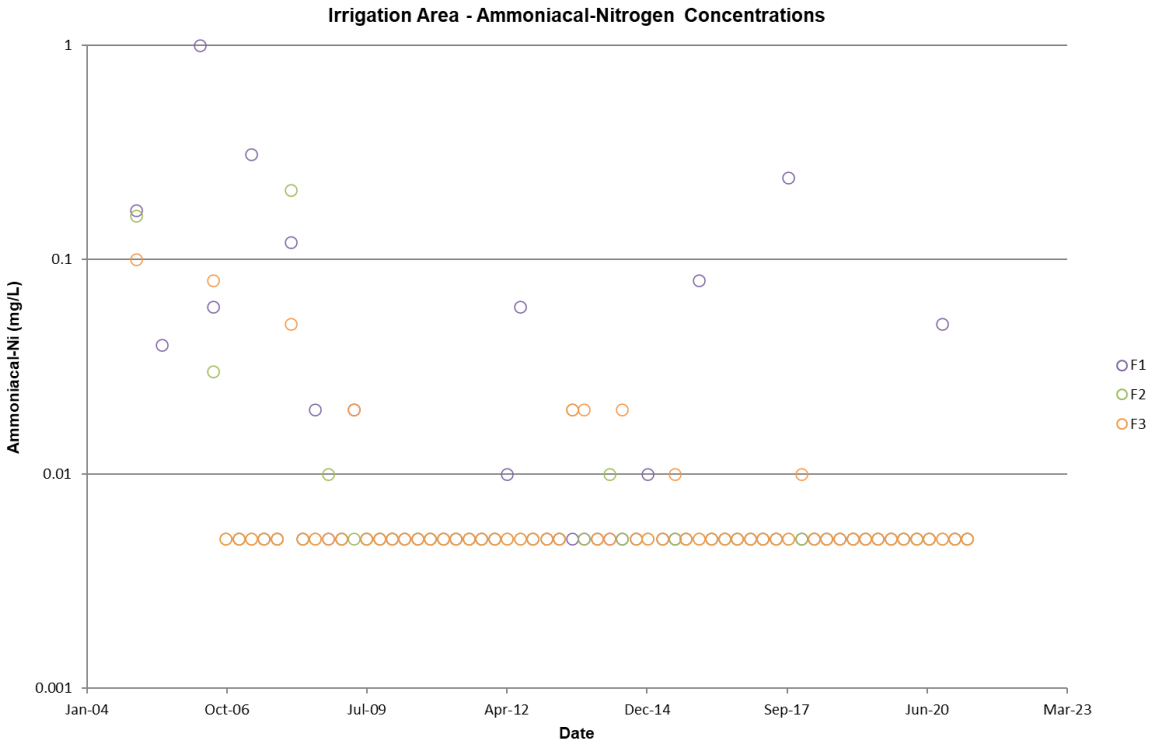

Sand Aquifer Downgrade of Old Landfill - Ammonia-N Concentrations
Ammonia-N (mg/L)
500.00
450.00
400.00
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
May-90
Oct-95
Apr-01
Oct-06
Apr-12
Sep-17
Mar-23
B1
B2
B3 (B3s)
C2
E2S
C1
C2DS
G2S

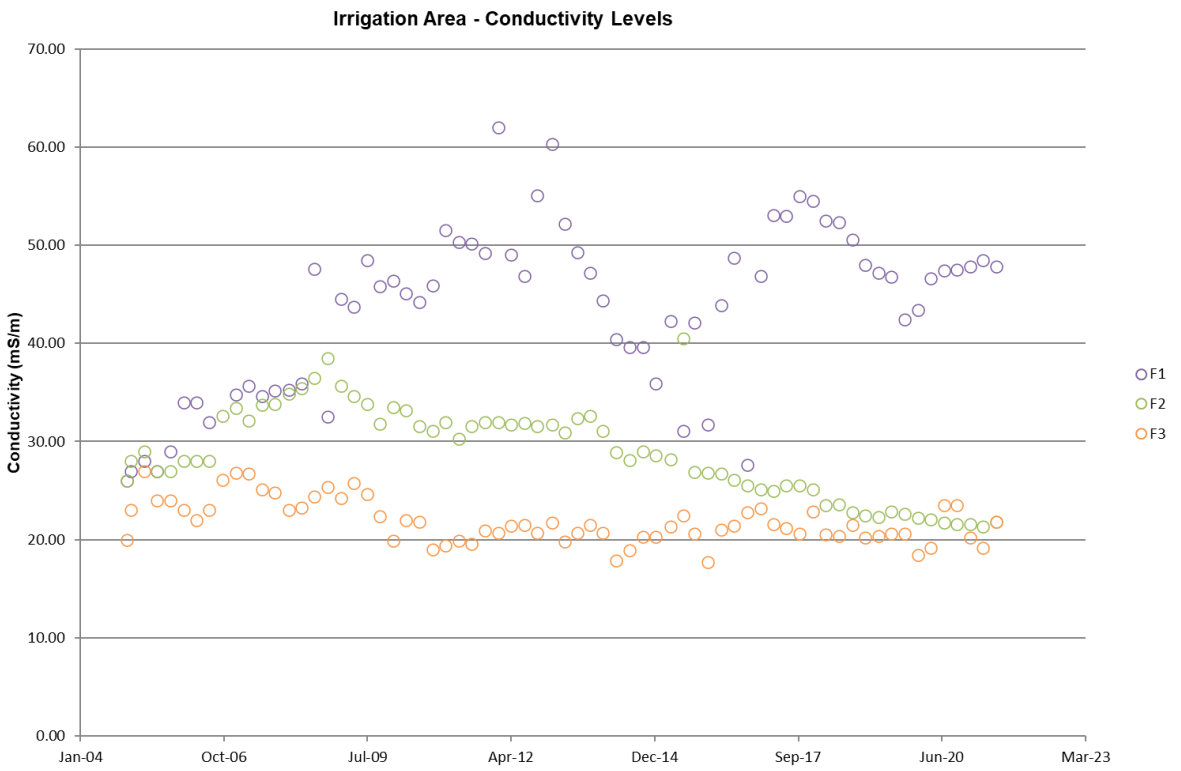

Sand Aquifer Downgrade of Old Landfill - Conductivity Levels
Conductivity (mS/m)
800.00
700.00
600.00
500.00
400.00
300.00
200.00
100.00
0.00
May-90
Oct-95
Apr-01
Oct-06
Apr-12
Sep-17
Mar-23
B1
B2
B3 (B3s)
C2
E2S
C1
C2DS
G2S

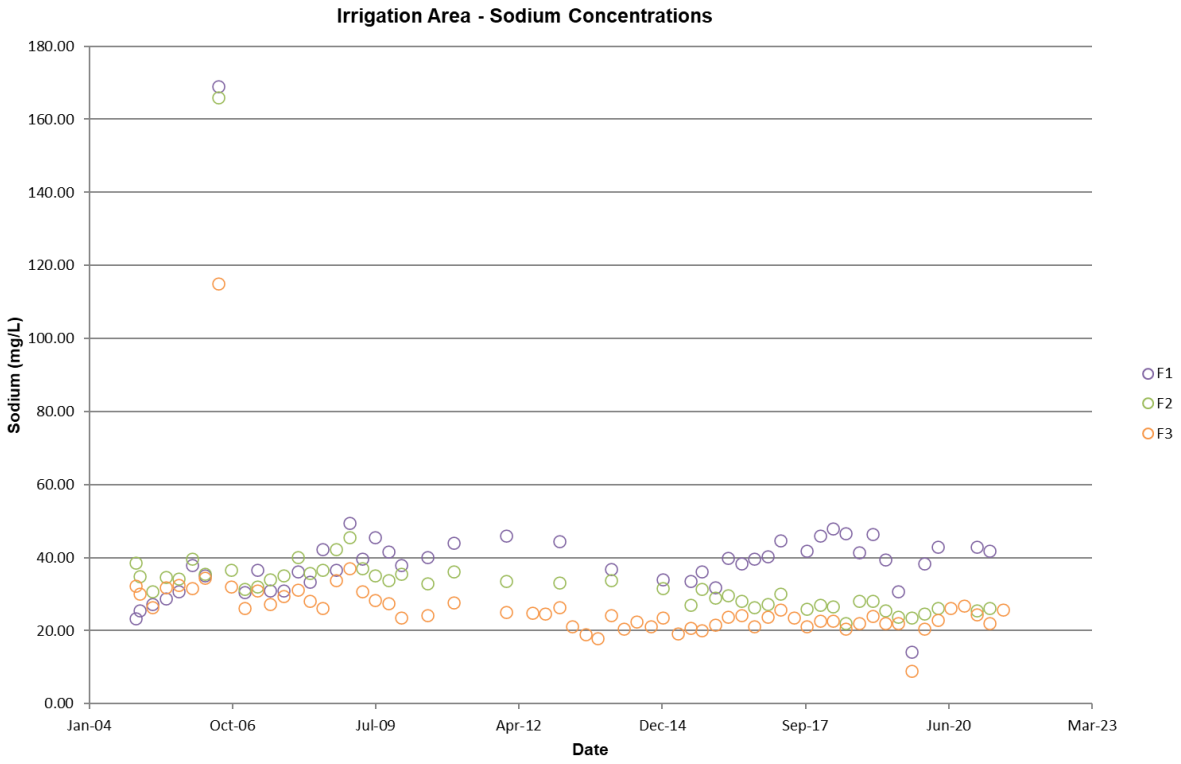

Sand Aquifer Downgrade of Old Landfill - Sodium Concentrations
Sodium (mg/L)
900.00
800.00
700.00
600.00
500.00
400.00
300.00
200.00
100.00
0.00
May-90
Oct-95
Apr-01
Oct-06
Apr-12
Sep-17
Mar-23
B1
B2
B3 (B3s)
C2
E2S
C1
C2DS
G2S

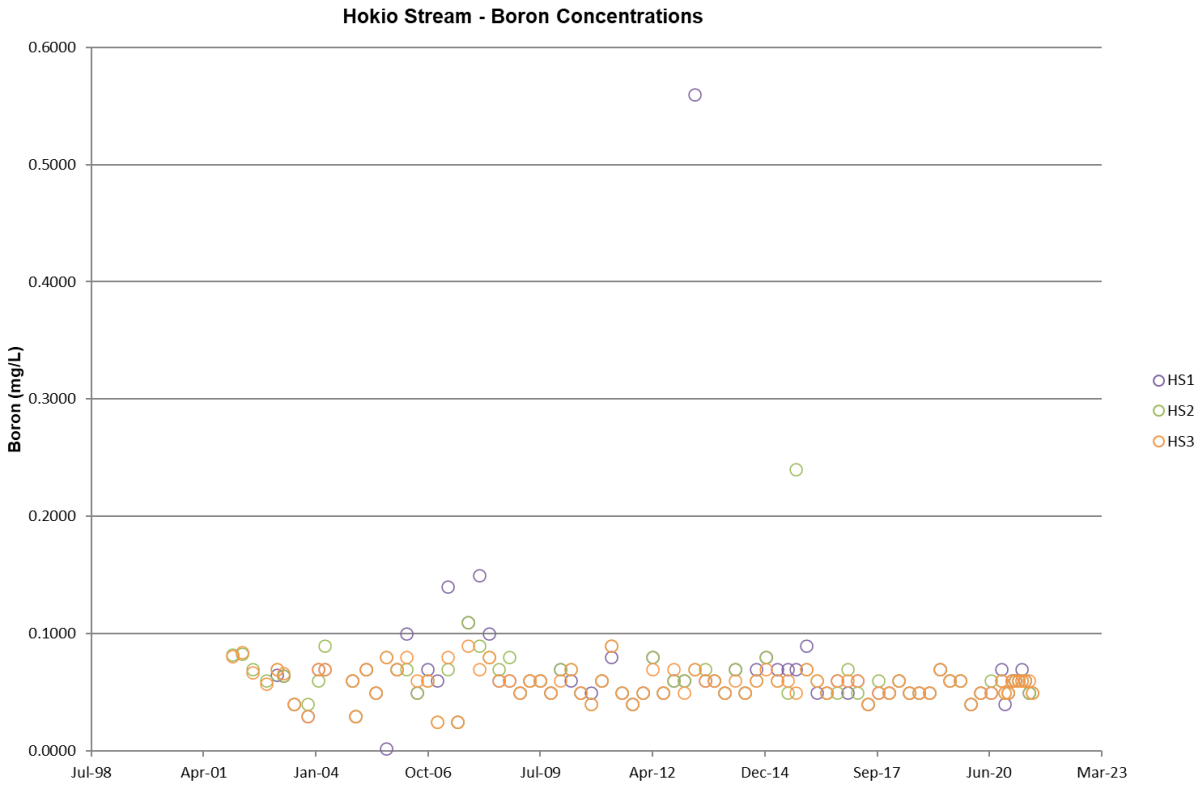

Irrigation Area - Boron Concentrations
Boron (mg/L)
400.00
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
F1
F2
F3

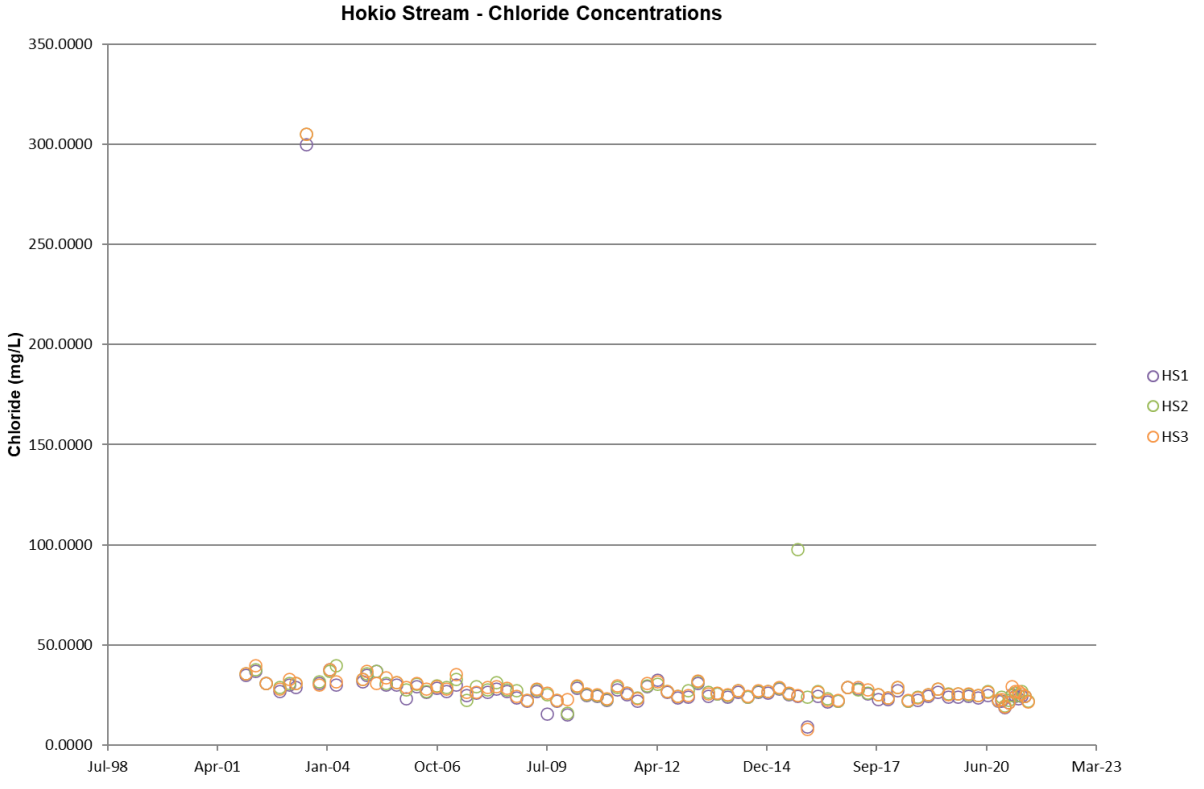

Irrigation Area - Chloride Concentrations
120.00
100.00
80.00
60.00
40.00
20.00
0.00
Chloride (mg/L)
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
Date
F1
F2
F3

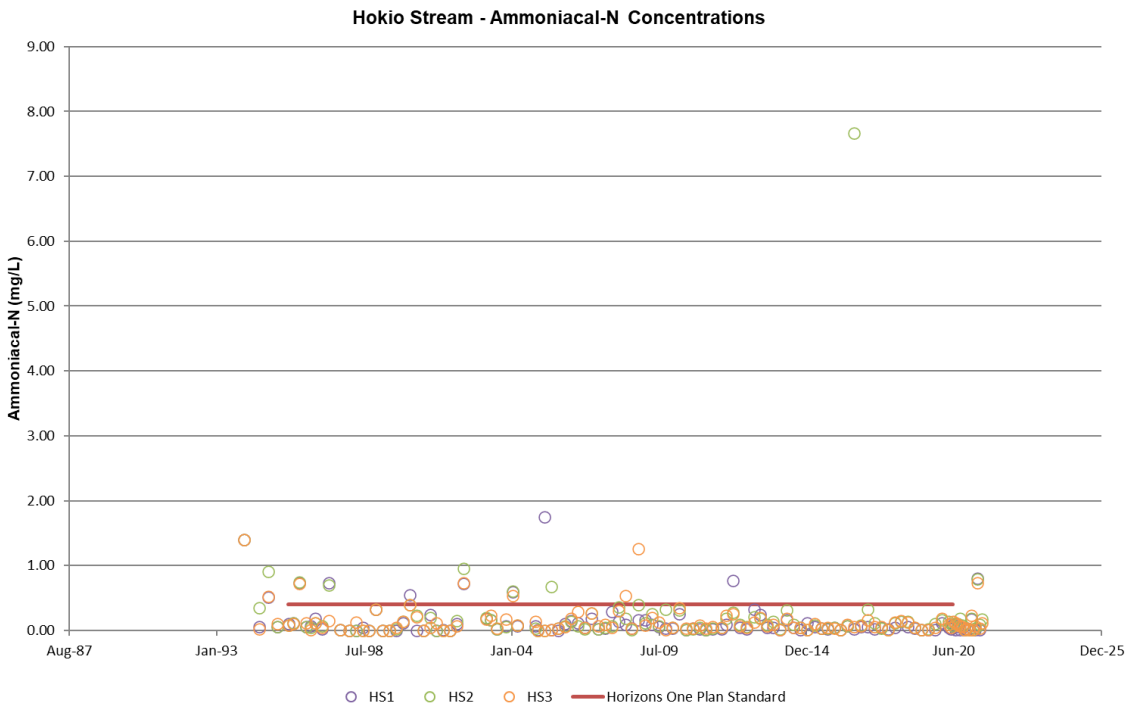

Irrigation Area - Ammoniacal-Nitrogen Concentrations
1
0.1
0.01
0.001
Ammoniacal-Ni (mg/L)
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
Date
F1
F2
F3

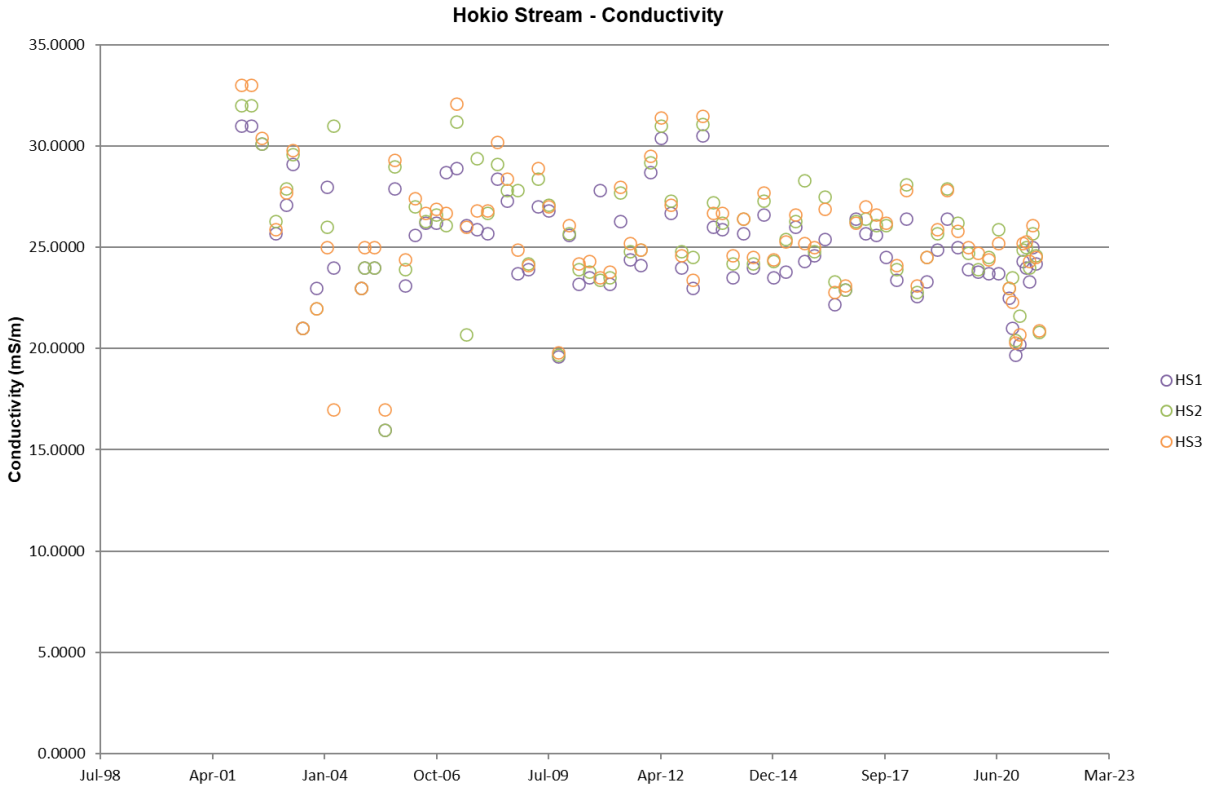

Irrigation Area - Conductivity Levels
Conductivity (mS/m)
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
F1
F2
F3

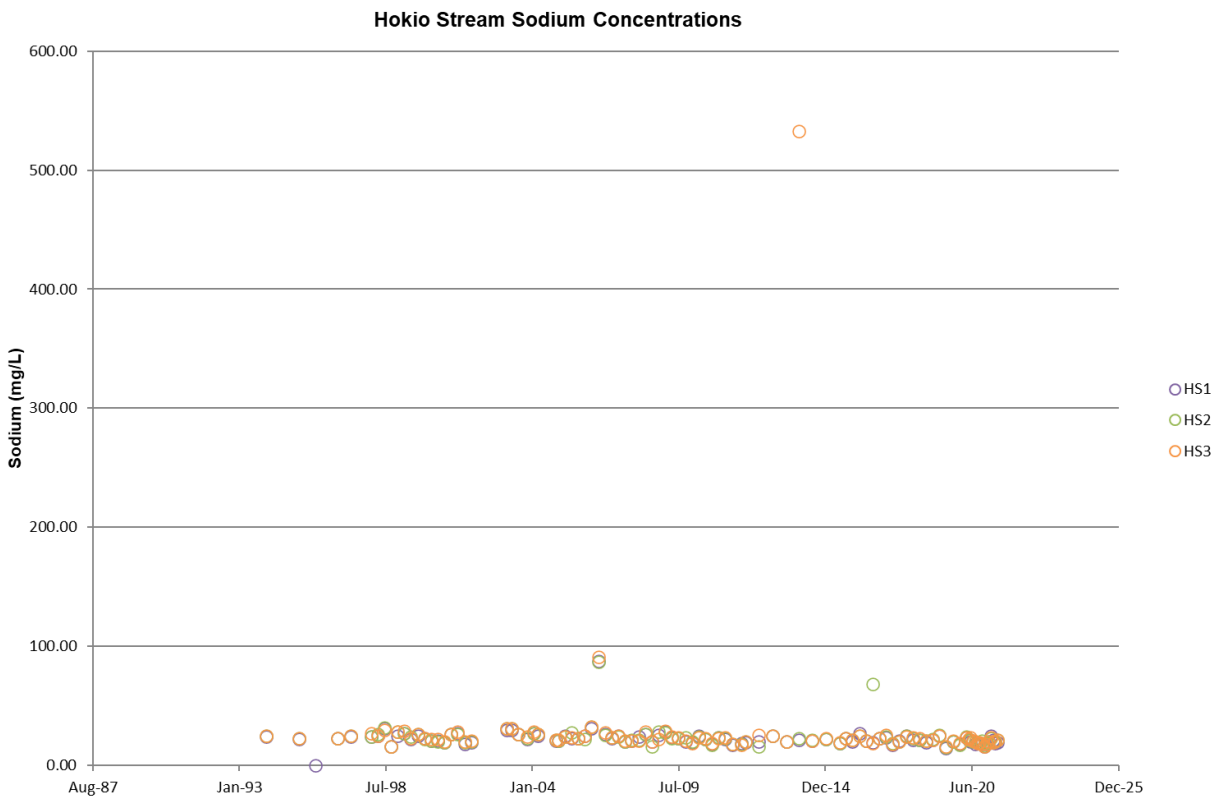

Irrigation Area - Sodium Concentrations
Sodium (mg/L)
180.00
160.00
140.00
120.00
100.00
80.00
60.00
40.00
20.00
0.00
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
Date
F1
F2
F3


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

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

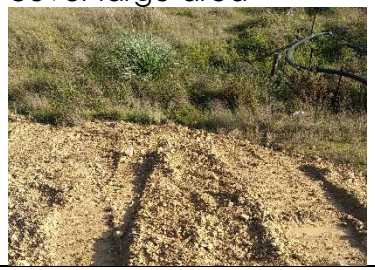
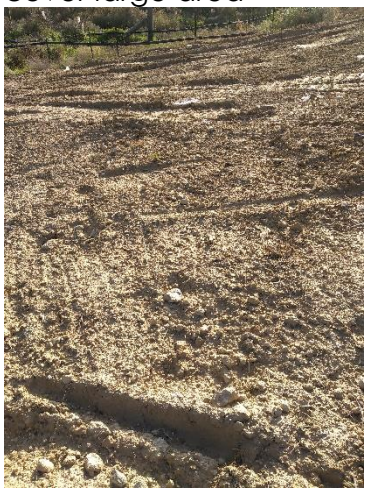
The results of the survey are plotted on the attached drawing. Details of readings above 500ppm are in Table 2.

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

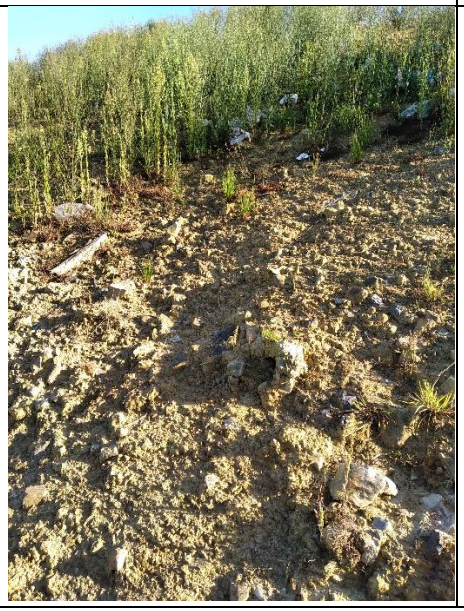
Table 2: Highest Methane readings recorded at localised survey area

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

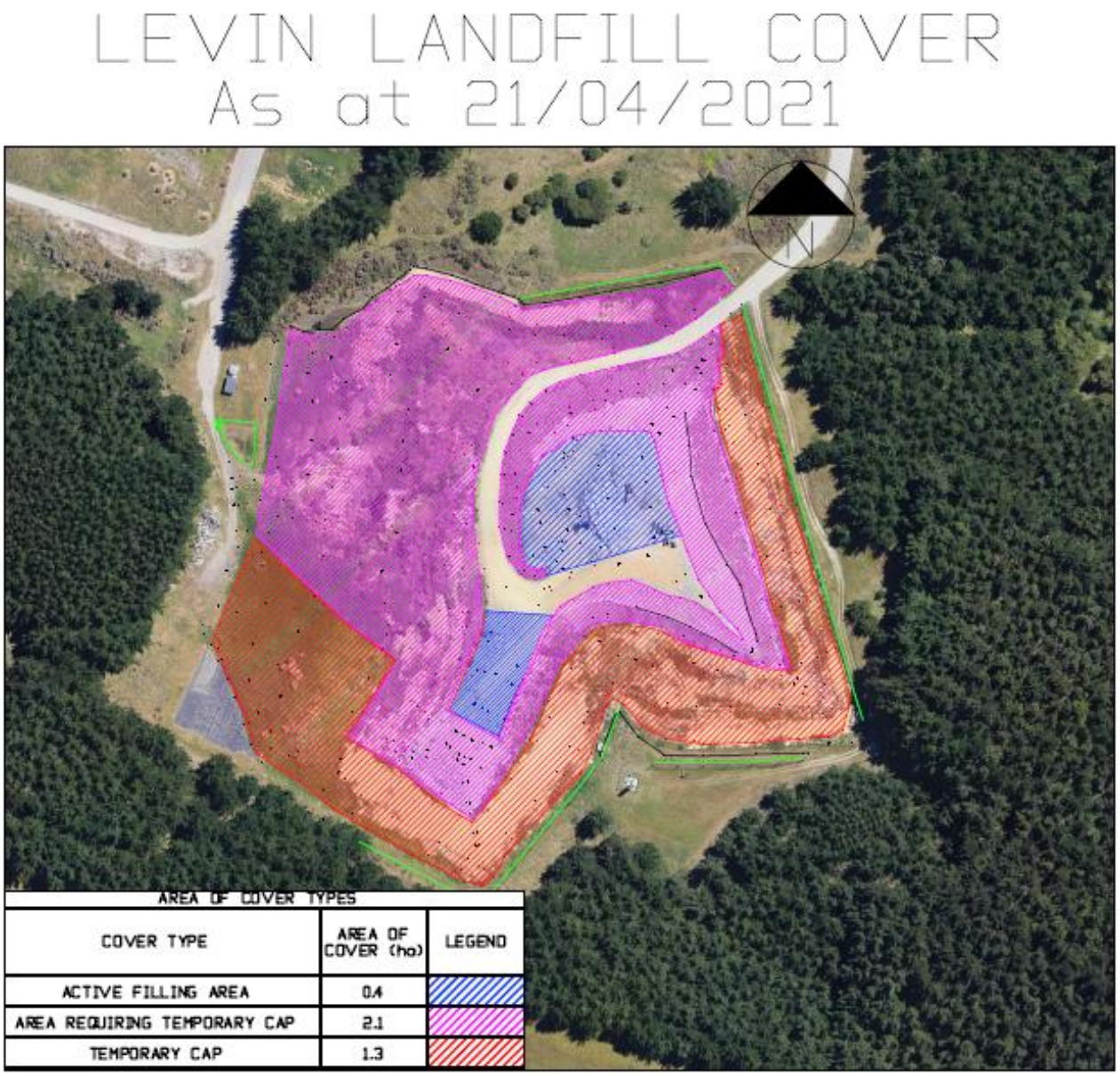


Figure 1: Map of Levin Landfill showing areas with temporary capping. (Aerial photo Feb 2021).

Surface Emissions Map for temporary cover areas

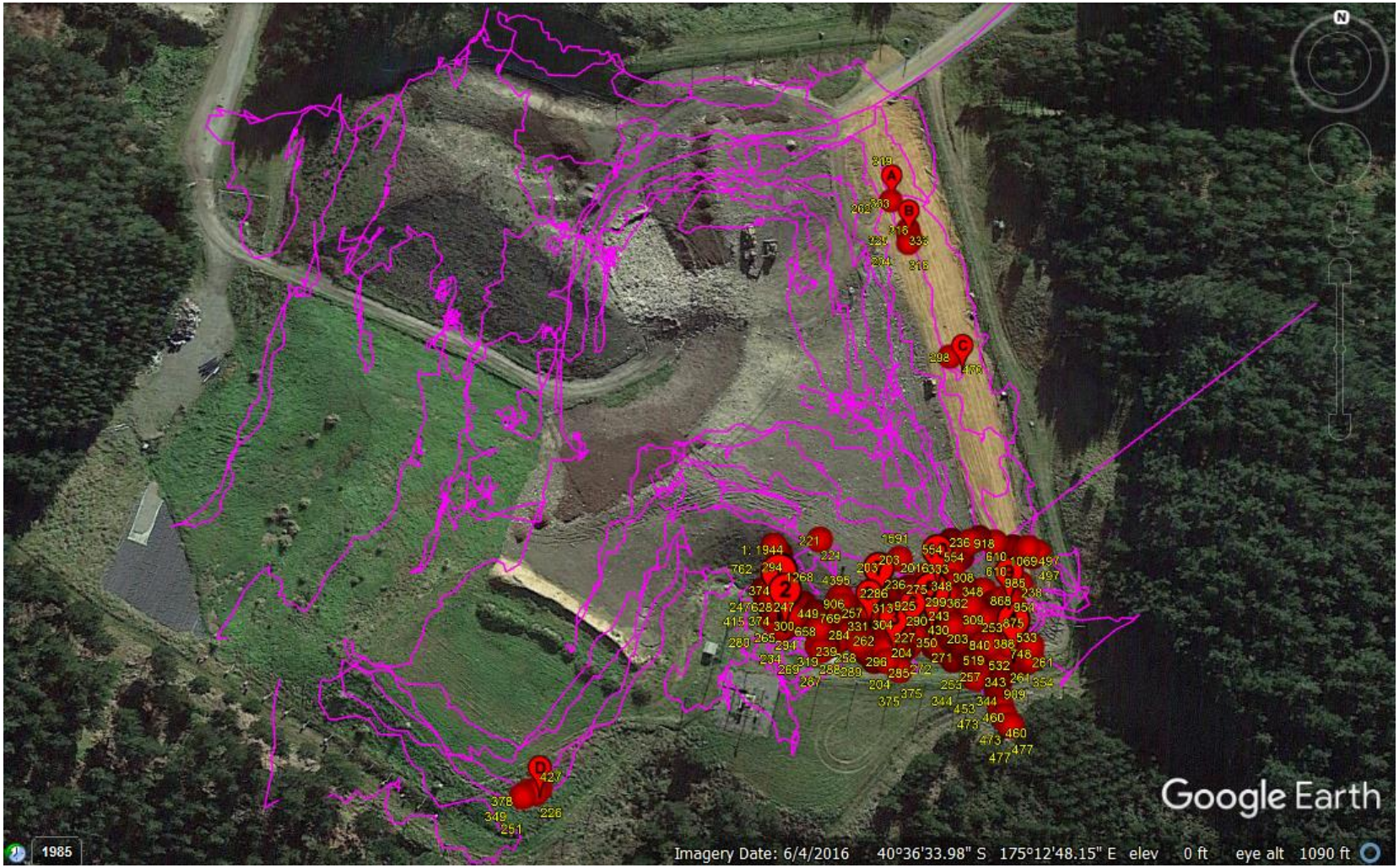


Figure 2: Levin Landfill surface emissions survey 18th March 2021, areas in red> 201ppm requiring remediation.

Surface Emissions Map for temporary cover areas

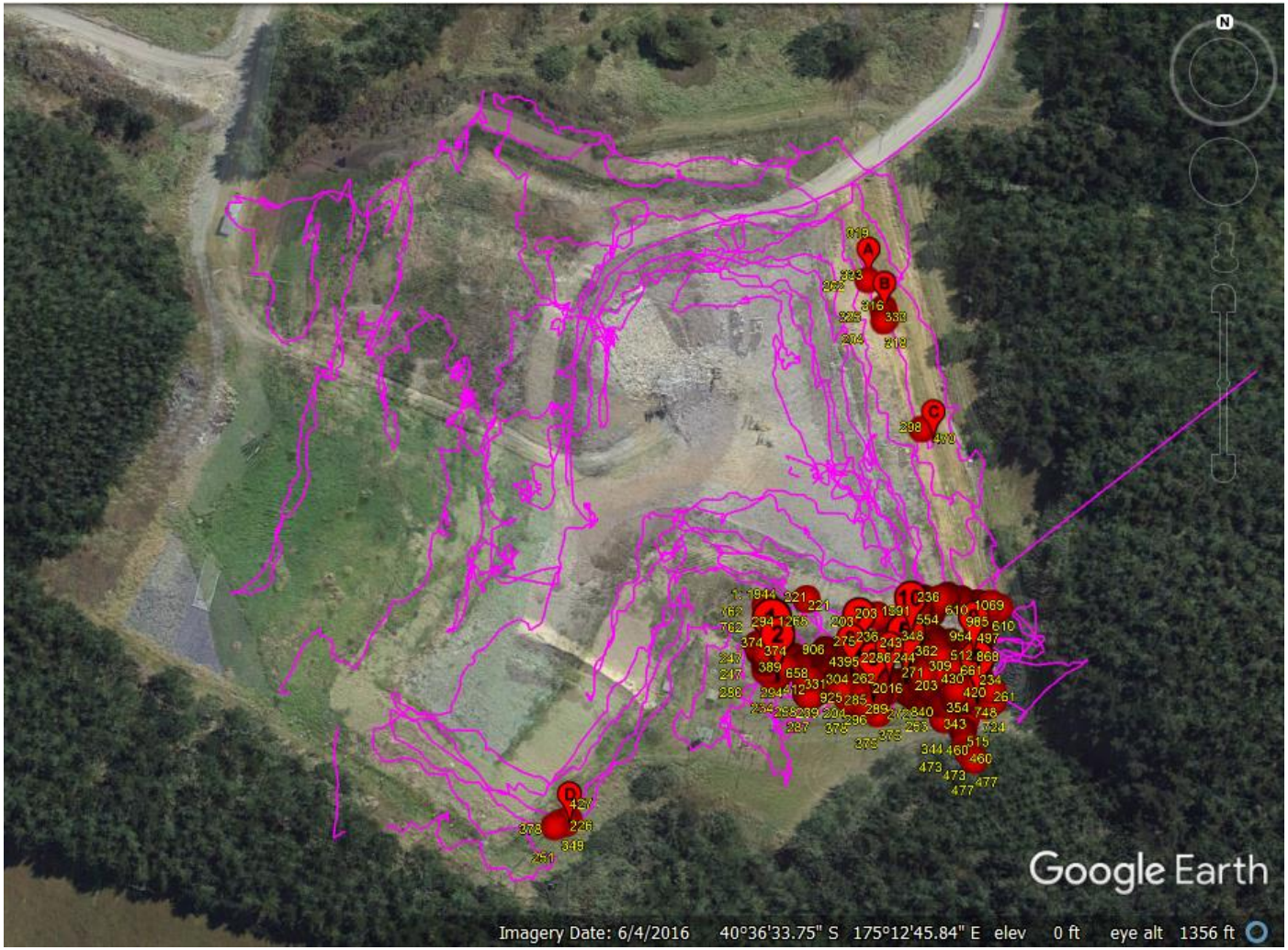


Figure 3: Levin Landfill surface emissions survey 18th March 2021, areas in red> 201ppm requiring remediation. Photo 5/2/21 overlay 50% transparency.

Surface Emissions Map close up southern edge for temporary cover areas

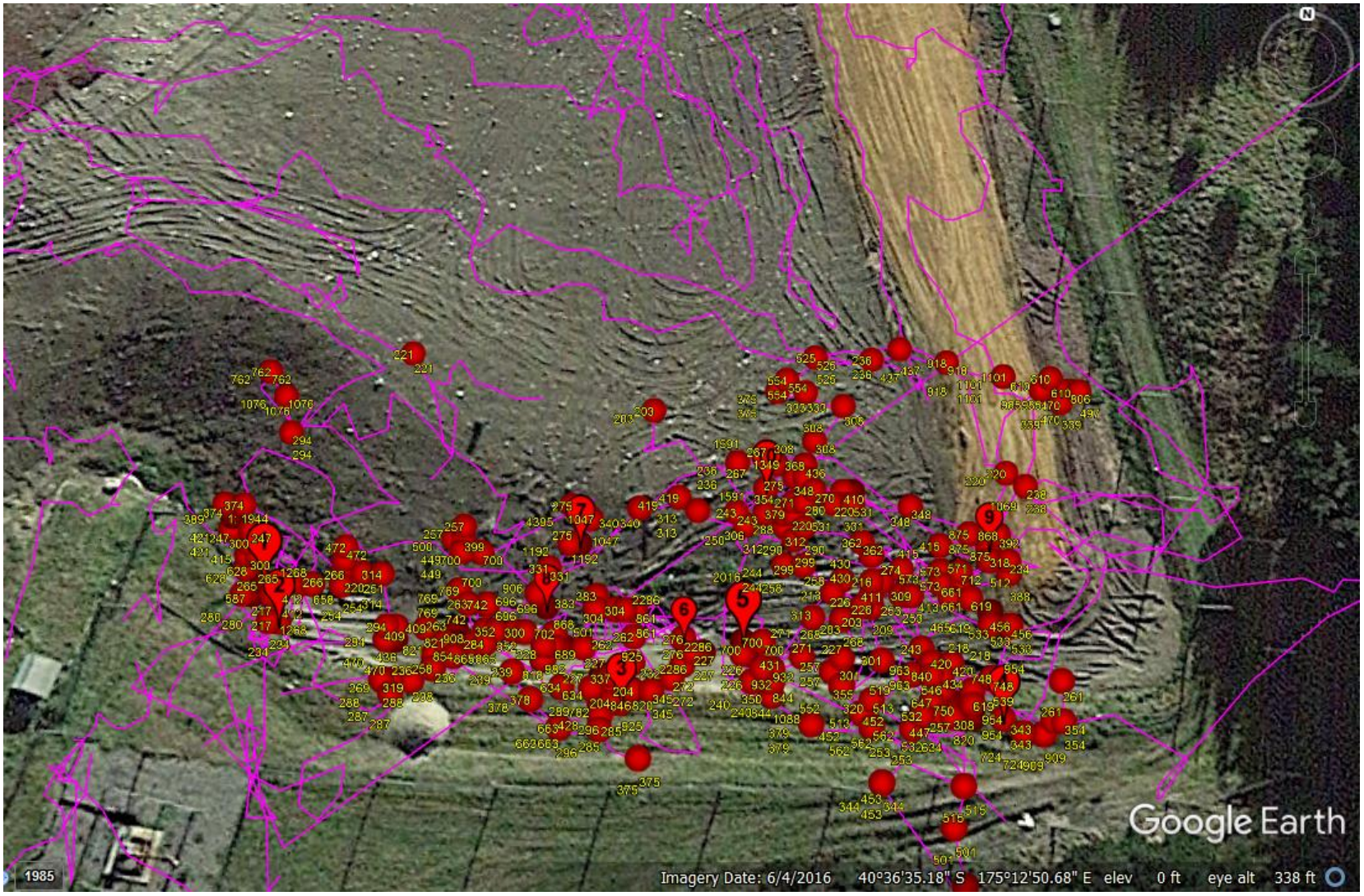


Figure 4: Levin Landfill surface emissions survey 18th March 2021, areas in red> 201ppm requiring remediation (Markers 1-10).

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

Previous | Weekly Mode | March | 21 | 2021 | View | Next

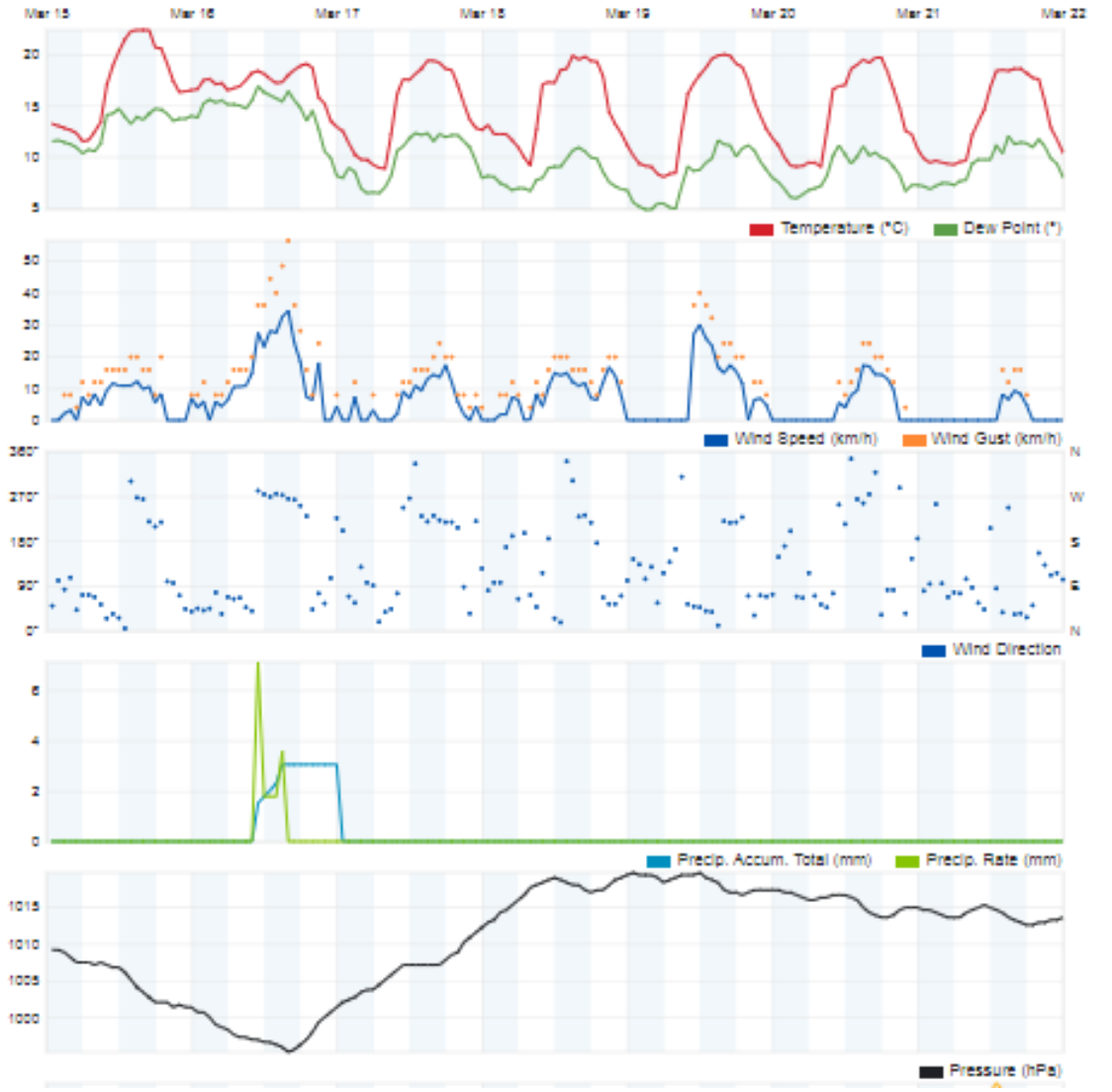
Summary
March 15, 2021 - March 21, 2021

	High	Low	Average
Temperature	22.4 °C	7.2 °C	14.6 °C
Dew Point	16.8 °C	3.6 °C	8.3 °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	68.2 km/h	--	3.0 km/h
Wind Direction	--	--	E SE
Pressure	1,018.84 hPa	994.58 hPa	--

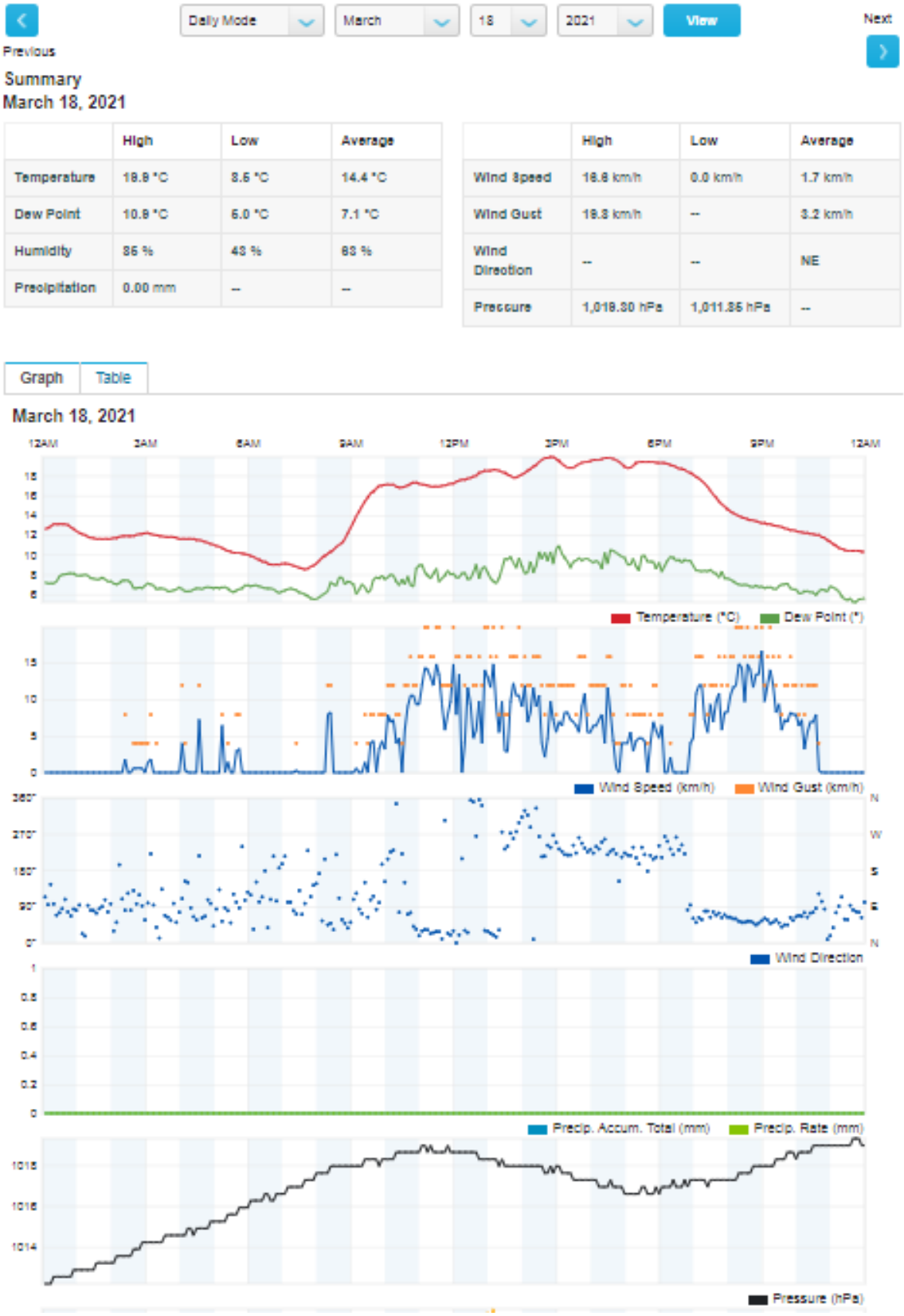
Graph | Table

March 15, 2021 - March 21, 2021



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

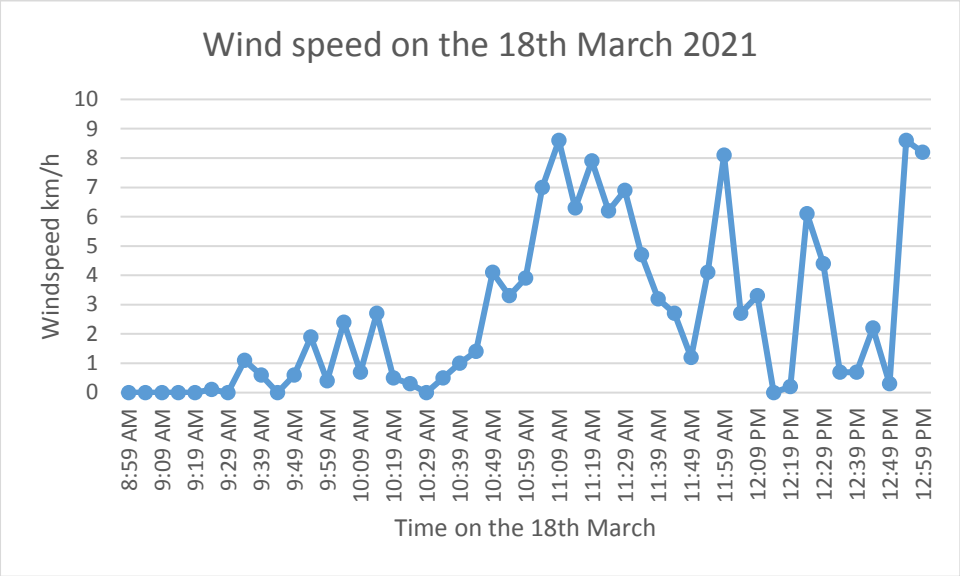


	High	Low	Average
Temperature	18.8 °C	8.6 °C	14.4 °C
Dew Point	10.8 °C	6.0 °C	7.1 °C
Humidity	86 %	43 %	63 %
Precipitation	0.00 mm	--	--

	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

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

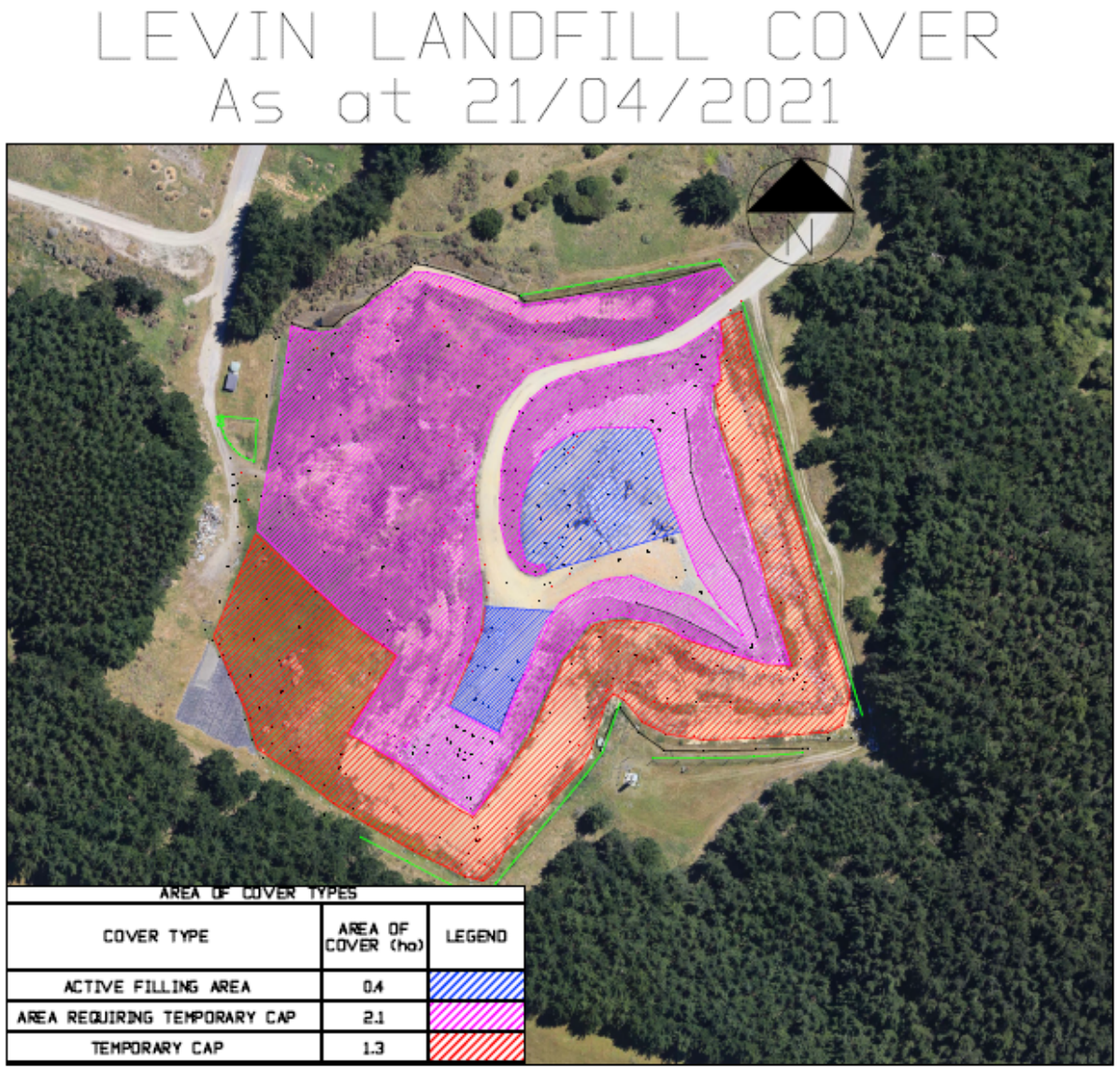


Figure 1: Map of Levin Landfill showing areas with temporary capping. (Aerial photo Feb 2021).

Surface Emissions Map for temporary cover areas

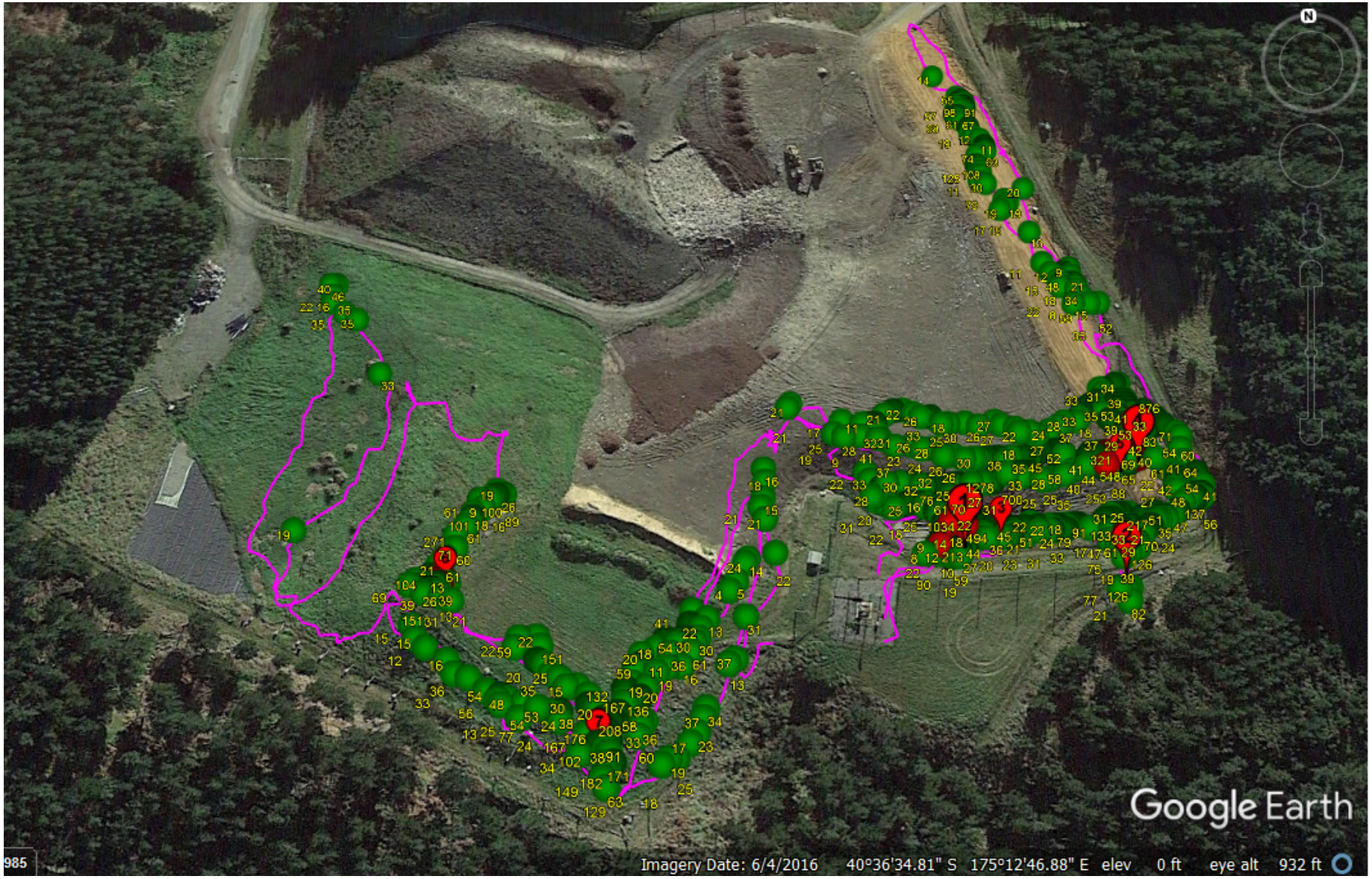
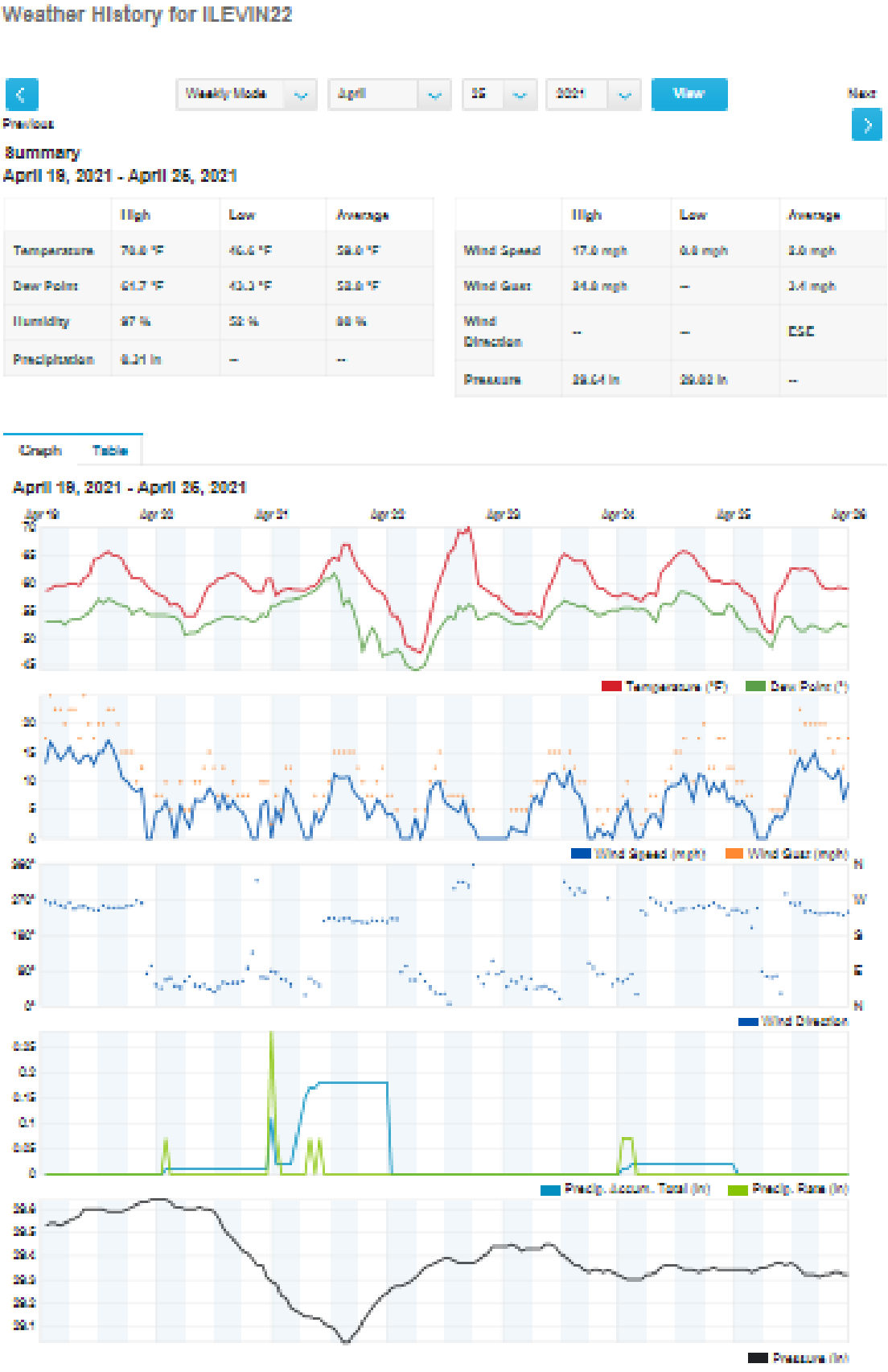


Figure 2: Levin Landfill surface emissions survey 22nd April 2021, areas in red> 200ppm requiring remediation.

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

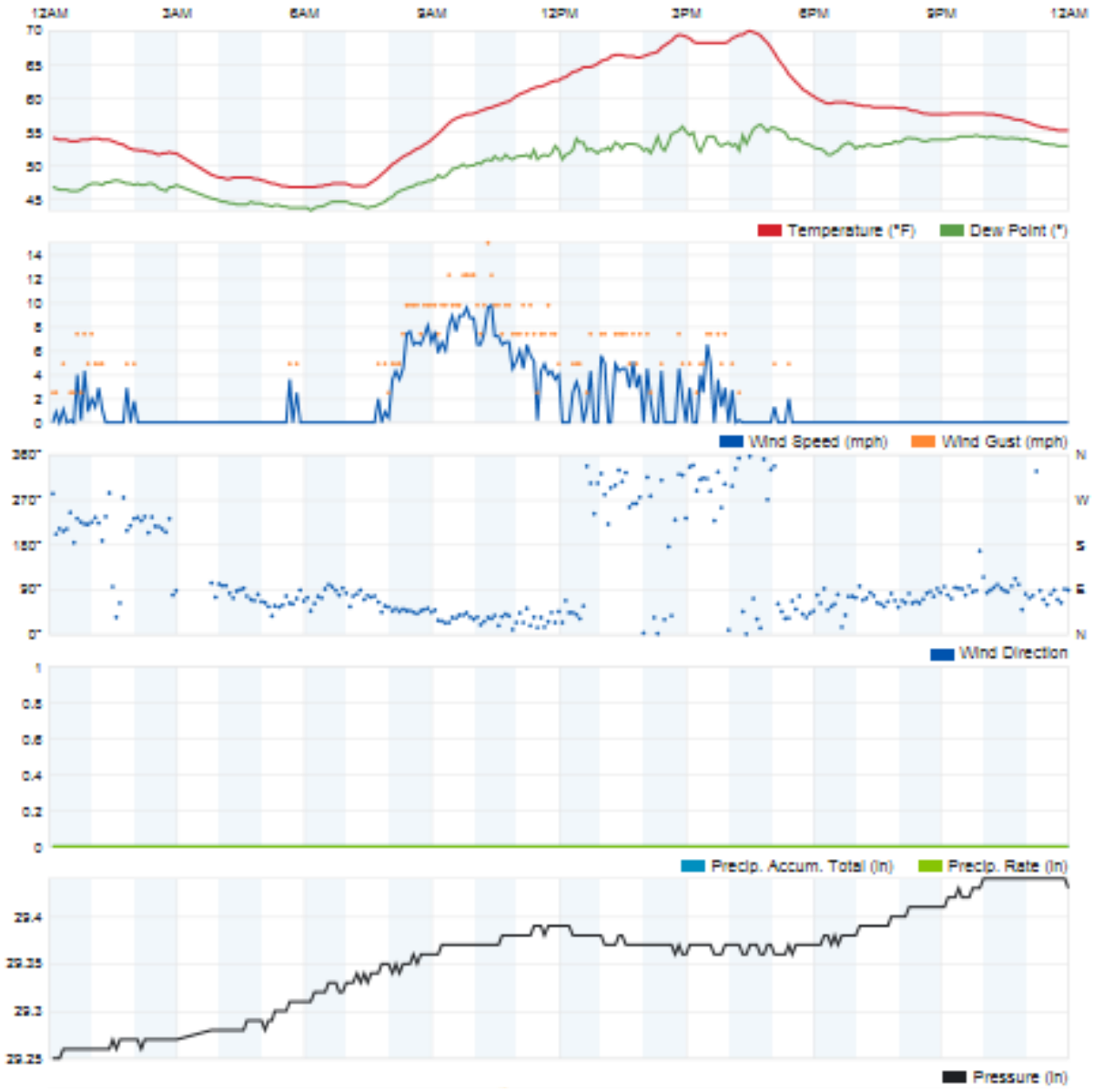
Summary
April 22, 2021

	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	92 %	62 %	77 %
Precipitation	0.00 in	--	--

	High	Low	Average
Wind Speed	8.8 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	--

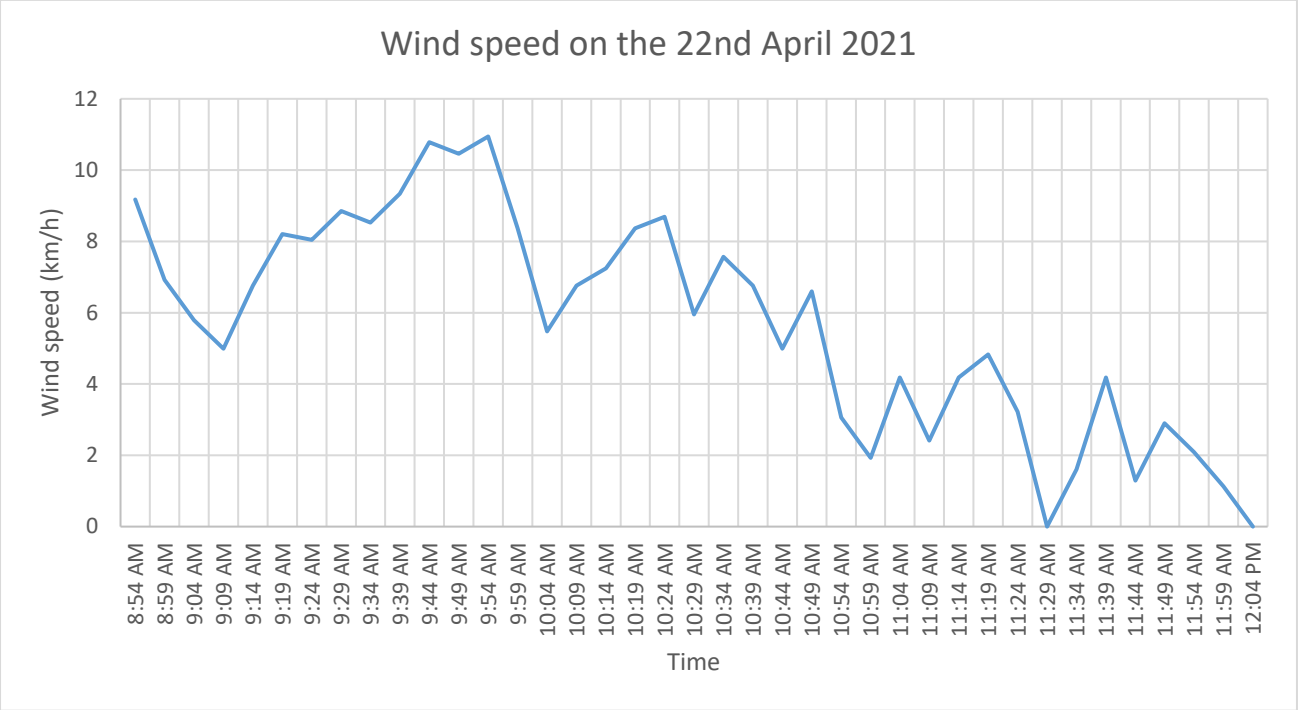
Graph Table

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

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. 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.  Added 2 bags of bentonite and water 	122ppm

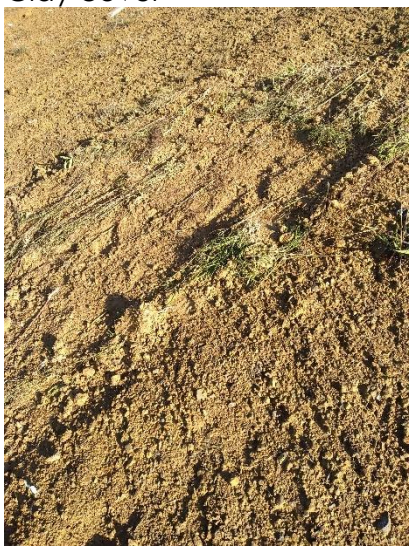
13	294ppm		Rill on clay slope	Bentonite and water	One bag of bentonite and water applied to rill of clay batter slope.  >397ppm Added two bags of bentonite and water. 	55ppm

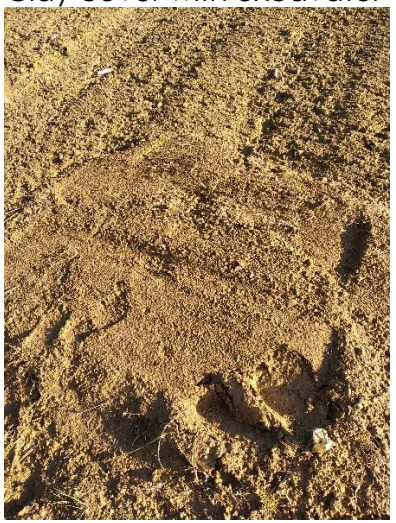
14	302ppm		Rill on clay slope	Bentonite and water	One bag bentonite and water.  >402ppm Added another bag of bentonite and water 	177ppm

15	224ppm		Rill on clay slope	Bentonite and water	Bentonite and water  Retest: 299ppm Added another bag of bentonite and water 	185ppm

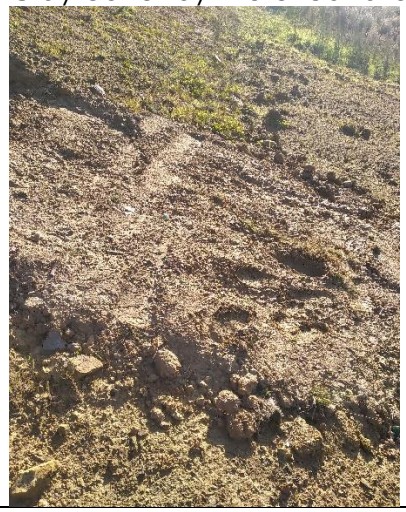
16	491ppm		Large rill full of litter, eastern cover.	Removed litter to find cover deficiency, added bentonite and water. 	One bag of bentonite and water 	39ppm
17	305ppm		Cracking of recent clay that hadn't been track rolled yet. Emissions were from the edge of the cover with the mulch covered refuse.	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

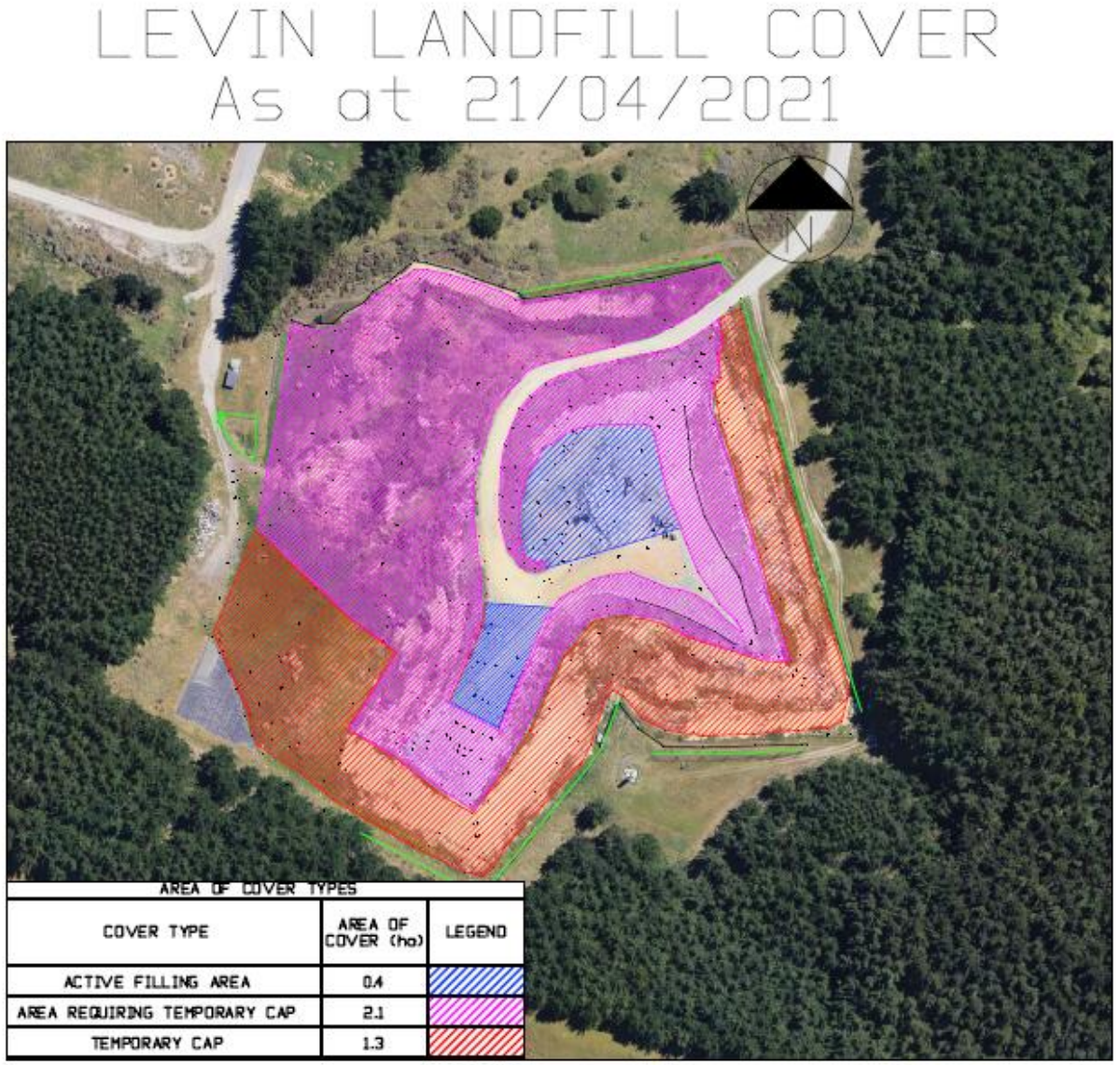


Figure 1: Map of Levin Landfill showing areas with temporary capping. (Aerial photo Feb 2021).

Surface Emissions Map for temporary cover

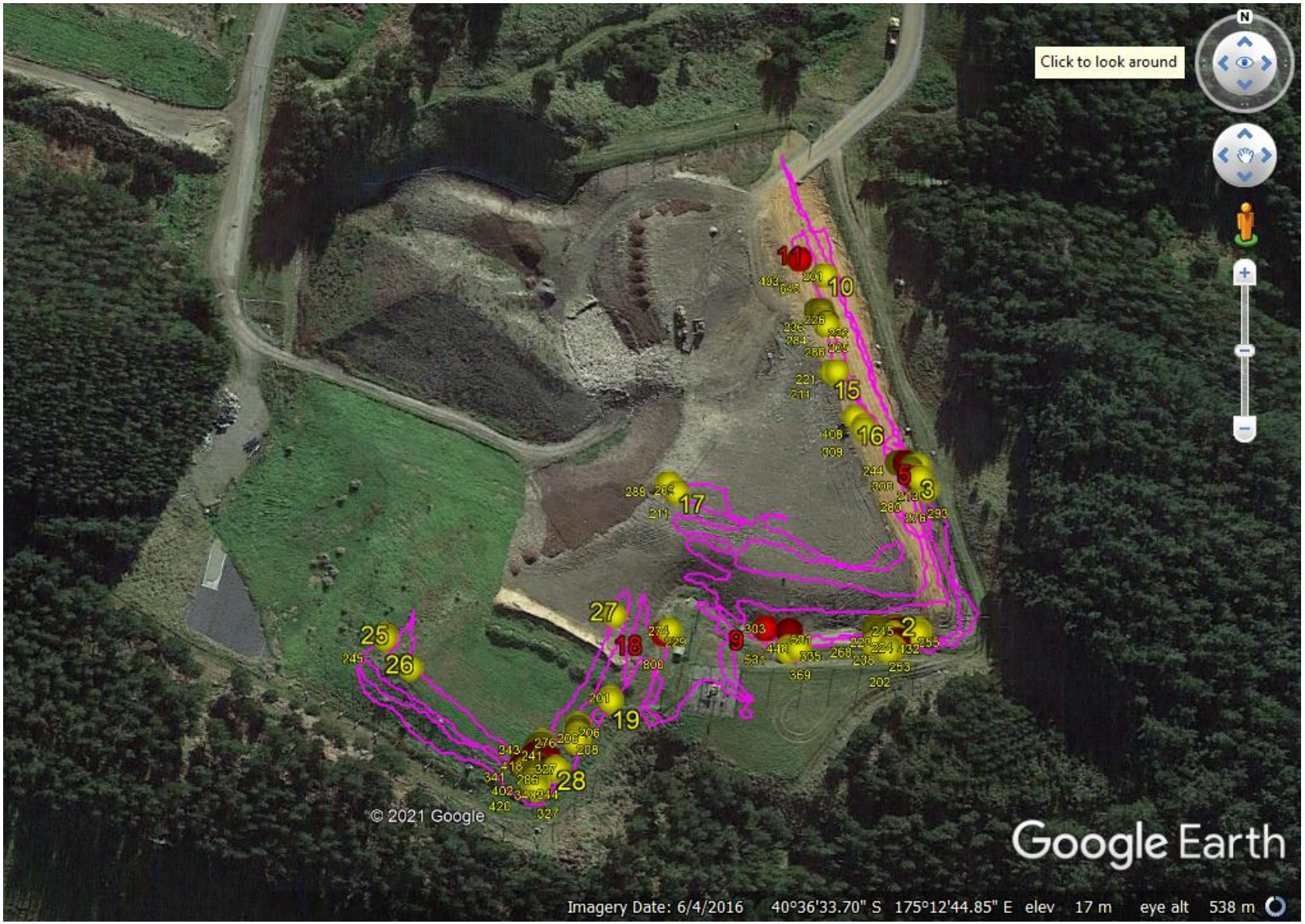


Figure 1: Map showing Levin Landfill surface emissions survey 27th May 2021, areas in red> 500ppm, areas in yellow >200ppm.

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

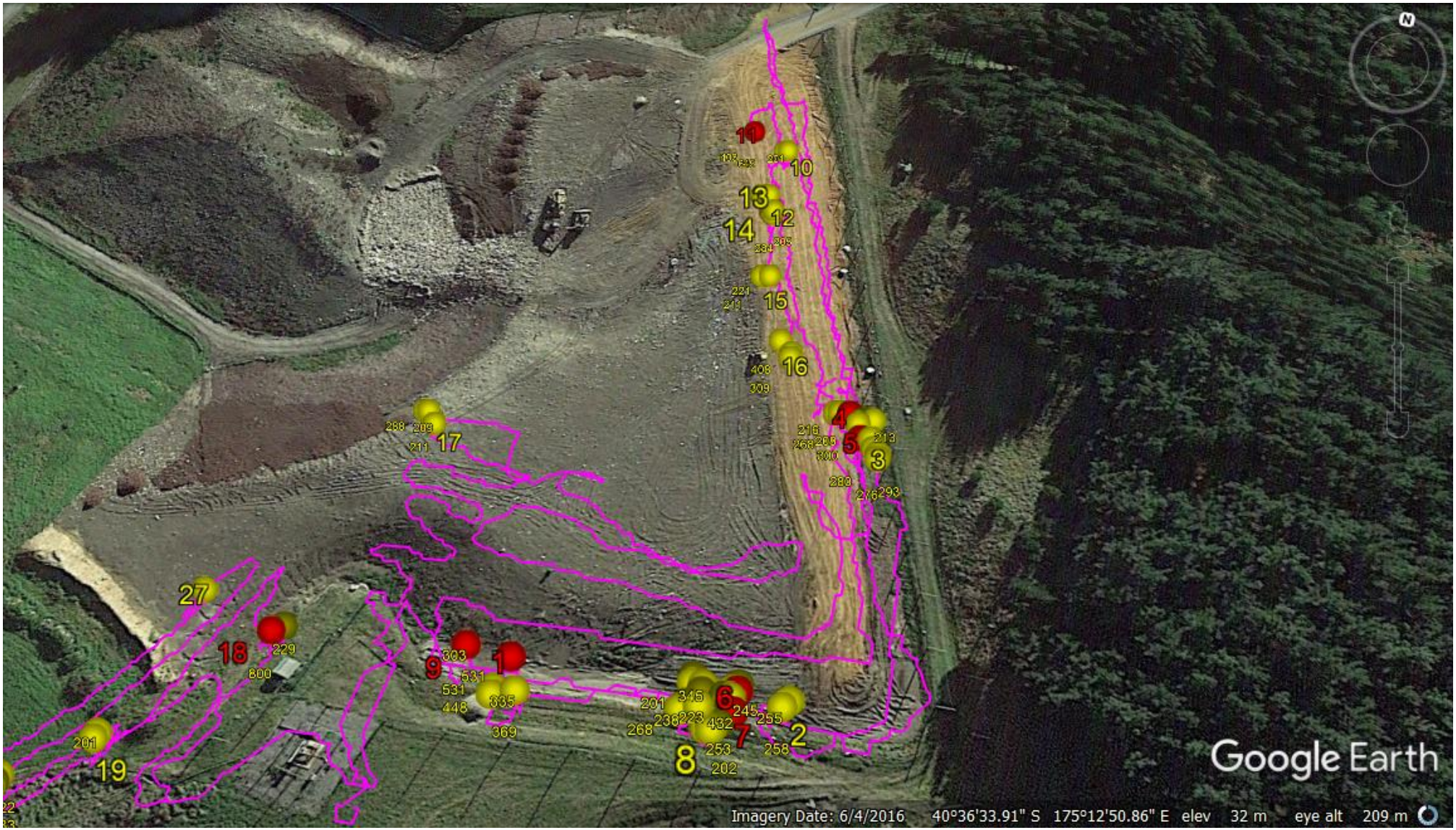
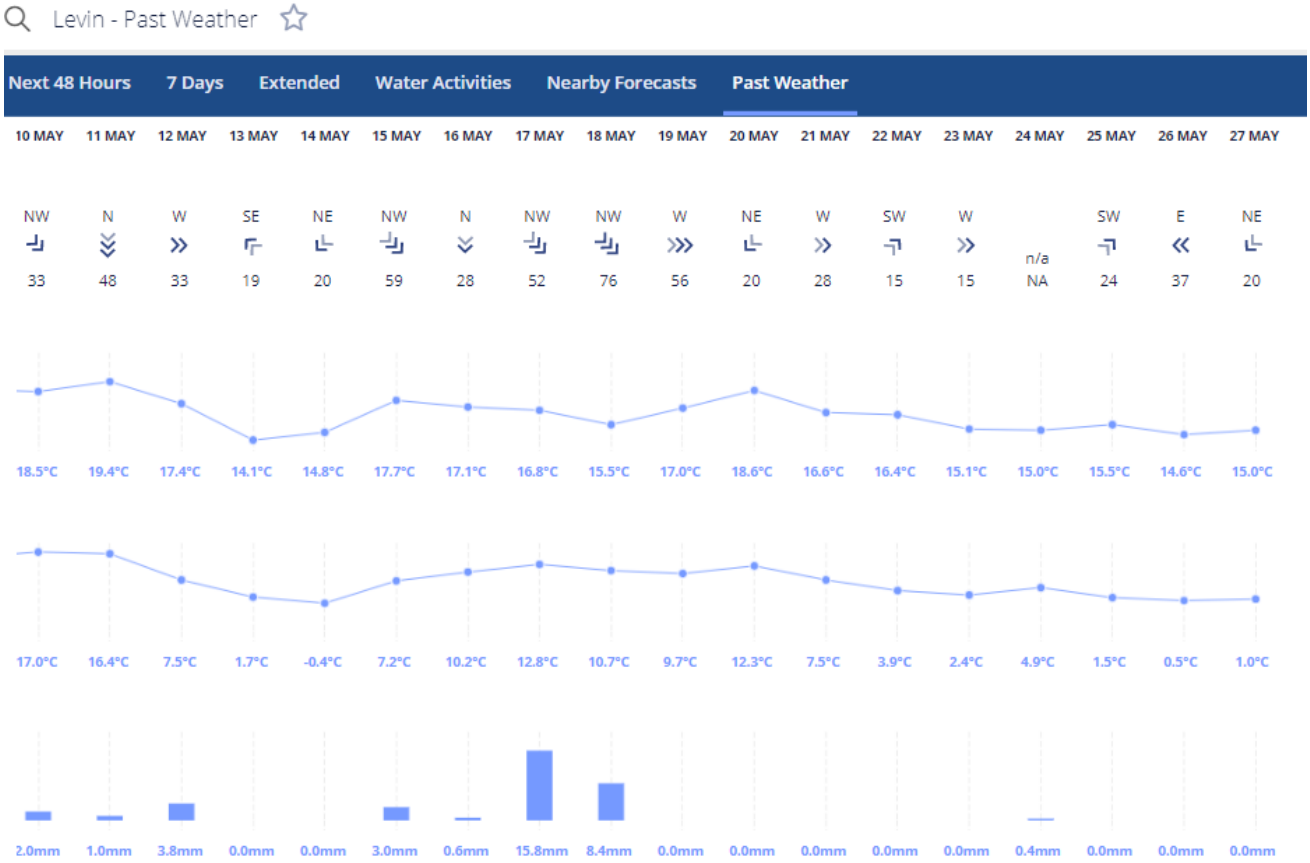


Figure 3: Map showing closer view of Levin Landfill surface emissions survey 27th May, areas in red> 500ppm, areas in yellow >200ppm.

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

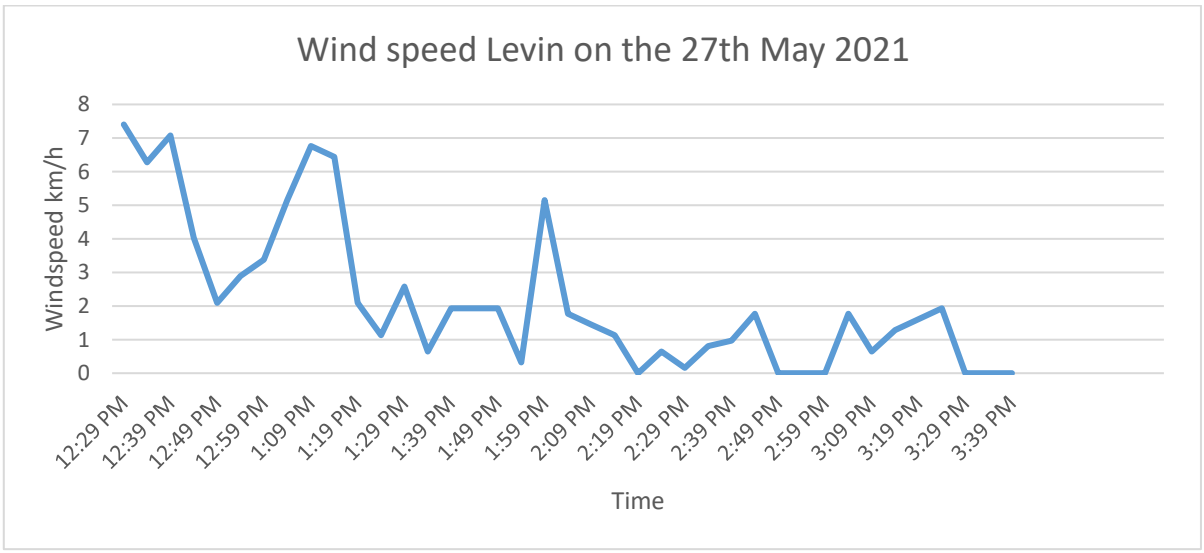


Appendix 2:

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

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

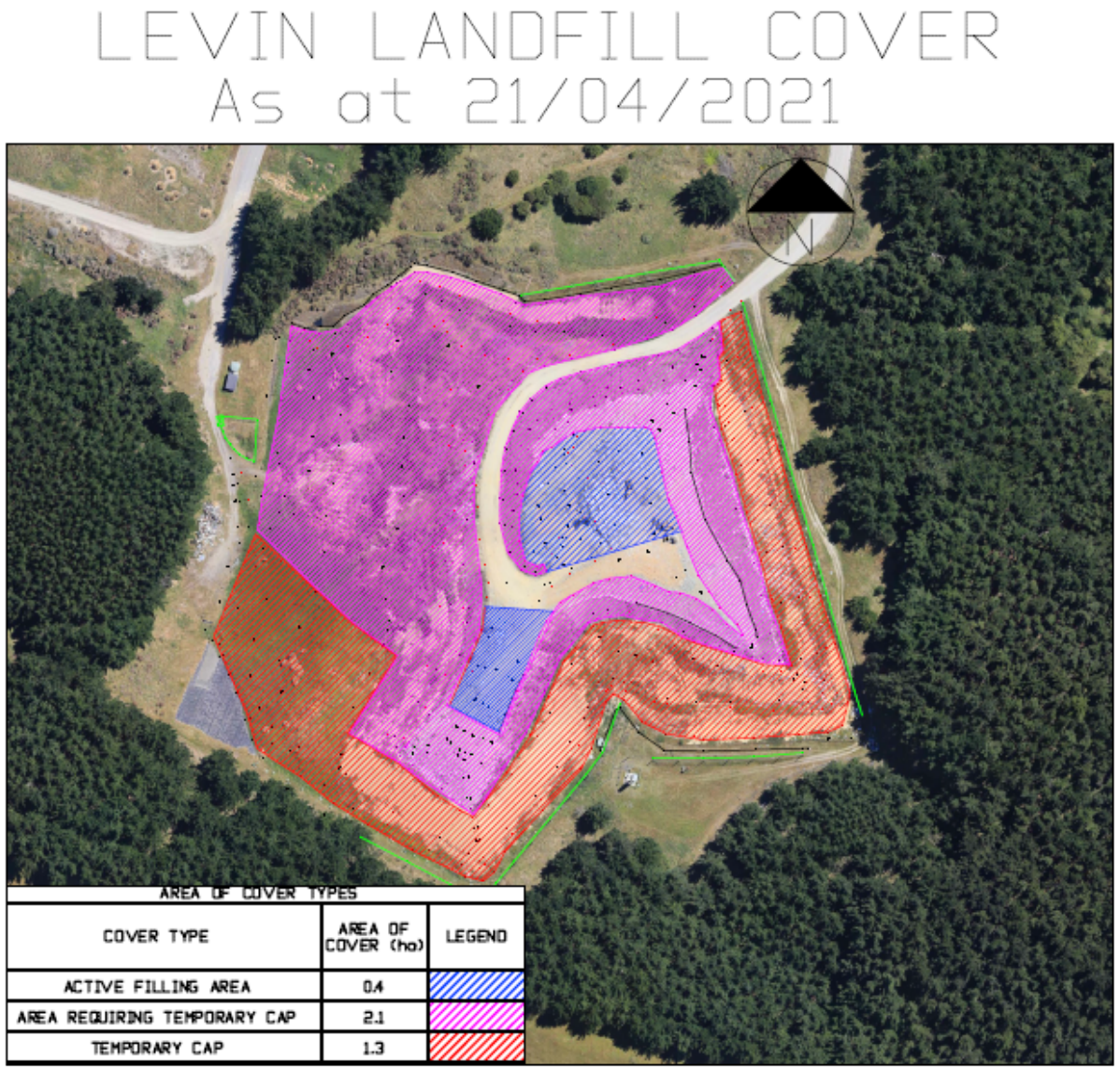


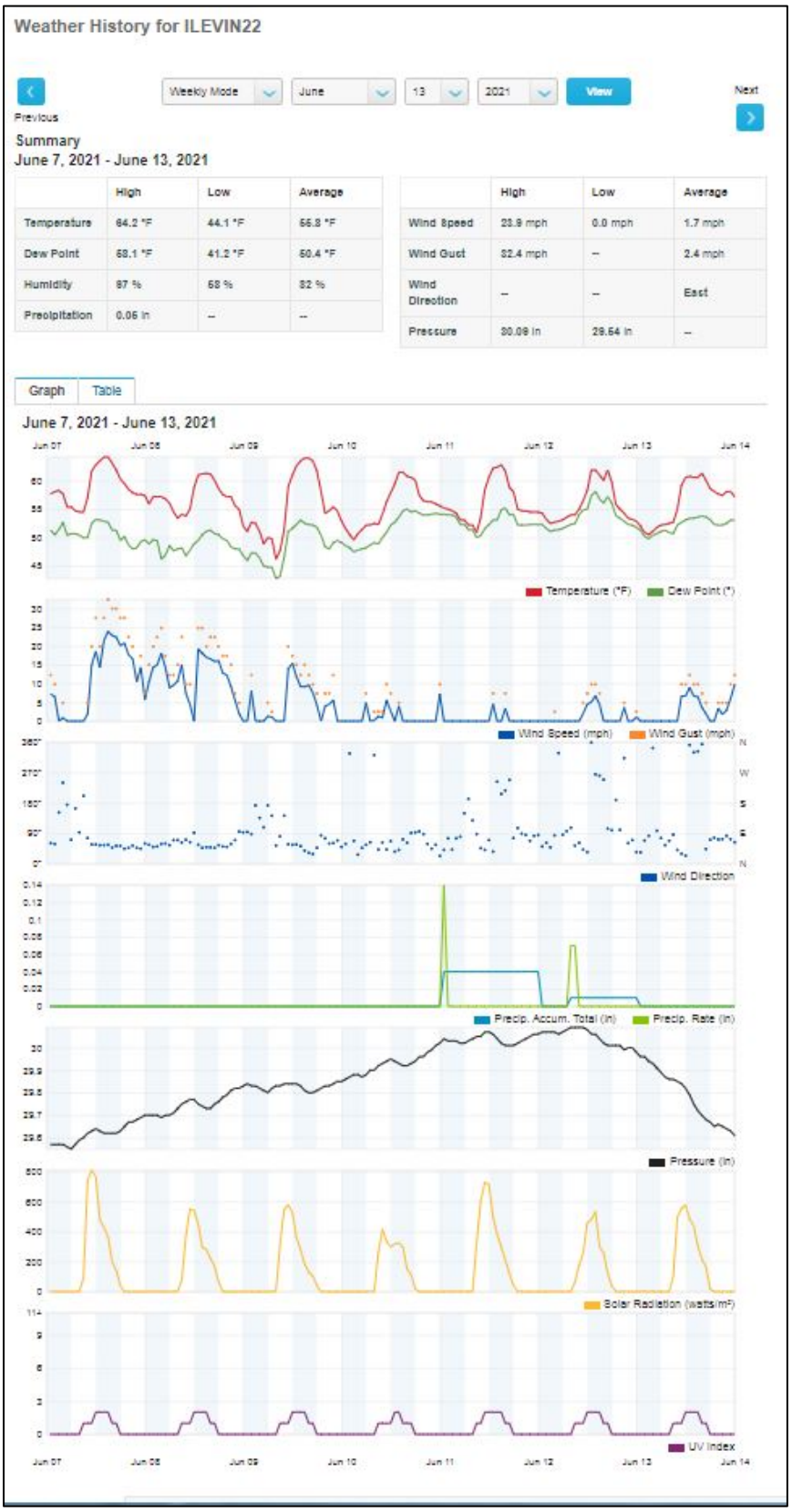
Figure 1: Map of Levin Landfill showing areas with temporary capping. (Aerial photo Feb 2021).

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.

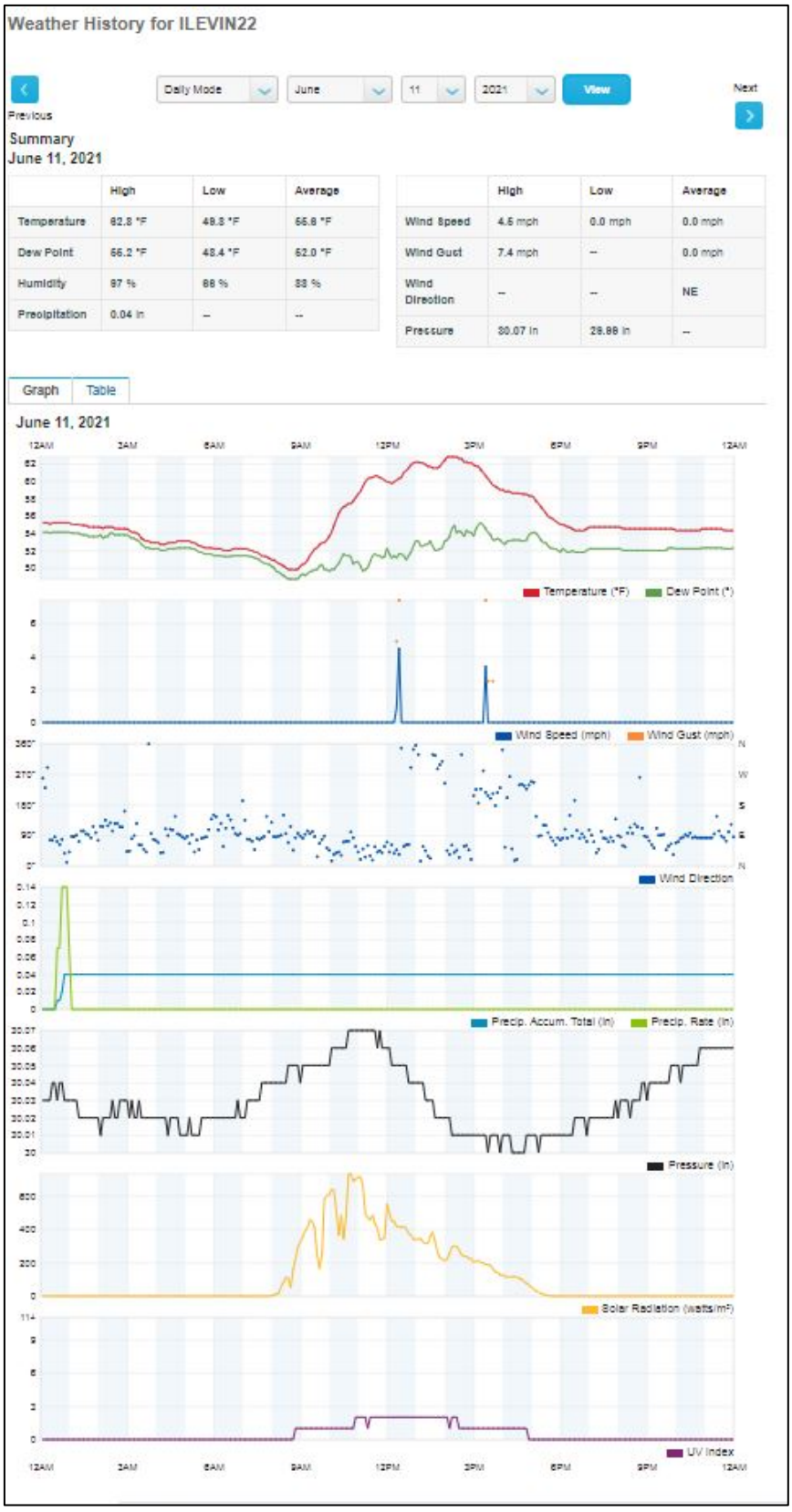
Appendix 1: Weather conditions preceding the survey.

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:

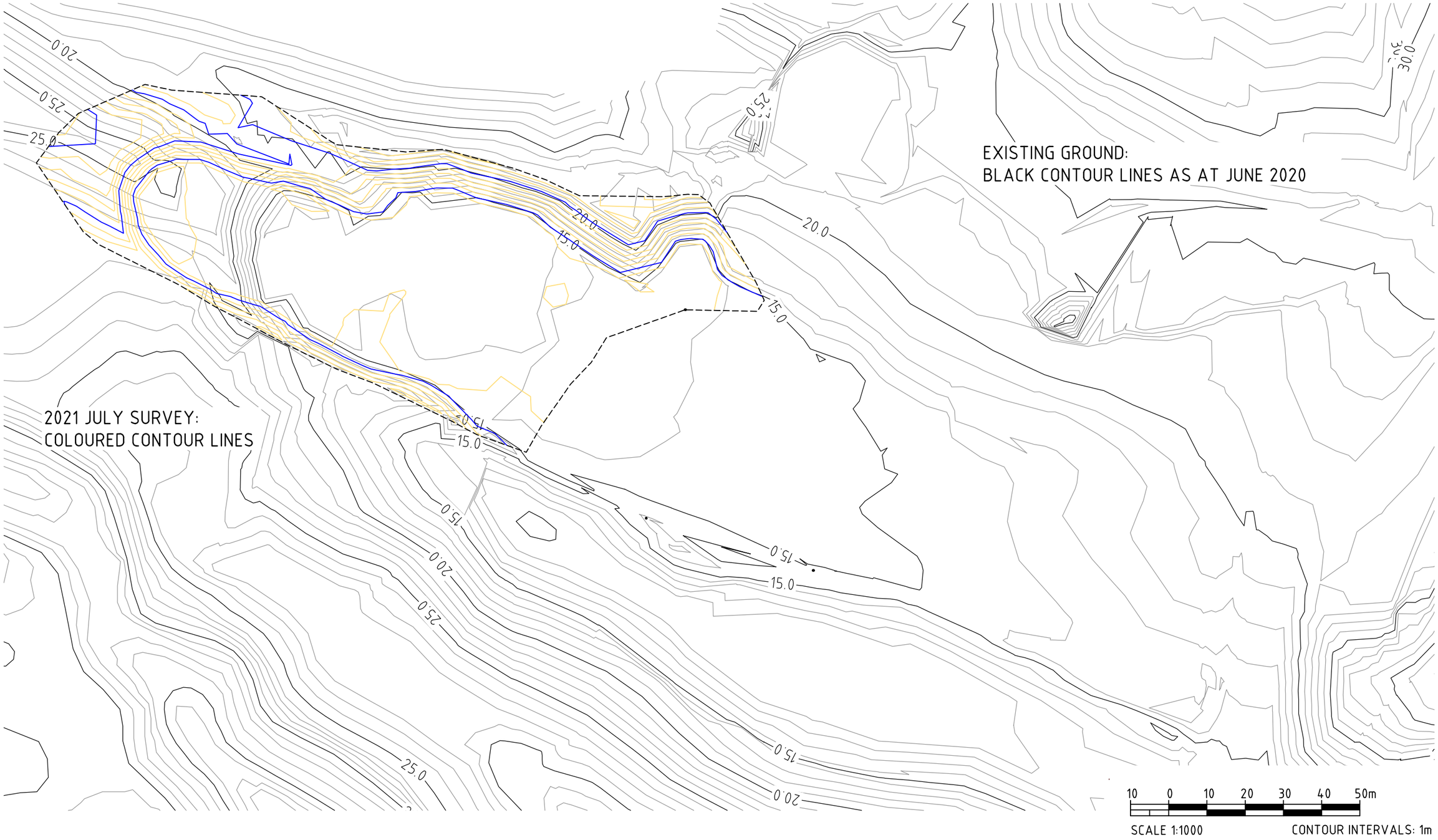
Weather conditions during the survey on the 11th June displayed below. There was no rainfall during the survey. Graph retrieved June 21th, 2021 from https://www.wunderground.com/dashboard/pws/ILEVIN22/graph/2021-06-11/2021-06-11/weekly



	High	Low	Average
Temperature	82.8 °F	48.3 °F	66.8 °F
Dew Point	66.2 °F	48.4 °F	62.0 °F
Humidity	97 %	88 %	93 %
Precipitation	0.04 in	--	--

	High	Low	Average
Wind Speed	4.6 mph	0.0 mph	0.0 mph
Wind Gust	7.4 mph	--	0.0 mph
Wind Direction	--	--	NE
Pressure	30.07 in	29.88 in	--

Appendix K Survey plan

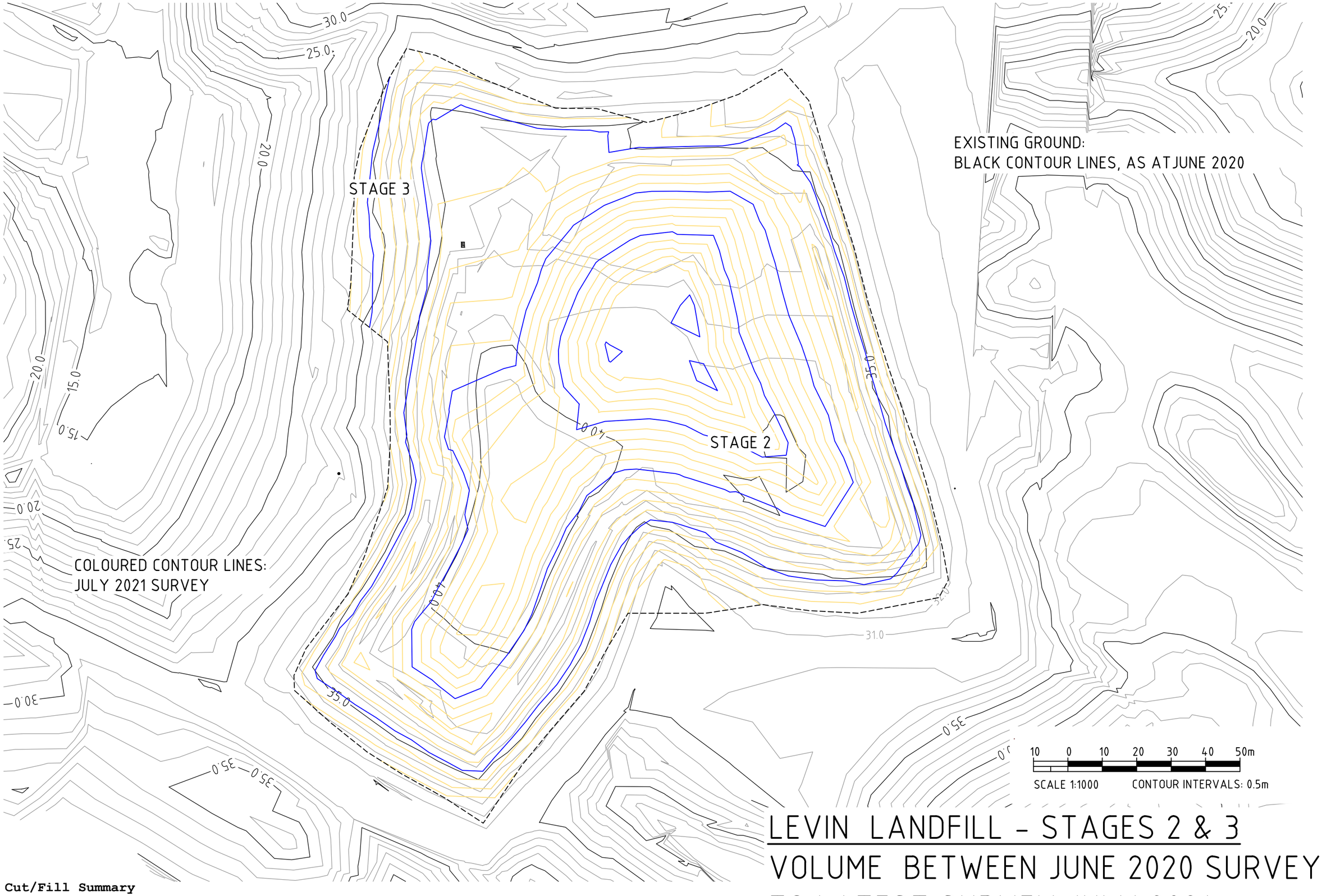


Cut/Fill Summary

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

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