Levin Landfill January 2023 Quarterly Groundwater, Surface Water and Leachate Monitoring Report

PREPARED FOR Horowhenua District Council | February 2023

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Revision Schedule

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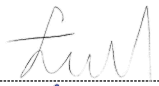
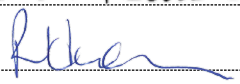
Quality Statement

Project manager	Project technical lead
R. Hulme	P. Landmark

PREPARED BY		
F. MacLeod		14/02/2023
CHECKED BY		
P. Landmark		16/02/2023
REVIEWED BY		
S. Fellers		21/02/2023
APPROVED FOR ISSUE BY		
R. Hulme		06/03/2023

118 Fitzherbert Avenue, Palmerston North 4410
PO Box 13-052, Armagh, Christchurch 8141
TEL +64 6 357 4034
STATUS FINAL | Project No 310103837

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Abbreviations

Abbreviation	Name
ANZECC LDW	ANZECC 2000 Livestock Drinking Water
BDL	Below the detection limit
cfu	Colony-forming unit
COD	Chemical Oxygen Demand
DWSNZ GVs	Drinking Water Standards for New Zealand - Guideline Values for aesthetic determinants
DWSNZ MAVs	Drinking Water Standards for New Zealand – Maximum Acceptable Values
EC	Electrical Conductivity
HDC	Horowhenua District Council
Hg	Soluble mercury
HRC	Horizons Regional Council
mbgl	Metres below ground level
NH_3-N	Ammoniacal-nitrogen
NO_3-N	Nitrate nitrogen
ppm	Parts per million
scBOD$_5$	Soluble carbonaceous Biochemical Oxygen Demand (5-day)

Executive Summary

Horowhenua District Council (HDC) is required to carry out quarterly compliance monitoring of groundwater and monthly sampling at selected surface water monitoring locations at the Levin Landfill, as part of the conditions of Resource Consents ATH-2002003982.03 (formerly DP6009), ATH-2002003983.02 (formerly DP6010), ATH-2002003984.02 (formerly DP6011) and ATH-2002009801.02 (formerly DP102259). This report summarises the findings for the monitoring events from the third quarter (i.e., November 2022 to January 2023) sampling round and includes results for:

- Background (natural) groundwater (Bores G1S and G1D)
- Landfill leachate (manhole next to leachate pond)
- Groundwater bores, down-gradient of the new landfill (Bores D1, D2, D3rs, D4, D5, D6 and E1S)
- Groundwater bores within the old irrigation area (Bores F1, F2 and F3)
- Shallow aquifers, down-gradient of the old landfill (Bores B1, B2, B3s, C2, C2DS, E2S, G2s, Xs1 and Xs2)
- The deep aquifer (Bores C2DD, D3rd, E1D, E2D and Xd1)
- The Tatana Drain (TD1), and
- The Hokio Stream (HS1A, HS1, HS2 and HS3).

Stantec has reviewed the results of this third quarter monitoring round on behalf of HDC.

Monitoring results for other aspects of the landfill operations such as for air quality/odour and stormwater quality are reported annually, as per resource consent requirements.

Samples were collected from 26[1] groundwater bores from around Levin Landfill during January 2023, and landfill leachate was sampled at a manhole next to the leachate pond. Additionally, five surface water sites were each sampled during November 2022, December 2022, and January 2023. All samples were analysed for the parameters set out in ATH-2002003983.02, and as listed in the results tables presented in this report.

For samples during the January 2023 quarter, time between sampling and reception at the laboratory ranged between 23 – 50 hours, which for most samples was outside the normally accepted timeframe of <24 hours. Meeting the monitoring timeframe is important because it provides greater confidence in the reliability of results, and comparisons with historical data.

The resource consent for the landfill (namely, ATH-2002003983.02) establishes compliance limits for the quality of deeper and shallow groundwater which are based upon the Drinking Water Standards for New Zealand – Maximum Acceptable Values (DWSNZ MAVs), Guideline Values for aesthetic determinants (DWSNZ GVs), and the ANZECC 2000 Livestock Drinking Water (ANZECC LDW) trigger values, respectively. Compliance limits for surface water are based on the ANZECC 2000[2] default guideline values (DGV) for 95th percentile species protection for toxicants in freshwater, as required by the revised Resource Consent condition approved in December 2019.

The November 2022 to January 2023 monitoring results have been assessed against these limits, where they are applicable.

Twenty-four non-compliances with resource consent conditions were recorded across thirteen monitoring locations, as follows:

- Bore C1 was not sampled, which is considered a consent non-compliance.
- *E. coli* counts in bores B1 (26,000 CFU/100ml), B2 (6,000 CFU/100ml) and C2 (1,400 CFU/100ml) exceeded the ANZECC LDW trigger value of 100 CFU/100ml. Whilst these bores have exceeded on occasions, these results are particularly high.
- Dissolved manganese concentrations exceeded the DWSNZ MAV of 0.4 mg/L in bores C2DD (0.64 mg/L), Xd1 (0.52 mg/L) and D3rd (0.45 mg/L).
- Dissolved arsenic exceeded the DWSNZ MAV of 0.01 mg/L at bore D3rd (0.018 mg/L).
- $scBOD_5$ exceeded the ANZECC (95%ile) DGV of 2 mg/L at Tatana Drain (TD1) in January 2023 with 51 mg/L. This is the highest concentration recorded so far.

[1] The consents require monitoring at 27 groundwater bores on a quarterly basis but bore C1 was not sampled during this monitoring round. This was due to the borehole being swamped when sampling was scheduled, and the bore could not be accessed safely. Since then, HDC has extended the bore riser pipe and built up around the bore with soil to allow improved access.

[2] Now superseded by the Australian and New Zealand Water Quality Guidelines 2018 (ANZG 2018), however the ANZECC 2000 guideline values are applied in accordance with the resource consent.

- Nitrate-nitrogen (NO_3-N) exceeded the ANZECC (95%ile) DGV of 0.16 mg/L at Tatana Drain (TD1) in November 2022 with 0.7 mg/L and January 2023 with 0.53 mg/L.
- Ammoniacal-nitrogen exceeded the ANZECC (95%ile) DGV of 2.1 mg/L at Tatana Drain (TD1) in November 2022 with 10.7 mg/L and January 2023 with 12.9 mg/L.
- For Hokio Stream, $scBOD_5$ exceeded the ANZECC (95%ile) DGV of 2 mg/L at HS1A (6 mg/L) in December 2022. Excluding previous monitoring periods where the laboratory detection limit was inappropriately set at 6 mg/L, this is the highest value on record for HS1A. Note that surface sampling locations HS1 and HS1A are both upstream of the old and new landfills.
- Nitrate-N (NO_3-N) concentrations exceeded the ANZECC (95%ile) DGV of 0.16 mg/L at all Hokio Stream sampling locations in November 2022.
- Ammoniacal-nitrogen did not exceed the ANZECC (95%ile) DGV of 2.1 mg/L but did exceed the consent average trigger value of 0.4mg/L in November 2022 with 1.37 mg/L and January 2023 with 1.38 mg/L.
- Dissolved copper concentrations exceeded the ANZECC (95%ile) DGV of 0.0014 mg/L at HS1A (0.0026 mg/L) and HS1 (0.002 mg/L) in December 2022. In January 2023 dissolved copper also exceeded at HS3 with 0.01 mg/L; one of the highest recorded at this bore.
- Dissolved zinc exceeded the ANZECC (95%ile) DGV of 0.008 mg/L at HS1 (0.729 mg/L). This is the highest concentration recorded at HS1 since sampling began.

The November 2022 to January 2023 results were also considered in the context of background water quality, both within the groundwater aquifers (shallow and deep bores) and the surface water receiving environment. For example, low pH at background bore G1S, and elevated iron concentrations in the same bore indicate that groundwater could be being impacted by up-gradient activities unrelated to the landfill operations. This trend will be examined in greater detail in the Annual Report.

There were two occasions where the leachate effluent quality (at the leachate pond manhole sampling location) was outside of the ranges for typical leachate composition, as recorded generally at Class 1 landfills in New Zealand. This occurred for Ammoniacal-N (NH_4-N) which exceeded the typical range for Class 1 landfills, and for dissolved mercury which was not detected and so was under the typical range. Note that leachate effluent is not subject to any consent limits. Typical leachate concentrations are derived from tables presented in the WasteMINZ *Technical Guidelines*. The data in those tables originate from seven landfills in New Zealand and date back to between 1998 and 1999. More updated data should be sought for comparison purposes.

Bore C1 was not sampled during January 2023. With respect to the resource consent conditions, this is a non-compliance.

For *E. coli* the current laboratory detection limit is 100 CFU/100ml. This is impractical, as recent practice has been to halve any results which have fallen below the level of detection (as described in Section 2.1 of this report). The ANZECC LDW is also set at 100 CFU/100ml and the DWSNZ MAV is NIL, thus room for error through unknown values is large. Whilst results below the detection limit have been described as 'not detected' (ND), due to specific results being unknown, these should be considered with caution. This detection limit is unacceptable and should be remedied for future sampling periods. Consistency in laboratory methods is also essential to analysing longer term trends and compliance at each of the monitoring locations.

Methane was detected in seven groundwater monitoring bores in the January 2023 sampling round. Methane concentrations are significantly less than they were during the October 2022 monitoring round. The highest concentration of methane during January 2023 was 0.06%, in bore Xd1. This is well below the explosive limit of 5% and represent a 'safe' level.

Additionally, a high level of carbon dioxide (7.01%) was measured at bore B2. Previously, B2 has showed carbon dioxide levels of 1.48% (October 2022), 3.6% (July 2022) and 5.2% (April 2022), so there appears to be a fluctuating trend.

Hydrogen sulphide was detected at bores D3rs, D1, G1d, G2s and Xs2 at concentrations of 1ppm.

The possibility of encountering methane (and possible hydrogen sulphide) in groundwater bores endorses the need for appropriate health and safety measures to be adopted during monitoring, as is the case for the landfill gas extraction wells. No smoking should be permitted when personnel undertake groundwater sampling and when in the vicinity of the groundwater monitoring wells, or in fact anywhere else on the Levin Landfill site. For sake of safety a personal gas detector should be worn by all staff when working at the landfill site.

1 Introduction

Horowhenua District Council (HDC) first commissioned Stantec New Zealand (then Montgomery Watson) to carry out environmental reporting for the discharge consent monitoring undertaken at the Levin Landfill site in the early 2000s. Monitoring has been undertaken by contractors every three months at 33 locations, as required by the resource consent conditions (namely for discharge permit ATH-2002003983.02). These sampling locations consist of 27 boreholes penetrating the sand and gravel aquifers; four surface water sampling locations within Hokio Stream; one surface sampling location along the Tatana Drain, and one leachate sampling point, as shown in the Site Plan in Appendix A.

The Levin Landfill site is comprised of two landfills: one old, closed, and unlined landfill and one new, lined landfill that has been closed pending a decision by HDC to continue operating it. The new landfill footprint has been developed in stages. The most recent stage was Stage 3C which was developed in 2017, though landfill operations have, until the end of October 2021, occurred over the top of Stages 1A, 2 and 3C. The current landfill within this new footprint has reached capacity and has been capped with a permanent clay capping (0.7m thick) on all sides except for under the access road and on the front face of the landfill where there is a temporary capping (0.3m thick). Council has deferred a decision on the future of the landfill and has committed to make that decision before the end of 2025.

The Levin Landfill site is located above two identified aquifers, a shallow sand aquifer and a deeper gravel aquifer. The shallow aquifer is unconfined, has a low to moderate permeability, and flows in a northerly direction. The deeper gravel aquifer is a confined to semi-confined aquifer. Horizons Regional Council hydrology staff advises that '*the general confined groundwater flow direction is towards the west*". Groundwater quality in the area is highly variable because of interaction with peat deposits that are prevalent in the area, localised effects such as from grazing activities, droppings from scavenging birds and from nitrogen-fixing plants such as gorse.

Since July 2010 groundwater has been tested for dissolved metals and nutrients, rather than for total concentrations of these parameters.

A review of the resource consent conditions was finalised in December 2019. Changes have been made to some of the surface water and groundwater monitoring conditions and HDC has acted on all the changes. Sampling since the January 2021 sampling round has been in line with previous monitoring, but different reference parameters have been applied to assess the surface water sampling results, as required by the new consent conditions.

This report presents the results for the January 2023 quarterly monitoring round.

Laboratory detection limits are provided for all test results which are attached in Appendix C.

2 Groundwater and Surface Water Monitoring

2.1 Sample Analyses

Surface water samples were collected by Downer (a contractor to HDC) on 2 November 2022, 6 December 2022, and 12 January 2023 with the samples being received by the Eurofins ELS Ltd laboratory in Lower Hutt, Wellington. The timeframe between sample collection and laboratory reception varied between 26 and 33 hours which is outside the normally accepted range of within 24 hours. The sampling date and time for HS3 in November was not noted on the laboratory report, but it is assumed that sampling was conducted at the same time as other Hokio Stream samples.

Groundwater samples were collected by Downer (a contractor to HDC) on 10, 11, and 12 January 2023, with the samples being received by the Eurofins ELS Ltd laboratory in Lower Hutt, Wellington. Whilst samples were collected within the normally accepted monitoring timeframe of within seven days, the time between collection and laboratory reception varied between 23 and 50 hours which is outside the normally accepted range of within 24 hours. It should be noted that C1 was not sampled this monitoring round.

Borehole water levels were measured on 10 January 2023.

The monitoring schedule for July 2021 - April 2024 is summarised in Appendix B. From July 2019, *E. coli* counts analyses have been included within the indicator and comprehensive analytical suites, as agreed by HDC with the Horizons Regional Council (HRC). This means that *E. coli* counts will be assessed more frequently throughout each year, as compared to the past monitoring regime.

Groundwater samples taken at each of the boreholes (except for C1) and a sample of the leachate effluent were analysed for the indicator list of parameters which is outlined in Table 2-1. Surface water samples from Hokio Stream were analysed for the comprehensive list of parameters (see Table 2-1).

Note that, following the revision of the resource consent conditions which were approved in December 2019, 5-day soluble carbonaceous Biochemical Oxygen Demand ($scBOD_5$) and soluble mercury (Hg) have each been added to the indicator and comprehensive suites of parameters, and *E. coli* added to the comprehensive suite of parameters. The $scBOD_5$ and *E. coli* parameters replace BOD_5 and faecal coliforms, respectively. Monitoring of these additional parameters began with the April 2020 sampling round.

Table 2-1: Test Parameters

Type	Indicator Parameters	Comprehensive Parameters
Physico-chemical characteristics	pH, Electrical Conductivity (EC)	pH, Electrical Conductivity (EC), Alkalinity, Total Hardness, Suspended Solids
Oxygen demand	Chemical Oxygen Demand (COD), $scBOD_5$**	Chemical Oxygen Demand (COD), soluble carbonaceous Biochemical Oxygen Demand ($scBOD_5$**)
Nutrients*	Nitrate nitrogen (NO_3-N), Ammoniacal-nitrogen (NH_4-N)	Nitrate nitrogen (NO_3-N), Ammoniacal-nitrogen (NH_4-N), Dissolved Reactive Phosphorus (DRP), Sulphate (SO_4)
Metals*	Aluminium (Al), Manganese (Mn), Nickel (Ni), Lead (Pb), Mercury (Hg)**	Aluminium (Al), Arsenic (As), Cadmium (Cd), Chromium (Cr), Copper (Cu), Iron (Fe)***, Magnesium (Mg), Manganese (Mn), Nickel (Ni), Lead (Pb), Zinc (Zn), Mercury (Hg)**
Other elements	Boron (B), Chloride (Cl)	Boron (B), Calcium (Ca), Chloride (Cl), Potassium (K), Sodium (Na)***
Biological+	*E. coli*	*E. coli*
Organics	Not required	Total organic carbon, total phenols, volatile acids

Note:

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

** $scBOD_5$ and Soluble Mercury added as per revised consent conditions for Discharge Permit ATH-2002003983.02, December 2019

*** Iron and sodium are tested at certain groundwater bores only.

Those chemical constituents for which concentrations were below laboratory detection limits during the reporting period have had results set at 50% of the laboratory detection limit, which is then used to calculate a median value for annual reporting purposes. This is standard practice when dealing with chemical concentrations in water, where the constituent is not detected.

For *E. coli*, the current laboratory detection limit, viz.,100 CFU/100ml, is not compatible with the standards defined in the consents. The ANZECC LDW is also set at 100 CFU/100ml and the DWSNZ MAV is NIL, thus room for error through unknown values is large. Whilst results below the detection limit have been described as 'not detected' (ND), due to specific results being unknown, these should be considered with caution. This detection limit is unacceptable and should be remedied for future sampling periods.

2.2 Background Groundwater Quality

The background (natural) quality of the groundwater water up-gradient from the landfill site is not subject to any consent conditions. However, for comparison purposes, both the ANZECC LDW trigger values and the DWSNZ guidelines are regularly used to benchmark the quality of water up-gradient from the landfill site.

Groundwater samples were collected from the two background bores situated hydraulically up-gradient from both the new and old landfills to the southeast of the site in January 2023 (bores G1S and G1D, see Site Plan, Appendix A). These two bores were constructed in late 2009 to sample background water quality from the two main hydrogeological units.

The results are presented in Table 2-2.

Bore F3 is also included in the background table as it is near the southern boundary of the landfill site (and further west) and is unlikely to be impacted by landfill activities. A full laboratory report containing analytical results is presented in Appendix C and the historical graphs are presented in Appendix D.

Table 2-2: Background Monitoring Results for January 2023

Determinant	Units	DWSNZ MAV	ANZECC LDW	G1S	G1D	F3
Sampling date				10/01/2023	10/01/2023	10/01/2023
Water level	mbgl	-	-	13.57	14.17	4.3
pH	pH units	7 to 8.5*	6 to 9	**6.5**	**6.8**	7.4
Conductivity	mS/m	-	-	49.3	28.2	26.9
COD	mg/L	-	-	84	*7.5*	*7.5*
$scBOD_5$	mg/L	-	-	*1.5*	*1.5*	*1.5*
E. Coli	CFU/100ml	NIL	100	ND	ND	ND
Chloride	mg/L	250*	-	76.2	32	42.4
Nitrate-N	mg/L	11.3	90.3	0.05	*0.005*	0.72
Ammoniacal-N	mg/L	1.17	-	0.04	0.1	*0.005*
Sodium	mg/L	200*	-	81.8	n/r	27.5
Dissolved Aluminium	mg/L	0.1*	5	**0.12**	*0.001*	*0.001*
Dissolved Boron	mg/L	1.4	5	*0.015*	*0.015*	*0.015*
Dissolved Iron	mg/L	0.2*	-	**2.43**	n/r	*0.005*
Dissolved Lead	mg/L	0.01	0.1	*0.00025*	*0.00025*	*0.00025*
Dissolved Manganese	mg/L	0.4	-	0.068	0.062	*0.00025*
Dissolved Mercury	mg/L	0.007	0.002	*0.00025*	*0.00025*	*0.00025*
Dissolved Nickel	mg/L	0.08	1	0.0017	*0.00025*	*0.00025*

Notes:

*denotes guideline values for aesthetic determinants (G.V.)
All `<' values have been reported as half the detection limit for statistical purposes and are *expressed in italics*
'ND' indicates where *E. coli* were not detected at or above the laboratory detection limit
n/r – not required to be tested during this monitoring period
Values which exceeded the DWSNZ MAV are shown in **bold**

The results in Table 2-2 show that all parameters at bore F3 were within the ANZECC LDW trigger values and DWSNZ limits during the January 2023 monitoring round.

At G1S, the dissolved aluminium (0.12 mg/L) concentration exceeded the DWSNZ limit of 0.1 mg/L, and the dissolved iron (2.43 mg/L) concentration exceeded the DWSNZ limit of 0.2 mg/L – akin to last quarter.

Additionally, the pH at G1S (6.5) and G1D (6.8) were below the lower DWSNZ limit of 7.0. This is the first time since 2015 that pH at G1D has been below 7.0.

2.3 Groundwater Quality Hydraulically Down-Gradient of the New Landfill

Monitoring is carried out within the two main hydrogeological units for bores hydraulically up-gradient of the old landfill and hydraulically down-gradient of the new landfill.

2.3.1 Shallow Aquifer

Bores D1, D2, D3rs, D4, D5, D6, and E1S (Refer to Site Plan, Appendix A) are located hydraulically up-gradient of the old landfill, but down-gradient of the new landfill. This means they are not influenced by potential leaching from the old landfill and can act as a warning system for any leaching from the new landfill.

Borehole D4 is likely to show evidence of any leaching from the new landfill if such leaching was to occur.

Borehole D5 is located at the south-western corner of the site and is expected to provide an indication of shallow background groundwater quality because it is unlikely to be influenced by either landfill.

It is considered unlikely that leachate from the new landfill would significantly affect groundwater quality due to the leachate collection system which is in place at the new landfill; however, these bores would still provide early warning of any potential problems. It is noted that bore D3r was replaced in June 2021 with two bores; D3rs, which is a shallow bore and D3rd, which is a deep bore. Both have been sampled from October 2021 onwards. It is also noted that new bores D3rs and D3rd are required to be monitored for the comprehensive suite of parameters for the first two years following installation.

The results from the January 2023 monitoring round for these bores are presented in Table 2-3 and the results have been compared with the ANZECC LDW trigger values as per the consent conditions.

The full laboratory report is included in Appendix C and the historical graphs are presented in Appendix D.

All sampling results for *E. coli*, were reported as being below the level of detection (<100 CFU/100ml).

Therefore, there were **no exceedances of the resource consent conditions during the January 2023** monitoring round in samples from the shallow aquifer.

Table 2-3: D-Series and E1S Monitoring Bore Results for January 2023

Determinant	Units	ANZECC LDW	D1	D2	D3rs	D4	D5	D6	E1S
Sampling date			11/01/2023	11/01/2023	11/01/2023	11/01/2023	10/01/2023	11/01/2023	11/01/2023
Water Level	mbgl	-	16.34	20.9	5.11	7.4	8.66	15.94	10.86
pH	pH units	6 to 9	7	6.6	6.6	7	7	6.9	7.1
Suspended Solids	mg/l	-	n/r	n/r	33	n/r	n/r	n/r	n/r
Phenol	mg/l	-	n/r	n/r	*0.025*	n/r	n/r	n/r	n/r
VFA	mg/l	-	n/r	n/r	*2.5*	n/r	n/r	n/r	n/r
TOC	mg/L	-	n/r	n/r	26.4	n/r	n/r	n/r	n/r
Alkalinity	mg $CaCO_3$/L	-	n/r	n/r	69	n/r	n/r	n/r	n/r
Conductivity	mS/m	-	22.7	47.4	20.5	28.5	32	32.7	25.4
COD	mg/L	-	17	49	87	22	*7.5*	18	*7.5*
$scBOD_5$	mg/L	-	*1.5*	*1.5*	*5*	*1.5*	*1.5*	*1.5*	*1.5*
E. coli	CFU/100ml	100	ND	ND	ND	ND	ND	ND	ND
Chloride	mg/L	-	13.7	50.2	16.4	33.5	31.9	13.6	27.6
Nitrate-N	mg/L	90.3	2.89	*0.005*	*0.005*	*0.005*	0.57	9.81	*0.005*
Sulphate	mg/L	1000	n/r	n/r	0.59	n/r	n/r	n/r	n/r
Ammoniacal-N	mg/L	-	*0.005*	0.63	0.65	0.18	0.02	*0.005*	0.16
Hardness	mg $CaCO_3$/L	-	n/r	n/r	46	n/r	n/r	n/r	n/r
Calcium	mg/L	1000	n/r	n/r	10.9	n/r	n/r	n/r	n/r
Magnesium	mg/L	-	n/r	n/r	4.59	n/r	n/r	n/r	n/r
Potassium	mg/L	-	n/r	n/r	4.5	n/r	n/r	n/r	n/r
Sodium	mg/L	-	n/r	32.7	23.5	31.8	n/r	n/r	27.5
D.R. Phosphorus	mg/L	-	n/r	n/r	0.07	n/r	n/r	n/r	n/r
Dissolved Aluminium	mg/L	5	0.004	0.003	0.083	*0.001*	*0.001*	0.003	0.006
Dissolved Arsenic	mg/L	0.5	n/r	n/r	0.001	n/r	n/r	n/r	n/r
Dissolved Boron	mg/L	5	*0.015*	0.04	*0.015*	0.03	*0.015*	0.03	*0.015*
Dissolved Cadmium	mg/L	0.01	n/r	n/r	*0.0001*	n/r	n/r	n/r	n/r
Dissolved Chromium (VI)	mg/L	1	n/r	n/r	0.004	n/r	n/r	n/r	n/r
Dissolved Copper	mg/L	0.4	n/r	n/r	*0.00025*	n/r	n/r	n/r	n/r
Dissolved Iron	mg/L	-	n/r	2.07	16.4	0.74	n/r	n/r	4.3

Determinant	Units	ANZECC LDW	D1	D2	D3rs	D4	D5	D6	E1S
Dissolved Lead	mg/L	0.1	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	0.0018
Dissolved Manganese	mg/L	-	*0.00025*	0.41	0.36	0.18	0.15	0.001	0.21
Dissolved Mercury	mg/L	0.002	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*
Dissolved Nickel	mg/L	1	*0.00025*	*0.00025*	0.0007	*0.00025*	*0.00025*	*0.00025*	*0.00025*
Dissolved Zinc	mg/L	20	n/r	n/r	*0.001*	n/r	n/r	n/r	n/r

Notes:

Results for bore D3rs were not available at the time of writing.

Bold – denotes an exceedance of the ANZECC LDW

Underlined – denotes exceedance of the Consent Trigger Value.

'ND' indicates where *E. coli* were not detected at or above the laboratory detection limit

All `<' values have been reported as half the detection limit for statistical purposes and are expressed in italics

n/r – not required to be tested during this monitoring period

2.3.2 Deep Gravel Aquifer

Bores E1D, C2DD, E2D, Xd1, and the new replacement bore D3rd all penetrate the deeper gravel aquifer. Deep groundwater flow is assumed to be towards the northwest.

Boreholes E2D and C2DD are located to the north-northwest of both the landfills and are therefore considered to be hydraulically down-gradient of both landfills.

Borehole E1D is located to the southwest of the old landfill and it is therefore considered that this bore would be unlikely to be affected by either landfill.

Bore Xd1 was installed in late 2020 as a requirement of the reviewed resource consent conditions (December 2019). It is located on the western boundary of the site and slightly downstream of the old landfill.

Results for the January 2023 compliance monitoring round are presented in Table 2-4. The results have been compared with the DWSNZ as per the requirements of discharge consent ATH-2002003983.02. The full laboratory report is included in Appendix C and the historical graphs are presented in Appendix D.

There were **four exceedances of the DWSNZ limits** in samples from the deep gravel aquifer during the January 2023 monitoring round, as follows:

- The dissolved manganese concentrations in bores C2DD (0.64 mg/L), Xd1 (0.52 mg/L) and D3rd (0.45 mg/L) exceeded the DWSNZ MAV of 0.4 mg/L. The results for C2DD (from 1997), Xd1 (from March 2021 when sampling started) and D3rd (from October 2021 when sampling started) are within the historical range of concentrations observed. Dissolved manganese is generally elevated in the deep aquifer bores.
- Dissolved arsenic exceeded the DWSNZ MAV of 0.01 mg/L at bore D3rd (0.018 mg/L). This is characteristic of D3rd.

Table 2-4: Results for Monitoring Bores within the Deep Aquifer for January 2023

Determinant	Units	DWSNZ MAV	E1D	C2DD	E2D	Xd1	D3rd
Sampling date			11/01/23	11/01/23	11/01/23	12/01/23	11/01/23
Water Level	mbgl	-	10.75	2.6	5.22	2.34	5.74
pH	pH units	7 to 8.5*	7.8	7.9	7.7	7.8	7.7
Suspended Solids	mg/l	-	n/r	n/r	n/r	n/r	105
Phenol	mg/l	-	n/r	n/r	n/r	n/r	*0.025*
VFA	mg/l	-	n/r	n/r	n/r	n/r	*2.5*
TOC	mg/L	-	n/r	n/r	n/r	n/r	5.5
Alkalinity	mg $CaCO_3$/L	-	n/r	n/r	n/r	n/r	216
Conductivity	mS/m	-	44.6	57.4	34.8	53.6	51.9
COD	mg/L	-	16	33	26	16	25
$scBOD_5$	mg/L	-	*1.5*	*1.5*	*1.5*	*3*	*3*
E. coli	CFU/100ml	NIL	ND	ND	ND	ND	ND
Chloride	mg/L	250*	38.7	42.1	42.4	57.1	31.2
Nitrate-N	mg/L	11.3	0.01	*0.005*	*0.005*	*0.005*	*0.005*
Sulphate	mg/L	250*	n/r	n/r	n/r	n/r	*0.01*
Ammoniacal-N	mg/L	1.17	0.18	0.3	0.31	0.29	0.38
Hardness	mg $CaCO_3$/L	200*	n/r	n/r	n/r	n/r	198
Calcium	mg/L	-	n/r	n/r	n/r	n/r	59.1
Magnesium	mg/L	-	n/r	n/r	n/r	n/r	12.2
Potassium	mg/L	-	n/r	n/r	n/r	n/r	6.8
Sodium	mg/L	200*	35.3	n/r	n/r	n/r	20.4
D.R. Phosphorus	mg/L	-	n/r	n/r	n/r	n/r	1.23
Dissolved Aluminium	mg/L	0.1*	*0.001*	0.01	*0.001*	*0.001*	0.005
Dissolved Arsenic	mg/L	0.01	n/r	n/r	n/r	n/r	**0.018**
Dissolved Boron	mg/L	1.4	0.04	0.05	*0.015*	0.05	0.03
Dissolved Cadmium	mg/L	0.004	n/r	n/r	n/r	n/r	*0.0001*
Dissolved Chromium (VI)	mg/L	0.05	n/r	n/r	n/r	n/r	*0.0005*
Dissolved Copper	mg/L	2	n/r	n/r	n/r	n/r	*0.00025*
Dissolved Iron	mg/L	0.2*	0.09	n/r	n/r	n/r	0.029
Dissolved Lead	mg/L	0.01	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*
Dissolved Manganese	mg/L	0.4	0.24	**0.64**	0.26	**0.52**	**0.45**
Dissolved Mercury	mg/L	-	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*
Dissolved Nickel	mg/L	0.08	*0.00025*	0.0005	*0.00025*	*0.00025*	*0.00025*
Dissolved Zinc	mg/L	1.5*	n/r	n/r	n/r	n/r	*0.001*

Notes:

Bold – denotes an exceedance of the DWSNZ MAV

Underlined – denotes exceedance of the Consent Trigger Value.

'ND' indicates where *E. coli* were not detected at or above the laboratory detection limit

All `<' values have been reported as half the detection limit for statistical purposes and are expressed in italics

n/r – not required to be tested during this monitoring period

2.4 Impact of Old Landfill on Groundwater Quality

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

The Series B boreholes are located within 50m of the old landfill in a line along its northern edge.

The Series C boreholes are located further down the hydraulic gradient from the old landfill towards Hokio Beach Road to detect whether leachate is moving off site.

Borehole C1 was not sampled during the January sampling round because it was reported to be swamped by surface water when sampling was scheduled. It is not known if this situation continued for the entire sampling period. This represents a non-compliance.

Borehole E2S is located northwest of the old landfill to detect any leachate moving directly towards the nearest house down-stream of the site.

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

Bores Xs1 and Xs2 are located along Hokio Beach Road, within the road reserve. Bore Xs1 is adjacent to Tatana's property and bore Xs2 is next to the driveway leading to a Council-owned property. Bore Xs2 is hydraulically upgradient of the old landfill (See Site Plan, Appendix A).

The results from the January 2023 consent monitoring round for these bores are presented in Table 2-5 and have been compared with the ANZECC LDW trigger values as per the requirements of discharge consent ATH-2002003983.02. The full laboratory report is included in Appendix C and the historical graphs are presented in Appendix D.

There were **three exceedances of the ANZECC LDW trigger values** during the January 2023 monitoring round, as follows:

- The *E. coli* count exceeded the ANZECC LDW trigger value of 100 CFU/100ml at bores B1 (26,000 CFU/100ml), B2 (6,000 CFU/100ml), and C2 (1,400 CFU/100ml). Thus, bores B1, B2, and C2 were non-compliant. Bore B1 has exceeded on one other occasion in the last two years, whilst this is the fourth exceedance for B2 and C2. Whilst not an exceedance, bore B3s presented a value of 100 CFU/100ml – at the trigger threshold.

Table 2-5: Monitoring Results for Shallow Boreholes Down-Gradient from the Old Landfill for January 2023

Determinant	Units	ANZECC LDW	E2S	B1	B2	B3s	C1	C2	C2DS	G2S	Xs1	Xs2
Sampling date			11/01/2023	12/01/2023	12/01/2023	12/01/2023	Not Sampled	12/01/2023	12/01/2023	10/01/2023	12/01/2023	13/01/2023
Water level	mbgl	-	4.3	0.8	0.95	0.05	n/p	0.4	2.66	2.13	0.4	2.41
pH	pH units	6 to 9	7.4	7.3	7.3	7.8	n/p	7.7	8	6.4	7.1	7.8
Conductivity	mS/m	-	43.8	224	163	182	n/p	284	103	215	141	18.8
COD	mg/L	-	44	131	84	208	n/p	63	42	95	81	*7.5*
scBOD5	mg/L	-	*1.5*	*3*	*3*	*3*	n/p	*3*	*3*	*1.5*	*3*	*3*
E-Coli	CFU/100ml	100	ND	**26,000**	**6,000**	100	n/p	**1,400**	ND	ND	ND	ND
Chloride	mg/L	-	41.2	397	88.3	105	n/p	207	74.1	585	119	19.4
Nitrate-N	mg/L	90.3	0.07	21.5	36.2	0.39	n/p	*0.05*	*0.05*	*0.005*	*0.05*	1.64
Ammoniacal-N	mg/L	-	0.2	4.33	57.4	72.7	n/p	170	1.27	0.04	12.4	0.01
Sodium	mg/L	-	41.3	n/r	n/r	n/r	n/p	n/r	n/r	n/r	n/r	n/r
Dissolved Aluminium	mg/L	5	0.004	0.02	0.065	0.003	n/p	0.018	*0.001*	0.004	0.003	0.006
Dissolved Boron	mg/L	5	0.06	1.55	2.16	0.74	n/p	2.09	0.65	0.4	0.57	0.04
Dissolved Iron	mg/L	-	0.06	n/r	n/r	n/r	n/p	n/r	n/r	n/r	n/r	n/r
Dissolved Lead	mg/L	0.1	0.0051	*0.00025*	0.0012	*0.00025*	n/p	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*
Dissolved Manganese	mg/L	-	0.36	5.24	1.63	2.85	n/p	0.22	1.62	0.33	1.47	0.06
Dissolved Mercury	mg/L	0.002	*0.00025*	*0.00025*	*0.00025*	*0.00025*	n/p	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*
Dissolved Nickel	mg/L	1	0.0006	0.0044	0.0025	0.0066	n/p	0.0054	0.0019	0.0012	0.0024	*0.00025*

Notes:

All `<' values represent a non-detection and have been reported as half the detection limit for statistical purposes and are expressed in italics

'ND' indicates where *E. coli* were not detected at or above the laboratory detection limit

n/r – not required to be tested during this monitoring period

n/p – result not provided at the time of preparing this report

Bold - denotes exceedance of ANZECC LDW

2.5 Groundwater Quality Down-Gradient of the Irrigation Area

The F-series boreholes intersect the shallow aquifer down-gradient of the area that was used to irrigate leachate from 2004 to October 2008. All leachate is now pumped to the Levin Wastewater Treatment Plant. The F1 borehole is located within the area where leachate from the new landfill was irrigated. The F2 and F3 boreholes are in an area that was set aside for leachate irrigation but was never used for that purpose. It is expected that bores F2 and F3 would therefore be representative of background groundwater quality.

The results from the F series boreholes are presented in Table 2-6 and have been compared with the ANZECC LDW trigger values, as per discharge consent ATH-2002003983.02. The full laboratory report is included in Appendix C and the historical graphs are presented in Appendix D.

There were **no exceedances of the resource consent conditions** in samples from these bores during the January 2023 monitoring round.

Table 2-6: Results from Monitoring Bores in the Irrigation Area for January 2023

Determinant	Units	ANZECC LDW	F1	F2	F3
Sampling Date			10/01/2023	10/01/2023	10/01/2023
Water Level	mbgl	-	707	1.8	4.3
pH	pH units	6 to 9	7	6.9	7.4
Conductivity	mS/m	-	40.1	22.2	26.9
COD	mg/L	-	24	*7.5*	*7.5*
scBOD5	mg/L	-	*1.5*	*1.5*	*1.5*
E-Coli	CFU/100ml	100	ND	ND	ND
Chloride	mg/L	-	38	24.1	42.4
Nitrate-N	mg/L	90.3	0.57	0.34	0.72
Ammoniacal-N	mg/L	-	*0.005*	*0.005*	*0.005*
Sodium	mg/L	-	n/r	n/r	27.5
Dissolved Aluminium	mg/L	5	0.002	*0.001*	*0.001*
Dissolved Boron	mg/L	5	*0.015*	*0.015*	*0.015*
Dissolved Iron	mg/L	-	n/r	n/r	*0.005*
Dissolved Lead	mg/L	0.1	*0.00025*	*0.00025*	*0.00025*
Dissolved Manganese	mg/L	-	0.0038	0.01	*0.00025*
Dissolved Mercury	mg/L	0.002	*0.00025*	*0.00025*	*0.00025*
Dissolved Nickel	mg/L	1	0.0007	*0.00025*	*0.00025*

Notes:

All `<' values have been reported as half the detection limit for statistical purposes and are *expressed in italics*

'ND' indicates where *E. coli* were not detected at or above the laboratory detection limit

n/r – not required to be tested during this monitoring period

2.6 Leachate Effluent Results

Leachate effluent from the landfill is not subject to any water quality consent conditions and is sent to the Levin Wastewater Treatment Plant for treatment. However, for comparison purposes, typical leachate characteristics for landfills, as published by the Waste Management Institute New Zealand (*Technical Guidelines for Disposal to Land*, October 2022, WasteMINZ), have been compared against the leachate quality monitoring results (Table 2-9). The full laboratory report is included in Appendix C and the historical graphs are presented in Appendix D

As stated, typical leachate concentrations are derived from tables presented in the WasteMINZ *Technical Guidelines*. The data in those tables originate from seven landfills in New Zealand and date back to between 1998 and 1999. In future, more updated data should be sought for comparison purposes.

Table 2-7 shows that the concentrations of monitored parameters for leachate effluent samples collected in January 2023 were mostly within the typical ranges to be expected for this type of landfill.

Up until April 2022, samples of leachate were tested monthly for the comprehensive suite of parameters, as stated in Table C under condition 3H of discharge permit ATH-2002003983.02. This requirement was for 2 years and condition 3P of discharge permit ATH-2002003983.02 allows the monitoring frequency to shift to a conditional sampling frequency (i.e., six monthly comprehensive, quarterly indicator) if water sample analysis results are consistent and there is no decline in water quality over a period of at least four consecutive sampling rounds. The quality of leachate is considered to have met these criteria and so the change in monitoring from April 2022 was justified. The resource consent conditions allowed this change to occur immediately after the four consecutive sampling rounds were completed.

There were **two outliers from the typical leachate characteristics in the January 2023 results,** with elevated ammoniacal-N, and a dissolved mercury that was not detected and therefore less than the minimum typical value.

The results reported here are generally consistent with those previously reported for leachate monitoring.

Table 2-7: Results from Leachate Effluent Monitoring for January 2023

Determinant	Units	Typical Leachate Characteristics* (range)	January 2023 Result
pH		5.9 - 8.5	7.9
Suspended Solids	mg/l	-	n/r
Phenol	mg/L	-	n/r
VFA	mg/L	-	n/r
TOC	mg/L	-	n/r
Alkalinity	mg $CaCO_3$/L	-	n/r
Conductivity	mS/m	264 – 27,900	1,760
COD	mg/L	84 – 5,090	3,440
$scBOD_5$	mg/L	-	116
E-Coli	CFU/100mL	-	ND
Chloride	mg/L	45 – 2,584	1,300
Nitrate-N	mg/L	-	*0.5*
Sulphate	mg/L	-	n/r
Ammonia-N	mg/L	3.4 – 1,440	**1,620**
Hardness	mg $CaCO_3$/L	-	n/r
Calcium	mg/L	-	n/r
Magnesium	mg/L	-	n/r
Potassium	mg/L	-	n/r
Sodium	mg/L	50 – 4,000**	n/r
D.R. Phosphorus	mg/L	-	n/r
Dissolved Aluminium	mg/L	-	0.856
Dissolved Arsenic	mg/L	-	n/r
Dissolved Boron	mg/L	0.54 – 20.1	6.52
Dissolved Cadmium	mg/L	-	n/r
Dissolved Chromium	mg/L	-	n/r
Dissolved Copper	mg/L	-	n/r
Dissolved Iron	mg/L	1.6 – 220	n/r
Dissolved Lead	mg/L	0.001 - 0.42	*0.0025*
Dissolved Manganese	mg/L	0.03 - 45***	1.17
Dissolved Mercury	mg/L	0.2 – 50	***0.00025***

Determinant	Units	Typical Leachate Characteristics* (range)	January 2023 Result
Dissolved Nickel	mg/L	0.02 – 2.05**	0.119
Dissolved Zinc	mg/L	-	n/r

Notes:

* for Class 1-type landfills, Table 5-5, p60, Technical Guidelines for Disposal to Land, WasteMINZ October 2022 (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, p59 of the same guideline, for parameters for which no differences in concentrations between the phases of landfill development could be observed

***Data taken from Table 5-4, p59 of the same guideline, for parameters during the methanogenic phase

Bold – denotes a deviation from the typical leachate characteristics range

All `<' values have been reported as half the detection limit for statistical purposes and are expressed in italics

'ND' indicates where *E. coli* and other parameters were not detected at or above the laboratory detection limit

n/r – not required to be tested during this monitoring period

2.7 Tatana Property Drain

A drain is located on the Tatana property (see Site Plan in Appendix A). Since July 2015 HDC has agreed to sample surface water from this drain for a selection of parameters that were set by HRC. Four sampling points were selected to represent the top of the drain (SW1), middle of the drain (SW2 and SW3) and lower drain (SW4) respectively.

The revised consent conditions have since reduced the extent of sampling to a single location. This is known as 'TD1' and is the same sampling location as for the previously denoted 'SW3'.

Results from the November 2022, December 2022 and January 2023 sampling rounds are presented in Table 2-8 and have been compared with the ANZECC[3] 95%ile DGVs, as per the revised resource consent conditions.

There have been **five exceedances of the resource consent conditions** for three monitored parameters in samples from the Tatana Drain property at the TD1 location during the November 2022, December 2022, and January 2023 sampling rounds.

scBOD5 exceeded the ANZECC (95%ile) DGV of 2 mg/L in January 2023 with a concentration of 51 mg/L. This is the highest concentration recorded since sampling began – the second highest being 41 mg/L in January 2018.

The concentration of Nitrate-N in November 2022 (0.7 mg/L) and January 2023 (0.53 mg/L) exceeded the ANZECC (95%ile) DGV of 0.16 mg/L. This site has exceeded for Nitrate-N upon every sample collection since June 2022.

The concentration of Ammoniacal-N in November 2022 (10.7 mg/L) and January 2023 (12.9 mg/L) exceeded the ANZECC (95%ile) DGV of 2.1 mg/L.

Whilst relatively high, these results are not uncharacteristic of results within the last two years. Localised conditions, such as having stock in the paddock next to Tatana Drain and the slow flow of water in the drain, may contribute to some of the elevated parameters.

Table 2-8 Tatana Drain Monitoring Results for November 2022, December 2022, and January 2023.

Determinant	Units	ANZECC DGV (95%ile species protection)	TD1 (formerly SW3)		
			November	December	January
Sampling date			02/11/2022	06/12/2022	12/01/23
pH	pH units	-	7.7	7	6.7
Suspended Solids	mg/L	-	69	90	5230
Phenol	mg/L	-	*0.025*	*0.025*	*0.025*
VFA	mg/L	-	*2.5*	*2.5*	*2.5*
TOC	mg/L	-	30.6	31.5	175

[3]Australian and New Zealand Guidelines for Fresh and Marine Water Quality - Aquatic Ecosystems (AE), Australian and New Zealand Environment and Conservation Council (ANZECC), Canberra, Australia, 2000

Determinant	Units	ANZECC DGV (95%ile species protection)	TD1 (formerly SW3)		
			November	December	January
Alkalinity	mg $CaCO_3$/L	-	389	85	630
Conductivity	mS/m	-	110	29.8	150
COD	mg/L	-	121	260	2840
scBOD5	mg/L	2	*1.5*	*1.5*	**51**
E-Coli	CFU/100ml	-	1,000	200	200
Chloride	mg/L	-	101	36.5	100
Nitrate-N	mg/L	0.16	**0.7**	*0.005*	**0.53**
Sulphate	mg/L	-	1.93	6.42	1.2
Ammoniacal-N	mg/L	2.1	**10.7**	0.03	**12.9**
Hardness	mg $CaCO_3$/L	-	317	73	334
Calcium	mg/L	-	68.4	16.6	74.6
Magnesium	mg/L	-	35.4	7.63	35.7
Potassium	mg/L	-	32.5	2.66	29.3
Sodium	mg/L	-	90.1	32.3	82.4
D.R. Phosphorus	mg/L	-	0.028	0.028	0.03
Dissolved Aluminium	mg/L	0.055	0.016	0.01	0.004
Dissolved Arsenic	mg/L	0.024	0.001	*0.0005*	0.001
Dissolved Boron	mg/L	-	0.57	0.05	0.39
Dissolved Cadmium	mg/L	0.0002	*0.0001*	*0.0001*	*0.0001*
Dissolved Chromium	mg/L	-	0.002	*0.0005*	0.001
Dissolved Copper	mg/L	0.0014	0.0008	*0.00025*	*0.00025*
Dissolved Iron	mg/L	-	0.17	0.155	0.617
Dissolved Lead	mg/L	0.0034	*0.00025*	*0.00025*	*0.00025*
Dissolved Manganese	mg/L	1.9	0.999	0.0589	0.816
Dissolved Mercury	mg/L	0.0006	*0.00025*	*0.00025*	*0.00025*
Dissolved Nickel	mg/L	0.011	0.0028	*0.00025*	0.0021
Dissolved Zinc	mg/L	0.008	0.005	*0.001*	*0.001*

Notes:
Bold – denotes an exceedance of the ANZECC DGV for 95%ile species protection
All `<' values have been reported as half the detection limit for statistical purposes and are expressed in italics

2.8 Hokio Stream

Surface water grab samples are obtained monthly from Hokio Stream at sites HS1A, HS1, HS2 and HS3 (refer to Appendix A) to investigate whether groundwater containing leachate is having an adverse environmental effect on the 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. Samples from these monitoring locations on Hokio Stream are analysed for a comprehensive suite of parameters every month (as shown in Appendix B).

Results from the November 2022, December 2022 and January 2023 monitoring rounds are presented in Table 2-9 and have been compared with the ANZECC AE 95%ile DGVs, as per the revised resource consent conditions (2019).

Monitoring for $scBOD_5$ and soluble mercury concentrations has now been added as per the revised Resource Consent conditions.

There were **eleven exceedances** of the resource consent conditions in samples from the Hokio Stream during the November and December 2022 sampling rounds. At the time of writing, results for January 2023 have not been received.

The exceedances are summarised as follows:

- $scBOD_5$ exceeded the ANZECC (95%ile) DGV of 2 mg/L at HS1A (6 mg/L) in December 2022. Excluding previous monitoring periods where the laboratory detection limit was inappropriately set at 6 mg/L, this is the highest value on record for HS1A.
- In November 2022, the Nitrate-N concentrations exceeded the ANZECC (95%ile) DGV of 0.16 mg/L at all sampling locations. These results are less than that of the previous quarter, and in reference to historical records, Nitrate-N exceedances are not unusual.
- Ammoniacal-N at HS2 did not exceed the ANZECC (95%ile) DGV of 2.1 mg/L but did exceed the consent average trigger value of 0.4 mg/L in November 2022 (1.37 mg/L) and January 2023 (1.38 mg/L).
- In December 2022, the dissolved copper concentrations exceeded the ANZECC (95%ile) DGV of 0.0014 mg/L at HS1A (0.0026 mg/L) and HS1 (0.002 mg/L). However, these exceedances are not uncharacteristic given historical data which shows copper frequently exceeding 0.0014 mg/L for all surface water sampling locations since 1994.
- In January 2023 however, dissolved copper presented a high exceedance of 0.01 mg/L for HS3. Whilst not the largest exceedance since sampling began (0.3 mg/L in October 2008), this is one of the highest.
- In December 2022, the concentration of dissolved zinc exceeded the ANZECC (95%ile) DGV of 0.008 mg/L at HS1 (0.729 mg/L). Whilst this site has exceeded on occasion in the past, this is the highest concentration recorded since sampling began – the second highest being 0.08 mg/L in April 2008.

Overall, the differences in monitoring results between the sites are generally marginal and for most determinants there is little to no change in concentrations between upstream and downstream sites on the Hokio Stream. $scBOD_5$, dissolved copper and dissolved zinc provided exceptions to this trend – with some results greater upstream than downstream. Monitoring for dissolved zinc should continue in future to assess whether the exceedance is anomalous. *E. coli* counts differ significantly between sites and sampling rounds. However, the *E. coli* counts noted in this report are within the historical range since sampling began in 1994.

Table 2-9: Hokio Stream Monitoring Results for November 2022, December 2022 and January 2023.

Determinant	Units	ANZECC DGV (95%ile species protection)	Consent Trigger Values (Table C1)	HS1A (from April 2020)	HS1	HS2	HS3	HS1A (from April 2020)	HS1	HS2	HS3	HS1A (from April 2020)	HS1	HS2	HS3
				November				December				January			
Sampling date				02/11/22	02/11/22	02/11/22	02/11/22	06/12/22	06/12/22	06/12/22	06/12/22	12/01/23	12/01/23	12/01/23	12/01/23
pH	pH units	-	-	7.4	7.5	7.6	7.5	7.5	7.5	7.6	7.4	7.1	7.3	7.2	7.2
Suspended Solids	mg/l	-	-	112	28	45	23	9	18	18	88	125	20	63	28
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*	*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*	*2.5*
TOC	mg/L	-	-	6	6.1	8.2	6.7	7	7	7	7	9.1	7.5	14	8
Alkalinity	mg $CaCO_3$/L	-	-	59	60	79	63	55	58	60	61	56	62	119	63
Conductivity	mS/m	-	-	25.1	25.3	30	26.2	23.4	23.8	24.2	24.8	25.4	25.7	40.6	27.3
COD	mg/L	-	-	*7.5*	21	41	20	29	40	28	28	48	36	59	28
$scBOD_5$	mg/L	2	Monthly Avg. 2	*1.5*	*1.5*	*1.5*	*1.5*	**6**	*1.5*	*1.5*	*1.5*	ND	ND	ND	ND
E. coli	CFU/100 ml	-	-	ND	ND	ND	32	200	500	200	500	200	300	100	800
Chloride	mg/L	-	-	22.8	23	32.5	24	22.9	26.6	24.9	24.5	24.7	25.4	34.8	27.1
Nitrate-N	mg/L	0.16	0.16	**0.94**	**0.93**	**0.83**	**0.93**	0.05	*0.005*	0.08	0.1	0.11	0.08	0.17	0.14
Sulphate	mg/L	-	-	21.9	21.7	18.4	21.3	21.8	22.8	22.3	21.1	20.3	20.5	17.4	19.8
Ammoniacal-N	mg/L	2.1	Max. 2.1 Avg. 0.400	0.16	0.17	1.37	0.24	0.09	0.02	0.17	0.18	0.18	0.23	1.38	0.29
Hardness	mg $CaCO_3$/L	-	-	69	71	96	73	65	65	70	69	69	69	88	75
Calcium	mg/L	-	-	15	15.4	20.6	15.8	13.7	13.6	14.7	15	14.6	14.8	19.4	16.1
Magnesium	mg/L	-	-	7.74	8	10.8	8.04	7.54	7.43	8.01	7.79	7.88	7.88	9.52	8.4
Potassium	mg/L	-	-	3.29	3.38	6.46	3.53	2.89	4.84	3.17	3.09	2.97	3.13	6.51	4.15
Sodium	mg/L	-	-	20.3	21.1	27.7	21.3	20.4	20.7	21.2	21.6	22.2	22.3	25.4	24.5
D.R. Phosphorus	mg/L	-	-	0.036	0.037	0.034	0.037	0.037	0.008	0.043	0.046	0.061	0.071	0.052	0.069
Dissolved Aluminium	mg/L	0.055	Med. 0.055	0.014	0.027	0.017	0.019	0.013	0.016	0.012	0.012	0.044	0.029	0.025	0.023

Determinant	Units	ANZECC DGV (95%ile species protection)	Consent Trigger Values (Table C1)	HS1A (from April 2020)	HS1	HS2	HS3	HS1A (from April 2020)	HS1	HS2	HS3	HS1A (from April 2020)	HS1	HS2	HS3
				November				December				January			
Dissolved Arsenic	mg/L	0.024	Med. 0.024	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*	0.001
Dissolved Boron	mg/L	0.370	-	0.07	0.07	0.12	0.07	0.07	0.07	0.07	0.07	0.05	0.05	0.09	0.06
Dissolved Cadmium	mg/L	0.0002	Med. 0.0002	*0.0001*	*0.0001*	*0.0001*	*0.0001*	*0.0001*	*0.0001*	*0.0001*	*0.0001*	*0.0001*	*0.0001*	*0.0001*	*0.0001*
Dissolved Chromium (VI)	mg/L	0.001	-	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*
Dissolved Copper	mg/L	0.0014	Med. 0.0014	0.0013	0.0013	0.001	0.0012	**0.0026**	**0.002**	0.0014	0.0012	0.0012	0.0012	0.0009	**0.01**
Dissolved Iron	mg/L	-	-	0.039	0.076	0.099	0.066	0.093	0.131	0.105	0.114	0.153	0.091	0.183	0.129
Dissolved Lead	mg/L	0.0034	Med. 0.0034	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*
Dissolved Manganese	mg/L	1.9	-	0.0158	0.0155	0.0825	0.0242	0.0361	0.0409	0.039	0.04	0.016	0.0375	0.0755	0.052
Dissolved Mercury	mg/L	0.0006	Med. 0.0006	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*
Dissolved Nickel	mg/L	0.011	Med. 0.011	*0.00025*	0.0005	0.0006	*0.00025*	0.0009	0.0005	*0.00025*	*0.00025*	*0.00025*	*0.00025*	0.0008	0.001
Dissolved Zinc	mg/L	0.008	Med. 0.008	*0.001*	*0.001*	*0.001*	*0.001*	0.007	**0.729**	*0.001*	*0.001*	*0.001*	0.004	*0.001*	*0.001*

Notes:

The November sampling date for HS3 was not noted on the laboratory report, but is assumed to be the same as HS1A, HS1 and HS2.

Bold – denotes an exceedance of the ANZECC AE 95% protection level trigger values

Underlined – denotes exceedance of the Consent Trigger Value.

All `<' values have been reported as half the detection limit for statistical purposes and are expressed in italics

n/p – result not provided at the time of preparing this report

3 Landfill Gas Detection in Monitoring Wells

Condition 4 of Discharge Permit ATH-2002003984.02 requires that: "…*groundwater monitoring wells shall be sampled for landfill gas when groundwater samples are taken from the wells. As a minimum, sampling shall be undertaken for methane, carbon dioxide and oxygen…*"

In the past, landfill gas monitoring results were only reported in the Annual Report. A recommendation of the 2019 - 2020 Annual Report was that these results should be included in every quarterly monitoring report so that if any results are unusually high, appropriate action can be promptly undertaken, including putting safeguards in place at the monitoring bores.

Appendix E summarises the results of landfill gas monitoring undertaken on 9 January 2023. C1 is assumed unsampled, given water sampling was not conducted for this bore.

Out of the 27 groundwater monitoring bores:

- Methane was detected in seven of the bores. The highest recorded level was 0.06% in bore Xd1, with the other bores ranging from 0.01 – 0.03%. Whilst the concentrations are less than last quarter's percentages, this is also well below the lower explosive limit of 5% and is therefore deemed to represent a 'safe' level. However, the detection of methane reinforces the need for the necessary precautions generally applicable at landfill sites to be taken when conducting sampling.
- Landfill bore B2 showed a high carbon dioxide level of 7.01% - considerably greater than last quarter's 1.48%. This bore has demonstrated such fluctuations historically. However, this result is much higher than most boreholes – the next highest being 0.45%. This quarter's result for B2 appears to invalidate the recent decreasing trend of carbon dioxide at this borehole.
- Hydrogen sulphide was detected at five bores at a concentration of 1ppm (D3rs, D1, G1d, G2s and Xs2), which is around the threshold at which a 'rotten egg' smell (commonly associated with H_2S) can be detected. Hydrogen sulphide was only detected at one bore last quarter.
- The landfill gas levels in January 2023 appear to be slightly variable compared to the previous quarter and reinforce the importance of continuing to monitor these changes and map any patterns. The results may be due to seasonal variations (e.g., different ground temperatures and/or groundwater levels), or may be related to prevailing weather conditions (e.g., different air pressures).

The possibility of encountering methane (and possible hydrogen sulphide) in groundwater bores endorses the need for appropriate health and safety measures to be adopted during monitoring, as is the case for the landfill gas extraction wells. No smoking should be permitted when personnel undertake groundwater sampling and when in the vicinity of the groundwater monitoring wells, or in fact anywhere else on the Levin Landfill site. For sake of safety a personal gas detector should be worn by all staff when working in the vicinity of the landfill.

4 Discussion

4.1 Sampling Quality Control and Assurance

The landfill extends over a significant area and there are many sampling locations. However, it is important that the time span of the sampling period is kept as short as possible because more infrequent (or erratic) sampling can make it difficult to compare results between rounds and determine trends at individual monitoring locations.

Whilst the surface water and groundwater samples were collected within a 7-day period, most of the samples were received by the laboratory outside the normally accepted 24-hour timeframe between sampling and reception. Meeting the monitoring timeframe is important because it means that there can be greater confidence in reliability of results, and comparisons with historical data.

The level of detection used in the laboratory for testing *E. coli* was set at 100 CFU/100ml for all samples except HS3 in November 2022 (4 CFU/100ml). 100 CFU/100ml as the level of detection is not conducive to assessing compliance with the resource consent conditions, as the ANZECC LDW is also set at 100 CFU/100ml and the DWSNZ MAV is 'NIL'. It is recommended that the laboratory method be reviewed and corrected for future analyses. Checks should be undertaken by the sampling personnel before submitting samples for analysis, including on the Chain of Custody documentation, to ensure that the correct tests are requested and performed, with appropriate limits of detection.

4.2 Background Groundwater Quality

The quality of the natural background groundwater up-gradient from the landfill site is not subject to any consent conditions.

Results since 2010 for the background bores indicate that low pH values (i.e., typically between 6.0 and 6.8) are representative of background water quality in the shallow sand aquifer (G1S). However, the pH level for the January 2023 sampling round was 6.5 which is below the lower limit of the DWSNZ MAV for aesthetic determinants (7.0 pH units). As usual the deeper gravel aquifer (G1D) had a slightly higher pH of 6.8.

Dissolved iron concentrations have fluctuated considerably at both the G1S and G1D bores since monitoring of those bores began in 2010 and are mostly above the DWSNZ GV for aesthetic determinants (0.2 mg/L). During the January 2023 sampling round, the iron concentration at G1S was 2.43 mg/L – an exceedance of the DWSNZ GV but still within the historical results range recorded at this bore. Analysis of dissolved iron was not required for bore G1D during this sampling round. Elevated iron concentrations in groundwater are likely to be related to hydrogeological conditions found at the site and this phenomenon is common in groundwater in this area.

During the January 2023 sampling round, the dissolved aluminium concentration at G1S (0.12 mg/L) exceeded the DWSNZ MAV limit of 0.1 mg/L but was within the range observed at this location historically.

The monitoring results suggest that the quality of background groundwater may be being impacted by local ground conditions and/or activities up-gradient of the landfill. Background bore G1S consistently records elevated concentrations of a range of parameters which indicates that it is likely modified or impacted by anthropogenic activities, and therefore may not be suitable to use as reliable 'control' location for background water quality in the future.

4.3 Shallow Aquifer Groundwater Quality

4.3.1 Hydraulically down-gradient of the Old Landfill

There were **three exceedances of the ANZECC LDW trigger values** during the January 2023 monitoring round in samples hydraulically down-gradient of the old landfill.

The *E. coli* counts for bores B1 (26,000 CFU/100ml), B2 (6,000 CFU/100ml), and C2 (1,400 CFU/100ml) all exceeded the ANZECC LDW trigger value of 100 CFU/100ml. Whilst on occasions, these bores have presented exceedances in the past, the January 2023 *E. coli* results are significantly high – particularly for bore B1. Given there were no exceedances for other determinants, the extent of *E. coli* contamination is unlikely to be related to the old landfill. Instead, animal activities around the bores likely contributed to these spikes. Accidental sampling/laboratory contamination may also be responsible. To determine the validity of these results future monitoring results at these locations should be closely assessed.

Bore C1 was not sampled during this monitoring round, which is a non-compliance with the resource consent conditions.

4.3.2 Hydraulically up-gradient of the Old Landfill and down-gradient of the New Landfill

There were **no exceedances of the ANZECC LDW trigger values** during the January 2023 monitoring round in shallow groundwater samples hydraulically up-gradient of the old landfill and down-gradient of the new landfill.

Bore D3rs was sampled for the comprehensive suite of parameters (refer to Table 2-1 for a description of both comprehensive and indicator analytical suites). Table B in resource consent condition 3 of discharge permit ATH-2002003983.02 requires bores D3rs and D3rd, as placement wells of bore D3r, to be sampled quarterly for the comprehensive suite of parameters for two years. Sampling of D3rs and D3rd started in October 2021 and should continue until, and including July 2023, to get two years of comprehensive monitoring.

4.3.3 Irrigation Area

There were **no exceedances of the ANZECC LDW trigger values** during the January 2023 monitoring round in groundwater samples taken from bores within the irrigation area (as described in Section 2.5 above).

4.4 Deep Aquifer Groundwater Quality

There were **four exceedances of the DWSNZ limits** in samples from the deep gravel aquifer during the January 2023 monitoring round.

The dissolved manganese concentrations in bores C2DD (0.64 mg/L), Xd1 (0.52 mg/L) and D3rd (0.45 mg/L) exceeded the DWSNZ MAV of 0.4 mg/L. These exceedances are within the historical range of concentrations observed.

The dissolved arsenic concentration in bore D3rd (0.018 mg/L) exceeded the DWSNZ MAV of 0.01 mg/L. This appears to be a characteristic of bore D3rd.

E. coli was noted as 'not detected' for all deep aquifer bores during January 2023. However, given that the laboratory level of detection was greater than the DWSNZ MAV of NIL, these 'non-detections' may have exceeded the DWSNZ MAV. For this reason, the laboratory should adjust its methodology for future sampling.

4.5 Leachate Effluent

Monitoring results from the leachate effluent samples are not required to meet either the ANZECC LDW trigger values or DWSNZ standards. However, during the January 2023 monitoring round there were two test results that were outside of the typical composition ranges for leachate at Class 1 landfills, as published in the WasteMINZ *Technical Guidelines*.

These were for Ammonia-N (1,620 mg/L) which exceeded the typical range of 3.4-1,440 mg/L, and for dissolved mercury which was not detected (i.e., < 0.0005 mg/L) and so was less than the range of 0.2-50 mg/l.

While these results are not reflective of typical conditions at other, similar landfills around New Zealand, it is noted that they are within the historical range of results observed at the Levin Landfill site. It is further noted that the data in the *Technical Guidelines* is somewhat dated (i.e., originates from between 1998 and 1999) and it is appropriate to source updated data for comparison purposes.

4.6 Tatana Property Drain

Under the revised resource consent conditions (2019), the Tatana Property drain samples are now assessed against the ANZECC 95%ile DGVs.

There were **five exceedances of the resource consent conditions** for three monitored parameters in samples from the TD1 location during the November 2022, December 2022, and January 2023 sampling rounds:

- The concentration of $scBOD_5$ in January 2023 (51 mg/L) exceeded the ANZECC (95%ile) DGV of 2 mg/L. This is the highest concentration ever recorded at TD1.
- The concentration of Nitrate-N in November 2022 (0.7 mg/L) and January 2023 (0.53 mg/L) exceeded the ANZECC (95%ile) DGV of 0.16 mg/L. This site has exceeded for Nitrate-N upon every sample collection since June 2022.
- The concentration of Ammoniacal-N in November 2022 (10.7 mg/L) and January 2023 (12.9 mg/L) exceeded the ANZECC (95%ile) DGV of 2.1 mg/L. Whilst relatively high, these are not uncharacteristic of results within the last two years.

4.7 Hokio Stream

Under the revised resource consent conditions (2019), a new monitoring location (HS1A), upstream of HS1, was added to the Hokio Stream monitoring sites and all monitoring results for the Hokio Stream samples are now assessed against the ANZECC 95%ile DGVs.

There were **eleven exceedances of the resource consent conditions** in samples from the Hokio Stream during the November 2022, December 2022, and January 2023 sampling rounds.

The exceedances are summarised as follows:

- $scBOD_5$ exceeded the ANZECC (95%ile) DGV of 2 mg/L at HS1A (6 mg/L) in December 2022. Excluding previous monitoring periods where the laboratory detection limit was inappropriately set at 6 mg/L, this is the highest value on record for HS1A.
- In November 2022, the Nitrate-N concentrations exceeded the ANZECC (95%ile) DGV of 0.16 mg/L at all sampling locations. These results are less than that of the previous quarter, and in reference to historical records, Nitrate-N exceedances are not unusual.
- Ammoniacal-N at HS2 did not exceed the ANZECC (95%ile) DGV of 2.1 mg/L but did exceed the consent average trigger value of 0.4 mg/L in November 2022 (1.37 mg/L) and January 2023 (1.38 mg/L).
- In December 2022, the dissolved copper concentrations exceeded the ANZECC (95%ile) DGV of 0.0014 mg/L at HS1A (0.0026 mg/L) and HS1 (0.002 mg/L). However, these exceedances are not uncharacteristic given historical data which shows copper frequently exceeding 0.0014 mg/L for all surface water sampling locations since 1994.
- In January 2023 however, dissolved copper presented a high exceedance of 0.01 mg/L for HS3. Whilst not the largest exceedance since sampling began (0.3 mg/L in October 2008), this is one of the highest.
- In December 2022, the concentration of dissolved zinc exceeded the ANZECC (95%ile) DGV of 0.008 mg/L at HS1 (0.729 mg/L). Whilst this site has exceeded on occasions in the past, this is the highest concentration recorded since sampling began – the second highest being 0.08 mg/L in April 2008.

4.8 Consent Compliance

Discharge permit ATH-2002003983.02 states that quarterly and annual monitoring results shall comply with the ANZECC LDW trigger values in the shallow groundwater aquifer (sand aquifer) and surface water bodies. Samples from the deep groundwater (gravel aquifer) shall comply with the applicable DWSNZ values. Should any parameters exceed these standards, the permit holder shall report to the Regional Council as soon as practicable on the significance of the results and, where the change can be attributed to the influence of landfill leachate, consult with the Regional Council to determine if further investigations or remedial measures are required.

Shallow Aquifer and Irrigation Area

There were **no exceedances** of consent conditions hydraulically up-gradient of the old landfill and down-gradient of the new landfill during the January 2023 monitoring period.

There were **three exceedance** of consent conditions hydraulically down-gradient of the old landfill during the January 2023 monitoring period.

- The *E. coli* counts at bores B1 (26,000 CFU/100ml), B2 (6,000 CFU/100ml) and C2 (1,400 CFU/100ml) exceeded the ANZECC LDW trigger value of 100 CFU/100ml. Whilst these bores have exceeded on occasions, these results are particularly high.

Bore C1 was not sampled during this monitoring round, which is a consent non-compliance.

There were **no exceedances** of the resource consent conditions during the January 2023 sampling round for samples obtained from bores within the irrigation area.

Deeper Gravel Aquifer

There were **four exceedances of the DWSNZ limits** in samples from the deep gravel aquifer during the January 2023 monitoring round.

- The dissolved manganese concentrations in bores C2DD (0.64 mg/L), Xd1 (0.52 mg/L) and D3rd (0.45 mg/L) exceeded the DWSNZ MAV of 0.4 mg/L. These results are within the historical range of concentrations observed.
- Dissolved arsenic exceeded the DWSNZ MAV of 0.01 mg/L at bore D3rd (0.018 mg/L). This appears to be a characteristic of bore D3rd.

E. coli was noted as 'not detected' for all deep aquifer bores during January 2023. However, given that the laboratory level of detection was greater than the DWSNZ MAV of NIL, it is not known if these 'non-detections' were non-exceedances.

Tatana Property Drain

There were **five exceedances of the resource consent conditions** for samples from TD1 location during the November 2022, December 2022, and January 2023 monitoring period as follows:

- scBOD5 exceeded the ANZECC (95%ile) DGV of 2 mg/L in January 2023 with a concentration of 51 mg/L. This is the highest concentration recorded since sampling began – the second highest being 41 mg/L in January 2018.
- The concentration of Nitrate-N in November 2022 (0.7 mg/L) and January 2023 (0.53 mg/L) exceeded the ANZECC (95%ile) DGV of 0.16 mg/L. This site has exceeded for Nitrate-N upon every sample collection since June 2022.
- The concentration of Ammoniacal-N in November 2022 (10.7 mg/L) and January 2023 (12.9 mg/L) exceeded the ANZECC (95%ile) DGV of 2.1 mg/L. Whilst relatively high, these results are not uncharacteristic of results within the last two years.

Hokio Stream

There were **eleven exceedances** of the resource consent conditions in samples from the Hokio Stream during the November and December 2022 sampling rounds.

The exceedances are summarised as follows:

- $scBOD_5$ exceeded the ANZECC (95%ile) DGV of 2 mg/L at HS1A (6 mg/L) in December 2022. Excluding previous monitoring periods where the laboratory detection limit was inappropriately set at 6 mg/L, this is the highest value on record for HS1A.
- In November 2022, the Nitrate-N concentrations exceeded the ANZECC (95%ile) DGV of 0.16 mg/L at all sampling locations. These results are less than that of the previous quarter, and in reference to historical records, Nitrate-N exceedances are not unusual. It is likely that these elevated results are due to causes outside and upstream of the landfills.
- Ammoniacal-N at HS2 did not exceed the ANZECC (95%ile) DGV of 2.1 mg/L but did exceed the consent average trigger value of 0.4 mg/L in November 2022 (1.37 mg/L) and January 2023 (1.38 mg/L).
- In December 2022, the dissolved copper concentrations exceeded the ANZECC (95%ile) DGV of 0.0014 mg/L at HS1A (0.0026 mg/L) and HS1 (0.002 mg/L). However, these exceedances are not uncharacteristic given historical data which shows copper frequently exceeding 0.0014 mg/L for all surface water sampling locations since 1994.
- In January 2023 however, dissolved copper presented a high exceedance of 0.01 mg/L for HS3. Whilst not the largest exceedance since sampling began (0.3 mg/L in October 2008), this is one of the highest.
- In December 2022, the concentration of dissolved zinc exceeded the ANZECC (95%ile) DGV of 0.008 mg/L at HS1 (0.729 mg/L). Whilst this site has exceeded on occasion in the past, this is the highest concentration recorded since sampling began – the second highest being 0.08 mg/L in April 2008.

5 Conclusions

Monitoring results obtained in the November 2022 to January 2023 sampling rounds suggest that the groundwater at the background monitoring sites at the Levin Landfill is being impacted by local ground conditions and/or activities up-gradient of the landfill.

During the November 2022 to January 2023 monitoring period there were 23 exceedances of the resource consent conditions; three in the shallow aquifer hydraulically down-gradient of the old landfill, four from the deep aquifer, five in samples from the Tatana Property drain, and the remaining eleven from surface water monitoring at locations along the Hokio Stream.

Bore C1 was not sampled during this monitoring round. This will result in non-compliance with respect to the resource consent conditions.

For *E. coli*, the current laboratory detection limit, viz., 100 CFU/100ml, is not compatible with the standards defined in the consents. The ANZECC LDW is also set at 100 CFU/100ml and the DWSNZ MAV is NIL, thus room for error through unknown values is large. Whilst results below the detection limit have been described as 'not detected' (ND), due to specific results being unknown, these should be considered with caution. This detection limit is unacceptable and should be remedied for future sampling periods.

Methane was detected in seven groundwater monitoring bores in the January 2023 sampling round. Methane concentrations are significantly less than they were during the October 2022 monitoring round. The highest concentration of methane during January 2023 was 0.06%, in bore Xd1. This is well below the explosive limit of 5% and represent a 'safe' level.

Additionally, a high level of carbon dioxide (7.01%) was measured at bore B2. Previously, B2 has showed carbon dioxide levels of 1.48% (October 2022), 3.6% (July 2022) and 5.2% (April 2022), so there appears to be a fluctuating trend.

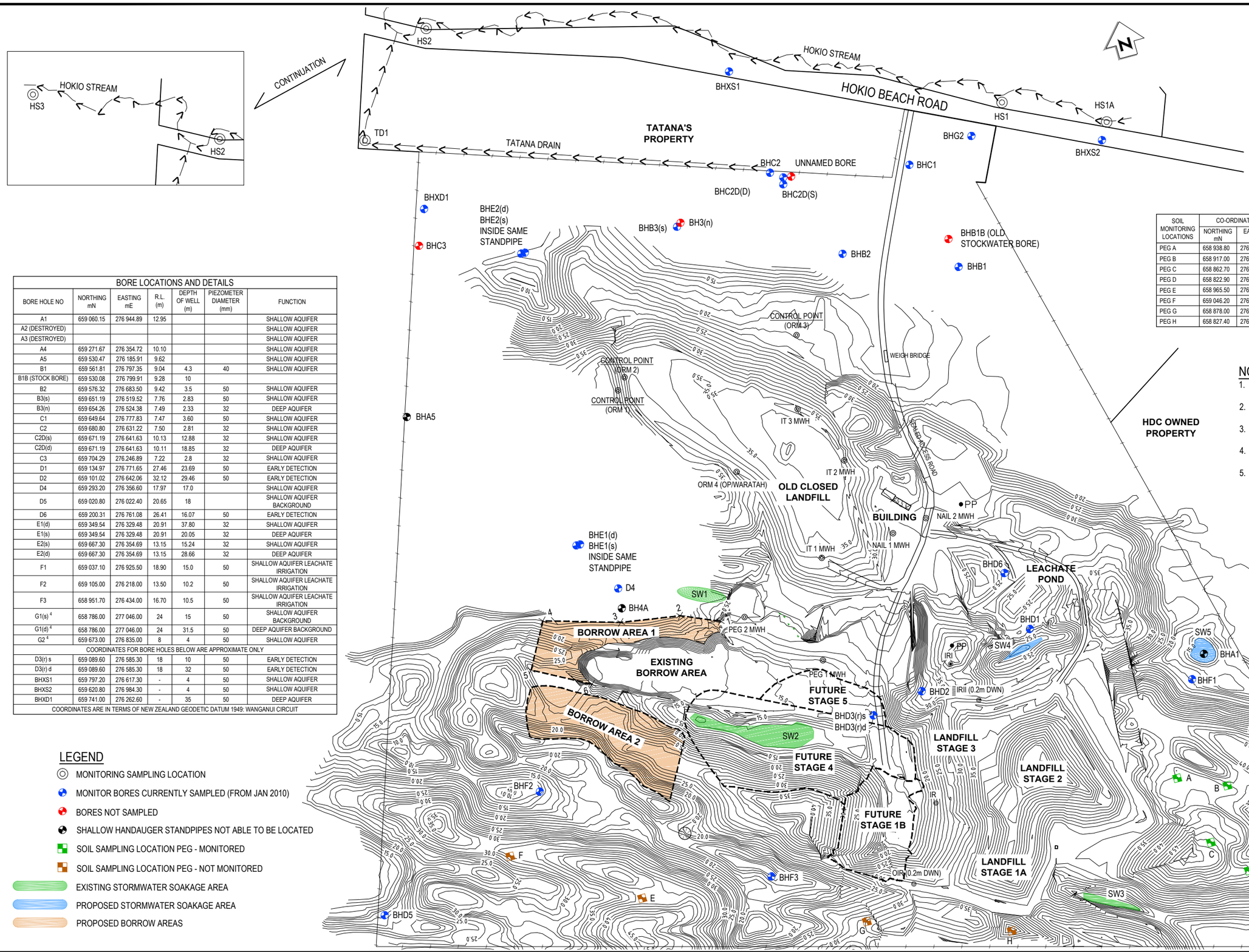
Hydrogen sulphide was detected at bores D3rs, D1, G1d, G2s and Xs2 at concentrations of 1ppm.

The possibility of encountering methane (and possible hydrogen sulphide) in groundwater bores endorses the need for appropriate health and safety measures to be adopted during monitoring, as is the case for the landfill gas extraction wells. No smoking should be permitted when personnel undertake groundwater sampling and when in the vicinity of the groundwater monitoring wells, or in fact anywhere else on the Levin Landfill site. For the safety of site personnel, a personal gas detector should be worn by all workers at the landfill site.

Appendices

We design with community in mind

Appendix A 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 B Sampling Schedule

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], [8]				Tatana Drain	Leachate Pond[5]	
Annual	Quarterly		C2dd	E1d	E2d	G1d	Xd1	D3rd[1]	C1	C2[6]	C2ds[6]	D4	B1	B2	B3s	E1s	E2s	D1[2]	D2[2]	D3rs[1,2]	D6[2]	G1s	G2s	Xs1[6]	Xs2[6]	D5[3]	F1[3]	F2[3]	F3[3]	HS1	HS1A	HS2	HS3	TD1[7]		
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	Monthly Compre. To 03/2022	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							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							
	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 + A	C + A	C + A	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
(6) Measure water level at C2, C2ds, Xs1 and Xs2 when taking monthly samples at TD1 and within the Hokio Stream.
(7) Start taking comprehensive samples at TD1 every month when sampling the Hokio Stream sites. Also note the depth of water in the drain invert at TD1.
(8) Start measuring approximately the depth of flow in the Hokio Stream at each sampling site when sampling monthly.
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 Analytical Results

Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-002794-01** REPORT DATE **24/01/2023**

Attention Downer NZ Ltd (EDI Levin)
Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND

Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill

Order code: EUNZWE-00100853

SAMPLE CODE **812-2023-00004900**

Client Reference: 270642-0
Sampling Point code: WIL-B1
Sampling Point name: Levin B1
Reception Date & Time: 13/01/2023 8:35
Analysis Start Date & Time: 13/01/2023 19:45
Analysis Ending Date: 24/01/2023
Sampled Date & Time 12/01/2023 06:55
Sampler(s) Client nominated external sampler
Sampled by Eurofins False

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	4.33	(± 0.65) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<6	(± 0.8) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	131	(± 14) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	397	(± 19.8) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	224	(± 4.5) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	26000	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	21.5	(± 1.08) mg/l	0.01
NW195	**pH**			
	pH	7.3	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	0.020	(± 0.002) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	1.55	mg/l	0.03
NW110	**Soluble Lead**			
	Lead (Pb)	0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	5.24	(± 0.524) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005

	RESULTS (UNCERTAINTY)	LOQ
NW116 Soluble Nickel		
Nickel (Ni)	0.0044 (± 0.0013) mg/l	0.0005

LIST OF METHODS

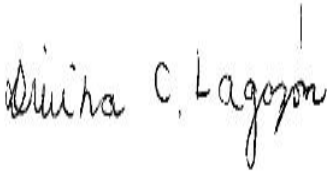
NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.	NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.	NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Marylou Cabral Laboratory Manager

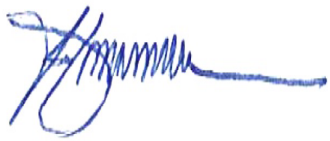
Jennifer Mont Supervisor

Amitesh Kumar Supervisor



Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst



Ivan Imamura Laboratory Analyst

Leo Cleave Senior Analyst

EXPLANATORY NOTE

① Test is not accredited
② Test is subcontracted within Eurofins group and is accredited
③ Test is subcontracted within Eurofins group and is not accredited
④ Test is subcontracted outside Eurofins group and is accredited
⑤ Test is subcontracted outside Eurofins group and is not accredited
⑥ Test result is provided by the customer and is not accredited
⑦ Tested at the sampling point by Eurofins and is not accredited
⑧ Tested at the sampling point by Eurofins and is accredited

N/A means Not applicable
Not Detected means not detected at or above the Limit of Quantification (LOQ
LOQ means Limit of Quantification and the unit of LOQ is the same as the result unit

The test result(s) in this report apply only to the sample as received.
This document can only be reproduced in full.
The tests are identified by a five-digit code, their description is available on request.
Accreditation does not apply to comments or graphical representations.
Unless otherwise stated, all tests in this analytical report (except for subcontracted tests) are performed at 85 Port Road, Seaview, Lower Hutt, Wellington, NEW ZEALAND.
The laboratory is not responsible for the information provided by the customer which can affect the validity of the results, for example: sampling information such as date/time, field data etc.
This report issued by Eurofins relates exclusively to the samples provided by the Customer and does not relate to the lot / batch from which the samples have been obtained.
Eurofins may subcontract the performance of part or all of the Services to a third party and the Customer authorises the release of all information necessary to the third party for the provision of the Services.
All samples become the property of Eurofins to the extent necessary for the performance of the Services.
Eurofins will not be required to store samples and may destroy or otherwise dispose of the samples or return the samples to the Customer (at the Customer's cost in all respects) immediately following analysis of the samples.
If the Customer pays for storage of the samples Eurofins will take commercially reasonable steps to store the samples for the agreed period in terms of industry practice.
The Customer acknowledges and accepts that: (a) it is solely responsible for the sampling process and warrants that the sample provided to Eurofins is representative of the lot / batch from which the samples were drawn; and (b) Eurofins expresses no opinion and accepts no liability in respect of the Customer's production process or homogeneity of the sample.
The Eurofins water sampling services uses IANZ approved methodology based on AS/NZS 5667 and / or best practice to collect and transport samples that are fit for the purpose of analytical testing. Eurofins shall have no liability if the sample collected is not representative of the source from which it has been taken. The laboratory is not responsible for sampling activities unless explicitly indicated by the statement "Sampled by Eurofins" on the report for water samples.
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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-002188-01** REPORT DATE **20/01/2023**

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Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND

Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill

Order code: EUNZWE-00100853

SAMPLE CODE **812-2023-00004905**

Client Reference: 270643-0
Sampling Point code: WIL-B2
Sampling Point name: Levin B2
Reception Date & Time: 13/01/2023 8:35
Analysis Start Date & Time: 13/01/2023 19:45
Analysis Ending Date: 20/01/2023
Sampled Date & Time 12/01/2023 09:00
Sampler(s) Client nominated external sampler
Sampled by Eurofins False

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	57.4	(± 5.74) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<6	(± 0.8) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	84	(± 14) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	88.3	(± 4.42) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	163	(± 3.3) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	6000	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	36.2	(± 1.81) mg/l	0.01
NW195	**pH**			
	pH	7.3	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	0.065	(± 0.007) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	2.16	mg/l	0.03
NW110	**Soluble Lead**			
	Lead (Pb)	0.0012	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	1.63	(± 0.163) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005

	RESULTS (UNCERTAINTY)	LOQ
NW116 Soluble Nickel		
Nickel (Ni)	0.0025 (± 0.0008) mg/l	0.0005

LIST OF METHODS

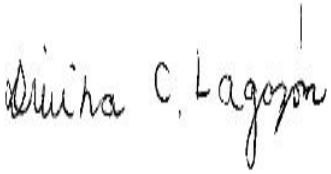
NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.	NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.	NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Marylou Cabral Laboratory Manager

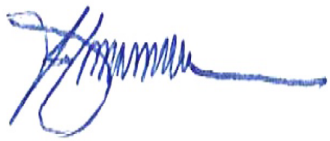
Jennifer Mont Supervisor

Amitesh Kumar Supervisor



Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst



Ivan Imamura Laboratory Analyst

Leo Cleave Senior Analyst

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LOQ means Limit of Quantification and the unit of LOQ is the same as the result unit

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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-002798-01** REPORT DATE **24/01/2023**

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Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND

Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill

Order code: EUNZWE-00100853

SAMPLE CODE **812-2023-00004904**

Client Reference: 270644-0
Sampling Point code: WIL-B3
Sampling Point name: Levin B3s
Reception Date & Time: 13/01/2023 8:35
Analysis Start Date & Time: 13/01/2023 19:45
Analysis Ending Date: 24/01/2023
Sampled Date & Time 12/01/2023 08:30
Sampler(s) Client nominated external sampler
Sampled by Eurofins False

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	72.7	(± 7.27) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<6	(± 0.8) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	208	(± 21) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	105	(± 5.25) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	182	(± 3.6) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	0.39	(± 0.10) mg/l	0.01
NW195	**pH**			
	pH	7.8	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	0.003	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.74	mg/l	0.03
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	2.85	(± 0.285) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005

	RESULTS (UNCERTAINTY)	LOQ
NW116 Soluble Nickel		
Nickel (Ni)	0.0066 (± 0.0020) mg/l	0.0005

LIST OF METHODS

NW007	**Chloride:** APHA Online Edition 4110 B
NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D
NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.
NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.
NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.
NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H
NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B
ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Marylou Cabral Laboratory Manager

Jennifer Mont Supervisor

Amitesh Kumar Supervisor

Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Ivan Imamura Laboratory Analyst

Leo Cleave Senior Analyst

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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-002795-01** REPORT DATE **24/01/2023**

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Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND

Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill

Order code: EUNZWE-00100853

SAMPLE CODE **812-2023-00004901**

Client Reference: 270639-0
Sampling Point code: WIL-C2
Sampling Point name: Levin C2
Reception Date & Time: 13/01/2023 8:35
Analysis Start Date & Time: 13/01/2023 19:45
Analysis Ending Date: 24/01/2023
Sampled Date & Time 12/01/2023 07:34
Sampler(s) Client nominated external sampler
Sampled by Eurofins False

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	170	(± 17.0) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<6	(± 0.8) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	63	(± 11) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	207	(± 10.3) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	284	(± 5.7) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	1400	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	<0.10	(± 0.02) mg/l	0.01
NW195	**pH**			
	pH	7.7	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	0.018	(± 0.002) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	2.09	mg/l	0.03
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.219	(± 0.0219) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005

	RESULTS (UNCERTAINTY)		LOQ
NW116 Soluble Nickel			
Nickel (Ni)	0.0054	(± 0.0016) mg/l	0.0005

LIST OF METHODS

NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.	NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.	NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Marylou Cabral Laboratory Manager

Jennifer Mont Supervisor

Amitesh Kumar Supervisor

Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Ivan Imamura Laboratory Analyst

Leo Cleave Senior Analyst

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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-002615-01** REPORT DATE **22/01/2023**

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Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND

Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill

Order code: EUNZWE-00100853

SAMPLE CODE **812-2023-00004547**

Client Reference: 270633-0
Sampling Point code: WIL-C2dd
Sampling Point name: Levin C2dd
Reception Date & Time: 13/01/2023 8:35
Analysis Start Date & Time: 13/01/2023 09:46
Analysis Ending Date: 22/01/2023
Sampled Date & Time 11/01/2023 06:42
Sampler(s) Client nominated external sampler
Sampled by Eurofins False

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.30	(± 0.09) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	(± 0.4) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	33	(± 7) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	42.1	(± 2.10) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	57.4	(± 1.1) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	<0.01	(± 0.004) mg/l	0.01
NW195	**pH**			
	pH	7.9	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	0.010	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.05	mg/l	0.03
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.642	(± 0.0642) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005

		RESULTS (UNCERTAINTY)		LOQ
NW116	**Soluble Nickel**			
	Nickel (Ni)	0.0005	(± 0.0002) mg/l	0.0005

LIST OF METHODS

NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.	NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.	NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Marylou Cabral Laboratory Manager

Amitesh Kumar Supervisor

Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Sunita Raju Business Unit Manager

Ivan Imamura Laboratory Analyst

Gabriela Carvalhaes Lean Project Manager

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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-002797-01** REPORT DATE **24/01/2023**

Attention Downer NZ Ltd (EDI Levin)
Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND

Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill

Order code: EUNZWE-00100853

SAMPLE CODE **812-2023-00004903**

Client Reference: 270640-0
Sampling Point code: WIL-C2ds
Sampling Point name: Levin C2ds
Reception Date & Time: 13/01/2023 8:35
Analysis Start Date & Time: 13/01/2023 19:45
Analysis Ending Date: 24/01/2023
Sampled Date & Time 12/01/2023 08:01
Sampler(s) Client nominated external sampler
Sampled by Eurofins False

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	1.27	(± 0.19) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<6	(± 0.8) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	42	(± 8) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	74.1	(± 3.71) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	103	(± 2.1) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	<0.10	(± 0.02) mg/l	0.01
NW195	**pH**			
	pH	8.0	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	<0.002	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.65	mg/l	0.03
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	1.62	(± 0.162) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005

	RESULTS (UNCERTAINTY)	LOQ
NW116 Soluble Nickel		
Nickel (Ni)	0.0019 (± 0.0006) mg/l	0.0005

LIST OF METHODS

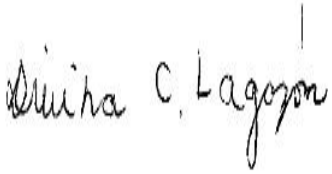
NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.	NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.	NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Marylou Cabral Laboratory Manager

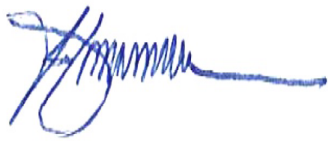
Jennifer Mont Supervisor

Amitesh Kumar Supervisor



Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst



Ivan Imamura Laboratory Analyst

Leo Cleave Senior Analyst

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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-002186-01** REPORT DATE **20/01/2023**

Attention Downer NZ Ltd (EDI Levin)
Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND

Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill

Order code: EUNZWE-00100853

SAMPLE CODE **812-2023-00004561**

Client Reference: 270647-0
Sampling Point code: WIL-D1
Sampling Point name: Levin D1
Reception Date & Time: 13/01/2023 8:35
Analysis Start Date & Time: 13/01/2023 10:33
Analysis Ending Date: 20/01/2023
Sampled Date & Time 11/01/2023 10:35
Sampler(s) Client nominated external sampler
Sampled by Eurofins False

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	<0.01	(± 0.003) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	(± 0.4) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	17	(± 6) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	13.7	(± 0.69) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	22.7	(± 0.5) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	2.89	(± 0.29) mg/l	0.01
NW195	**pH**			
	pH	7.0	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	0.004	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	<0.03	mg/l	0.03
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	<0.0005	(± 0.0002) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005

	RESULTS (UNCERTAINTY)	LOQ
NW116 Soluble Nickel		
Nickel (Ni)	<0.0005 (± 0.0002) mg/l	0.0005

LIST OF METHODS

NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.	NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.	NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Marylou Cabral Laboratory Manager

Amitesh Kumar Supervisor

Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Sunita Raju Business Unit Manager

Ivan Imamura Laboratory Analyst

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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-002187-01** REPORT DATE **20/01/2023**

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Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND
Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz
Copy to: Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Gabriela Carvalhaes **Order code:** EUNZWE-00100853
Contract: Landfill

SAMPLE CODE **812-2023-00004562**

Client Reference: 270648-0
Sampling Point code: WIL-D2 **Sampling Point name:** Levin D2
Reception Date & Time: 13/01/2023 8:35
Analysis Start Date & Time: 13/01/2023 10:33 **Analysis Ending Date:** 20/01/2023
Sampled Date & Time 11/01/2023 10:55 **Sampler(s)** Client nominated external sampler
Sampled by Eurofins False

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.63	(± 0.19) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	(± 0.4) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	49	(± 9) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	50.2	(± 2.51) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	47.4	(± 0.9) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	<0.01	(± 0.003) mg/l	0.01
NW195	**pH**			
	pH	6.6	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	0.003	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.04	mg/l	0.03
NW109	**Soluble Iron**			
	Iron (Fe)	2.07	(± 0.41) mg/l	0.01
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.406	(± 0.0406) mg/l	0.0005

		RESULTS (UNCERTAINTY)		LOQ
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005
NW120	**Soluble Sodium**			
	Sodium (Na)	32.7	mg/l	0.01

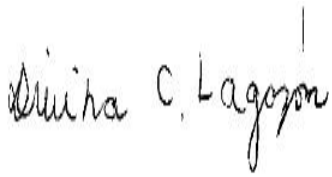
LIST OF METHODS

NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW109	**Soluble Iron:** APHA Online Edition 3125 B mod.	NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.
NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.	NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.
NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.	NW120	**Soluble Sodium:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Marylou Cabral Laboratory Manager

Amitesh Kumar Supervisor



Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

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END OF REPORT

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ANALYTICAL REPORT

REPORT CODE **AR-23-NW-005630-01** REPORT DATE **12/02/2023**

Attention Downer NZ Ltd (EDI Levin)
Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND
Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill
Order code: EUNZWE-00100853

SAMPLE CODE **812-2023-00004565**

Client Reference: 270709-0
Sampling Point code: WIL-D3rd
Sampling Point name: Levin D3rd
Reception Date & Time: 13/01/2023 8:35
Analysis Start Date & Time: 13/01/2023 10:33
Analysis Ending Date: 12/02/2023
Sampled Date & Time 11/01/2023 11:20
Sampler(s) Client nominated external sampler
Sampled by Eurofins False

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.38	(± 0.11) mg/l	0.01
NW583	**Arsenic - Soluble**			
	Arsenic (As)	0.018	(± 0.002) mg/l	0.001
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<6	(± 0.8) mg/l	1
NW457	**Calcium - Dissolved**			
	Calcium (Ca)	59.1	(± 5.91) mg/l	0.01
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	25	(± 6) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	31.2	(± 1.56) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	51.9	(± 1.0) mS/m	0.1
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	1.23	(± 0.123) mg/l	0.005
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW460	**Iron - Dissolved**			
	Iron (Fe)	0.029	(± 0.006) mg/l	0.005
NW462	**Magnesium - Dissolved**			
	Magnesium (Mg)	12.2	(± 1.22) mg/l	0.01
NW010	**Nitrate-N**			
	Nitrate-N	<0.01	(± 0.003) mg/l	0.01
NW195	**pH**			
	pH	7.7	(± 0.2)	0.1

		RESULTS	(UNCERTAINTY)	LOQ
③VQ088	**Phenolics (Total)**			
	Total phenols	<0.05	mg/l	0.05
NW469	**Sodium - Dissolved**			
	Sodium (Na)	20.4	(± 2.04) mg/l	0.02
NW098	**Soluble Aluminium**			
	Aluminium	0.005	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.03	mg/l	0.03
NW104	**Soluble Cadmium**			
	Cadmium (Cd)	<0.0002	(± 0.0001) mg/l	0.0002
NW106	**Soluble Chromium**			
	Chromium (Cr)	<0.001	(± 0.0003) mg/l	0.001
NW108	**Soluble Copper**			
	Copper (Cu)	<0.0005	(± 0.0002) mg/l	0.0005
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.448	(± 0.0448) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005
NW117	**Soluble Potassium**			
	Potassium (K)	6.80	mg/l	0.01
NW125	**Soluble Zinc**			
	Zinc (Zn)	<0.002	(± 0.0007) mg/l	0.002
NW011	**Sulphate**			
	Sulphate	<0.02	(± 0.01) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	105	mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	216	(± 22) mg CaCO3/l	1
NW029	**Total Hardness**			
	Hardness	198	(± 20) mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	5.5	(± 0.5) mg/l	0.1
③VQ876	**Volatile Fatty Acids (VFA) by GC-MS**			
	Acetic acid	<5	mg/l	5
	Butyric acid	<5	mg/l	5
	Heptanoic Acid C7:0	<5	mg/l	5
	Hexanoic acid	<5	mg/l	5
	Iso caproic acid	<5	mg/l	5
	Isobutyric acid	<5	mg/l	5
	Isovaleric acid	<5	mg/l	5

	RESULTS (UNCERTAINTY)		LOQ
③VQ876 **Volatile Fatty Acids (VFA) by GC-MS**			
Propionic acid	<5	mg/l	5
Valeric acid	<5	mg/l	5
Volatile fatty acids as acetic acid	<5	mg/l	5

LIST OF METHODS

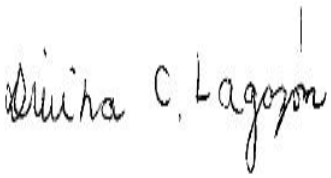
NW003	**Total Alkalinity:** APHA Online Edition 2320 B
NW007	**Chloride:** APHA Online Edition 4110 B
NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW011	**Sulphate:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D
NW023	**Conductivity:** APHA Online Edition 2510 B
NW029	**Total Hardness:** APHA Online Edition 2340 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.
NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW104	**Soluble Cadmium:** APHA Online Edition 3125 B mod.
NW106	**Soluble Chromium:** APHA Online Edition 3125 B mod.
NW108	**Soluble Copper:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.
NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.
NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW117	**Soluble Potassium:** APHA Online Edition 3125 B mod.
NW125	**Soluble Zinc:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H
NW193	**Dissolved Reactive Phosphorus:** APHA Online Edition 4500-P G
NW195	**pH:** APHA Online Edition 4500-H B
NW206	**Suspended Solids:** APHA Online Edition 2540 D
NW210	**Total Non-Purgeable Organic Carbon:** APHA Online Edition 5310 B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B
NW457	**Calcium - Dissolved:** APHA Online Edition 3120 B mod.
NW460	**Iron - Dissolved:** APHA Online Edition 3120 B mod.
NW462	**Magnesium - Dissolved:** APHA Online Edition 3120 B mod.
NW469	**Sodium - Dissolved:** APHA Online Edition 3120 B mod.
NW583	**Arsenic - Soluble:** APHA Online Edition 3125 B mod.
VQ088	**Phenolics (Total):** APHA 5530
VQ876	**Volatile Fatty Acids (VFA) by GC-MS:** APHA 5560-D
ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Marylou Cabral Laboratory Manager

Jennifer Mont Supervisor

Amitesh Kumar Supervisor



Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Sunita Raju Business Unit Manager

Ivan Imamura Laboratory Analyst

EXPLANATORY NOTE

Eurofins ELS Limited
85 Port Road
Seaview
Lower Hutt
Wellington 5010
NEW ZEALAND

Phone +64 4 576 5016
www.eurofins.co.nz

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Not Detected means not detected at or above the Limit of Quantification (LOQ)
LOQ means Limit of Quantification and the unit of LOQ is the same as the result unit

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ANALYTICAL REPORT

REPORT CODE **AR-23-NW-005631-01** REPORT DATE **12/02/2023**

Attention Downer NZ Ltd (EDI Levin)
Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND
Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill
Order code: EUNZWE-00100853

SAMPLE CODE **812-2023-00004568**

Client Reference: 270710-0
Sampling Point code: WIL-D3rs
Sampling Point name: Levin D3rs
Reception Date & Time: 13/01/2023 8:35
Analysis Start Date & Time: 13/01/2023 10:33
Analysis Ending Date: 12/02/2023
Sampled Date & Time 11/01/2023 11:37
Sampler(s) Client nominated external sampler
Sampled by Eurofins False

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.65	(± 0.20) mg/l	0.01
NW583	**Arsenic - Soluble**			
	Arsenic (As)	0.001	(± 0.0004) mg/l	0.001
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<10	(± 1) mg/l	1
NW457	**Calcium - Dissolved**			
	Calcium (Ca)	10.9	(± 1.09) mg/l	0.01
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	87	(± 14) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	16.4	(± 0.82) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	20.5	(± 0.4) mS/m	0.1
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	0.070	(± 0.014) mg/l	0.005
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW460	**Iron - Dissolved**			
	Iron (Fe)	16.6	(± 1.66) mg/l	0.005
NW462	**Magnesium - Dissolved**			
	Magnesium (Mg)	4.59	(± 0.46) mg/l	0.01
NW010	**Nitrate-N**			
	Nitrate-N	<0.01	(± 0.003) mg/l	0.01
NW195	**pH**			
	pH	6.6	(± 0.2)	0.1

		RESULTS	(UNCERTAINTY)	LOQ
③VQ088	**Phenolics (Total)**			
	Total phenols	<0.05	mg/l	0.05
NW469	**Sodium - Dissolved**			
	Sodium (Na)	20.4	(± 2.04) mg/l	0.02
NW098	**Soluble Aluminium**			
	Aluminium	0.083	(± 0.008) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	<0.03	mg/l	0.03
NW104	**Soluble Cadmium**			
	Cadmium (Cd)	<0.0002	(± 0.0001) mg/l	0.0002
NW106	**Soluble Chromium**			
	Chromium (Cr)	0.004	(± 0.0005) mg/l	0.001
NW108	**Soluble Copper**			
	Copper (Cu)	<0.0005	(± 0.0002) mg/l	0.0005
NW109	**Soluble Iron**			
	Iron (Fe)	16.4	(± 1.64) mg/l	0.01
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.360	(± 0.0360) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	0.0007	(± 0.0003) mg/l	0.0005
NW117	**Soluble Potassium**			
	Potassium (K)	4.50	mg/l	0.01
NW120	**Soluble Sodium**			
	Sodium (Na)	23.5	mg/l	0.01
NW125	**Soluble Zinc**			
	Zinc (Zn)	<0.002	(± 0.0007) mg/l	0.002
NW011	**Sulphate**			
	Sulphate	0.59	(± 0.15) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	33	mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	69	(± 7) mg CaCO3/l	1
NW029	**Total Hardness**			
	Hardness	46	(± 5) mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	26.4	(± 2.6) mg/l	0.1
③VQ876	**Volatile Fatty Acids (VFA) by GC-MS**			
	Acetic acid	<5	mg/l	5
	Butyric acid	<5	mg/l	5

	RESULTS (UNCERTAINTY)		LOQ
③VQ876 **Volatile Fatty Acids (VFA) by GC-MS**			
Heptanoic Acid C7:0	<5	mg/l	5
Hexanoic acid	<5	mg/l	5
Iso caproic acid	<5	mg/l	5
Isobutyric acid	<5	mg/l	5
Isovaleric acid	<5	mg/l	5
Propionic acid	<5	mg/l	5
Valeric acid	<5	mg/l	5
Volatile fatty acids as acetic acid	<5	mg/l	5

LIST OF METHODS

NW003	**Total Alkalinity:** APHA Online Edition 2320 B	NW007	**Chloride:** APHA Online Edition 4110 B
NW010	**Nitrate-N:** APHA Online Edition 4110 B	NW011	**Sulphate:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW029	**Total Hardness:** APHA Online Edition 2340 B	NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.
NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.	NW104	**Soluble Cadmium:** APHA Online Edition 3125 B mod.
NW106	**Soluble Chromium:** APHA Online Edition 3125 B mod.	NW108	**Soluble Copper:** APHA Online Edition 3125 B mod.
NW109	**Soluble Iron:** APHA Online Edition 3125 B mod.	NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.
NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.	NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.
NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.	NW117	**Soluble Potassium:** APHA Online Edition 3125 B mod.
NW120	**Soluble Sodium:** APHA Online Edition 3125 B mod.	NW125	**Soluble Zinc:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW193	**Dissolved Reactive Phosphorus:** APHA Online Edition 4500-P G
NW195	**pH:** APHA Online Edition 4500-H B	NW206	**Suspended Solids:** APHA Online Edition 2540 D
NW210	**Total Non-Purgeable Organic Carbon:** APHA Online Edition 5310 B	NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B
NW457	**Calcium - Dissolved:** APHA Online Edition 3120 B mod.	NW460	**Iron - Dissolved:** APHA Online Edition 3120 B mod.
NW462	**Magnesium - Dissolved:** APHA Online Edition 3120 B mod.	NW469	**Sodium - Dissolved:** APHA Online Edition 3120 B mod.
NW583	**Arsenic - Soluble:** APHA Online Edition 3125 B mod.	VQ088	**Phenolics (Total):** APHA 5530
VQ876	**Volatile Fatty Acids (VFA) by GC-MS:** APHA 5560-D	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Marylou Cabral Laboratory Manager

Jennifer Mont Supervisor

Amitesh Kumar Supervisor

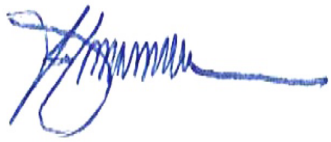
Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Sunita Raju Business Unit Manager

Eurofins ELS Limited
85 Port Road
Seaview
Lower Hutt
Wellington 5010
NEW ZEALAND

Phone +64 4 576 5016
www.eurofins.co.nz



Ivan Imamura Laboratory Analyst

EXPLANATORY NOTE

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⑧ Tested at the sampling point by Eurofins and is accredited

N/A means Not applicable
Not Detected means not detected at or above the Limit of Quantification (LOQ
LOQ means Limit of Quantification and the unit of LOQ is the same as the result unit

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END OF REPORT

Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-003903-01** REPORT DATE **31/01/2023**

Attention Downer NZ Ltd (EDI Levin)
Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND

Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill

Order code: EUNZWE-00100853

SAMPLE CODE **812-2023-00004505**

Client Reference: 270641-0
Sampling Point code: WIL-D4
Sampling Point name: Levin D4
Reception Date & Time: 13/01/2023 8:35
Analysis Start Date & Time: 13/01/2023 08:55
Analysis Ending Date: 31/01/2023
Sampled Date & Time 11/01/2023 12:10
Sampler(s) Client nominated external sampler
Sampled by Eurofins False

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.18	(± 0.06) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	(± 0.4) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	22	(± 6) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	33.5	(± 1.67) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	28.5	(± 0.6) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	<0.01	(± 0.003) mg/l	0.01
NW195	**pH**			
	pH	7.0	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	<0.002	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.03	mg/l	0.03
NW109	**Soluble Iron**			
	Iron (Fe)	0.74	(± 0.15) mg/l	0.01
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.179	(± 0.0180) mg/l	0.0005

		RESULTS (UNCERTAINTY)		LOQ
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005
NW120	**Soluble Sodium**			
	Sodium (Na)	31.8	mg/l	0.01

LIST OF METHODS

NW007	**Chloride:** APHA Online Edition 4110 B
NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D
NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.
NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW109	**Soluble Iron:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.
NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.
NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW120	**Soluble Sodium:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H
NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B
ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Marylou Cabral Laboratory Manager

Amitesh Kumar Supervisor

Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Sunita Raju Business Unit Manager

Ivan Imamura Laboratory Analyst

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END OF REPORT

Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-001895-01** REPORT DATE **18/01/2023**

Attention Downer NZ Ltd (EDI Levin)
Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND

Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill

Order code: EUNZWE-00099813

SAMPLE CODE **812-2023-00003374**

Client Reference: 270653-0
Sampling Point code: WIL-D5
Sampling Point name: Levin D5
Reception Date & Time: 11/01/2023 13:05
Analysis Start Date & Time: 11/01/2023 13:23
Analysis Ending Date: 18/01/2023
Sampled Date & Time 10/01/2023 08:57
Sampler(s) Client nominated external sampler
Sampled by Eurofins False

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.02	(± 0.006) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	(± 0.4) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	<15	(± 5) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	31.9	(± 1.60) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	32.0	(± 0.6) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	0.57	(± 0.14) mg/l	0.01
NW195	**pH**			
	pH	7.0	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	<0.002	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	<0.03	mg/l	0.03
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.0658	(± 0.0132) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005

	RESULTS (UNCERTAINTY)	LOQ
NW116 Soluble Nickel		
Nickel (Ni)	<0.0005 (± 0.0002) mg/l	0.0005

LIST OF METHODS

NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.	NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.	NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Marylou Cabral Laboratory Manager

Jennifer Mont Supervisor

Amitesh Kumar Supervisor

Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Ivan Imamura Laboratory Analyst

Leo Cleave Senior Analyst

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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-002185-01** REPORT DATE **20/01/2023**

Attention Downer NZ Ltd (EDI Levin)
Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND

Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill

Order code: EUNZWE-00100853

SAMPLE CODE **812-2023-00004559**

Client Reference: 270650-0
Sampling Point code: WIL-D6
Sampling Point name: Levin D6
Reception Date & Time: 13/01/2023 8:35
Analysis Start Date & Time: 13/01/2023 10:33
Analysis Ending Date: 20/01/2023
Sampled Date & Time 11/01/2023 11:51
Sampler(s) Client nominated external sampler
Sampled by Eurofins False

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	<0.01	(± 0.003) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	(± 0.4) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	18	(± 6) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	13.6	(± 0.68) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	32.7	(± 0.7) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	9.81	(± 0.98) mg/l	0.01
NW195	**pH**			
	pH	6.9	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	0.003	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.03	mg/l	0.03
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.0010	(± 0.0003) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005

	RESULTS (UNCERTAINTY)	LOQ
NW116 Soluble Nickel		
Nickel (Ni)	<0.0005 (± 0.0002) mg/l	0.0005

LIST OF METHODS

NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.	NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.	NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Marylou Cabral Laboratory Manager

Amitesh Kumar Supervisor

Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Sunita Raju Business Unit Manager

Ivan Imamura Laboratory Analyst

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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-002616-01** REPORT DATE **22/01/2023**

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Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND

Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill

Order code: EUNZWE-00100853

SAMPLE CODE **812-2023-00004576**

Client Reference: 270634-0
Sampling Point code: WIL-E1d
Sampling Point name: Levin E1d
Reception Date & Time: 13/01/2023 8:35
Analysis Start Date & Time: 13/01/2023 11:01
Analysis Ending Date: 22/01/2023
Sampled Date & Time 11/01/2023 07:30
Sampler(s) Client nominated external sampler
Sampled by Eurofins False

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.18	(± 0.06) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	(± 0.4) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	16	(± 6) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	38.7	(± 1.93) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	44.6	(± 0.9) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	0.01	(± 0.005) mg/l	0.01
NW195	**pH**			
	pH	7.8	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	<0.002	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.04	mg/l	0.03
NW109	**Soluble Iron**			
	Iron (Fe)	0.09	(± 0.02) mg/l	0.01
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.239	(± 0.0239) mg/l	0.0005

		RESULTS (UNCERTAINTY)		LOQ
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005
NW120	**Soluble Sodium**			
	Sodium (Na)	35.3	mg/l	0.01

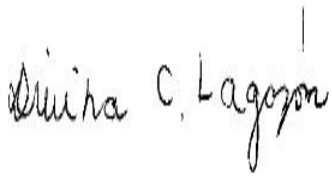
LIST OF METHODS

NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW109	**Soluble Iron:** APHA Online Edition 3125 B mod.	NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.
NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.	NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.
NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.	NW120	**Soluble Sodium:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Jennifer Mont Supervisor

Amitesh Kumar Supervisor



Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Sunita Raju Business Unit Manager

Ivan Imamura Laboratory Analyst

Gabriela Carvalhaes Lean Project Manager

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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-003902-01** REPORT DATE **31/01/2023**

Attention Downer NZ Ltd (EDI Levin)
Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND

Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill

Order code: EUNZWE-00100853

SAMPLE CODE **812-2023-00004504**

Client Reference: 270645-0
Sampling Point code: WIL-E1s
Sampling Point name: Levin E1s
Reception Date & Time: 13/01/2023 8:35
Analysis Start Date & Time: 13/01/2023 08:55
Analysis Ending Date: 31/01/2023
Sampled Date & Time 11/01/2023 12:29
Sampler(s) Client nominated external sampler
Sampled by Eurofins False

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.16	(± 0.05) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	(± 0.4) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	<15	(± 5) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	27.6	(± 1.38) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	25.4	(± 0.5) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	<0.01	(± 0.003) mg/l	0.01
NW195	**pH**			
	pH	7.1	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	0.006	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	<0.03	mg/l	0.03
NW109	**Soluble Iron**			
	Iron (Fe)	4.30	(± 0.86) mg/l	0.01
NW110	**Soluble Lead**			
	Lead (Pb)	0.0018	(± 0.0003) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.214	(± 0.0214) mg/l	0.0005

		RESULTS (UNCERTAINTY)		LOQ
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005
NW120	**Soluble Sodium**			
	Sodium (Na)	27.5	mg/l	0.01

LIST OF METHODS

NW007	**Chloride:** APHA Online Edition 4110 B
NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D
NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.
NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW109	**Soluble Iron:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.
NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.
NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW120	**Soluble Sodium:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H
NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B
ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Marylou Cabral Laboratory Manager

Amitesh Kumar Supervisor

Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Pathma Ranjanie Senior laboratory Analyst

Ivan Imamura Laboratory Analyst

EXPLANATORY NOTE

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Not Detected means not detected at or above the Limit of Quantification (LOQ
LOQ means Limit of Quantification and the unit of LOQ is the same as the result unit

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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-002184-01** REPORT DATE **20/01/2023**

Attention Downer NZ Ltd (EDI Levin)
Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND

Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill

Order code: EUNZWE-00100853

SAMPLE CODE **812-2023-00004542**

Client Reference: 270635-0
Sampling Point code: WIL-E2d
Sampling Point name: Levin E2d
Reception Date & Time: 13/01/2023 8:35
Analysis Start Date & Time: 13/01/2023 09:46
Analysis Ending Date: 20/01/2023
Sampled Date & Time 11/01/2023 08:25
Sampler(s) Client nominated external sampler
Sampled by Eurofins False

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.31	(± 0.09) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	(± 0.4) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	26	(± 6) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	42.4	(± 2.12) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	34.8	(± 0.7) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	<0.01	(± 0.004) mg/l	0.01
NW195	**pH**			
	pH	7.7	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	<0.002	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	<0.03	mg/l	0.03
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.261	(± 0.0261) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005

		RESULTS (UNCERTAINTY)		LOQ
NW116	**Soluble Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005

LIST OF METHODS

NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.	NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.	NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Marylou Cabral Laboratory Manager

Amitesh Kumar Supervisor

Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Sunita Raju Business Unit Manager

Ivan Imamura Laboratory Analyst

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ANALYTICAL REPORT

REPORT CODE **AR-23-NW-003901-01** REPORT DATE **31/01/2023**

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Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND
Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz
Copy to: Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Gabriela Carvalhaes **Order code:** EUNZWE-00100853
Contract: Landfill

SAMPLE CODE **812-2023-00004503**

Client Reference: 270646-0
Sampling Point code: WIL-E2s **Sampling Point name:** Levin E2s
Reception Date & Time: 13/01/2023 8:35
Analysis Start Date & Time: 13/01/2023 08:55 **Analysis Ending Date:** 31/01/2023
Sampled Date & Time 11/01/2023 12:57 **Sampler(s)** Client nominated external sampler
Sampled by Eurofins False

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.20	(± 0.06) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	(± 0.4) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	44	(± 8) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	41.2	(± 2.06) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	43.8	(± 0.9) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	0.07	(± 0.02) mg/l	0.01
NW195	**pH**			
	pH	7.4	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	0.004	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.06	mg/l	0.03
NW109	**Soluble Iron**			
	Iron (Fe)	0.06	(± 0.01) mg/l	0.01
NW110	**Soluble Lead**			
	Lead (Pb)	0.0051	(± 0.0005) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.358	(± 0.0358) mg/l	0.0005

		RESULTS (UNCERTAINTY)		LOQ
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	0.0006	(± 0.0002) mg/l	0.0005
NW120	**Soluble Sodium**			
	Sodium (Na)	41.3	mg/l	0.01

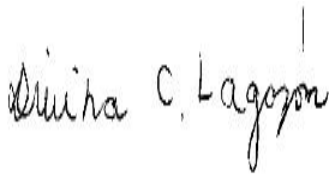
LIST OF METHODS

NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW109	**Soluble Iron:** APHA Online Edition 3125 B mod.	NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.
NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.	NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.
NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.	NW120	**Soluble Sodium:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Marylou Cabral Laboratory Manager

Amitesh Kumar Supervisor



Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Sunita Raju Business Unit Manager

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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-001899-01** REPORT DATE **18/01/2023**

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Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND

Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill

Order code: EUNZWE-00099813

SAMPLE CODE **812-2023-00003474**

Client Reference: 270654-0
Sampling Point code: WIL-F1
Sampling Point name: Levin F1
Reception Date & Time: 11/01/2023 13:05
Analysis Start Date & Time: 11/01/2023 14:04
Analysis Ending Date: 18/01/2023
Sampled Date & Time 10/01/2023 09:37
Sampler(s) Client nominated external sampler
Sampled by Eurofins False

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	<0.01	(± 0.003) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	(± 0.4) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	24	(± 6) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	38.0	(± 1.90) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	40.1	(± 0.8) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	0.57	(± 0.14) mg/l	0.01
NW195	**pH**			
	pH	7.0	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	0.002	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	<0.03	mg/l	0.03
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.0038	(± 0.0008) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005

	RESULTS (UNCERTAINTY)		LOQ
NW116 Soluble Nickel			
Nickel (Ni)	0.0007	(± 0.0003) mg/l	0.0005

LIST OF METHODS

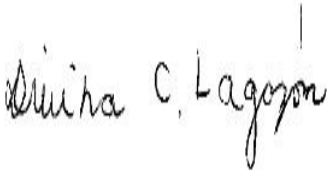
NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.	NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.	NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Marylou Cabral Laboratory Manager

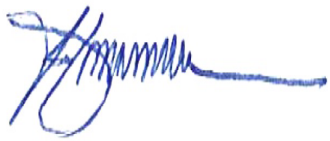
Jennifer Mont Supervisor

Amitesh Kumar Supervisor



Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst



Ivan Imamura Laboratory Analyst

Leo Cleave Senior Analyst

EXPLANATORY NOTE

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N/A means Not applicable
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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-001894-01** REPORT DATE **18/01/2023**

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Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND

Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill

Order code: EUNZWE-00099813

SAMPLE CODE **812-2023-00003371**

Client Reference: 270655-0
Sampling Point code: WIL-F2
Sampling Point name: Levin F2
Reception Date & Time: 11/01/2023 13:05
Analysis Start Date & Time: 11/01/2023 13:16
Analysis Ending Date: 18/01/2023
Sampled Date & Time 10/01/2023 10:05
Sampler(s) Client nominated external sampler
Sampled by Eurofins False

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	<0.01	(± 0.004) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	(± 0.4) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	<15	(± 5) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	24.1	(± 1.21) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	22.2	(± 0.4) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	0.34	(± 0.08) mg/l	0.01
NW195	**pH**			
	pH	6.9	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	<0.002	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	<0.03	mg/l	0.03
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.0102	(± 0.0020) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005

	RESULTS (UNCERTAINTY)	LOQ
NW116 Soluble Nickel		
Nickel (Ni)	<0.0005 (± 0.0002) mg/l	0.0005

LIST OF METHODS

NW007	**Chloride:** APHA Online Edition 4110 B
NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D
NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.
NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.
NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.
NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H
NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B
ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Marylou Cabral Laboratory Manager

Jennifer Mont Supervisor

Amitesh Kumar Supervisor

Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Ivan Imamura Laboratory Analyst

Leo Cleave Senior Analyst

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LOQ means Limit of Quantification and the unit of LOQ is the same as the result unit

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Eurofins ELS Limited
85 Port Road
Seaview
Lower Hutt
Wellington 5010
NEW ZEALAND

Phone +64 4 576 5016
www.eurofins.co.nz

Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-001893-01** REPORT DATE **18/01/2023**

Attention Downer NZ Ltd (EDI Levin)
Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND

Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill

Order code: EUNZWE-00099813

SAMPLE CODE **812-2023-00003365**

Client Reference: 270656-0
Sampling Point code: WIL-F3
Sampling Point name: Levin F3
Reception Date & Time: 11/01/2023 13:05
Analysis Start Date & Time: 11/01/2023 13:07
Analysis Ending Date: 18/01/2023
Sampled Date & Time 10/01/2023 10:25
Sampler(s) Client nominated external sampler
Sampled by Eurofins False

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	<0.01	(± 0.003) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	(± 0.4) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	<15	(± 5) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	42.4	(± 2.12) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	26.9	(± 0.5) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	0.72	(± 0.18) mg/l	0.01
NW195	**pH**			
	pH	7.4	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	<0.002	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	<0.03	mg/l	0.03
NW109	**Soluble Iron**			
	Iron (Fe)	<0.01	(± 0.003) mg/l	0.01
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	<0.0005	(± 0.0002) mg/l	0.0005

		RESULTS (UNCERTAINTY)		LOQ
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005
NW120	**Soluble Sodium**			
	Sodium (Na)	27.5	mg/l	0.01

LIST OF METHODS

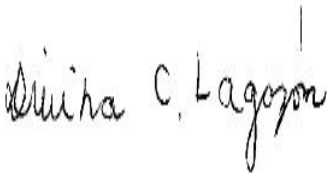
NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW109	**Soluble Iron:** APHA Online Edition 3125 B mod.	NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.
NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.	NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.
NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.	NW120	**Soluble Sodium:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Marylou Cabral Laboratory Manager

Jennifer Mont Supervisor

Amitesh Kumar Supervisor



Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Ivan Imamura Laboratory Analyst

Leo Cleave Senior Analyst

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Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND

Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill

Order code: EUNZWE-00099813

SAMPLE CODE **812-2023-00003421**

Client Reference: 270636-0
Sampling Point code: WIL-G1D
Sampling Point name: Levin G1D
Reception Date & Time: 11/01/2023 13:05
Analysis Start Date & Time: 11/01/2023 13:32
Analysis Ending Date: 18/01/2023
Sampled Date & Time 10/01/2023 19:19
Sampler(s) Client nominated external sampler
Sampled by Eurofins False

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.10	(± 0.03) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	(± 0.4) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	<15	(± 5) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	32.0	(± 1.60) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	28.2	(± 0.6) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	<0.01	(± 0.003) mg/l	0.01
NW195	**pH**			
	pH	6.8	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	<0.002	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	<0.03	mg/l	0.03
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.0623	(± 0.0125) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005

	RESULTS (UNCERTAINTY)	LOQ
NW116 Soluble Nickel		
Nickel (Ni)	<0.0005 (± 0.0002) mg/l	0.0005

LIST OF METHODS

NW007	**Chloride:** APHA Online Edition 4110 B
NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D
NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.
NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.
NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.
NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H
NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B
ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Marylou Cabral Laboratory Manager

Jennifer Mont Supervisor

Amitesh Kumar Supervisor

Divina Cunanan Lagazon Supervisor

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Ivan Imamura Laboratory Analyst

Leo Cleave Senior Analyst

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ANALYTICAL REPORT

REPORT CODE **AR-23-NW-001898-01** REPORT DATE **18/01/2023**

Attention Downer NZ Ltd (EDI Levin)
Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND
Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz
Copy to: Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Gabriela Carvalhaes **Order code:** EUNZWE-00099813
Contract: Landfill

SAMPLE CODE **812-2023-00003445**

Client Reference: 270651-0
Sampling Point code: WIL-G1S **Sampling Point name:** Levin G1S
Reception Date & Time: 11/01/2023 13:05
Analysis Start Date & Time: 11/01/2023 13:55 **Analysis Ending Date:** 18/01/2023
Sampled Date & Time 10/01/2023 19:37 **Sampler(s)** Client nominated external sampler
Sampled by Eurofins False

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.04	(± 0.01) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	(± 0.4) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	84	(± 14) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	76.2	(± 3.81) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	49.3	(± 1.0) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	0.05	(± 0.01) mg/l	0.01
NW195	**pH**			
	pH	6.5	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	0.124	(± 0.012) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	<0.03	mg/l	0.03
NW109	**Soluble Iron**			
	Iron (Fe)	2.43	(± 0.49) mg/l	0.01
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.0675	(± 0.0135) mg/l	0.0005

		RESULTS (UNCERTAINTY)		LOQ
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	0.0017	(± 0.0005) mg/l	0.0005
NW120	**Soluble Sodium**			
	Sodium (Na)	81.8	mg/l	0.01

LIST OF METHODS

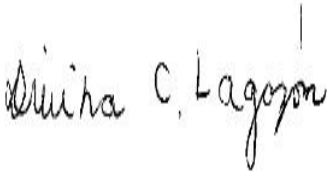
NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW109	**Soluble Iron:** APHA Online Edition 3125 B mod.	NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.
NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.	NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.
NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.	NW120	**Soluble Sodium:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Marylou Cabral Laboratory Manager

Jennifer Mont Supervisor

Amitesh Kumar Supervisor



Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Ivan Imamura Laboratory Analyst

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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-001897-01** REPORT DATE **18/01/2023**

Attention Downer NZ Ltd (EDI Levin)
Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND

Phone (06) 367 2705
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Contract: Landfill

Order code: EUNZWE-00099813

SAMPLE CODE **812-2023-00003429**

Client Reference: 270652-0
Sampling Point code: WIL-G2
Sampling Point name: Levin G2s
Reception Date & Time: 11/01/2023 13:05
Analysis Start Date & Time: 11/01/2023 13:43
Analysis Ending Date: 18/01/2023
Sampled Date & Time 10/01/2023 08:15
Sampler(s) Client nominated external sampler
Sampled by Eurofins False

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.04	(± 0.01) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	(± 0.4) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	95	(± 15) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	585	(± 29.2) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	215	(± 4.3) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	<0.01	(± 0.003) mg/l	0.01
NW195	**pH**			
	pH	6.4	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	0.004	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.40	mg/l	0.03
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.330	(± 0.0330) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005

	RESULTS (UNCERTAINTY)		LOQ
NW116 Soluble Nickel			
Nickel (Ni)	0.0012	(± 0.0004) mg/l	0.0005

LIST OF METHODS

NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.	NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.	NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Marylou Cabral Laboratory Manager

Jennifer Mont Supervisor

Amitesh Kumar Supervisor

Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Ivan Imamura Laboratory Analyst

Leo Cleave Senior Analyst

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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-002337-01** REPORT DATE **20/01/2023**

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Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND

Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill

Order code: EUNZWE-00082944

SAMPLE CODE **812-2022-00135449**

Client Reference: 265423-0
Sampling Point code: WIL-HS1
Sampling Point name: Levin HS1
Reception Date & Time: 07/12/2022 14:25
Analysis Start Date & Time: 07/12/2022 14:45
Analysis Ending Date: 20/01/2023
Sampled Date & Time 06/12/2022 12:04
Sampler(s) Client nominated external sampler
Sampled by Eurofins False

		RESULTS (UNCERTAINTY)		LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.02	(± 0.006) mg/l	0.01
NW583	**Arsenic - Soluble**			
	Arsenic (As)	<0.001	(± 0.0004) mg/l	0.001
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	(± 0.4) mg/l	1
NW457	**Calcium - Dissolved**			
	Calcium (Ca)	13.6	(± 1.36) mg/l	0.01
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	40	(± 8) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	26.6	(± 1.33) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	23.8	(± 0.5) mS/m	0.1
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	0.008	(± 0.002) mg/l	0.005
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	500	cfu/100 ml	100
NW460	**Iron - Dissolved**			
	Iron (Fe)	0.131	(± 0.026) mg/l	0.005
NW462	**Magnesium - Dissolved**			
	Magnesium (Mg)	7.43	(± 0.74) mg/l	0.01
NW010	**Nitrate-N**			
	Nitrate-N	<0.01	(± 0.004) mg/l	0.01
NW195	**pH**			
	pH	7.5	(± 0.2)	0.1

		RESULTS (UNCERTAINTY)		LOQ
③VQ088	**Phenolics (Total)**			
	Total phenols	<0.05	mg/l	0.05
NW469	**Sodium - Dissolved**			
	Sodium (Na)	20.7	(± 2.07) mg/l	0.02
NW098	**Soluble Aluminium**			
	Aluminium	0.016	(± 0.002) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.07	mg/l	0.03
NW104	**Soluble Cadmium**			
	Cadmium (Cd)	<0.0002	(± 0.0001) mg/l	0.0002
NW106	**Soluble Chromium**			
	Chromium (Cr)	<0.001	(± 0.0003) mg/l	0.001
NW108	**Soluble Copper**			
	Copper (Cu)	0.0020	(± 0.0004) mg/l	0.0005
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.0409	(± 0.0082) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	0.0005	(± 0.0002) mg/l	0.0005
NW117	**Soluble Potassium**			
	Potassium (K)	4.84	mg/l	0.01
NW125	**Soluble Zinc**			
	Zinc (Zn)	0.729	(± 0.073) mg/l	0.002
NW011	**Sulphate**			
	Sulphate	22.8	(± 1.14) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	18	mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	58	(± 6) mg CaCO3/l	1
NW029	**Total Hardness**			
	Hardness	65	(± 6) mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	7.0	(± 0.7) mg/l	0.1
③VQ876	**Volatile Fatty Acids (VFA) by GC-MS**			
	Acetic acid	<5	mg/l	5
	Butyric acid	<5	mg/l	5
	Heptanoic Acid C7:0	<5	mg/l	5
	Hexanoic acid	<5	mg/l	5
	Iso caproic acid	<5	mg/l	5
	Isobutyric acid	<5	mg/l	5

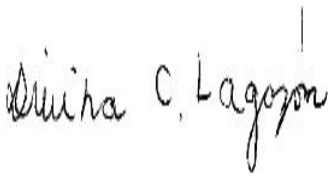
	RESULTS (UNCERTAINTY)		LOQ
③VQ876 **Volatile Fatty Acids (VFA) by GC-MS**			
Isovaleric acid	<5	mg/l	5
Propionic acid	<5	mg/l	5
Valeric acid	<5	mg/l	5
Volatile fatty acids as acetic acid	<5	mg/l	5

LIST OF METHODS

NW003 **Total Alkalinity:** APHA Online Edition 2320 B
NW007 **Chloride:** APHA Online Edition 4110 B
NW010 **Nitrate-N:** APHA Online Edition 4110 B
NW011 **Sulphate:** APHA Online Edition 4110 B
NW020 **Chemical Oxygen Demand:** APHA Online Edition 5220 D
NW023 **Conductivity:** APHA Online Edition 2510 B
NW029 **Total Hardness:** APHA Online Edition 2340 B
NW098 **Soluble Aluminium:** APHA Online Edition 3125 B mod.
NW103 **Soluble Boron:** APHA Online Edition 3125 B mod.
NW104 **Soluble Cadmium:** APHA Online Edition 3125 B mod.
NW106 **Soluble Chromium:** APHA Online Edition 3125 B mod.
NW108 **Soluble Copper:** APHA Online Edition 3125 B mod.
NW110 **Soluble Lead:** APHA Online Edition 3125 B mod.
NW113 **Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114 **Soluble Mercury:** APHA Online Edition 3125 B mod.
NW116 **Soluble Nickel:** APHA Online Edition 3125 B mod.
NW117 **Soluble Potassium:** APHA Online Edition 3125 B mod.
NW125 **Soluble Zinc:** APHA Online Edition 3125 B mod.
NW179 **Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H
NW193 **Dissolved Reactive Phosphorus:** APHA Online Edition 4500-P G
NW195 **pH:** APHA Online Edition 4500-H B
NW206 **Suspended Solids:** APHA Online Edition 2540 D
NW210 **Total Non-Purgeable Organic Carbon:** APHA Online Edition 5310 B
NW341 **BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B
NW457 **Calcium - Dissolved:** APHA Online Edition 3120 B mod.
NW460 **Iron - Dissolved:** APHA Online Edition 3120 B mod.
NW462 **Magnesium - Dissolved:** APHA Online Edition 3120 B mod.
NW469 **Sodium - Dissolved:** APHA Online Edition 3120 B mod.
NW583 **Arsenic - Soluble:** APHA Online Edition 3125 B mod.
VQ088 **Phenolics (Total):** APHA 5530
VQ876 **Volatile Fatty Acids (VFA) by GC-MS:** APHA 5560-D
ZM2GA **Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature


Amitesh Kumar Supervisor


Divina Cunanan Lagazon Supervisor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Arvinder Singh Supervisor


Marylou Cabral Laboratory Manager

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Eurofins ELS Limited
85 Port Road
Seaview
Lower Hutt
Wellington 5010
NEW ZEALAND

Phone +64 4 576 5016
www.eurofins.co.nz

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ANALYTICAL REPORT

REPORT CODE **AR-23-NW-005633-01** REPORT DATE **12/02/2023**

Attention Downer NZ Ltd (EDI Levin)
Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND
Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill
Order code: EUNZWE-00100853

SAMPLE CODE **812-2023-00004897**

Client Reference: 270661-0
Sampling Point code: WIL-HS1
Sampling Point name: Levin HS1
Reception Date & Time: 13/01/2023 8:35
Analysis Start Date & Time: 13/01/2023 19:54
Analysis Ending Date: 12/02/2023
Sampled Date & Time 12/01/2023 12:00
Sampler(s) Client nominated external sampler
Sampled by Eurofins False

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.23	(± 0.07) mg/l	0.01
NW583	**Arsenic - Soluble**			
	Arsenic (As)	<0.001	(± 0.0004) mg/l	0.001
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<6	(± 0.8) mg/l	1
NW457	**Calcium - Dissolved**			
	Calcium (Ca)	14.8	(± 1.48) mg/l	0.01
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	36	(± 7) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	25.4	(± 1.27) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	25.7	(± 0.5) mS/m	0.1
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	0.071	(± 0.014) mg/l	0.005
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	300	cfu/100 ml	100
NW460	**Iron - Dissolved**			
	Iron (Fe)	0.091	(± 0.018) mg/l	0.005
NW462	**Magnesium - Dissolved**			
	Magnesium (Mg)	7.88	(± 0.79) mg/l	0.01
NW010	**Nitrate-N**			
	Nitrate-N	0.08	(± 0.02) mg/l	0.01
NW195	**pH**			
	pH	7.3	(± 0.2)	0.1

		RESULTS	(UNCERTAINTY)	LOQ
③VQ088	**Phenolics (Total)**			
	Total phenols	<0.05	mg/l	0.05
NW469	**Sodium - Dissolved**			
	Sodium (Na)	22.3	(± 2.23) mg/l	0.02
NW098	**Soluble Aluminium**			
	Aluminium	0.029	(± 0.003) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.05	mg/l	0.03
NW104	**Soluble Cadmium**			
	Cadmium (Cd)	<0.0002	(± 0.0001) mg/l	0.0002
NW106	**Soluble Chromium**			
	Chromium (Cr)	<0.001	(± 0.0003) mg/l	0.001
NW108	**Soluble Copper**			
	Copper (Cu)	0.0012	(± 0.0003) mg/l	0.0005
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.0375	(± 0.0075) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005
NW117	**Soluble Potassium**			
	Potassium (K)	3.13	mg/l	0.01
NW125	**Soluble Zinc**			
	Zinc (Zn)	0.004	(± 0.0008) mg/l	0.002
NW011	**Sulphate**			
	Sulphate	20.5	(± 1.02) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	20	mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	62	(± 6) mg CaCO3/l	1
NW029	**Total Hardness**			
	Hardness	69	(± 7) mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	7.5	(± 0.8) mg/l	0.1
③VQ876	**Volatile Fatty Acids (VFA) by GC-MS**			
	Acetic acid	<5	mg/l	5
	Butyric acid	<5	mg/l	5
	Heptanoic Acid C7:0	<5	mg/l	5
	Hexanoic acid	<5	mg/l	5
	Iso caproic acid	<5	mg/l	5
	Isobutyric acid	<5	mg/l	5
	Isovaleric acid	<5	mg/l	5

	RESULTS (UNCERTAINTY)		LOQ
③VQ876 **Volatile Fatty Acids (VFA) by GC-MS**			
Propionic acid	<5	mg/l	5
Valeric acid	<5	mg/l	5
Volatile fatty acids as acetic acid	<5	mg/l	5

LIST OF METHODS

NW003	**Total Alkalinity:** APHA Online Edition 2320 B	NW007	**Chloride:** APHA Online Edition 4110 B
NW010	**Nitrate-N:** APHA Online Edition 4110 B	NW011	**Sulphate:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW029	**Total Hardness:** APHA Online Edition 2340 B	NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.
NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.	NW104	**Soluble Cadmium:** APHA Online Edition 3125 B mod.
NW106	**Soluble Chromium:** APHA Online Edition 3125 B mod.	NW108	**Soluble Copper:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.	NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.	NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW117	**Soluble Potassium:** APHA Online Edition 3125 B mod.	NW125	**Soluble Zinc:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW193	**Dissolved Reactive Phosphorus:** APHA Online Edition 4500-P G
NW195	**pH:** APHA Online Edition 4500-H B	NW206	**Suspended Solids:** APHA Online Edition 2540 D
NW210	**Total Non-Purgeable Organic Carbon:** APHA Online Edition 5310 B	NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B
NW457	**Calcium - Dissolved:** APHA Online Edition 3120 B mod.	NW460	**Iron - Dissolved:** APHA Online Edition 3120 B mod.
NW462	**Magnesium - Dissolved:** APHA Online Edition 3120 B mod.	NW469	**Sodium - Dissolved:** APHA Online Edition 3120 B mod.
NW583	**Arsenic - Soluble:** APHA Online Edition 3125 B mod.	VQ088	**Phenolics (Total):** APHA 5530
VQ876	**Volatile Fatty Acids (VFA) by GC-MS:** APHA 5560-D	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Marylou Cabral Laboratory Manager

Amitesh Kumar Supervisor

Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Ivan Imamura Laboratory Analyst

Leo Cleave Senior Analyst

Gabriela Carvalhaes Manager Food and Water Testing Chemistry

EXPLANATORY NOTE

Eurofins ELS Limited
85 Port Road
Seaview
Lower Hutt
Wellington 5010
NEW ZEALAND

Phone +64 4 576 5016
www.eurofins.co.nz

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③ Test is subcontracted within Eurofins group and is not accredited
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N/A means Not applicable
Not Detected means not detected at or above the Limit of Quantification (LOQ)
LOQ means Limit of Quantification and the unit of LOQ is the same as the result unit

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Eurofins ELS Limited
85 Port Road
Seaview
Lower Hutt
Wellington 5010
NEW ZEALAND

Phone +64 4 576 5016
www.eurofins.co.nz

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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-000075-01** REPORT DATE **03/01/2023**

Attention Downer NZ Ltd (EDI Levin)
Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND

Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill

Order code: EUNZWE-00068716

SAMPLE CODE **812-2022-00120658**

Client Reference: 261806-0
Sampling Point WIL-HS1:Levin HS1
Reception Date & Time: 03/11/2022 20:10
Analysis Start Date & Time: 03/11/2022 20:33
Analysis Ending Date: 03/01/2023
Sampled Date & Time 02/11/2022 11:42
Sampler(s) Client nominated external sampler
Sampled by Eurofins False

		RESULTS (UNCERTAINTY)		LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.17	(± 0.05) mg/l	0.01
NW583	**Arsenic - Soluble**			
	Arsenic (As)	<0.001	(± 0.0004) mg/l	0.001
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	(± 0.4) mg/l	1
NW457	**Calcium - Dissolved**			
	Calcium (Ca)	15.4	(± 1.54) mg/l	0.01
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	21	(± 6) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	23.0	(± 1.15) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	25.3	(± 0.5) mS/m	0.1
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	0.037	(± 0.008) mg/l	0.005
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW460	**Iron - Dissolved**			
	Iron (Fe)	0.076	(± 0.015) mg/l	0.005
NW462	**Magnesium - Dissolved**			
	Magnesium (Mg)	8.00	(± 0.80) mg/l	0.01
NW010	**Nitrate-N**			
	Nitrate-N	0.93	(± 0.23) mg/l	0.01
NW195	**pH**			
	pH	7.5	(± 0.2)	0.1

		RESULTS	(UNCERTAINTY)	LOQ
③VQ088	**Phenolics (Total)**			
	Total phenols	<0.05	mg/l	0.05
NW469	**Sodium - Dissolved**			
	Sodium (Na)	21.1	(± 2.11) mg/l	0.02
NW098	**Soluble Aluminium**			
	Aluminium	0.027	(± 0.003) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.07	mg/l	0.03
NW104	**Soluble Cadmium**			
	Cadmium (Cd)	<0.0002	(± 0.0001) mg/l	0.0002
NW106	**Soluble Chromium**			
	Chromium (Cr)	<0.001	(± 0.0003) mg/l	0.001
NW108	**Soluble Copper**			
	Copper (Cu)	0.0013	(± 0.0003) mg/l	0.0005
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.0155	(± 0.0031) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	0.0005	(± 0.0002) mg/l	0.0005
NW117	**Soluble Potassium**			
	Potassium (K)	3.38	mg/l	0.01
NW125	**Soluble Zinc**			
	Zinc (Zn)	<0.002	(± 0.0007) mg/l	0.002
NW011	**Sulphate**			
	Sulphate	21.7	(± 1.09) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	28	mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	60	(± 6) mg CaCO3/l	1
NW029	**Total Hardness**			
	Hardness	71	(± 7) mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	6.1	(± 0.6) mg/l	0.1
③VQ876	**Volatile Fatty Acids (VFA) by GC-MS**			
	Acetic acid	<5	mg/l	5
	Butyric acid	<5	mg/l	5
	Heptanoic Acid C7:0	<5	mg/l	5
	Hexanoic acid	<5	mg/l	5
	Iso caproic acid	<5	mg/l	5
	Isobutyric acid	<5	mg/l	5

	RESULTS (UNCERTAINTY)		LOQ
③VQ876 **Volatile Fatty Acids (VFA) by GC-MS**			
Isovaleric acid	<5	mg/l	5
Propionic acid	<5	mg/l	5
Valeric acid	<5	mg/l	5
Volatile fatty acids as acetic acid	<5	mg/l	5

LIST OF METHODS

NW003 **Total Alkalinity:** APHA Online Edition 2320 B
NW007 **Chloride:** APHA Online Edition 4110 B
NW010 **Nitrate-N:** APHA Online Edition 4110 B
NW011 **Sulphate:** APHA Online Edition 4110 B
NW020 **Chemical Oxygen Demand:** APHA Online Edition 5220 D
NW023 **Conductivity:** APHA Online Edition 2510 B
NW029 **Total Hardness:** APHA Online Edition 2340 B
NW098 **Soluble Aluminium:** APHA Online Edition 3125 B mod.
NW103 **Soluble Boron:** APHA Online Edition 3125 B mod.
NW104 **Soluble Cadmium:** APHA Online Edition 3125 B mod.
NW106 **Soluble Chromium:** APHA Online Edition 3125 B mod.
NW108 **Soluble Copper:** APHA Online Edition 3125 B mod.
NW110 **Soluble Lead:** APHA Online Edition 3125 B mod.
NW113 **Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114 **Soluble Mercury:** APHA Online Edition 3125 B mod.
NW116 **Soluble Nickel:** APHA Online Edition 3125 B mod.
NW117 **Soluble Potassium:** APHA Online Edition 3125 B mod.
NW125 **Soluble Zinc:** APHA Online Edition 3125 B mod.
NW179 **Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H
NW193 **Dissolved Reactive Phosphorus:** APHA Online Edition 4500-P G
NW195 **pH:** APHA Online Edition 4500-H B
NW206 **Suspended Solids:** APHA Online Edition 2540 D
NW210 **Total Non-Purgeable Organic Carbon:** APHA Online Edition 5310 B
NW341 **BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B
NW457 **Calcium - Dissolved:** APHA Online Edition 3120 B mod.
NW460 **Iron - Dissolved:** APHA Online Edition 3120 B mod.
NW462 **Magnesium - Dissolved:** APHA Online Edition 3120 B mod.
NW469 **Sodium - Dissolved:** APHA Online Edition 3120 B mod.
NW583 **Arsenic - Soluble:** APHA Online Edition 3125 B mod.
VQ088 **Phenolics (Total):** APHA 5530
VQ876 **Volatile Fatty Acids (VFA) by GC-MS:** APHA 5560-D
ZM2GA **Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Jennifer Mont Supervisor
Amitesh Kumar Supervisor
Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst
Leo Cleave Senior Analyst
Marylou Cabral Laboratory Manager

EXPLANATORY NOTE

① Test is not accredited
② Test is subcontracted within Eurofins group and is accredited
③ Test is subcontracted within Eurofins group and is not accredited
④ Test is subcontracted outside Eurofins group and is accredited
⑤ Test is subcontracted outside Eurofins group and is not accredited
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⑦ Tested at the sampling point by Eurofins and is not accredited
⑧ Tested at the sampling point by Eurofins and is accredited

N/A means Not applicable
Not Detected means not detected at or above the Limit of Quantification (LOQ)
LOQ means Limit of Quantification and the unit of LOQ is the same as the result unit

Eurofins ELS Limited
85 Port Road
Seaview
Lower Hutt
Wellington 5010
NEW ZEALAND

Phone +64 4 576 5016
www.eurofins.co.nz

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The Customer acknowledges and accepts that: (a) it is solely responsible for the sampling process and warrants that the sample provided to Eurofins is representative of the lot / batch from which the samples were drawn; and (b) Eurofins expresses no opinion and accepts no liability in respect of the Customer's production process or homogeneity of the sample.
The Eurofins water sampling services uses IANZ approved methodology based on AS/NZS 5667 and / or best practice to collect and transport samples that are fit for the purpose of analytical testing. Eurofins shall have no liability if the sample collected is not representative of the source from which it has been taken. The laboratory is not responsible for sampling activities unless explicitly indicated by the statement "Sampled by Eurofins" on the report for water samples.
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ANALYTICAL REPORT

REPORT CODE **AR-23-NW-002338-01** REPORT DATE **20/01/2023**

Attention Downer NZ Ltd (EDI Levin)
Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND

Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill

Order code: EUNZWE-00082944

SAMPLE CODE **812-2022-00135482**

Client Reference: 265424-0
Sampling Point code: WIL-HS1A
Sampling Point name: Levin HS1A
Reception Date & Time: 07/12/2022 14:25
Analysis Start Date & Time: 07/12/2022 14:45
Analysis Ending Date: 20/01/2023
Sampled Date & Time 06/12/2022 12:05
Sampler(s) Client nominated external sampler
Sampled by Eurofins False

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.09	(± 0.03) mg/l	0.01
NW583	**Arsenic - Soluble**			
	Arsenic (As)	<0.001	(± 0.0004) mg/l	0.001
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	6	(± 1) mg/l	1
NW457	**Calcium - Dissolved**			
	Calcium (Ca)	13.7	(± 1.37) mg/l	0.01
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	29	(± 7) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	22.9	(± 1.15) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	23.4	(± 0.5) mS/m	0.1
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	0.037	(± 0.008) mg/l	0.005
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	200	cfu/100 ml	100
NW460	**Iron - Dissolved**			
	Iron (Fe)	0.093	(± 0.019) mg/l	0.005
NW462	**Magnesium - Dissolved**			
	Magnesium (Mg)	7.54	(± 0.75) mg/l	0.01
NW010	**Nitrate-N**			
	Nitrate-N	0.05	(± 0.01) mg/l	0.01
NW195	**pH**			
	pH	7.5	(± 0.2)	0.1

		RESULTS (UNCERTAINTY)		LOQ
③VQ088	**Phenolics (Total)**			
	Total phenols	<0.05	mg/l	0.05
NW469	**Sodium - Dissolved**			
	Sodium (Na)	20.4	(± 2.04) mg/l	0.02
NW098	**Soluble Aluminium**			
	Aluminium	0.013	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.07	mg/l	0.03
NW104	**Soluble Cadmium**			
	Cadmium (Cd)	<0.0002	(± 0.0001) mg/l	0.0002
NW106	**Soluble Chromium**			
	Chromium (Cr)	<0.001	(± 0.0003) mg/l	0.001
NW108	**Soluble Copper**			
	Copper (Cu)	0.0026	(± 0.0005) mg/l	0.0005
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.0361	(± 0.0072) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	0.0009	(± 0.0003) mg/l	0.0005
NW117	**Soluble Potassium**			
	Potassium (K)	2.89	mg/l	0.01
NW125	**Soluble Zinc**			
	Zinc (Zn)	0.007	(± 0.0009) mg/l	0.002
NW011	**Sulphate**			
	Sulphate	21.8	(± 1.09) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	9	mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	55	(± 6) mg CaCO3/l	1
NW029	**Total Hardness**			
	Hardness	65	(± 7) mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	7.0	(± 0.7) mg/l	0.1
③VQ876	**Volatile Fatty Acids (VFA) by GC-MS**			
	Acetic acid	<5	mg/l	5
	Butyric acid	<5	mg/l	5
	Heptanoic Acid C7:0	<5	mg/l	5
	Hexanoic acid	<5	mg/l	5
	Iso caproic acid	<5	mg/l	5
	Isobutyric acid	<5	mg/l	5

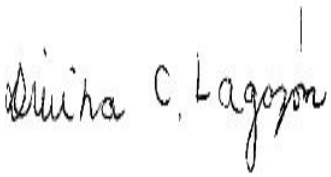
	RESULTS (UNCERTAINTY)		LOQ
③VQ876 **Volatile Fatty Acids (VFA) by GC-MS**			
Isovaleric acid	<5	mg/l	5
Propionic acid	<5	mg/l	5
Valeric acid	<5	mg/l	5
Volatile fatty acids as acetic acid	<5	mg/l	5

LIST OF METHODS

NW003 **Total Alkalinity:** APHA Online Edition 2320 B
NW007 **Chloride:** APHA Online Edition 4110 B
NW010 **Nitrate-N:** APHA Online Edition 4110 B
NW011 **Sulphate:** APHA Online Edition 4110 B
NW020 **Chemical Oxygen Demand:** APHA Online Edition 5220 D
NW023 **Conductivity:** APHA Online Edition 2510 B
NW029 **Total Hardness:** APHA Online Edition 2340 B
NW098 **Soluble Aluminium:** APHA Online Edition 3125 B mod.
NW103 **Soluble Boron:** APHA Online Edition 3125 B mod.
NW104 **Soluble Cadmium:** APHA Online Edition 3125 B mod.
NW106 **Soluble Chromium:** APHA Online Edition 3125 B mod.
NW108 **Soluble Copper:** APHA Online Edition 3125 B mod.
NW110 **Soluble Lead:** APHA Online Edition 3125 B mod.
NW113 **Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114 **Soluble Mercury:** APHA Online Edition 3125 B mod.
NW116 **Soluble Nickel:** APHA Online Edition 3125 B mod.
NW117 **Soluble Potassium:** APHA Online Edition 3125 B mod.
NW125 **Soluble Zinc:** APHA Online Edition 3125 B mod.
NW179 **Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H
NW193 **Dissolved Reactive Phosphorus:** APHA Online Edition 4500-P G
NW195 **pH:** APHA Online Edition 4500-H B
NW206 **Suspended Solids:** APHA Online Edition 2540 D
NW210 **Total Non-Purgeable Organic Carbon:** APHA Online Edition 5310 B
NW341 **BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B
NW457 **Calcium - Dissolved:** APHA Online Edition 3120 B mod.
NW460 **Iron - Dissolved:** APHA Online Edition 3120 B mod.
NW462 **Magnesium - Dissolved:** APHA Online Edition 3120 B mod.
NW469 **Sodium - Dissolved:** APHA Online Edition 3120 B mod.
NW583 **Arsenic - Soluble:** APHA Online Edition 3125 B mod.
VQ088 **Phenolics (Total):** APHA 5530
VQ876 **Volatile Fatty Acids (VFA) by GC-MS:** APHA 5560-D
ZM2GA **Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature


Amitesh Kumar Supervisor


Divina Cunanan Lagazon Supervisor


Gordon McArthur Senior laboratory Analyst


Ivan Imamura Laboratory Analyst


Arvinder Singh Supervisor


Marylou Cabral Laboratory Manager

EXPLANATORY NOTE

① Test is not accredited
② Test is subcontracted within Eurofins group and is accredited
③ Test is subcontracted within Eurofins group and is not accredited
④ Test is subcontracted outside Eurofins group and is accredited
⑤ Test is subcontracted outside Eurofins group and is not accredited
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⑧ Tested at the sampling point by Eurofins and is accredited

N/A means Not applicable
Not Detected means not detected at or above the Limit of Quantification (LOQ
LOQ means Limit of Quantification and the unit of LOQ is the same as the result unit

Eurofins ELS Limited
85 Port Road
Seaview
Lower Hutt
Wellington 5010
NEW ZEALAND

Phone +64 4 576 5016
www.eurofins.co.nz

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END OF REPORT

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ANALYTICAL REPORT

REPORT CODE **AR-23-NW-005635-01** REPORT DATE **12/02/2023**

Attention Downer NZ Ltd (EDI Levin)
Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND
Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill
Order code: EUNZWE-00100853

SAMPLE CODE **812-2023-00004908**

Client Reference: 270662-0
Sampling Point code: WIL-HS1A
Sampling Point name: Levin HS1A
Reception Date & Time: 13/01/2023 8:35
Analysis Start Date & Time: 13/01/2023 19:54
Analysis Ending Date: 12/02/2023
Sampled Date & Time 12/01/2023 11:59
Sampler(s) Client nominated external sampler
Sampled by Eurofins False

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.18	(± 0.05) mg/l	0.01
NW583	**Arsenic - Soluble**			
	Arsenic (As)	<0.001	(± 0.0004) mg/l	0.001
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<6	(± 0.8) mg/l	1
NW457	**Calcium - Dissolved**			
	Calcium (Ca)	14.6	(± 1.46) mg/l	0.01
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	48	(± 9) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	24.7	(± 1.23) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	25.4	(± 0.5) mS/m	0.1
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	0.061	(± 0.012) mg/l	0.005
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	200	cfu/100 ml	100
NW460	**Iron - Dissolved**			
	Iron (Fe)	0.153	(± 0.031) mg/l	0.005
NW462	**Magnesium - Dissolved**			
	Magnesium (Mg)	7.88	(± 0.79) mg/l	0.01
NW010	**Nitrate-N**			
	Nitrate-N	0.11	(± 0.03) mg/l	0.01
NW195	**pH**			
	pH	7.1	(± 0.2)	0.1

		RESULTS	(UNCERTAINTY)	LOQ
③VQ088	**Phenolics (Total)**			
	Total phenols	<0.05	mg/l	0.05
NW469	**Sodium - Dissolved**			
	Sodium (Na)	22.2	(± 2.22) mg/l	0.02
NW098	**Soluble Aluminium**			
	Aluminium	0.044	(± 0.004) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.05	mg/l	0.03
NW104	**Soluble Cadmium**			
	Cadmium (Cd)	<0.0002	(± 0.0001) mg/l	0.0002
NW106	**Soluble Chromium**			
	Chromium (Cr)	<0.001	(± 0.0003) mg/l	0.001
NW108	**Soluble Copper**			
	Copper (Cu)	0.0012	(± 0.0003) mg/l	0.0005
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.0160	(± 0.0032) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005
NW117	**Soluble Potassium**			
	Potassium (K)	2.97	mg/l	0.01
NW125	**Soluble Zinc**			
	Zinc (Zn)	<0.002	(± 0.0007) mg/l	0.002
NW011	**Sulphate**			
	Sulphate	20.3	(± 1.01) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	125	mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	56	(± 6) mg CaCO3/l	1
NW029	**Total Hardness**			
	Hardness	69	(± 7) mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	9.1	(± 0.9) mg/l	0.1
③VQ876	**Volatile Fatty Acids (VFA) by GC-MS**			
	Acetic acid	<5	mg/l	5
	Butyric acid	<5	mg/l	5
	Heptanoic Acid C7:0	<5	mg/l	5
	Hexanoic acid	<5	mg/l	5
	Iso caproic acid	<5	mg/l	5
	Isobutyric acid	<5	mg/l	5
	Isovaleric acid	<5	mg/l	5

	RESULTS (UNCERTAINTY)		LOQ
③VQ876 **Volatile Fatty Acids (VFA) by GC-MS**			
Propionic acid	<5	mg/l	5
Valeric acid	<5	mg/l	5
Volatile fatty acids as acetic acid	<5	mg/l	5

LIST OF METHODS

NW003	**Total Alkalinity:** APHA Online Edition 2320 B
NW007	**Chloride:** APHA Online Edition 4110 B
NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW011	**Sulphate:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D
NW023	**Conductivity:** APHA Online Edition 2510 B
NW029	**Total Hardness:** APHA Online Edition 2340 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.
NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW104	**Soluble Cadmium:** APHA Online Edition 3125 B mod.
NW106	**Soluble Chromium:** APHA Online Edition 3125 B mod.
NW108	**Soluble Copper:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.
NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.
NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW117	**Soluble Potassium:** APHA Online Edition 3125 B mod.
NW125	**Soluble Zinc:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H
NW193	**Dissolved Reactive Phosphorus:** APHA Online Edition 4500-P G
NW195	**pH:** APHA Online Edition 4500-H B
NW206	**Suspended Solids:** APHA Online Edition 2540 D
NW210	**Total Non-Purgeable Organic Carbon:** APHA Online Edition 5310 B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B
NW457	**Calcium - Dissolved:** APHA Online Edition 3120 B mod.
NW460	**Iron - Dissolved:** APHA Online Edition 3120 B mod.
NW462	**Magnesium - Dissolved:** APHA Online Edition 3120 B mod.
NW469	**Sodium - Dissolved:** APHA Online Edition 3120 B mod.
NW583	**Arsenic - Soluble:** APHA Online Edition 3125 B mod.
VQ088	**Phenolics (Total):** APHA 5530
VQ876	**Volatile Fatty Acids (VFA) by GC-MS:** APHA 5560-D
ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Marylou Cabral Laboratory Manager

Jennifer Mont Supervisor

Amitesh Kumar Supervisor

Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Ivan Imamura Laboratory Analyst

Leo Cleave Senior Analyst

EXPLANATORY NOTE

Eurofins ELS Limited
85 Port Road
Seaview
Lower Hutt
Wellington 5010
NEW ZEALAND

Phone +64 4 576 5016
www.eurofins.co.nz

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⑧ Tested at the sampling point by Eurofins and is accredited

N/A means Not applicable
Not Detected means not detected at or above the Limit of Quantification (LOQ)
LOQ means Limit of Quantification and the unit of LOQ is the same as the result unit

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The Eurofins water sampling services uses IANZ approved methodology based on AS/NZS 5667 and / or best practice to collect and transport samples that are fit for the purpose of analytical testing. Eurofins shall have no liability if the sample collected is not representative of the source from which it has been taken. The laboratory is not responsible for sampling activities unless explicitly indicated by the statement "Sampled by Eurofins" on the report for water samples.
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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-000074-01** REPORT DATE **03/01/2023**

Attention Downer NZ Ltd (EDI Levin)
Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND
Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill
Order code: EUNZWE-00068716

SAMPLE CODE **812-2022-00120657**

Client Reference: 261807-0
Sampling Point WIL-HS1A:Levin HS1A
Reception Date & Time: 03/11/2022 20:10
Analysis Start Date & Time: 03/11/2022 20:33
Analysis Ending Date: 03/01/2023
Sampled Date & Time 02/11/2022 11:41
Sampler(s) Client nominated external sampler
Sampled by Eurofins False

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.16	(± 0.05) mg/l	0.01
NW583	**Arsenic - Soluble**			
	Arsenic (As)	<0.001	(± 0.0004) mg/l	0.001
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	(± 0.4) mg/l	1
NW457	**Calcium - Dissolved**			
	Calcium (Ca)	15.0	(± 1.50) mg/l	0.01
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	<15	(± 5) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	22.8	(± 1.14) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	25.1	(± 0.5) mS/m	0.1
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	0.036	(± 0.007) mg/l	0.005
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW460	**Iron - Dissolved**			
	Iron (Fe)	0.039	(± 0.008) mg/l	0.005
NW462	**Magnesium - Dissolved**			
	Magnesium (Mg)	7.74	(± 0.77) mg/l	0.01
NW010	**Nitrate-N**			
	Nitrate-N	0.94	(± 0.24) mg/l	0.01
NW195	**pH**			
	pH	7.4	(± 0.2)	0.1

		RESULTS	(UNCERTAINTY)	LOQ
③VQ088	**Phenolics (Total)**			
	Total phenols	<0.05	mg/l	0.05
NW469	**Sodium - Dissolved**			
	Sodium (Na)	20.3	(± 2.03) mg/l	0.02
NW098	**Soluble Aluminium**			
	Aluminium	0.014	(± 0.002) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.07	mg/l	0.03
NW104	**Soluble Cadmium**			
	Cadmium (Cd)	<0.0002	(± 0.0001) mg/l	0.0002
NW106	**Soluble Chromium**			
	Chromium (Cr)	<0.001	(± 0.0003) mg/l	0.001
NW108	**Soluble Copper**			
	Copper (Cu)	0.0013	(± 0.0003) mg/l	0.0005
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.0158	(± 0.0032) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005
NW117	**Soluble Potassium**			
	Potassium (K)	3.29	mg/l	0.01
NW125	**Soluble Zinc**			
	Zinc (Zn)	<0.002	(± 0.0007) mg/l	0.002
NW011	**Sulphate**			
	Sulphate	21.9	(± 1.09) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	112	mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	59	(± 6) mg CaCO3/l	1
NW029	**Total Hardness**			
	Hardness	69	(± 7) mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	6.0	(± 0.6) mg/l	0.1
③VQ876	**Volatile Fatty Acids (VFA) by GC-MS**			
	Acetic acid	<5	mg/l	5
	Butyric acid	<5	mg/l	5
	Heptanoic Acid C7:0	<5	mg/l	5
	Hexanoic acid	<5	mg/l	5
	Iso caproic acid	<5	mg/l	5
	Isobutyric acid	<5	mg/l	5

	RESULTS (UNCERTAINTY)		LOQ
③VQ876 **Volatile Fatty Acids (VFA) by GC-MS**			
Isovaleric acid	<5	mg/l	5
Propionic acid	<5	mg/l	5
Valeric acid	<5	mg/l	5
Volatile fatty acids as acetic acid	<5	mg/l	5

LIST OF METHODS

NW003 **Total Alkalinity:** APHA Online Edition 2320 B
NW007 **Chloride:** APHA Online Edition 4110 B
NW010 **Nitrate-N:** APHA Online Edition 4110 B
NW011 **Sulphate:** APHA Online Edition 4110 B
NW020 **Chemical Oxygen Demand:** APHA Online Edition 5220 D
NW023 **Conductivity:** APHA Online Edition 2510 B
NW029 **Total Hardness:** APHA Online Edition 2340 B
NW098 **Soluble Aluminium:** APHA Online Edition 3125 B mod.
NW103 **Soluble Boron:** APHA Online Edition 3125 B mod.
NW104 **Soluble Cadmium:** APHA Online Edition 3125 B mod.
NW106 **Soluble Chromium:** APHA Online Edition 3125 B mod.
NW108 **Soluble Copper:** APHA Online Edition 3125 B mod.
NW110 **Soluble Lead:** APHA Online Edition 3125 B mod.
NW113 **Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114 **Soluble Mercury:** APHA Online Edition 3125 B mod.
NW116 **Soluble Nickel:** APHA Online Edition 3125 B mod.
NW117 **Soluble Potassium:** APHA Online Edition 3125 B mod.
NW125 **Soluble Zinc:** APHA Online Edition 3125 B mod.
NW179 **Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H
NW193 **Dissolved Reactive Phosphorus:** APHA Online Edition 4500-P G
NW195 **pH:** APHA Online Edition 4500-H B
NW206 **Suspended Solids:** APHA Online Edition 2540 D
NW210 **Total Non-Purgeable Organic Carbon:** APHA Online Edition 5310 B
NW341 **BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B
NW457 **Calcium - Dissolved:** APHA Online Edition 3120 B mod.
NW460 **Iron - Dissolved:** APHA Online Edition 3120 B mod.
NW462 **Magnesium - Dissolved:** APHA Online Edition 3120 B mod.
NW469 **Sodium - Dissolved:** APHA Online Edition 3120 B mod.
NW583 **Arsenic - Soluble:** APHA Online Edition 3125 B mod.
VQ088 **Phenolics (Total):** APHA 5530
VQ876 **Volatile Fatty Acids (VFA) by GC-MS:** APHA 5560-D
ZM2GA **Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Jennifer Mont Supervisor
Amitesh Kumar Supervisor
Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst
Leo Cleave Senior Analyst
Marylou Cabral Laboratory Manager

EXPLANATORY NOTE

① Test is not accredited
② Test is subcontracted within Eurofins group and is accredited
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⑥ Test result is provided by the customer and is not accredited
⑦ Tested at the sampling point by Eurofins and is not accredited
⑧ Tested at the sampling point by Eurofins and is accredited

N/A means Not applicable
Not Detected means not detected at or above the Limit of Quantification (LOQ)
LOQ means Limit of Quantification and the unit of LOQ is the same as the result unit

The test result(s) in this report apply only to the sample as received.
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The tests are identified by a five-digit code, their description is available on request.
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If the Customer pays for storage of the samples Eurofins will take commercially reasonable steps to store the samples for the agreed period in terms of industry practice.
The Customer acknowledges and accepts that: (a) it is solely responsible for the sampling process and warrants that the sample provided to Eurofins is representative of the lot / batch from which the samples were drawn; and (b) Eurofins expresses no opinion and accepts no liability in respect of the Customer's production process or homogeneity of the sample.
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END OF REPORT

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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-002341-01** REPORT DATE **20/01/2023**

Attention Downer NZ Ltd (EDI Levin)
Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND

Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill

Order code: EUNZWE-00082944

SAMPLE CODE **812-2022-00135489**

Client Reference: 265425-0
Sampling Point code: WIL-HS2
Sampling Point name: Levin HS2
Reception Date & Time: 07/12/2022 14:25
Analysis Start Date & Time: 07/12/2022 14:45
Analysis Ending Date: 20/01/2023
Sampled Date & Time 06/12/2022 12:03
Sampler(s) Client nominated external sampler
Sampled by Eurofins False

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.17	(± 0.05) mg/l	0.01
NW583	**Arsenic - Soluble**			
	Arsenic (As)	<0.001	(± 0.0004) mg/l	0.001
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	(± 0.4) mg/l	1
NW457	**Calcium - Dissolved**			
	Calcium (Ca)	14.7	(± 1.47) mg/l	0.01
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	28	(± 7) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	24.9	(± 1.24) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	24.2	(± 0.5) mS/m	0.1
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	0.043	(± 0.009) mg/l	0.005
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	200	cfu/100 ml	100
NW460	**Iron - Dissolved**			
	Iron (Fe)	0.105	(± 0.021) mg/l	0.005
NW462	**Magnesium - Dissolved**			
	Magnesium (Mg)	8.01	(± 0.80) mg/l	0.01
NW010	**Nitrate-N**			
	Nitrate-N	0.08	(± 0.02) mg/l	0.01
NW195	**pH**			
	pH	7.6	(± 0.2)	0.1

		RESULTS (UNCERTAINTY)		LOQ
③VQ088	**Phenolics (Total)**			
	Total phenols	<0.05	mg/l	0.05
NW469	**Sodium - Dissolved**			
	Sodium (Na)	21.2	(± 2.12) mg/l	0.02
NW098	**Soluble Aluminium**			
	Aluminium	0.012	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.07	mg/l	0.03
NW104	**Soluble Cadmium**			
	Cadmium (Cd)	<0.0002	(± 0.0001) mg/l	0.0002
NW106	**Soluble Chromium**			
	Chromium (Cr)	<0.001	(± 0.0003) mg/l	0.001
NW108	**Soluble Copper**			
	Copper (Cu)	0.0014	(± 0.0003) mg/l	0.0005
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.0390	(± 0.0078) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005
NW117	**Soluble Potassium**			
	Potassium (K)	3.17	mg/l	0.01
NW125	**Soluble Zinc**			
	Zinc (Zn)	<0.002	(± 0.0007) mg/l	0.002
NW011	**Sulphate**			
	Sulphate	22.3	(± 1.11) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	18	mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	60	(± 6) mg CaCO3/l	1
NW029	**Total Hardness**			
	Hardness	70	(± 7) mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	7.0	(± 0.7) mg/l	0.1
③VQ876	**Volatile Fatty Acids (VFA) by GC-MS**			
	Acetic acid	<5	mg/l	5
	Butyric acid	<5	mg/l	5
	Heptanoic Acid C7:0	<5	mg/l	5
	Hexanoic acid	<5	mg/l	5
	Iso caproic acid	<5	mg/l	5
	Isobutyric acid	<5	mg/l	5

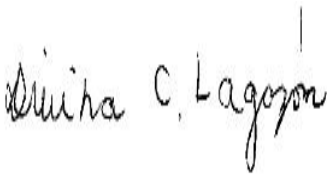
	RESULTS (UNCERTAINTY)		LOQ
③VQ876 **Volatile Fatty Acids (VFA) by GC-MS**			
Isovaleric acid	<5	mg/l	5
Propionic acid	<5	mg/l	5
Valeric acid	<5	mg/l	5
Volatile fatty acids as acetic acid	<5	mg/l	5

LIST OF METHODS

NW003 **Total Alkalinity:** APHA Online Edition 2320 B
NW007 **Chloride:** APHA Online Edition 4110 B
NW010 **Nitrate-N:** APHA Online Edition 4110 B
NW011 **Sulphate:** APHA Online Edition 4110 B
NW020 **Chemical Oxygen Demand:** APHA Online Edition 5220 D
NW023 **Conductivity:** APHA Online Edition 2510 B
NW029 **Total Hardness:** APHA Online Edition 2340 B
NW098 **Soluble Aluminium:** APHA Online Edition 3125 B mod.
NW103 **Soluble Boron:** APHA Online Edition 3125 B mod.
NW104 **Soluble Cadmium:** APHA Online Edition 3125 B mod.
NW106 **Soluble Chromium:** APHA Online Edition 3125 B mod.
NW108 **Soluble Copper:** APHA Online Edition 3125 B mod.
NW110 **Soluble Lead:** APHA Online Edition 3125 B mod.
NW113 **Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114 **Soluble Mercury:** APHA Online Edition 3125 B mod.
NW116 **Soluble Nickel:** APHA Online Edition 3125 B mod.
NW117 **Soluble Potassium:** APHA Online Edition 3125 B mod.
NW125 **Soluble Zinc:** APHA Online Edition 3125 B mod.
NW179 **Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H
NW193 **Dissolved Reactive Phosphorus:** APHA Online Edition 4500-P G
NW195 **pH:** APHA Online Edition 4500-H B
NW206 **Suspended Solids:** APHA Online Edition 2540 D
NW210 **Total Non-Purgeable Organic Carbon:** APHA Online Edition 5310 B
NW341 **BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B
NW457 **Calcium - Dissolved:** APHA Online Edition 3120 B mod.
NW460 **Iron - Dissolved:** APHA Online Edition 3120 B mod.
NW462 **Magnesium - Dissolved:** APHA Online Edition 3120 B mod.
NW469 **Sodium - Dissolved:** APHA Online Edition 3120 B mod.
NW583 **Arsenic - Soluble:** APHA Online Edition 3125 B mod.
VQ088 **Phenolics (Total):** APHA 5530
VQ876 **Volatile Fatty Acids (VFA) by GC-MS:** APHA 5560-D
ZM2GA **Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature


Amitesh Kumar Supervisor


Divina Cunanan Lagazon Supervisor


Gordon McArthur Senior laboratory Analyst


Ivan Imamura Laboratory Analyst


Arvinder Singh Supervisor


Marylou Cabral Laboratory Manager

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LOQ means Limit of Quantification and the unit of LOQ is the same as the result unit

Eurofins ELS Limited
85 Port Road
Seaview
Lower Hutt
Wellington 5010
NEW ZEALAND

Phone +64 4 576 5016
www.eurofins.co.nz

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ANALYTICAL REPORT

REPORT CODE **AR-23-NW-005632-01** REPORT DATE **12/02/2023**

Attention Downer NZ Ltd (EDI Levin)
Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND
Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill
Order code: EUNZWE-00100853

SAMPLE CODE **812-2023-00004883**

Client Reference: 270663-0
Sampling Point code: WIL-HS2
Sampling Point name: Levin HS2
Reception Date & Time: 13/01/2023 8:35
Analysis Start Date & Time: 13/01/2023 18:31
Analysis Ending Date: 12/02/2023
Sampled Date & Time 12/01/2023 12:01
Sampler(s) Client nominated external sampler
Sampled by Eurofins False

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	1.38	(± 0.21) mg/l	0.01
NW583	**Arsenic - Soluble**			
	Arsenic (As)	<0.001	(± 0.0004) mg/l	0.001
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<6	(± 0.8) mg/l	1
NW457	**Calcium - Dissolved**			
	Calcium (Ca)	19.4	(± 1.94) mg/l	0.01
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	59	(± 10) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	34.8	(± 1.74) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	40.6	(± 0.8) mS/m	0.1
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	0.052	(± 0.011) mg/l	0.005
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	100	cfu/100 ml	100
NW460	**Iron - Dissolved**			
	Iron (Fe)	0.183	(± 0.037) mg/l	0.005
NW462	**Magnesium - Dissolved**			
	Magnesium (Mg)	9.52	(± 0.95) mg/l	0.01
NW010	**Nitrate-N**			
	Nitrate-N	0.17	(± 0.04) mg/l	0.01
NW195	**pH**			
	pH	7.2	(± 0.2)	0.1

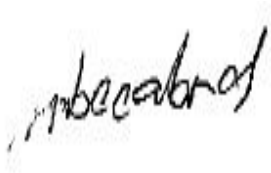
		RESULTS	(UNCERTAINTY)	LOQ
③VQ088	**Phenolics (Total)**			
	Total phenols	<0.05	mg/l	0.05
NW469	**Sodium - Dissolved**			
	Sodium (Na)	25.4	(± 2.54) mg/l	0.02
NW098	**Soluble Aluminium**			
	Aluminium	0.025	(± 0.003) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.09	mg/l	0.03
NW104	**Soluble Cadmium**			
	Cadmium (Cd)	<0.0002	(± 0.0001) mg/l	0.0002
NW106	**Soluble Chromium**			
	Chromium (Cr)	<0.001	(± 0.0003) mg/l	0.001
NW108	**Soluble Copper**			
	Copper (Cu)	0.0009	(± 0.0003) mg/l	0.0005
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.0755	(± 0.0151) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	0.0008	(± 0.0003) mg/l	0.0005
NW117	**Soluble Potassium**			
	Potassium (K)	6.51	mg/l	0.01
NW125	**Soluble Zinc**			
	Zinc (Zn)	<0.002	(± 0.0007) mg/l	0.002
NW011	**Sulphate**			
	Sulphate	17.4	(± 0.87) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	63	mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	119	(± 12) mg CaCO3/l	1
NW029	**Total Hardness**			
	Hardness	88	(± 9) mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	14.0	(± 1.4) mg/l	0.1
③VQ876	**Volatile Fatty Acids (VFA) by GC-MS**			
	Acetic acid	<5	mg/l	5
	Butyric acid	<5	mg/l	5
	Heptanoic Acid C7:0	<5	mg/l	5
	Hexanoic acid	<5	mg/l	5
	Iso caproic acid	<5	mg/l	5
	Isobutyric acid	<5	mg/l	5
	Isovaleric acid	<5	mg/l	5

	RESULTS (UNCERTAINTY)		LOQ
③VQ876 **Volatile Fatty Acids (VFA) by GC-MS**			
Propionic acid	<5	mg/l	5
Valeric acid	<5	mg/l	5
Volatile fatty acids as acetic acid	<5	mg/l	5

LIST OF METHODS

NW003	**Total Alkalinity:** APHA Online Edition 2320 B
NW007	**Chloride:** APHA Online Edition 4110 B
NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW011	**Sulphate:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D
NW023	**Conductivity:** APHA Online Edition 2510 B
NW029	**Total Hardness:** APHA Online Edition 2340 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.
NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW104	**Soluble Cadmium:** APHA Online Edition 3125 B mod.
NW106	**Soluble Chromium:** APHA Online Edition 3125 B mod.
NW108	**Soluble Copper:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.
NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.
NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW117	**Soluble Potassium:** APHA Online Edition 3125 B mod.
NW125	**Soluble Zinc:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H
NW193	**Dissolved Reactive Phosphorus:** APHA Online Edition 4500-P G
NW195	**pH:** APHA Online Edition 4500-H B
NW206	**Suspended Solids:** APHA Online Edition 2540 D
NW210	**Total Non-Purgeable Organic Carbon:** APHA Online Edition 5310 B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B
NW457	**Calcium - Dissolved:** APHA Online Edition 3120 B mod.
NW460	**Iron - Dissolved:** APHA Online Edition 3120 B mod.
NW462	**Magnesium - Dissolved:** APHA Online Edition 3120 B mod.
NW469	**Sodium - Dissolved:** APHA Online Edition 3120 B mod.
NW583	**Arsenic - Soluble:** APHA Online Edition 3125 B mod.
VQ088	**Phenolics (Total):** APHA 5530
VQ876	**Volatile Fatty Acids (VFA) by GC-MS:** APHA 5560-D
ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

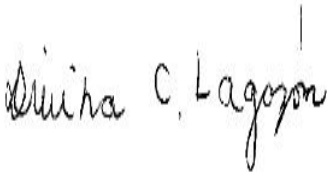
Signature



Marylou Cabral Laboratory Manager

Jennifer Mont Supervisor

Amitesh Kumar Supervisor



Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Ivan Imamura Laboratory Analyst

Leo Cleave Senior Analyst

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The Eurofins water sampling services uses IANZ approved methodology based on AS/NZS 5667 and / or best practice to collect and transport samples that are fit for the purpose of analytical testing. Eurofins shall have no liability if the sample collected is not representative of the source from which it has been taken. The laboratory is not responsible for sampling activities unless explicitly indicated by the statement "Sampled by Eurofins" on the report for water samples.
The Customer acknowledges that the Services are provided using the then current state of technology and methods developed and generally applied by Eurofins and involve analysis, interpretations, consulting work and conclusions. Eurofins shall use commercially reasonable degree of care in providing the Services.
This report is produced and issued on the basis of information, documents and/or samples provided by, or on behalf of, the Customer and solely for the benefit of the Customer who is responsible for acting as it sees fit on the basis of this report. Neither Eurofins nor any of its officers, employees, agents or subcontractors shall be liable to the Customer nor any third party for any actions taken or not taken on the basis of this report nor for any incorrect results arising from unclear, erroneous, incomplete, misleading or false information provided to Eurofins.
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END OF REPORT

Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-000077-01** REPORT DATE **03/01/2023**

Attention Downer NZ Ltd (EDI Levin)
Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND
Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill
Order code: EUNZWE-00068716

SAMPLE CODE **812-2022-00120660**

Client Reference: 261808-0
Sampling Point WIL-HS2:Levin HS2
Reception Date & Time: 03/11/2022 20:10
Analysis Start Date & Time: 03/11/2022 20:33
Analysis Ending Date: 03/01/2023
Sampled Date & Time 02/11/2022 11:44
Sampler(s) Client nominated external sampler
Sampled by Eurofins False

		RESULTS (UNCERTAINTY)		LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	1.37	(± 0.21) mg/l	0.01
NW583	**Arsenic - Soluble**			
	Arsenic (As)	<0.001	(± 0.0004) mg/l	0.001
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	(± 0.4) mg/l	1
NW457	**Calcium - Dissolved**			
	Calcium (Ca)	20.6	(± 2.06) mg/l	0.01
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	41	(± 8) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	32.5	(± 1.62) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	30.0	(± 0.6) mS/m	0.1
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	0.034	(± 0.007) mg/l	0.005
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW460	**Iron - Dissolved**			
	Iron (Fe)	0.099	(± 0.020) mg/l	0.005
NW462	**Magnesium - Dissolved**			
	Magnesium (Mg)	10.8	(± 1.08) mg/l	0.01
NW010	**Nitrate-N**			
	Nitrate-N	0.83	(± 0.21) mg/l	0.01
NW195	**pH**			
	pH	7.6	(± 0.2)	0.1

		RESULTS (UNCERTAINTY)		LOQ
③VQ088	**Phenolics (Total)**			
	Total phenols	<0.05	mg/l	0.05
NW469	**Sodium - Dissolved**			
	Sodium (Na)	27.7	(± 2.77) mg/l	0.02
NW098	**Soluble Aluminium**			
	Aluminium	0.017	(± 0.002) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.12	mg/l	0.03
NW104	**Soluble Cadmium**			
	Cadmium (Cd)	<0.0002	(± 0.0001) mg/l	0.0002
NW106	**Soluble Chromium**			
	Chromium (Cr)	<0.001	(± 0.0003) mg/l	0.001
NW108	**Soluble Copper**			
	Copper (Cu)	0.0010	(± 0.0003) mg/l	0.0005
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.0825	(± 0.0165) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	0.0006	(± 0.0003) mg/l	0.0005
NW117	**Soluble Potassium**			
	Potassium (K)	6.46	mg/l	0.01
NW125	**Soluble Zinc**			
	Zinc (Zn)	<0.002	(± 0.0007) mg/l	0.002
NW011	**Sulphate**			
	Sulphate	18.4	(± 0.92) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	45	mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	79	(± 8) mg CaCO3/l	1
NW029	**Total Hardness**			
	Hardness	96	(± 10) mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	8.2	(± 0.8) mg/l	0.1
③VQ876	**Volatile Fatty Acids (VFA) by GC-MS**			
	Acetic acid	<5	mg/l	5
	Butyric acid	<5	mg/l	5
	Heptanoic Acid C7:0	<5	mg/l	5
	Hexanoic acid	<5	mg/l	5
	Iso caproic acid	<5	mg/l	5
	Isobutyric acid	<5	mg/l	5

	RESULTS (UNCERTAINTY)		LOQ
③VQ876 **Volatile Fatty Acids (VFA) by GC-MS**			
Isovaleric acid	<5	mg/l	5
Propionic acid	<5	mg/l	5
Valeric acid	<5	mg/l	5
Volatile fatty acids as acetic acid	<5	mg/l	5

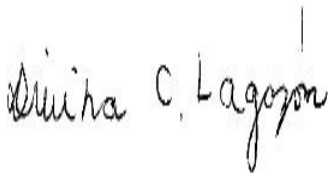
LIST OF METHODS

NW003	**Total Alkalinity:** APHA Online Edition 2320 B	NW007	**Chloride:** APHA Online Edition 4110 B
NW010	**Nitrate-N:** APHA Online Edition 4110 B	NW011	**Sulphate:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW029	**Total Hardness:** APHA Online Edition 2340 B	NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.
NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.	NW104	**Soluble Cadmium:** APHA Online Edition 3125 B mod.
NW106	**Soluble Chromium:** APHA Online Edition 3125 B mod.	NW108	**Soluble Copper:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.	NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.	NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW117	**Soluble Potassium:** APHA Online Edition 3125 B mod.	NW125	**Soluble Zinc:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW193	**Dissolved Reactive Phosphorus:** APHA Online Edition 4500-P G
NW195	**pH:** APHA Online Edition 4500-H B	NW206	**Suspended Solids:** APHA Online Edition 2540 D
NW210	**Total Non-Purgeable Organic Carbon:** APHA Online Edition 5310 B	NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B
NW457	**Calcium - Dissolved:** APHA Online Edition 3120 B mod.	NW460	**Iron - Dissolved:** APHA Online Edition 3120 B mod.
NW462	**Magnesium - Dissolved:** APHA Online Edition 3120 B mod.	NW469	**Sodium - Dissolved:** APHA Online Edition 3120 B mod.
NW583	**Arsenic - Soluble:** APHA Online Edition 3125 B mod.	VQ088	**Phenolics (Total):** APHA 5530
VQ876	**Volatile Fatty Acids (VFA) by GC-MS:** APHA 5560-D	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Jennifer Mont Supervisor

Amitesh Kumar Supervisor



Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Leo Cleave Senior Analyst

Marylou Cabral Laboratory Manager

EXPLANATORY NOTE

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② Test is subcontracted within Eurofins group and is accredited
③ Test is subcontracted within Eurofins group and is not accredited
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⑥ Test result is provided by the customer and is not accredited
⑦ Tested at the sampling point by Eurofins and is not accredited
⑧ Tested at the sampling point by Eurofins and is accredited

N/A means Not applicable
Not Detected means not detected at or above the Limit of Quantification (LOQ)
LOQ means Limit of Quantification and the unit of LOQ is the same as the result unit

Eurofins ELS Limited
85 Port Road
Seaview
Lower Hutt
Wellington 5010
NEW ZEALAND

Phone +64 4 576 5016
www.eurofins.co.nz

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The tests are identified by a five-digit code, their description is available on request.
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END OF REPORT

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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-002339-01** REPORT DATE **20/01/2023**

Attention Downer NZ Ltd (EDI Levin)
Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND

Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill

Order code: EUNZWE-00082944

SAMPLE CODE **812-2022-00135483**

Client Reference: 265426-0
Sampling Point code: WIL-HS3
Sampling Point name: Levin HS3
Reception Date & Time: 07/12/2022 14:25
Analysis Start Date & Time: 07/12/2022 14:45
Analysis Ending Date: 20/01/2023
Sampled Date & Time 06/12/2022 12:03
Sampler(s) Client nominated external sampler
Sampled by Eurofins False

		RESULTS (UNCERTAINTY)		LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.18	(± 0.05) mg/l	0.01
NW583	**Arsenic - Soluble**			
	Arsenic (As)	<0.001	(± 0.0004) mg/l	0.001
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	(± 0.4) mg/l	1
NW457	**Calcium - Dissolved**			
	Calcium (Ca)	15.0	(± 1.50) mg/l	0.01
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	28	(± 7) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	24.5	(± 1.22) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	24.8	(± 0.5) mS/m	0.1
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	0.046	(± 0.009) mg/l	0.005
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	500	cfu/100 ml	100
NW460	**Iron - Dissolved**			
	Iron (Fe)	0.114	(± 0.023) mg/l	0.005
NW462	**Magnesium - Dissolved**			
	Magnesium (Mg)	7.79	(± 0.78) mg/l	0.01
NW010	**Nitrate-N**			
	Nitrate-N	0.10	(± 0.02) mg/l	0.01
NW195	**pH**			
	pH	7.4	(± 0.2)	0.1

		RESULTS	(UNCERTAINTY)	LOQ
③VQ088	**Phenolics (Total)**			
	Total phenols	<0.05	mg/l	0.05
NW469	**Sodium - Dissolved**			
	Sodium (Na)	21.6	(± 2.16) mg/l	0.02
NW098	**Soluble Aluminium**			
	Aluminium	0.012	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.07	mg/l	0.03
NW104	**Soluble Cadmium**			
	Cadmium (Cd)	<0.0002	(± 0.0001) mg/l	0.0002
NW106	**Soluble Chromium**			
	Chromium (Cr)	<0.001	(± 0.0003) mg/l	0.001
NW108	**Soluble Copper**			
	Copper (Cu)	0.0012	(± 0.0003) mg/l	0.0005
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.0400	(± 0.0080) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005
NW117	**Soluble Potassium**			
	Potassium (K)	3.09	mg/l	0.01
NW125	**Soluble Zinc**			
	Zinc (Zn)	<0.002	(± 0.0007) mg/l	0.002
NW011	**Sulphate**			
	Sulphate	21.1	(± 1.06) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	88	mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	61	(± 6) mg CaCO3/l	1
NW029	**Total Hardness**			
	Hardness	69	(± 7) mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	7.0	(± 0.7) mg/l	0.1
③VQ876	**Volatile Fatty Acids (VFA) by GC-MS**			
	Acetic acid	<5	mg/l	5
	Butyric acid	<5	mg/l	5
	Heptanoic Acid C7:0	<5	mg/l	5
	Hexanoic acid	<5	mg/l	5
	Iso caproic acid	<5	mg/l	5
	Isobutyric acid	<5	mg/l	5

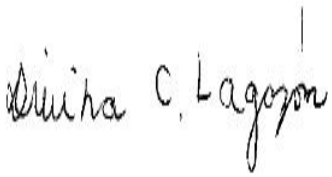
	RESULTS (UNCERTAINTY)		LOQ
③VQ876 **Volatile Fatty Acids (VFA) by GC-MS**			
Isovaleric acid	<5	mg/l	5
Propionic acid	<5	mg/l	5
Valeric acid	<5	mg/l	5
Volatile fatty acids as acetic acid	<5	mg/l	5

LIST OF METHODS

NW003 **Total Alkalinity:** APHA Online Edition 2320 B
NW007 **Chloride:** APHA Online Edition 4110 B
NW010 **Nitrate-N:** APHA Online Edition 4110 B
NW011 **Sulphate:** APHA Online Edition 4110 B
NW020 **Chemical Oxygen Demand:** APHA Online Edition 5220 D
NW023 **Conductivity:** APHA Online Edition 2510 B
NW029 **Total Hardness:** APHA Online Edition 2340 B
NW098 **Soluble Aluminium:** APHA Online Edition 3125 B mod.
NW103 **Soluble Boron:** APHA Online Edition 3125 B mod.
NW104 **Soluble Cadmium:** APHA Online Edition 3125 B mod.
NW106 **Soluble Chromium:** APHA Online Edition 3125 B mod.
NW108 **Soluble Copper:** APHA Online Edition 3125 B mod.
NW110 **Soluble Lead:** APHA Online Edition 3125 B mod.
NW113 **Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114 **Soluble Mercury:** APHA Online Edition 3125 B mod.
NW116 **Soluble Nickel:** APHA Online Edition 3125 B mod.
NW117 **Soluble Potassium:** APHA Online Edition 3125 B mod.
NW125 **Soluble Zinc:** APHA Online Edition 3125 B mod.
NW179 **Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H
NW193 **Dissolved Reactive Phosphorus:** APHA Online Edition 4500-P G
NW195 **pH:** APHA Online Edition 4500-H B
NW206 **Suspended Solids:** APHA Online Edition 2540 D
NW210 **Total Non-Purgeable Organic Carbon:** APHA Online Edition 5310 B
NW341 **BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B
NW457 **Calcium - Dissolved:** APHA Online Edition 3120 B mod.
NW460 **Iron - Dissolved:** APHA Online Edition 3120 B mod.
NW462 **Magnesium - Dissolved:** APHA Online Edition 3120 B mod.
NW469 **Sodium - Dissolved:** APHA Online Edition 3120 B mod.
NW583 **Arsenic - Soluble:** APHA Online Edition 3125 B mod.
VQ088 **Phenolics (Total):** APHA 5530
VQ876 **Volatile Fatty Acids (VFA) by GC-MS:** APHA 5560-D
ZM2GA **Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature


Amitesh Kumar Supervisor


Divina Cunanan Lagazon Supervisor


Gordon McArthur Senior laboratory Analyst


Ivan Imamura Laboratory Analyst


Arvinder Singh Supervisor


Marylou Cabral Laboratory Manager

EXPLANATORY NOTE

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⑧ Tested at the sampling point by Eurofins and is accredited

N/A means Not applicable
Not Detected means not detected at or above the Limit of Quantification (LOQ
LOQ means Limit of Quantification and the unit of LOQ is the same as the result unit

Eurofins ELS Limited
85 Port Road
Seaview
Lower Hutt
Wellington 5010
NEW ZEALAND

Phone +64 4 576 5016
www.eurofins.co.nz

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ANALYTICAL REPORT

REPORT CODE **AR-23-NW-005634-01** REPORT DATE **12/02/2023**

Attention Downer NZ Ltd (EDI Levin)
Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND
Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill
Order code: EUNZWE-00100853

SAMPLE CODE **812-2023-00004899**

Client Reference: 270664-0
Sampling Point code: WIL-HS3
Sampling Point name: Levin HS3
Reception Date & Time: 13/01/2023 8:35
Analysis Start Date & Time: 13/01/2023 19:54
Analysis Ending Date: 12/02/2023
Sampled Date & Time 12/01/2023 12:01
Sampler(s) Client nominated external sampler
Sampled by Eurofins False

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.29	(± 0.09) mg/l	0.01
NW583	**Arsenic - Soluble**			
	Arsenic (As)	0.001	(± 0.0004) mg/l	0.001
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<6	(± 0.8) mg/l	1
NW457	**Calcium - Dissolved**			
	Calcium (Ca)	16.1	(± 1.61) mg/l	0.01
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	28	(± 7) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	27.1	(± 1.36) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	27.3	(± 0.5) mS/m	0.1
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	0.069	(± 0.014) mg/l	0.005
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	800	cfu/100 ml	100
NW460	**Iron - Dissolved**			
	Iron (Fe)	0.129	(± 0.026) mg/l	0.005
NW462	**Magnesium - Dissolved**			
	Magnesium (Mg)	8.40	(± 0.84) mg/l	0.01
NW010	**Nitrate-N**			
	Nitrate-N	0.14	(± 0.04) mg/l	0.01
NW195	**pH**			
	pH	7.2	(± 0.2)	0.1

		RESULTS	(UNCERTAINTY)	LOQ
③VQ088	**Phenolics (Total)**			
	Total phenols	<0.05	mg/l	0.05
NW469	**Sodium - Dissolved**			
	Sodium (Na)	24.5	(± 2.45) mg/l	0.02
NW098	**Soluble Aluminium**			
	Aluminium	0.023	(± 0.002) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.06	mg/l	0.03
NW104	**Soluble Cadmium**			
	Cadmium (Cd)	<0.0002	(± 0.0001) mg/l	0.0002
NW106	**Soluble Chromium**			
	Chromium (Cr)	<0.001	(± 0.0003) mg/l	0.001
NW108	**Soluble Copper**			
	Copper (Cu)	0.0101	(± 0.0020) mg/l	0.0005
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.0520	(± 0.0104) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	0.0010	(± 0.0003) mg/l	0.0005
NW117	**Soluble Potassium**			
	Potassium (K)	4.15	mg/l	0.01
NW125	**Soluble Zinc**			
	Zinc (Zn)	<0.002	(± 0.0007) mg/l	0.002
NW011	**Sulphate**			
	Sulphate	19.8	(± 0.99) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	28	mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	63	(± 6) mg CaCO3/l	1
NW029	**Total Hardness**			
	Hardness	75	(± 8) mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	8.0	(± 0.8) mg/l	0.1
③VQ876	**Volatile Fatty Acids (VFA) by GC-MS**			
	Acetic acid	<5	mg/l	5
	Butyric acid	<5	mg/l	5
	Heptanoic Acid C7:0	<5	mg/l	5
	Hexanoic acid	<5	mg/l	5
	Iso caproic acid	<5	mg/l	5
	Isobutyric acid	<5	mg/l	5
	Isovaleric acid	<5	mg/l	5

	RESULTS (UNCERTAINTY)		LOQ
③VQ876 **Volatile Fatty Acids (VFA) by GC-MS**			
Propionic acid	<5	mg/l	5
Valeric acid	<5	mg/l	5
Volatile fatty acids as acetic acid	<5	mg/l	5

LIST OF METHODS

NW003	**Total Alkalinity:** APHA Online Edition 2320 B
NW007	**Chloride:** APHA Online Edition 4110 B
NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW011	**Sulphate:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D
NW023	**Conductivity:** APHA Online Edition 2510 B
NW029	**Total Hardness:** APHA Online Edition 2340 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.
NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW104	**Soluble Cadmium:** APHA Online Edition 3125 B mod.
NW106	**Soluble Chromium:** APHA Online Edition 3125 B mod.
NW108	**Soluble Copper:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.
NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.
NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW117	**Soluble Potassium:** APHA Online Edition 3125 B mod.
NW125	**Soluble Zinc:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H
NW193	**Dissolved Reactive Phosphorus:** APHA Online Edition 4500-P G
NW195	**pH:** APHA Online Edition 4500-H B
NW206	**Suspended Solids:** APHA Online Edition 2540 D
NW210	**Total Non-Purgeable Organic Carbon:** APHA Online Edition 5310 B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B
NW457	**Calcium - Dissolved:** APHA Online Edition 3120 B mod.
NW460	**Iron - Dissolved:** APHA Online Edition 3120 B mod.
NW462	**Magnesium - Dissolved:** APHA Online Edition 3120 B mod.
NW469	**Sodium - Dissolved:** APHA Online Edition 3120 B mod.
NW583	**Arsenic - Soluble:** APHA Online Edition 3125 B mod.
VQ088	**Phenolics (Total):** APHA 5530
VQ876	**Volatile Fatty Acids (VFA) by GC-MS:** APHA 5560-D
ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Marylou Cabral Laboratory Manager

Jennifer Mont Supervisor

Amitesh Kumar Supervisor

Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Ivan Imamura Laboratory Analyst

Leo Cleave Senior Analyst

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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-000073-01** REPORT DATE **03/01/2023**

Attention Downer NZ Ltd (EDI Levin)
Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND

Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Gabriela Carvalhaes **Order code:** EUNZWE-00068716
Contract: Landfill

SAMPLE CODE **812-2022-00120656**

Client Reference: 261809-0
Sampling Point WIL-HS3:Levin HS3
Reception Date & Time: 03/11/2022 20:10
Analysis Start Date & Time: 03/11/2022 20:33 **Analysis Ending Date:** 03/01/2023
Sampled by Eurofins False

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.24	(± 0.07) mg/l	0.01
NW583	**Arsenic - Soluble**			
	Arsenic (As)	<0.001	(± 0.0004) mg/l	0.001
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	(± 0.4) mg/l	1
NW457	**Calcium - Dissolved**			
	Calcium (Ca)	15.8	(± 1.58) mg/l	0.01
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	20	(± 6) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	24.0	(± 1.20) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	26.2	(± 0.5) mS/m	0.1
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	0.037	(± 0.008) mg/l	0.005
ZM0UY	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	32	cfu/100 ml	4
NW460	**Iron - Dissolved**			
	Iron (Fe)	0.066	(± 0.013) mg/l	0.005
NW462	**Magnesium - Dissolved**			
	Magnesium (Mg)	8.04	(± 0.80) mg/l	0.01
NW010	**Nitrate-N**			
	Nitrate-N	0.93	(± 0.23) mg/l	0.01
NW195	**pH**			
	pH	7.5	(± 0.2)	0.1
③**VQ088**	**Phenolics (Total)**			

		RESULTS	(UNCERTAINTY)	LOQ
③VQ088	**Phenolics (Total)**			
	Total phenols	<0.05	mg/l	0.05
NW469	**Sodium - Dissolved**			
	Sodium (Na)	21.3	(± 2.13) mg/l	0.02
NW098	**Soluble Aluminium**			
	Aluminium	0.019	(± 0.002) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.07	mg/l	0.03
NW104	**Soluble Cadmium**			
	Cadmium (Cd)	<0.0002	(± 0.0001) mg/l	0.0002
NW106	**Soluble Chromium**			
	Chromium (Cr)	<0.001	(± 0.0003) mg/l	0.001
NW108	**Soluble Copper**			
	Copper (Cu)	0.0012	(± 0.0003) mg/l	0.0005
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.0242	(± 0.0048) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005
NW117	**Soluble Potassium**			
	Potassium (K)	3.53	mg/l	0.01
NW125	**Soluble Zinc**			
	Zinc (Zn)	<0.002	(± 0.0007) mg/l	0.002
NW011	**Sulphate**			
	Sulphate	21.3	(± 1.06) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	23	mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	63	(± 6) mg CaCO3/l	1
NW029	**Total Hardness**			
	Hardness	73	(± 7) mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	6.7	(± 0.7) mg/l	0.1
③VQ876	**Volatile Fatty Acids (VFA) by GC-MS**			
	Acetic acid	<5	mg/l	5
	Butyric acid	<5	mg/l	5
	Heptanoic Acid C7:0	<5	mg/l	5
	Hexanoic acid	<5	mg/l	5
	Iso caproic acid	<5	mg/l	5
	Isobutyric acid	<5	mg/l	5

	RESULTS (UNCERTAINTY)		LOQ
③VQ876 **Volatile Fatty Acids (VFA) by GC-MS**			
Isovaleric acid	<5	mg/l	5
Propionic acid	<5	mg/l	5
Valeric acid	<5	mg/l	5
Volatile fatty acids as acetic acid	<5	mg/l	5

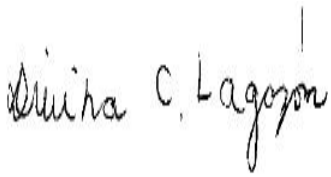
LIST OF METHODS

NW003	**Total Alkalinity:** APHA Online Edition 2320 B	NW007	**Chloride:** APHA Online Edition 4110 B
NW010	**Nitrate-N:** APHA Online Edition 4110 B	NW011	**Sulphate:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW029	**Total Hardness:** APHA Online Edition 2340 B	NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.
NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.	NW104	**Soluble Cadmium:** APHA Online Edition 3125 B mod.
NW106	**Soluble Chromium:** APHA Online Edition 3125 B mod.	NW108	**Soluble Copper:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.	NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.	NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW117	**Soluble Potassium:** APHA Online Edition 3125 B mod.	NW125	**Soluble Zinc:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW193	**Dissolved Reactive Phosphorus:** APHA Online Edition 4500-P G
NW195	**pH:** APHA Online Edition 4500-H B	NW206	**Suspended Solids:** APHA Online Edition 2540 D
NW210	**Total Non-Purgeable Organic Carbon:** APHA Online Edition 5310 B	NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B
NW457	**Calcium - Dissolved:** APHA Online Edition 3120 B mod.	NW460	**Iron - Dissolved:** APHA Online Edition 3120 B mod.
NW462	**Magnesium - Dissolved:** APHA Online Edition 3120 B mod.	NW469	**Sodium - Dissolved:** APHA Online Edition 3120 B mod.
NW583	**Arsenic - Soluble:** APHA Online Edition 3125 B mod.	VQ088	**Phenolics (Total):** APHA 5530
VQ876	**Volatile Fatty Acids (VFA) by GC-MS:** APHA 5560-D	ZM0UY	**Escherichia coli E (Water) [NZ] <4 >240 /100 ml (0) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Jennifer Mont Supervisor

Amitesh Kumar Supervisor



Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Leo Cleave Senior Analyst

Marylou Cabral Laboratory Manager

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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-002969-01** REPORT DATE **25/01/2023**

Attention Downer NZ Ltd (EDI Levin)
Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND

Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill

Order code: EUNZWE-00100853

SAMPLE CODE **812-2023-00004885**

Client Reference: 270660-0
Sampling Point code: WIL-LP
Sampling Point name: Levin Leachate Pond
Reception Date & Time: 13/01/2023 8:35
Analysis Start Date & Time: 13/01/2023 18:31
Analysis Ending Date: 25/01/2023
Sampled Date & Time 12/01/2023 12:01
Sampler(s) Client nominated external sampler
Sampled by Eurofins False

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	1620	(± 160) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	116	(± 17) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	3440	(± 170) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	1300	(± 70.0) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	1760	(± 40.0) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	<1.00	(± 0.10) mg/l	0.01
NW195	**pH**			
	pH	7.9	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	0.856	(± 0.086) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	6.52	mg/l	0.03
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0050	(± 0.0005) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	1.17	(± 0.117) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005

	RESULTS (UNCERTAINTY)	LOQ
NW116 Soluble Nickel		
Nickel (Ni)	0.119 (± 0.0119) mg/l	0.0005

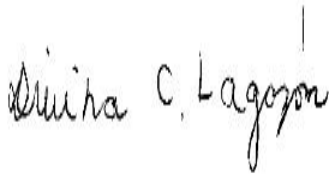
LIST OF METHODS

NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.	NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.	NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Marylou Cabral Laboratory Manager

Amitesh Kumar Supervisor



Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

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Leo Cleave Senior Analyst

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END OF REPORT

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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-002340-01** REPORT DATE **20/01/2023**

Attention Downer NZ Ltd (EDI Levin)
Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND

Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill

Order code: EUNZWE-00082944

SAMPLE CODE **812-2022-00135484**

Client Reference: 265422-0
Sampling Point code: WIL-TD1
Sampling Point name: Levin TD1
Reception Date & Time: 07/12/2022 14:25
Analysis Start Date & Time: 07/12/2022 14:45
Analysis Ending Date: 20/01/2023
Sampled Date & Time 06/12/2022 12:05
Sampler(s) Client nominated external sampler
Sampled by Eurofins False

		RESULTS (UNCERTAINTY)		LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.03	(± 0.008) mg/l	0.01
NW583	**Arsenic - Soluble**			
	Arsenic (As)	<0.001	(± 0.0004) mg/l	0.001
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	(± 0.4) mg/l	1
NW457	**Calcium - Dissolved**			
	Calcium (Ca)	16.6	(± 1.66) mg/l	0.01
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	260	(± 27) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	36.5	(± 1.83) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	29.8	(± 0.6) mS/m	0.1
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	0.028	(± 0.006) mg/l	0.005
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	200	cfu/100 ml	100
NW460	**Iron - Dissolved**			
	Iron (Fe)	0.155	(± 0.031) mg/l	0.005
NW462	**Magnesium - Dissolved**			
	Magnesium (Mg)	7.63	(± 0.76) mg/l	0.01
NW010	**Nitrate-N**			
	Nitrate-N	<0.01	(± 0.004) mg/l	0.01
NW195	**pH**			
	pH	7.0	(± 0.2)	0.1

		RESULTS (UNCERTAINTY)		LOQ
③VQ088	**Phenolics (Total)**			
	Total phenols	<0.05	mg/l	0.05
NW469	**Sodium - Dissolved**			
	Sodium (Na)	32.3	(± 3.23) mg/l	0.02
NW098	**Soluble Aluminium**			
	Aluminium	0.010	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.05	mg/l	0.03
NW104	**Soluble Cadmium**			
	Cadmium (Cd)	<0.0002	(± 0.0001) mg/l	0.0002
NW106	**Soluble Chromium**			
	Chromium (Cr)	<0.001	(± 0.0004) mg/l	0.001
NW108	**Soluble Copper**			
	Copper (Cu)	<0.0005	(± 0.0002) mg/l	0.0005
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.0589	(± 0.0118) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005
NW117	**Soluble Potassium**			
	Potassium (K)	2.66	mg/l	0.01
NW125	**Soluble Zinc**			
	Zinc (Zn)	<0.002	(± 0.0007) mg/l	0.002
NW011	**Sulphate**			
	Sulphate	6.42	(± 0.64) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	90	mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	85	(± 9) mg CaCO3/l	1
NW029	**Total Hardness**			
	Hardness	73	(± 7) mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	31.5	(± 3.1) mg/l	0.1
③VQ876	**Volatile Fatty Acids (VFA) by GC-MS**			
	Acetic acid	<5	mg/l	5
	Butyric acid	<5	mg/l	5
	Heptanoic Acid C7:0	<5	mg/l	5
	Hexanoic acid	<5	mg/l	5
	Iso caproic acid	<5	mg/l	5
	Isobutyric acid	<5	mg/l	5

	RESULTS (UNCERTAINTY)		LOQ
③VQ876 **Volatile Fatty Acids (VFA) by GC-MS**			
Isovaleric acid	<5	mg/l	5
Propionic acid	<5	mg/l	5
Valeric acid	<5	mg/l	5
Volatile fatty acids as acetic acid	<5	mg/l	5

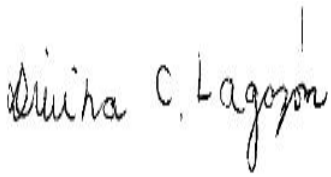
LIST OF METHODS

NW003 **Total Alkalinity:** APHA Online Edition 2320 B
NW007 **Chloride:** APHA Online Edition 4110 B
NW010 **Nitrate-N:** APHA Online Edition 4110 B
NW011 **Sulphate:** APHA Online Edition 4110 B
NW020 **Chemical Oxygen Demand:** APHA Online Edition 5220 D
NW023 **Conductivity:** APHA Online Edition 2510 B
NW029 **Total Hardness:** APHA Online Edition 2340 B
NW098 **Soluble Aluminium:** APHA Online Edition 3125 B mod.
NW103 **Soluble Boron:** APHA Online Edition 3125 B mod.
NW104 **Soluble Cadmium:** APHA Online Edition 3125 B mod.
NW106 **Soluble Chromium:** APHA Online Edition 3125 B mod.
NW108 **Soluble Copper:** APHA Online Edition 3125 B mod.
NW110 **Soluble Lead:** APHA Online Edition 3125 B mod.
NW113 **Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114 **Soluble Mercury:** APHA Online Edition 3125 B mod.
NW116 **Soluble Nickel:** APHA Online Edition 3125 B mod.
NW117 **Soluble Potassium:** APHA Online Edition 3125 B mod.
NW125 **Soluble Zinc:** APHA Online Edition 3125 B mod.
NW179 **Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H
NW193 **Dissolved Reactive Phosphorus:** APHA Online Edition 4500-P G
NW195 **pH:** APHA Online Edition 4500-H B
NW206 **Suspended Solids:** APHA Online Edition 2540 D
NW210 **Total Non-Purgeable Organic Carbon:** APHA Online Edition 5310 B
NW341 **BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B
NW457 **Calcium - Dissolved:** APHA Online Edition 3120 B mod.
NW460 **Iron - Dissolved:** APHA Online Edition 3120 B mod.
NW462 **Magnesium - Dissolved:** APHA Online Edition 3120 B mod.
NW469 **Sodium - Dissolved:** APHA Online Edition 3120 B mod.
NW583 **Arsenic - Soluble:** APHA Online Edition 3125 B mod.
VQ088 **Phenolics (Total):** APHA 5530
VQ876 **Volatile Fatty Acids (VFA) by GC-MS:** APHA 5560-D
ZM2GA **Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Jennifer Mont Supervisor

Amitesh Kumar Supervisor



Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Arvinder Singh Supervisor

Marylou Cabral Laboratory Manager

EXPLANATORY NOTE

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② Test is subcontracted within Eurofins group and is accredited
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⑥ Test result is provided by the customer and is not accredited
⑦ Tested at the sampling point by Eurofins and is not accredited
⑧ Tested at the sampling point by Eurofins and is accredited

N/A means Not applicable
Not Detected means not detected at or above the Limit of Quantification (LOQ
LOQ means Limit of Quantification and the unit of LOQ is the same as the result unit

Eurofins ELS Limited
85 Port Road
Seaview
Lower Hutt
Wellington 5010
NEW ZEALAND

Phone +64 4 576 5016
www.eurofins.co.nz

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ANALYTICAL REPORT

REPORT CODE **AR-23-NW-005636-01** REPORT DATE **12/02/2023**

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Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND
Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill
Order code: EUNZWE-00100853

SAMPLE CODE **812-2023-00004914**

Client Reference: 270659-0
Sampling Point code: WIL-TD1
Sampling Point name: Levin TD1
Reception Date & Time: 13/01/2023 8:35
Analysis Start Date & Time: 13/01/2023 20:05
Analysis Ending Date: 12/02/2023
Sampled Date & Time 12/01/2023 11:59
Sampler(s) Client nominated external sampler
Sampled by Eurofins False

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	12.9	(± 1.29) mg/l	0.01
NW583	**Arsenic - Soluble**			
	Arsenic (As)	0.001	(± 0.0004) mg/l	0.001
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	51	(± 8) mg/l	1
NW457	**Calcium - Dissolved**			
	Calcium (Ca)	74.6	(± 7.46) mg/l	0.01
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	2840	(± 140) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	100	(± 5.02) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	150	(± 3.0) mS/m	0.1
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	0.030	(± 0.006) mg/l	0.005
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	200	cfu/100 ml	100
NW460	**Iron - Dissolved**			
	Iron (Fe)	0.617	(± 0.123) mg/l	0.005
NW462	**Magnesium - Dissolved**			
	Magnesium (Mg)	35.7	(± 3.57) mg/l	0.01
NW010	**Nitrate-N**			
	Nitrate-N	0.53	(± 0.13) mg/l	0.01
NW195	**pH**			
	pH	6.7	(± 0.2)	0.1

		RESULTS	(UNCERTAINTY)	LOQ
③VQ088	**Phenolics (Total)**			
	Total phenols	<0.05	mg/l	0.05
NW469	**Sodium - Dissolved**			
	Sodium (Na)	82.4	(± 8.24) mg/l	0.02
NW098	**Soluble Aluminium**			
	Aluminium	0.004	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.39	mg/l	0.03
NW104	**Soluble Cadmium**			
	Cadmium (Cd)	<0.0002	(± 0.0001) mg/l	0.0002
NW106	**Soluble Chromium**			
	Chromium (Cr)	0.001	(± 0.0004) mg/l	0.001
NW108	**Soluble Copper**			
	Copper (Cu)	<0.0005	(± 0.0002) mg/l	0.0005
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.816	(± 0.0816) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	0.0021	(± 0.0007) mg/l	0.0005
NW117	**Soluble Potassium**			
	Potassium (K)	29.3	mg/l	0.01
NW125	**Soluble Zinc**			
	Zinc (Zn)	<0.002	(± 0.0007) mg/l	0.002
NW011	**Sulphate**			
	Sulphate	1.20	(± 0.12) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	5230	mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	630	(± 63) mg CaCO3/l	1
NW029	**Total Hardness**			
	Hardness	334	(± 33) mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	175	(± 17.5) mg/l	0.1
③VQ876	**Volatile Fatty Acids (VFA) by GC-MS**			
	Acetic acid	38	mg/l	5
	Butyric acid	<5	mg/l	5
	Heptanoic Acid C7:0	<5	mg/l	5
	Hexanoic acid	<5	mg/l	5
	Iso caproic acid	<5	mg/l	5
	Isobutyric acid	<5	mg/l	5
	Isovaleric acid	<5	mg/l	5

	RESULTS (UNCERTAINTY)		LOQ
③VQ876 **Volatile Fatty Acids (VFA) by GC-MS**			
Propionic acid	<5	mg/l	5
Valeric acid	<5	mg/l	5
Volatile fatty acids as acetic acid	40	mg/l	5

LIST OF METHODS

NW003	**Total Alkalinity:** APHA Online Edition 2320 B
NW007	**Chloride:** APHA Online Edition 4110 B
NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW011	**Sulphate:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D
NW023	**Conductivity:** APHA Online Edition 2510 B
NW029	**Total Hardness:** APHA Online Edition 2340 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.
NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW104	**Soluble Cadmium:** APHA Online Edition 3125 B mod.
NW106	**Soluble Chromium:** APHA Online Edition 3125 B mod.
NW108	**Soluble Copper:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.
NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.
NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW117	**Soluble Potassium:** APHA Online Edition 3125 B mod.
NW125	**Soluble Zinc:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H
NW193	**Dissolved Reactive Phosphorus:** APHA Online Edition 4500-P G
NW195	**pH:** APHA Online Edition 4500-H B
NW206	**Suspended Solids:** APHA Online Edition 2540 D
NW210	**Total Non-Purgeable Organic Carbon:** APHA Online Edition 5310 B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B
NW457	**Calcium - Dissolved:** APHA Online Edition 3120 B mod.
NW460	**Iron - Dissolved:** APHA Online Edition 3120 B mod.
NW462	**Magnesium - Dissolved:** APHA Online Edition 3120 B mod.
NW469	**Sodium - Dissolved:** APHA Online Edition 3120 B mod.
NW583	**Arsenic - Soluble:** APHA Online Edition 3125 B mod.
VQ088	**Phenolics (Total):** APHA 5530
VQ876	**Volatile Fatty Acids (VFA) by GC-MS:** APHA 5560-D
ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Marylou Cabral Laboratory Manager

Jennifer Mont Supervisor

Amitesh Kumar Supervisor

Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Ivan Imamura Laboratory Analyst

Leo Cleave Senior Analyst

EXPLANATORY NOTE

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② Test is subcontracted within Eurofins group and is accredited
③ Test is subcontracted within Eurofins group and is not accredited
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⑦ Tested at the sampling point by Eurofins and is not accredited
⑧ Tested at the sampling point by Eurofins and is accredited

N/A means Not applicable
Not Detected means not detected at or above the Limit of Quantification (LOQ)
LOQ means Limit of Quantification and the unit of LOQ is the same as the result unit

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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-000076-01** REPORT DATE **03/01/2023**

Attention Downer NZ Ltd (EDI Levin)
Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND
Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill
Order code: EUNZWE-00068716

SAMPLE CODE **812-2022-00120659**

Client Reference: 261805-0
Sampling Point WIL-TD1:Levin TD1
Reception Date & Time: 03/11/2022 20:10
Analysis Start Date & Time: 03/11/2022 20:33
Analysis Ending Date: 03/01/2023
Sampled Date & Time 02/11/2022 11:43
Sampler(s) Client nominated external sampler
Sampled by Eurofins False

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	10.7	(± 1.07) mg/l	0.01
NW583	**Arsenic - Soluble**			
	Arsenic (As)	0.001	(± 0.0004) mg/l	0.001
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	(± 0.4) mg/l	1
NW457	**Calcium - Dissolved**			
	Calcium (Ca)	68.4	(± 6.84) mg/l	0.01
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	121	(± 13) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	101	(± 5.05) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	110	(± 2.2) mS/m	0.1
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	0.028	(± 0.006) mg/l	0.005
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	1000	cfu/100 ml	100
NW460	**Iron - Dissolved**			
	Iron (Fe)	0.170	(± 0.034) mg/l	0.005
NW462	**Magnesium - Dissolved**			
	Magnesium (Mg)	35.4	(± 3.54) mg/l	0.01
NW010	**Nitrate-N**			
	Nitrate-N	0.70	(± 0.17) mg/l	0.01
NW195	**pH**			
	pH	7.7	(± 0.2)	0.1

		RESULTS (UNCERTAINTY)		LOQ
③VQ088	**Phenolics (Total)**			
	Total phenols	<0.05	mg/l	0.05
NW469	**Sodium - Dissolved**			
	Sodium (Na)	90.1	(± 9.01) mg/l	0.02
NW098	**Soluble Aluminium**			
	Aluminium	0.016	(± 0.002) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.57	mg/l	0.03
NW104	**Soluble Cadmium**			
	Cadmium (Cd)	<0.0002	(± 0.0001) mg/l	0.0002
NW106	**Soluble Chromium**			
	Chromium (Cr)	0.002	(± 0.0004) mg/l	0.001
NW108	**Soluble Copper**			
	Copper (Cu)	0.0008	(± 0.0002) mg/l	0.0005
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.999	(± 0.0999) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	0.0028	(± 0.0009) mg/l	0.0005
NW117	**Soluble Potassium**			
	Potassium (K)	32.5	mg/l	0.01
NW125	**Soluble Zinc**			
	Zinc (Zn)	0.005	(± 0.0008) mg/l	0.002
NW011	**Sulphate**			
	Sulphate	1.93	(± 0.19) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	69	mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	389	(± 39) mg CaCO3/l	1
NW029	**Total Hardness**			
	Hardness	317	(± 32) mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	30.6	(± 3.1) mg/l	0.1
③VQ876	**Volatile Fatty Acids (VFA) by GC-MS**			
	Acetic acid	<5	mg/l	5
	Butyric acid	<5	mg/l	5
	Heptanoic Acid C7:0	<5	mg/l	5
	Hexanoic acid	<5	mg/l	5
	Iso caproic acid	<5	mg/l	5
	Isobutyric acid	<5	mg/l	5

	RESULTS (UNCERTAINTY)		LOQ
③VQ876 **Volatile Fatty Acids (VFA) by GC-MS**			
Isovaleric acid	<5	mg/l	5
Propionic acid	<5	mg/l	5
Valeric acid	<5	mg/l	5
Volatile fatty acids as acetic acid	<5	mg/l	5

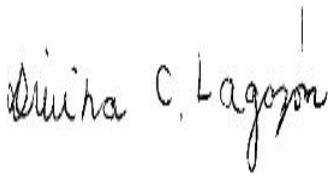
LIST OF METHODS

NW003	**Total Alkalinity:** APHA Online Edition 2320 B	NW007	**Chloride:** APHA Online Edition 4110 B
NW010	**Nitrate-N:** APHA Online Edition 4110 B	NW011	**Sulphate:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW029	**Total Hardness:** APHA Online Edition 2340 B	NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.
NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.	NW104	**Soluble Cadmium:** APHA Online Edition 3125 B mod.
NW106	**Soluble Chromium:** APHA Online Edition 3125 B mod.	NW108	**Soluble Copper:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.	NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.	NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW117	**Soluble Potassium:** APHA Online Edition 3125 B mod.	NW125	**Soluble Zinc:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW193	**Dissolved Reactive Phosphorus:** APHA Online Edition 4500-P G
NW195	**pH:** APHA Online Edition 4500-H B	NW206	**Suspended Solids:** APHA Online Edition 2540 D
NW210	**Total Non-Purgeable Organic Carbon:** APHA Online Edition 5310 B	NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B
NW457	**Calcium - Dissolved:** APHA Online Edition 3120 B mod.	NW460	**Iron - Dissolved:** APHA Online Edition 3120 B mod.
NW462	**Magnesium - Dissolved:** APHA Online Edition 3120 B mod.	NW469	**Sodium - Dissolved:** APHA Online Edition 3120 B mod.
NW583	**Arsenic - Soluble:** APHA Online Edition 3125 B mod.	VQ088	**Phenolics (Total):** APHA 5530
VQ876	**Volatile Fatty Acids (VFA) by GC-MS:** APHA 5560-D	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Jennifer Mont Supervisor

Amitesh Kumar Supervisor



Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Leo Cleave Senior Analyst

Marylou Cabral Laboratory Manager

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LOQ means Limit of Quantification and the unit of LOQ is the same as the result unit

Eurofins ELS Limited
85 Port Road
Seaview
Lower Hutt
Wellington 5010
NEW ZEALAND

Phone +64 4 576 5016
www.eurofins.co.nz

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END OF REPORT

Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-002799-01** REPORT DATE **24/01/2023**

Attention Downer NZ Ltd (EDI Levin)
Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND

Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill

Order code: EUNZWE-00100853

SAMPLE CODE **812-2023-00004906**

Client Reference: 270637-0
Sampling Point code: WIL-Xd1
Sampling Point name: Levin Xd1
Reception Date & Time: 13/01/2023 8:35
Analysis Start Date & Time: 13/01/2023 19:45
Analysis Ending Date: 24/01/2023
Sampled Date & Time 12/01/2023 09:45
Sampler(s) Client nominated external sampler
Sampled by Eurofins False

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.29	(± 0.09) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<6	(± 0.8) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	16	(± 6) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	57.1	(± 2.86) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	53.6	(± 1.1) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	<0.01	(± 0.003) mg/l	0.01
NW195	**pH**			
	pH	7.8	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	<0.002	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.05	mg/l	0.03
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.521	(± 0.0521) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005

Food & Water Testing

	RESULTS (UNCERTAINTY)		LOQ
NW116 Soluble Nickel			
Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005

LIST OF METHODS

NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.	NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.	NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Marylou Cabral Laboratory Manager

Jennifer Mont Supervisor

Amitesh Kumar Supervisor

Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Ivan Imamura Laboratory Analyst

Leo Cleave Senior Analyst

Gabriela Carvalhaes Lean Project Manager

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85 Port Road
Seaview
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Phone +64 4 576 5016
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ANALYTICAL REPORT

REPORT CODE **AR-23-NW-002800-01** REPORT DATE **24/01/2023**

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Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND

Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill

Order code: EUNZWE-00100853

SAMPLE CODE **812-2023-00004907**

Client Reference: 270657-0
Sampling Point code: WIL-Xs1
Sampling Point name: Levin Xs1
Reception Date & Time: 13/01/2023 8:35
Analysis Start Date & Time: 13/01/2023 19:45
Analysis Ending Date: 24/01/2023
Sampled Date & Time 12/01/2023 10:30
Sampler(s) Client nominated external sampler
Sampled by Eurofins False

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	12.4	(± 1.24) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<6	(± 0.8) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	81	(± 13) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	119	(± 5.93) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	141	(± 2.8) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	<0.10	(± 0.02) mg/l	0.01
NW195	**pH**			
	pH	7.1	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	0.003	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.57	mg/l	0.03
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	1.47	(± 0.147) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005

	RESULTS (UNCERTAINTY)	LOQ
NW116 Soluble Nickel		
Nickel (Ni)	0.0024 (± 0.0007) mg/l	0.0005

LIST OF METHODS

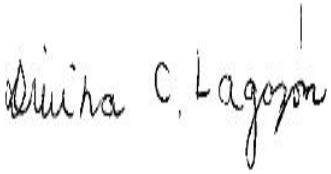
NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.	NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.	NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Marylou Cabral Laboratory Manager

Jennifer Mont Supervisor

Amitesh Kumar Supervisor



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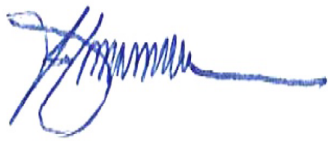

Ivan Imamura Laboratory Analyst

Leo Cleave Senior Analyst

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Food & Water Testing

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REPORT CODE **AR-23-NW-002796-01** REPORT DATE **24/01/2023**

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Horowhenua Admin
P O Box 642
4741 Levin
NEW ZEALAND

Phone (06) 367 2705
Email horowhenuaadmin@downer.co.nz

Copy to: Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Yvettef

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill

Order code: EUNZWE-00100853

SAMPLE CODE **812-2023-00004902**

Client Reference: 270658-0
Sampling Point code: WIL-Xs2
Sampling Point name: Levin Xs2
Reception Date & Time: 13/01/2023 8:35
Analysis Start Date & Time: 13/01/2023 19:45
Analysis Ending Date: 24/01/2023
Sampled by Eurofins False

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.01	(± 0.005) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<6	(± 0.8) mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	<15	(± 5) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	19.4	(± 0.97) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	18.8	(± 0.4) mS/m	0.1
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	1.64	(± 0.16) mg/l	0.01
NW195	**pH**			
	pH	7.8	(± 0.2)	0.1
NW098	**Soluble Aluminium**			
	Aluminium	0.006	(± 0.001) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.04	mg/l	0.03
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.0598	(± 0.0120) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			

	RESULTS (UNCERTAINTY)	LOQ
NW116 Soluble Nickel		
Nickel (Ni)	<0.0005 (± 0.0002) mg/l	0.0005

LIST OF METHODS

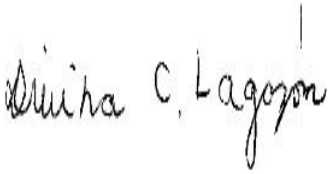
NW007	**Chloride:** APHA Online Edition 4110 B	NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW098	**Soluble Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Soluble Boron:** APHA Online Edition 3125 B mod.
NW110	**Soluble Lead:** APHA Online Edition 3125 B mod.	NW113	**Soluble Manganese:** APHA Online Edition 3125 B mod.
NW114	**Soluble Mercury:** APHA Online Edition 3125 B mod.	NW116	**Soluble Nickel:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Marylou Cabral Laboratory Manager

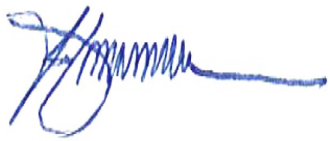
Jennifer Mont Supervisor

Amitesh Kumar Supervisor



Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst



Ivan Imamura Laboratory Analyst

Leo Cleave Senior Analyst

EXPLANATORY NOTE

① Test is not accredited
② Test is subcontracted within Eurofins group and is accredited
③ Test is subcontracted within Eurofins group and is not accredited
④ Test is subcontracted outside Eurofins group and is accredited
⑤ Test is subcontracted outside Eurofins group and is not accredited
⑥ Test result is provided by the customer and is not accredited
⑦ Tested at the sampling point by Eurofins and is not accredited
⑧ Tested at the sampling point by Eurofins and is accredited

N/A means Not applicable
Not Detected means not detected at or above the Limit of Quantification (LOQ
LOQ means Limit of Quantification and the unit of LOQ is the same as the result unit

The test result(s) in this report apply only to the sample as received.
This document can only be reproduced in full.
The tests are identified by a five-digit code, their description is available on request.
Accreditation does not apply to comments or graphical representations.
Unless otherwise stated, all tests in this analytical report (except for subcontracted tests) are performed at 85 Port Road, Seaview, Lower Hutt, Wellington, NEW ZEALAND.
The laboratory is not responsible for the information provided by the customer which can affect the validity of the results, for example: sampling information such as date/time, field data etc.
This report issued by Eurofins relates exclusively to the samples provided by the Customer and does not relate to the lot / batch from which the samples have been obtained.
Eurofins may subcontract the performance of part or all of the Services to a third party and the Customer authorises the release of all information necessary to the third party for the provision of the Services.
All samples become the property of Eurofins to the extent necessary for the performance of the Services.
Eurofins will not be required to store samples and may destroy or otherwise dispose of the samples or return the samples to the Customer (at the Customer's cost in all respects) immediately following analysis of the samples.
If the Customer pays for storage of the samples Eurofins will take commercially reasonable steps to store the samples for the agreed period in terms of industry practice.
The Customer acknowledges and accepts that: (a) it is solely responsible for the sampling process and warrants that the sample provided to Eurofins is representative of the lot / batch from which the samples were drawn; and (b) Eurofins expresses no opinion and accepts no liability in respect of the Customer's production process or homogeneity of the sample.
The Eurofins water sampling services uses IANZ approved methodology based on AS/NZS 5667 and / or best practice to collect and transport samples that are fit for the purpose of analytical testing. Eurofins shall have no liability if the sample collected is not representative of the source from which it has been taken. The laboratory is not responsible for sampling activities unless explicitly indicated by the statement "Sampled by Eurofins" on the report for water samples.
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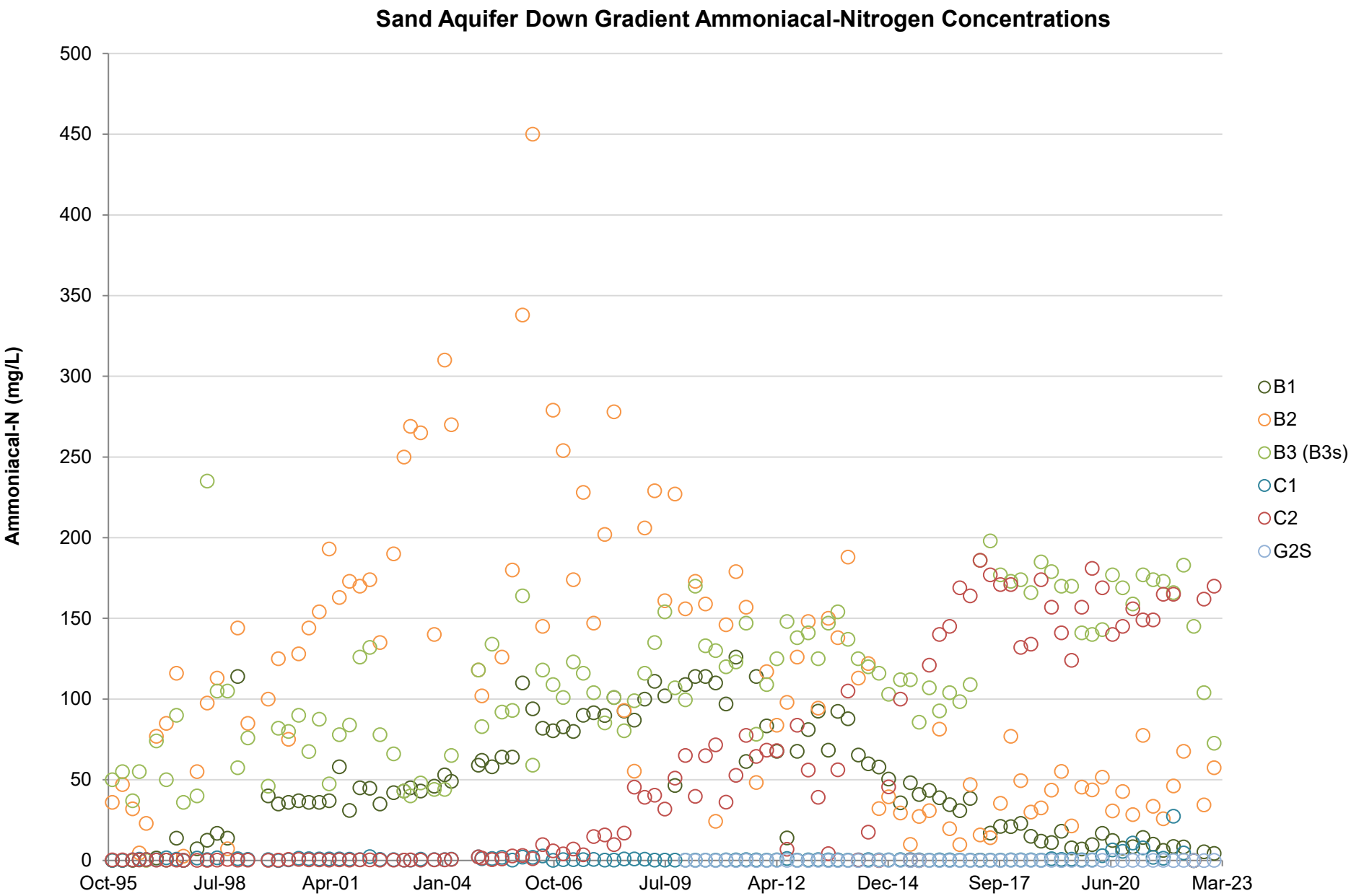
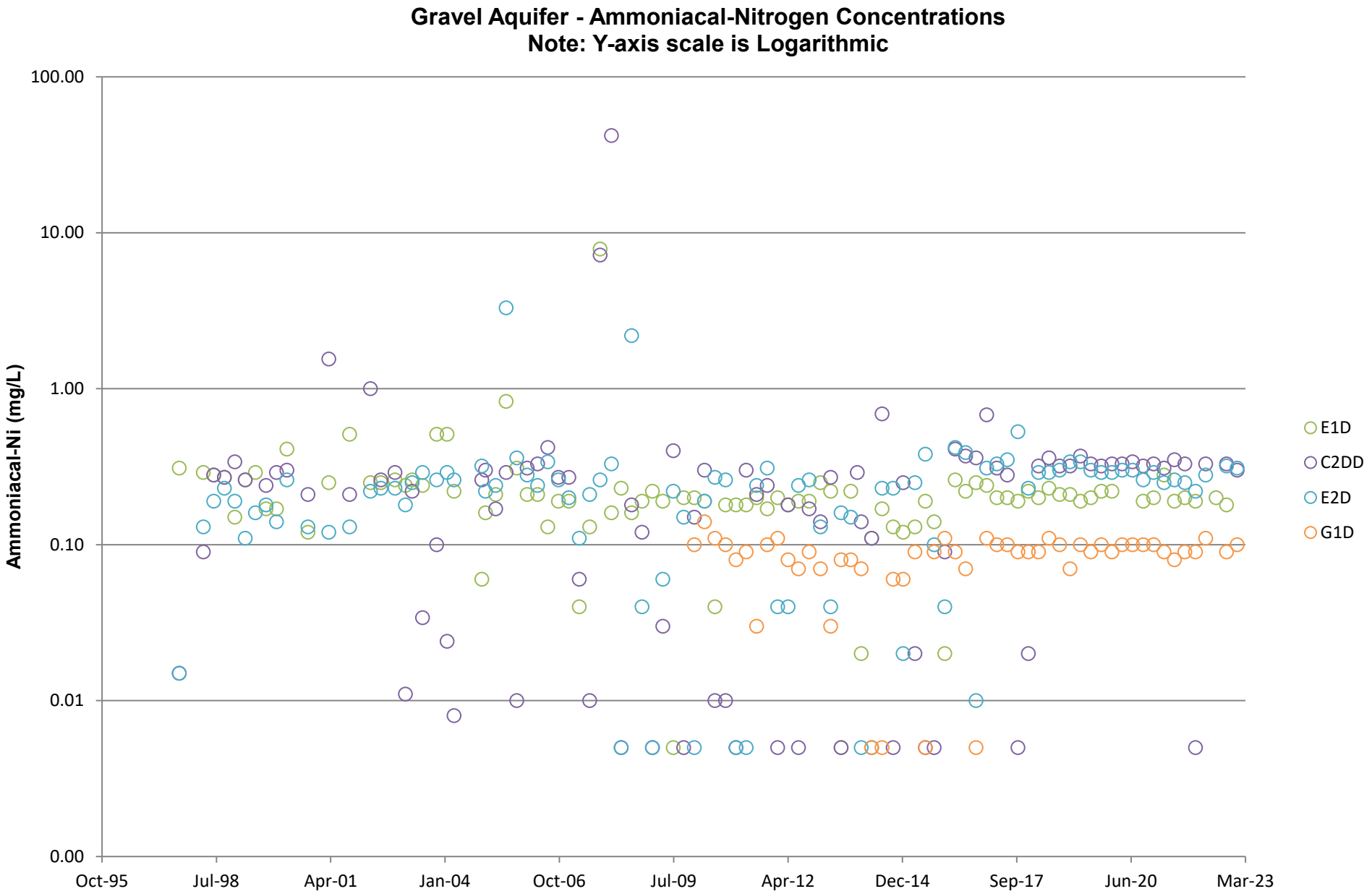
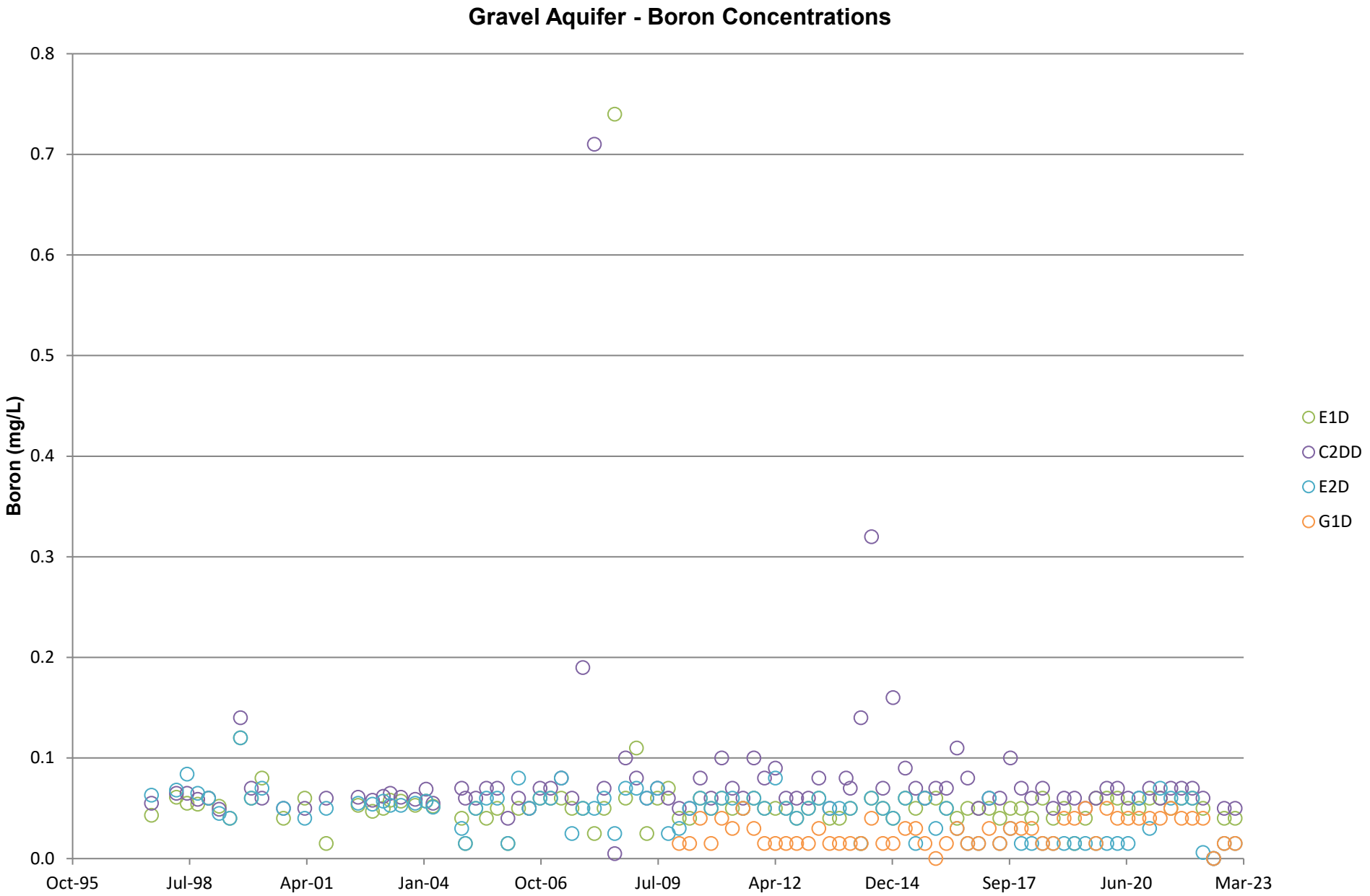
Eurofins shall have no liability for any indirect or consequential loss including, without limitation, loss of production, loss of contracts, loss of profits, loss of business or costs incurred from business interruption, loss of opportunity, loss of goodwill or damage to reputation and cost of product recall (including any losses suffered as a result of distribution of the Customer's products subject of the Services prior to the report being released by Eurofins). It shall further have no liability for any loss, damage or expenses arising from the claims of any third party (including, without limitation, product liability claims) that may be incurred by the Customer.
Eurofins General Terms and Conditions apply.

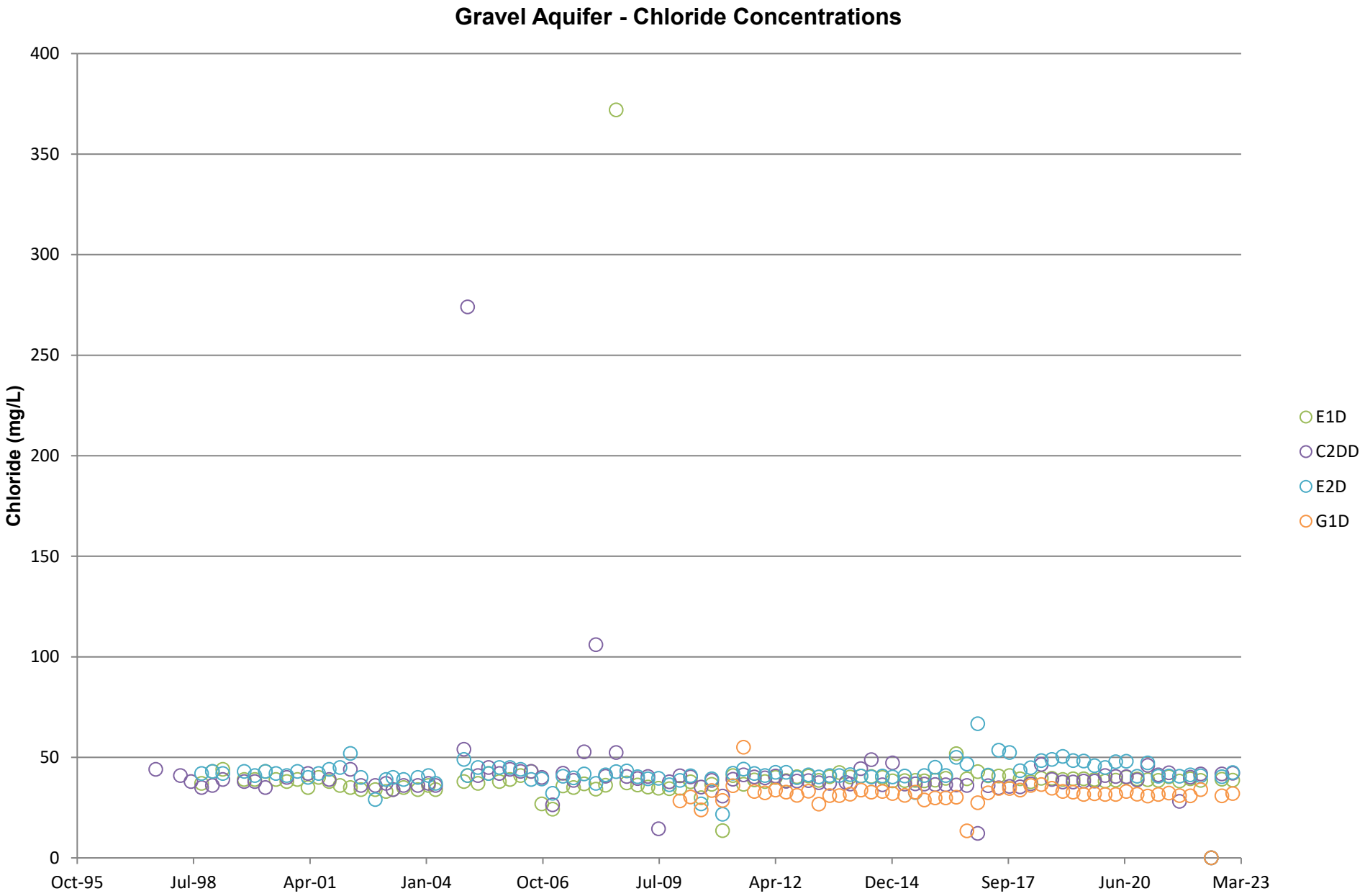
END OF REPORT

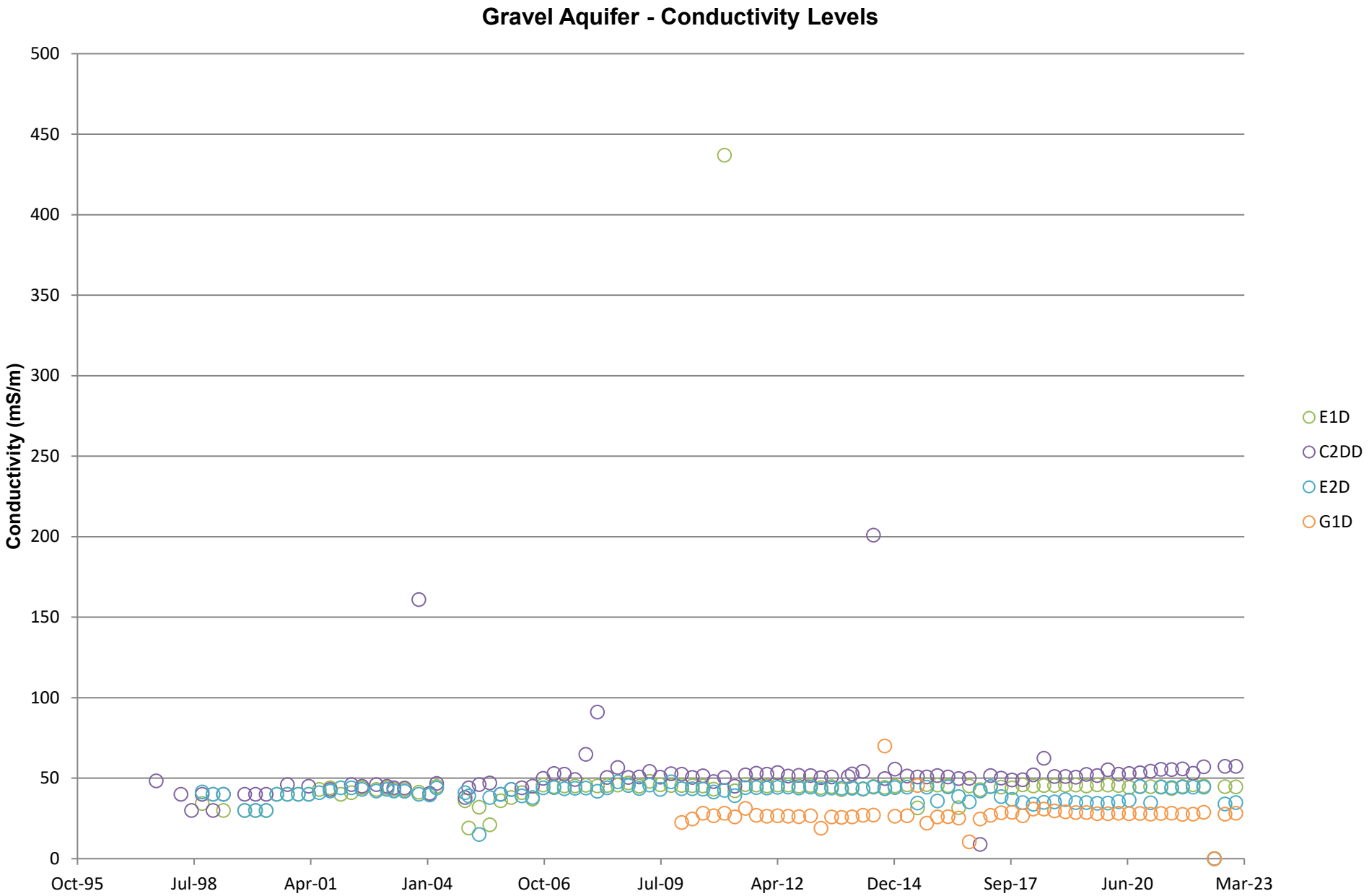
Appendix D Historical Results Graphs

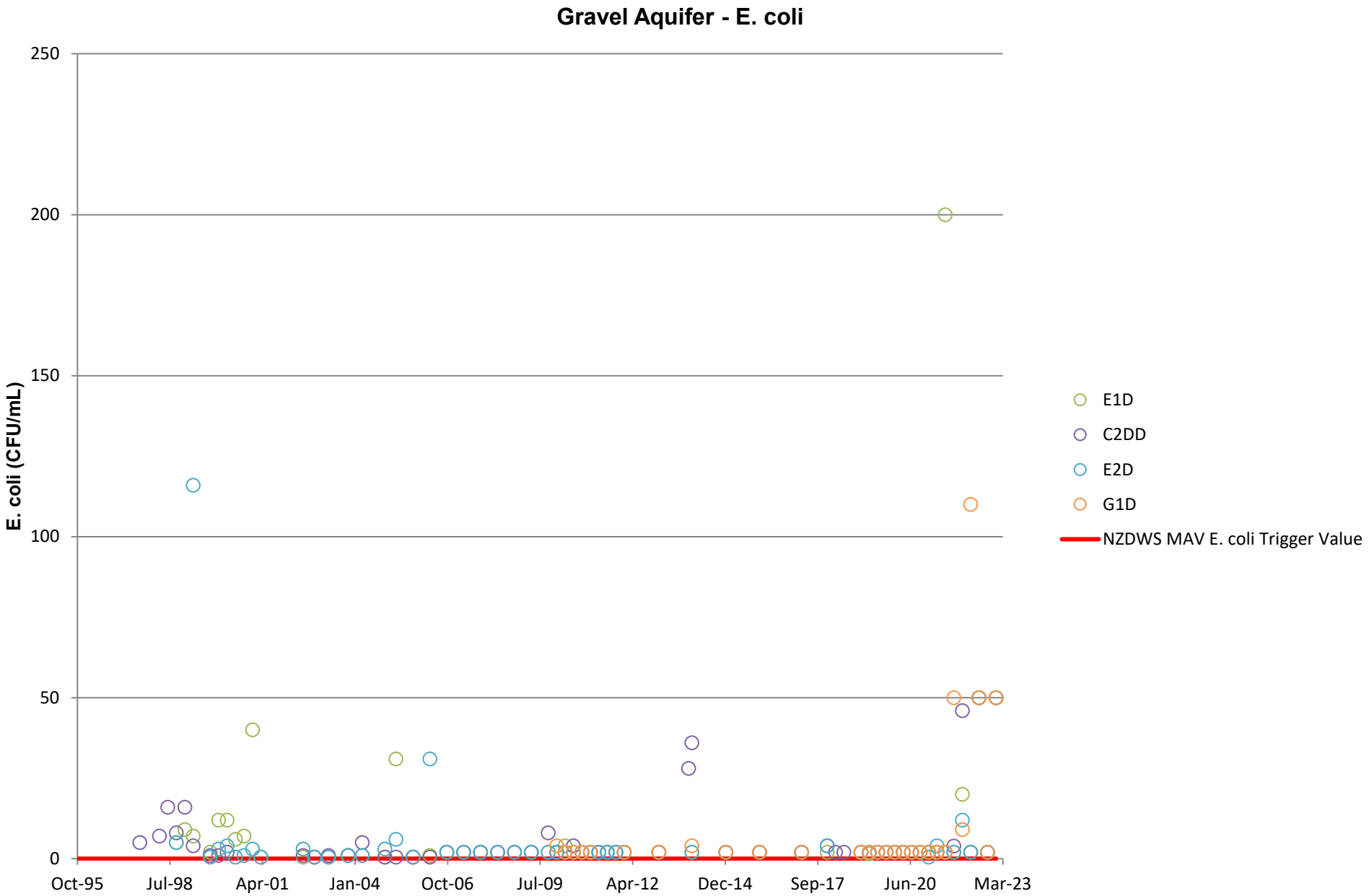

Sand Aquifer Down Gradient Ammoniacal-Nitrogen Concentrations
Ammoniacal-N (mg/L)
500
450
400
350
300
250
200
150
100
50
0
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
B1
B2
B3 (B3s)
C1
C2
G2S

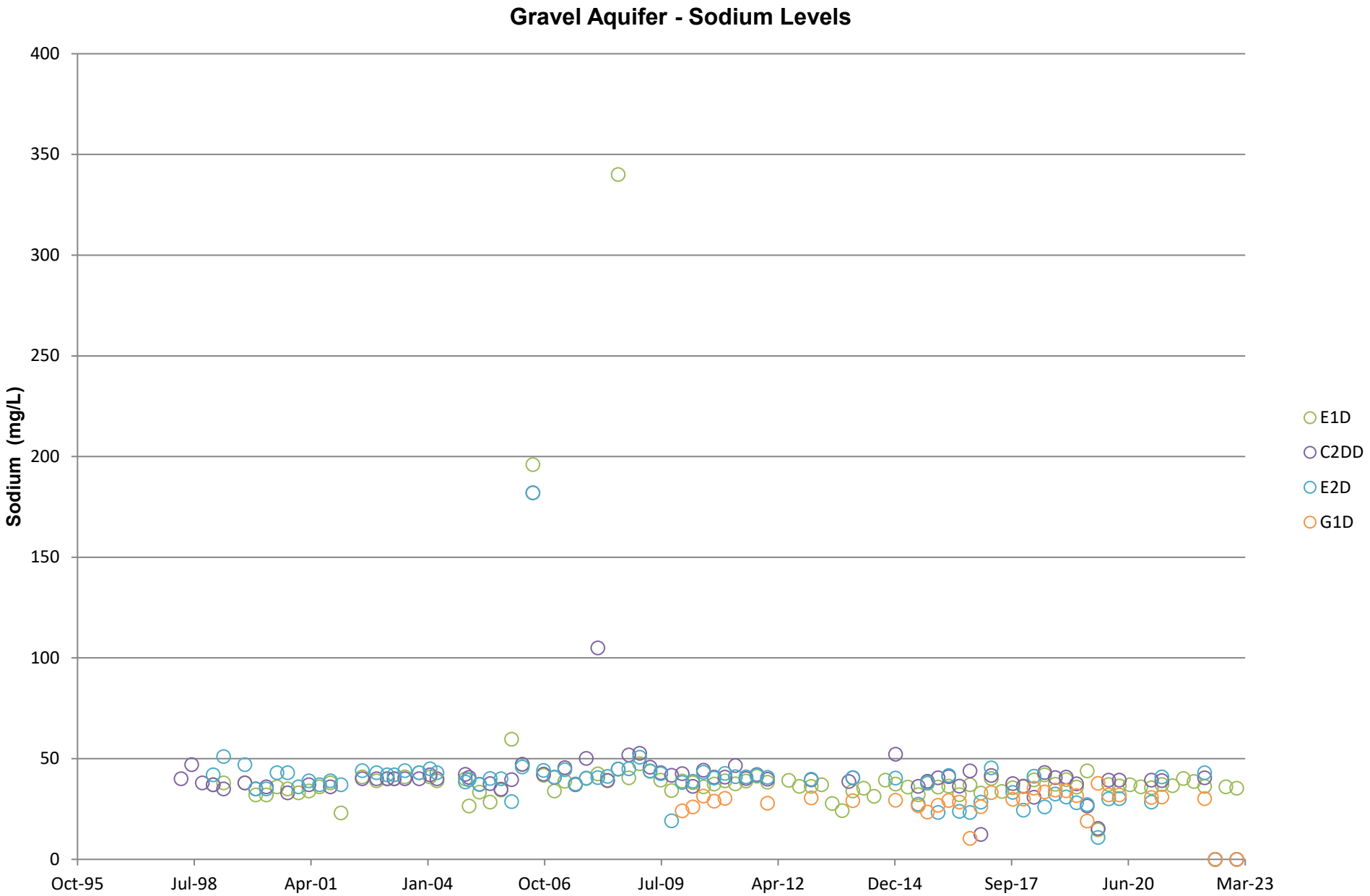

Gravel Aquifer - Ammoniacal-Nitrogen Concentrations
Note: Y-axis scale is Logarithmic
Ammoniacal-Ni (mg/L)
100.00
10.00
1.00
0.10
0.01
0.00
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
E1D
C2DD
E2D
G1D

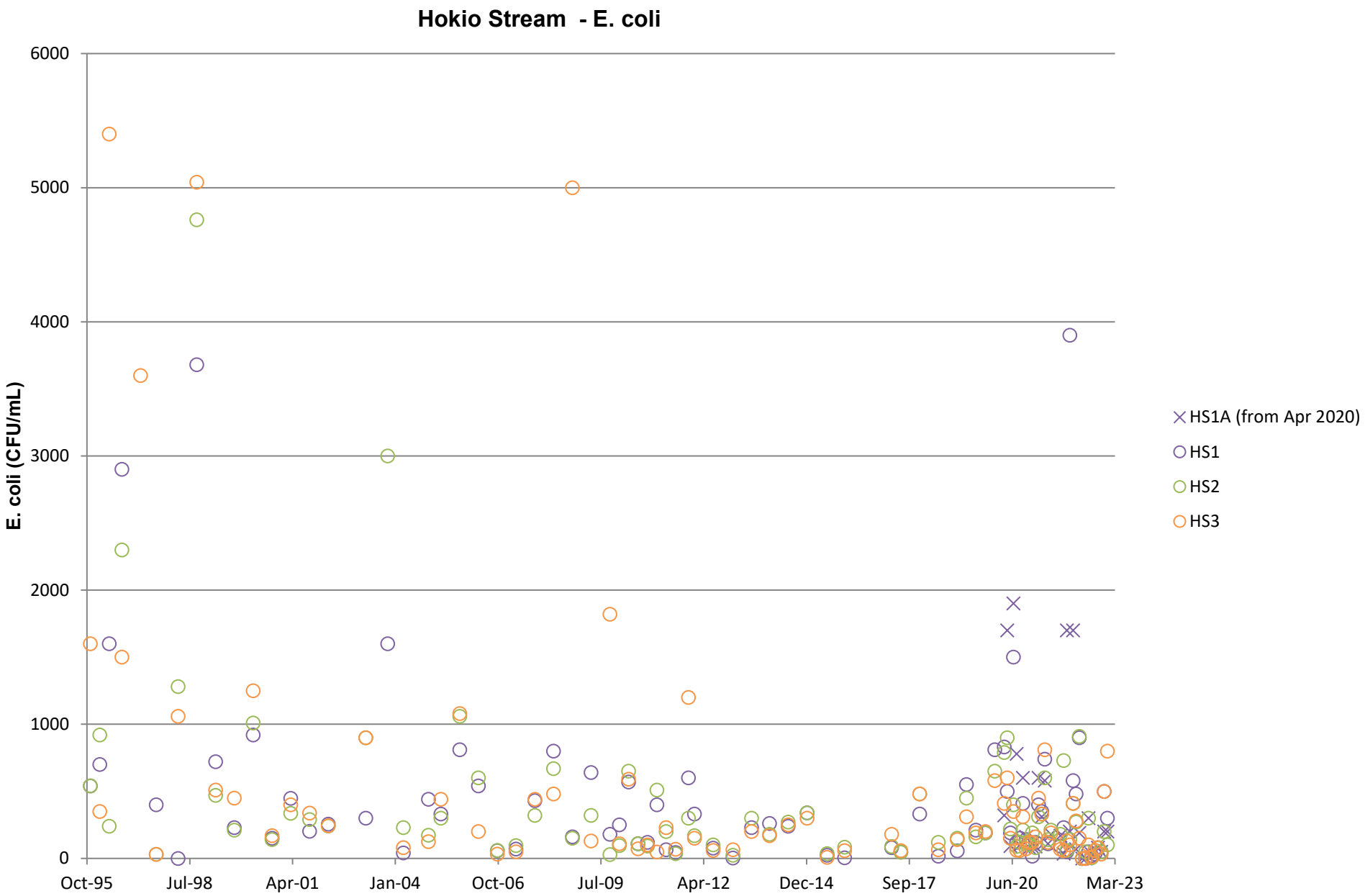

Gravel Aquifer - Boron Concentrations
Boron (mg/L)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
E1D
C2DD
E2D
G1D

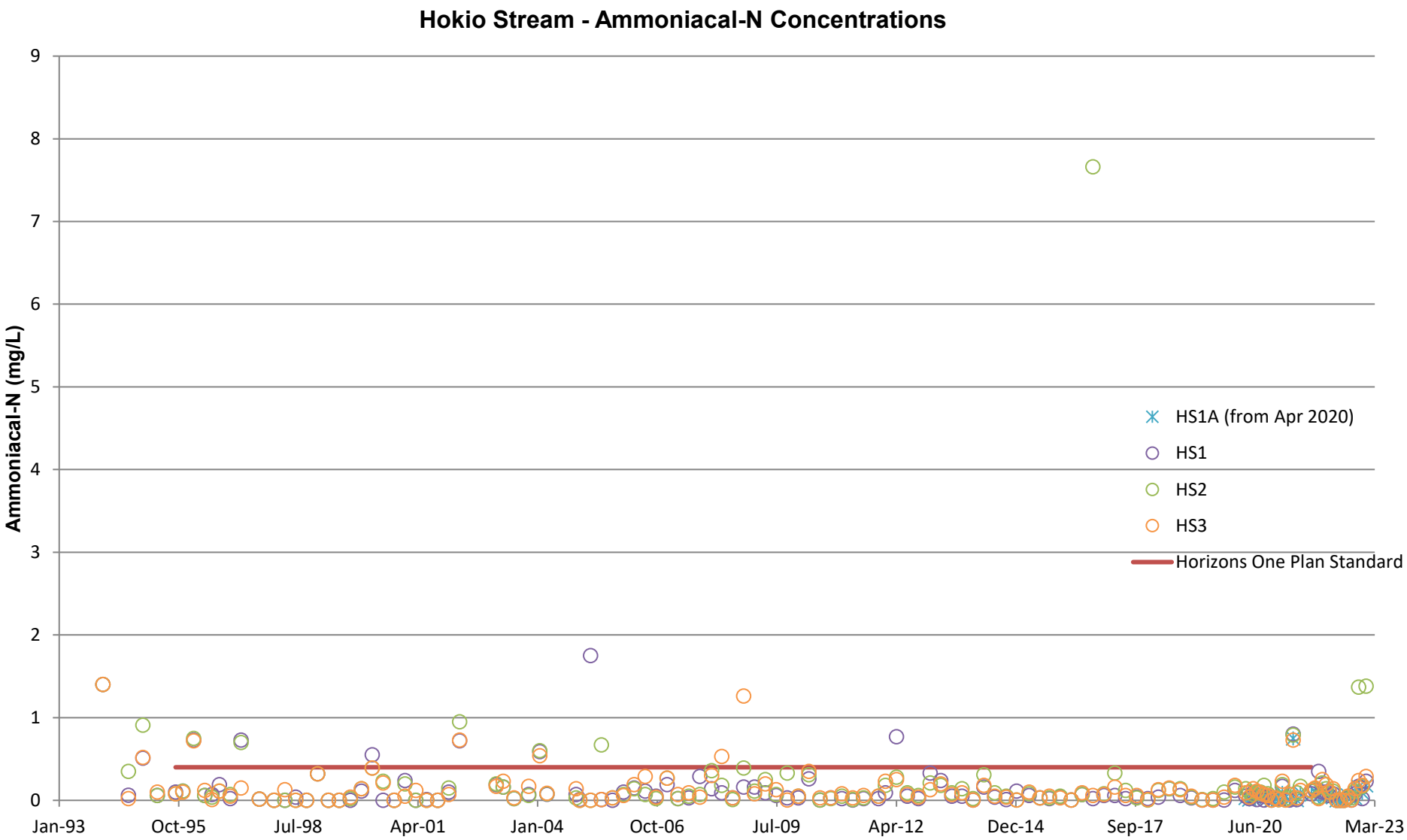

Gravel Aquifer - Chloride Concentrations
Chloride (mg/L)
400
350
300
250
200
150
100
50
0
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
E1D
C2DD
E2D
G1D

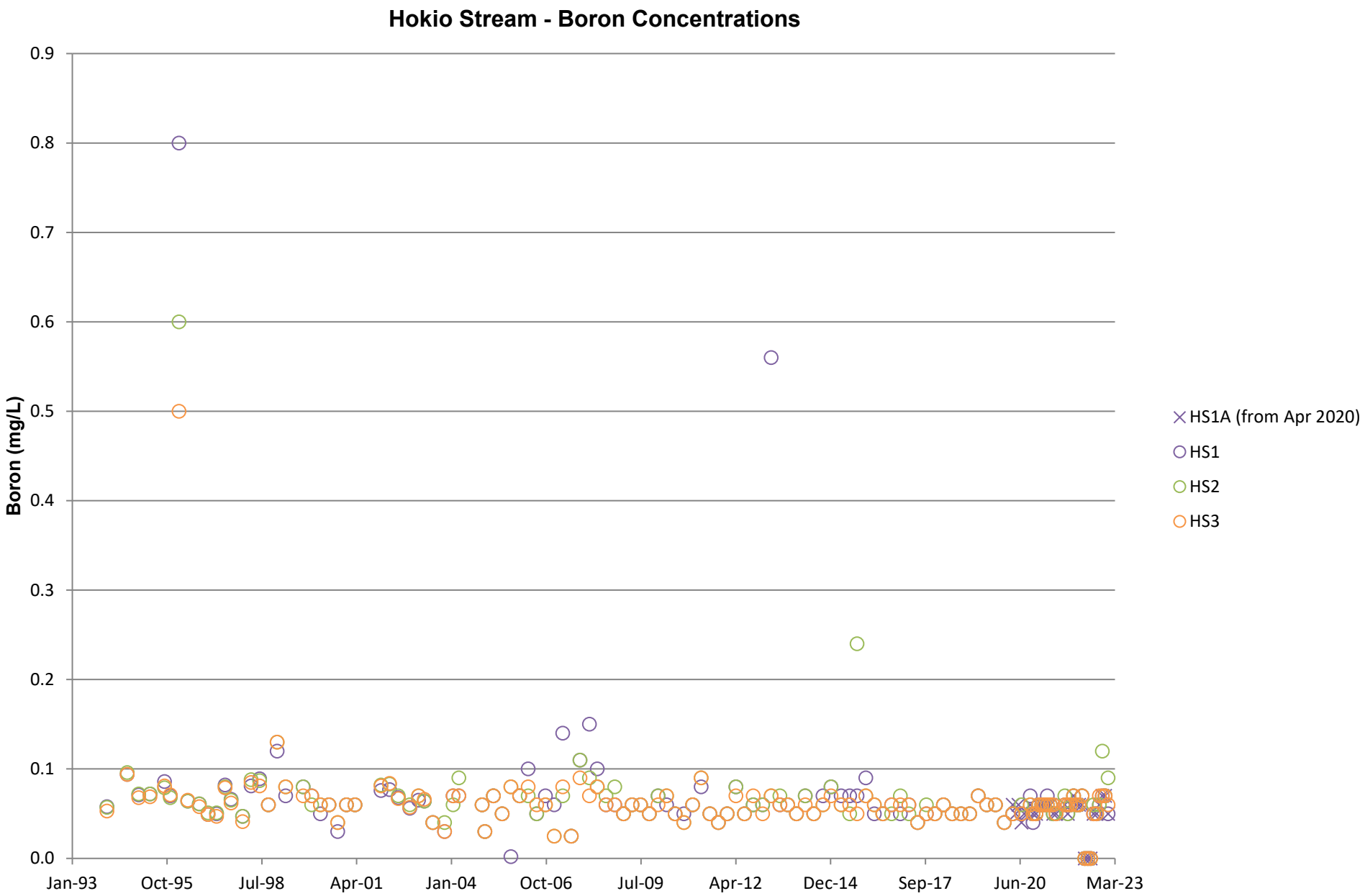

Gravel Aquifer - Conductivity Levels
Conductivity (mS/m)
500
450
400
350
300
250
200
150
100
50
0
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
E1D
C2DD
E2D
G1D

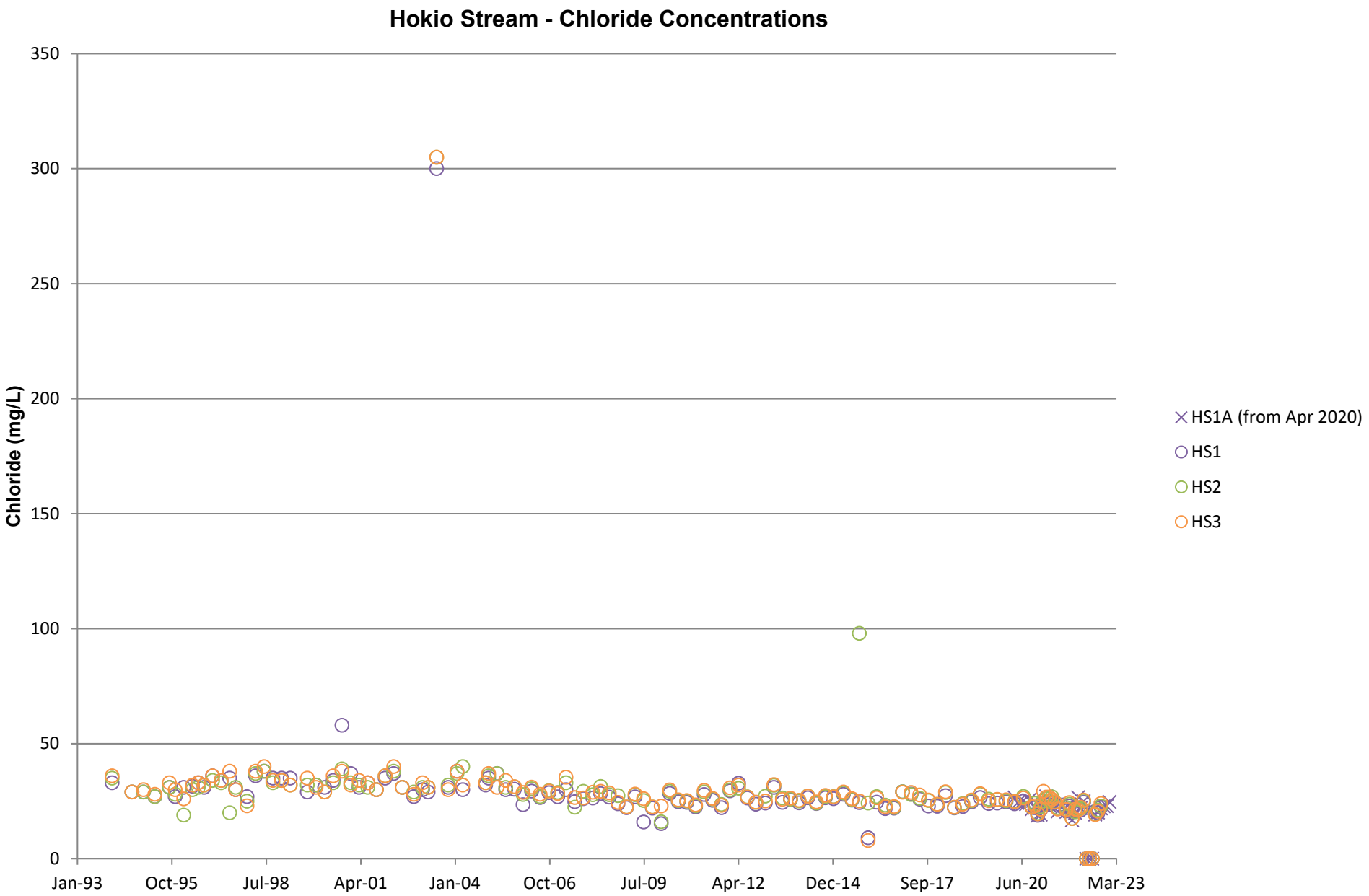

Gravel Aquifer - E. coli
E. coli (CFU/mL)
250
200
150
100
50
0
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
E1D
C2DD
E2D
G1D
NZDWS MAV E. coli Trigger Value

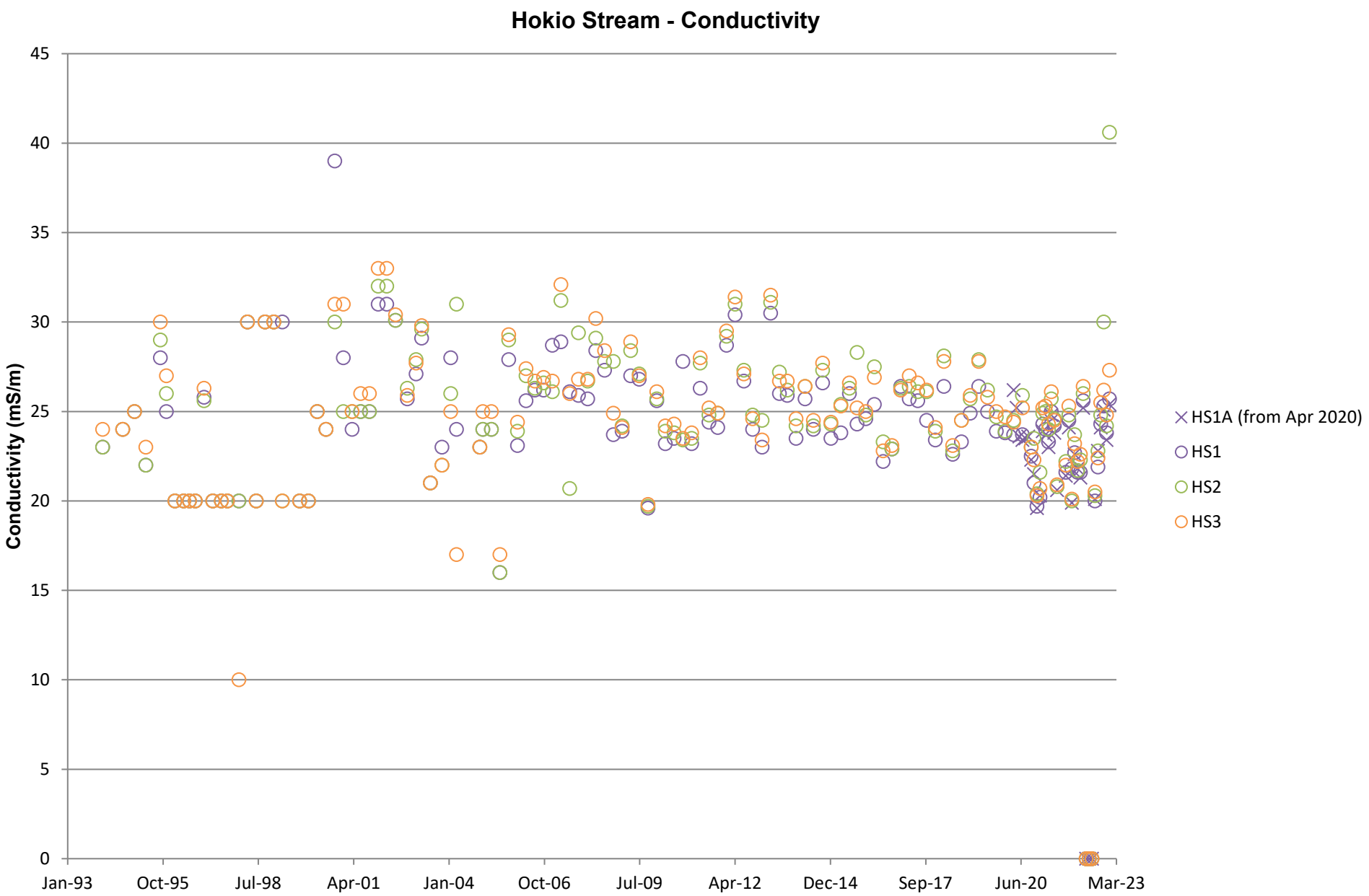

Gravel Aquifer - Sodium Levels
Sodium (mg/L)
400
350
300
250
200
150
100
50
0
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
E1D
C2DD
E2D
G1D

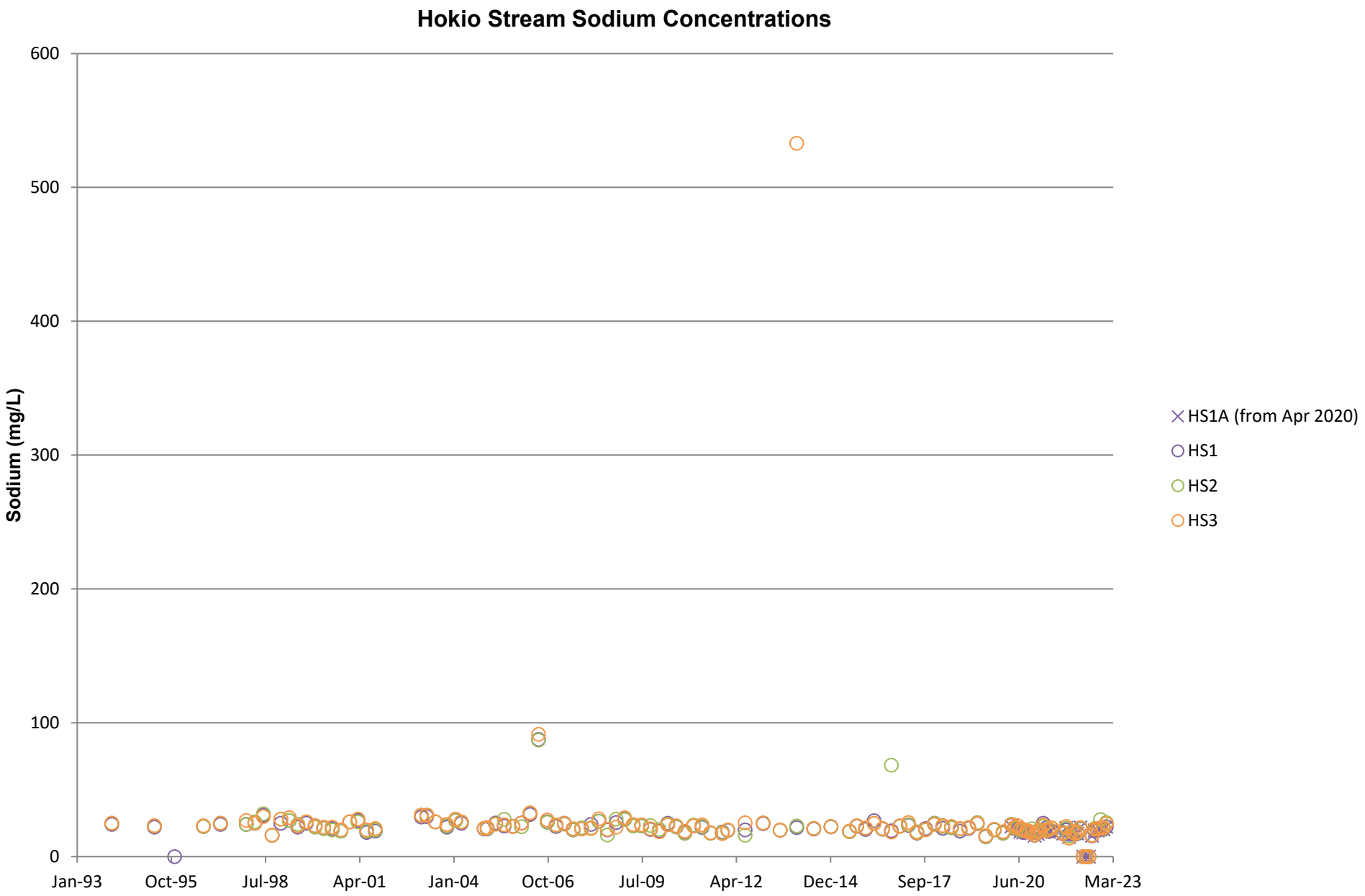

Hokio Stream - E. coli
E. coli (CFU/mL)
6000
5000
4000
3000
2000
1000
0
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
HS1A (from Apr 2020)
HS1
HS2
HS3

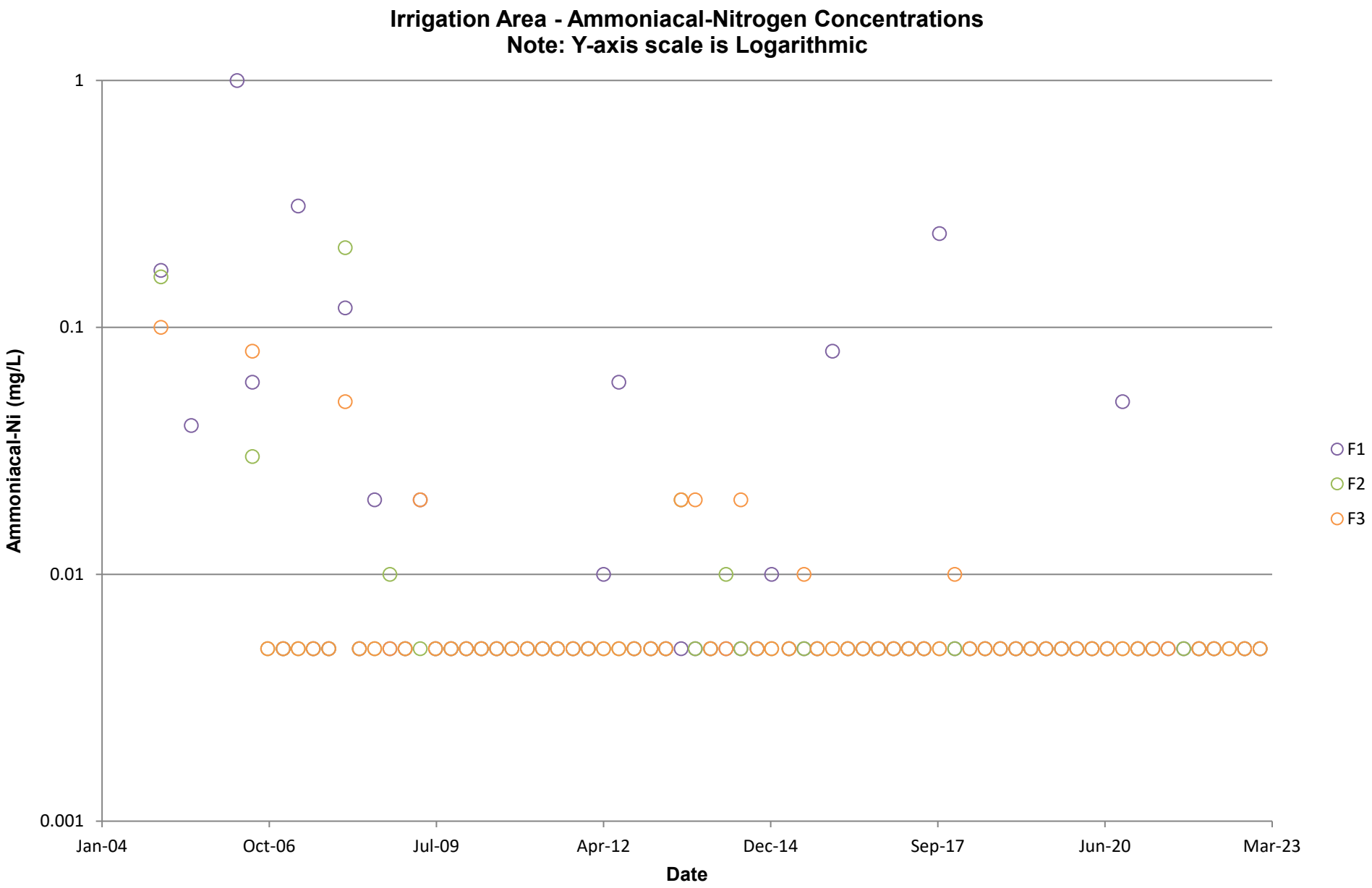

Hokio Stream - Ammoniacal-N Concentrations
Ammoniacal-N (mg/L)
9
8
7
6
5
4
3
2
1
0
Jan-93
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
HS1A (from Apr 2020)
HS1
HS2
HS3
Horizons One Plan Standard

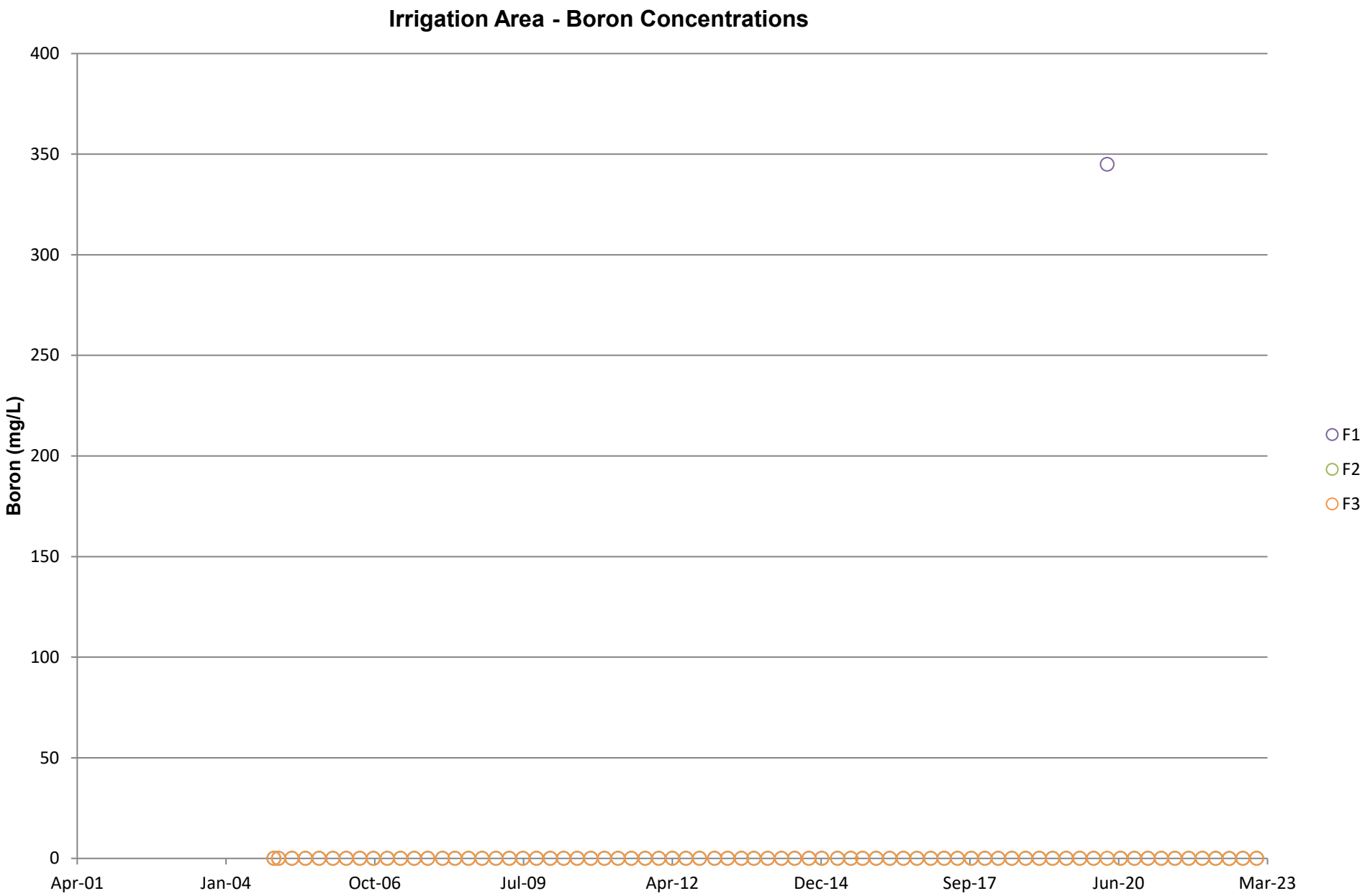

Hokio Stream - Boron Concentrations
Boron (mg/L)
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Jan-93
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
HS1A (from Apr 2020)
HS1
HS2
HS3

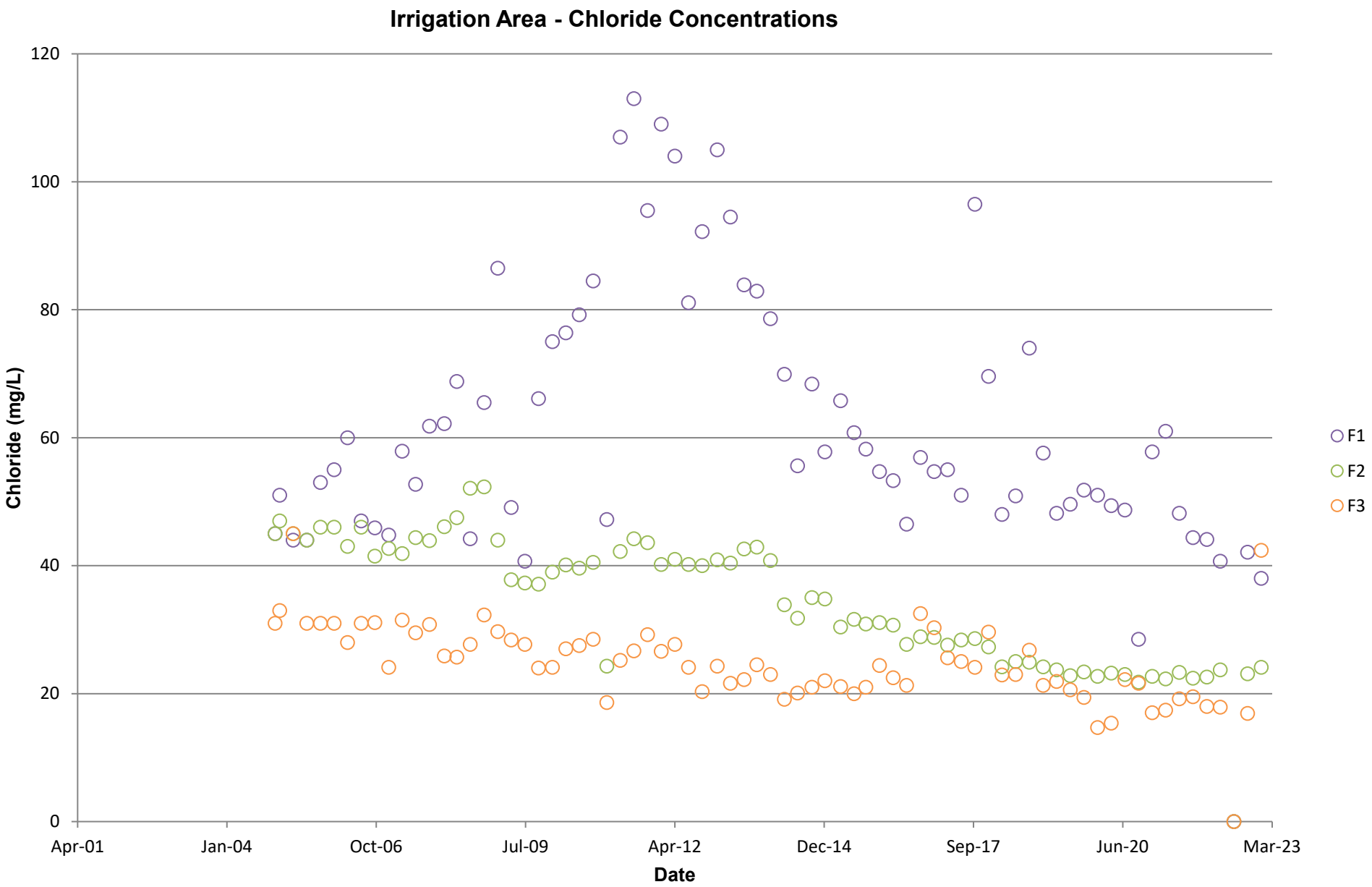

Hokio Stream - Chloride Concentrations
Chloride (mg/L)
350
300
250
200
150
100
50
0
Jan-93
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
HS1A (from Apr 2020)
HS1
HS2
HS3

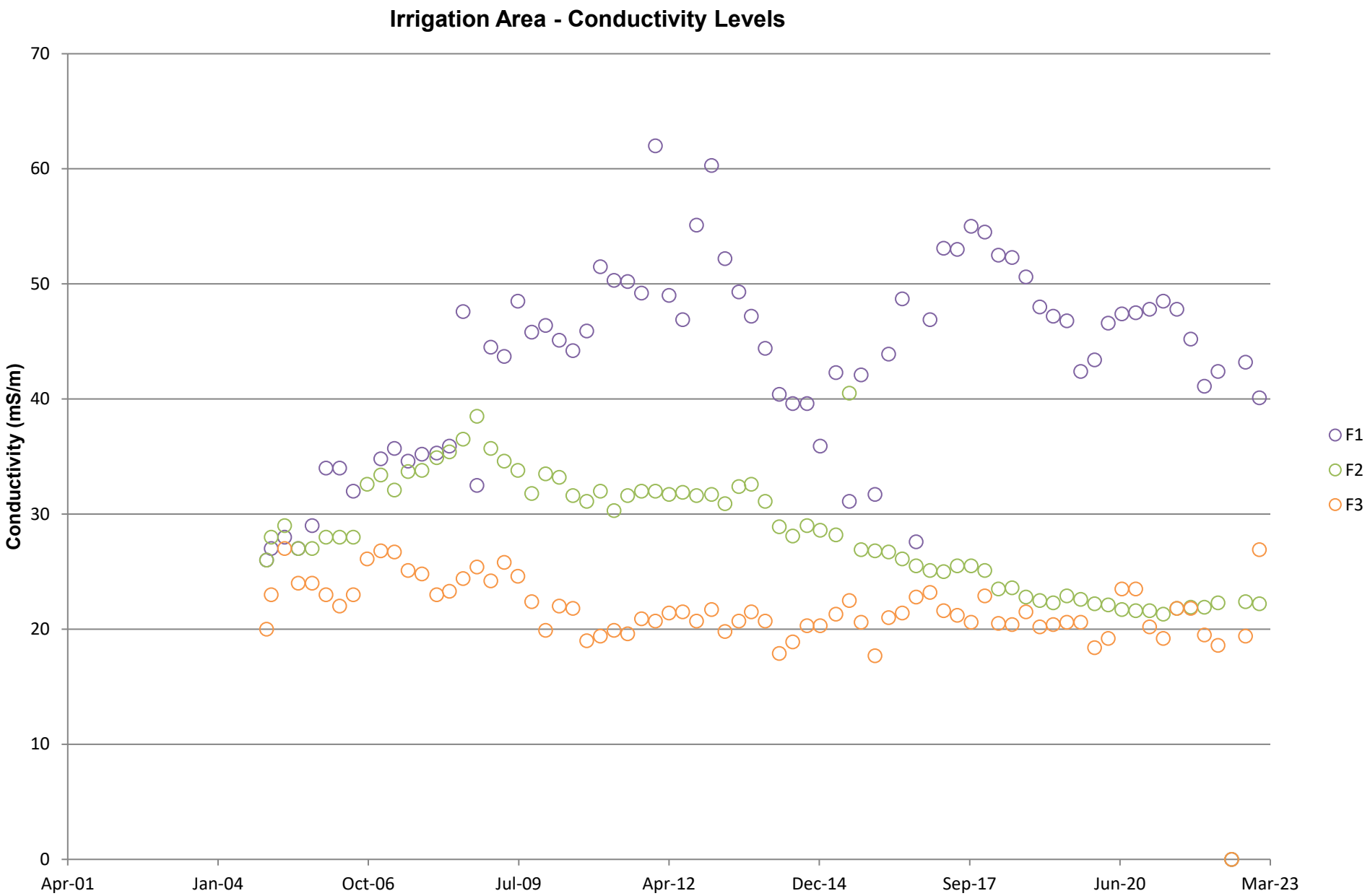

Hokio Stream - Conductivity
Conductivity (mS/m)
45
40
35
30
25
20
15
10
5
0
Jan-93
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
HS1A (from Apr 2020)
HS1
HS2
HS3

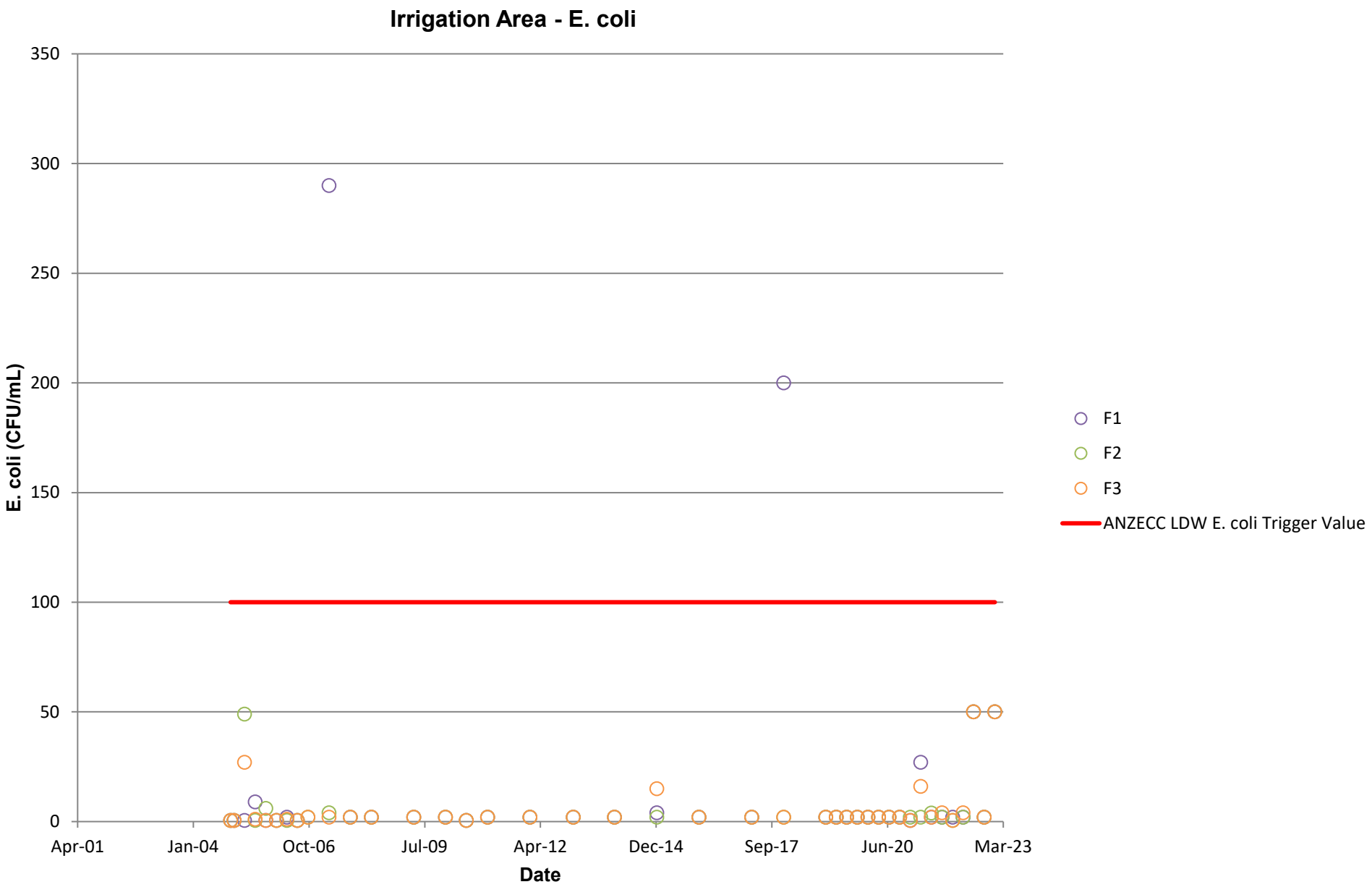

Hokio Stream Sodium Concentrations
Sodium (mg/L)
600
500
400
300
200
100
0
Jan-93
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
HS1A (from Apr 2020)
HS1
HS2
HS3

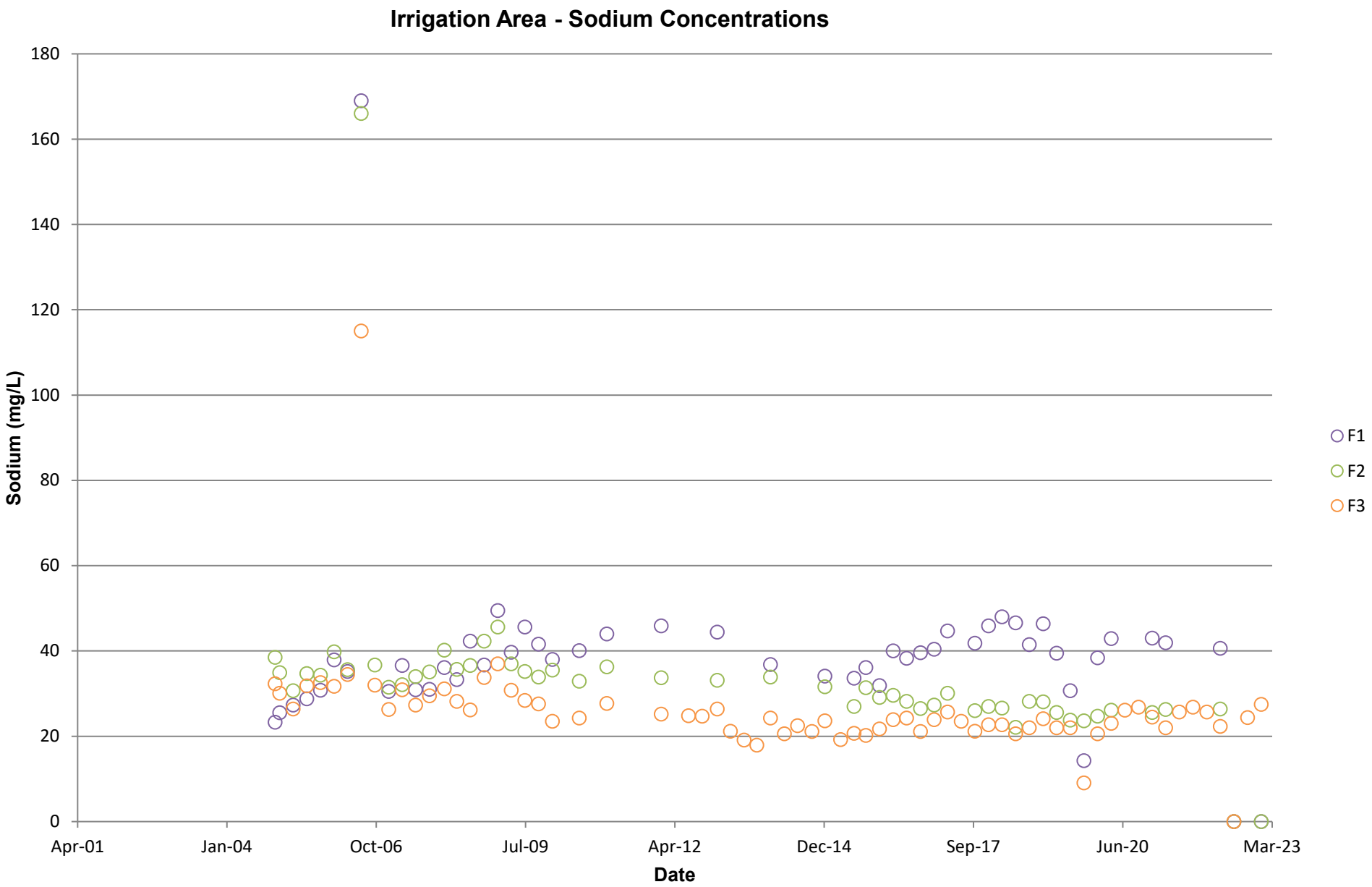

Irrigation Area - Ammoniacal-Nitrogen Concentrations
Note: Y-axis scale is Logarithmic
Ammoniacal-Ni (mg/L)
1
0.1
0.01
0.001
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
Date
F1
F2
F3


Irrigation Area - Boron Concentrations
Boron (mg/L)
400
350
300
250
200
150
100
50
0
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
F1
F2
F3

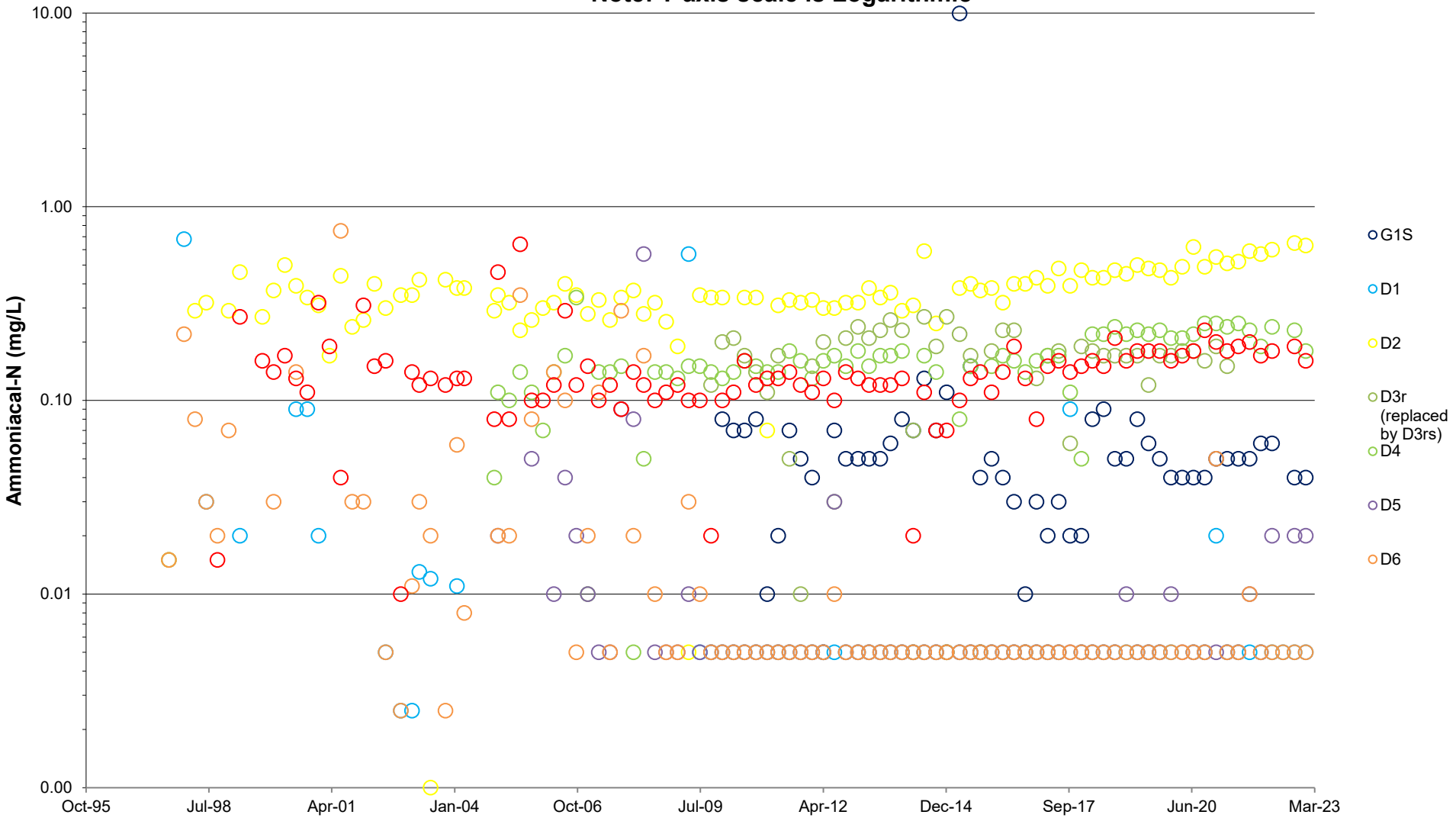

Irrigation Area - Chloride Concentrations
Chloride (mg/L)
120
100
80
60
40
20
0
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
Date
F1
F2
F3


Irrigation Area - Conductivity Levels
Conductivity (mS/m)
70
60
50
40
30
20
10
0
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
F1
F2
F3

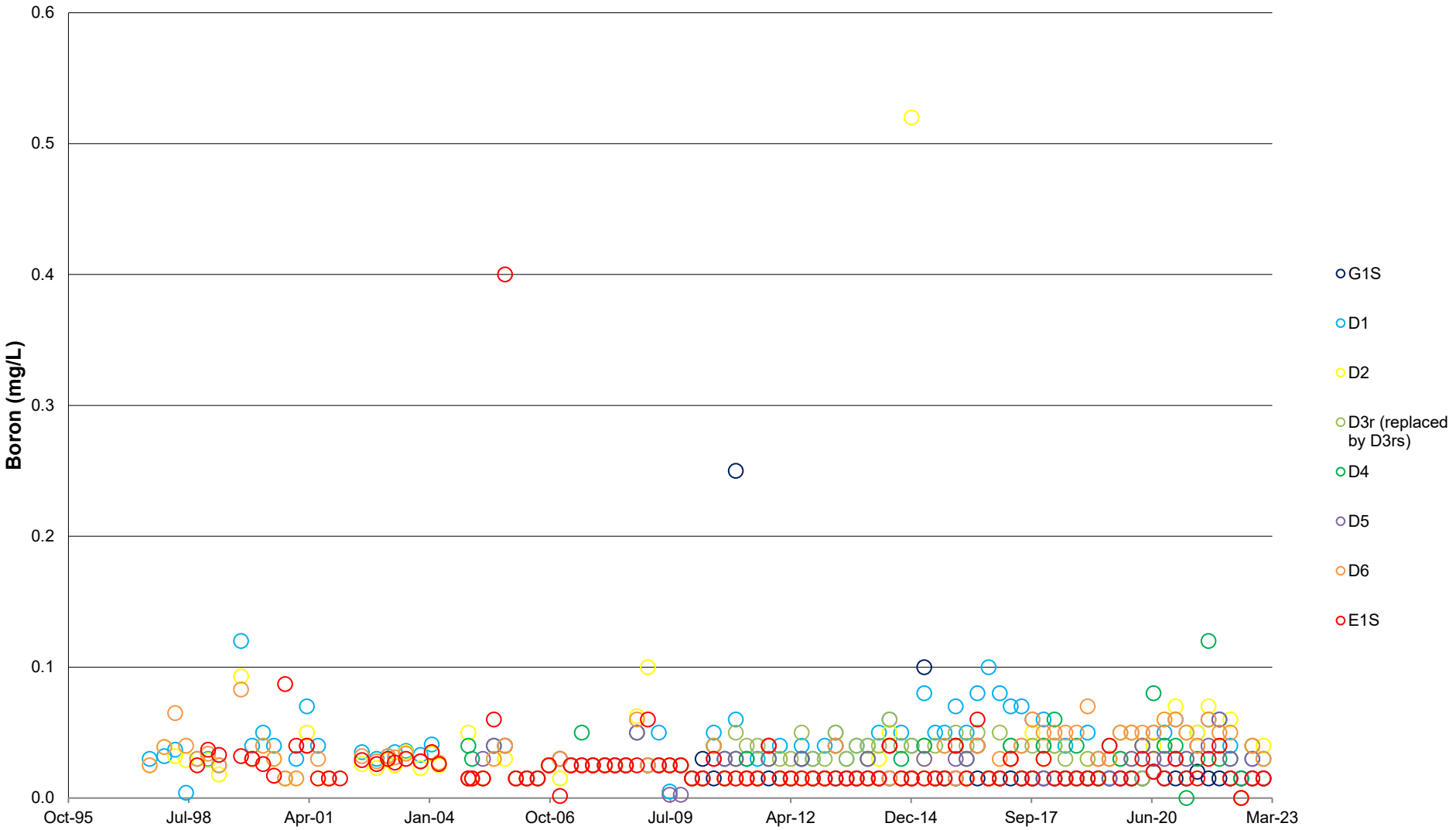

Irrigation Area - E. coli
E. coli (CFU/mL)
350
300
250
200
150
100
50
0
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
Date
F1
F2
F3
ANZECC LDW E. coli Trigger Value


Irrigation Area - Sodium Concentrations
Sodium (mg/L)
180
160
140
120
100
80
60
40
20
0
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
Date
F1
F2
F3

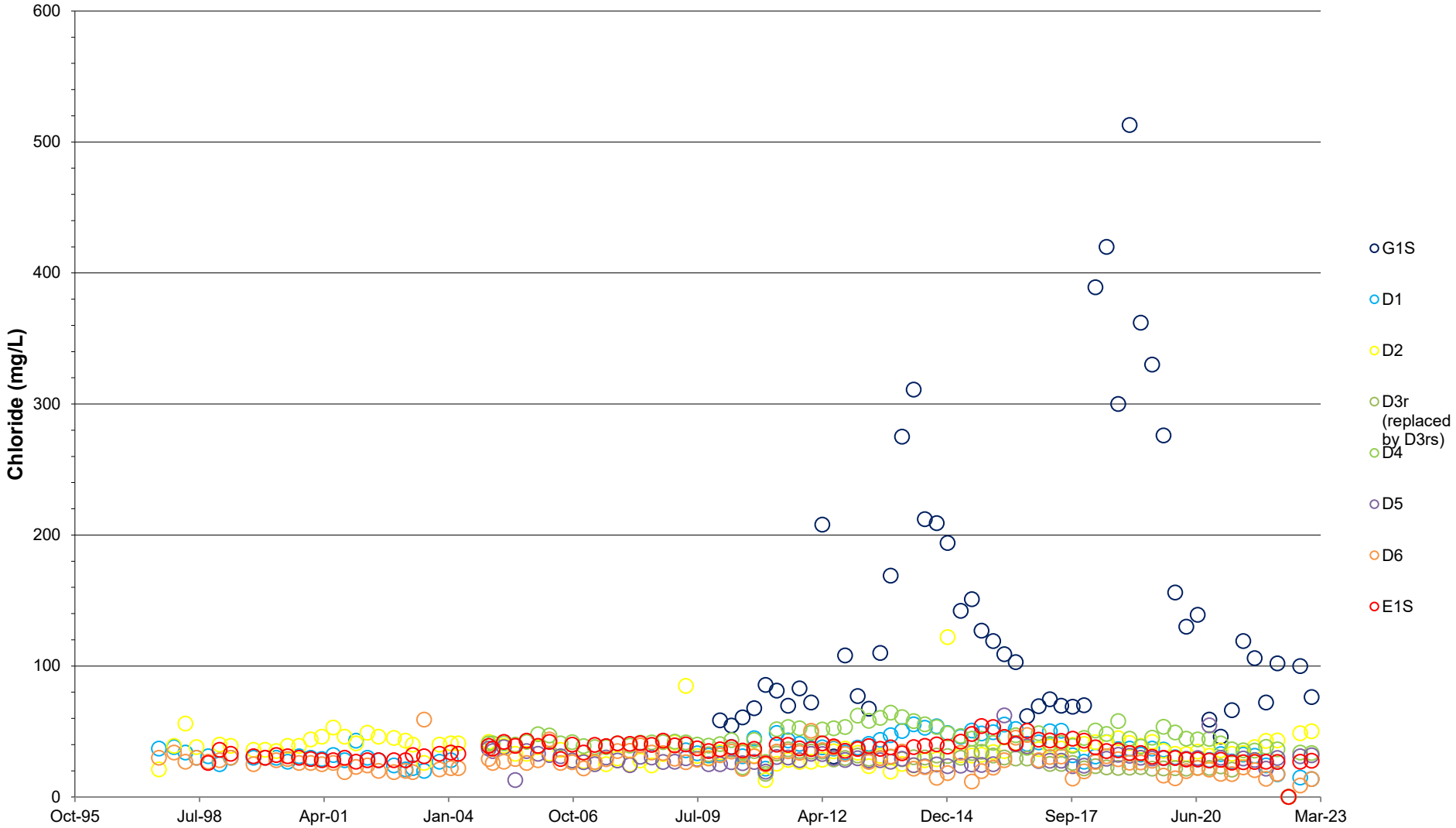
Sand Aquifer Downgradient of New Landfill - Ammoniacal-Nitrogen Concentrations
Note: Y-axis scale is Logarithmic



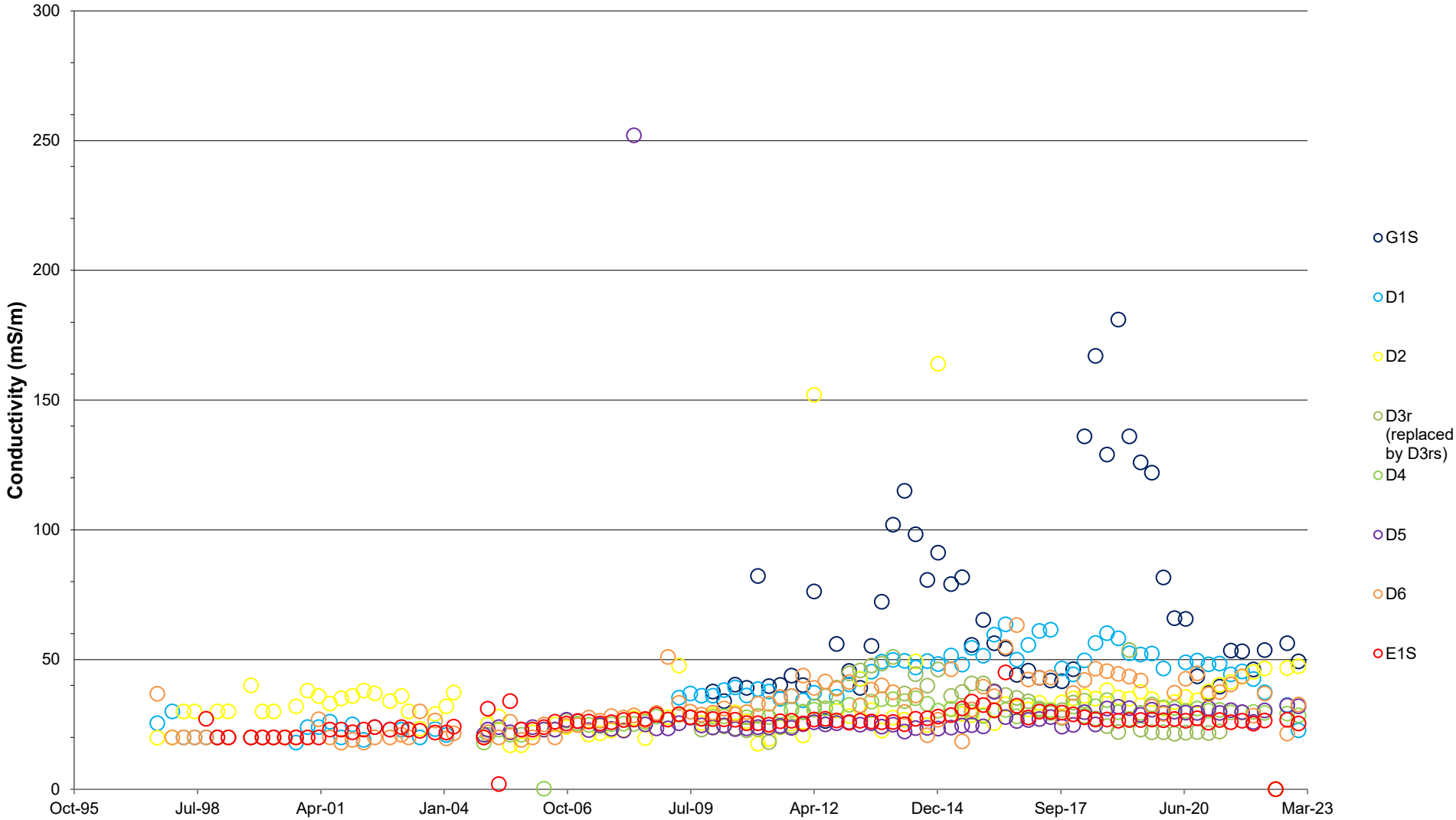
Sand Aquifer Downgradient of New Landfill - Boron Concentrations

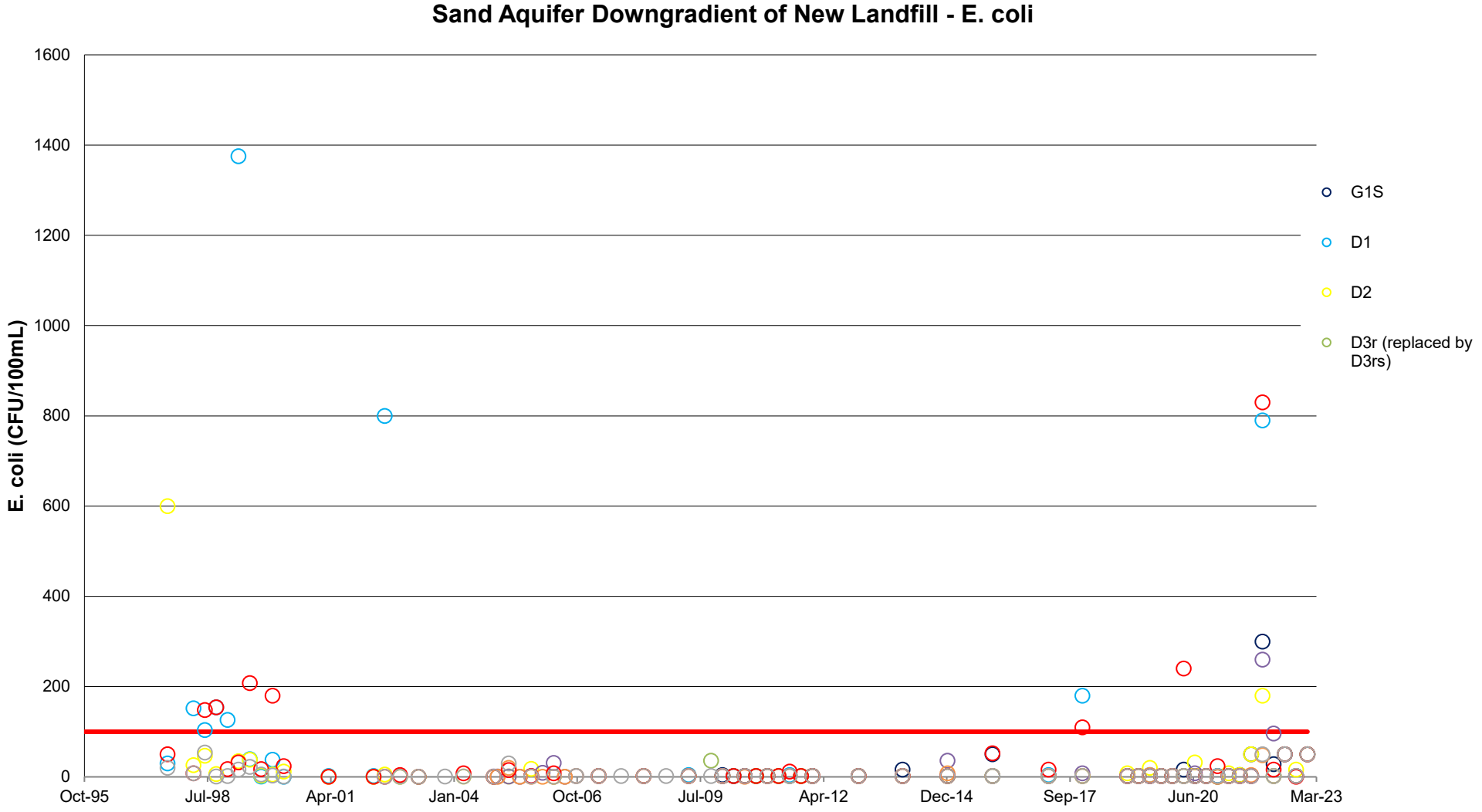


Sand Aquifer Downgradient of New Landfill - Chloride Concentrations

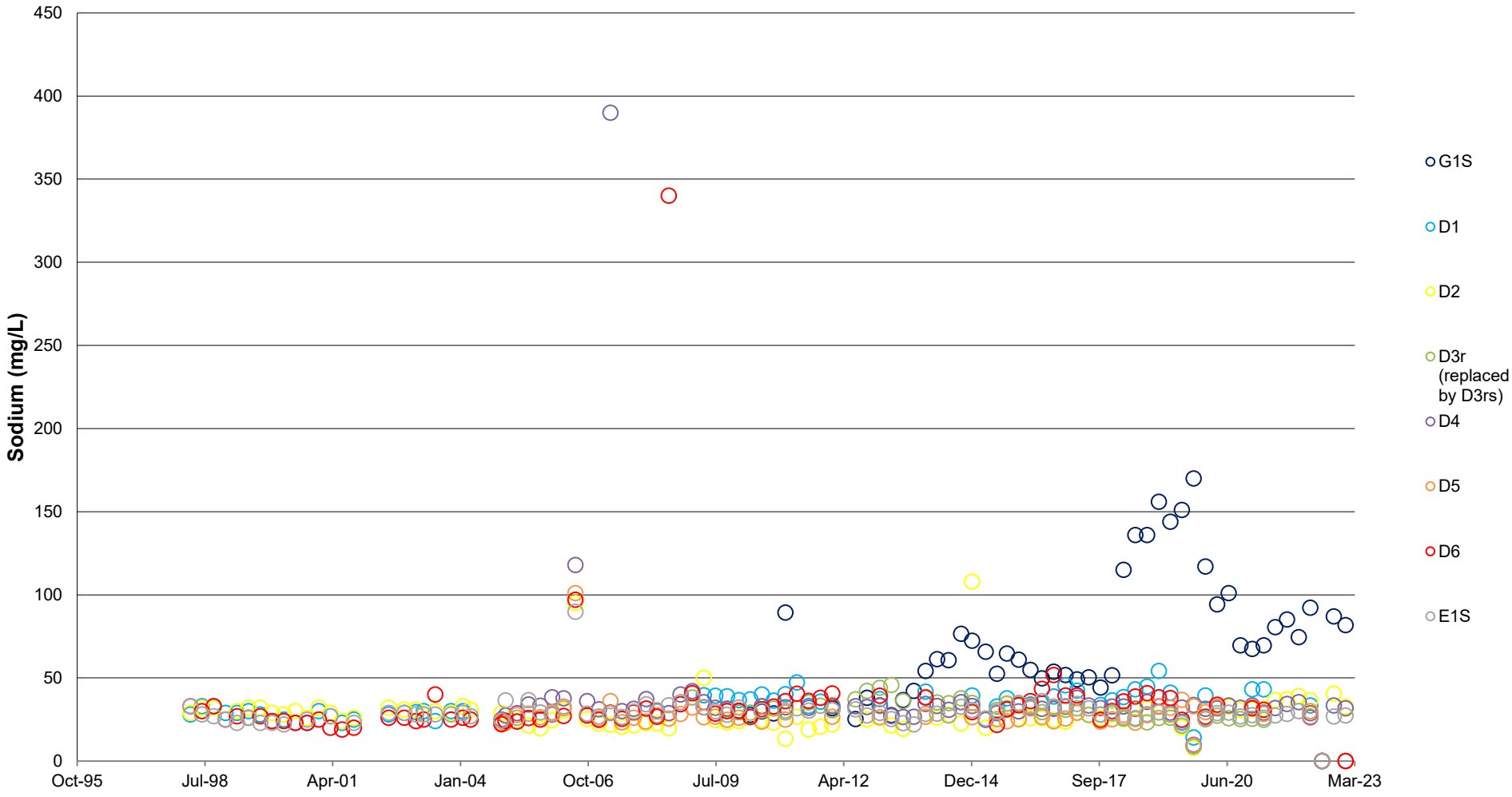


Sand Aquifer Downgradient of New Landfill - Conductivity Levels

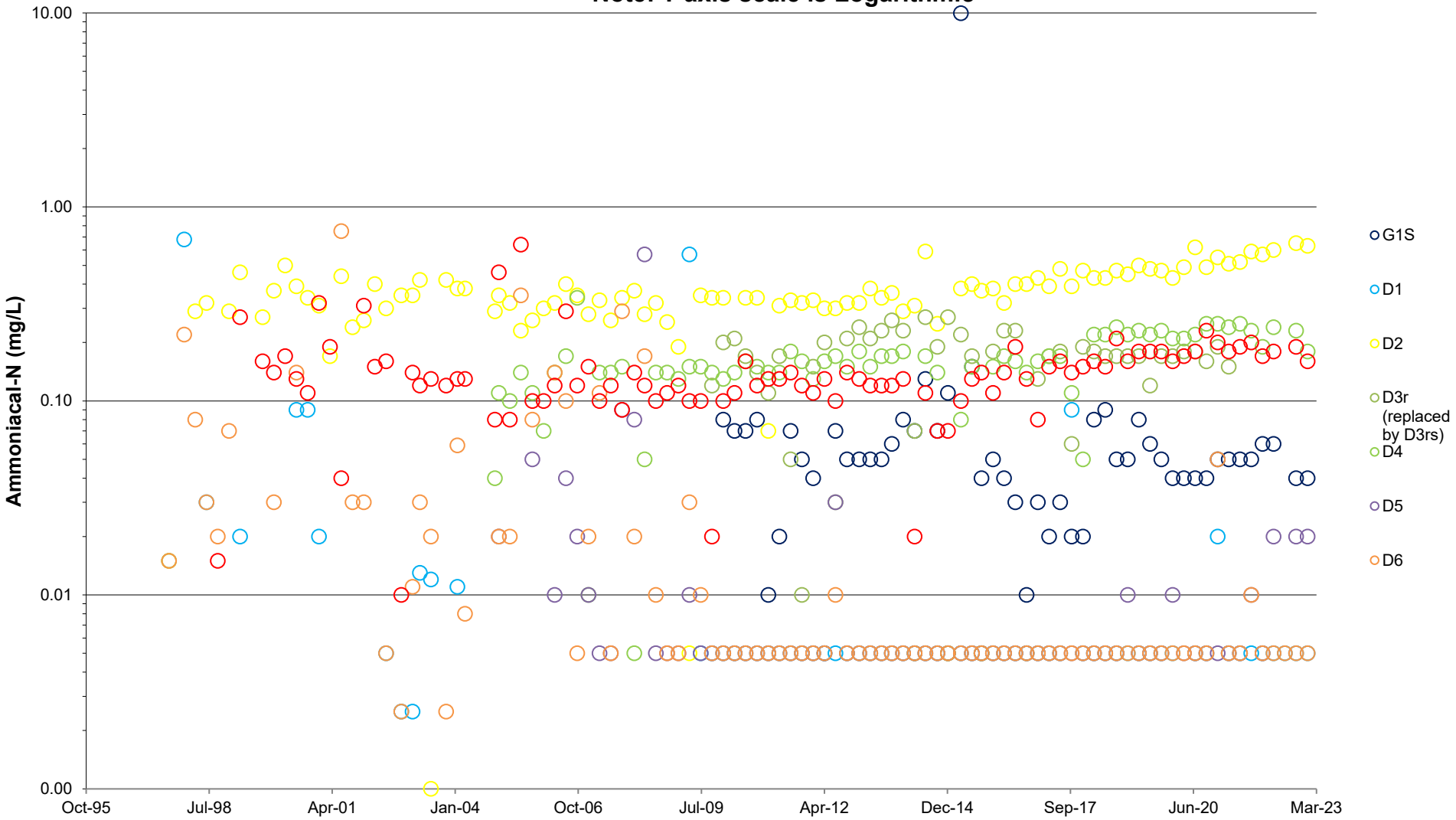


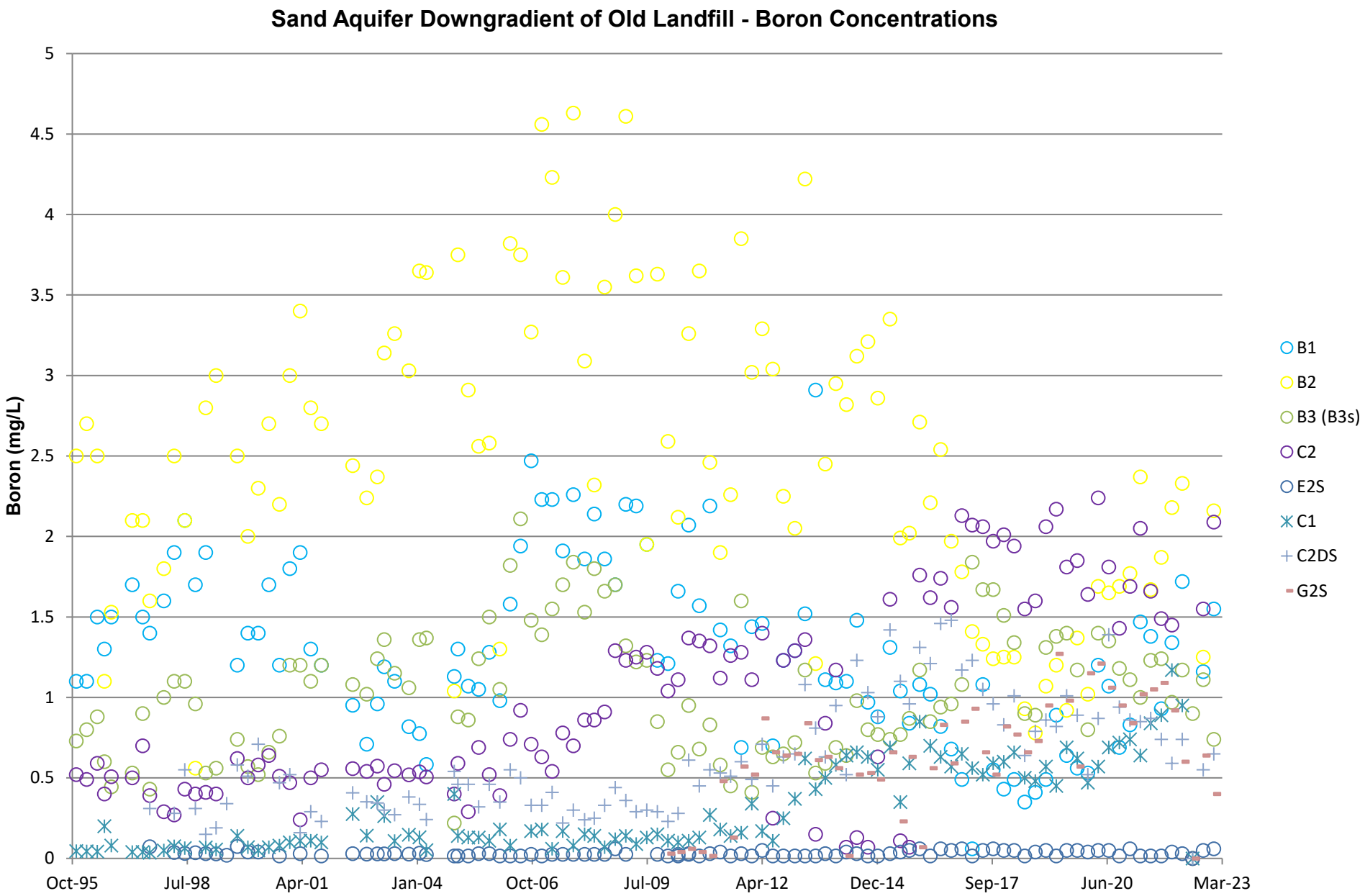

Sand Aquifer Downgradient of New Landfill - E. coli
E. coli (CFU/100mL)
1600
1400
1200
1000
800
600
400
200
0
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
G1S
D1
D2
D3r (replaced by D3rs)

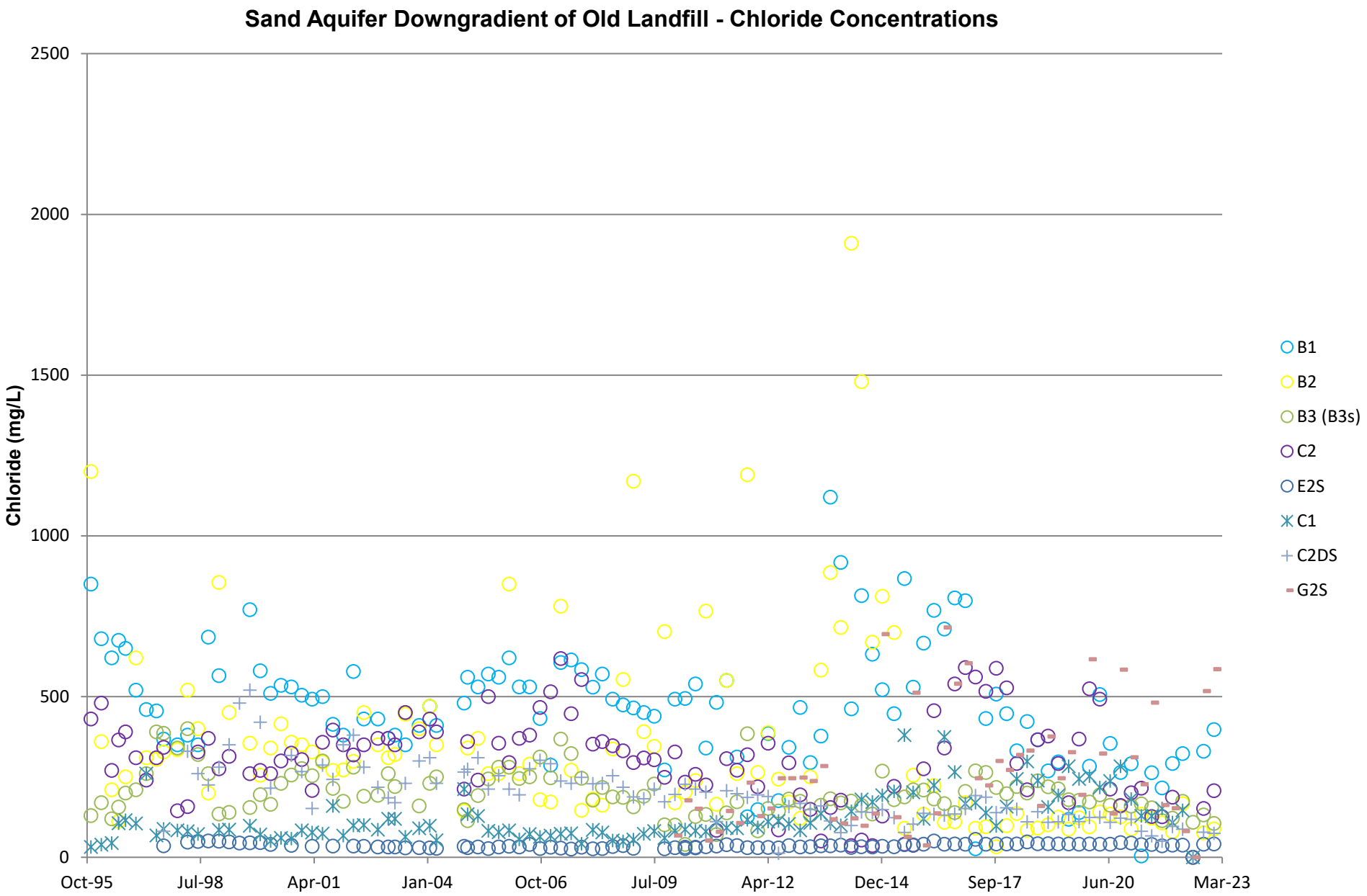
Sand Aquifer Downgradient of New Landfill - Sodium Concentrations



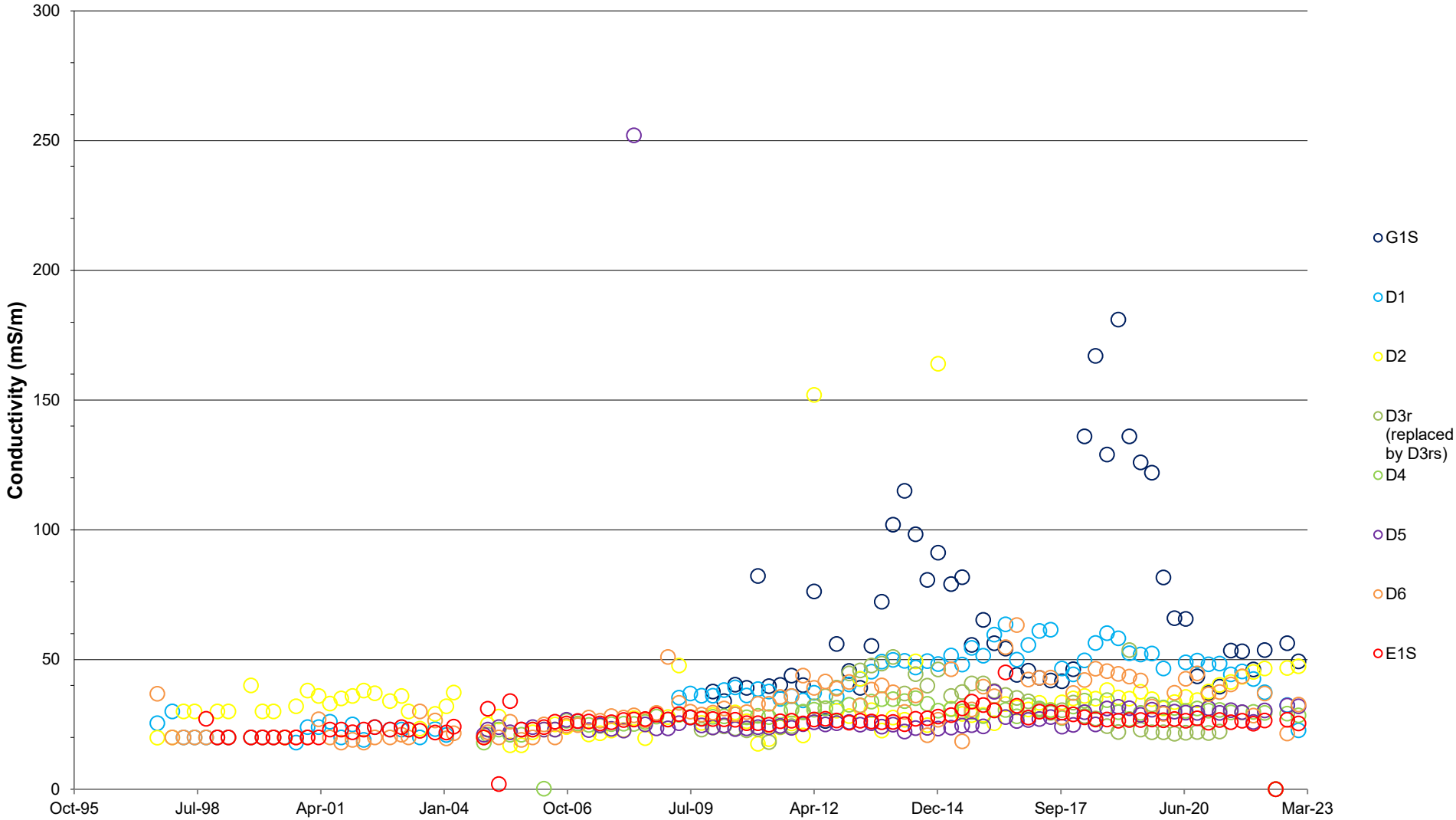
Sand Aquifer Downgradient of New Landfill - Ammoniacal-Nitrogen Concentrations
Note: Y-axis scale is Logarithmic

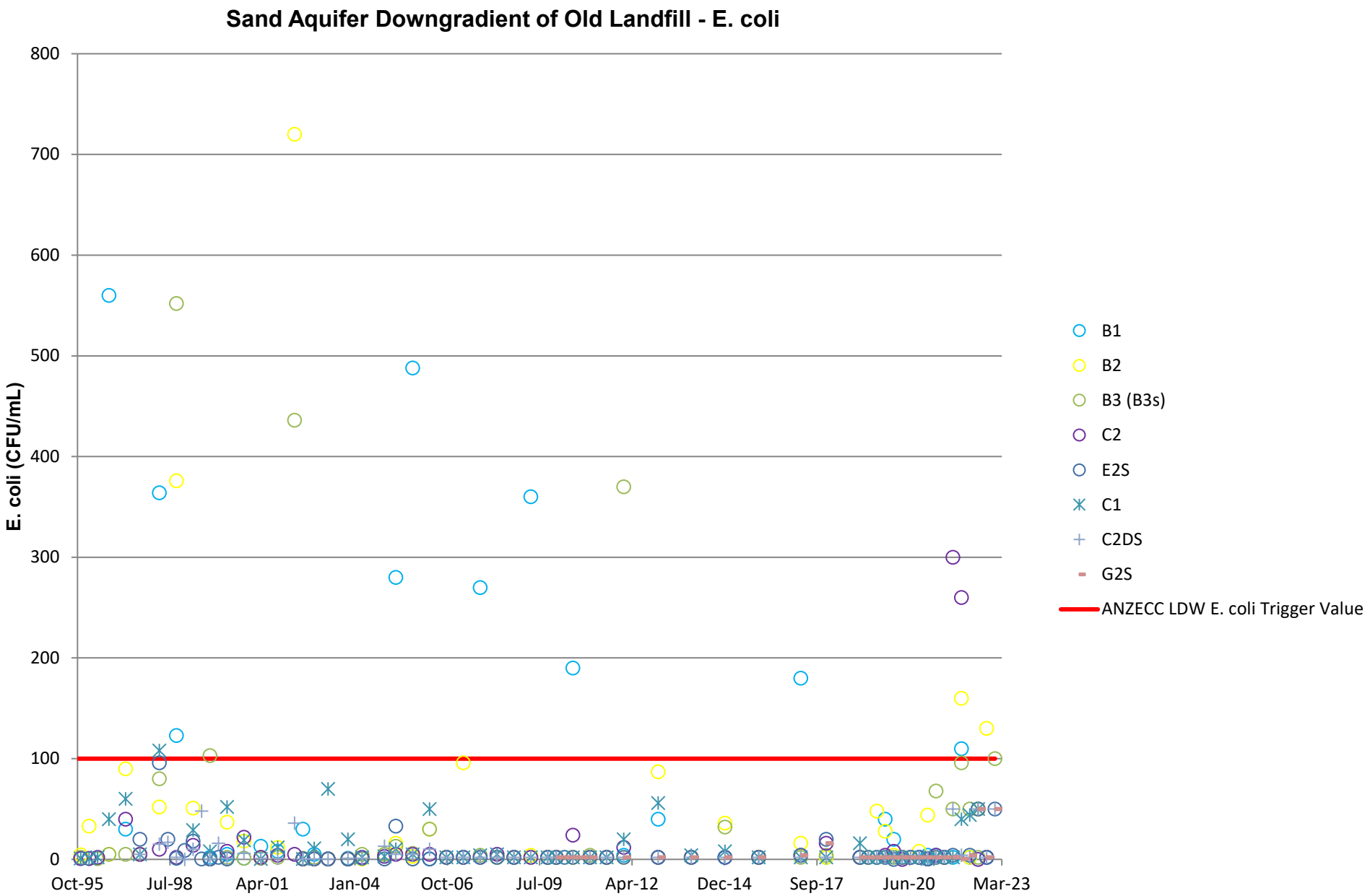



Sand Aquifer Downgradient of Old Landfill - Boron Concentrations
Boron (mg/L)
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
B1
B2
B3 (B3s)
C2
E2S
C1
C2DS
G2S

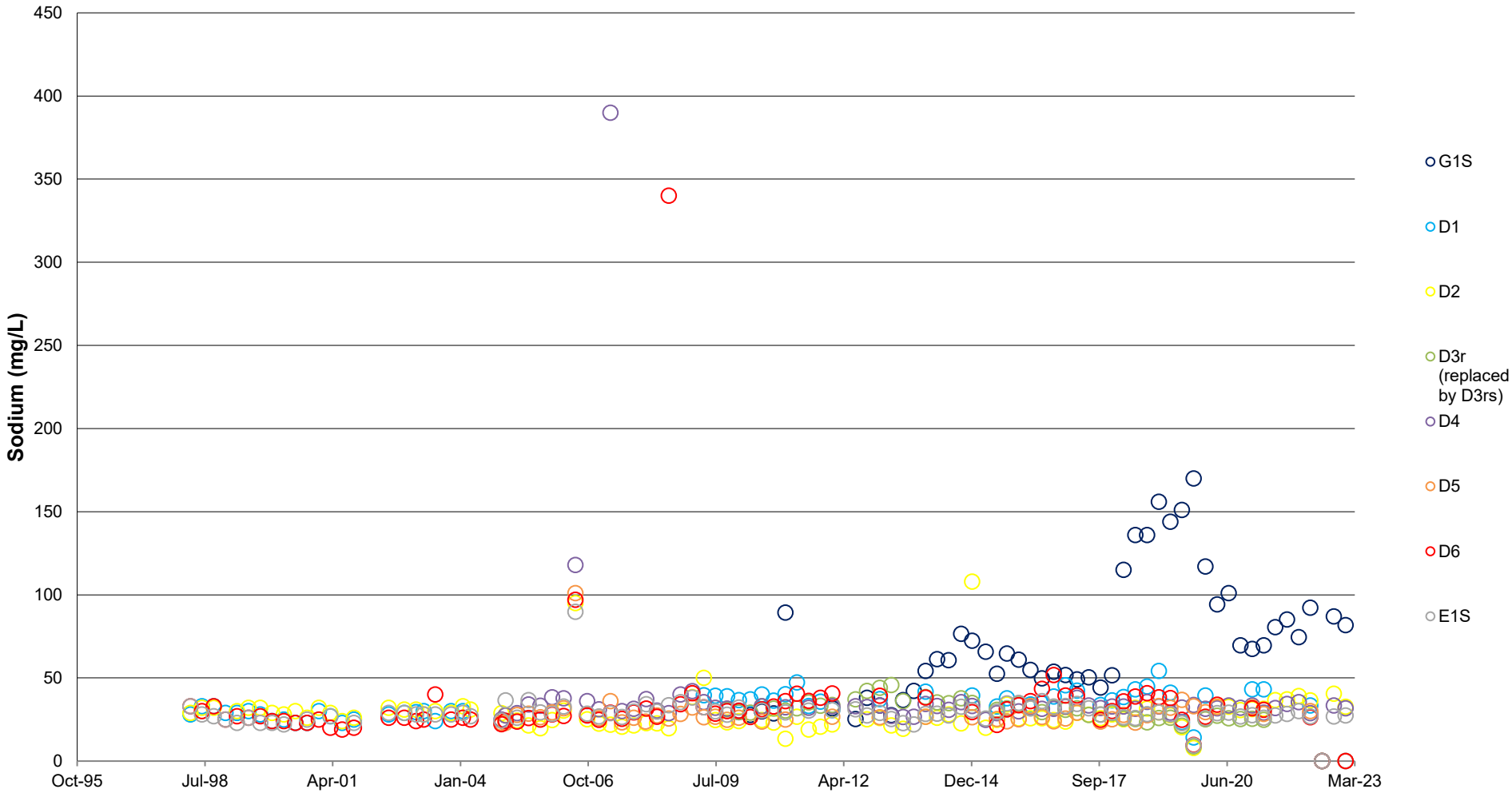

Sand Aquifer Downgradient of Old Landfill - Chloride Concentrations
Chloride (mg/L)
2500
2000
1500
1000
500
0
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
B1
B2
B3 (B3s)
C2
E2S
C1
C2DS
G2S

Sand Aquifer Downgradient of New Landfill - Conductivity Levels




Sand Aquifer Downgradient of Old Landfill - E. coli
E. coli (CFU/mL)
800
700
600
500
400
300
200
100
0
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
B1
B2
B3 (B3s)
C2
E2S
C1
C2DS
G2S
ANZECC LDW E. coli Trigger Value

Sand Aquifer Downgradient of New Landfill - Sodium Concentrations



Appendix E Landfill Gas Monitoring Results at GW Bores for January 2023

Created	Borehole	Methane (% CH_4)	Carbon Dioxide (% CO_2)	Hydrogen Sulphide (ppm H_2S)	Oxygen (% O_2)
9/01/2023	Levin Landfill: Levin C2	0	0.08	0	21.6
9/01/2023	Levin Landfill: Levin C2dd	0	0.21	0	21.29
9/01/2023	Levin Landfill: Levin C2ds	0	0.19	0	21.13
9/01/2023	Levin Landfill: Levin B3s	0.01	0.05	0	21.16
9/01/2023	Levin Landfill: Levin Xd1	0.06	0.06	0	21.77
9/01/2023	Levin Landfill: Levin E2s	0	0.06	0	21.42
9/01/2023	Levin Landfill: Levin E2d	0	0.05	0	21.33
9/01/2023	Levin Landfill: Levin B2	0.01	7.01	0	13.01
9/01/2023	Levin Landfill: Levin B1	0.01	0.62	0	20.38
9/01/2023	Levin Landfill: Levin D5	0	0.06	0	21.28
9/01/2023	Levin Landfill: Levin D4	0	0.09	0	21.48
9/01/2023	Levin Landfill: Levin E1d	0	0.04	0	21.77
9/01/2023	Levin Landfill: Levin E1s	0	0.04	0	21.54
9/01/2023	Levin Landfill: Levin F3	0	0.05	0	21.72
9/01/2023	Levin Landfill: Levin F2	0	0.04	0	21.28
9/01/2023	Levin Landfill: Levin D3rs	0.03	0.04	1	21.17
9/01/2023	Levin Landfill: Levin D3rd	0.02	0.04	0	21.12
9/01/2023	Levin Landfill: Levin D1	0	0.14	1	21.87
9/01/2023	Levin Landfill: Levin D2	0	0.25	0	21.06
9/01/2023	Levin Landfill: Levin D6	0.02	0.12	0	20.79
9/01/2023	Levin Landfill: Levin F1	0	0.03	0	
9/01/2023	Levin Landfill: Levin G1s	0	0.03	0	20.58
9/01/2023	Levin Landfill: Levin G1d	0	0.07	1	20.9
9/01/2023	Levin Landfill: Levin G2s	0	0.44	1	20.1
9/01/2023	Levin Landfill: Levin Xs1	0	0.14	0	20.04
9/01/2023	Levin Landfill: Levin Xs2	0	0.45	1	20.3

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, Nelson, Palmerston North, Queenstown, Tauranga, Wellington, Whangārei

118 Fitzherbert Avenue, Palmerston North, 4410
PO Box 13-052, Armagh, Christchurch, 8141
New Zealand: +64 6 357 4034 | www.stantec.com