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

PREPARED FOR Horowhenua District Council | August 2023

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Revision Schedule

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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 first quarter (i.e., May 2023 to July 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 Northern Farm Drain (TD1), and
- The Hokio Stream (HS1A, HS1, HS2 and HS3).

Stantec has reviewed the results of this first 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 27 groundwater bores from around Levin Landfill during July 2023, and landfill leachate was sampled at a manhole next to the leachate pond. Additionally, five surface water sites were each sampled during May 2023, June 2023, and July 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 many of the samples taken during the July 2023 quarter, time between sampling and reception at the laboratory was considerably longer than the normally accepted timeframe of <24 hours. The specifics of this issue are discussed further, but the issue of extended timeframes must be addressed and corrected for the next round of sampling, as the accuracy of this period's groundwater sampling results are put into question.

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[1] 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 May 2023 to July 2023 monitoring results have been assessed against these limits, where they are applicable.

Thirty-two non-compliances with resource consent conditions were recorded across nine monitoring locations, as follows:

- The pH level in bore E1D (6.9 pH units) was below the DWSNZ MAV lower limit of 7.0 pH units. Whilst it has been lower than this in the past, the pH level is usually within the limit range.
- *E. coli* in bore E2D (1 cfu/100mL) exceeded the DWSNZ MAV of NIL. This bore is usually analysed with a detection level of 100 cfu/100mL – which is not ideal, however this round was analysed at 1 cfu/100mL. This makes it difficult to compare with historical results, however, is still an exceedance of NIL.
- Hardness at bore D3rd (208 mg $CaCO_3$/L) exceeded the DWSNZ MAV of 200 mg $CaCO_3$/L. Elevated hardness is characteristic of D3rd.
- Dissolved arsenic at bore D3rd (0.019 mg/L) exceeded the DWSNZ MAV of 0.01 mg/L, again, characteristic of D3rd.
- Dissolved manganese concentrations in bores C2DD (0.73 mg/L), E2D (0.5 mg/L), Xd1 (0.58 mg//L), and D3rd (0.5 mg/L) exceeded the DWSNZ MAV of 0.4 mg/L. The results for C2DD (from 1997), E2D (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.

[1] 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.

- *E. coli* count in bore Xs1 (400 cfu/100mL) exceeded the ANZECC LDW trigger value of 100 CFU/100ml. This is the highest level of *E. coli* recorded at this bore since monitoring began, with the previous maximum being 99 cfu/100mL in January 2022.
- Nitrate-N at TD1 in June 2023 (1.62 mg/L) and July 2023 (1.43 mg/L) exceeded the ANZECC (95%ile) DGV of 0.16 mg/L. This site has commonly presented elevated levels.
- Ammoniacal-N at TD1 in May 2023 (8.25 mg/L), June 2023 (17.8 mg/L), and July 2023 (13.3 mg/L) exceeded the ANZECC (95%ile) DGV of 2.1 mg/L.
- Dissolved zinc at TD1 in June 2023 (0.018 mg/L) exceeded the ANZECC (95%ile) DGV of 0.008 mg/L. This is the highest concentration recorded since monitoring began.
- Dissolved copper at TD1 in June 2023 (0.002 mg/L) exceeded the ANZECC (95%ile) DGV of 0.0014 mg/L.
- Nitrate-N exceeded the ANZECC (95%ile) DGV and consent trigger value of 0.16 mg/L at all Hokio Stream sites for May 2023, June 2023, and July 2023, with values ranging between 1.01 mg/L and 1.62 mg/L.
- Dissolved copper exceeded the ANZECC (95%ile) DGV and consent trigger value median of 0.0014 mg/L in May 2023 at HS2 (0.0019 mg/L) and June 2023 at HS1 (0.0051 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.
- Dissolved zinc exceeded the ANZECC (95%ile) and consent trigger value median of 0.008 mg/L in May 2023 at HS2 (0.033 mg/L) and June 2023 at HS1 (0.021 mg/L). Whilst historically, HS1 has presented periodic exceedances, this is the highest concentration recorded at HS2 since October 2008.

The May 2023 to July 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 four 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 COD and Ammoniacal-N (NH_4-N), which exceeded the typical range for Class 1 landfills, and for dissolved lead and mercury which were not detected, so were under their typical ranges. Note that leachate effluent is not subject to any consent limits. Typical leachate concentrations are derived from data originating from seven New Zealand landfills, dating back to between 1998 and 1999. More updated data could be sought for comparison purposes.

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.

For the July 2023 monitoring round, methane and hydrogen sulphide were not detected in any of the groundwater bores. Given past results, this is somewhat anomalous, but is possible. Minor concentrations of carbon dioxide were recorded at all bores, with the highest being 0.67% at bore B2. Historically, fluctuations have been seen across the bores, and July concentrations are within historical ranges. In January 2023, B2 presented a significantly high concentration of 7.01% - the July quarter showing substantial decrease.

Despite not detecting methane or hydrogen sulphide in the groundwater bores in July 2023, there is always a possibility of encountering these gases in groundwater bores, and this endorses the need for appropriate health and safety measures to be adopted during monitoring.

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 Northern Farm Drain (previously referenced as 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 now been closed for the disposal of municipal solid waste, following a recent decision by Council. 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). Following Council's decision to close the landfill, the remainder of the permanent capping will be completed later this year.

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 July 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 3 May 2023, 12 June 2023, and 4 July 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 28 and 44 hours (June 2023 round) which is outside the normally accepted range of within 24 hours.

Groundwater samples were collected by Downer (a contractor to HDC) on 4, 5, 6, 10, and 11 July 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 (excluding one instance on the 11th), the time between collection and laboratory reception frequently exceeded the <24-hour guideline. Generally, these were below 35 hours, but exceedingly longer timeframes were recorded. Three bores presented unacceptable turnaround times of 147 hours (C2ds) and 195 hours (Xs1 and Xs2), where laboratory reception occurred eight days after sampling. Whilst the information presented may be incorrect, Stantec cannot be certain about this. Incorrect sampling times were also noted through apparent late-night sampling, such as 9:55pm for G2s. Sampling at this time is assumed to be highly unlikely. Laboratory reports have also stated two instances where analysis had been completed hours before samples had even been taken (G1s and G1d). Clearly, these are incorrect, and this stresses the importance of correct sample dating upon collection, as it is difficult to correctly identify turnaround time. Furthermore, with increased time between sampling and testing, results become less reliable due to sample deterioration, therefore assessments can be inaccurate. This issue must be addressed for the next round of sampling, as the accuracy of this period's groundwater sampling results is questionable.

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 (excluding D3rs, D3rd, Xd1, Xs1, and Xs2) were analysed for the indicator list of parameters which is outlined in Table 2-1. Groundwater samples at D3rs, D3rd, Xd1, Xs1, and Xs2, and surface water samples from Hokio Stream, the Northern Farm Drain and a sample of the leachate effluent 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)***

Type	Indicator Parameters	Comprehensive Parameters
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.

Issues regarding fluctuating/inappropriate detection limits have also been noted for scBOD5.

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 July 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. 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.

The results presented in Table 2-2 show that all parameters at bore F3 were within the ANZECC LDW trigger values and DWSNZ limits during the July 2023 monitoring round. Results outside the range of relevant guidelines are as follows:

- Dissolved iron at G1S (1.82 mg/L) exceeded the DWSNZ limit of 0.2 mg/L, in line with historical reporting.
- pH at G1S (6.8) was below the lower DWSNZ limit of 7.0.
- *E. coli* at G1D exceeded the DWSNZ MAV of NIL, with a value of 5 cfu/100mL. However, the laboratory detection level changed between sites – 1cfu/100mL at G1D and 100 cfu/100mL at G1S and F3. This means that levels of non-detection fluctuated above the comparable standard, which is not acceptable analytical practice.

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. Elevated iron concentrations are likely to be related to hydrogeological conditions found at this site, and this phenomenon is common for groundwater in this area. Results dating to 2010 indicate that low pH values are representative of background water quality in the shallow sand aquifer, whereas the deep gravel aquifer frequently presents higher pH readings. Overall, monitoring results at G1S indicate 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.

Table 2-2: Background Monitoring Results for July 2023

Determinant	Units	DWSNZ MAV	ANZECC LDW	G1S	G1D	F3
Sampling date				4/07/2023	4/07/2023	4/07/2023
Water level	mbgl	-	-	13.7	14.28	4.47
pH	pH units	7 to 8.5*	6 to 9	**6.8**	7.1	7.2
Conductivity	mS/m	-	-	54.9	28	19
COD	mg/L	-	-	18	*7.5*	*7.5*
$scBOD_5$	mg/L	-	-	*0.5*	*0.5*	*0.5*
E. Coli	CFU/100ml	NIL	100	ND	**5**	ND
Chloride	mg/L	250*	-	121	32.4	16
Nitrate-N	mg/L	11.3	90.3	0.18	*0.005*	1.05
Ammoniacal-N	mg/L	1.17	-	0.05	0.1	0.005
Sodium	mg/L	200*	-	65.5	n/r	19.2
Dissolved Aluminium	mg/L	0.1*	5	0.047	0.003	0.002
Dissolved Boron	mg/L	1.4	5	0.05	0.05	*0.015*
Dissolved Iron	mg/L	0.2*	-	**1.82**	n/r	*0.005*
Dissolved Lead	mg/L	0.01	0.1	0.0007	*0.00025*	*0.00025*
Dissolved Manganese	mg/L	0.4	-	0.0589	0.0709	*0.00025*
Dissolved Mercury	mg/L	0.007	0.002	*0.00025*	*0.00025*	*0.00025*
Dissolved Nickel	mg/L	0.08	1	0.0006	*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**

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, 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 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 July 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.

There were **no exceedances of the resource consent conditions during the July 2023** monitoring round in samples from the shallow aquifer.

One result for *E. coli* at E1S equalled the ANZECC LDW of 100 cfu/100mL, but this is not considered an exceedance.

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

Determinant	Units	ANZECC LDW	D1	D2	D3rs	D4	D5	D6	E1S
Sampling date			5/07/2023	6/07/2023	6/07/2023	6/07/2023	4/07/2023	5/07/2023	6/07/2023
Water Level	mbgl	-	16.48	21.09	5.23	7.42	8.85	16.09	10.97
pH	pH units	6 to 9	6.7	6.5	6.5	7	7.2	6.9	7.2
Suspended Solids	mg/l	-	n/r	n/r	*3*	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	23.8	n/r	n/r	n/r	n/r
Alkalinity	mg $CaCO_3$/L	-	n/r	n/r	63	n/r	n/r	n/r	n/r
Conductivity	mS/m	-	40.1	53.5	19.8	27.4	31.7	41.4	25.5
COD	mg/L	-	*7.5*	34	70	18	36	*7.5*	22
$scBOD_5$	mg/L	-	*0.5*	*2*	*1.5*	*1.5*	*0.5*	*0.5*	*1.5*
E. coli	CFU/100ml	100	ND	ND	ND	ND	ND	ND	100
Chloride	mg/L	-	15.3	53	16	30.8	30	21.4	27.2
Nitrate-N	mg/L	90.3	8.94	*0.005*	*0.005*	*0.005*	0.89	12.4	*0.005*
Sulphate	mg/L	1000	n/r	n/r	1.67	n/r	n/r	n/r	n/r
Ammoniacal-N	mg/L	-	0.02	0.7	0.66	0.23	0.01	*0.005*	0.17
Hardness	mg $CaCO_3$/L	-	n/r	n/r	52	n/r	n/r	n/r	n/r
Calcium	mg/L	1000	n/r	n/r	12.8	n/r	n/r	n/r	n/r
Magnesium	mg/L	-	n/r	n/r	4.77	n/r	n/r	n/r	n/r
Potassium	mg/L	-	n/r	n/r	4.13	n/r	n/r	n/r	n/r
Sodium	mg/L	-	n/r	31.4	22.1	29.1	n/r	n/r	25.7
D.R. Phosphorus	mg/L	-	n/r	n/r	0.069	n/r	n/r	n/r	n/r
Dissolved Aluminium	mg/L	5	*0.001*	0.007	0.089	0.003	0.002	0.008	0.008
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	0.05	0.05	0.06	0.05	0.04	0.07	0.05
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	0.003	n/r	n/r	n/r	n/r
Dissolved Copper	mg/L	0.4	n/r	n/r	0.0008	n/r	n/r	n/r	n/r
Dissolved Iron	mg/L	-	n/r	12.7	14.1	0.84	n/r	n/r	4.55

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*	0.0006
Dissolved Manganese	mg/L	-	*0.00025*	0.41	0.34	0.21	0.027	0.0039	0.23
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*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*
Dissolved Zinc	mg/L	20	n/r	n/r	0.003	n/r	n/r	n/r	n/r

Notes:

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 July 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 **eight exceedances of the DWSNZ limits** in samples from the deep gravel aquifer during the July 2023 monitoring round, as follows:

- The pH level in bore E1D (6.9 pH units) was below the DWSNZ MAV lower limit of 7.0 pH units. Whilst it has been lower than this in the past, the pH level is usually within the limit range.
- *E. coli* in bore E2D exceeded the DWSNZ MAV of NIL with a value of 1 cfu/100mL.
- Hardness in bore D3rd (208 mg $CaCO_3$/L) exceeded the DWSNZ MAV of 200 mg $CaCO_3$/L. Elevated hardness is characteristic of D3rd.
- Dissolved arsenic exceeded the DWSNZ MAV of 0.01 mg/L at bore D3rd (0.019 mg/L). This again is characteristic of D3rd.
- The dissolved manganese concentrations in bores C2DD (0.73 mg/L), E2D (0.5 mg/L), Xd1 (0.58 mg/L) and D3rd (0.5 mg/L) exceeded the DWSNZ MAV of 0.4 mg/L. The results for C2DD (from 1997), E2D (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.

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

Determinant	Units	DWSNZ MAV	E1D	C2DD	E2D	Xd1	D3rd
Sampling date			5/07/2023	5/07/2023	5/07/2023	11/07/2023	6/07/2023
Water Level	mbgl	-	10.9	n/p	5.2	2.26	5.55
pH	pH units	7 to 8.5*	**6.9**	7.6	7.6	7.6	7.8
Suspended Solids	mg/l	-	n/r	n/r	n/r	10	86
Phenol	mg/l	-	n/r	n/r	n/r	*0.025*	*0.025*
VFA	mg/l	-	n/r	n/r	n/r	*2.5*	*2.5*
TOC	mg/L	-	n/r	n/r	n/r	4.6	5.9
Alkalinity	mg $CaCO_3$/L	-	n/r	n/r	n/r	187	215
Conductivity	mS/m	-	44.5	53.8	44.4	53.7	52.5
COD	mg/L	-	28	*7.5*	16	20	23
$scBOD_5$	mg/L	-	*0.5*	*0.5*	*0.5*	*0.5*	*1.5*
E. coli	CFU/100ml	NIL	ND	ND	**1**	ND	ND
Chloride	mg/L	250*	38	39.4	41.4	55.1	31.2
Nitrate-N	mg/L	11.3	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Sulphate	mg/L	250*	n/r	n/r	n/r	*0.01*	*0.01*
Ammoniacal-N	mg/L	1.17	0.19	0.33	0.26	0.37	0.39
Hardness	mg $CaCO_3$/L	200*	n/r	n/r	n/r	170	**208**
Calcium	mg/L	-	n/r	n/r	n/r	37.2	57.3
Magnesium	mg/L	-	n/r	n/r	n/r	18.8	15.7
Potassium	mg/L	-	n/r	n/r	n/r	6.33	7.28
Sodium	mg/L	200*	35.2	n/r	n/r	44.2	25.8
D.R. Phosphorus	mg/L	-	n/r	n/r	n/r	0.104	1.15
Dissolved Aluminium	mg/L	0.1*	*0.001*	0.012	*0.001*	*0.001*	0.003
Dissolved Arsenic	mg/L	0.01	n/r	n/r	n/r	*0.0005*	**0.019**
Dissolved Boron	mg/L	1.4	0.07	0.07	0.06	0.06	0.07
Dissolved Cadmium	mg/L	0.004	n/r	n/r	n/r	*0.0001*	*0.0001*
Dissolved Chromium (VI)	mg/L	0.05	n/r	n/r	n/r	*0.0005*	*0.0005*
Dissolved Copper	mg/L	2	n/r	n/r	n/r	0.0012	0.0009
Dissolved Iron	mg/L	0.2*	0.03	n/r	n/r	0.04	0.02
Dissolved Lead	mg/L	0.01	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*
Dissolved Manganese	mg/L	0.4	0.3	**0.73**	**0.5**	**0.58**	**0.5**
Dissolved Mercury	mg/L	-	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*
Dissolved Nickel	mg/L	0.08	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*
Dissolved Zinc	mg/L	1.5*	n/r	n/r	n/r	*0.001*	*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

n/p – not provided

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 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 the Northern Farm 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 July 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 was **one exceedance of the ANZECC LDW trigger values** during the July 2023 monitoring round, as follows:

- The *E. coli* count exceeded the ANZECC LDW trigger value of 100 CFU/100ml at bore Xs1 (400 cfu/100mL). This is the highest level of *E. coli* recorded at this bore since monitoring began, with the previous maximum being 99 cfu/100mL in January 2022.

Given that there were no exceedances for other determinants at Xs1, *E. coli* contamination may not to be related to the old landfill. Instead, animal activities around the bore likely contributed to this result. Either accidental contamination during sampling or laboratory analysis may also provide an explanation. To determine the validity of this result, future monitoring should be closely assessed. *E. coli* exceedances were of issue in the January 2023 monitoring round, with significant exceedances at B1, B2, and C2. However, this appears to have been an anomaly, as all results were below the level of detection for July 2023.

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

Determinant	Units	ANZECC LDW	E2S	B1	B2	B3s	C1	C2	C2DS	G2S	Xs1	Xs2
Sampling date			6/07/23	10/07/23	10/07/23	10/07/23	4/07/23	4/07/23	4/07/23	4/07/23	4/07/23	11/07/23
Water level	mbgl	-	4.33	0.76	0.95	0.06	0.59	0.15	2.57	2.0	0.54	2.43
pH	pH units	6 to 9	7.7	7	7	7	6.9	7	7	7.1	7.3	6.7
Suspended Solids	mg/l	-	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r	34	2.5
Phenol	mg/l	-	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r	*0.025*	*0.025*
VFA	mg/l	-	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r	*2.5*	*2.5*
TOC	mg/l	-	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r	24.9	1.8
Alkalinity	mg $CaCO_3$/L	-	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r	303	59
Conductivity	mS/m	-	33.9	233	177	246	128	252	139	118	72.2	19.6
COD	mg/L	-	*7.5*	59	94	138	74	109	62	46	67	7.5
scBOD5	mg/L	-	*1.5*	*0.5*	*0.5*	1	*1.5*	*1.5*	*1.5*	*0.5*	*0.5*	*0.5*
E-Coli	CFU/100ml	100	ND	ND	ND	ND	ND	ND	ND	ND	**400**	ND
Chloride	mg/L	-	40.3	380	153	129	167	135	93.6	235	37.4	15.6
Nitrate-N	mg/L	90.3	*0.005*	26.1	8.21	*0.05*	*0.005*	*0.05*	*0.05*	*0.005*	*0.005*	0.66
Sulphate	mg/L	1000	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r	6.57	9.81
Ammoniacal-N	mg/L	-	0.29	7.41	45.1	133	11.4	181	1.29	0.02	11.4	0.02
Hardness	mg $CaCO_3$/L	-	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r	258	56
Calcium	mg/L	1000	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r	62.2	12.4
Magnesium	mg/L	-	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r	24.8	6.19
Potassium	mg/L	-	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r	13.9	4.02
Sodium	mg/L	-	27.2	n/r	n/r	n/r	n/p	n/r	n/r	n/r	38.2	15.7
D. R. Phosphorus	mg/L	-	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r	0.012	0.026
Dissolved Aluminium	mg/L	5	0.004	0.008	0.018	0.005	0.038	0.02	*0.001*	0.007	0.009	0.011
Dissolved Arsenic	mg/L	0.5	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r	0.001	*0.0005*
Dissolved Boron	mg/L	5	0.05	2.27	2.53	1.23	1.38	2.1	0.74	0.62	0.14	0.04
Dissolved Cadmium	mg/L	0.01	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r	*0.0001*	*0.0001*
Dissolved Chromium (VI)	mg/L	1	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r	*0.0005*	*0.0005*
Dissolved Copper	mg/L	0.4	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r	0.0047	0.0215
Dissolved Iron	mg/L	-	0.08	n/r	n/r	n/r	n/p	n/r	n/r	n/r	2.55	0.11

Determinant	Units	ANZECC LDW	E2S	B1	B2	B3s	C1	C2	C2DS	G2S	Xs1	Xs2
Dissolved Lead	mg/L	0.1	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*
Dissolved Manganese	mg/L	-	0.269	5.61	3.47	3.62	0.377	0.156	2.23	0.34	1.43	0.0416
Dissolved Mercury	mg/L	0.002	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*
Dissolved Nickel	mg/L	1	*0.00025*	0.0049	0.0029	0.0089	0.0012	0.004	0.0023	0.0016	*0.0008*	*0.00025*
Dissolved Zinc	mg/L	20	n/r	n/r	n/r	n/r	n/r	n/r	n/r	n/r	0.005	*0.001*

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 July 2023 monitoring round.

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

Determinant	Units	ANZECC LDW	F1	F2	F3
Sampling Date			4/07/2023	4/07/2023	4/07/2023
Water Level	mbgl	-	7.32	2.1	4.47
pH	pH units	6 to 9	7.2	7.3	7.2
Conductivity	mS/m	-	42.5	22.4	19
COD	mg/L	-	34	22	*7.5*
scBOD5	mg/L	-	*0.5*	*0.5*	*0.5*
E-Coli	CFU/100ml	100	ND	ND	ND
Chloride	mg/L	-	38.5	22.7	16
Nitrate-N	mg/L	90.3	0.65	0.5	1.05
Ammoniacal-N	mg/L	-	*0.005*	*0.005*	*0.005*
Sodium	mg/L	-	n/r	n/r	19.2
Dissolved Aluminium	mg/L	5	0.002	0.003	0.002
Dissolved Boron	mg/L	5	0.04	*0.05*	*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	-	0.0064	0.005	*0.00025*
Dissolved Mercury	mg/L	0.002	*0.00025*	*0.00025*	*0.00025*
Dissolved Nickel	mg/L	1	0.0006	*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 could be sought for comparison purposes.

Table 2-7 presents the concentrations of monitored parameters for leachate effluent samples collected in July 2023.

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 **four outliers from the typical leachate characteristics in the July 2023 results.** COD and Ammoniacal-N were detected at elevated levels, and dissolved lead and mercury were not detected and therefore less than their minimum typical values.

While these results are not reflective of typical conditions at other, similar landfills around New Zealand, it is noted that they are generally consistent with 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.

It should be noted that comprehensive analysis was undertaken in July 2023. Usually this is conducted for the April monitoring round, but April 2023 encountered analysis issues. June 2023 resamples included comprehensive analysis, so it is not known why this has been conducted in July as well.

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

Determinant	Units	Typical Leachate Characteristics* (range)	July 2023 Result
Sampling Date			5/07/2023
pH		5.9 - 8.5	7.8
Suspended Solids	mg/l	-	38
Phenol	mg/L	-	0.07
VFA	mg/L	-	*2.5*
TOC	mg/L	-	841
Alkalinity	mg $CaCO_3$/L	-	7,570
Conductivity	mS/m	264 – 27,900	1,710
COD	mg/L	84 – 5,090	**5,990**
$scBOD_5$	mg/L	-	107
E-Coli	CFU/100mL	-	ND
Chloride	mg/L	45 – 2,584	1,230
Nitrate-N	mg/L	-	*0.5*
Sulphate	mg/L	-	20.5
Ammonia-N	mg/L	3.4 – 1,440	**1,810**
Hardness	mg $CaCO_3$/L	-	434
Calcium	mg/L	-	95.4
Magnesium	mg/L	-	47.5
Potassium	mg/L	-	599
Sodium	mg/L	50 – 4,000**	843
D.R. Phosphorus	mg/L	-	15.9
Dissolved Aluminium	mg/L	-	0.55
Dissolved Arsenic	mg/L	-	0.31
Dissolved Boron	mg/L	0.54 – 20.1	5.17
Dissolved Cadmium	mg/L	-	0.001
Dissolved Chromium	mg/L	-	0.68
Dissolved Copper	mg/L	-	0.0066
Dissolved Iron	mg/L	1.6 – 220	6.63
Dissolved Lead	mg/L	0.001 - 0.42	***0.00025***

Determinant	Units	Typical Leachate Characteristics* (range)	July 2023 Result
Dissolved Manganese	mg/L	0.03 - 45***	1.02
Dissolved Mercury	mg/L	0.2 – 50	***0.0025***
Dissolved Nickel	mg/L	0.02 – 2.05**	0.13
Dissolved Zinc	mg/L	-	0.054

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 Northern Farm Drain (Tatana Property)

A drain is located on the Northern Farm, previously known as 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 May 2023, June 2023 and July 2023 sampling rounds are presented in Table 2-8 and have been compared with the ANZECC[2] 95%ile DGVs, as per the revised resource consent conditions.

There have been **seven exceedances of the resource consent conditions** for three monitored parameters in samples from the Northern Farm property at the TD1 location during the May 2023, June 2023, and July 2023 sampling rounds.

- The concentration of Nitrate-N in June 2023 (1.62 mg/L) and July 2023 (1.43 mg/L) exceeded the ANZECC (95%ile) DGV of 0.16 mg/L. This site has commonly presented elevated levels.
- The concentration of Ammoniacal-N in May 2023 (8.25 mg/L), June 2023 (17.8 mg/L), and July 2023 (13.3 mg/L) exceeded the ANZECC (95%ile) DGV of 2.1 mg/L.
- The concentration of dissolved copper in June 2023 (0.002 mg/L) exceeded the ANZECC (95%ile) DGV of 0.0014 mg/L.
- The concentration of dissolved zinc in June 2023 (0.018 mg/L) exceeded the ANZECC (95%ile) DGV of 0.008 mg/L. This is the highest concentration recorded since monitoring began.

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 Northern Farm Drain and the slow flow of water in the drain, may contribute to some of the elevated parameters.

Table 2-8 Northern Farm Drain Monitoring Results for May 2023, June 2023, and July 2023.

Determinant	Units	ANZECC DGV (95%ile species protection)	TD1 (formerly SW3)		
			May	June	July
Sampling date			3/05/2023	13/06/2023	4/07/2023
pH	pH units	-	7.6	7.2	7.7
Suspended Solids	mg/L	-	37	7	18
Phenol	mg/L	-	*0.025*	*0.025*	*0.025*

[2]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)		
			May	June	July
VFA	mg/L	-	*2.5*	*2.5*	*2.5*
TOC	mg/L	-	31	24	20.8
Alkalinity	mg $CaCO_3$/L	-	225	236	335
Conductivity	mS/m	-	71.5	78.1	95.6
COD	mg/L	-	98	69	77
scBOD5	mg/L	2	*2*	*0.5*	*0.5*
E-Coli	CFU/100ml	-	100	ND	100
Chloride	mg/L	-	83.7	84.8	82.5
Nitrate-N	mg/L	0.16	*0.005*	**1.62**	**1.43**
Sulphate	mg/L	-	1.39	7.74	3.08
Ammoniacal-N	mg/L	2.1	**8.25**	**17.8**	**13.3**
Hardness	mg $CaCO_3$/L	-	161	153	295
Calcium	mg/L	-	32.0	26.4	72.4
Magnesium	mg/L	-	19.6	21.2	27.8
Potassium	mg/L	-	19.3	24.8	25.1
Sodium	mg/L	-	63.8	71.7	67.2
D.R. Phosphorus	mg/L	-	0.033	0.063	0.023
Dissolved Aluminium	mg/L	0.055	0.024	0.02	0.019
Dissolved Arsenic	mg/L	0.024	0.002	0.002	*0.0005*
Dissolved Boron	mg/L	-	0.25	0.26	0.44
Dissolved Cadmium	mg/L	0.0002	*0.0001*	*0.0001*	*0.0001*
Dissolved Chromium	mg/L	-	*0.0005*	0.004	*0.0005*
Dissolved Copper	mg/L	0.0014	0.0005	**0.002**	0.0006
Dissolved Iron	mg/L	-	3.24	0.811	0.3
Dissolved Lead	mg/L	0.0034	*0.00025*	*0.00025*	*0.00025*
Dissolved Manganese	mg/L	1.9	0.297	0.0737	0.576
Dissolved Mercury	mg/L	0.0006	*0.00025*	*0.00025*	*0.00025*
Dissolved Nickel	mg/L	0.011	0.0015	0.0022	0.002
Dissolved Zinc	mg/L	0.008	0.0030	**0.018**	0.008

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 Northern Farm Drain discharge, and HS3 is located approximately 50m down-stream of the landfill site property boundary and the Northern Farm 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 May 2023, June 2023, and July 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).

There were **sixteen exceedances** of the resource consent conditions in samples from the Hokio Stream during the May 2023, June 2023, and July 2023 sampling rounds.

The exceedances are summarised as follows:

- Nitrate-N exceeded both the ANZECC (95%ile) DGV and consent trigger value of 0.16 mg/L at all sites for May 2023, June 2023 and July 2023, with values ranging between 1.01 mg/L and 1.62 mg/L.

- Dissolved copper exceeded the ANZECC (95%ile) DGV and consent trigger value median of 0.0014 mg/L in May 2023 at HS2 (0.0019 mg/L) and June 2023 at HS1 (0.0051 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.
- Dissolved zinc exceeded the ANZECC (95%ile) and consent trigger value median of 0.008 mg/L in May 2023 at HS2 (0.033 mg/L) and June 2023 at HS1 (0.021 mg/L). Whilst historically, HS1 has presented periodic exceedances, this is the highest concentration recorded at HS2 since October 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. Dissolved copper and zinc provided exceptions to this trend – which have been noted in recent quarterly reports. However, for these exceedance events, concentrations downstream were still within normal ranges. *E. coli* counts have shown some significant differences 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 May 2023, June 2023, and July 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
				May				June				July			
Sampling date				3/05/23	3/05/23	3/05/23	3/05/23	13/06/23	13/06/23	13/06/23	13/06/23	4/07/23	4/07/23	4/07/23	4/07/23
pH	pH units	-	-	7.3	7.4	7.2	7.5	7.6	7.7	7.7	7.6	7.5	7.5	7.4	7.5
Suspended Solids	mg/l	-	-	*3*	*3*	9	*3*	*2.5*	*2.5*	6	9	15	15	14	49
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*	5.3	*2.5*
TOC	mg/L	-	-	5.4	5.4	5.7	5.4	6.5	7.2	6.5	6.5	4.7	5.1	4.9	5
Alkalinity	mg $CaCO_3$/L	-	-	55	56	57	59	61	64	63	64	60	58	60	62
Conductivity	mS/m	-	-	22.9	22.6	23.4	23.3	23.4	23.6	24.1	24.4	23.8	23.9	24.5	25
COD	mg/L	-	-	19	19	27	21	22	28	20	22	30	22	31	34
$scBOD_5$	mg/L	2	Monthly Avg. 2	*1.5*	*1.5*	*1.5*	*1.5*	*0.5*	1	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*
E. coli	CFU/100 ml	-	-	800	ND	600	ND	100	ND	ND	100	ND	200	ND	ND
Chloride	mg/L	-	-	21.7	21	21.9	22.1	22.8	23.1	23.9	24.3	22.3	22.3	23.3	23.8
Nitrate-N	mg/L	0.16	0.16	**1.46**	**1.46**	**1.52**	**1.55**	**1.05**	**1.01**	**1.03**	**1.04**	**1.61**	**1.6**	**1.58**	**1.62**
Sulphate	mg/L	-	-	15.3	15.2	15.3	15.4	15.7	15.8	15.9	15.7	17.8	17.7	17.7	17.6
Ammoniacal-N	mg/L	2.1	Max. 2.1 Avg. 0.400	0.08	0.11	0.14	0.13	0.06	0.07	0.08	0.13	0.05	0.06	0.1	0.14
Hardness	mg $CaCO_3$/L	-	-	64	64	65	66	64	62	65	67	98	85	87	95
Calcium	mg/L	-	-	13	12.9	13	13.2	13.4	12.9	13.7	14.1	24	20.6	21.3	23.3
Magnesium	mg/L	-	-	7.72	7.81	7.78	7.99	7.3	7.28	7.41	7.63	9.2	8.14	8.19	8.93
Potassium	mg/L	-	-	3.22	3.08	3.23	3.2	3.2	3.28	3.35	3.54	4.3	3.93	3.92	4.51
Sodium	mg/L	-	-	19.5	19.5	19.7	20.1	20.3	20.4	20.6	21.2	25.3	22.5	22.5	25.2
D.R. Phosphorus	mg/L	-	-	0.1	0.11	0.068	0.093	0.045	0.041	0.046	0.047	0.031	0.03	0.032	0.035
Dissolved Aluminium	mg/L	0.055	Med. 0.055	0.015	0.015	0.021	0.014	0.011	0.01	0.012	0.011	0.014	0.009	0.008	0.016

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
				May				June				July			
Dissolved Arsenic	mg/L	0.024	Med. 0.024	0.001	0.001	0.001	0.001	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*
Dissolved Boron	mg/L	0.370	-	0.08	0.08	0.08	0.09	0.03	0.03	0.04	0.04	0.08	0.07	0.07	0.08
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	0.0012	0.001	**0.0019**	0.0014	0.0007	**0.0051**	0.0009	0.0007	0.0008	0.0009	0.0008	0.0007
Dissolved Iron	mg/L	-	-	0.13	0.16	0.15	0.18	0.13	0.13	0.17	0.18	0.07	0.05	0.06	0.1
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	-	0.017	0.023	0.018	0.026	0.03	0.041	0.031	0.039	0.013	0.014	0.026	0.021
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	0.0006	*0.00025*	0.001	*0.00025*	*0.00025*	0.001	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*
Dissolved Zinc	mg/L	0.008	Med. 0.008	0.006	0.008	**0.033**	0.005	0.006	**0.021**	*0.001*	*0.001*	*0.001*	0.002	0.003	*0.001*

Notes:

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

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 3 July 2023. It is noted that two sets of gas monitoring results did not state their corresponding borehole name. Xs1 was missing from the result list, but results were assumed based on the data set corresponding to gas levels at Xs2. However, 28 sets were recorded, and there are only 27 boreholes, so one site was sampled twice. It is assumed the unnamed data set is a duplicate because it corresponds exactly with the data set which was given below it in the spreadsheet, that being for bore F1.

Out of the 27 groundwater monitoring bores:

- Methane and hydrogen sulphide were not detected in any of the bores. Given the past analyses, this is somewhat anomalous, but is possible.
- Carbon dioxide was recorded at all bores, but at relatively minor concentrations – the highest being 0.67% at bore B2. Historically, fluctuations have been seen across the bores, and July concentrations are within historical ranges. In January 2023, B2 presented a significantly high concentration of 7.01% - the July quarter showing substantial decrease.
- The landfill gas levels in July 2023 appear to indicate concentration decreases for the measured gases, in comparison to previous quarters. The continued monitoring of gas changes is recommended, to map any patterns. Gas 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).

Despite methane and hydrogen sulphide not being detected in the bores in July 2023, there is always a possibility of encountering these gases in the groundwater bores which endorses the need for appropriate health and safety measures to be adopted during monitoring. 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 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 most samples. 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.

5 Consent Compliance

Discharge permit ATH-2002003983.02 states that quarterly and annual monitoring results for the shallow groundwater aquifer (sand aquifer) shall comply with the ANZECC LDW trigger values, and samples from the deep groundwater (gravel aquifer) shall comply with the applicable DWSNZ values. Furthermore, samples taken from surface water bodies shall comply with ANZECC AE 95%ile DGVs. 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.

Background Groundwater Quality

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

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 was **one exceedance** of consent conditions hydraulically down-gradient of the old landfill during the July 2023 monitoring period.

- The *E. coli* count exceeded the ANZECC LDW trigger value of 100 CFU/100ml at bore Xs1 (400 cfu/100mL). This is the highest level of *E. coli* recorded at this bore since monitoring began, with the previous maximum being 99 cfu/100mL in January 2022.

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

Deeper Gravel Aquifer

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

- The pH level in bore E1D (6.9 pH units) was below the DWSNZ MAV lower limit of 7.0 pH units. Whilst it has been lower than this in the past, the pH level is usually within the limit range.
- *E. coli* in bore E2D exceeded the DWSNZ MAV of NIL with a value of 1 cfu/100mL. However, the level of laboratory detection, and thus, results considered as 'ND', fluctuated between sites – 1cfu/100mL and 100 cfu/100mL.
- Hardness in bore D3rd (208 mg $CaCO_3$/L) exceeded the DWSNZ MAV of 200 mg $CaCO_3$/L. Elevated hardness is characteristic of D3rd.
- Dissolved arsenic exceeded the DWSNZ MAV of 0.01 mg/L at bore D3rd (0.019 mg/L). This again is characteristic of D3rd.
- The dissolved manganese concentrations in bores C2DD (0.73 mg/L), E2D (0.5 mg/L), Xd1 (0.58 mg/L) and D3rd (0.5 mg/L) exceeded the DWSNZ MAV of 0.4 mg/L. The results for C2DD (from 1997), E2D (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.

Leachate Effluent

Leachate effluent from the Levin Landfill is not subject to any water quality consent conditions and is sent to the Levin Wastewater Treatment Plant for treatment.

However, there were four outliers from the typical leachate characteristics in the July 2023 results. COD and Ammoniacal-N were detected at elevated levels, whereas dissolved lead and mercury were not detected, and therefore, less than their minimum typical values.

Northern Farm Drain

There were **seven exceedances** of the resource consent conditions for samples from the Northern Farm property at the TD1 location during the May 2023, June 2023, and July 2023 sampling.

- The concentration of Nitrate-N in June 2023 (1.62 mg/L) and July 2023 (1.43 mg/L) exceeded the ANZECC (95%ile) DGV of 0.16 mg/L. This site has commonly presented elevated levels.
- The concentration of Ammoniacal-N in May 2023 (8.25 mg/L), June 2023 (17.8 mg/L), and July 2023 (13.3 mg/L) exceeded the ANZECC (95%ile) DGV of 2.1 mg/L.
- The concentration of dissolved zinc in June 2023 (0.018 mg/L) exceeded the ANZECC (95%ile) DGV of 0.008 mg/L. This is the highest concentration recorded since monitoring began.
- The concentration of dissolved copper in June 2023 (0.002 mg/L) exceeded the ANZECC (95%ile) DGV of 0.0014 mg/L.

Hokio Stream

There were **sixteen exceedances** of the resource consent conditions in samples from the Hokio Stream during the May 2023, June 2023, and July 2023 sampling rounds.

- Nitrate-N exceeded both the ANZECC (95%ile) DGV and consent trigger value of 0.16 mg/L at all sites for May 2023, June 2023 and July 2023, with values ranging between 1.01 mg/L and 1.62 mg/L.
- Dissolved copper exceeded the ANZECC (95%ile) DGV and consent trigger value median of 0.0014 mg/L in May 2023 at HS2 (0.0019 mg/L) and June 2023 at HS1 (0.0051 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.
- Dissolved zinc exceeded the ANZECC (95%ile) and consent trigger value median of 0.008 mg/L in May 2023 at HS2 (0.033 mg/L) and June 2023 at HS1 (0.021 mg/L). Whilst historically, HS1 has presented periodic exceedances, this is the highest concentration recorded at HS2 since October 2008.

6 Conclusions

Monitoring results obtained in the May 2023 to July 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 May 2023 to July 2023 monitoring period, there were 32 exceedances of resource consent conditions: one in the shallow aquifer hydraulically downgradient of the old landfill, eight from the deep gravel aquifer, seven in the samples from the Northern Farm Drain (formerly known as Tatana Property Drain), and the remaining sixteen from surface water monitoring locations along the Hokio Stream.

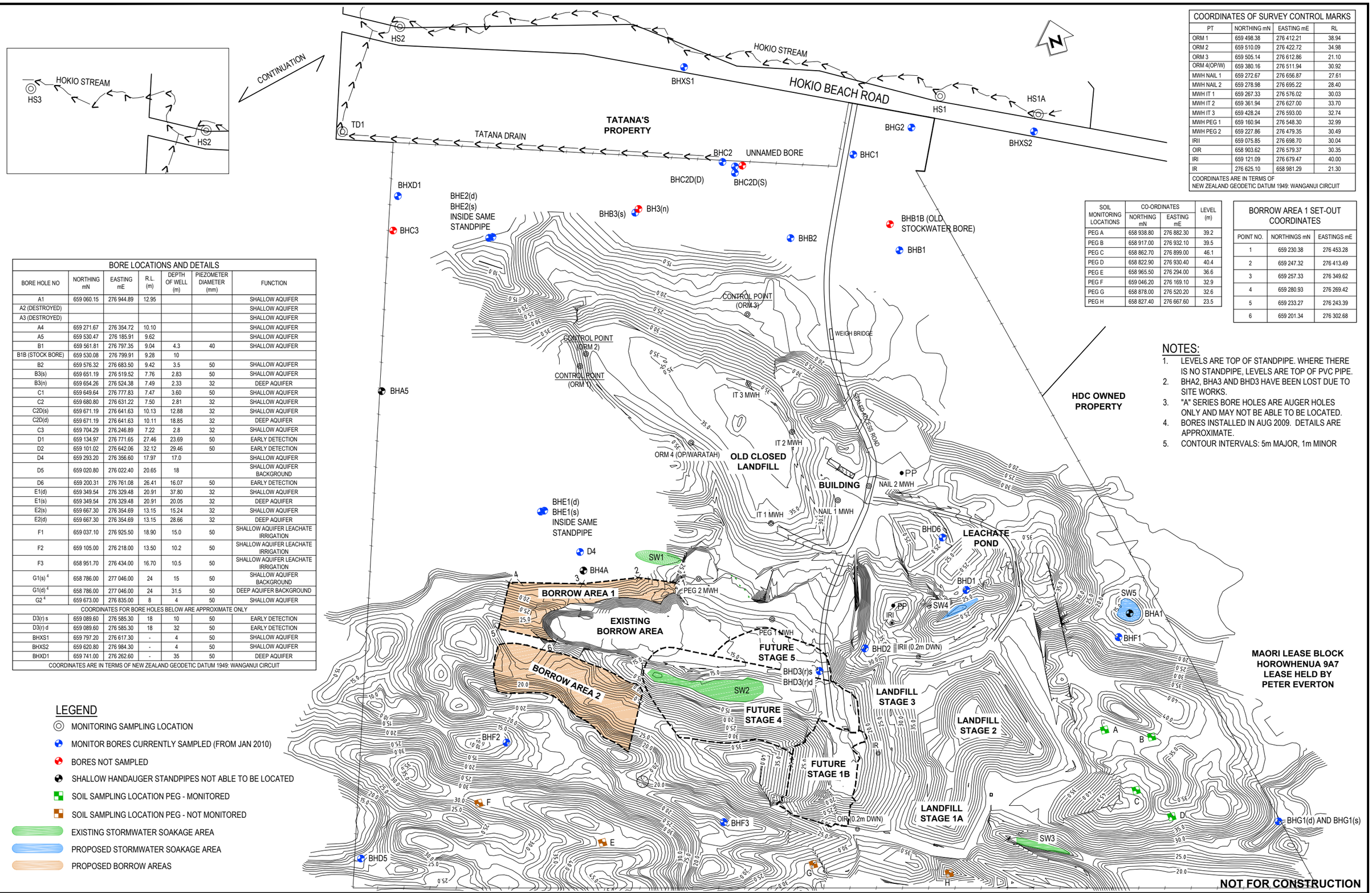
For the July 2023 monitoring round, no methane or hydrogen sulphide was detected in any of the groundwater bores, which is somewhat anomalous, but is possible. Minor concentrations of carbon dioxide were recorded at all bores, with the highest being 0.67% at bore B2. Historically, fluctuations have been seen across the bores, and July concentrations are within historical ranges. In January 2023, B2 presented a significantly high concentration of 7.01% - the July quarter showing substantial decrease.

The possibility of encountering methane and hydrogen sulphide in groundwater bores endorses the need for appropriate health and safety measures to be adopted during monitoring.

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						

LEGEND

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

NOTES:

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

NOT FOR CONSTRUCTION

DO NOT SCALE - IF IN DOUBT, ASK

ORIGINAL SIZE A1

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

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

Stantec

Client:

HOROWHENUA DISTRICT COUNCIL
LEVIN LANDFILL

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

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

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

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 2023 - April 2026).

(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, ATH-2002003983.02, formerly DP 6010)						Table B (Condition 3, ATH-2002003983.02, formerly DP 6010)																				Table C (Condition 3, ATH-2002003983.02, formerly DP 6010)					
			Deep Aquifer Bores						Shallow Aquifer Bores																				Irrigation Bores				Hokio Stream[4], [8]				Northern Farm Drain[9]	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-23	**Aug-23**	**Jul-23**	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.	Monthly Compre.	Monthly Compre.	Monthly Compre.	Monthly Compre.	Monthly Compre.
	Nov-23	**Oct-23**	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						
	Feb-24	**Jan-24**	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-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 + A
Sep-24	**Aug-24**	**Jul-24**	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
	Nov-24	**Oct-24**	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-25	**Jan-25**	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-25	**Apr-25**	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C	C	C	C	C + A
Sep-25	**Aug-25**	**Jul-25**	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-25	**Oct-25**	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-26	**Jan-26**	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-26	**Apr-26**	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C	C	C	C	C + A

Sampling at HS1 to be discontinued when HRC advises.

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 called D3rs and D3rd. Testing for comprehensive to continue to provide 2 year's of comprehensive monitoring.
(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. Testing of X-series bores to continue at comprehensive to provide 2 year's of comprehensive data.
(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. Continue monthly comprehensive sampling to October 2023 to give 24 month's continuous data.
(8) Start measuring approximately the depth of flow in the Hokio Stream at each sampling site when sampling monthly. Monthly sampling at comprehensive level to continue to, and including, October 2023, to give a full continuous 24 months of data.
(9) Northern Farm Drain is a name change from the former 'Tatana Drain'
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-035791-01** REPORT DATE **19/07/2023**

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), McMillan

Contact for your orders: Gabriela Carvalhaes **Order code:** EUNZWE-00132140
Contract: Landfill

SAMPLE CODE **812-2023-00094009**

Client Reference: 296982-0
Product: Ground water
Sampling Point code: WIL-B1 **Sampling Point name:** Levin B1
Reception Date & Time: 12/07/2023 15:34
Analysis Start Date & Time: 12/07/2023 15:43 **Analysis Ending Date:** 19/07/2023
Sampled Date & Time 10/07/2023 09:30 **Sampler(s)** Client nominated external sampler
Sampled by Eurofins No

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	7.41	(± 1.11) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<1	mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	59	(± 10) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	380	(± 19.0) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	233	(± 4.7) mS/m	0.1
NW098	**Dissolved Aluminium**			
	Aluminium	0.008	(± 0.001) mg/l	0.002
NW103	**Dissolved Boron**			
	Boron (B)	2.27	mg/l	0.03
NW110	**Dissolved Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Dissolved Manganese**			
	Manganese (Mn)	5.61	(± 0.561) mg/l	0.0005
NW114	**Dissolved Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Dissolved Nickel**			
	Nickel (Ni)	0.0049	(± 0.0015) mg/l	0.0005
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			

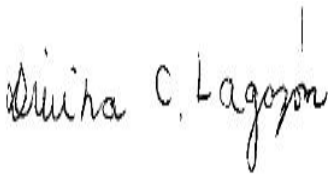
		RESULTS (UNCERTAINTY)		LOQ
NW010	**Nitrate-N**			
	Nitrate-N	26.1	(± 1.30) mg/l	0.01
NW195	**pH**			
	pH	7.0	(± 0.2)	0.1

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	**Dissolved Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Dissolved Boron:** APHA Online Edition 3125 B mod.
NW110	**Dissolved Lead:** APHA Online Edition 3125 B mod.	NW113	**Dissolved Manganese:** APHA Online Edition 3125 B mod.
NW114	**Dissolved Mercury:** APHA Online Edition 3125 B mod.	NW116	**Dissolved 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

Jennifer Mont Supervisor



Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Leo Cleave Senior Analyst Microbiology

Gabriela Carvalhaes Manager Food and Water Testing Chemistry

EXPLANATORY NOTE

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

END OF REPORT

Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-035792-01** REPORT DATE **19/07/2023**

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), McMillan

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill
Order code: EUNZWE-00132140

SAMPLE CODE **812-2023-00094010**

Client Reference: 296983-0
Product: Ground water
Sampling Point code: WIL-B2
Sampling Point name: Levin B2
Reception Date & Time: 12/07/2023 15:36
Analysis Start Date & Time: 12/07/2023 15:43
Analysis Ending Date: 19/07/2023
Sampled Date & Time 10/07/2023 09:10
Sampler(s) Client nominated external sampler
Sampled by Eurofins No

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	45.1	(± 4.51) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<1	mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	94	(± 15) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	153	(± 7.64) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	177	(± 3.5) mS/m	0.1
NW098	**Dissolved Aluminium**			
	Aluminium	0.018	(± 0.002) mg/l	0.002
NW103	**Dissolved Boron**			
	Boron (B)	2.53	mg/l	0.03
NW110	**Dissolved Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Dissolved Manganese**			
	Manganese (Mn)	3.47	(± 0.347) mg/l	0.0005
NW114	**Dissolved Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Dissolved Nickel**			
	Nickel (Ni)	0.0029	(± 0.0009) mg/l	0.0005
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			

		RESULTS (UNCERTAINTY)		LOQ
NW010	**Nitrate-N**			
	Nitrate-N	8.21	(± 0.82) mg/l	0.01
NW195	**pH**			
	pH	7.0	(± 0.2)	0.1

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
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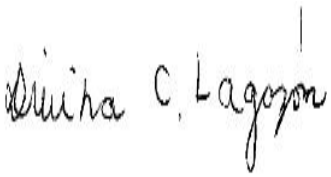
NW114	**Dissolved Mercury:** APHA Online Edition 3125 B mod.	NW116	**Dissolved Nickel:** APHA Online Edition 3125 B mod.
NW179	**Ammonia Nitrogen:** APHA Online Edition 4500-NH3 H	NW195	**pH:** APHA Online Edition 4500-H B
NW341	**BOD5 - Soluble Carbonaceous:** APHA Online Edition 5210 B	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature

Jennifer Mont Supervisor



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⑦Tested at the sampling point by Eurofins and is not accredited
⑧Tested 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.
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.
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.
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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-035790-01** REPORT DATE **19/07/2023**

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), McMillan

Contact for your orders: Gabriela Carvalhaes **Order code:** EUNZWE-00132140
Contract: Landfill

SAMPLE CODE **812-2023-00094007**

Client Reference: 296984-0
Product: Ground water
Sampling Point code: WIL-B3 **Sampling Point name:** Levin B3s
Reception Date & Time: 12/07/2023 15:27
Analysis Start Date & Time: 12/07/2023 15:43 **Analysis Ending Date:** 19/07/2023
Sampled Date & Time 10/07/2023 09:55 **Sampler(s)** Client nominated external sampler
Sampled by Eurofins No

		RESULTS (UNCERTAINTY)		LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	133	(± 13.3) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	1	mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	138	(± 15) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	129	(± 6.44) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	246	(± 4.9) mS/m	0.1
NW098	**Dissolved Aluminium**			
	Aluminium	0.005	(± 0.001) mg/l	0.002
NW103	**Dissolved Boron**			
	Boron (B)	1.23	mg/l	0.03
NW110	**Dissolved Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Dissolved Manganese**			
	Manganese (Mn)	3.62	(± 0.362) mg/l	0.0005
NW114	**Dissolved Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Dissolved Nickel**			
	Nickel (Ni)	0.0089	(± 0.0027) mg/l	0.0005
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			

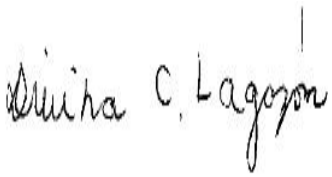
		RESULTS	(UNCERTAINTY)	LOQ
NW010	**Nitrate-N**			
	Nitrate-N	<0.10	(± 0.02) mg/l	0.01
NW195	**pH**			
	pH	7.0	(± 0.2)	0.1

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	**Dissolved Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Dissolved Boron:** APHA Online Edition 3125 B mod.
NW110	**Dissolved Lead:** APHA Online Edition 3125 B mod.	NW113	**Dissolved Manganese:** APHA Online Edition 3125 B mod.
NW114	**Dissolved Mercury:** APHA Online Edition 3125 B mod.	NW116	**Dissolved 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

Jennifer Mont Supervisor



Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Leo Cleave Senior Analyst Microbiology

Gabriela Carvalhaes Manager Food and Water Testing Chemistry

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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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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE	AR-23-NW-036074-01	REPORT DATE	20/07/2023

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Horowhenua Admin
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4741 Levin
NEW ZEALAND

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

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

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill
Order code: EUNZWE-00131742

SAMPLE CODE 812-2023-00092572

Client Reference: 296978-0
Product: Ground water
Sampling Point code: WIL-C1
Sampling Point name: Levin C1
Reception Date & Time: 10/07/2023 14:59
Analysis Start Date & Time: 10/07/2023 15:01
Analysis Ending Date: 20/07/2023
Sampled Date & Time 10/07/2023 06:20
Sampler(s) Client nominated external sampler
Sampled by Eurofins No

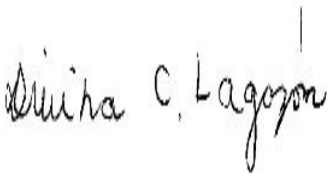
		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	11.4	(± 1.14) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	74	(± 12) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	167	(± 8.36) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	128	(± 2.6) mS/m	0.1
NW098	**Dissolved Aluminium**			
	Aluminium	0.038	(± 0.004) mg/l	0.002
NW103	**Dissolved Boron**			
	Boron (B)	1.38	mg/l	0.03
NW110	**Dissolved Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Dissolved Manganese**			
	Manganese (Mn)	0.377	(± 0.0377) mg/l	0.0005
NW114	**Dissolved Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Dissolved Nickel**			
	Nickel (Ni)	0.0012	(± 0.0004) mg/l	0.0005
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			

		RESULTS	(UNCERTAINTY)	LOQ
NW010	**Nitrate-N**			
	Nitrate-N	<0.01	(± 0.003) mg/l	0.01
NW195	**pH**			
	pH	6.9	(± 0.2)	0.1

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	**Dissolved Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Dissolved Boron:** APHA Online Edition 3125 B mod.
NW110	**Dissolved Lead:** APHA Online Edition 3125 B mod.	NW113	**Dissolved Manganese:** APHA Online Edition 3125 B mod.
NW114	**Dissolved Mercury:** APHA Online Edition 3125 B mod.	NW116	**Dissolved 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



Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Sunita Raju Business Unit Manager

Gabriela Carvalhaes Manager Food and Water Testing Chemistry

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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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ANALYTICAL REPORT

REPORT CODE	AR-23-NW-035761-01	REPORT DATE	19/07/2023

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4741 Levin
NEW ZEALAND

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

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

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill
Order code: EUNZWE-00131540

SAMPLE CODE 812-2023-00091905

Client Reference: 296979-0
Product: Ground water
Sampling Point code: WIL-C2
Sampling Point name: Levin C2
Reception Date & Time: 07/07/2023 18:20
Analysis Start Date & Time: 07/07/2023 18:21
Analysis Ending Date: 19/07/2023
Sampled Date & Time 04/07/2023 12:16
Sampler(s) Client nominated external sampler
Sampled by Eurofins No

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	181	(± 18.1) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	109	(± 12) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	135	(± 6.73) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	252	(± 5.0) mS/m	0.1
NW098	**Dissolved Aluminium**			
	Aluminium	0.020	(± 0.002) mg/l	0.002
NW103	**Dissolved Boron**			
	Boron (B)	2.10	mg/l	0.03
NW110	**Dissolved Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Dissolved Manganese**			
	Manganese (Mn)	0.156	(± 0.0156) mg/l	0.0005
NW114	**Dissolved Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Dissolved Nickel**			
	Nickel (Ni)	0.0040	(± 0.0012) mg/l	0.0005
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			

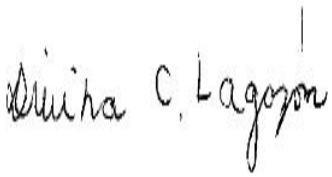
		RESULTS (UNCERTAINTY)		LOQ
NW010	**Nitrate-N**			
	Nitrate-N	<0.10	(± 0.02) mg/l	0.01
①**NW195**	**pH**			
	pH	7.0	(± 0.2)	0.1

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	**Dissolved Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Dissolved Boron:** APHA Online Edition 3125 B mod.
NW110	**Dissolved Lead:** APHA Online Edition 3125 B mod.	NW113	**Dissolved Manganese:** APHA Online Edition 3125 B mod.
NW114	**Dissolved Mercury:** APHA Online Edition 3125 B mod.	NW116	**Dissolved 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

Jennifer Mont Supervisor



Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Sunita Raju Business Unit Manager

Gabriela Carvalhaes Manager Food and Water Testing Chemistry

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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE	AR-23-NW-036067-01	REPORT DATE	20/07/2023

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P O Box 642
4741 Levin
NEW ZEALAND

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Email horowhenuaadmin@downer.co.nz

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

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill

Order code: EUNZWE-00131298

SAMPLE CODE 812-2023-00091344

Client Reference: 296973-0
Product: Ground water
Sampling Point code: WIL-C2dd
Sampling Point name: Levin C2dd
Reception Date & Time: 06/07/2023 18:12
Analysis Start Date & Time: 06/07/2023 18:13
Analysis Ending Date: 20/07/2023
Sampled Date & Time 05/07/2023 13:09
Sampler(s) Client nominated external sampler
Sampled by Eurofins No

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.33	(± 0.10) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<1	mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	<15	(± 5) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	39.4	(± 1.97) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	53.8	(± 1.1) mS/m	0.1
NW098	**Dissolved Aluminium**			
	Aluminium	0.012	(± 0.001) mg/l	0.002
NW103	**Dissolved Boron**			
	Boron (B)	0.07	mg/l	0.03
NW110	**Dissolved Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Dissolved Manganese**			
	Manganese (Mn)	0.728	(± 0.0728) mg/l	0.0005
NW114	**Dissolved Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Dissolved Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005
ZMF1E	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<1	cfu/100 ml	1
NW010	**Nitrate-N**			

		RESULTS	(UNCERTAINTY)	LOQ
NW010	**Nitrate-N**			
	Nitrate-N	<0.01	(± 0.003) mg/l	0.01
NW195	**pH**			
	pH	7.6	(± 0.2)	0.1

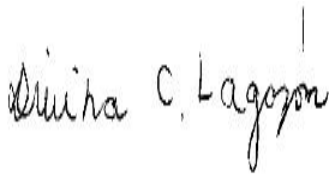
LIST OF METHODS

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	**Dissolved Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Dissolved Boron:** APHA Online Edition 3125 B mod.
NW110	**Dissolved Lead:** APHA Online Edition 3125 B mod.	NW113	**Dissolved Manganese:** APHA Online Edition 3125 B mod.
NW114	**Dissolved Mercury:** APHA Online Edition 3125 B mod.	NW116	**Dissolved 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	ZMF1E	**Escherichia coli E (Water) [NZ] <1 >80 /100 ml (0) Ml Agar-F:** SMEWW 9222K; APHA Online

Signature

Marylou Cabral Laboratory Manager

Jennifer Mont Supervisor



Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Sunita Raju Business Unit Manager

Gabriela Carvalhaes Manager Food and Water Testing Chemistry

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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-035481-01** REPORT DATE **18/07/2023**

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4741 Levin
NEW ZEALAND

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

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

Contact for your orders: Gabriela Carvalhaes **Order code:** EUNZWE-00131742
Contract: Landfill

SAMPLE CODE **812-2023-00092568**

Client Reference: 296980-0
Product: Ground water
Sampling Point code: WIL-C2ds **Sampling Point name:** Levin C2ds
Reception Date & Time: 10/07/2023 14:58
Analysis Start Date & Time: 10/07/2023 15:01 **Analysis Ending Date:** 18/07/2023
Sampled Date & Time 04/07/2023 12:17 **Sampler(s)** Client nominated external sampler
Sampled by Eurofins No

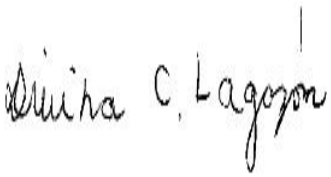
		RESULTS (UNCERTAINTY)		LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	1.29	(± 0.19) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	62	(± 11) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	93.6	(± 4.68) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	139	(± 2.8) mS/m	0.1
NW098	**Dissolved Aluminium**			
	Aluminium	<0.002	(± 0.001) mg/l	0.002
NW103	**Dissolved Boron**			
	Boron (B)	0.74	mg/l	0.03
NW110	**Dissolved Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Dissolved Manganese**			
	Manganese (Mn)	2.23	(± 0.223) mg/l	0.0005
NW114	**Dissolved Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Dissolved Nickel**			
	Nickel (Ni)	0.0023	(± 0.0007) mg/l	0.0005
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			

		RESULTS	(UNCERTAINTY)	LOQ
NW010	**Nitrate-N**			
	Nitrate-N	<0.10	(± 0.02) mg/l	0.01
NW195	**pH**			
	pH	7.0	(± 0.2)	0.1

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	**Dissolved Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Dissolved Boron:** APHA Online Edition 3125 B mod.
NW110	**Dissolved Lead:** APHA Online Edition 3125 B mod.	NW113	**Dissolved Manganese:** APHA Online Edition 3125 B mod.
NW114	**Dissolved Mercury:** APHA Online Edition 3125 B mod.	NW116	**Dissolved 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



Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Sunita Raju Business Unit Manager

Gabriela Carvalhaes Manager Food and Water Testing Chemistry

EXPLANATORY NOTE

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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

END OF REPORT

Food & Water Testing

ANALYTICAL REPORT

REPORT CODE	AR-23-NW-036066-01	REPORT DATE	20/07/2023

Attention Downer NZ Ltd (EDI Levin)
Horowhenua Admin
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NEW ZEALAND

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

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill
Order code: EUNZWE-00131298

SAMPLE CODE 812-2023-00091343

Client Reference: 296987-0
Product: Ground water
Sampling Point code: WIL-D1
Sampling Point name: Levin D1
Reception Date & Time: 06/07/2023 18:12
Analysis Start Date & Time: 06/07/2023 18:13
Analysis Ending Date: 20/07/2023
Sampled Date & Time 05/07/2023 13:10
Sampler(s) Client nominated external sampler
Sampled by Eurofins No

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.02	(± 0.007) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<1	mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	<15	(± 5) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	15.3	(± 0.76) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	40.1	(± 0.8) mS/m	0.1
NW098	**Dissolved Aluminium**			
	Aluminium	<0.002	(± 0.001) mg/l	0.002
NW103	**Dissolved Boron**			
	Boron (B)	0.05	mg/l	0.03
NW110	**Dissolved Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Dissolved Manganese**			
	Manganese (Mn)	<0.0005	(± 0.0002) mg/l	0.0005
NW114	**Dissolved Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Dissolved Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			

		RESULTS (UNCERTAINTY)		LOQ
NW010	**Nitrate-N**			
	Nitrate-N	8.94	(± 0.89) mg/l	0.01
NW195	**pH**			
	pH	6.7	(± 0.2)	0.1

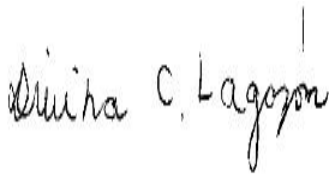
LIST OF METHODS

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	**Dissolved Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Dissolved Boron:** APHA Online Edition 3125 B mod.
NW110	**Dissolved Lead:** APHA Online Edition 3125 B mod.	NW113	**Dissolved Manganese:** APHA Online Edition 3125 B mod.
NW114	**Dissolved Mercury:** APHA Online Edition 3125 B mod.	NW116	**Dissolved 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



Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Arvinder Singh Supervisor Laboratory Supervisor

Gabriela Carvalhaes Manager Food and Water Testing Chemistry

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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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END OF REPORT

Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-036063-01** REPORT DATE **20/07/2023**

Attention Downer NZ Ltd (EDI Levin)
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NEW ZEALAND

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

Contact for your orders: Gabriela Carvalhaes **Order code:** EUNZWE-00131298
Contract: Landfill

SAMPLE CODE **812-2023-00091255**

Client Reference: 296988-0
Product: Ground water
Sampling Point code: WIL-D2 **Sampling Point name:** Levin D2
Reception Date & Time: 06/07/2023 16:57
Analysis Start Date & Time: 06/07/2023 17:03 **Analysis Ending Date:** 20/07/2023
Sampled Date & Time 06/07/2023 07:30 **Sampler(s)** Client nominated external sampler
Sampled by Eurofins No

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.70	(± 0.21) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	2	mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	34	(± 7) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	53.0	(± 2.65) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	53.5	(± 1.1) mS/m	0.1
NW098	**Dissolved Aluminium**			
	Aluminium	0.007	(± 0.001) mg/l	0.002
NW103	**Dissolved Boron**			
	Boron (B)	0.05	mg/l	0.03
NW109	**Dissolved Iron**			
	Iron (Fe)	12.7	(± 1.27) mg/l	0.01
NW110	**Dissolved Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Dissolved Manganese**			
	Manganese (Mn)	0.390	(± 0.0390) mg/l	0.0005
NW114	**Dissolved Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Dissolved Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005
NW120	**Dissolved Sodium**			

		RESULTS (UNCERTAINTY)		LOQ
NW120	**Dissolved Sodium**			
	Sodium (Na)	31.4	mg/l	0.01
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	6.5	(± 0.2)	0.1

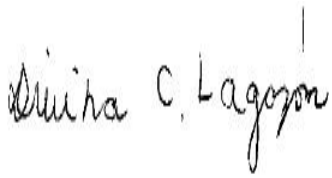
LIST OF METHODS

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	**Dissolved Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Dissolved Boron:** APHA Online Edition 3125 B mod.
NW109	**Dissolved Iron:** APHA Online Edition 3125 B mod.	NW110	**Dissolved Lead:** APHA Online Edition 3125 B mod.
NW113	**Dissolved Manganese:** APHA Online Edition 3125 B mod.	NW114	**Dissolved Mercury:** APHA Online Edition 3125 B mod.
NW116	**Dissolved Nickel:** APHA Online Edition 3125 B mod.	NW120	**Dissolved 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



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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-036852-01** REPORT DATE **24/07/2023**

Attention Downer NZ Ltd (EDI Levin)
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Copy to: Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), Goode

Contact for your orders: Gabriela Carvalhaes
Contract: Potable
Order code: EUNZWE-00131540

SAMPLE CODE **812-2023-00091904**

Client Reference: 304621-0
Product: Ground water
Sampling Point code: WIL-D3rd
Sampling Point name: Levin D3rd
Reception Date & Time: 07/07/2023 18:20
Analysis Start Date & Time: 07/07/2023 18:21
Analysis Ending Date: 24/07/2023
Sampled Date & Time 06/07/2023 21:50
Sampler(s) Client nominated external sampler
Sampled by Eurofins No

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.39	(± 0.12) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	23	(± 6) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	31.2	(± 1.56) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	52.5	(± 1.1) mS/m	0.1
NW098	**Dissolved Aluminium**			
	Aluminium	0.003	(± 0.001) mg/l	0.002
NW583	**Dissolved Arsenic**			
	Arsenic (As)	0.019	(± 0.002) mg/l	0.001
NW103	**Dissolved Boron**			
	Boron (B)	0.07	mg/l	0.03
NW104	**Dissolved Cadmium**			
	Cadmium (Cd)	<0.0002	(± 0.0001) mg/l	0.0002
NW105	**Dissolved Calcium**			
	Calcium (Ca)	57.3	mg/l	0.1
NW106	**Dissolved Chromium**			
	Chromium (Cr)	<0.001	(± 0.0003) mg/l	0.001
NW108	**Dissolved Copper**			
	Copper (Cu)	0.0009	(± 0.0002) mg/l	0.0005
NW109	**Dissolved Iron**			

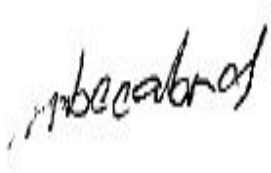
		RESULTS	(UNCERTAINTY)	LOQ
NW109	**Dissolved Iron**			
	Iron (Fe)	0.02	(± 0.006) mg/l	0.01
NW110	**Dissolved Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW112	**Dissolved Magnesium**			
	Magnesium (Mg)	15.7	mg/l	0.01
NW113	**Dissolved Manganese**			
	Manganese (Mn)	0.498	(± 0.0498) mg/l	0.0005
NW114	**Dissolved Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Dissolved Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005
NW117	**Dissolved Potassium**			
	Potassium (K)	7.28	mg/l	0.01
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	1.15	(± 0.115) mg/l	0.005
NW120	**Dissolved Sodium**			
	Sodium (Na)	25.8	mg/l	0.01
NW125	**Dissolved Zinc**			
	Zinc (Zn)	<0.002	(± 0.0007) mg/l	0.002
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
⑤**VQ088**	**Phenolics (Total)**			
	Total phenols	<0.05	mg/l	0.05
NW011	**Sulphate**			
	Sulphate	<0.02	(± 0.01) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	86	mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	215	(± 22) mg CaCO3/l	1
NW030	**Total Hardness**			
	Hardness	208	(± 62) mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	5.9	(± 0.6) mg/l	0.1
⑤**VQ876**	**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

	RESULTS (UNCERTAINTY)		LOQ
⑤VQ876 **Volatile Fatty Acids (VFA) by GC-MS**			
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

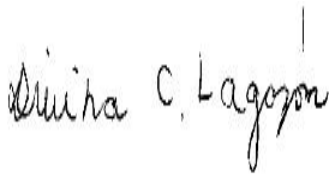
NW003	**Total Alkalinity:** APHA Online Edition 2320 B	NW007	**Chloride:** APHA Online Edition 4110 B
NW010	**Nitrate-N:** APHA Online Edition 4110 B	NW011	**Sulphate:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW030	**Total Hardness:** APHA Online Edition 2340 B	NW098	**Dissolved Aluminium:** APHA Online Edition 3125 B mod.
NW103	**Dissolved Boron:** APHA Online Edition 3125 B mod.	NW104	**Dissolved Cadmium:** APHA Online Edition 3125 B mod.
NW105	**Dissolved Calcium:** APHA Online Edition 3125 B mod.	NW106	**Dissolved Chromium:** APHA Online Edition 3125 B mod.
NW108	**Dissolved Copper:** APHA Online Edition 3125 B mod.	NW109	**Dissolved Iron:** APHA Online Edition 3125 B mod.
NW110	**Dissolved Lead:** APHA Online Edition 3125 B mod.	NW112	**Dissolved Magnesium:** APHA Online Edition 3125 B mod.
NW113	**Dissolved Manganese:** APHA Online Edition 3125 B mod.	NW114	**Dissolved Mercury:** APHA Online Edition 3125 B mod.
NW116	**Dissolved Nickel:** APHA Online Edition 3125 B mod.	NW117	**Dissolved Potassium:** APHA Online Edition 3125 B mod.
NW120	**Dissolved Sodium:** APHA Online Edition 3125 B mod.	NW125	**Dissolved 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
NW583	**Dissolved Arsenic:** 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



Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Sunita Raju Business Unit Manager

Gabriela Carvalhaes Manager Food and Water Testing Chemistry

EXPLANATORY NOTE

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⑤Test is subcontracted outside Eurofins group and is not accredited
⑥Test result is provided by the customer and is not accredited
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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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END OF REPORT

Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-036851-01** REPORT DATE **24/07/2023**

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), Goode

Contact for your orders: Gabriela Carvalhaes
Contract: Potable

Order code: EUNZWE-00131540

SAMPLE CODE **812-2023-00091901**

Client Reference: 304625-0
Product: Ground water
Sampling Point code: WIL-D3rs
Sampling Point name: Levin D3rs
Reception Date & Time: 07/07/2023 18:18
Analysis Start Date & Time: 07/07/2023 18:21
Analysis Ending Date: 24/07/2023
Sampled Date & Time 06/07/2023 10:15
Sampler(s) Client nominated external sampler
Sampled by Eurofins No

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.66	(± 0.20) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	70	(± 12) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	16.0	(± 0.80) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	19.8	(± 0.4) mS/m	0.1
NW098	**Dissolved Aluminium**			
	Aluminium	0.089	(± 0.009) mg/l	0.002
NW583	**Dissolved Arsenic**			
	Arsenic (As)	0.001	(± 0.0004) mg/l	0.001
NW103	**Dissolved Boron**			
	Boron (B)	0.06	mg/l	0.03
NW104	**Dissolved Cadmium**			
	Cadmium (Cd)	<0.0002	(± 0.0001) mg/l	0.0002
NW105	**Dissolved Calcium**			
	Calcium (Ca)	12.8	mg/l	0.1
NW106	**Dissolved Chromium**			
	Chromium (Cr)	0.003	(± 0.0005) mg/l	0.001
NW108	**Dissolved Copper**			
	Copper (Cu)	0.0008	(± 0.0002) mg/l	0.0005
NW109	**Dissolved Iron**			

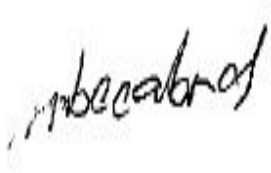
		RESULTS	(UNCERTAINTY)	LOQ
NW109	**Dissolved Iron**			
	Iron (Fe)	14.1	(± 1.41) mg/l	0.01
NW110	**Dissolved Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW112	**Dissolved Magnesium**			
	Magnesium (Mg)	4.77	mg/l	0.01
NW113	**Dissolved Manganese**			
	Manganese (Mn)	0.342	(± 0.0342) mg/l	0.0005
NW114	**Dissolved Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Dissolved Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005
NW117	**Dissolved Potassium**			
	Potassium (K)	4.13	mg/l	0.01
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	0.069	(± 0.014) mg/l	0.005
NW120	**Dissolved Sodium**			
	Sodium (Na)	22.1	mg/l	0.01
NW125	**Dissolved Zinc**			
	Zinc (Zn)	0.003	(± 0.0007) mg/l	0.002
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	6.5	(± 0.2)	0.1
⑤**VQ088**	**Phenolics (Total)**			
	Total phenols	<0.05	mg/l	0.05
NW011	**Sulphate**			
	Sulphate	1.67	(± 0.17) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	<6	mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	63	(± 6) mg CaCO3/l	1
NW030	**Total Hardness**			
	Hardness	52	(± 16) mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	23.8	(± 2.4) mg/l	0.1
⑤**VQ876**	**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

	RESULTS (UNCERTAINTY)		LOQ
⑤VQ876 **Volatile Fatty Acids (VFA) by GC-MS**			
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

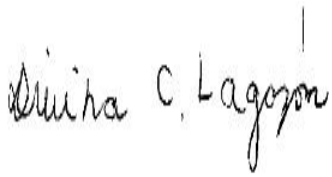
NW003	**Total Alkalinity:** APHA Online Edition 2320 B	NW007	**Chloride:** APHA Online Edition 4110 B
NW010	**Nitrate-N:** APHA Online Edition 4110 B	NW011	**Sulphate:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW030	**Total Hardness:** APHA Online Edition 2340 B	NW098	**Dissolved Aluminium:** APHA Online Edition 3125 B mod.
NW103	**Dissolved Boron:** APHA Online Edition 3125 B mod.	NW104	**Dissolved Cadmium:** APHA Online Edition 3125 B mod.
NW105	**Dissolved Calcium:** APHA Online Edition 3125 B mod.	NW106	**Dissolved Chromium:** APHA Online Edition 3125 B mod.
NW108	**Dissolved Copper:** APHA Online Edition 3125 B mod.	NW109	**Dissolved Iron:** APHA Online Edition 3125 B mod.
NW110	**Dissolved Lead:** APHA Online Edition 3125 B mod.	NW112	**Dissolved Magnesium:** APHA Online Edition 3125 B mod.
NW113	**Dissolved Manganese:** APHA Online Edition 3125 B mod.	NW114	**Dissolved Mercury:** APHA Online Edition 3125 B mod.
NW116	**Dissolved Nickel:** APHA Online Edition 3125 B mod.	NW117	**Dissolved Potassium:** APHA Online Edition 3125 B mod.
NW120	**Dissolved Sodium:** APHA Online Edition 3125 B mod.	NW125	**Dissolved 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
NW583	**Dissolved Arsenic:** 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



Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Sunita Raju Business Unit Manager

Gabriela Carvalhaes Manager Food and Water Testing Chemistry

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⑧Tested at the sampling point by Eurofins and is accredited

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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-035758-01** REPORT DATE **19/07/2023**

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), McMillan

Contact for your orders: Gabriela Carvalhaes **Order code:** EUNZWE-00131540
Contract: Landfill

SAMPLE CODE **812-2023-00091900**

Client Reference: 296981-0
Product: Ground water
Sampling Point code: WIL-D4 **Sampling Point name:** Levin D4
Reception Date & Time: 07/07/2023 18:17
Analysis Start Date & Time: 07/07/2023 18:21 **Analysis Ending Date:** 19/07/2023
Sampled Date & Time 06/07/2023 11:40 **Sampler(s)** Client nominated external sampler
Sampled by Eurofins No

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.23	(± 0.07) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	18	(± 6) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	30.8	(± 1.54) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	27.4	(± 0.5) mS/m	0.1
NW098	**Dissolved Aluminium**			
	Aluminium	0.003	(± 0.001) mg/l	0.002
NW103	**Dissolved Boron**			
	Boron (B)	0.05	mg/l	0.03
NW109	**Dissolved Iron**			
	Iron (Fe)	0.84	(± 0.17) mg/l	0.01
NW110	**Dissolved Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Dissolved Manganese**			
	Manganese (Mn)	0.207	(± 0.0207) mg/l	0.0005
NW114	**Dissolved Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Dissolved Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005
NW120	**Dissolved Sodium**			

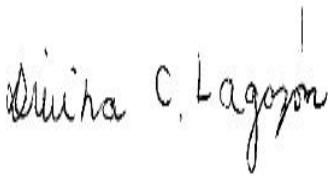
		RESULTS (UNCERTAINTY)		LOQ
NW120	**Dissolved Sodium**			
	Sodium (Na)	29.1	mg/l	0.01
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	<0.01	(± 0.003) mg/l	0.01
①**NW195**	**pH**			
	pH	7.0	(± 0.2)	0.1

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	**Dissolved Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Dissolved Boron:** APHA Online Edition 3125 B mod.
NW109	**Dissolved Iron:** APHA Online Edition 3125 B mod.	NW110	**Dissolved Lead:** APHA Online Edition 3125 B mod.
NW113	**Dissolved Manganese:** APHA Online Edition 3125 B mod.	NW114	**Dissolved Mercury:** APHA Online Edition 3125 B mod.
NW116	**Dissolved Nickel:** APHA Online Edition 3125 B mod.	NW120	**Dissolved 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



Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

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Gabriela Carvalhaes Manager Food and Water Testing Chemistry

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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

END OF REPORT

Food & Water Testing

ANALYTICAL REPORT

REPORT CODE	AR-23-NW-037029-01	REPORT DATE	25/07/2023

Attention Downer NZ Ltd (EDI Levin)
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4741 Levin
NEW ZEALAND

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Email horowhenuaadmin@downer.co.nz

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

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill
Order code: EUNZWE-00131043

SAMPLE CODE 812-2023-00090487

Client Reference: 296993-0
Product: Ground water
Sampling Point code: WIL-D5
Sampling Point name: Levin D5
Reception Date & Time: 05/07/2023 17:23
Analysis Start Date & Time: 05/07/2023 17:33
Analysis Ending Date: 25/07/2023
Sampled Date & Time 04/07/2023 11:20
Sampler(s) Client nominated external sampler
Sampled by Eurofins No

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.01	(± 0.005) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<1	mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	36	(± 7) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	30.0	(± 1.50) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	31.7	(± 0.6) mS/m	0.1
NW098	**Dissolved Aluminium**			
	Aluminium	0.002	(± 0.001) mg/l	0.002
NW103	**Dissolved Boron**			
	Boron (B)	0.04	mg/l	0.03
NW110	**Dissolved Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Dissolved Manganese**			
	Manganese (Mn)	0.0267	(± 0.0053) mg/l	0.0005
NW114	**Dissolved Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Dissolved Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			

		RESULTS (UNCERTAINTY)		LOQ
NW010	**Nitrate-N**			
	Nitrate-N	0.89	(± 0.22) mg/l	0.01
①**NW195**	**pH**			
	pH	7.2	(± 0.2)	0.1

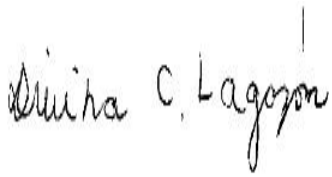
LIST OF METHODS

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	**Dissolved Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Dissolved Boron:** APHA Online Edition 3125 B mod.
NW110	**Dissolved Lead:** APHA Online Edition 3125 B mod.	NW113	**Dissolved Manganese:** APHA Online Edition 3125 B mod.
NW114	**Dissolved Mercury:** APHA Online Edition 3125 B mod.	NW116	**Dissolved 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



Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Arvinder Singh Supervisor Laboratory Supervisor

Gabriela Carvalhaes Manager Food and Water Testing Chemistry

EXPLANATORY NOTE

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⑤Test is subcontracted outside Eurofins group and is not accredited
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⑧Tested 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-036065-01	REPORT DATE	20/07/2023

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), McMillan

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill
Order code: EUNZWE-00131298

SAMPLE CODE 812-2023-00091340

Client Reference: 296990-0
Product: Ground water
Sampling Point code: WIL-D6
Sampling Point name: Levin D6
Reception Date & Time: 06/07/2023 18:11
Analysis Start Date & Time: 06/07/2023 18:13
Analysis Ending Date: 20/07/2023
Sampled Date & Time 05/07/2023 13:10
Sampler(s) Client nominated external sampler
Sampled by Eurofins No

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	<0.01	(± 0.003) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<1	mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	<15	(± 5) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	21.4	(± 1.07) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	41.4	(± 0.8) mS/m	0.1
NW098	**Dissolved Aluminium**			
	Aluminium	0.008	(± 0.001) mg/l	0.002
NW103	**Dissolved Boron**			
	Boron (B)	0.07	mg/l	0.03
NW110	**Dissolved Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Dissolved Manganese**			
	Manganese (Mn)	0.0039	(± 0.0008) mg/l	0.0005
NW114	**Dissolved Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Dissolved Nickel**			
	Nickel (Ni)	0.0023	(± 0.0007) mg/l	0.0005
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			

		RESULTS (UNCERTAINTY)		LOQ
NW010	**Nitrate-N**			
	Nitrate-N	12.4	(± 0.62) mg/l	0.01
NW195	**pH**			
	pH	6.9	(± 0.2)	0.1

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	**Dissolved Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Dissolved Boron:** APHA Online Edition 3125 B mod.
NW110	**Dissolved Lead:** APHA Online Edition 3125 B mod.	NW113	**Dissolved Manganese:** APHA Online Edition 3125 B mod.
NW114	**Dissolved Mercury:** APHA Online Edition 3125 B mod.	NW116	**Dissolved 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

Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Arvinder Singh Supervisor Laboratory Supervisor

Gabriela Carvalhaes Manager Food and Water Testing Chemistry

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END OF REPORT

Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-037031-01** REPORT DATE **25/07/2023**

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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), McMillan

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill
Order code: EUNZWE-00131043

SAMPLE CODE **812-2023-00090489**

Client Reference: 296974-0
Product: Ground water
Sampling Point code: WIL-E1d
Sampling Point name: Levin E1d
Reception Date & Time: 05/07/2023 17:24
Analysis Start Date & Time: 05/07/2023 17:33
Analysis Ending Date: 25/07/2023
Sampled Date & Time 05/07/2023 06:50
Sampler(s) Client nominated external sampler
Sampled by Eurofins No

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.19	(± 0.06) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<1	mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	28	(± 6) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	38.0	(± 1.90) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	44.5	(± 0.9) mS/m	0.1
NW098	**Dissolved Aluminium**			
	Aluminium	<0.002	(± 0.001) mg/l	0.002
NW103	**Dissolved Boron**			
	Boron (B)	0.07	mg/l	0.03
NW109	**Dissolved Iron**			
	Iron (Fe)	0.03	(± 0.007) mg/l	0.01
NW110	**Dissolved Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Dissolved Manganese**			
	Manganese (Mn)	0.304	(± 0.0304) mg/l	0.0005
NW114	**Dissolved Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Dissolved Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005
NW120	**Dissolved Sodium**			

		RESULTS (UNCERTAINTY)		LOQ
NW120	**Dissolved Sodium**			
	Sodium (Na)	35.2	mg/l	0.01
ZMF1E	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<1	cfu/100 ml	1
NW010	**Nitrate-N**			
	Nitrate-N	<0.01	(± 0.003) mg/l	0.01
①**NW195**	**pH**			
	pH	6.9	(± 0.2)	0.1

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	**Dissolved Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Dissolved Boron:** APHA Online Edition 3125 B mod.
NW109	**Dissolved Iron:** APHA Online Edition 3125 B mod.	NW110	**Dissolved Lead:** APHA Online Edition 3125 B mod.
NW113	**Dissolved Manganese:** APHA Online Edition 3125 B mod.	NW114	**Dissolved Mercury:** APHA Online Edition 3125 B mod.
NW116	**Dissolved Nickel:** APHA Online Edition 3125 B mod.	NW120	**Dissolved 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	ZMF1E	**Escherichia coli E (Water) [NZ] <1 >80 /100 ml (0) Ml Agar-F:** SMEWW 9222K; APHA Online

Signature

Marylou Cabral Laboratory Manager

Jennifer Mont Supervisor

Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Arvinder Singh Supervisor Laboratory Supervisor

Gabriela Carvalhaes Manager Food and Water Testing Chemistry

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END OF REPORT

Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-035760-01** REPORT DATE **19/07/2023**

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), McMillan

Contact for your orders: Gabriela Carvalhaes **Order code:** EUNZWE-00131540
Contract: Landfill

SAMPLE CODE **812-2023-00091903**

Client Reference: 296985-0
Product: Ground water
Sampling Point code: WIL-E1s **Sampling Point name:** Levin E1s
Reception Date & Time: 07/07/2023 18:19
Analysis Start Date & Time: 07/07/2023 18:21 **Analysis Ending Date:** 19/07/2023
Sampled Date & Time 06/07/2023 10:35 **Sampler(s)** Client nominated external sampler
Sampled by Eurofins No

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.17	(± 0.05) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	22	(± 6) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	27.2	(± 1.36) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	25.5	(± 0.5) mS/m	0.1
NW098	**Dissolved Aluminium**			
	Aluminium	0.008	(± 0.001) mg/l	0.002
NW103	**Dissolved Boron**			
	Boron (B)	0.05	mg/l	0.03
NW109	**Dissolved Iron**			
	Iron (Fe)	4.55	(± 0.91) mg/l	0.01
NW110	**Dissolved Lead**			
	Lead (Pb)	0.0006	(± 0.0002) mg/l	0.0005
NW113	**Dissolved Manganese**			
	Manganese (Mn)	0.225	(± 0.0225) mg/l	0.0005
NW114	**Dissolved Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Dissolved Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005
NW120	**Dissolved Sodium**			

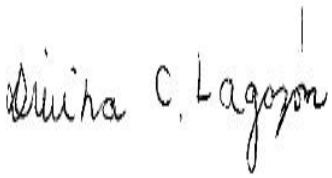
		RESULTS (UNCERTAINTY)		LOQ
NW120	**Dissolved Sodium**			
	Sodium (Na)	25.7	mg/l	0.01
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	<0.01	(± 0.003) mg/l	0.01
①**NW195**	**pH**			
	pH	7.2	(± 0.2)	0.1

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	**Dissolved Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Dissolved Boron:** APHA Online Edition 3125 B mod.
NW109	**Dissolved Iron:** APHA Online Edition 3125 B mod.	NW110	**Dissolved Lead:** APHA Online Edition 3125 B mod.
NW113	**Dissolved Manganese:** APHA Online Edition 3125 B mod.	NW114	**Dissolved Mercury:** APHA Online Edition 3125 B mod.
NW116	**Dissolved Nickel:** APHA Online Edition 3125 B mod.	NW120	**Dissolved 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



Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Sunita Raju Business Unit Manager

Gabriela Carvalhaes Manager Food and Water Testing Chemistry

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END OF REPORT

Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-036064-01** REPORT DATE **20/07/2023**

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), McMillan

Contact for your orders: Gabriela Carvalhaes **Order code:** EUNZWE-00131298
Contract: Landfill

SAMPLE CODE **812-2023-00091339**

Client Reference: 296975-0
Product: Ground water
Sampling Point code: WIL-E2d **Sampling Point name:** Levin E2d
Reception Date & Time: 06/07/2023 18:10
Analysis Start Date & Time: 06/07/2023 18:13 **Analysis Ending Date:** 20/07/2023
Sampled Date & Time 05/07/2023 13:10 **Sampler(s)** Client nominated external sampler
Sampled by Eurofins No

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.26	(± 0.08) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<1	mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	16	(± 6) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	41.4	(± 2.07) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	44.4	(± 0.9) mS/m	0.1
NW098	**Dissolved Aluminium**			
	Aluminium	<0.002	(± 0.001) mg/l	0.002
NW103	**Dissolved Boron**			
	Boron (B)	0.06	mg/l	0.03
NW110	**Dissolved Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Dissolved Manganese**			
	Manganese (Mn)	0.505	(± 0.0505) mg/l	0.0005
NW114	**Dissolved Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Dissolved Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005
ZMF1E	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	1	cfu/100 ml	1
NW010	**Nitrate-N**			

		RESULTS	(UNCERTAINTY)	LOQ
NW010	**Nitrate-N**			
	Nitrate-N	<0.01	(± 0.003) mg/l	0.01
NW195	**pH**			
	pH	7.6	(± 0.2)	0.1

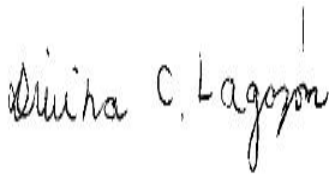
LIST OF METHODS

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	**Dissolved Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Dissolved Boron:** APHA Online Edition 3125 B mod.
NW110	**Dissolved Lead:** APHA Online Edition 3125 B mod.	NW113	**Dissolved Manganese:** APHA Online Edition 3125 B mod.
NW114	**Dissolved Mercury:** APHA Online Edition 3125 B mod.	NW116	**Dissolved 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	ZMF1E	**Escherichia coli E (Water) [NZ] <1 >80 /100 ml (0) Ml Agar-F:** SMEWW 9222K; APHA Online

Signature

Marylou Cabral Laboratory Manager

Jennifer Mont Supervisor



Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Sunita Raju Business Unit Manager

Gabriela Carvalhaes Manager Food and Water Testing Chemistry

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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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END OF REPORT

Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-035759-01** REPORT DATE **19/07/2023**

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), McMillan

Contact for your orders: Gabriela Carvalhaes **Order code:** EUNZWE-00131540
Contract: Landfill

SAMPLE CODE **812-2023-00091902**

Client Reference: 296986-0
Product: Ground water
Sampling Point code: WIL-E2s **Sampling Point name:** Levin E2s
Reception Date & Time: 07/07/2023 18:18
Analysis Start Date & Time: 07/07/2023 18:21 **Analysis Ending Date:** 19/07/2023
Sampled Date & Time 06/07/2023 11:10 **Sampler(s)** Client nominated external sampler
Sampled by Eurofins No

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.29	(± 0.09) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	<15	(± 5) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	40.3	(± 2.02) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	33.9	(± 0.7) mS/m	0.1
NW098	**Dissolved Aluminium**			
	Aluminium	0.004	(± 0.001) mg/l	0.002
NW103	**Dissolved Boron**			
	Boron (B)	0.05	mg/l	0.03
NW109	**Dissolved Iron**			
	Iron (Fe)	0.08	(± 0.02) mg/l	0.01
NW110	**Dissolved Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Dissolved Manganese**			
	Manganese (Mn)	0.269	(± 0.0269) mg/l	0.0005
NW114	**Dissolved Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Dissolved Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005
NW120	**Dissolved Sodium**			

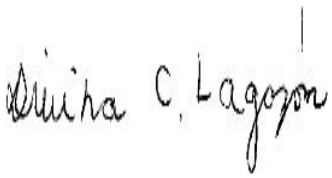
		RESULTS (UNCERTAINTY)		LOQ
NW120	**Dissolved Sodium**			
	Sodium (Na)	27.2	mg/l	0.01
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	<0.01	(± 0.003) mg/l	0.01
①**NW195**	**pH**			
	pH	7.7	(± 0.2)	0.1

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	**Dissolved Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Dissolved Boron:** APHA Online Edition 3125 B mod.
NW109	**Dissolved Iron:** APHA Online Edition 3125 B mod.	NW110	**Dissolved Lead:** APHA Online Edition 3125 B mod.
NW113	**Dissolved Manganese:** APHA Online Edition 3125 B mod.	NW114	**Dissolved Mercury:** APHA Online Edition 3125 B mod.
NW116	**Dissolved Nickel:** APHA Online Edition 3125 B mod.	NW120	**Dissolved 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



Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Sunita Raju Business Unit Manager

Gabriela Carvalhaes Manager Food and Water Testing Chemistry

EXPLANATORY NOTE

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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

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.
Accreditation does not apply to comments or graphical representations.
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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE	AR-23-NW-037028-01	REPORT DATE	25/07/2023

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), McMillan

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill
Order code: EUNZWE-00131043

SAMPLE CODE 812-2023-00090486

Client Reference: 296994-0
Product: Ground water
Sampling Point code: WIL-F1
Sampling Point name: Levin F1
Reception Date & Time: 05/07/2023 17:22
Analysis Start Date & Time: 05/07/2023 17:33
Analysis Ending Date: 25/07/2023
Sampled Date & Time 04/07/2023 11:50
Sampler(s) Client nominated external sampler
Sampled by Eurofins No

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	<0.01	(± 0.004) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<1	mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	34	(± 7) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	38.5	(± 1.93) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	42.5	(± 0.9) mS/m	0.1
NW098	**Dissolved Aluminium**			
	Aluminium	0.002	(± 0.001) mg/l	0.002
NW103	**Dissolved Boron**			
	Boron (B)	0.04	mg/l	0.03
NW110	**Dissolved Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Dissolved Manganese**			
	Manganese (Mn)	0.0064	(± 0.0013) mg/l	0.0005
NW114	**Dissolved Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Dissolved Nickel**			
	Nickel (Ni)	0.0006	(± 0.0002) mg/l	0.0005
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			

		RESULTS (UNCERTAINTY)		LOQ
NW010	**Nitrate-N**			
	Nitrate-N	0.65	(± 0.16) mg/l	0.01
①**NW195**	**pH**			
	pH	7.2	(± 0.2)	0.1

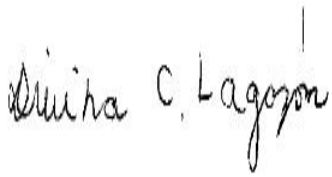
LIST OF METHODS

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	**Dissolved Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Dissolved Boron:** APHA Online Edition 3125 B mod.
NW110	**Dissolved Lead:** APHA Online Edition 3125 B mod.	NW113	**Dissolved Manganese:** APHA Online Edition 3125 B mod.
NW114	**Dissolved Mercury:** APHA Online Edition 3125 B mod.	NW116	**Dissolved 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



Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Arvinder Singh Supervisor Laboratory Supervisor

Gabriela Carvalhaes Manager Food and Water Testing Chemistry

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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-037033-01** REPORT DATE **25/07/2023**

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), McMillan

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill
Order code: EUNZWE-00131043

SAMPLE CODE **812-2023-00090491**

Client Reference: 296995-0
Product: Ground water
Sampling Point code: WIL-F2
Sampling Point name: Levin F2
Reception Date & Time: 05/07/2023 17:26
Analysis Start Date & Time: 05/07/2023 17:33
Analysis Ending Date: 25/07/2023
Sampled Date & Time 04/07/2023 10:40
Sampler(s) Client nominated external sampler
Sampled by Eurofins No

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	<0.01	(± 0.003) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<1	mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	22	(± 6) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	22.7	(± 1.13) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	22.4	(± 0.4) mS/m	0.1
NW098	**Dissolved Aluminium**			
	Aluminium	0.003	(± 0.001) mg/l	0.002
NW103	**Dissolved Boron**			
	Boron (B)	0.05	mg/l	0.03
NW110	**Dissolved Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Dissolved Manganese**			
	Manganese (Mn)	0.0050	(± 0.0010) mg/l	0.0005
NW114	**Dissolved Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Dissolved Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			

		RESULTS (UNCERTAINTY)		LOQ
NW010	**Nitrate-N**			
	Nitrate-N	0.50	(± 0.13) mg/l	0.01
①**NW195**	**pH**			
	pH	7.3	(± 0.2)	0.1

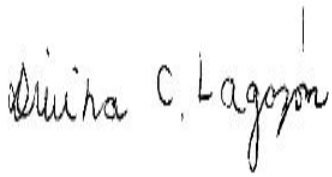
LIST OF METHODS

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	**Dissolved Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Dissolved Boron:** APHA Online Edition 3125 B mod.
NW110	**Dissolved Lead:** APHA Online Edition 3125 B mod.	NW113	**Dissolved Manganese:** APHA Online Edition 3125 B mod.
NW114	**Dissolved Mercury:** APHA Online Edition 3125 B mod.	NW116	**Dissolved 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



Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Arvinder Singh Supervisor Laboratory Supervisor

Gabriela Carvalhaes Manager Food and Water Testing Chemistry

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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-037030-01** REPORT DATE **25/07/2023**

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), McMillan

Contact for your orders: Gabriela Carvalhaes **Order code:** EUNZWE-00131043
Contract: Landfill

SAMPLE CODE **812-2023-00090488**

Client Reference: 296996-0
Product: Ground water
Sampling Point code: WIL-F3 **Sampling Point name:** Levin F3
Reception Date & Time: 05/07/2023 17:24
Analysis Start Date & Time: 05/07/2023 17:33 **Analysis Ending Date:** 25/07/2023
Sampled Date & Time 04/07/2023 10:25 **Sampler(s)** Client nominated external sampler
Sampled by Eurofins No

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	<0.01	(± 0.003) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<1	mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	19	(± 6) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	16.0	(± 0.80) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	19.0	(± 0.4) mS/m	0.1
NW098	**Dissolved Aluminium**			
	Aluminium	0.002	(± 0.001) mg/l	0.002
NW103	**Dissolved Boron**			
	Boron (B)	<0.03	mg/l	0.03
NW109	**Dissolved Iron**			
	Iron (Fe)	<0.01	(± 0.003) mg/l	0.01
NW110	**Dissolved Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Dissolved Manganese**			
	Manganese (Mn)	<0.0005	(± 0.0002) mg/l	0.0005
NW114	**Dissolved Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Dissolved Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005
NW120	**Dissolved Sodium**			

		RESULTS (UNCERTAINTY)		LOQ
NW120	**Dissolved Sodium**			
	Sodium (Na)	19.2	mg/l	0.01
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	1.05	(± 0.11) mg/l	0.01
①**NW195**	**pH**			
	pH	7.2	(± 0.2)	0.1

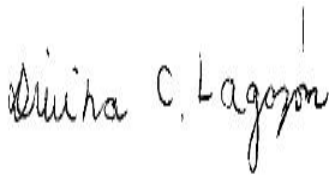
LIST OF METHODS

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	**Dissolved Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Dissolved Boron:** APHA Online Edition 3125 B mod.
NW109	**Dissolved Iron:** APHA Online Edition 3125 B mod.	NW110	**Dissolved Lead:** APHA Online Edition 3125 B mod.
NW113	**Dissolved Manganese:** APHA Online Edition 3125 B mod.	NW114	**Dissolved Mercury:** APHA Online Edition 3125 B mod.
NW116	**Dissolved Nickel:** APHA Online Edition 3125 B mod.	NW120	**Dissolved 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



Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Arvinder Singh Supervisor Laboratory Supervisor

Gabriela Carvalhaes Manager Food and Water Testing Chemistry

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END OF REPORT

Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-034104-01** REPORT DATE **12/07/2023**

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), McMillan

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill
Order code: EUNZWE-00130828

SAMPLE CODE **812-2023-00089851**

Client Reference: 296976-0
Product: Ground water
Sampling Point code: WIL-G1D
Sampling Point name: Levin G1D
Reception Date & Time: 04/07/2023 15:32
Analysis Start Date & Time: 04/07/2023 15:39
Analysis Ending Date: 12/07/2023
Sampled Date & Time 04/07/2023 19:30
Sampler(s) Client nominated external sampler
Sampled by Eurofins No

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.10	(± 0.03) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<1	mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	<15	(± 5) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	32.4	(± 1.62) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	28.0	(± 0.6) mS/m	0.1
NW098	**Dissolved Aluminium**			
	Aluminium	0.003	(± 0.001) mg/l	0.002
NW103	**Dissolved Boron**			
	Boron (B)	0.05	mg/l	0.03
NW110	**Dissolved Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Dissolved Manganese**			
	Manganese (Mn)	0.0709	(± 0.0142) mg/l	0.0005
NW114	**Dissolved Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Dissolved Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005
ZMF1E	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	5	cfu/100 ml	1
NW010	**Nitrate-N**			

		RESULTS	(UNCERTAINTY)	LOQ
NW010	**Nitrate-N**			
	Nitrate-N	<0.01	(± 0.003) mg/l	0.01
NW195	**pH**			
	pH	7.1	(± 0.2)	0.1

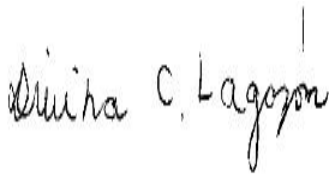
LIST OF METHODS

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	**Dissolved Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Dissolved Boron:** APHA Online Edition 3125 B mod.
NW110	**Dissolved Lead:** APHA Online Edition 3125 B mod.	NW113	**Dissolved Manganese:** APHA Online Edition 3125 B mod.
NW114	**Dissolved Mercury:** APHA Online Edition 3125 B mod.	NW116	**Dissolved 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	ZMF1E	**Escherichia coli E (Water) [NZ] <1 >80 /100 ml (0) Ml Agar-F:** SMEWW 9222K; APHA Online

Signature

Marylou Cabral Laboratory Manager

Jennifer Mont Supervisor



Divina Cunanan Lagazon Supervisor

Sunita Raju Business Unit Manager

Gabriela Carvalhaes Manager Food and Water Testing Chemistry

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END OF REPORT

Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-034105-01** REPORT DATE **12/07/2023**

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), McMillan

Contact for your orders: Gabriela Carvalhaes **Order code:** EUNZWE-00130828
Contract: Landfill

SAMPLE CODE **812-2023-00089853**

Client Reference: 296991-0
Product: Ground water
Sampling Point code: WIL-G1S **Sampling Point name:** Levin G1S
Reception Date & Time: 04/07/2023 15:32
Analysis Start Date & Time: 04/07/2023 15:39 **Analysis Ending Date:** 12/07/2023
Sampled Date & Time 04/07/2023 18:55 **Sampler(s)** Client nominated external sampler
Sampled by Eurofins No

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.05	(± 0.01) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<1	mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	18	(± 6) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	121	(± 6.03) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	54.9	(± 1.1) mS/m	0.1
NW098	**Dissolved Aluminium**			
	Aluminium	0.047	(± 0.005) mg/l	0.002
NW103	**Dissolved Boron**			
	Boron (B)	0.05	mg/l	0.03
NW109	**Dissolved Iron**			
	Iron (Fe)	1.82	(± 0.36) mg/l	0.01
NW110	**Dissolved Lead**			
	Lead (Pb)	0.0007	(± 0.0002) mg/l	0.0005
NW113	**Dissolved Manganese**			
	Manganese (Mn)	0.0589	(± 0.0118) mg/l	0.0005
NW114	**Dissolved Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Dissolved Nickel**			
	Nickel (Ni)	0.0006	(± 0.0002) mg/l	0.0005
NW120	**Dissolved Sodium**			

		RESULTS (UNCERTAINTY)		LOQ
NW120	**Dissolved Sodium**			
	Sodium (Na)	65.5	mg/l	0.01
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	0.18	(± 0.05) mg/l	0.01
NW195	**pH**			
	pH	6.8	(± 0.2)	0.1

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	**Dissolved Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Dissolved Boron:** APHA Online Edition 3125 B mod.
NW109	**Dissolved Iron:** APHA Online Edition 3125 B mod.	NW110	**Dissolved Lead:** APHA Online Edition 3125 B mod.
NW113	**Dissolved Manganese:** APHA Online Edition 3125 B mod.	NW114	**Dissolved Mercury:** APHA Online Edition 3125 B mod.
NW116	**Dissolved Nickel:** APHA Online Edition 3125 B mod.	NW120	**Dissolved 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

Divina Cunanan Lagazon Supervisor

Arvinder Singh Supervisor Laboratory Supervisor

Gabriela Carvalhaes Manager Food and Water Testing Chemistry

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END OF REPORT

Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-037032-01** REPORT DATE **25/07/2023**

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), McMillan

Contact for your orders: Gabriela Carvalhaes **Order code:** EUNZWE-00131043
Contract: Landfill

SAMPLE CODE **812-2023-00090490**

Client Reference: 296992-0
Product: Ground water
Sampling Point code: WIL-G2 **Sampling Point name:** Levin G2s
Reception Date & Time: 05/07/2023 17:25
Analysis Start Date & Time: 05/07/2023 17:33 **Analysis Ending Date:** 25/07/2023
Sampled Date & Time 04/07/2023 21:55 **Sampler(s)** Client nominated external sampler
Sampled by Eurofins No

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.02	(± 0.006) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<1	mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	46	(± 9) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	235	(± 11.7) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	118	(± 2.4) mS/m	0.1
NW098	**Dissolved Aluminium**			
	Aluminium	0.007	(± 0.001) mg/l	0.002
NW103	**Dissolved Boron**			
	Boron (B)	0.62	mg/l	0.03
NW110	**Dissolved Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Dissolved Manganese**			
	Manganese (Mn)	0.341	(± 0.0342) mg/l	0.0005
NW114	**Dissolved Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Dissolved Nickel**			
	Nickel (Ni)	0.0016	(± 0.0005) mg/l	0.0005
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			

		RESULTS (UNCERTAINTY)		LOQ
NW010	**Nitrate-N**			
	Nitrate-N	<0.01	(± 0.003) mg/l	0.01
①**NW195**	**pH**			
	pH	7.1	(± 0.2)	0.1

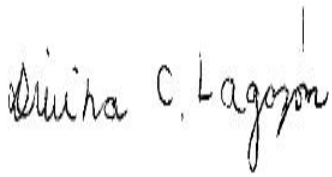
LIST OF METHODS

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	**Dissolved Aluminium:** APHA Online Edition 3125 B mod.	NW103	**Dissolved Boron:** APHA Online Edition 3125 B mod.
NW110	**Dissolved Lead:** APHA Online Edition 3125 B mod.	NW113	**Dissolved Manganese:** APHA Online Edition 3125 B mod.
NW114	**Dissolved Mercury:** APHA Online Edition 3125 B mod.	NW116	**Dissolved 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



Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

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Gabriela Carvalhaes Manager Food and Water Testing Chemistry

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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

END OF REPORT

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ANALYTICAL REPORT

REPORT CODE **AR-23-NW-025191-01** REPORT DATE **24/05/2023**

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), McMillan

Contact for your orders: Gabriela Carvalhaes **Order code:** EUNZWE-00121232
Contract: Landfill

SAMPLE CODE **812-2023-00061814**

Client Reference: 287692-0
Product: Ground water
Sampling Point code: WIL-HS1 **Sampling Point name:** Levin HS1
Reception Date & Time: 04/05/2023 18:23
Analysis Start Date & Time: 04/05/2023 18:30 **Analysis Ending Date:** 24/05/2023
Sampled Date & Time 03/05/2023 12:05 **Sampler(s)** Client nominated external sampler
Sampled by Eurofins No

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.11	(± 0.03) mg/l	0.01
NW583	**Arsenic - Soluble**			
	Arsenic (As)	0.001	(± 0.0004) mg/l	0.001
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	mg/l	1
NW457	**Calcium - Dissolved**			
	Calcium (Ca)	12.9	(± 1.29) mg/l	0.01
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	19	(± 6) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	21.0	(± 1.05) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	22.6	(± 0.5) mS/m	0.1
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	0.109	(± 0.022) mg/l	0.005
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW460	**Iron - Dissolved**			
	Iron (Fe)	0.156	(± 0.031) mg/l	0.005
NW462	**Magnesium - Dissolved**			
	Magnesium (Mg)	7.81	(± 0.78) mg/l	0.01
NW010	**Nitrate-N**			
	Nitrate-N	1.46	(± 0.15) mg/l	0.01
NW195	**pH**			

		RESULTS	(UNCERTAINTY)	LOQ
NW195	**pH**			
	pH	7.4	(± 0.2)	0.1
③VQ088	**Phenolics (Total)**			
	Total phenols	<0.05	mg/l	0.05
NW469	**Sodium - Dissolved**			
	Sodium (Na)	19.5	(± 1.95) mg/l	0.02
NW098	**Soluble Aluminium**			
	Aluminium	0.015	(± 0.002) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.08	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)	0.0234	(± 0.0047) 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)	3.08	mg/l	0.01
NW125	**Soluble Zinc**			
	Zinc (Zn)	0.008	(± 0.001) mg/l	0.002
NW011	**Sulphate**			
	Sulphate	15.2	(± 0.76) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	<6	mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	56	(± 6) mg CaCO3/l	1
NW029	**Total Hardness**			
	Hardness	64	(± 6) mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	5.4	(± 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

	RESULTS (UNCERTAINTY)		LOQ
③VQ876 **Volatile Fatty Acids (VFA) by GC-MS**			
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.
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

Gabriela Carvalhaes Manager Food and Water Testing Chemistry

EXPLANATORY NOTE

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

Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-036051-01** REPORT DATE **20/07/2023**

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), McMillan

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill
Order code: EUNZWE-00127741

SAMPLE CODE **812-2023-00080604**

Client Reference: 292386-0
Product: Ground water
Sampling Point code: WIL-HS1
Sampling Point name: Levin HS1
Reception Date & Time: 15/06/2023 8:49
Analysis Start Date & Time: 15/06/2023 09:04
Analysis Ending Date: 20/07/2023
Sampled Date & Time 13/06/2023 13:01
Sampler(s) Client nominated external sampler
Sampled by Eurofins No

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.07	(± 0.02) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	1	mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	28	(± 6) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	23.1	(± 1.16) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	23.6	(± 0.5) mS/m	0.1
NW098	**Dissolved Aluminium**			
	Aluminium	0.010	(± 0.001) mg/l	0.002
NW583	**Dissolved Arsenic**			
	Arsenic (As)	<0.001	(± 0.0004) mg/l	0.001
NW103	**Dissolved Boron**			
	Boron (B)	0.03	mg/l	0.03
NW104	**Dissolved Cadmium**			
	Cadmium (Cd)	<0.0002	(± 0.0001) mg/l	0.0002
NW457	**Dissolved Calcium**			
	Calcium (Ca)	12.9	(± 1.29) mg/l	0.01
NW106	**Dissolved Chromium**			
	Chromium (Cr)	<0.001	(± 0.0004) mg/l	0.001
NW108	**Dissolved Copper**			
	Copper (Cu)	0.0051	(± 0.0010) mg/l	0.0005
NW460	**Dissolved Iron**			

		RESULTS	(UNCERTAINTY)	LOQ
NW460	**Dissolved Iron**			
	Iron (Fe)	0.131	(± 0.026) mg/l	0.005
NW110	**Dissolved Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW462	**Dissolved Magnesium**			
	Magnesium (Mg)	7.28	(± 0.73) mg/l	0.01
NW113	**Dissolved Manganese**			
	Manganese (Mn)	0.0412	(± 0.0083) mg/l	0.0005
NW114	**Dissolved Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Dissolved Nickel**			
	Nickel (Ni)	0.0010	(± 0.0004) mg/l	0.0005
NW117	**Dissolved Potassium**			
	Potassium (K)	3.28	mg/l	0.01
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	0.041	(± 0.008) mg/l	0.005
NW469	**Dissolved Sodium**			
	Sodium (Na)	20.4	(± 2.04) mg/l	0.02
NW125	**Dissolved Zinc**			
	Zinc (Zn)	0.021	(± 0.002) mg/l	0.002
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	1.01	(± 0.10) mg/l	0.01
①NW195	**pH**			
	pH	7.7	(± 0.2)	0.1
③VQ088	**Phenolics (Total)**			
	Total phenols	<0.05	mg/l	0.05
NW011	**Sulphate**			
	Sulphate	15.8	(± 0.79) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	<5	mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	64	(± 6) mg CaCO3/l	1
NW029	**Total Hardness**			
	Hardness	62	(± 6) mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	7.2	(± 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

	RESULTS (UNCERTAINTY)		LOQ
③VQ876 **Volatile Fatty Acids (VFA) by GC-MS**			
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	**Dissolved Aluminium:** APHA Online Edition 3125 B mod.
NW103	**Dissolved Boron:** APHA Online Edition 3125 B mod.	NW104	**Dissolved Cadmium:** APHA Online Edition 3125 B mod.
NW106	**Dissolved Chromium:** APHA Online Edition 3125 B mod.	NW108	**Dissolved Copper:** APHA Online Edition 3125 B mod.
NW110	**Dissolved Lead:** APHA Online Edition 3125 B mod.	NW113	**Dissolved Manganese:** APHA Online Edition 3125 B mod.
NW114	**Dissolved Mercury:** APHA Online Edition 3125 B mod.	NW116	**Dissolved Nickel:** APHA Online Edition 3125 B mod.
NW117	**Dissolved Potassium:** APHA Online Edition 3125 B mod.	NW125	**Dissolved 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	**Dissolved Calcium:** APHA Online Edition 3120 B mod.	NW460	**Dissolved Iron:** APHA Online Edition 3120 B mod.
NW462	**Dissolved Magnesium:** APHA Online Edition 3120 B mod.	NW469	**Dissolved Sodium:** APHA Online Edition 3120 B mod.
NW583	**Dissolved Arsenic:** APHA Online Edition 3125 B mod.	VQ088	**Phenolics (Total):**
VQ876	**Volatile Fatty Acids (VFA) by GC-MS:**	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

Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Maria Norris Laboratory Manager, Microbiology

Gabriela Carvalhaes Manager Food and Water Testing Chemistry

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END OF REPORT

Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-037025-01** REPORT DATE **25/07/2023**

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), McMillan

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill
Order code: EUNZWE-00131043

SAMPLE CODE **812-2023-00090471**

Client Reference: 305525-0
Product: Ground water
Sampling Point code: WIL-HS1
Sampling Point name: Levin HS1
Reception Date & Time: 05/07/2023 16:47
Analysis Start Date & Time: 05/07/2023 16:57
Analysis Ending Date: 25/07/2023
Sampled Date & Time 04/07/2023 12:11
Sampler(s) Client nominated external sampler
Sampled by Eurofins No

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.06	(± 0.02) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<1	mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	22	(± 6) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	22.3	(± 1.12) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	23.9	(± 0.5) mS/m	0.1
NW098	**Dissolved Aluminium**			
	Aluminium	0.009	(± 0.001) mg/l	0.002
NW583	**Dissolved Arsenic**			
	Arsenic (As)	<0.001	(± 0.0004) mg/l	0.001
NW103	**Dissolved Boron**			
	Boron (B)	0.07	mg/l	0.03
NW104	**Dissolved Cadmium**			
	Cadmium (Cd)	<0.0002	(± 0.0001) mg/l	0.0002
NW105	**Dissolved Calcium**			
	Calcium (Ca)	20.6	mg/l	0.1
NW106	**Dissolved Chromium**			
	Chromium (Cr)	<0.001	(± 0.0003) mg/l	0.001
NW108	**Dissolved Copper**			
	Copper (Cu)	0.0009	(± 0.0002) mg/l	0.0005
NW109	**Dissolved Iron**			

		RESULTS	(UNCERTAINTY)	LOQ
NW109	**Dissolved Iron**			
	Iron (Fe)	0.05	(± 0.01) mg/l	0.01
NW110	**Dissolved Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW112	**Dissolved Magnesium**			
	Magnesium (Mg)	8.14	mg/l	0.01
NW113	**Dissolved Manganese**			
	Manganese (Mn)	0.0136	(± 0.0027) mg/l	0.0005
NW114	**Dissolved Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Dissolved Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005
NW117	**Dissolved Potassium**			
	Potassium (K)	3.93	mg/l	0.01
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	0.030	(± 0.006) mg/l	0.005
NW120	**Dissolved Sodium**			
	Sodium (Na)	22.5	mg/l	0.01
NW125	**Dissolved Zinc**			
	Zinc (Zn)	0.002	(± 0.0007) mg/l	0.002
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	200	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	1.60	(± 0.16) mg/l	0.01
①NW195	**pH**			
	pH	7.5	(± 0.2)	0.1
③VQ088	**Phenolics (Total)**			
	Total phenols	<0.05	mg/l	0.05
NW011	**Sulphate**			
	Sulphate	17.7	(± 0.89) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	15	mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	58	(± 6) mg CaCO3/l	1
NW030	**Total Hardness**			
	Hardness	85	(± 26) mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	5.1	(± 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

	RESULTS (UNCERTAINTY)		LOQ
③VQ876 **Volatile Fatty Acids (VFA) by GC-MS**			
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
NW030	**Total Hardness:** APHA Online Edition 2340 B	NW098	**Dissolved Aluminium:** APHA Online Edition 3125 B mod.
NW103	**Dissolved Boron:** APHA Online Edition 3125 B mod.	NW104	**Dissolved Cadmium:** APHA Online Edition 3125 B mod.
NW105	**Dissolved Calcium:** APHA Online Edition 3125 B mod.	NW106	**Dissolved Chromium:** APHA Online Edition 3125 B mod.
NW108	**Dissolved Copper:** APHA Online Edition 3125 B mod.	NW109	**Dissolved Iron:** APHA Online Edition 3125 B mod.
NW110	**Dissolved Lead:** APHA Online Edition 3125 B mod.	NW112	**Dissolved Magnesium:** APHA Online Edition 3125 B mod.
NW113	**Dissolved Manganese:** APHA Online Edition 3125 B mod.	NW114	**Dissolved Mercury:** APHA Online Edition 3125 B mod.
NW116	**Dissolved Nickel:** APHA Online Edition 3125 B mod.	NW117	**Dissolved Potassium:** APHA Online Edition 3125 B mod.
NW120	**Dissolved Sodium:** APHA Online Edition 3125 B mod.	NW125	**Dissolved 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
NW583	**Dissolved Arsenic:** APHA Online Edition 3125 B mod.	VQ088	**Phenolics (Total):**
VQ876	**Volatile Fatty Acids (VFA) by GC-MS:**	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

Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Arvinder Singh Supervisor Laboratory Supervisor

Gabriela Carvalhaes Manager Food and Water Testing Chemistry

EXPLANATORY NOTE

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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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ANALYTICAL REPORT

REPORT CODE **AR-23-NW-025189-01** REPORT DATE **24/05/2023**

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), McMillan

Contact for your orders: Gabriela Carvalhaes **Order code:** EUNZWE-00121232
Contract: Landfill

SAMPLE CODE **812-2023-00061804**

Client Reference: 287693-0
Product: Ground water
Sampling Point code: WIL-HS1A **Sampling Point name:** Levin HS1A
Reception Date & Time: 04/05/2023 18:21
Analysis Start Date & Time: 04/05/2023 18:30 **Analysis Ending Date:** 24/05/2023
Sampled Date & Time 03/05/2023 12:05 **Sampler(s)** Client nominated external sampler
Sampled by Eurofins No

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.08	(± 0.02) mg/l	0.01
NW583	**Arsenic - Soluble**			
	Arsenic (As)	0.001	(± 0.0004) mg/l	0.001
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	mg/l	1
NW457	**Calcium - Dissolved**			
	Calcium (Ca)	13.0	(± 1.30) mg/l	0.01
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	19	(± 6) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	21.7	(± 1.09) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	22.9	(± 0.5) mS/m	0.1
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	0.102	(± 0.020) mg/l	0.005
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	800	cfu/100 ml	100
NW460	**Iron - Dissolved**			
	Iron (Fe)	0.130	(± 0.026) mg/l	0.005
NW462	**Magnesium - Dissolved**			
	Magnesium (Mg)	7.72	(± 0.77) mg/l	0.01
NW010	**Nitrate-N**			
	Nitrate-N	1.46	(± 0.15) mg/l	0.01
NW195	**pH**			

		RESULTS	(UNCERTAINTY)	LOQ
NW195	**pH**			
	pH	7.3	(± 0.2)	0.1
③VQ088	**Phenolics (Total)**			
	Total phenols	<0.05	mg/l	0.05
NW469	**Sodium - Dissolved**			
	Sodium (Na)	19.5	(± 1.95) mg/l	0.02
NW098	**Soluble Aluminium**			
	Aluminium	0.015	(± 0.002) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.08	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)	0.0171	(± 0.0034) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	0.0006	(± 0.0002) mg/l	0.0005
NW117	**Soluble Potassium**			
	Potassium (K)	3.22	mg/l	0.01
NW125	**Soluble Zinc**			
	Zinc (Zn)	0.006	(± 0.0009) mg/l	0.002
NW011	**Sulphate**			
	Sulphate	15.3	(± 0.76) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	<6	mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	55	(± 6) mg CaCO3/l	1
NW029	**Total Hardness**			
	Hardness	64	(± 6) mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	5.4	(± 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

	RESULTS (UNCERTAINTY)		LOQ
③VQ876 **Volatile Fatty Acids (VFA) by GC-MS**			
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.
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

Leo Cleave Senior Analyst Senior Analyst

Gabriela Carvalhaes Manager Food and Water Testing Chemistry

EXPLANATORY NOTE

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

Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-036464-01** REPORT DATE **22/07/2023**

Attention Downer NZ Ltd (EDI Levin)
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Copy to: Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), McMillan

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill
Order code: EUNZWE-00127741

SAMPLE CODE **812-2023-00080614**

Client Reference: 292387-0
Product: Ground water
Sampling Point code: WIL-HS1A
Sampling Point name: Levin HS1A
Reception Date & Time: 15/06/2023 9:01
Analysis Start Date & Time: 15/06/2023 09:04
Analysis Ending Date: 22/07/2023
Sampled Date & Time 13/06/2023 13:03
Sampler(s) Client nominated external sampler
Sampled by Eurofins No

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.06	(± 0.02) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<1	mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	22	(± 6) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	22.8	(± 1.14) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	23.4	(± 0.5) mS/m	0.1
NW098	**Dissolved Aluminium**			
	Aluminium	0.011	(± 0.001) mg/l	0.002
NW583	**Dissolved Arsenic**			
	Arsenic (As)	<0.001	(± 0.0004) mg/l	0.001
NW103	**Dissolved Boron**			
	Boron (B)	0.03	mg/l	0.03
NW104	**Dissolved Cadmium**			
	Cadmium (Cd)	<0.0002	(± 0.0001) mg/l	0.0002
NW457	**Dissolved Calcium**			
	Calcium (Ca)	13.4	(± 1.34) mg/l	0.01
NW106	**Dissolved Chromium**			
	Chromium (Cr)	<0.001	(± 0.0003) mg/l	0.001
NW108	**Dissolved Copper**			
	Copper (Cu)	0.0007	(± 0.0002) mg/l	0.0005
NW460	**Dissolved Iron**			

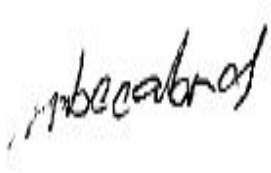
		RESULTS	(UNCERTAINTY)	LOQ
NW460	**Dissolved Iron**			
	Iron (Fe)	0.134	(± 0.027) mg/l	0.005
NW110	**Dissolved Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW462	**Dissolved Magnesium**			
	Magnesium (Mg)	7.30	(± 0.73) mg/l	0.01
NW113	**Dissolved Manganese**			
	Manganese (Mn)	0.0299	(± 0.0060) mg/l	0.0005
NW114	**Dissolved Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Dissolved Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005
NW117	**Dissolved Potassium**			
	Potassium (K)	3.20	mg/l	0.01
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	0.045	(± 0.009) mg/l	0.005
NW469	**Dissolved Sodium**			
	Sodium (Na)	20.3	(± 2.03) mg/l	0.02
NW125	**Dissolved Zinc**			
	Zinc (Zn)	0.006	(± 0.0009) mg/l	0.002
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	1.05	(± 0.10) mg/l	0.01
①NW195	**pH**			
	pH	7.6	(± 0.2)	0.1
③VQ088	**Phenolics (Total)**			
	Total phenols	<0.05	mg/l	0.05
NW011	**Sulphate**			
	Sulphate	15.7	(± 0.78) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	<5	mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	61	(± 6) mg CaCO3/l	1
NW029	**Total Hardness**			
	Hardness	64	(± 6) mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	6.5	(± 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

	RESULTS (UNCERTAINTY)		LOQ
③VQ876 **Volatile Fatty Acids (VFA) by GC-MS**			
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

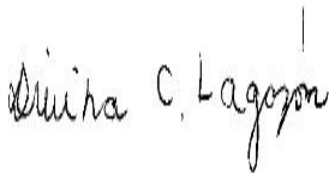
NW003	**Total Alkalinity:** APHA Online Edition 2320 B
NW007	**Chloride:** APHA Online Edition 4110 B
NW010	**Nitrate-N:** APHA Online Edition 4110 B
NW011	**Sulphate:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D
NW023	**Conductivity:** APHA Online Edition 2510 B
NW029	**Total Hardness:** APHA Online Edition 2340 B
NW098	**Dissolved Aluminium:** APHA Online Edition 3125 B mod.
NW103	**Dissolved Boron:** APHA Online Edition 3125 B mod.
NW104	**Dissolved Cadmium:** APHA Online Edition 3125 B mod.
NW106	**Dissolved Chromium:** APHA Online Edition 3125 B mod.
NW108	**Dissolved Copper:** APHA Online Edition 3125 B mod.
NW110	**Dissolved Lead:** APHA Online Edition 3125 B mod.
NW113	**Dissolved Manganese:** APHA Online Edition 3125 B mod.
NW114	**Dissolved Mercury:** APHA Online Edition 3125 B mod.
NW116	**Dissolved Nickel:** APHA Online Edition 3125 B mod.
NW117	**Dissolved Potassium:** APHA Online Edition 3125 B mod.
NW125	**Dissolved 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	**Dissolved Calcium:** APHA Online Edition 3120 B mod.
NW460	**Dissolved Iron:** APHA Online Edition 3120 B mod.
NW462	**Dissolved Magnesium:** APHA Online Edition 3120 B mod.
NW469	**Dissolved Sodium:** APHA Online Edition 3120 B mod.
NW583	**Dissolved Arsenic:** APHA Online Edition 3125 B mod.
VQ088	**Phenolics (Total):**
VQ876	**Volatile Fatty Acids (VFA) by GC-MS:**
ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature



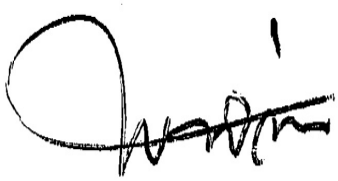
Marylou Cabral Laboratory Manager

Jennifer Mont Supervisor



Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst



Maria Norris Laboratory Manager, Microbiology

Gabriela Carvalhaes Manager Food and Water Testing Chemistry

EXPLANATORY NOTE

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⑤Test is subcontracted outside Eurofins group and is not accredited
⑥Test result is provided by the customer and is not accredited
⑦Tested at the sampling point by Eurofins and is not accredited
⑧Tested 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.
Accreditation does not apply to comments or graphical representations.
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All samples become the property of Eurofins to the extent necessary for the performance of the Services.
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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.
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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END OF REPORT

Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-037023-01** REPORT DATE **25/07/2023**

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

Phone (06) 367 2705
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Copy to: Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), McMillan

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill
Order code: EUNZWE-00131043

SAMPLE CODE **812-2023-00090464**

Client Reference: 305527-0
Product: Ground water
Sampling Point code: WIL-HS1A
Sampling Point name: Levin HS1A
Reception Date & Time: 05/07/2023 16:40
Analysis Start Date & Time: 05/07/2023 16:57
Analysis Ending Date: 25/07/2023
Sampled Date & Time 04/07/2023 12:13
Sampler(s) Client nominated external sampler
Sampled by Eurofins No

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.05	(± 0.02) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<1	mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	30	(± 7) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	22.3	(± 1.11) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	23.8	(± 0.5) mS/m	0.1
NW098	**Dissolved Aluminium**			
	Aluminium	0.014	(± 0.002) mg/l	0.002
NW583	**Dissolved Arsenic**			
	Arsenic (As)	<0.001	(± 0.0004) mg/l	0.001
NW103	**Dissolved Boron**			
	Boron (B)	0.08	mg/l	0.03
NW104	**Dissolved Cadmium**			
	Cadmium (Cd)	<0.0002	(± 0.0001) mg/l	0.0002
NW105	**Dissolved Calcium**			
	Calcium (Ca)	24.0	mg/l	0.1
NW106	**Dissolved Chromium**			
	Chromium (Cr)	<0.001	(± 0.0003) mg/l	0.001
NW108	**Dissolved Copper**			
	Copper (Cu)	0.0008	(± 0.0002) mg/l	0.0005
NW109	**Dissolved Iron**			

		RESULTS	(UNCERTAINTY)	LOQ
NW109	**Dissolved Iron**			
	Iron (Fe)	0.07	(± 0.02) mg/l	0.01
NW110	**Dissolved Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW112	**Dissolved Magnesium**			
	Magnesium (Mg)	9.20	mg/l	0.01
NW113	**Dissolved Manganese**			
	Manganese (Mn)	0.0129	(± 0.0026) mg/l	0.0005
NW114	**Dissolved Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Dissolved Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005
NW117	**Dissolved Potassium**			
	Potassium (K)	4.30	mg/l	0.01
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	0.031	(± 0.006) mg/l	0.005
NW120	**Dissolved Sodium**			
	Sodium (Na)	25.3	mg/l	0.01
NW125	**Dissolved Zinc**			
	Zinc (Zn)	<0.002	(± 0.0007) mg/l	0.002
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	1.61	(± 0.16) mg/l	0.01
①NW195	**pH**			
	pH	7.5	(± 0.2)	0.1
③VQ088	**Phenolics (Total)**			
	Total phenols	<0.05	mg/l	0.05
NW011	**Sulphate**			
	Sulphate	17.8	(± 0.89) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	15	mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	60	(± 6) mg CaCO3/l	1
NW030	**Total Hardness**			
	Hardness	98	(± 29) mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	4.7	(± 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

	RESULTS (UNCERTAINTY)		LOQ
③VQ876 **Volatile Fatty Acids (VFA) by GC-MS**			
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
NW030	**Total Hardness:** APHA Online Edition 2340 B	NW098	**Dissolved Aluminium:** APHA Online Edition 3125 B mod.
NW103	**Dissolved Boron:** APHA Online Edition 3125 B mod.	NW104	**Dissolved Cadmium:** APHA Online Edition 3125 B mod.
NW105	**Dissolved Calcium:** APHA Online Edition 3125 B mod.	NW106	**Dissolved Chromium:** APHA Online Edition 3125 B mod.
NW108	**Dissolved Copper:** APHA Online Edition 3125 B mod.	NW109	**Dissolved Iron:** APHA Online Edition 3125 B mod.
NW110	**Dissolved Lead:** APHA Online Edition 3125 B mod.	NW112	**Dissolved Magnesium:** APHA Online Edition 3125 B mod.
NW113	**Dissolved Manganese:** APHA Online Edition 3125 B mod.	NW114	**Dissolved Mercury:** APHA Online Edition 3125 B mod.
NW116	**Dissolved Nickel:** APHA Online Edition 3125 B mod.	NW117	**Dissolved Potassium:** APHA Online Edition 3125 B mod.
NW120	**Dissolved Sodium:** APHA Online Edition 3125 B mod.	NW125	**Dissolved 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
NW583	**Dissolved Arsenic:** APHA Online Edition 3125 B mod.	VQ088	**Phenolics (Total):**
VQ876	**Volatile Fatty Acids (VFA) by GC-MS:**	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

Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Arvinder Singh Supervisor Laboratory Supervisor

Gabriela Carvalhaes Manager Food and Water Testing Chemistry

EXPLANATORY NOTE

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

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ANALYTICAL REPORT

REPORT CODE **AR-23-NW-025192-01** REPORT DATE **24/05/2023**

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), McMillan

Contact for your orders: Gabriela Carvalhaes **Order code:** EUNZWE-00121232
Contract: Landfill

SAMPLE CODE **812-2023-00061815**

Client Reference: 287694-0
Product: Ground water
Sampling Point code: WIL-HS2 **Sampling Point name:** Levin HS2
Reception Date & Time: 04/05/2023 18:24
Analysis Start Date & Time: 04/05/2023 18:30 **Analysis Ending Date:** 24/05/2023
Sampled Date & Time 03/05/2023 12:06 **Sampler(s)** Client nominated external sampler
Sampled by Eurofins No

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.14	(± 0.04) mg/l	0.01
NW583	**Arsenic - Soluble**			
	Arsenic (As)	0.001	(± 0.0004) mg/l	0.001
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	mg/l	1
NW457	**Calcium - Dissolved**			
	Calcium (Ca)	13.0	(± 1.30) mg/l	0.01
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	27	(± 6) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	21.9	(± 1.09) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	23.4	(± 0.5) mS/m	0.1
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	0.068	(± 0.014) mg/l	0.005
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	600	cfu/100 ml	100
NW460	**Iron - Dissolved**			
	Iron (Fe)	0.148	(± 0.030) mg/l	0.005
NW462	**Magnesium - Dissolved**			
	Magnesium (Mg)	7.78	(± 0.78) mg/l	0.01
NW010	**Nitrate-N**			
	Nitrate-N	1.52	(± 0.15) mg/l	0.01
NW195	**pH**			

		RESULTS	(UNCERTAINTY)	LOQ
NW195	**pH**			
	pH	7.2	(± 0.2)	0.1
③VQ088	**Phenolics (Total)**			
	Total phenols	<0.05	mg/l	0.05
NW469	**Sodium - Dissolved**			
	Sodium (Na)	19.7	(± 1.97) mg/l	0.02
NW098	**Soluble Aluminium**			
	Aluminium	0.021	(± 0.002) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.08	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)	0.0019	(± 0.0004) mg/l	0.0005
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.0182	(± 0.0036) 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)	3.23	mg/l	0.01
NW125	**Soluble Zinc**			
	Zinc (Zn)	0.033	(± 0.003) mg/l	0.002
NW011	**Sulphate**			
	Sulphate	15.3	(± 0.76) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	9	mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	57	(± 6) mg CaCO3/l	1
NW029	**Total Hardness**			
	Hardness	65	(± 6) mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	5.7	(± 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

	RESULTS (UNCERTAINTY)		LOQ
③VQ876 **Volatile Fatty Acids (VFA) by GC-MS**			
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

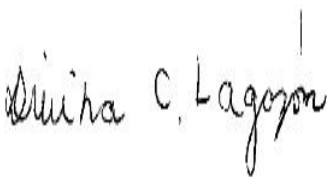
NW003	**Total Alkalinity:** APHA Online Edition 2320 B	NW007	**Chloride:** APHA Online Edition 4110 B
NW010	**Nitrate-N:** APHA Online Edition 4110 B	NW011	**Sulphate:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 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.
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

Leo Cleave Senior Analyst Senior Analyst

Gabriela Carvalhaes Manager Food and Water Testing Chemistry

EXPLANATORY NOTE

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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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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE	AR-23-NW-036463-01	REPORT DATE	22/07/2023

Attention Downer NZ Ltd (EDI Levin)
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NEW ZEALAND

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

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill
Order code: EUNZWE-00127741

SAMPLE CODE 812-2023-00080613

Client Reference: 292388-0
Product: Ground water
Sampling Point code: WIL-HS2
Sampling Point name: Levin HS2
Reception Date & Time: 15/06/2023 8:59
Analysis Start Date & Time: 15/06/2023 09:04
Analysis Ending Date: 22/07/2023
Sampled Date & Time 13/06/2023 13:01
Sampler(s) Client nominated external sampler
Sampled by Eurofins No

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.08	(± 0.03) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<1	mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	20	(± 6) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	23.9	(± 1.20) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	24.1	(± 0.5) mS/m	0.1
NW098	**Dissolved Aluminium**			
	Aluminium	0.012	(± 0.001) mg/l	0.002
NW583	**Dissolved Arsenic**			
	Arsenic (As)	<0.001	(± 0.0004) mg/l	0.001
NW103	**Dissolved Boron**			
	Boron (B)	0.04	mg/l	0.03
NW104	**Dissolved Cadmium**			
	Cadmium (Cd)	<0.0002	(± 0.0001) mg/l	0.0002
NW457	**Dissolved Calcium**			
	Calcium (Ca)	13.7	(± 1.37) mg/l	0.01
NW106	**Dissolved Chromium**			
	Chromium (Cr)	<0.001	(± 0.0003) mg/l	0.001
NW108	**Dissolved Copper**			
	Copper (Cu)	0.0009	(± 0.0002) mg/l	0.0005
NW460	**Dissolved Iron**			

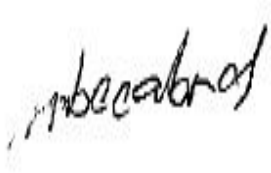
		RESULTS	(UNCERTAINTY)	LOQ
NW460	**Dissolved Iron**			
	Iron (Fe)	0.170	(± 0.034) mg/l	0.005
NW110	**Dissolved Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW462	**Dissolved Magnesium**			
	Magnesium (Mg)	7.41	(± 0.74) mg/l	0.01
NW113	**Dissolved Manganese**			
	Manganese (Mn)	0.0308	(± 0.0062) mg/l	0.0005
NW114	**Dissolved Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Dissolved Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005
NW117	**Dissolved Potassium**			
	Potassium (K)	3.35	mg/l	0.01
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	0.046	(± 0.009) mg/l	0.005
NW469	**Dissolved Sodium**			
	Sodium (Na)	20.6	(± 2.06) mg/l	0.02
NW125	**Dissolved Zinc**			
	Zinc (Zn)	<0.002	(± 0.0007) mg/l	0.002
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	1.03	(± 0.10) mg/l	0.01
①NW195	**pH**			
	pH	7.7	(± 0.2)	0.1
③VQ088	**Phenolics (Total)**			
	Total phenols	<0.05	mg/l	0.05
NW011	**Sulphate**			
	Sulphate	15.9	(± 0.80) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	6	mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	63	(± 6) mg CaCO3/l	1
NW029	**Total Hardness**			
	Hardness	65	(± 6) mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	6.5	(± 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

	RESULTS (UNCERTAINTY)		LOQ
③VQ876 **Volatile Fatty Acids (VFA) by GC-MS**			
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

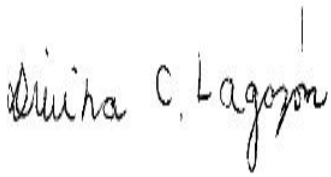
NW003	**Total Alkalinity:** APHA Online Edition 2320 B	NW007	**Chloride:** APHA Online Edition 4110 B
NW010	**Nitrate-N:** APHA Online Edition 4110 B	NW011	**Sulphate:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW029	**Total Hardness:** APHA Online Edition 2340 B	NW098	**Dissolved Aluminium:** APHA Online Edition 3125 B mod.
NW103	**Dissolved Boron:** APHA Online Edition 3125 B mod.	NW104	**Dissolved Cadmium:** APHA Online Edition 3125 B mod.
NW106	**Dissolved Chromium:** APHA Online Edition 3125 B mod.	NW108	**Dissolved Copper:** APHA Online Edition 3125 B mod.
NW110	**Dissolved Lead:** APHA Online Edition 3125 B mod.	NW113	**Dissolved Manganese:** APHA Online Edition 3125 B mod.
NW114	**Dissolved Mercury:** APHA Online Edition 3125 B mod.	NW116	**Dissolved Nickel:** APHA Online Edition 3125 B mod.
NW117	**Dissolved Potassium:** APHA Online Edition 3125 B mod.	NW125	**Dissolved 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	**Dissolved Calcium:** APHA Online Edition 3120 B mod.	NW460	**Dissolved Iron:** APHA Online Edition 3120 B mod.
NW462	**Dissolved Magnesium:** APHA Online Edition 3120 B mod.	NW469	**Dissolved Sodium:** APHA Online Edition 3120 B mod.
NW583	**Dissolved Arsenic:** APHA Online Edition 3125 B mod.	VQ088	**Phenolics (Total):**
VQ876	**Volatile Fatty Acids (VFA) by GC-MS:**	ZM2GA	**Escherichia coli E (Water) [NZ] <100 >6 000 000 /100 ml (0-3) m-FC Agar-F:** SMEWW 9222I; APHA Online

Signature



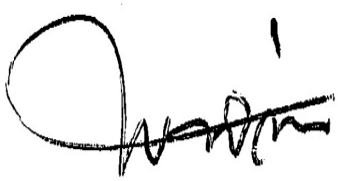
Marylou Cabral Laboratory Manager

Jennifer Mont Supervisor



Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst



Maria Norris Laboratory Manager, Microbiology

Gabriela Carvalhaes Manager Food and Water Testing Chemistry

EXPLANATORY NOTE

①Test is not accredited
②Test is subcontracted within Eurofins group and is accredited
③Test is subcontracted within Eurofins group and is not accredited
④Test is subcontracted outside Eurofins group and is accredited
⑤Test is subcontracted outside Eurofins group and is not accredited
⑥Test result is provided by the customer and is not accredited
⑦Tested at the sampling point by Eurofins and is not accredited
⑧Tested 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-037026-01** REPORT DATE **25/07/2023**

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), McMillan

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill
Order code: EUNZWE-00131043

SAMPLE CODE **812-2023-00090472**

Client Reference: 305529-0
Product: Ground water
Sampling Point code: WIL-HS2
Sampling Point name: Levin HS2
Reception Date & Time: 05/07/2023 16:52
Analysis Start Date & Time: 05/07/2023 16:57
Analysis Ending Date: 25/07/2023
Sampled Date & Time 04/07/2023 12:11
Sampler(s) Client nominated external sampler
Sampled by Eurofins No

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.10	(± 0.03) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<1	mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	31	(± 7) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	23.3	(± 1.16) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	24.5	(± 0.5) mS/m	0.1
NW098	**Dissolved Aluminium**			
	Aluminium	0.008	(± 0.001) mg/l	0.002
NW583	**Dissolved Arsenic**			
	Arsenic (As)	<0.001	(± 0.0004) mg/l	0.001
NW103	**Dissolved Boron**			
	Boron (B)	0.07	mg/l	0.03
NW104	**Dissolved Cadmium**			
	Cadmium (Cd)	<0.0002	(± 0.0001) mg/l	0.0002
NW105	**Dissolved Calcium**			
	Calcium (Ca)	21.3	mg/l	0.1
NW106	**Dissolved Chromium**			
	Chromium (Cr)	<0.001	(± 0.0003) mg/l	0.001
NW108	**Dissolved Copper**			
	Copper (Cu)	0.0008	(± 0.0002) mg/l	0.0005
NW109	**Dissolved Iron**			

		RESULTS	(UNCERTAINTY)	LOQ
NW109	**Dissolved Iron**			
	Iron (Fe)	0.06	(± 0.01) mg/l	0.01
NW110	**Dissolved Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW112	**Dissolved Magnesium**			
	Magnesium (Mg)	8.19	mg/l	0.01
NW113	**Dissolved Manganese**			
	Manganese (Mn)	0.0257	(± 0.0051) mg/l	0.0005
NW114	**Dissolved Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Dissolved Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005
NW117	**Dissolved Potassium**			
	Potassium (K)	3.92	mg/l	0.01
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	0.032	(± 0.007) mg/l	0.005
NW120	**Dissolved Sodium**			
	Sodium (Na)	22.5	mg/l	0.01
NW125	**Dissolved Zinc**			
	Zinc (Zn)	0.003	(± 0.0007) mg/l	0.002
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	1.58	(± 0.16) mg/l	0.01
①NW195	**pH**			
	pH	7.4	(± 0.2)	0.1
③VQ088	**Phenolics (Total)**			
	Total phenols	<0.05	mg/l	0.05
NW011	**Sulphate**			
	Sulphate	17.7	(± 0.89) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	14	mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	60	(± 6) mg CaCO3/l	1
NW030	**Total Hardness**			
	Hardness	87	(± 26) mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	4.9	(± 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

	RESULTS (UNCERTAINTY)		LOQ
③VQ876 **Volatile Fatty Acids (VFA) by GC-MS**			
Iso caproic acid	7.9	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	5.3	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
NW030	**Total Hardness:** APHA Online Edition 2340 B	NW098	**Dissolved Aluminium:** APHA Online Edition 3125 B mod.
NW103	**Dissolved Boron:** APHA Online Edition 3125 B mod.	NW104	**Dissolved Cadmium:** APHA Online Edition 3125 B mod.
NW105	**Dissolved Calcium:** APHA Online Edition 3125 B mod.	NW106	**Dissolved Chromium:** APHA Online Edition 3125 B mod.
NW108	**Dissolved Copper:** APHA Online Edition 3125 B mod.	NW109	**Dissolved Iron:** APHA Online Edition 3125 B mod.
NW110	**Dissolved Lead:** APHA Online Edition 3125 B mod.	NW112	**Dissolved Magnesium:** APHA Online Edition 3125 B mod.
NW113	**Dissolved Manganese:** APHA Online Edition 3125 B mod.	NW114	**Dissolved Mercury:** APHA Online Edition 3125 B mod.
NW116	**Dissolved Nickel:** APHA Online Edition 3125 B mod.	NW117	**Dissolved Potassium:** APHA Online Edition 3125 B mod.
NW120	**Dissolved Sodium:** APHA Online Edition 3125 B mod.	NW125	**Dissolved 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
NW583	**Dissolved Arsenic:** APHA Online Edition 3125 B mod.	VQ088	**Phenolics (Total):**
VQ876	**Volatile Fatty Acids (VFA) by GC-MS:**	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

Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Arvinder Singh Supervisor Laboratory Supervisor

Gabriela Carvalhaes Manager Food and Water Testing Chemistry

EXPLANATORY NOTE

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85 Port Road
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⑦Tested at the sampling point by Eurofins and is not accredited
⑧Tested 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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END OF REPORT

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ANALYTICAL REPORT

REPORT CODE **AR-23-NW-025188-01** REPORT DATE **24/05/2023**

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), McMillan

Contact for your orders: Gabriela Carvalhaes **Order code:** EUNZWE-00121232
Contract: Landfill

SAMPLE CODE **812-2023-00061803**

Client Reference: 287695-0
Product: Ground water
Sampling Point code: WIL-HS3 **Sampling Point name:** Levin HS3
Reception Date & Time: 04/05/2023 18:20
Analysis Start Date & Time: 04/05/2023 18:30 **Analysis Ending Date:** 24/05/2023
Sampled Date & Time 03/05/2023 12:07 **Sampler(s)** Client nominated external sampler
Sampled by Eurofins No

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.13	(± 0.04) mg/l	0.01
NW583	**Arsenic - Soluble**			
	Arsenic (As)	0.001	(± 0.0004) mg/l	0.001
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	mg/l	1
NW457	**Calcium - Dissolved**			
	Calcium (Ca)	13.2	(± 1.32) mg/l	0.01
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	21	(± 6) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	22.1	(± 1.10) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	23.3	(± 0.5) mS/m	0.1
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	0.093	(± 0.019) mg/l	0.005
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW460	**Iron - Dissolved**			
	Iron (Fe)	0.177	(± 0.035) mg/l	0.005
NW462	**Magnesium - Dissolved**			
	Magnesium (Mg)	7.99	(± 0.80) mg/l	0.01
NW010	**Nitrate-N**			
	Nitrate-N	1.55	(± 0.15) mg/l	0.01
NW195	**pH**			

		RESULTS	(UNCERTAINTY)	LOQ
NW195	**pH**			
	pH	7.5	(± 0.2)	0.1
③VQ088	**Phenolics (Total)**			
	Total phenols	<0.05	mg/l	0.05
NW469	**Sodium - Dissolved**			
	Sodium (Na)	20.1	(± 2.01) mg/l	0.02
NW098	**Soluble Aluminium**			
	Aluminium	0.014	(± 0.002) 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)	0.0014	(± 0.0003) mg/l	0.0005
NW110	**Soluble Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW113	**Soluble Manganese**			
	Manganese (Mn)	0.0260	(± 0.0052) 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)	3.20	mg/l	0.01
NW125	**Soluble Zinc**			
	Zinc (Zn)	0.005	(± 0.0009) mg/l	0.002
NW011	**Sulphate**			
	Sulphate	15.4	(± 0.77) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	<6	mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	59	(± 6) mg CaCO3/l	1
NW029	**Total Hardness**			
	Hardness	66	(± 7) mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	5.4	(± 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

	RESULTS (UNCERTAINTY)		LOQ
③VQ876 **Volatile Fatty Acids (VFA) by GC-MS**			
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.
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

Leo Cleave Senior Analyst Senior Analyst

Gabriela Carvalhaes Manager Food and Water Testing Chemistry

EXPLANATORY NOTE

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⑧Tested 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.
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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.
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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END OF REPORT

Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-036050-01** REPORT DATE **20/07/2023**

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), McMillan

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill

Order code: EUNZWE-00127741

SAMPLE CODE **812-2023-00080611**

Client Reference: 292389-0
Product: Ground water
Sampling Point code: WIL-HS3
Sampling Point name: Levin HS3
Reception Date & Time: 15/06/2023 8:55
Analysis Start Date & Time: 15/06/2023 09:04
Analysis Ending Date: 20/07/2023
Sampled Date & Time 13/06/2023 12:54
Sampler(s) Client nominated external sampler
Sampled by Eurofins No

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.13	(± 0.04) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<1	mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	22	(± 6) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	24.3	(± 1.22) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	24.4	(± 0.5) mS/m	0.1
NW098	**Dissolved Aluminium**			
	Aluminium	0.011	(± 0.001) mg/l	0.002
NW583	**Dissolved Arsenic**			
	Arsenic (As)	<0.001	(± 0.0004) mg/l	0.001
NW103	**Dissolved Boron**			
	Boron (B)	0.04	mg/l	0.03
NW104	**Dissolved Cadmium**			
	Cadmium (Cd)	<0.0002	(± 0.0001) mg/l	0.0002
NW457	**Dissolved Calcium**			
	Calcium (Ca)	14.1	(± 1.41) mg/l	0.01
NW106	**Dissolved Chromium**			
	Chromium (Cr)	<0.001	(± 0.0004) mg/l	0.001
NW108	**Dissolved Copper**			
	Copper (Cu)	0.0007	(± 0.0002) mg/l	0.0005
NW460	**Dissolved Iron**			

		RESULTS	(UNCERTAINTY)	LOQ
NW460	**Dissolved Iron**			
	Iron (Fe)	0.177	(± 0.035) mg/l	0.005
NW110	**Dissolved Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW462	**Dissolved Magnesium**			
	Magnesium (Mg)	7.63	(± 0.76) mg/l	0.01
NW113	**Dissolved Manganese**			
	Manganese (Mn)	0.0390	(± 0.0078) mg/l	0.0005
NW114	**Dissolved Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Dissolved Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005
NW117	**Dissolved Potassium**			
	Potassium (K)	3.54	mg/l	0.01
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	0.047	(± 0.010) mg/l	0.005
NW469	**Dissolved Sodium**			
	Sodium (Na)	21.2	(± 2.12) mg/l	0.02
NW125	**Dissolved Zinc**			
	Zinc (Zn)	<0.002	(± 0.0007) mg/l	0.002
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	1.04	(± 0.10) mg/l	0.01
①NW195	**pH**			
	pH	7.6	(± 0.2)	0.1
③VQ088	**Phenolics (Total)**			
	Total phenols	<0.05	mg/l	0.05
NW011	**Sulphate**			
	Sulphate	15.7	(± 0.79) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	9	mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	64	(± 6) mg CaCO3/l	1
NW029	**Total Hardness**			
	Hardness	67	(± 7) mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	6.5	(± 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

	RESULTS (UNCERTAINTY)		LOQ
③VQ876 **Volatile Fatty Acids (VFA) by GC-MS**			
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	**Dissolved Aluminium:** APHA Online Edition 3125 B mod.
NW103	**Dissolved Boron:** APHA Online Edition 3125 B mod.	NW104	**Dissolved Cadmium:** APHA Online Edition 3125 B mod.
NW106	**Dissolved Chromium:** APHA Online Edition 3125 B mod.	NW108	**Dissolved Copper:** APHA Online Edition 3125 B mod.
NW110	**Dissolved Lead:** APHA Online Edition 3125 B mod.	NW113	**Dissolved Manganese:** APHA Online Edition 3125 B mod.
NW114	**Dissolved Mercury:** APHA Online Edition 3125 B mod.	NW116	**Dissolved Nickel:** APHA Online Edition 3125 B mod.
NW117	**Dissolved Potassium:** APHA Online Edition 3125 B mod.	NW125	**Dissolved 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	**Dissolved Calcium:** APHA Online Edition 3120 B mod.	NW460	**Dissolved Iron:** APHA Online Edition 3120 B mod.
NW462	**Dissolved Magnesium:** APHA Online Edition 3120 B mod.	NW469	**Dissolved Sodium:** APHA Online Edition 3120 B mod.
NW583	**Dissolved Arsenic:** APHA Online Edition 3125 B mod.	VQ088	**Phenolics (Total):**
VQ876	**Volatile Fatty Acids (VFA) by GC-MS:**	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

Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Maria Norris Laboratory Manager, Microbiology

Gabriela Carvalhaes Manager Food and Water Testing Chemistry

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END OF REPORT

Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-037024-01** REPORT DATE **25/07/2023**

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), McMillan

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill
Order code: EUNZWE-00131043

SAMPLE CODE **812-2023-00090465**

Client Reference: 305531-0
Product: Ground water
Sampling Point code: WIL-HS3
Sampling Point name: Levin HS3
Reception Date & Time: 05/07/2023 16:44
Analysis Start Date & Time: 05/07/2023 16:57
Analysis Ending Date: 25/07/2023
Sampled Date & Time 04/07/2023 12:10
Sampler(s) Client nominated external sampler
Sampled by Eurofins No

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.14	(± 0.04) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<1	mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	34	(± 7) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	23.8	(± 1.19) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	25.0	(± 0.5) mS/m	0.1
NW098	**Dissolved Aluminium**			
	Aluminium	0.016	(± 0.002) mg/l	0.002
NW583	**Dissolved Arsenic**			
	Arsenic (As)	<0.001	(± 0.0004) mg/l	0.001
NW103	**Dissolved Boron**			
	Boron (B)	0.08	mg/l	0.03
NW104	**Dissolved Cadmium**			
	Cadmium (Cd)	<0.0002	(± 0.0001) mg/l	0.0002
NW105	**Dissolved Calcium**			
	Calcium (Ca)	23.3	mg/l	0.1
NW106	**Dissolved Chromium**			
	Chromium (Cr)	<0.001	(± 0.0003) mg/l	0.001
NW108	**Dissolved Copper**			
	Copper (Cu)	0.0007	(± 0.0002) mg/l	0.0005
NW109	**Dissolved Iron**			

		RESULTS	(UNCERTAINTY)	LOQ
NW109	**Dissolved Iron**			
	Iron (Fe)	0.10	(± 0.02) mg/l	0.01
NW110	**Dissolved Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW112	**Dissolved Magnesium**			
	Magnesium (Mg)	8.93	mg/l	0.01
NW113	**Dissolved Manganese**			
	Manganese (Mn)	0.0214	(± 0.0043) mg/l	0.0005
NW114	**Dissolved Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Dissolved Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005
NW117	**Dissolved Potassium**			
	Potassium (K)	4.51	mg/l	0.01
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	0.035	(± 0.007) mg/l	0.005
NW120	**Dissolved Sodium**			
	Sodium (Na)	25.2	mg/l	0.01
NW125	**Dissolved Zinc**			
	Zinc (Zn)	<0.002	(± 0.0007) mg/l	0.002
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	1.62	(± 0.16) mg/l	0.01
①NW195	**pH**			
	pH	7.5	(± 0.2)	0.1
③VQ088	**Phenolics (Total)**			
	Total phenols	<0.05	mg/l	0.05
NW011	**Sulphate**			
	Sulphate	17.6	(± 0.88) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	49	mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	62	(± 6) mg CaCO3/l	1
NW030	**Total Hardness**			
	Hardness	95	(± 28) mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	5.0	(± 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

	RESULTS (UNCERTAINTY)		LOQ
③VQ876 **Volatile Fatty Acids (VFA) by GC-MS**			
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

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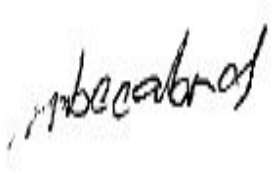
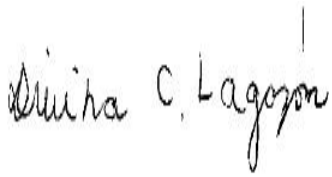
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 2510 B
NW030	**Total Hardness:** APHA Online Edition 2340 B	NW098	**Dissolved Aluminium:** APHA Online Edition 3125 B mod.
NW103	**Dissolved Boron:** APHA Online Edition 3125 B mod.	NW104	**Dissolved Cadmium:** APHA Online Edition 3125 B mod.
NW105	**Dissolved Calcium:** APHA Online Edition 3125 B mod.	NW106	**Dissolved Chromium:** APHA Online Edition 3125 B mod.
NW108	**Dissolved Copper:** APHA Online Edition 3125 B mod.	NW109	**Dissolved Iron:** APHA Online Edition 3125 B mod.
NW110	**Dissolved Lead:** APHA Online Edition 3125 B mod.	NW112	**Dissolved Magnesium:** APHA Online Edition 3125 B mod.
NW113	**Dissolved Manganese:** APHA Online Edition 3125 B mod.	NW114	**Dissolved Mercury:** APHA Online Edition 3125 B mod.
NW116	**Dissolved Nickel:** APHA Online Edition 3125 B mod.	NW117	**Dissolved Potassium:** APHA Online Edition 3125 B mod.
NW120	**Dissolved Sodium:** APHA Online Edition 3125 B mod.	NW125	**Dissolved 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
NW583	**Dissolved Arsenic:** APHA Online Edition 3125 B mod.	VQ088	**Phenolics (Total):**
VQ876	**Volatile Fatty Acids (VFA) by GC-MS:**	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



Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Arvinder Singh Supervisor Laboratory Supervisor

Gabriela Carvalhaes Manager Food and Water Testing Chemistry

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END OF REPORT

Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-037034-01** REPORT DATE **25/07/2023**

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

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

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill
Order code: EUNZWE-00131043

SAMPLE CODE **812-2023-00090494**

Client Reference: 305533-0
Product: Ground water
Sampling Point code: WIL-LP
Sampling Point name: Levin Leachate Pond
Reception Date & Time: 05/07/2023 17:32
Analysis Start Date & Time: 05/07/2023 17:33
Analysis Ending Date: 25/07/2023
Sampled Date & Time 05/07/2023 06:47
Sampler(s) Client nominated external sampler
Sampled by Eurofins No

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	1810	(± 180) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	107	mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	5990	(± 300) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	1230	(± 60.0) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	1710	(± 30.0) mS/m	0.1
NW098	**Dissolved Aluminium**			
	Aluminium	0.553	(± 0.055) mg/l	0.002
NW583	**Dissolved Arsenic**			
	Arsenic (As)	0.310	(± 0.031) mg/l	0.001
NW103	**Dissolved Boron**			
	Boron (B)	5.17	mg/l	0.03
NW104	**Dissolved Cadmium**			
	Cadmium (Cd)	<0.0020	(± 0.0006) mg/l	0.0002
NW105	**Dissolved Calcium**			
	Calcium (Ca)	95.4	mg/l	0.1
NW106	**Dissolved Chromium**			
	Chromium (Cr)	0.678	(± 0.068) mg/l	0.001
NW108	**Dissolved Copper**			
	Copper (Cu)	0.0066	(± 0.0013) mg/l	0.0005
NW109	**Dissolved Iron**			

		RESULTS	(UNCERTAINTY)	LOQ
NW109	**Dissolved Iron**			
	Iron (Fe)	6.63	(± 1.33) mg/l	0.01
NW110	**Dissolved Lead**			
	Lead (Pb)	<0.0050	(± 0.0005) mg/l	0.0005
NW112	**Dissolved Magnesium**			
	Magnesium (Mg)	47.5	mg/l	0.01
NW113	**Dissolved Manganese**			
	Manganese (Mn)	1.02	(± 0.102) mg/l	0.0005
NW114	**Dissolved Mercury**			
	Mercury (Hg)	<0.0050	mg/l	0.0005
NW116	**Dissolved Nickel**			
	Nickel (Ni)	0.125	(± 0.0125) mg/l	0.0005
NW117	**Dissolved Potassium**			
	Potassium (K)	599	mg/l	0.01
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	15.9	(± 1.59) mg/l	0.005
NW120	**Dissolved Sodium**			
	Sodium (Na)	843	mg/l	0.01
NW125	**Dissolved Zinc**			
	Zinc (Zn)	0.054	(± 0.005) mg/l	0.002
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
①NW195	**pH**			
	pH	7.8	(± 0.2)	0.1
③VQ088	**Phenolics (Total)**			
	Total phenols	0.070	mg/l	0.05
NW011	**Sulphate**			
	Sulphate	20.5	(± 1.03) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	38	mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	7570	(± 760) mg CaCO3/l	1
NW030	**Total Hardness**			
	Hardness	434	(± 130) mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	841	(± 84.1) 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

	RESULTS (UNCERTAINTY)		LOQ
③VQ876 **Volatile Fatty Acids (VFA) by GC-MS**			
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
NW030	**Total Hardness:** APHA Online Edition 2340 B	NW098	**Dissolved Aluminium:** APHA Online Edition 3125 B mod.
NW103	**Dissolved Boron:** APHA Online Edition 3125 B mod.	NW104	**Dissolved Cadmium:** APHA Online Edition 3125 B mod.
NW105	**Dissolved Calcium:** APHA Online Edition 3125 B mod.	NW106	**Dissolved Chromium:** APHA Online Edition 3125 B mod.
NW108	**Dissolved Copper:** APHA Online Edition 3125 B mod.	NW109	**Dissolved Iron:** APHA Online Edition 3125 B mod.
NW110	**Dissolved Lead:** APHA Online Edition 3125 B mod.	NW112	**Dissolved Magnesium:** APHA Online Edition 3125 B mod.
NW113	**Dissolved Manganese:** APHA Online Edition 3125 B mod.	NW114	**Dissolved Mercury:** APHA Online Edition 3125 B mod.
NW116	**Dissolved Nickel:** APHA Online Edition 3125 B mod.	NW117	**Dissolved Potassium:** APHA Online Edition 3125 B mod.
NW120	**Dissolved Sodium:** APHA Online Edition 3125 B mod.	NW125	**Dissolved 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
NW583	**Dissolved Arsenic:** APHA Online Edition 3125 B mod.	VQ088	**Phenolics (Total):**
VQ876	**Volatile Fatty Acids (VFA) by GC-MS:**	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

Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Arvinder Singh Supervisor Laboratory Supervisor

Gabriela Carvalhaes Manager Food and Water Testing Chemistry

EXPLANATORY NOTE

Eurofins ELS Limited
85 Port Road
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www.eurofins.co.nz

①Test is not accredited
②Test is subcontracted within Eurofins group and is accredited
③Test is subcontracted within Eurofins group and is not accredited
④Test is subcontracted outside Eurofins group and is 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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END OF REPORT

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ANALYTICAL REPORT

REPORT CODE **AR-23-NW-025190-01** REPORT DATE **24/05/2023**

Attention Downer NZ Ltd (EDI Levin)
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4741 Levin
NEW ZEALAND

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

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

Contact for your orders: Gabriela Carvalhaes **Order code:** EUNZWE-00121232
Contract: Landfill

SAMPLE CODE **812-2023-00061813**

Client Reference: 287691-0
Product: Ground water
Sampling Point code: WIL-TD1 **Sampling Point name:** Levin TD1
Reception Date & Time: 04/05/2023 18:22
Analysis Start Date & Time: 04/05/2023 18:30 **Analysis Ending Date:** 24/05/2023
Sampled Date & Time 03/05/2023 12:08 **Sampler(s)** Client nominated external sampler
Sampled by Eurofins No

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	8.25	(± 1.24) mg/l	0.01
NW583	**Arsenic - Soluble**			
	Arsenic (As)	0.002	(± 0.0004) mg/l	0.001
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<3	mg/l	1
NW457	**Calcium - Dissolved**			
	Calcium (Ca)	32.0	(± 3.20) mg/l	0.01
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	98	(± 16) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	83.7	(± 4.19) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	71.5	(± 1.4) mS/m	0.1
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	0.033	(± 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)	3.24	(± 0.324) mg/l	0.005
NW462	**Magnesium - Dissolved**			
	Magnesium (Mg)	19.6	(± 1.96) mg/l	0.01
NW010	**Nitrate-N**			
	Nitrate-N	<0.01	(± 0.004) mg/l	0.01
NW195	**pH**			

		RESULTS	(UNCERTAINTY)	LOQ
NW195	**pH**			
	pH	7.6	(± 0.2)	0.1
③VQ088	**Phenolics (Total)**			
	Total phenols	<0.05	mg/l	0.05
NW469	**Sodium - Dissolved**			
	Sodium (Na)	63.8	(± 6.38) mg/l	0.02
NW098	**Soluble Aluminium**			
	Aluminium	0.024	(± 0.002) mg/l	0.002
NW103	**Soluble Boron**			
	Boron (B)	0.25	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)	0.297	(± 0.0297) mg/l	0.0005
NW114	**Soluble Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Soluble Nickel**			
	Nickel (Ni)	0.0015	(± 0.0005) mg/l	0.0005
NW117	**Soluble Potassium**			
	Potassium (K)	19.3	mg/l	0.01
NW125	**Soluble Zinc**			
	Zinc (Zn)	0.003	(± 0.0008) mg/l	0.002
NW011	**Sulphate**			
	Sulphate	1.39	(± 0.14) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	37	mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	225	(± 23) mg CaCO3/l	1
NW029	**Total Hardness**			
	Hardness	161	(± 16) mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	31.0	(± 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

	RESULTS (UNCERTAINTY)		LOQ
③VQ876 **Volatile Fatty Acids (VFA) by GC-MS**			
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

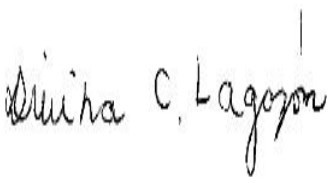
NW003	**Total Alkalinity:** APHA Online Edition 2320 B	NW007	**Chloride:** APHA Online Edition 4110 B
NW010	**Nitrate-N:** APHA Online Edition 4110 B	NW011	**Sulphate:** APHA Online Edition 4110 B
NW020	**Chemical Oxygen Demand:** APHA Online Edition 5220 D	NW023	**Conductivity:** APHA Online Edition 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.
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

Leo Cleave Senior Analyst Senior Analyst

Gabriela Carvalhaes Manager Food and Water Testing Chemistry

EXPLANATORY NOTE

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

Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-036049-01** REPORT DATE **20/07/2023**

Attention Downer NZ Ltd (EDI Levin)
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Copy to: Water and Waste Team (waterandwasteteam@horowhenua.govt.nz), McMillan

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill
Order code: EUNZWE-00127741

SAMPLE CODE **812-2023-00080610**

Client Reference: 292385-0
Product: Ground water
Sampling Point code: WIL-TD1
Sampling Point name: Levin TD1
Reception Date & Time: 15/06/2023 8:52
Analysis Start Date & Time: 15/06/2023 09:04
Analysis Ending Date: 20/07/2023
Sampled Date & Time 13/06/2023 13:02
Sampler(s) Client nominated external sampler
Sampled by Eurofins No

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	17.8	(± 1.78) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<1	mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	69	(± 12) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	84.8	(± 4.24) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	78.1	(± 1.6) mS/m	0.1
NW098	**Dissolved Aluminium**			
	Aluminium	0.020	(± 0.002) mg/l	0.002
NW583	**Dissolved Arsenic**			
	Arsenic (As)	0.002	(± 0.0004) mg/l	0.001
NW103	**Dissolved Boron**			
	Boron (B)	0.26	mg/l	0.03
NW104	**Dissolved Cadmium**			
	Cadmium (Cd)	<0.0002	(± 0.0001) mg/l	0.0002
NW457	**Dissolved Calcium**			
	Calcium (Ca)	26.4	(± 2.64) mg/l	0.01
NW106	**Dissolved Chromium**			
	Chromium (Cr)	0.004	(± 0.0005) mg/l	0.001
NW108	**Dissolved Copper**			
	Copper (Cu)	0.0020	(± 0.0004) mg/l	0.0005
NW460	**Dissolved Iron**			

		RESULTS	(UNCERTAINTY)	LOQ
NW460	**Dissolved Iron**			
	Iron (Fe)	0.811	(± 0.162) mg/l	0.005
NW110	**Dissolved Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW462	**Dissolved Magnesium**			
	Magnesium (Mg)	21.2	(± 2.12) mg/l	0.01
NW113	**Dissolved Manganese**			
	Manganese (Mn)	0.0737	(± 0.0147) mg/l	0.0005
NW114	**Dissolved Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Dissolved Nickel**			
	Nickel (Ni)	0.0022	(± 0.0007) mg/l	0.0005
NW117	**Dissolved Potassium**			
	Potassium (K)	24.8	mg/l	0.01
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	0.063	(± 0.013) mg/l	0.005
NW469	**Dissolved Sodium**			
	Sodium (Na)	71.7	(± 7.17) mg/l	0.02
NW125	**Dissolved Zinc**			
	Zinc (Zn)	0.018	(± 0.002) mg/l	0.002
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	1.62	(± 0.16) mg/l	0.01
①NW195	**pH**			
	pH	7.2	(± 0.2)	0.1
③VQ088	**Phenolics (Total)**			
	Total phenols	<0.05	mg/l	0.05
NW011	**Sulphate**			
	Sulphate	7.74	(± 0.77) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	7	mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	236	(± 24) mg CaCO3/l	1
NW029	**Total Hardness**			
	Hardness	153	(± 15) mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	24.0	(± 2.4) 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

	RESULTS (UNCERTAINTY)		LOQ
③VQ876 **Volatile Fatty Acids (VFA) by GC-MS**			
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	**Dissolved Aluminium:** APHA Online Edition 3125 B mod.
NW103	**Dissolved Boron:** APHA Online Edition 3125 B mod.	NW104	**Dissolved Cadmium:** APHA Online Edition 3125 B mod.
NW106	**Dissolved Chromium:** APHA Online Edition 3125 B mod.	NW108	**Dissolved Copper:** APHA Online Edition 3125 B mod.
NW110	**Dissolved Lead:** APHA Online Edition 3125 B mod.	NW113	**Dissolved Manganese:** APHA Online Edition 3125 B mod.
NW114	**Dissolved Mercury:** APHA Online Edition 3125 B mod.	NW116	**Dissolved Nickel:** APHA Online Edition 3125 B mod.
NW117	**Dissolved Potassium:** APHA Online Edition 3125 B mod.	NW125	**Dissolved 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	**Dissolved Calcium:** APHA Online Edition 3120 B mod.	NW460	**Dissolved Iron:** APHA Online Edition 3120 B mod.
NW462	**Dissolved Magnesium:** APHA Online Edition 3120 B mod.	NW469	**Dissolved Sodium:** APHA Online Edition 3120 B mod.
NW583	**Dissolved Arsenic:** APHA Online Edition 3125 B mod.	VQ088	**Phenolics (Total):**
VQ876	**Volatile Fatty Acids (VFA) by GC-MS:**	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

Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Maria Norris Laboratory Manager, Microbiology

Gabriela Carvalhaes Manager Food and Water Testing Chemistry

EXPLANATORY NOTE

①Test is not accredited
②Test is subcontracted within Eurofins group and is accredited
③Test is subcontracted within Eurofins group and is not accredited
④Test is subcontracted outside Eurofins group and is accredited
⑤Test is subcontracted outside Eurofins group and is not accredited
⑥Test result is provided by the customer and is not accredited
⑦Tested at the sampling point by Eurofins and is not accredited
⑧Tested 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-037027-01** REPORT DATE **25/07/2023**

Attention Downer NZ Ltd (EDI Levin)
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4741 Levin
NEW ZEALAND

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

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

Contact for your orders: Gabriela Carvalhaes
Contract: Landfill
Order code: EUNZWE-00131043

SAMPLE CODE **812-2023-00090473**

Client Reference: 305535-0
Product: Ground water
Sampling Point code: WIL-TD1
Sampling Point name: Levin TD1
Reception Date & Time: 05/07/2023 16:55
Analysis Start Date & Time: 05/07/2023 16:57
Analysis Ending Date: 25/07/2023
Sampled Date & Time 04/07/2023 12:13
Sampler(s) Client nominated external sampler
Sampled by Eurofins No

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	13.3	(± 1.33) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<1	mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	77	(± 13) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	82.5	(± 4.12) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	95.6	(± 1.9) mS/m	0.1
NW098	**Dissolved Aluminium**			
	Aluminium	0.019	(± 0.002) mg/l	0.002
NW583	**Dissolved Arsenic**			
	Arsenic (As)	<0.001	(± 0.0004) mg/l	0.001
NW103	**Dissolved Boron**			
	Boron (B)	0.44	mg/l	0.03
NW104	**Dissolved Cadmium**			
	Cadmium (Cd)	<0.0002	(± 0.0001) mg/l	0.0002
NW105	**Dissolved Calcium**			
	Calcium (Ca)	72.4	mg/l	0.1
NW106	**Dissolved Chromium**			
	Chromium (Cr)	<0.001	(± 0.0004) mg/l	0.001
NW108	**Dissolved Copper**			
	Copper (Cu)	0.0006	(± 0.0002) mg/l	0.0005
NW109	**Dissolved Iron**			

		RESULTS (UNCERTAINTY)		LOQ
NW109	**Dissolved Iron**			
	Iron (Fe)	0.30	(± 0.06) mg/l	0.01
NW110	**Dissolved Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW112	**Dissolved Magnesium**			
	Magnesium (Mg)	27.8	mg/l	0.01
NW113	**Dissolved Manganese**			
	Manganese (Mn)	0.576	(± 0.0576) mg/l	0.0005
NW114	**Dissolved Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Dissolved Nickel**			
	Nickel (Ni)	0.0020	(± 0.0006) mg/l	0.0005
NW117	**Dissolved Potassium**			
	Potassium (K)	25.1	mg/l	0.01
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	0.023	(± 0.005) mg/l	0.005
NW120	**Dissolved Sodium**			
	Sodium (Na)	67.2	mg/l	0.01
NW125	**Dissolved Zinc**			
	Zinc (Zn)	0.008	(± 0.001) mg/l	0.002
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	1.43	(± 0.14) mg/l	0.01
①NW195	**pH**			
	pH	7.7	(± 0.2)	0.1
③VQ088	**Phenolics (Total)**			
	Total phenols	<0.05	mg/l	0.05
NW011	**Sulphate**			
	Sulphate	3.08	(± 0.31) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	18	mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	335	(± 34) mg CaCO3/l	1
NW030	**Total Hardness**			
	Hardness	295	(± 89) mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	20.8	(± 2.1) 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

	RESULTS (UNCERTAINTY)		LOQ
③VQ876 **Volatile Fatty Acids (VFA) by GC-MS**			
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
NW030	**Total Hardness:** APHA Online Edition 2340 B	NW098	**Dissolved Aluminium:** APHA Online Edition 3125 B mod.
NW103	**Dissolved Boron:** APHA Online Edition 3125 B mod.	NW104	**Dissolved Cadmium:** APHA Online Edition 3125 B mod.
NW105	**Dissolved Calcium:** APHA Online Edition 3125 B mod.	NW106	**Dissolved Chromium:** APHA Online Edition 3125 B mod.
NW108	**Dissolved Copper:** APHA Online Edition 3125 B mod.	NW109	**Dissolved Iron:** APHA Online Edition 3125 B mod.
NW110	**Dissolved Lead:** APHA Online Edition 3125 B mod.	NW112	**Dissolved Magnesium:** APHA Online Edition 3125 B mod.
NW113	**Dissolved Manganese:** APHA Online Edition 3125 B mod.	NW114	**Dissolved Mercury:** APHA Online Edition 3125 B mod.
NW116	**Dissolved Nickel:** APHA Online Edition 3125 B mod.	NW117	**Dissolved Potassium:** APHA Online Edition 3125 B mod.
NW120	**Dissolved Sodium:** APHA Online Edition 3125 B mod.	NW125	**Dissolved 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
NW583	**Dissolved Arsenic:** APHA Online Edition 3125 B mod.	VQ088	**Phenolics (Total):**
VQ876	**Volatile Fatty Acids (VFA) by GC-MS:**	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

Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Arvinder Singh Supervisor Laboratory Supervisor

Gabriela Carvalhaes Manager Food and Water Testing Chemistry

EXPLANATORY NOTE

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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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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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END OF REPORT

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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-037420-01** REPORT DATE **27/07/2023**

Attention Downer NZ Ltd (EDI Levin)
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4741 Levin
NEW ZEALAND

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

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

Contact for your orders: Gabriela Carvalhaes
Contract: Potable

Order code: EUNZWE-00132140

SAMPLE CODE **812-2023-00093949**

Client Reference: 304618-0
Product: Ground water
Sampling Point code: WIL-Xd1
Sampling Point name: Levin Xd1
Reception Date & Time: 12/07/2023 13:50
Analysis Start Date & Time: 12/07/2023 13:52
Analysis Ending Date: 27/07/2023
Sampled Date & Time 11/07/2023 11:47
Sampler(s) Client nominated external sampler
Sampled by Eurofins No

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.37	(± 0.11) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<1	mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	20	(± 6) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	55.1	(± 2.76) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	53.7	(± 1.1) mS/m	0.1
NW098	**Dissolved Aluminium**			
	Aluminium	<0.002	(± 0.001) mg/l	0.002
NW583	**Dissolved Arsenic**			
	Arsenic (As)	<0.001	(± 0.0003) mg/l	0.001
NW103	**Dissolved Boron**			
	Boron (B)	0.06	mg/l	0.03
NW104	**Dissolved Cadmium**			
	Cadmium (Cd)	<0.0002	(± 0.0001) mg/l	0.0002
NW105	**Dissolved Calcium**			
	Calcium (Ca)	37.2	mg/l	0.1
NW106	**Dissolved Chromium**			
	Chromium (Cr)	<0.001	(± 0.0003) mg/l	0.001
NW108	**Dissolved Copper**			
	Copper (Cu)	0.0012	(± 0.0003) mg/l	0.0005
NW109	**Dissolved Iron**			

		RESULTS	(UNCERTAINTY)	LOQ
NW109	**Dissolved Iron**			
	Iron (Fe)	0.04	(± 0.008) mg/l	0.01
NW110	**Dissolved Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW112	**Dissolved Magnesium**			
	Magnesium (Mg)	18.8	mg/l	0.01
NW113	**Dissolved Manganese**			
	Manganese (Mn)	0.576	(± 0.0576) mg/l	0.0005
NW114	**Dissolved Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Dissolved Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005
NW117	**Dissolved Potassium**			
	Potassium (K)	6.33	mg/l	0.01
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	0.104	(± 0.021) mg/l	0.005
NW120	**Dissolved Sodium**			
	Sodium (Na)	44.2	mg/l	0.01
NW125	**Dissolved Zinc**			
	Zinc (Zn)	<0.002	(± 0.0007) mg/l	0.002
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	7.6	(± 0.2)	0.1
⑤**VQ088**	**Phenolics (Total)**			
	Total phenols	<0.05	mg/l	0.05
NW011	**Sulphate**			
	Sulphate	<0.02	(± 0.01) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	10	mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	187	(± 19) mg CaCO3/l	1
NW030	**Total Hardness**			
	Hardness	170	mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	4.6	(± 0.5) mg/l	0.1
④**VQ876**	**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

	RESULTS (UNCERTAINTY)		LOQ
④VQ876 **Volatile Fatty Acids (VFA) by GC-MS**			
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

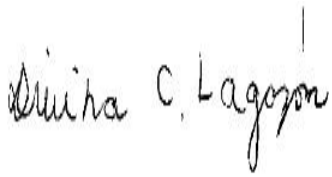
LIST OF METHODS

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
NW030	**Total Hardness:** APHA Online Edition 2340 B	NW098	**Dissolved Aluminium:** APHA Online Edition 3125 B mod.
NW103	**Dissolved Boron:** APHA Online Edition 3125 B mod.	NW104	**Dissolved Cadmium:** APHA Online Edition 3125 B mod.
NW105	**Dissolved Calcium:** APHA Online Edition 3125 B mod.	NW106	**Dissolved Chromium:** APHA Online Edition 3125 B mod.
NW108	**Dissolved Copper:** APHA Online Edition 3125 B mod.	NW109	**Dissolved Iron:** APHA Online Edition 3125 B mod.
NW110	**Dissolved Lead:** APHA Online Edition 3125 B mod.	NW112	**Dissolved Magnesium:** APHA Online Edition 3125 B mod.
NW113	**Dissolved Manganese:** APHA Online Edition 3125 B mod.	NW114	**Dissolved Mercury:** APHA Online Edition 3125 B mod.
NW116	**Dissolved Nickel:** APHA Online Edition 3125 B mod.	NW117	**Dissolved Potassium:** APHA Online Edition 3125 B mod.
NW120	**Dissolved Sodium:** APHA Online Edition 3125 B mod.	NW125	**Dissolved 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
NW583	**Dissolved Arsenic:** 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



Divina Cunanan Lagazon Supervisor

Gordon McArthur Senior laboratory Analyst

Sunita Raju Business Unit Manager

Gabriela Carvalhaes Manager Food and Water Testing Chemistry

EXPLANATORY NOTE

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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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END OF REPORT

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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE	AR-23-NW-037422-01	REPORT DATE	27/07/2023

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), Goode

Contact for your orders: Gabriela Carvalhaes
Contract: Potable

Order code: EUNZWE-00132140

SAMPLE CODE 812-2023-00094012

Client Reference: 304626-0
Product: Ground water
Sampling Point code: WIL-Xs1
Sampling Point name: Levin Xs1
Reception Date & Time: 12/07/2023 15:39
Analysis Start Date & Time: 12/07/2023 15:43
Analysis Ending Date: 27/07/2023
Sampled Date & Time 04/07/2023 12:18
Sampler(s) Client nominated external sampler
Sampled by Eurofins No

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	11.4	(± 1.14) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<1	mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	67	(± 11) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	37.4	(± 1.87) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	72.2	(± 1.4) mS/m	0.1
NW098	**Dissolved Aluminium**			
	Aluminium	0.009	(± 0.001) mg/l	0.002
NW583	**Dissolved Arsenic**			
	Arsenic (As)	0.001	(± 0.0004) mg/l	0.001
NW103	**Dissolved Boron**			
	Boron (B)	0.14	mg/l	0.03
NW104	**Dissolved Cadmium**			
	Cadmium (Cd)	<0.0002	(± 0.0001) mg/l	0.0002
NW105	**Dissolved Calcium**			
	Calcium (Ca)	62.2	mg/l	0.1
NW106	**Dissolved Chromium**			
	Chromium (Cr)	<0.001	(± 0.0004) mg/l	0.001
NW108	**Dissolved Copper**			
	Copper (Cu)	0.0047	(± 0.0010) mg/l	0.0005
NW109	**Dissolved Iron**			

		RESULTS	(UNCERTAINTY)	LOQ
NW109	**Dissolved Iron**			
	Iron (Fe)	2.55	(± 0.51) mg/l	0.01
NW110	**Dissolved Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW112	**Dissolved Magnesium**			
	Magnesium (Mg)	24.8	mg/l	0.01
NW113	**Dissolved Manganese**			
	Manganese (Mn)	1.43	(± 0.143) mg/l	0.0005
NW114	**Dissolved Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Dissolved Nickel**			
	Nickel (Ni)	0.0008	(± 0.0003) mg/l	0.0005
NW117	**Dissolved Potassium**			
	Potassium (K)	13.9	mg/l	0.01
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	0.012	(± 0.003) mg/l	0.005
NW120	**Dissolved Sodium**			
	Sodium (Na)	38.2	mg/l	0.01
NW125	**Dissolved Zinc**			
	Zinc (Zn)	0.005	(± 0.0008) mg/l	0.002
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	400	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	<0.01	(± 0.003) mg/l	0.01
NW195	**pH**			
	pH	7.3	(± 0.2)	0.1
⑤**VQ088**	**Phenolics (Total)**			
	Total phenols	<0.05	mg/l	0.05
NW011	**Sulphate**			
	Sulphate	6.57	(± 0.66) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	34	mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	303	(± 30) mg CaCO3/l	1
NW030	**Total Hardness**			
	Hardness	258	mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	24.9	(± 2.5) mg/l	0.1
④**VQ876**	**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

	RESULTS (UNCERTAINTY)		LOQ
④VQ876 **Volatile Fatty Acids (VFA) by GC-MS**			
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

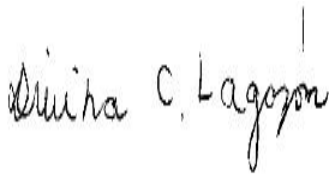
LIST OF METHODS

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
NW030	**Total Hardness:** APHA Online Edition 2340 B	NW098	**Dissolved Aluminium:** APHA Online Edition 3125 B mod.
NW103	**Dissolved Boron:** APHA Online Edition 3125 B mod.	NW104	**Dissolved Cadmium:** APHA Online Edition 3125 B mod.
NW105	**Dissolved Calcium:** APHA Online Edition 3125 B mod.	NW106	**Dissolved Chromium:** APHA Online Edition 3125 B mod.
NW108	**Dissolved Copper:** APHA Online Edition 3125 B mod.	NW109	**Dissolved Iron:** APHA Online Edition 3125 B mod.
NW110	**Dissolved Lead:** APHA Online Edition 3125 B mod.	NW112	**Dissolved Magnesium:** APHA Online Edition 3125 B mod.
NW113	**Dissolved Manganese:** APHA Online Edition 3125 B mod.	NW114	**Dissolved Mercury:** APHA Online Edition 3125 B mod.
NW116	**Dissolved Nickel:** APHA Online Edition 3125 B mod.	NW117	**Dissolved Potassium:** APHA Online Edition 3125 B mod.
NW120	**Dissolved Sodium:** APHA Online Edition 3125 B mod.	NW125	**Dissolved 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
NW583	**Dissolved Arsenic:** 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



Divina Cunanan Lagazon Supervisor

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Leo Cleave Senior Analyst Microbiology

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Food & Water Testing

ANALYTICAL REPORT

REPORT CODE **AR-23-NW-037421-01** REPORT DATE **27/07/2023**

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), Goode

Contact for your orders: Gabriela Carvalhaes **Order code:** EUNZWE-00132140
Contract: Potable

SAMPLE CODE **812-2023-00094006**

Client Reference: 304627-0
Product: Ground water
Sampling Point code: WIL-Xs2 **Sampling Point name:** Levin Xs2
Reception Date & Time: 12/07/2023 15:23
Analysis Start Date & Time: 12/07/2023 15:43 **Analysis Ending Date:** 27/07/2023
Sampled Date & Time 04/07/2023 12:15 **Sampler(s)** Client nominated external sampler
Sampled by Eurofins No

		RESULTS	(UNCERTAINTY)	LOQ
NW179	**Ammonia Nitrogen**			
	Ammoniacal nitrogen (N)	0.02	(± 0.007) mg/l	0.01
NW341	**BOD5 - Soluble Carbonaceous**			
	BOD5	<1	mg/l	1
NW020	**Chemical Oxygen Demand**			
	Chemical oxygen demand (COD)	<15	(± 5) mg/l	15
NW007	**Chloride**			
	Chloride (Cl)	15.6	(± 0.78) mg/l	0.02
NW023	**Conductivity**			
	Conductivity	19.6	(± 0.4) mS/m	0.1
NW098	**Dissolved Aluminium**			
	Aluminium	0.011	(± 0.001) mg/l	0.002
NW583	**Dissolved Arsenic**			
	Arsenic (As)	<0.001	(± 0.0004) mg/l	0.001
NW103	**Dissolved Boron**			
	Boron (B)	0.04	mg/l	0.03
NW104	**Dissolved Cadmium**			
	Cadmium (Cd)	<0.0002	(± 0.0001) mg/l	0.0002
NW105	**Dissolved Calcium**			
	Calcium (Ca)	12.4	mg/l	0.1
NW106	**Dissolved Chromium**			
	Chromium (Cr)	<0.001	(± 0.0003) mg/l	0.001
NW108	**Dissolved Copper**			
	Copper (Cu)	0.0215	(± 0.0043) mg/l	0.0005
NW109	**Dissolved Iron**			

		RESULTS	(UNCERTAINTY)	LOQ
NW109	**Dissolved Iron**			
	Iron (Fe)	0.11	(± 0.02) mg/l	0.01
NW110	**Dissolved Lead**			
	Lead (Pb)	<0.0005	(± 0.0002) mg/l	0.0005
NW112	**Dissolved Magnesium**			
	Magnesium (Mg)	6.19	mg/l	0.01
NW113	**Dissolved Manganese**			
	Manganese (Mn)	0.0416	(± 0.0083) mg/l	0.0005
NW114	**Dissolved Mercury**			
	Mercury (Hg)	<0.0005	mg/l	0.0005
NW116	**Dissolved Nickel**			
	Nickel (Ni)	<0.0005	(± 0.0002) mg/l	0.0005
NW117	**Dissolved Potassium**			
	Potassium (K)	4.02	mg/l	0.01
NW193	**Dissolved Reactive Phosphorus**			
	Phosphorus (soluble reactive)	0.026	(± 0.005) mg/l	0.005
NW120	**Dissolved Sodium**			
	Sodium (Na)	15.7	mg/l	0.01
NW125	**Dissolved Zinc**			
	Zinc (Zn)	<0.002	(± 0.0007) mg/l	0.002
ZM2GA	**Enumeration of Escherichia coli By Membrane Filtration**			
	Escherichia coli	<100	cfu/100 ml	100
NW010	**Nitrate-N**			
	Nitrate-N	0.66	(± 0.16) mg/l	0.01
NW195	**pH**			
	pH	6.7	(± 0.2)	0.1
⑤VQ088	**Phenolics (Total)**			
	Total phenols	<0.05	mg/l	0.05
NW011	**Sulphate**			
	Sulphate	9.81	(± 0.98) mg/l	0.02
NW206	**Suspended Solids**			
	Suspended Solids	<5	mg/l	3
NW003	**Total Alkalinity**			
	Alkalinity total	59	(± 6) mg CaCO3/l	1
NW030	**Total Hardness**			
	Hardness	56	mg CaCO3/l	1
NW210	**Total Non-Purgeable Organic Carbon**			
	Total Organic Carbon	1.8	(± 0.2) mg/l	0.1
④VQ876	**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

	RESULTS (UNCERTAINTY)		LOQ
④VQ876 **Volatile Fatty Acids (VFA) by GC-MS**			
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
NW030	**Total Hardness:** APHA Online Edition 2340 B	NW098	**Dissolved Aluminium:** APHA Online Edition 3125 B mod.
NW103	**Dissolved Boron:** APHA Online Edition 3125 B mod.	NW104	**Dissolved Cadmium:** APHA Online Edition 3125 B mod.
NW105	**Dissolved Calcium:** APHA Online Edition 3125 B mod.	NW106	**Dissolved Chromium:** APHA Online Edition 3125 B mod.
NW108	**Dissolved Copper:** APHA Online Edition 3125 B mod.	NW109	**Dissolved Iron:** APHA Online Edition 3125 B mod.
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NW113	**Dissolved Manganese:** APHA Online Edition 3125 B mod.	NW114	**Dissolved Mercury:** APHA Online Edition 3125 B mod.
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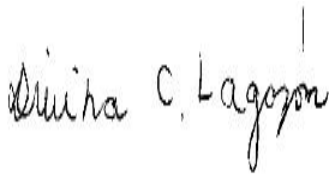
Signature

Marylou Cabral Laboratory Manager

Jennifer Mont Supervisor



Divina Cunanan Lagazon Supervisor

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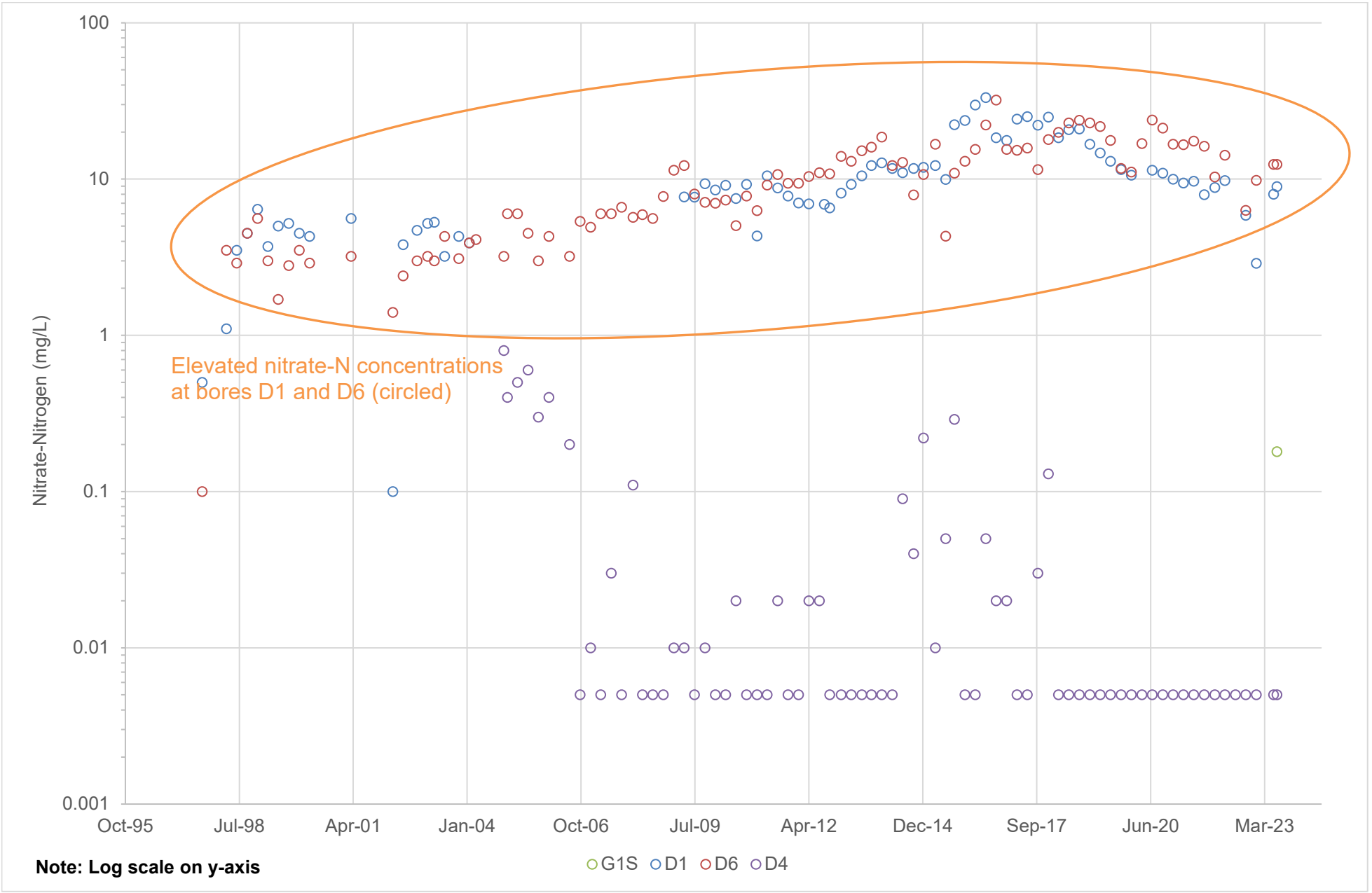
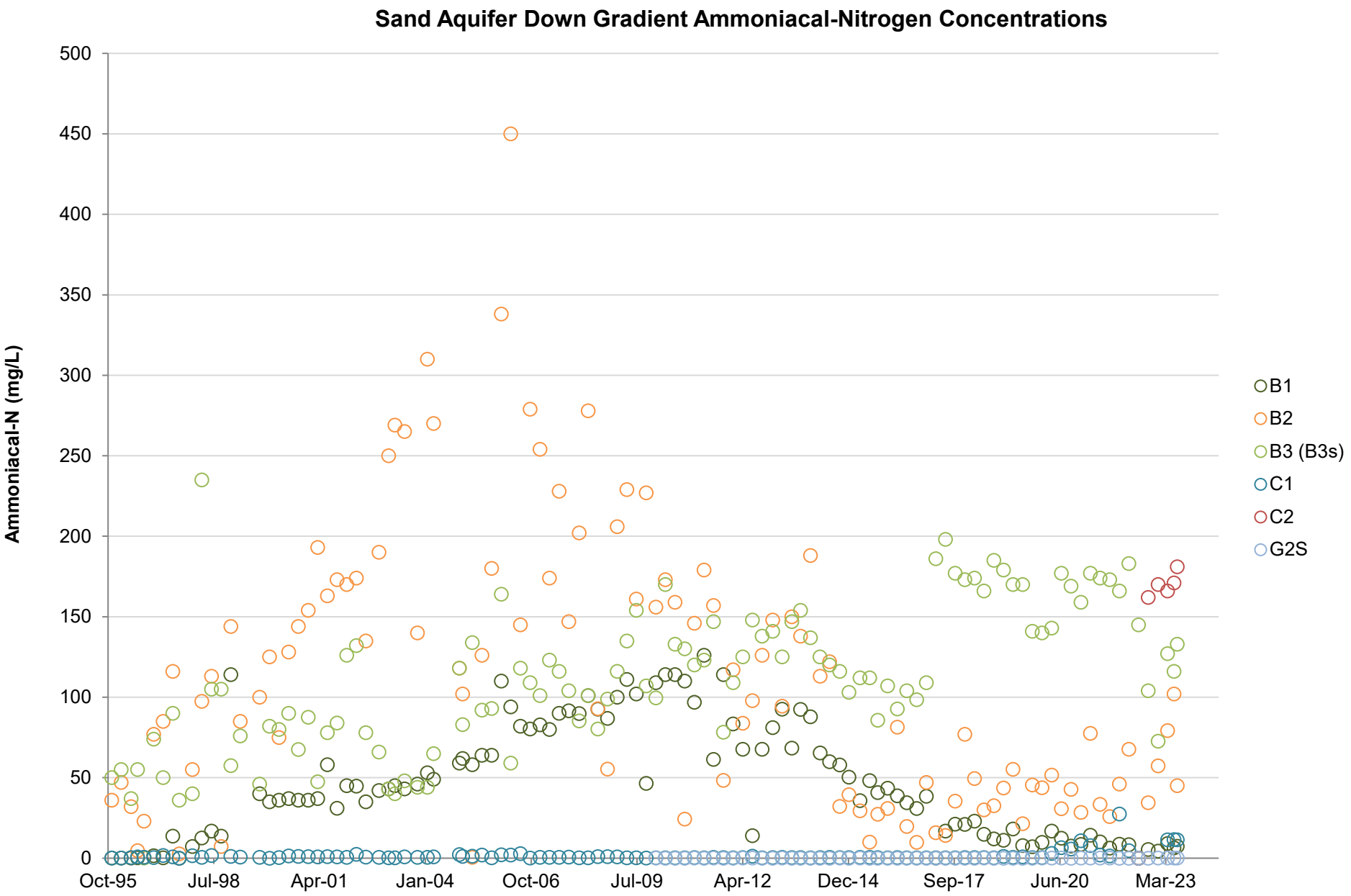
If the Customer pays for storage of the samples Eurofins will take commercially reasonable steps to store the samples for the agreed period in terms of industry practice.
The Customer acknowledges and accepts that: (a) it is solely responsible for the sampling process and warrants that the sample provided 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.
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.
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.

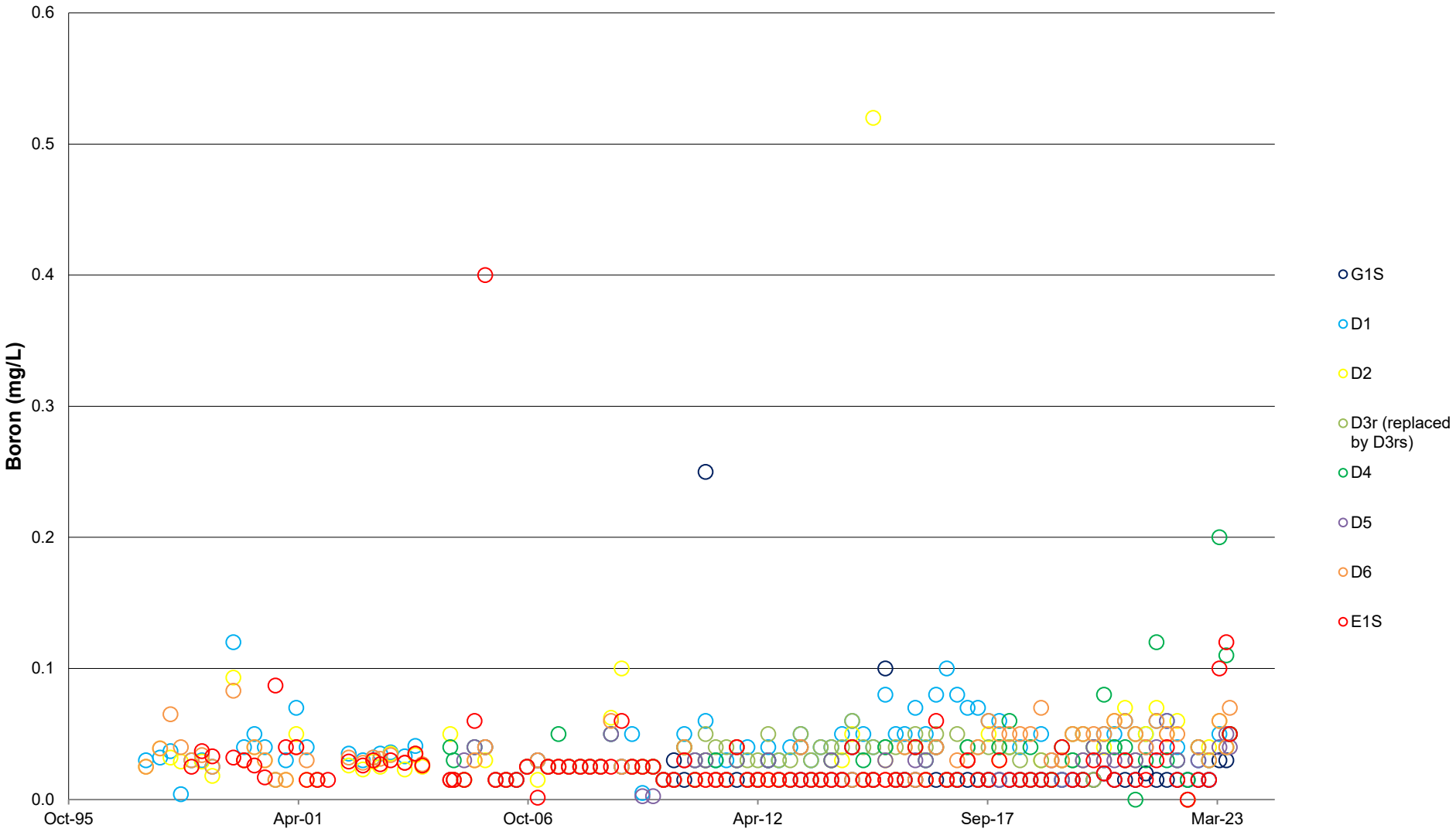
END OF REPORT

Appendix D Historical Results Graphs


100
10
1
0.1
0.01
0.001
Nitrate-Nitrogen (mg/L)
Elevated nitrate-N concentrations
at bores D1 and D6 (circled)
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
G1S
D1
D6
D4
Note: Log scale on y-axis

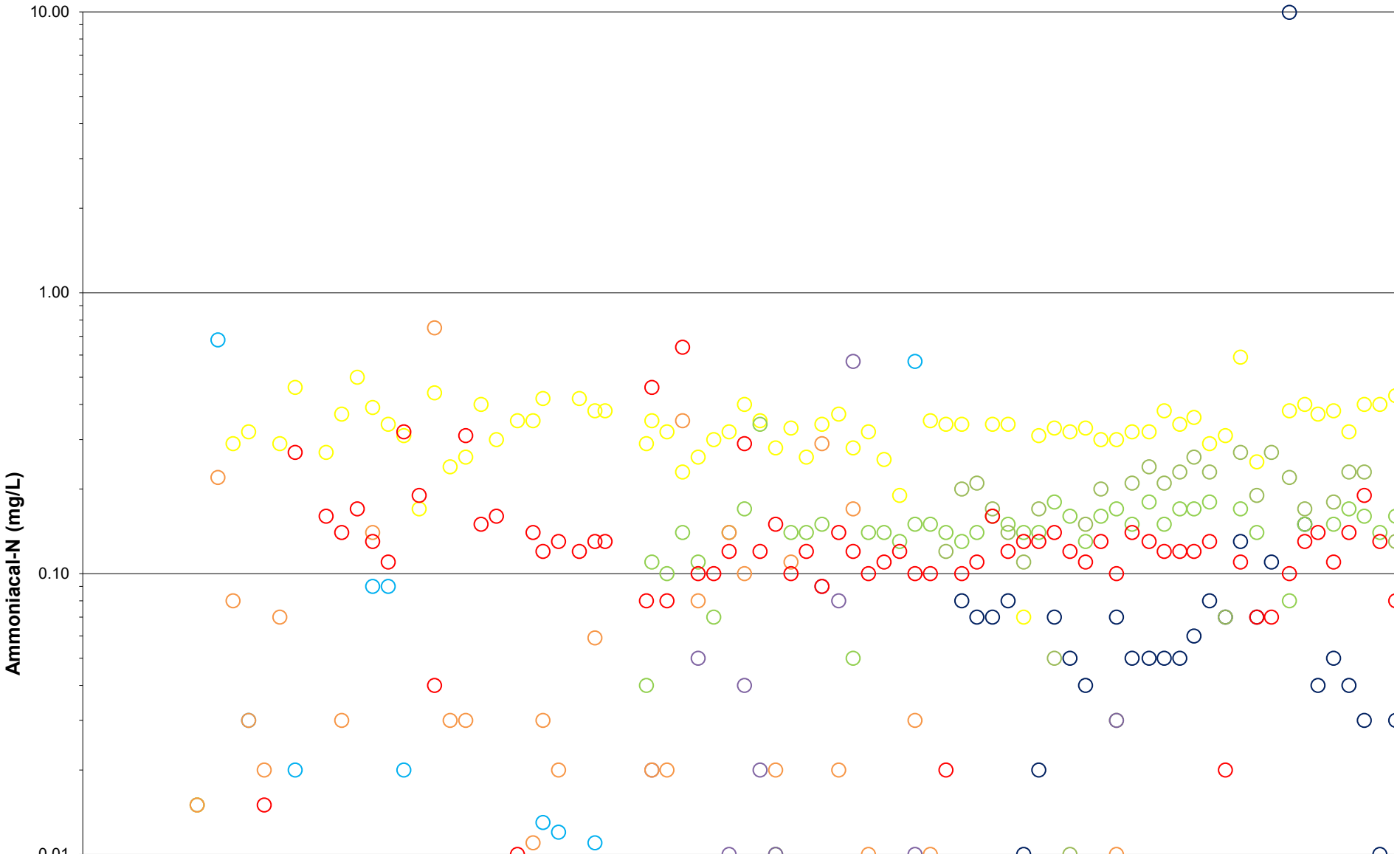

Sand Aquifer Down Gradient Ammoniacal-Nitrogen Concentrations
Ammoniacal-N (mg/L)
500
450
400
350
300
250
200
150
100
50
0
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
B1
B2
B3 (B3s)
C1
C2
G2S

Sand Aquifer Downgradient of New Landfill - Boron Concentrations

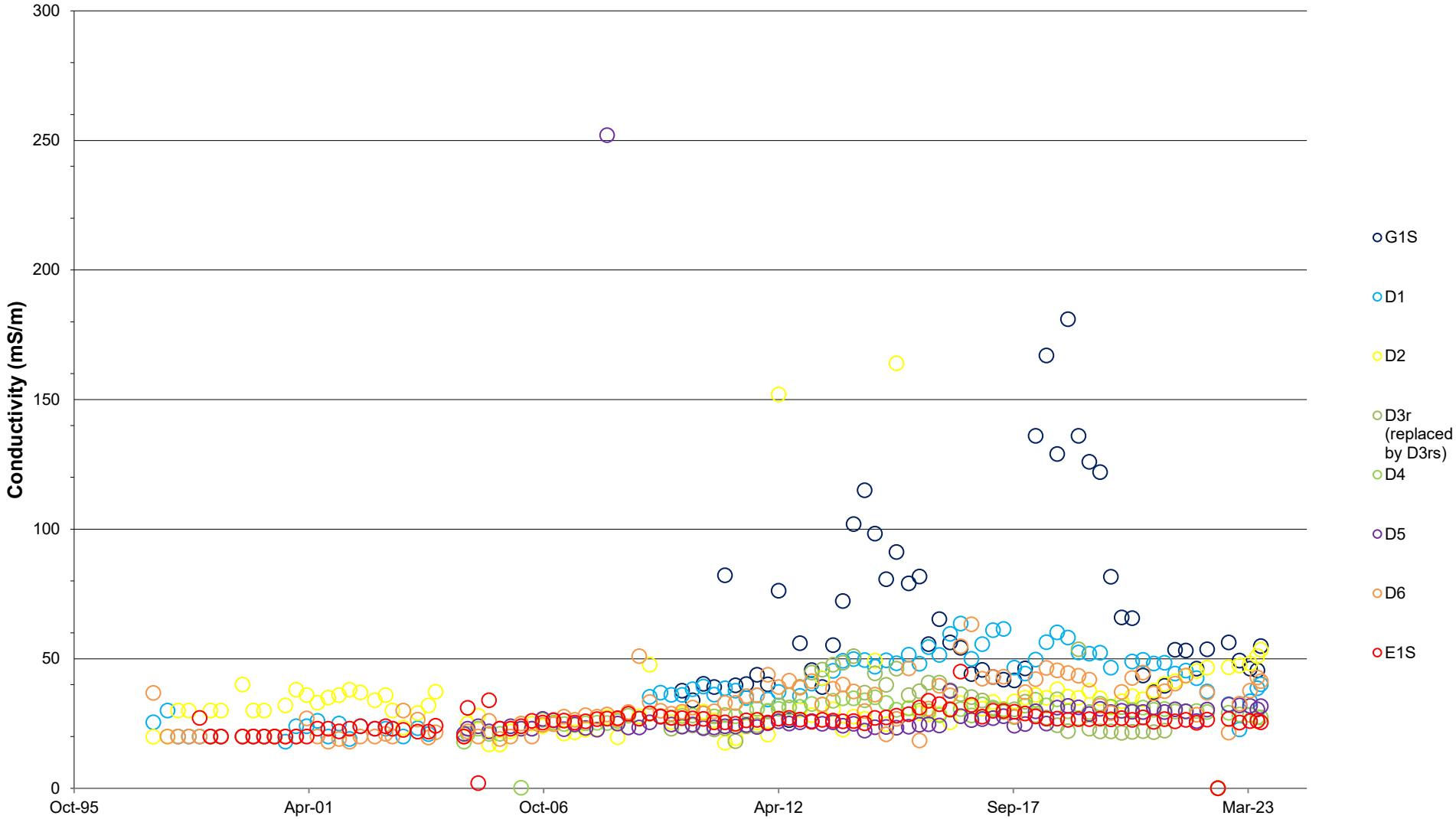


Sand Aquifer Downgradient of New Landfill - Chloride Concentrations

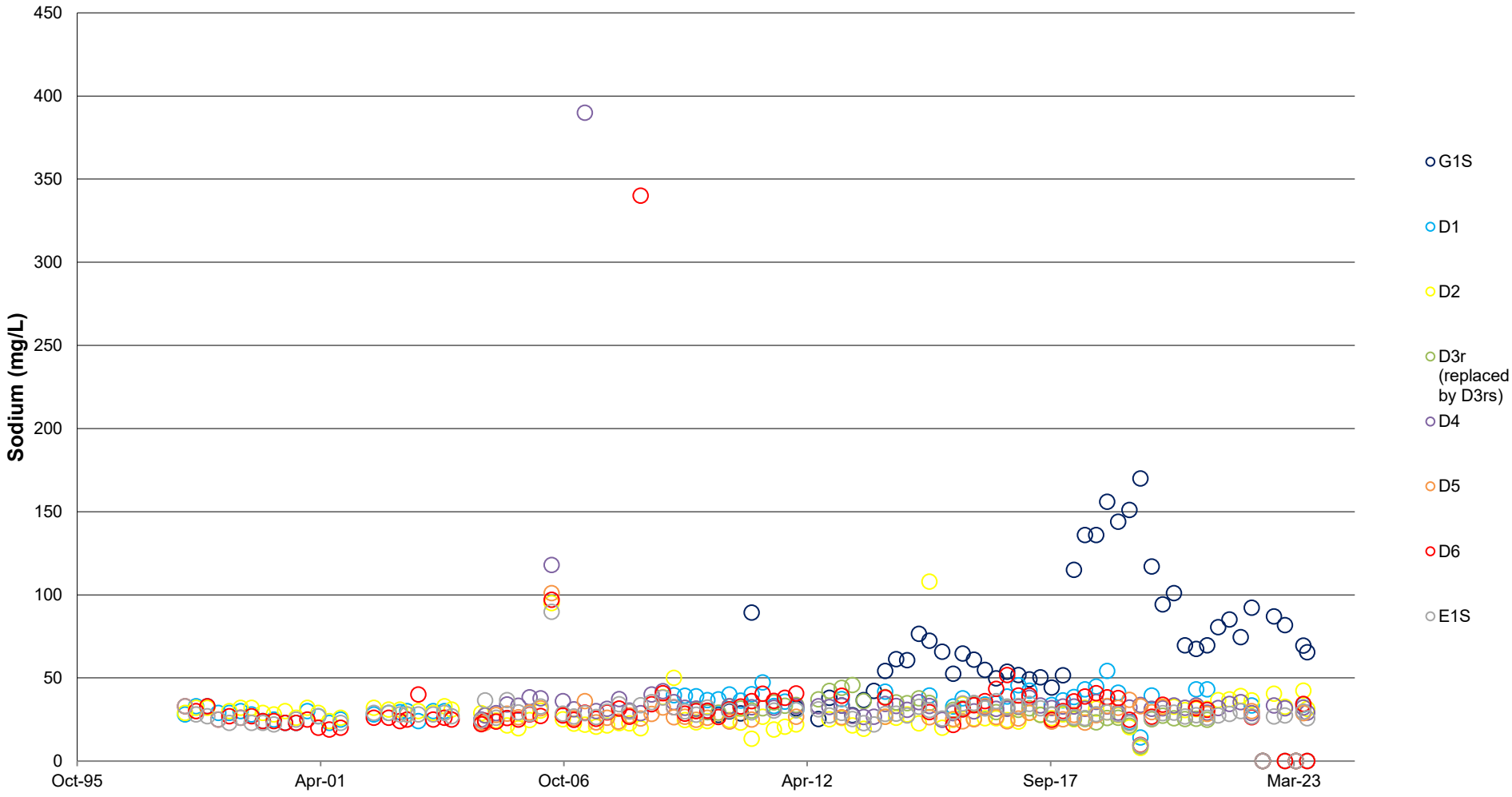
Sand Aquifer Downgradient of New Landfill - Ammoniacal-Nitrogen Concentrations
Note: Y-axis scale is Logarithmic

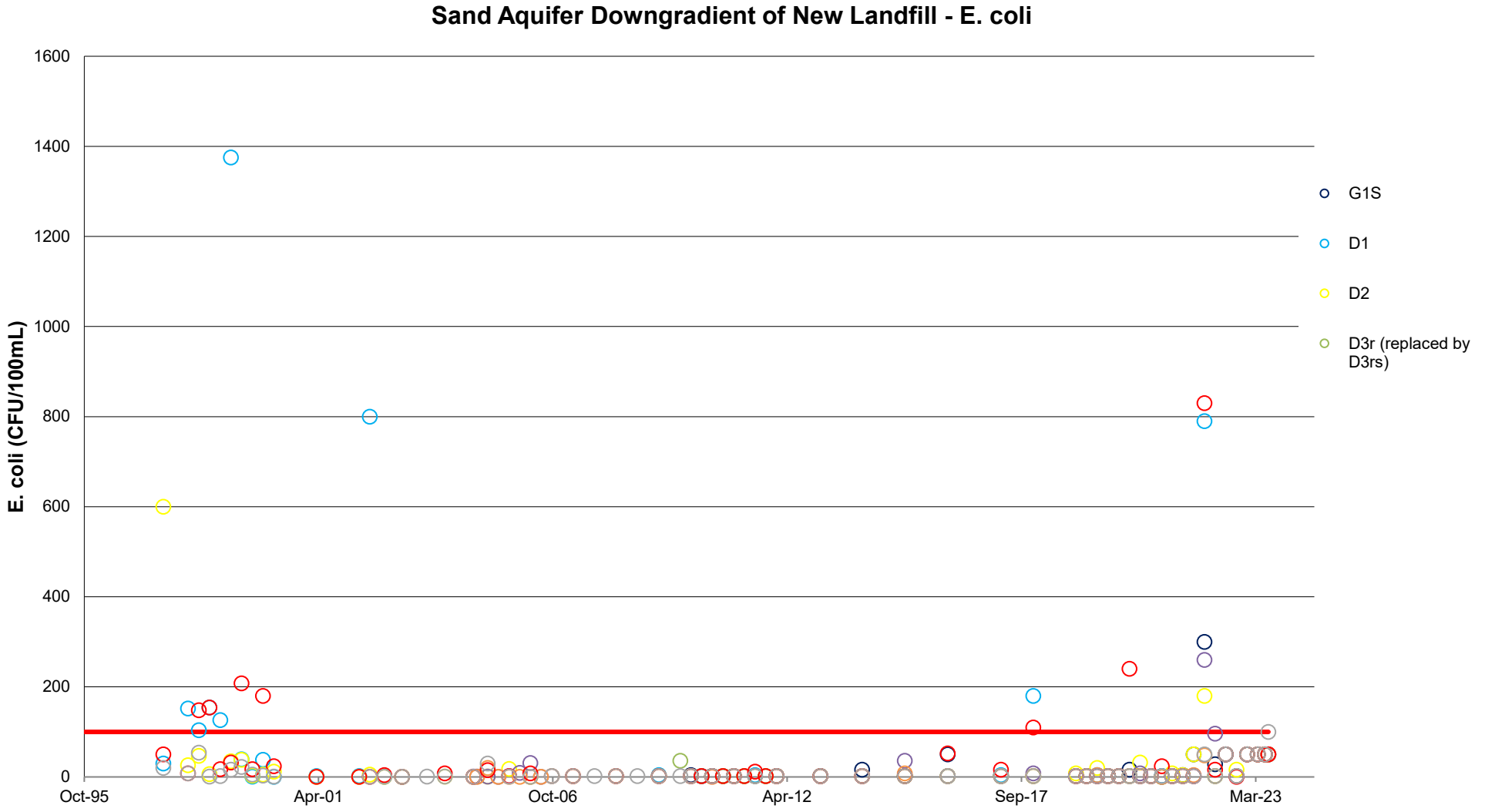


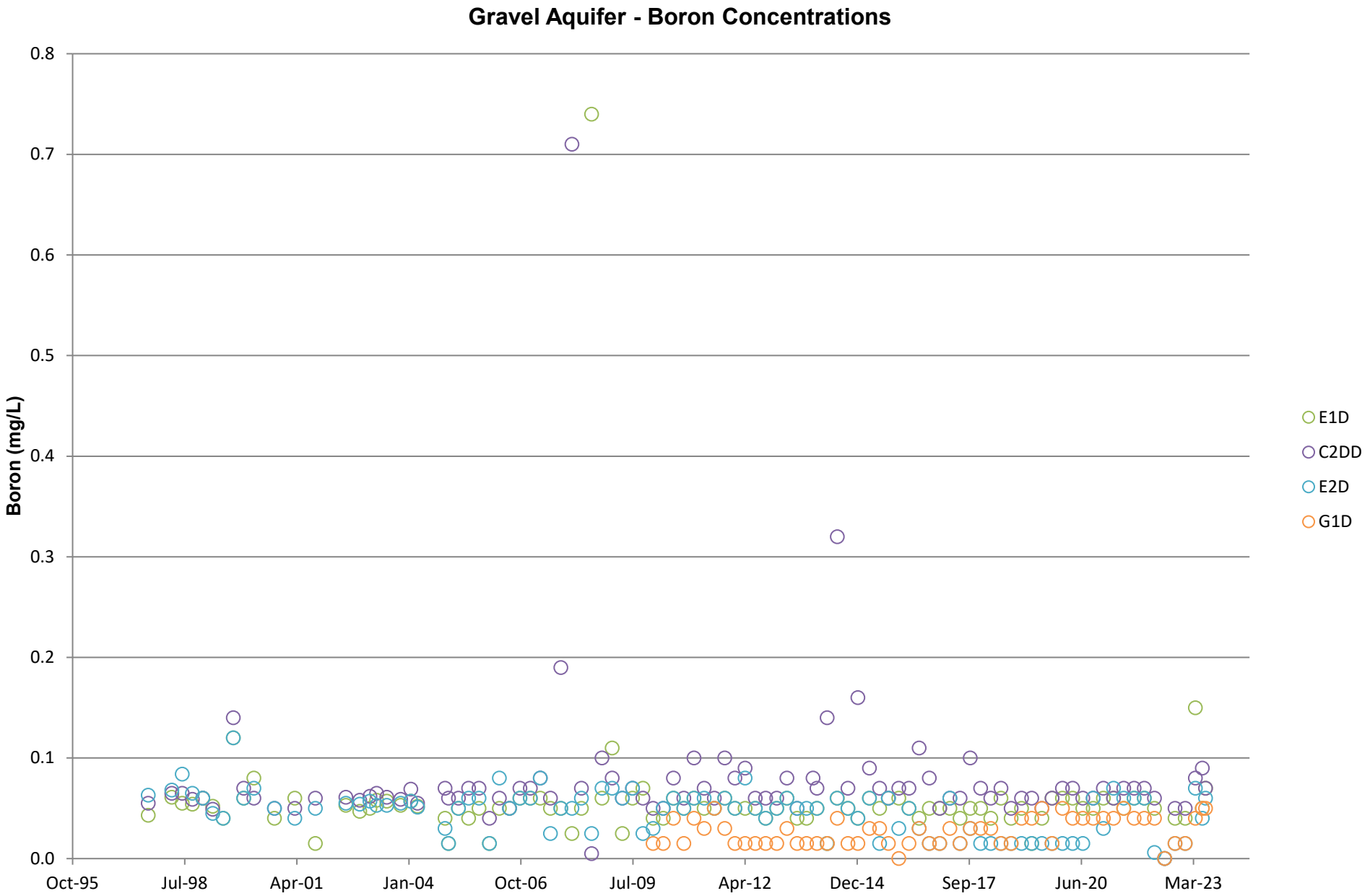
Sand Aquifer Downgradient of New Landfill - Conductivity Levels

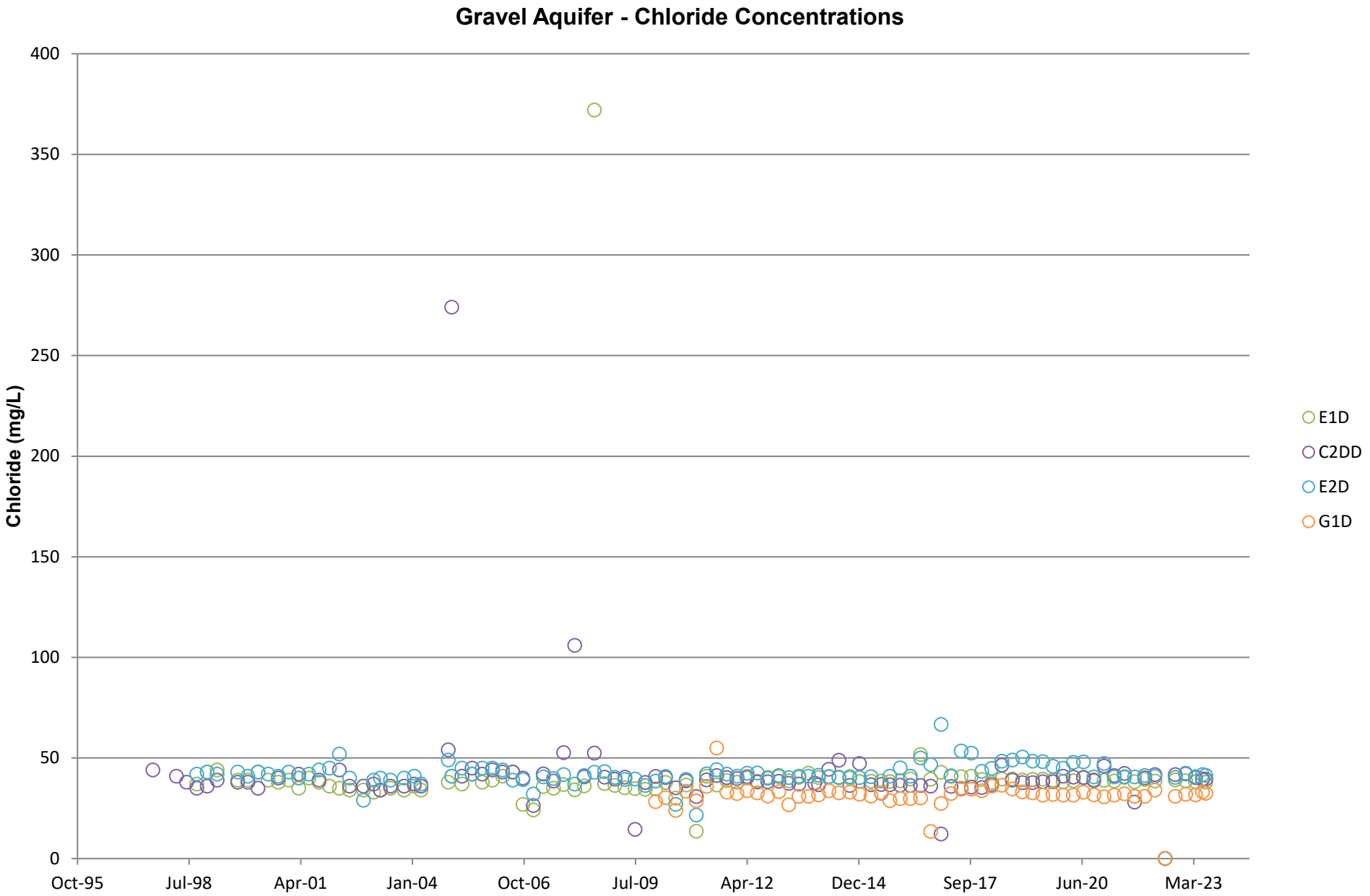


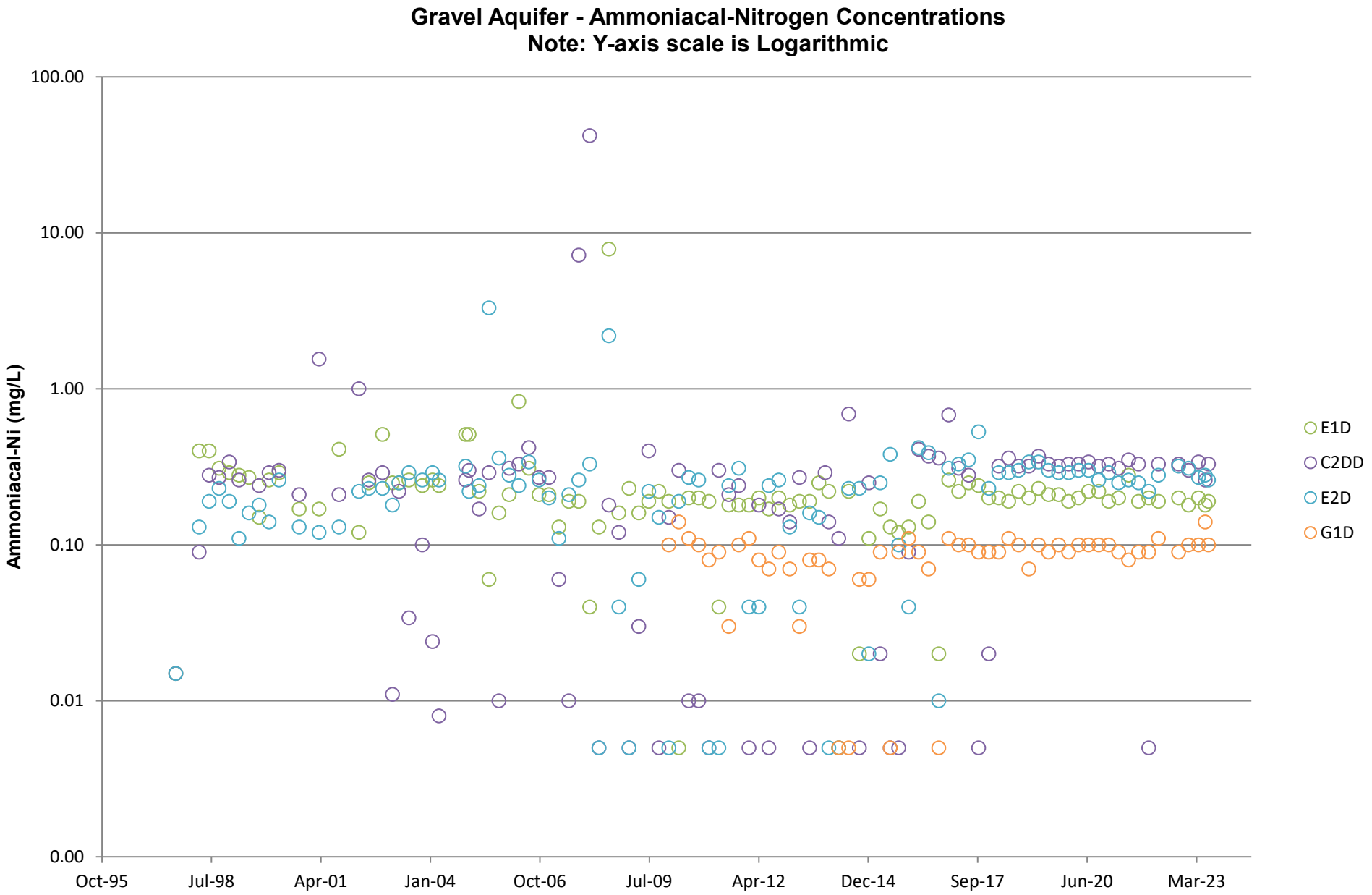
Sand Aquifer Downgradient of New Landfill - Sodium Concentrations

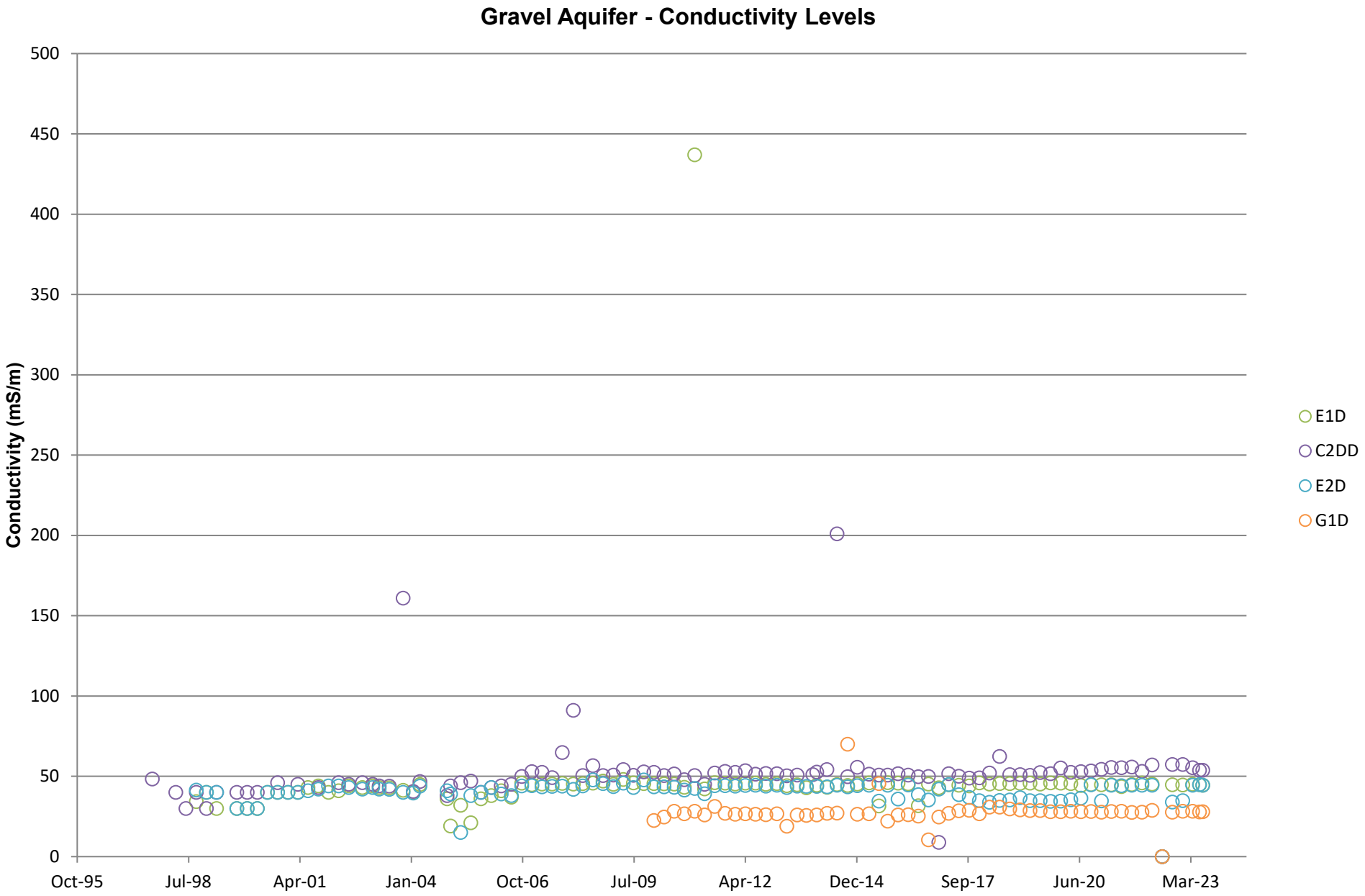


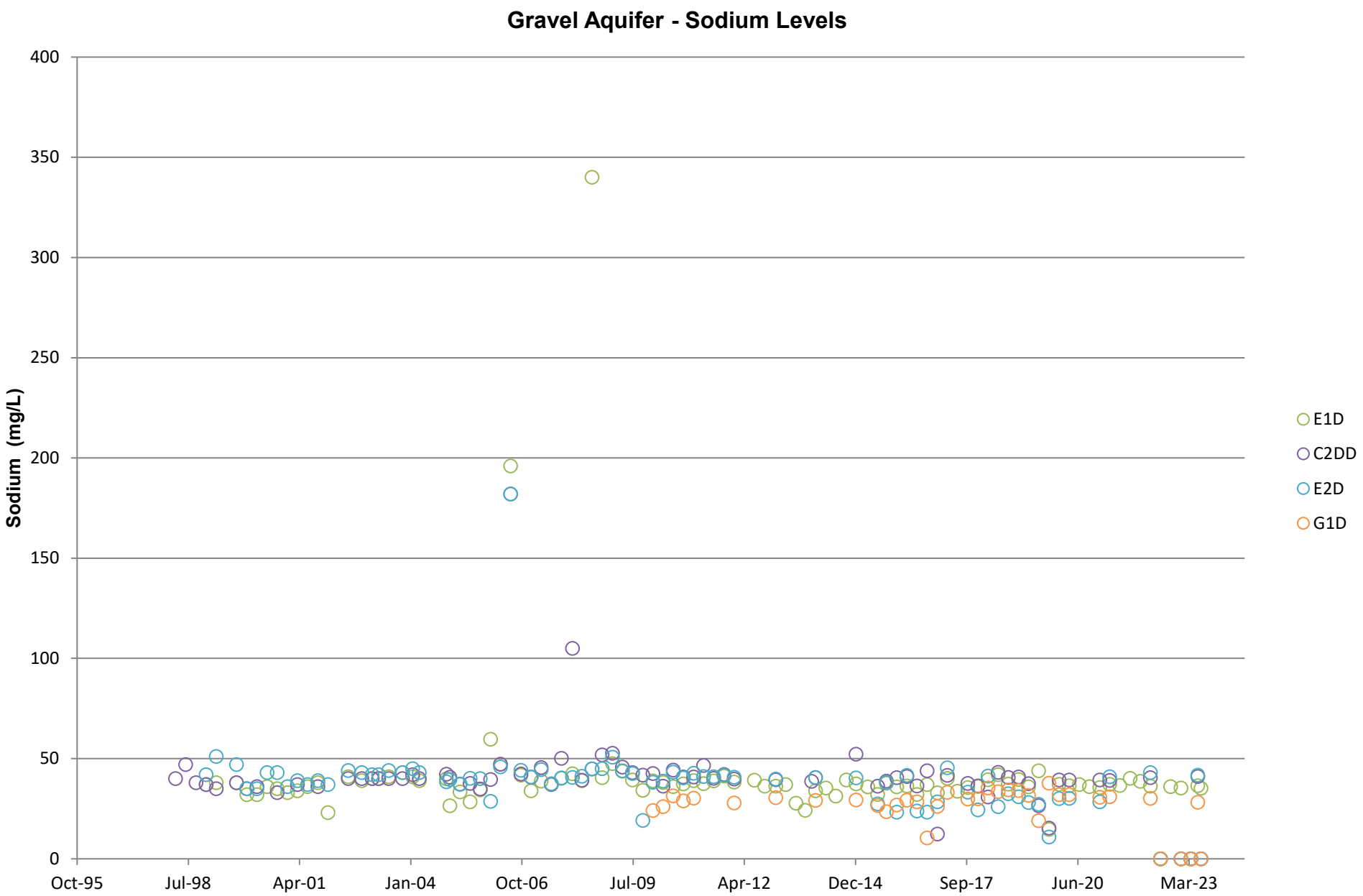

Sand Aquifer Downgradient of New Landfill - E. coli
E. coli (CFU/100mL)
1600
1400
1200
1000
800
600
400
200
0
Oct-95
Apr-01
Oct-06
Apr-12
Sep-17
Mar-23
G1S
D1
D2
D3r (replaced by D3rs)

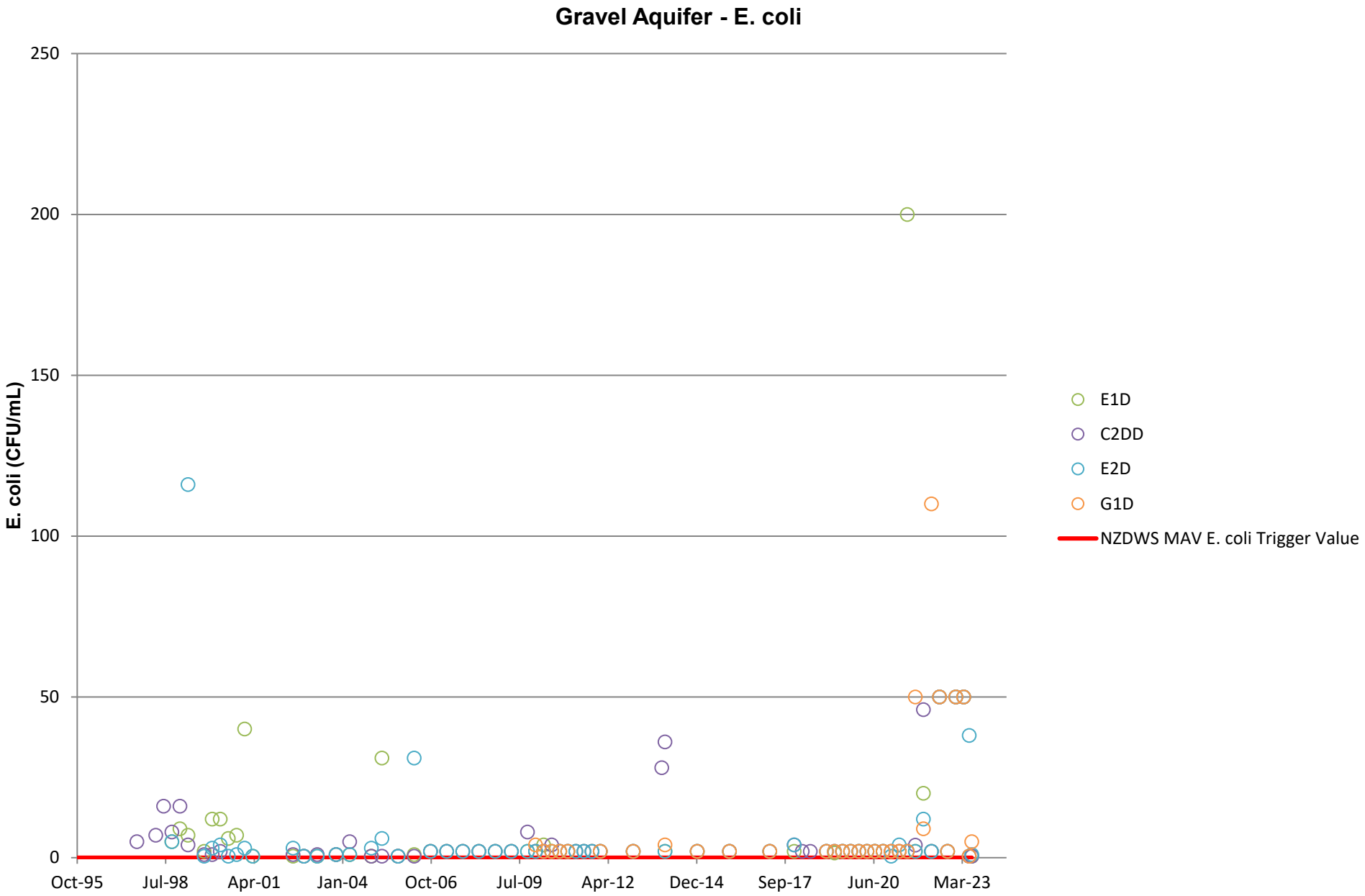

Gravel Aquifer - Boron Concentrations
Boron (mg/L)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
E1D
C2DD
E2D
G1D

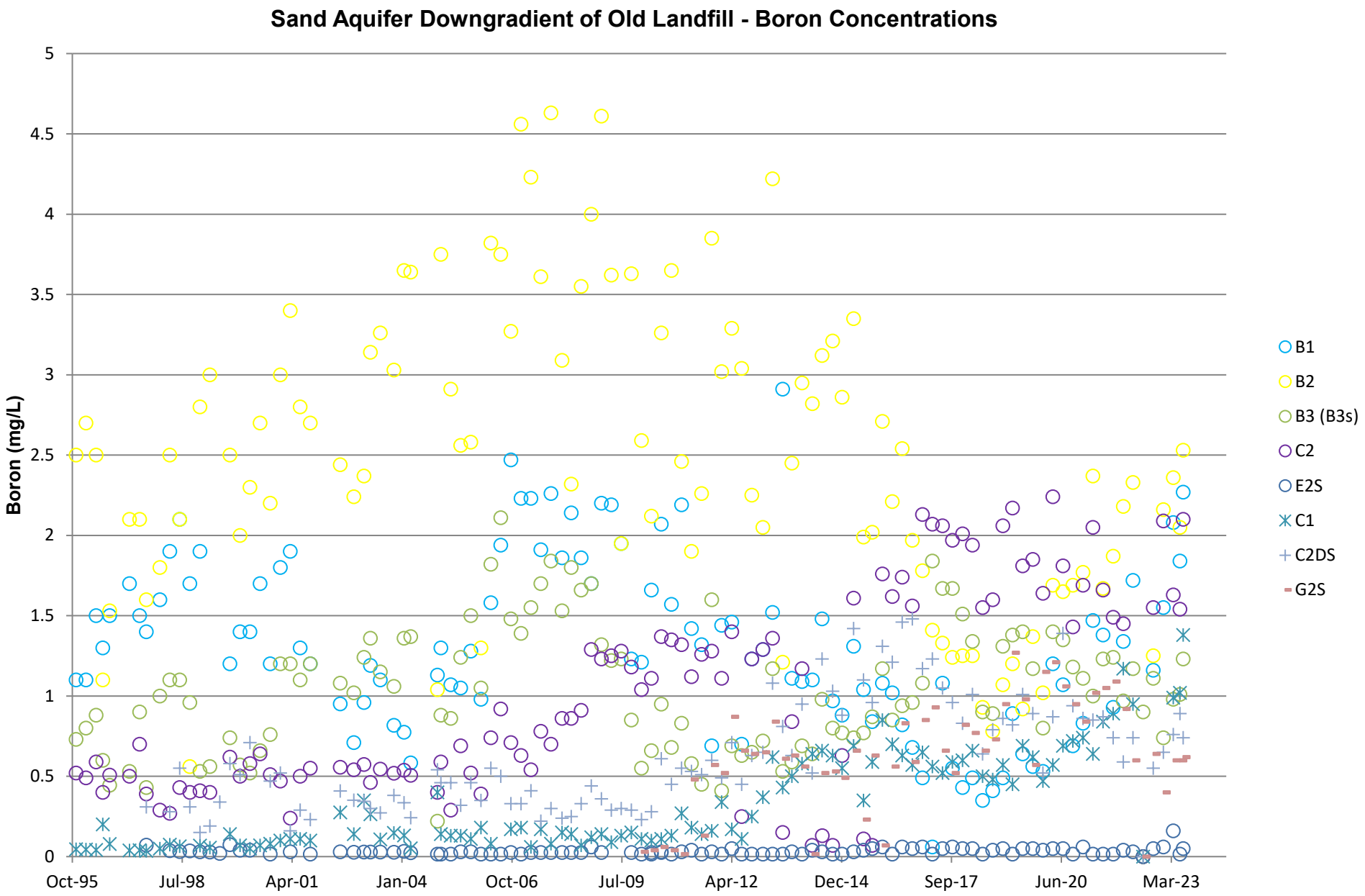

Gravel Aquifer - Chloride Concentrations
Chloride (mg/L)
400
350
300
250
200
150
100
50
0
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
E1D
C2DD
E2D
G1D

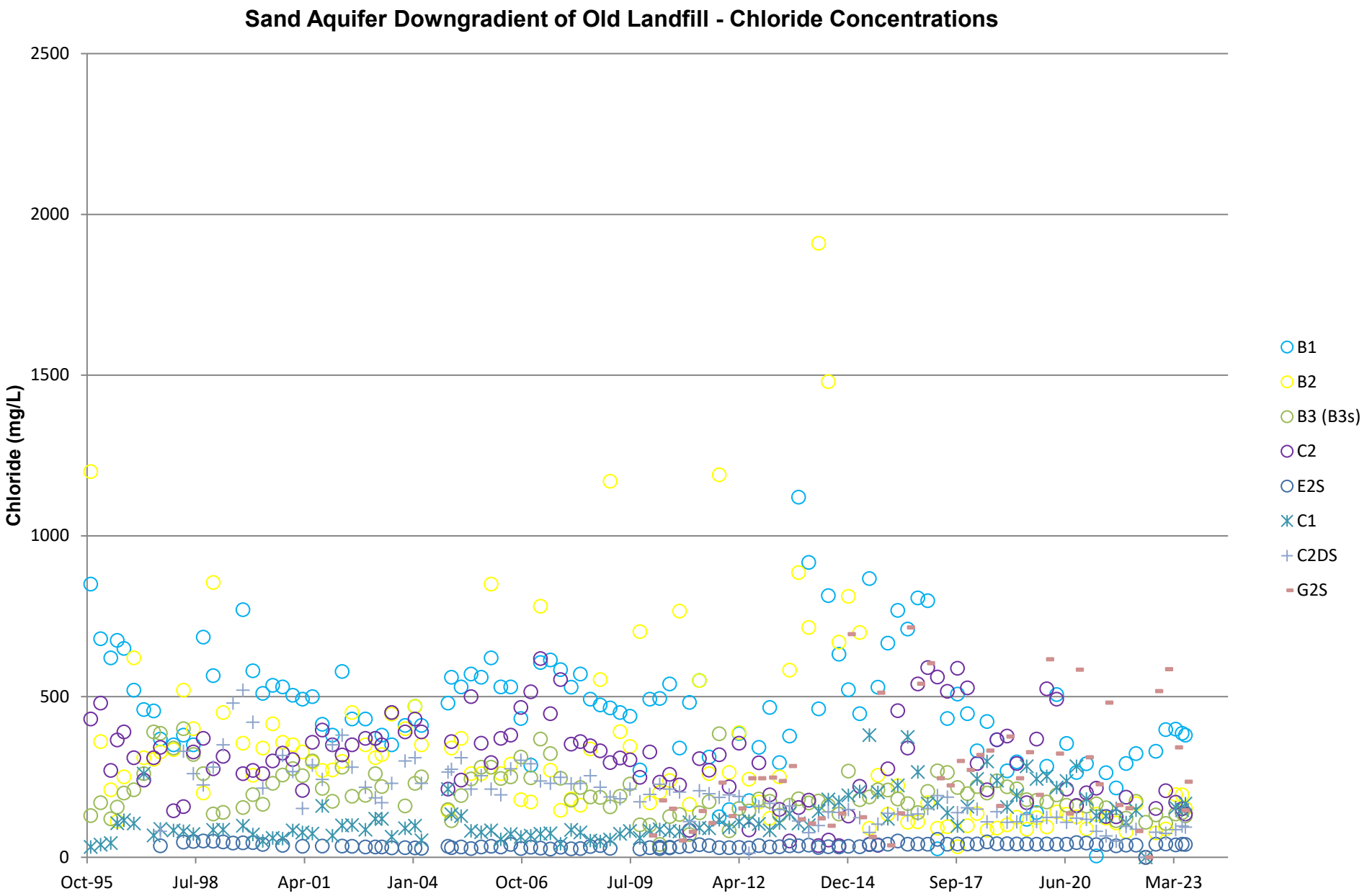

Gravel Aquifer - Ammoniacal-Nitrogen Concentrations
Note: Y-axis scale is Logarithmic
Ammoniacal-Ni (mg/L)
100.00
10.00
1.00
0.10
0.01
0.00
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
E1D
C2DD
E2D
G1D

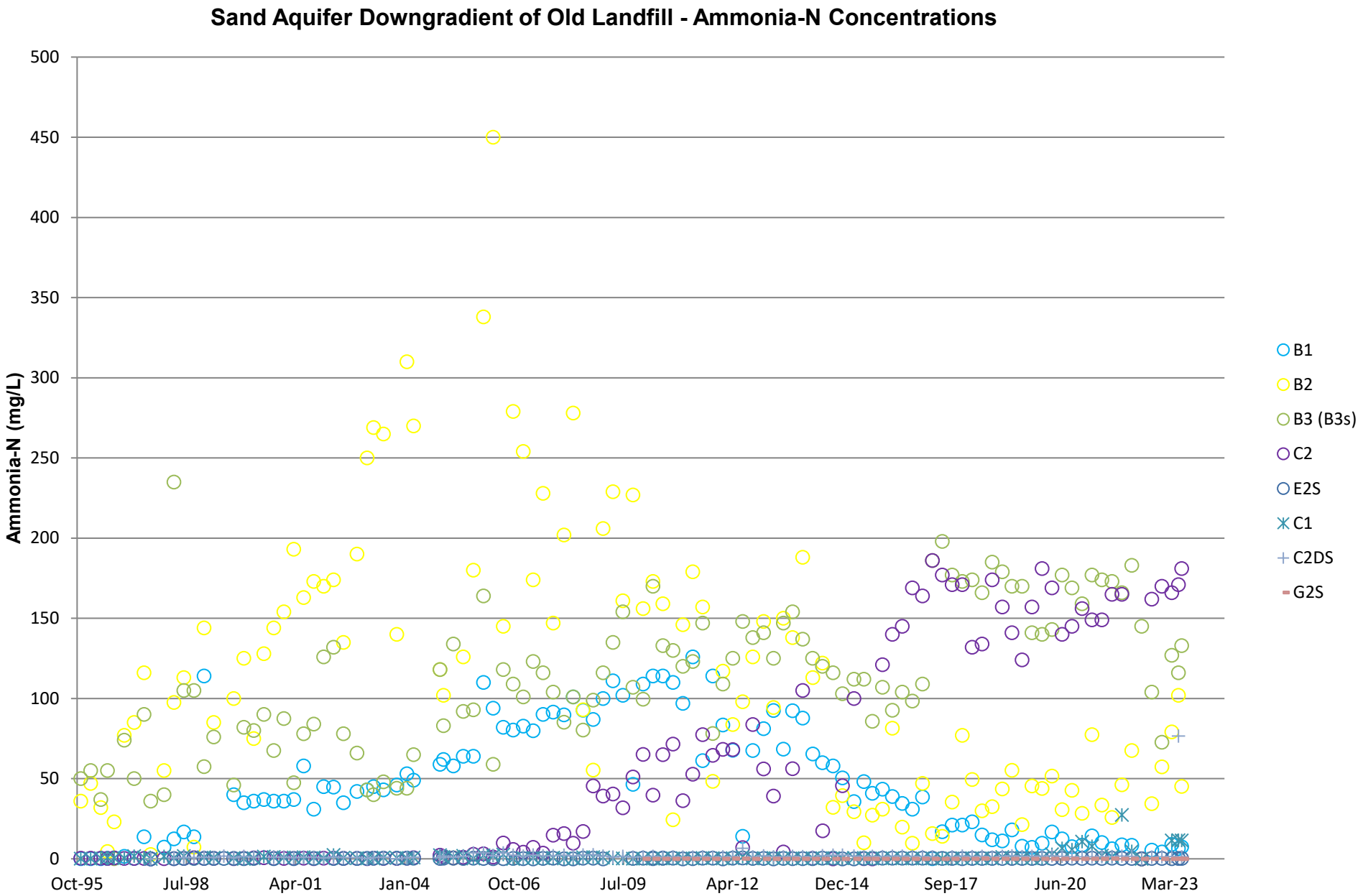

Gravel Aquifer - Conductivity Levels
Conductivity (mS/m)
500
450
400
350
300
250
200
150
100
50
0
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
E1D
C2DD
E2D
G1D

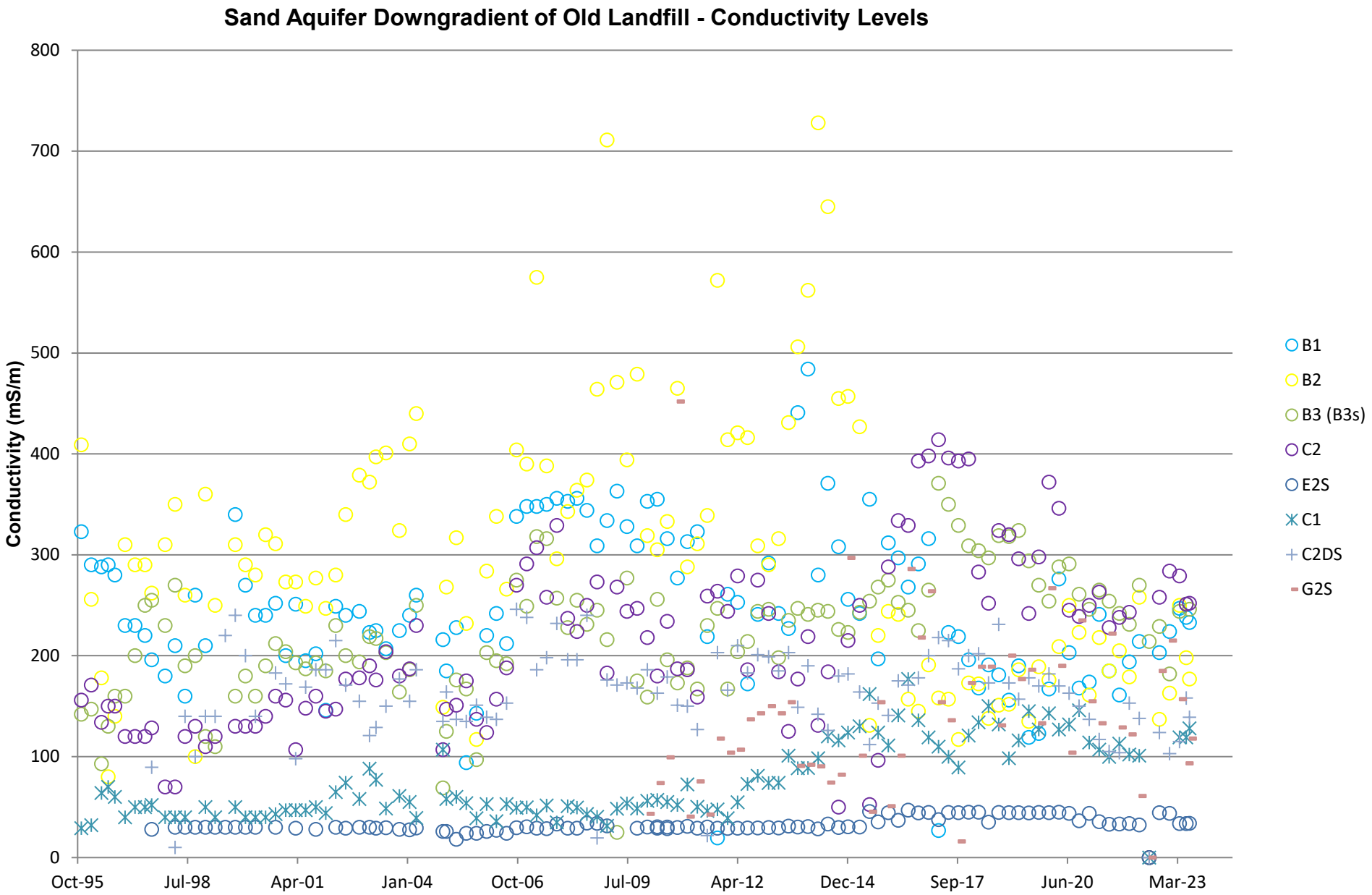

Gravel Aquifer - Sodium Levels
Sodium (mg/L)
400
350
300
250
200
150
100
50
0
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
E1D
C2DD
E2D
G1D

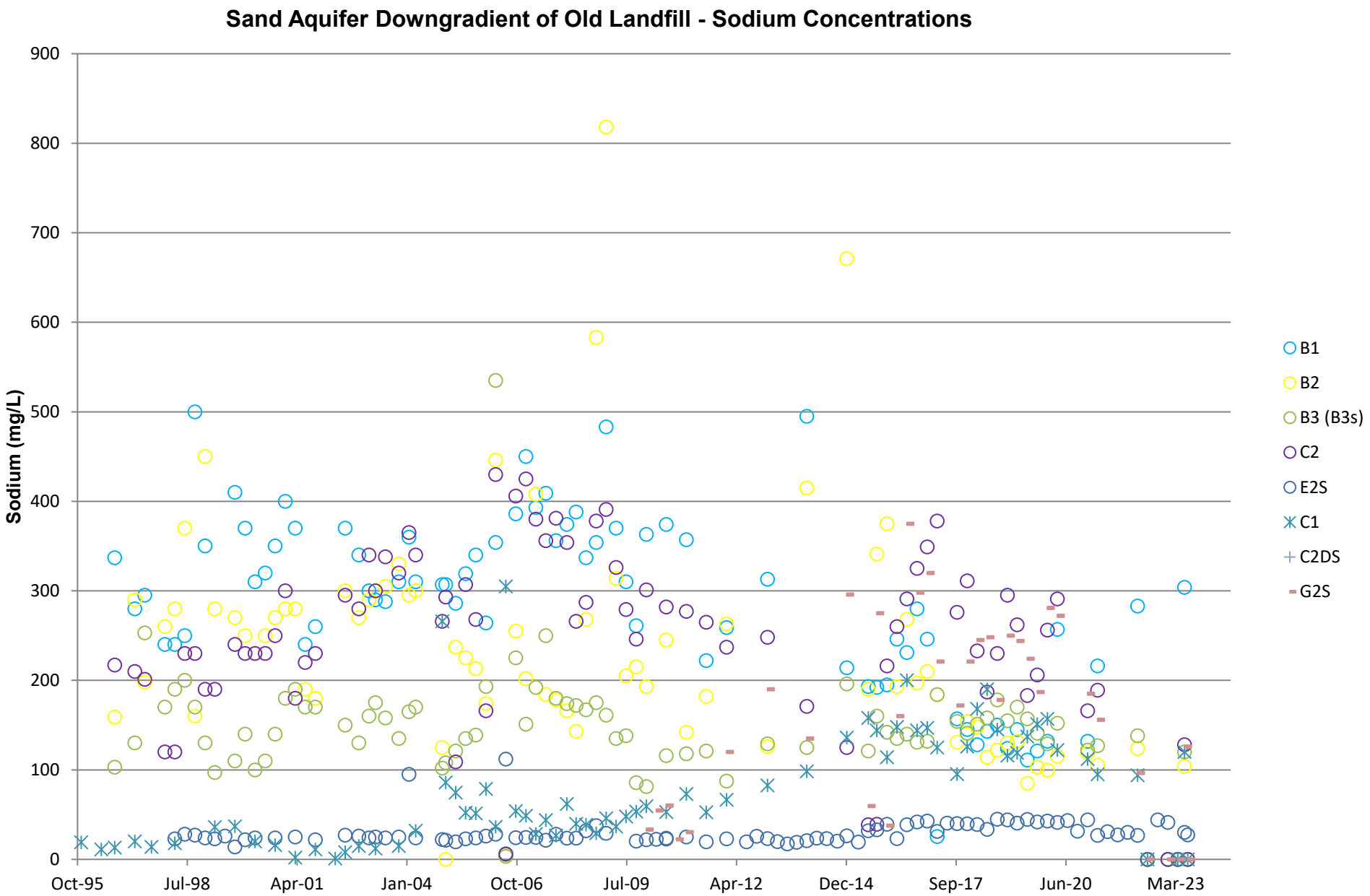

Gravel Aquifer - E. coli
E. coli (CFU/mL)
250
200
150
100
50
0
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
E1D
C2DD
E2D
G1D
NZDWS MAV E. coli Trigger Value

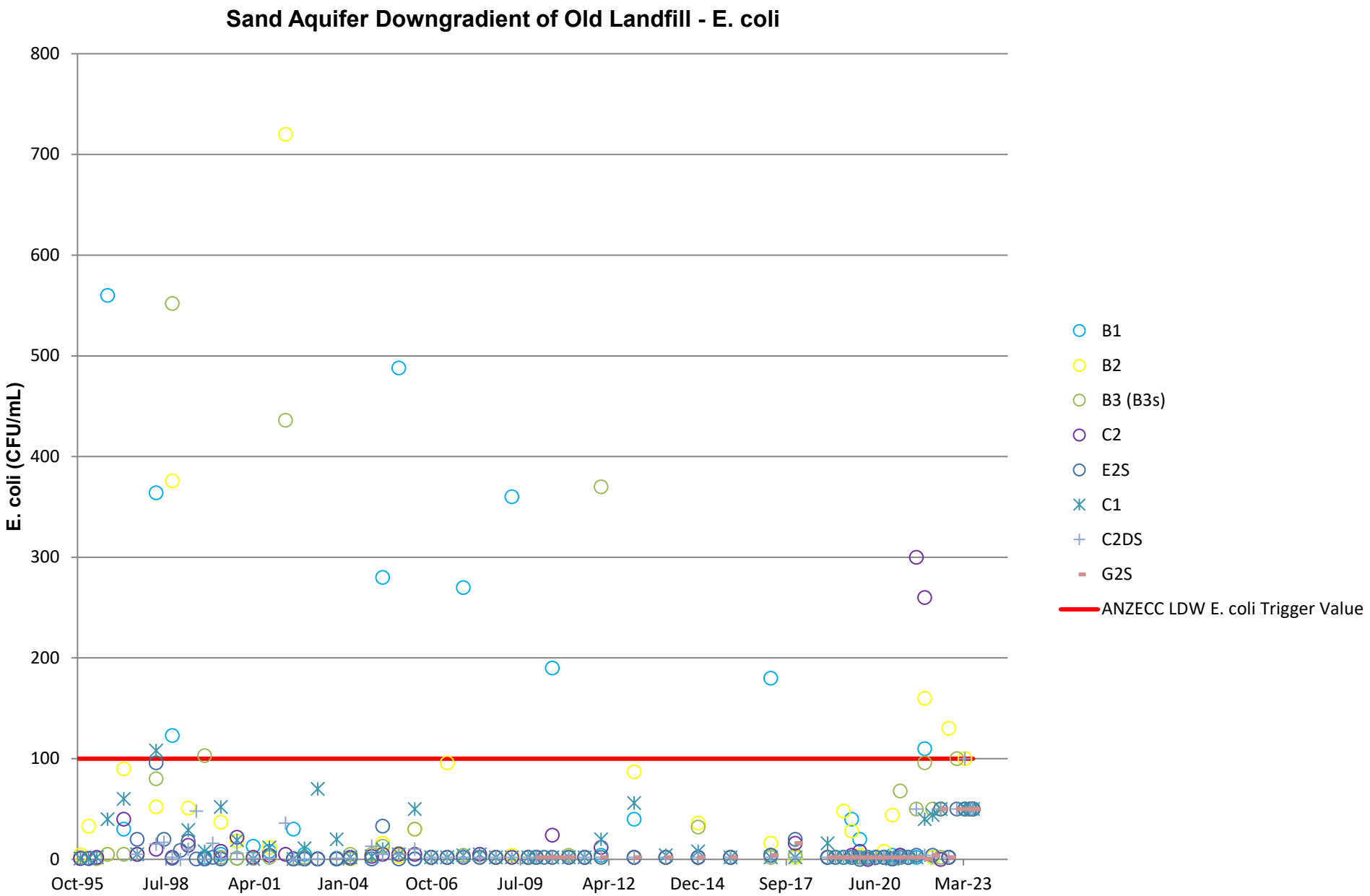

Sand Aquifer Downgradient of Old Landfill - Boron Concentrations
Boron (mg/L)
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
B1
B2
B3 (B3s)
C2
E2S
C1
C2DS
G2S


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

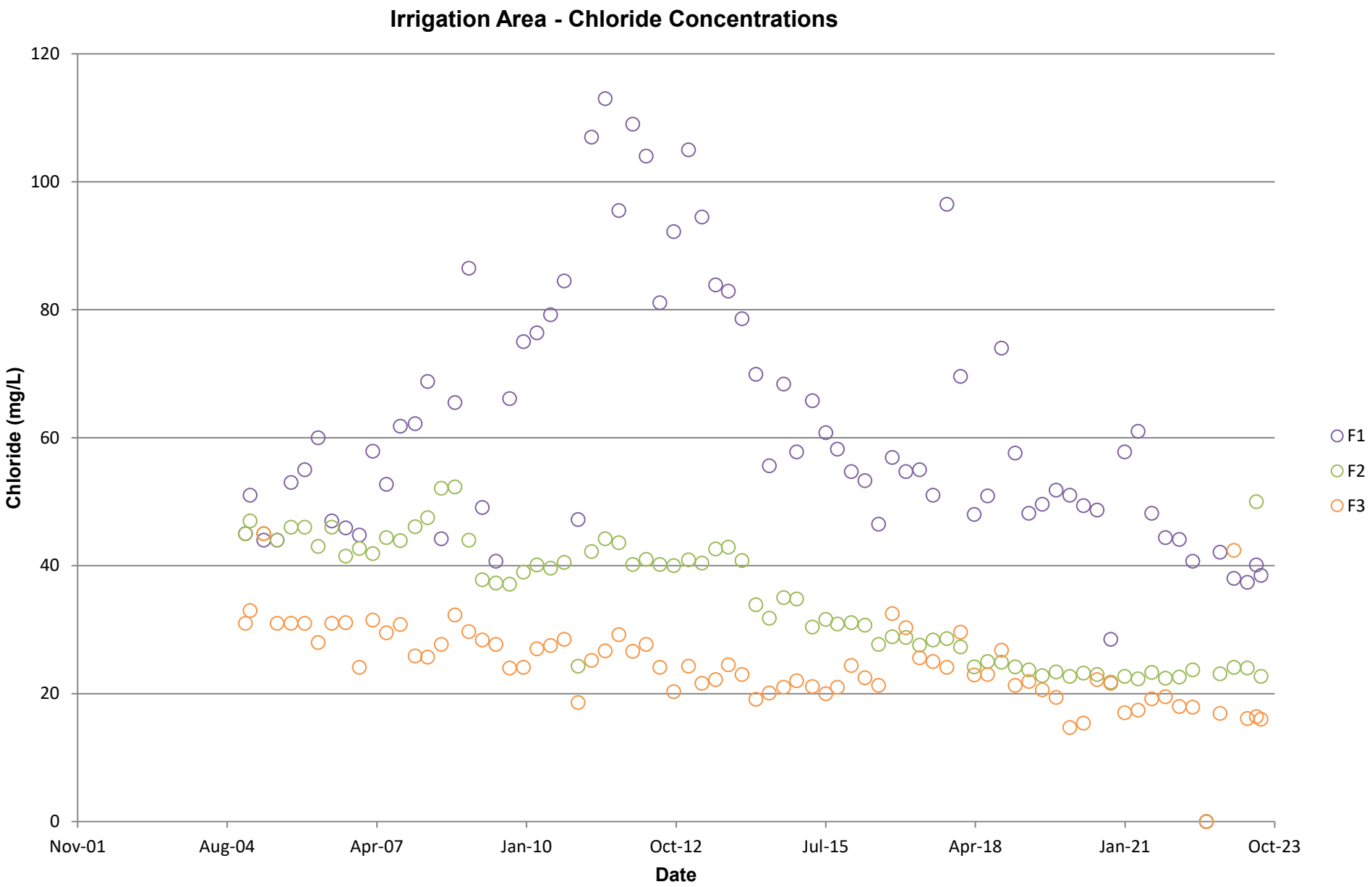

Sand Aquifer Downgradient of Old Landfill - Ammonia-N Concentrations
Ammonia-N (mg/L)
500
450
400
350
300
250
200
150
100
50
0
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
B1
B2
B3 (B3s)
C2
E2S
C1
C2DS
G2S

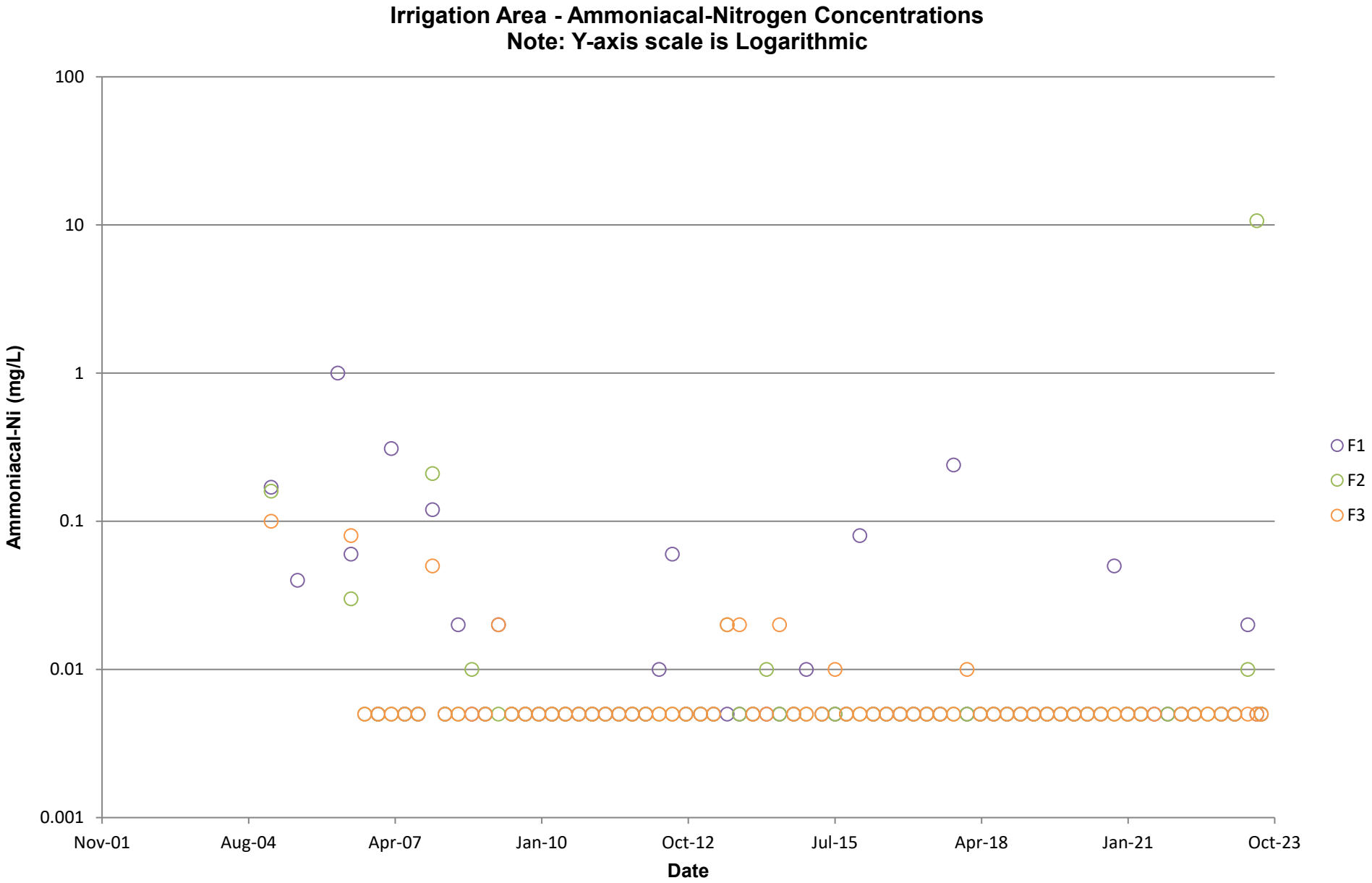

Sand Aquifer Downgradient of Old Landfill - Conductivity Levels
Conductivity (mS/m)
800
700
600
500
400
300
200
100
0
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
B1
B2
B3 (B3s)
C2
E2S
C1
C2DS
G2S

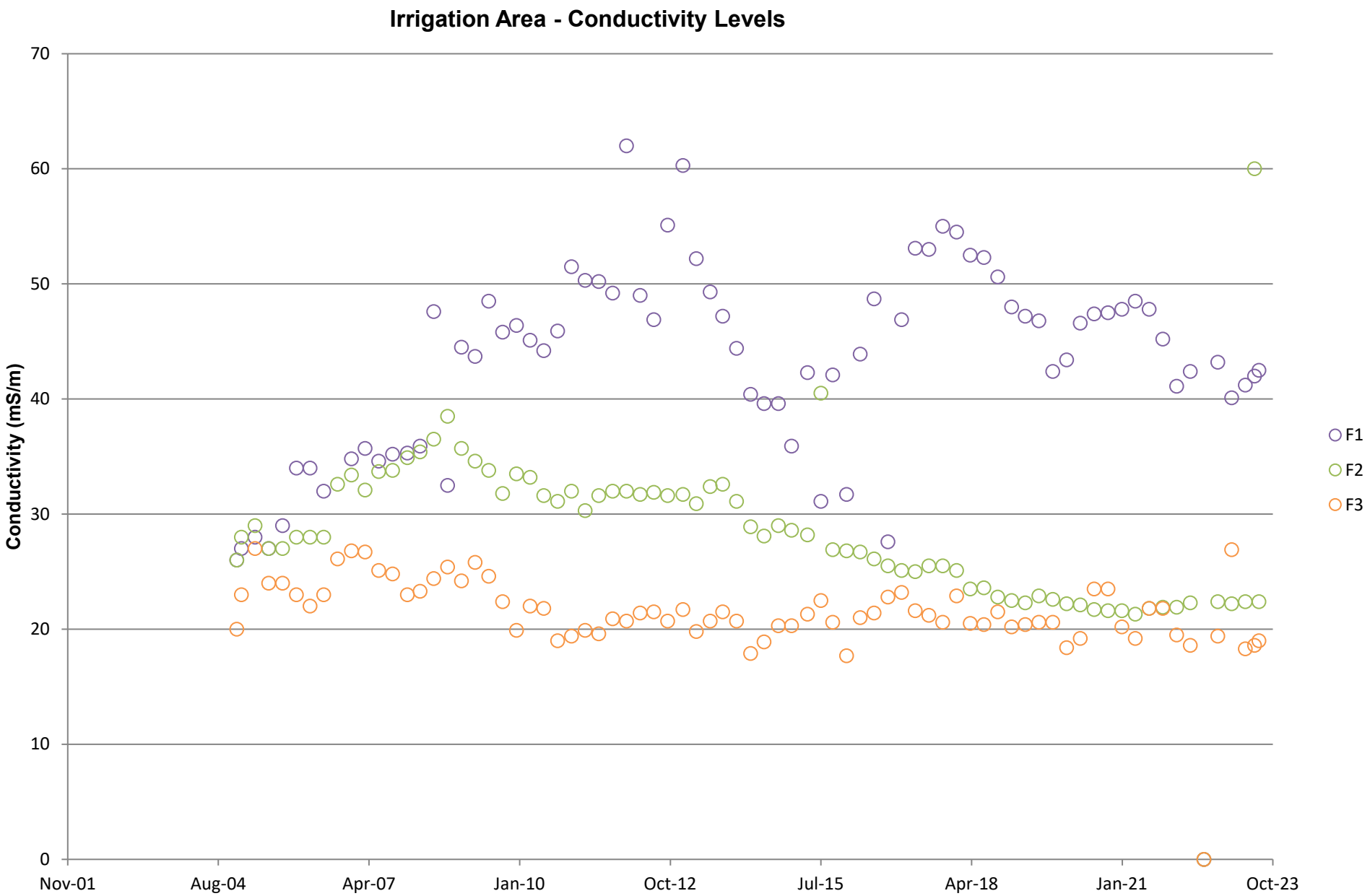

Sand Aquifer Downgradient of Old Landfill - Sodium Concentrations
Sodium (mg/L)
900
800
700
600
500
400
300
200
100
0
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
B1
B2
B3 (B3s)
C2
E2S
C1
C2DS
G2S

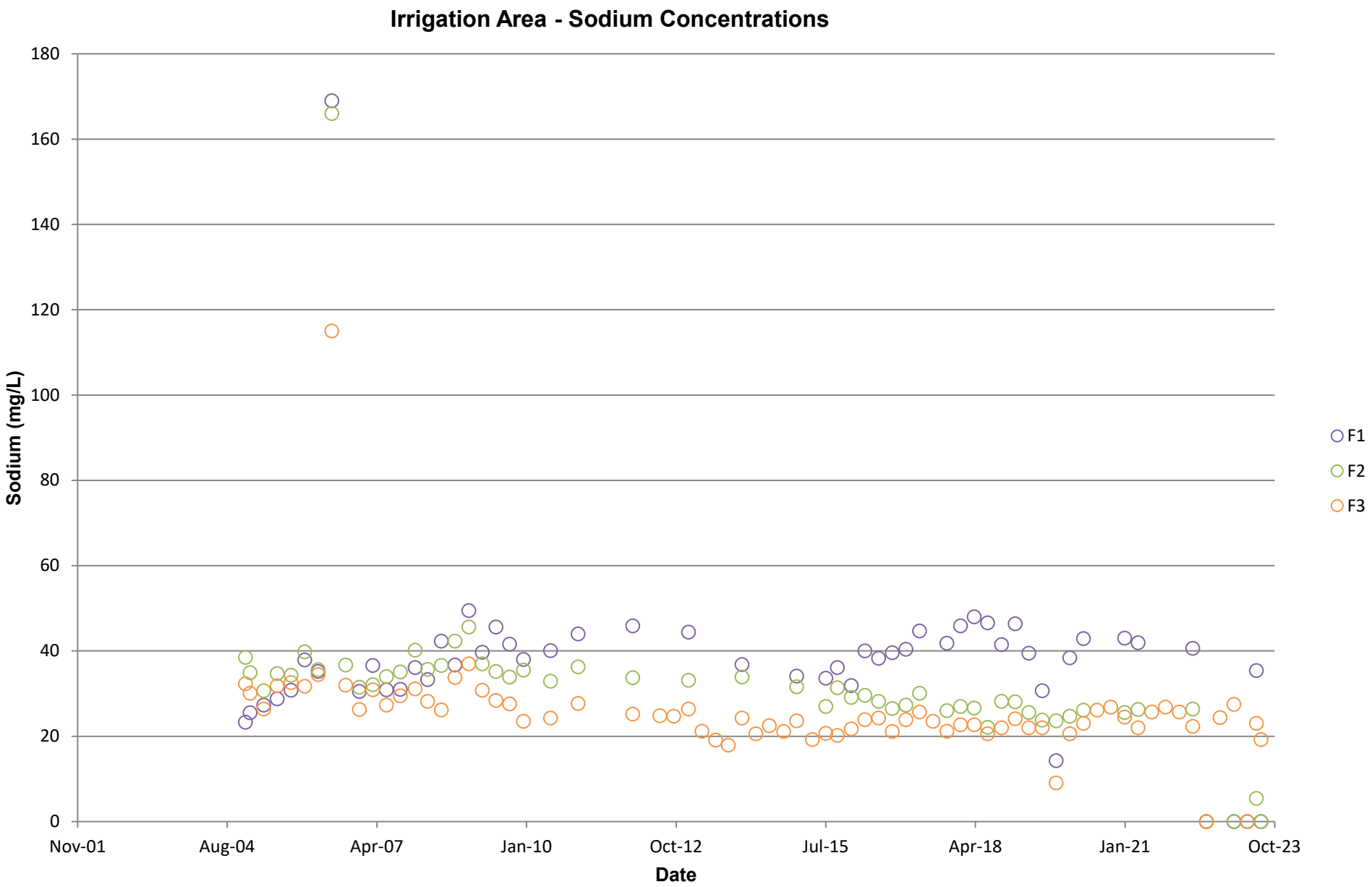

Sand Aquifer Downgradient of Old Landfill - E. coli
E. coli (CFU/mL)
800
700
600
500
400
300
200
100
0
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
B1
B2
B3 (B3s)
C2
E2S
C1
C2DS
G2S
ANZECC LDW E. coli Trigger Value

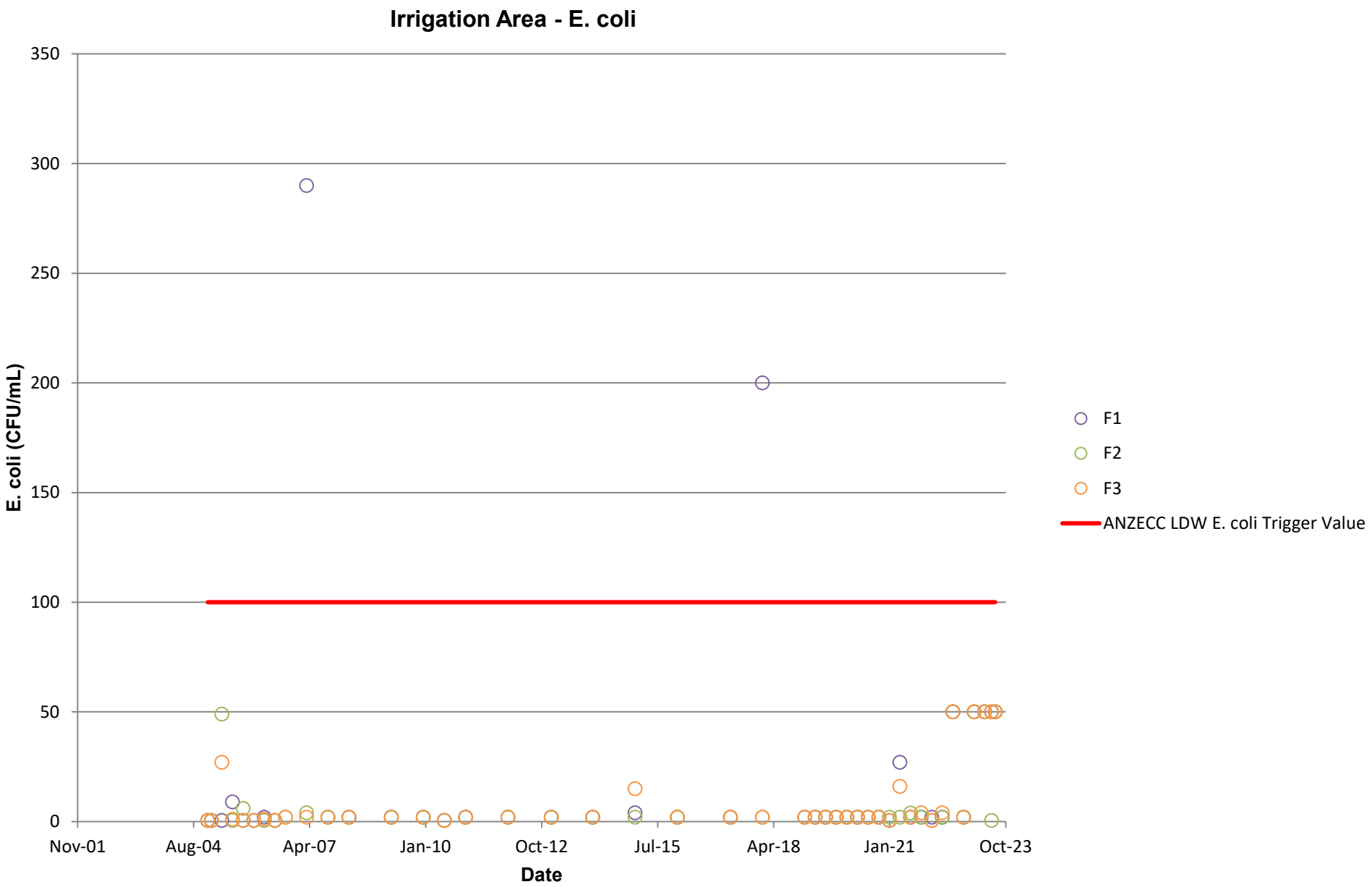

Irrigation Area - Boron Concentrations
Boron (mg/L)
400
350
300
250
200
150
100
50
0
Nov-01
Aug-04
Apr-07
Jan-10
Oct-12
Jul-15
Apr-18
Jan-21
Oct-23
F1
F2
F3

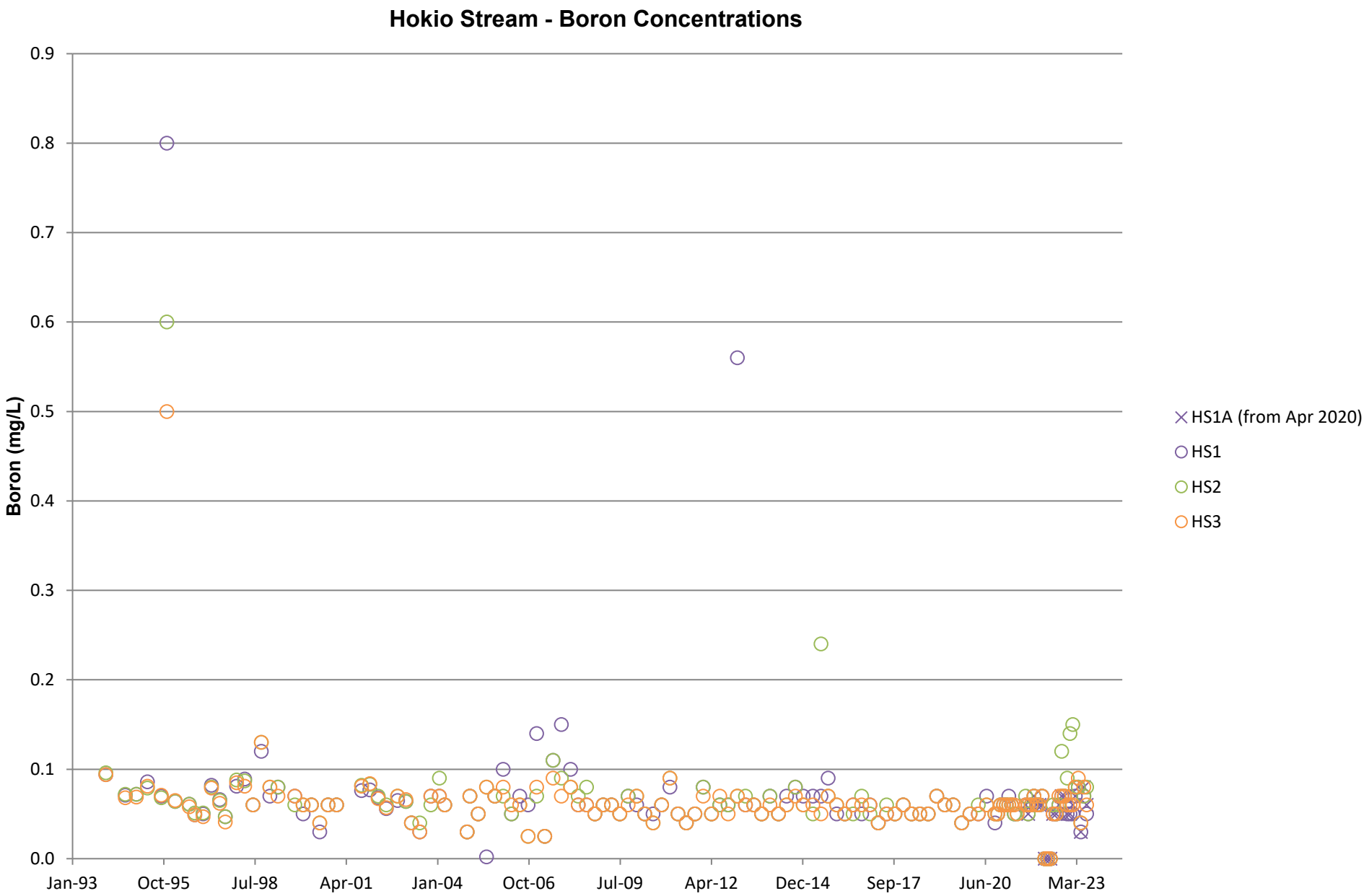

Irrigation Area - Chloride Concentrations
Chloride (mg/L)
120
100
80
60
40
20
0
Nov-01
Aug-04
Apr-07
Jan-10
Oct-12
Jul-15
Apr-18
Jan-21
Oct-23
Date
F1
F2
F3

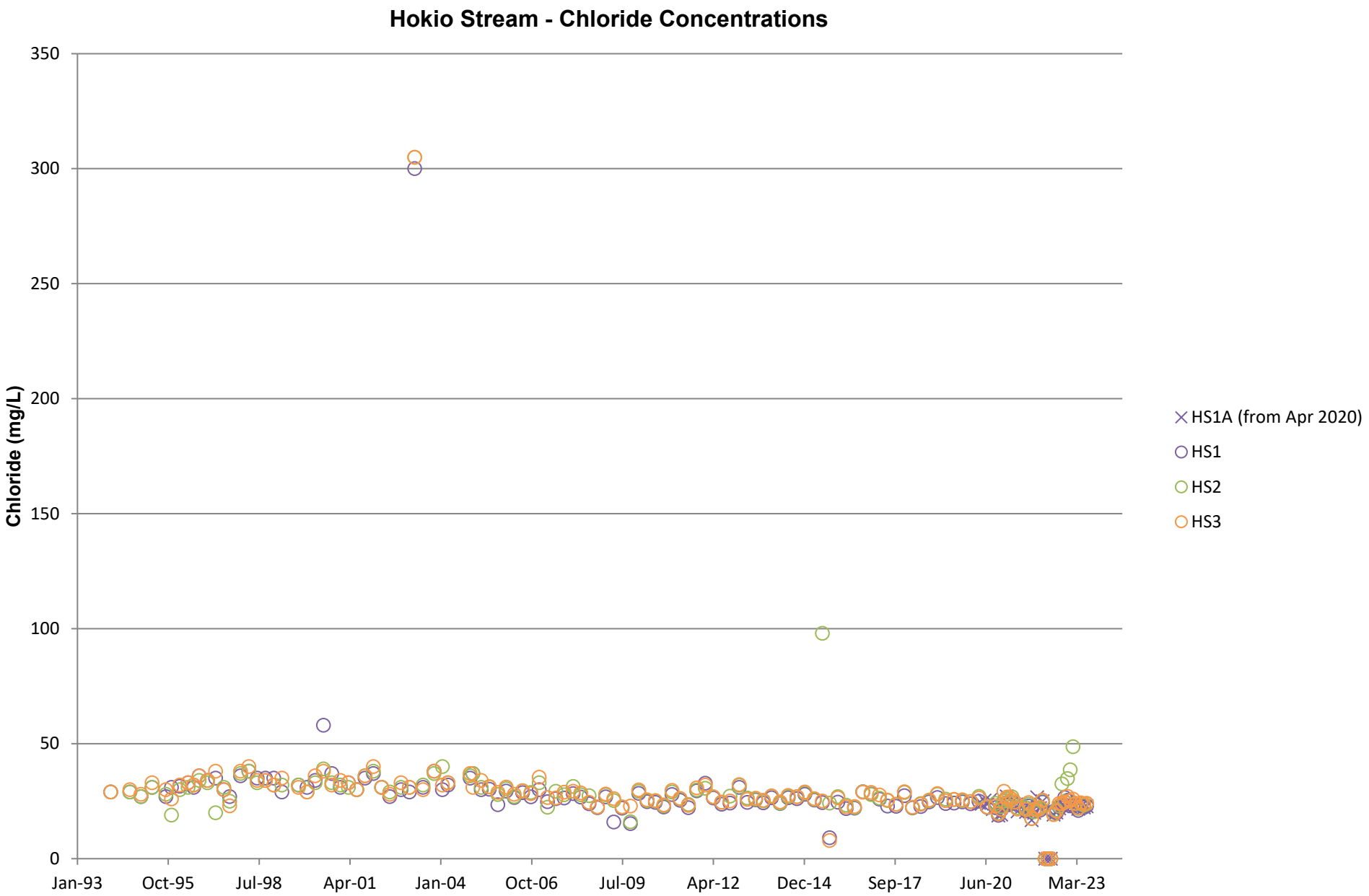

Irrigation Area - Ammoniacal-Nitrogen Concentrations
Note: Y-axis scale is Logarithmic
Ammoniacal-Ni (mg/L)
100
10
1
0.1
0.01
0.001
Nov-01
Aug-04
Apr-07
Jan-10
Oct-12
Jul-15
Apr-18
Jan-21
Oct-23
Date
F1
F2
F3

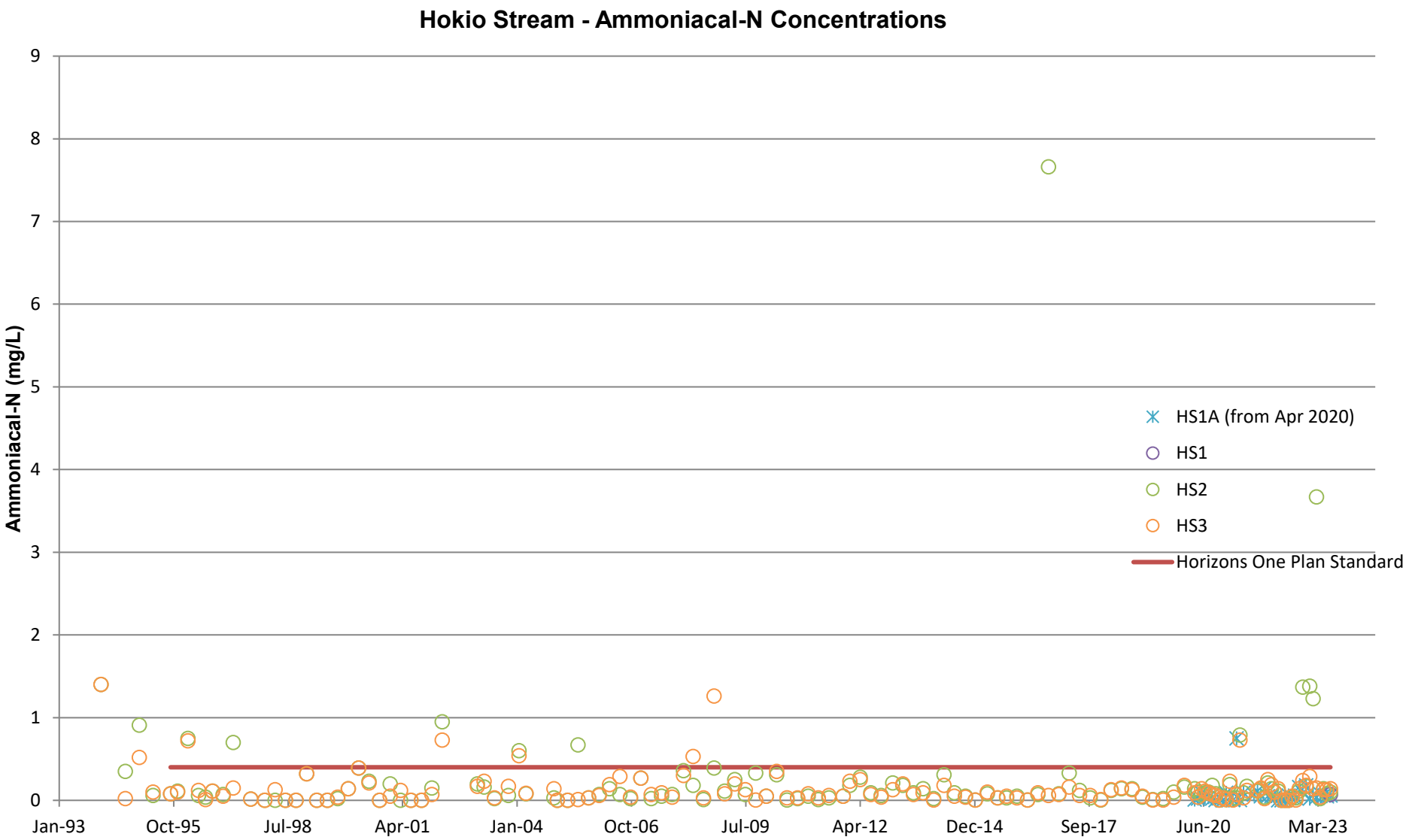

Irrigation Area - Conductivity Levels
Conductivity (mS/m)
70
60
50
40
30
20
10
0
Nov-01
Aug-04
Apr-07
Jan-10
Oct-12
Jul-15
Apr-18
Jan-21
Oct-23
F1
F2
F3

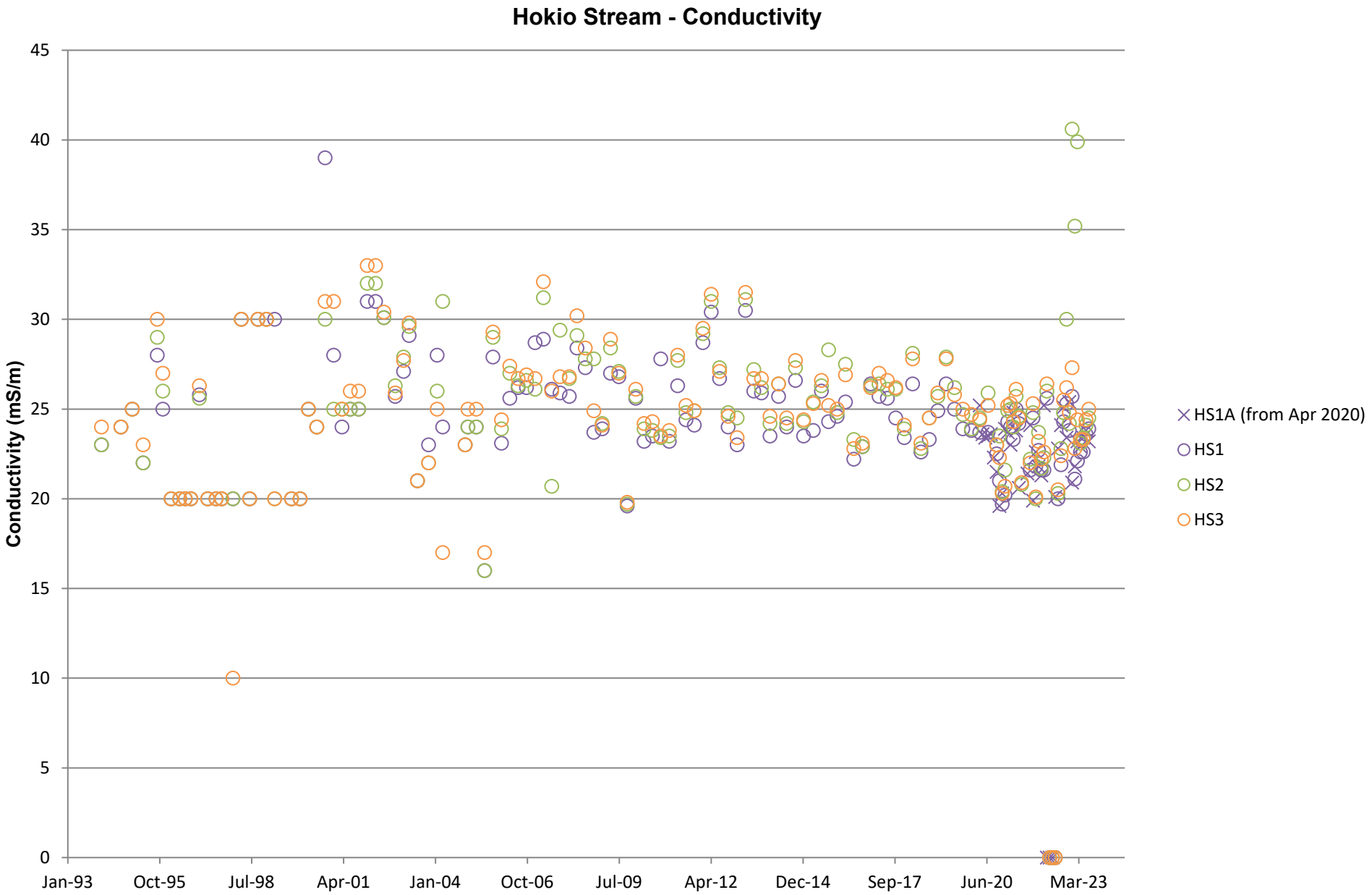

Irrigation Area - Sodium Concentrations
Sodium (mg/L)
180
160
140
120
100
80
60
40
20
0
Nov-01
Aug-04
Apr-07
Jan-10
Oct-12
Jul-15
Apr-18
Jan-21
Oct-23
Date
F1
F2
F3

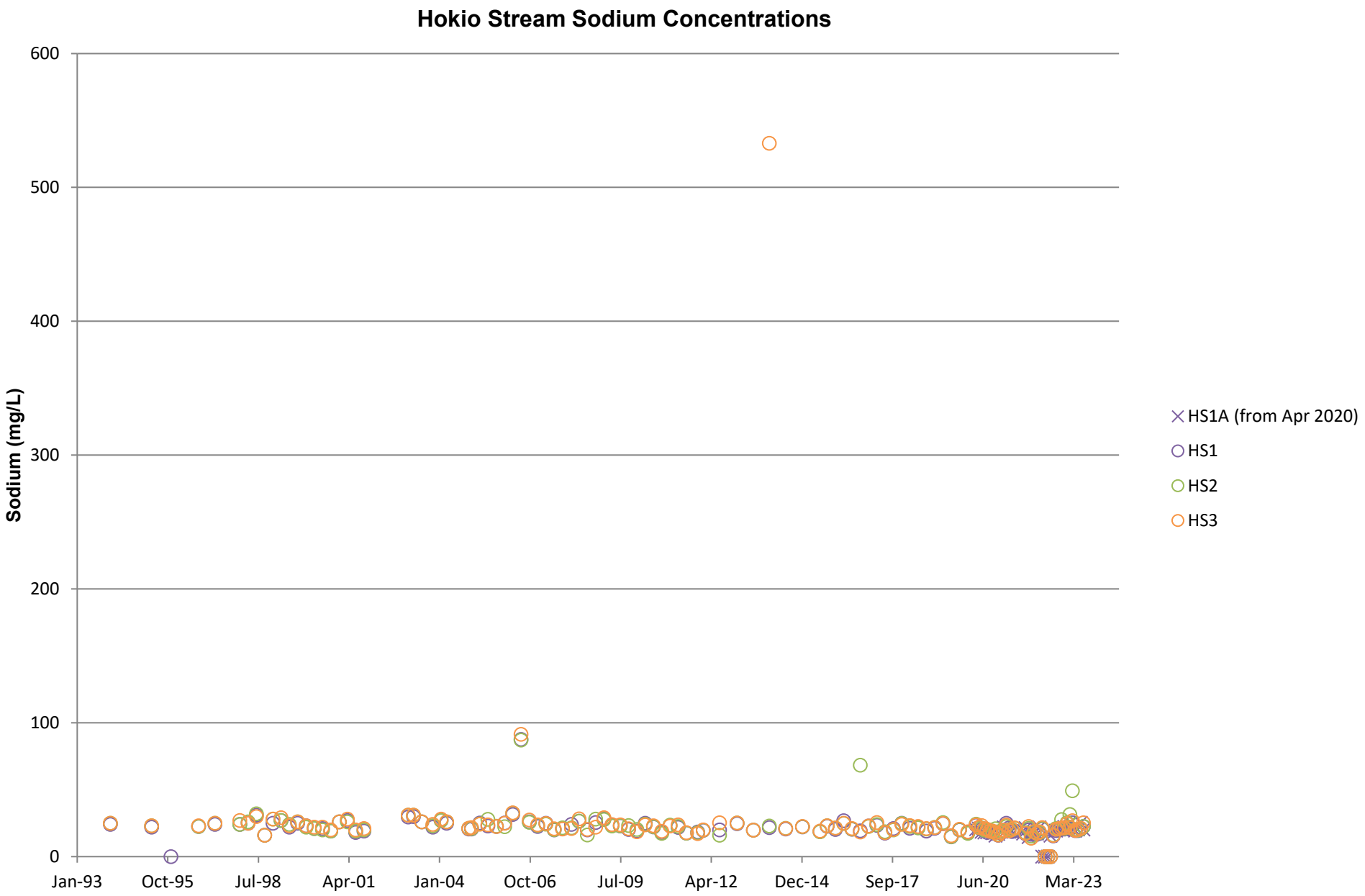

Irrigation Area - E. coli
E. coli (CFU/mL)
350
300
250
200
150
100
50
0
Nov-01
Aug-04
Apr-07
Jan-10
Oct-12
Jul-15
Apr-18
Jan-21
Oct-23
Date
F1
F2
F3
ANZECC LDW E. coli Trigger Value

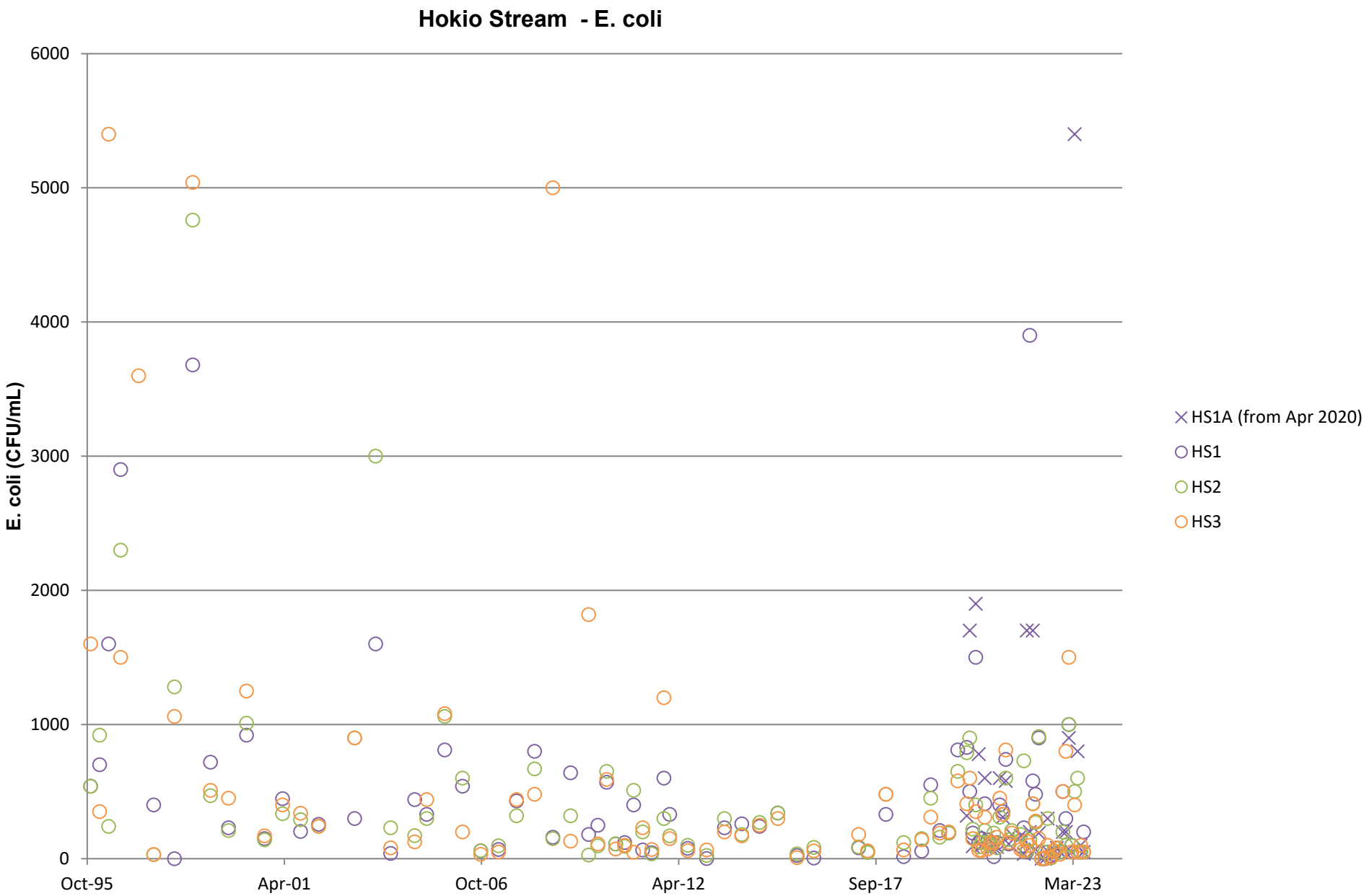

Hokio Stream - Boron Concentrations
Boron (mg/L)
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Jan-93
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
HS1A (from Apr 2020)
HS1
HS2
HS3


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 - 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 - 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


Hokio Stream - E. coli
E. coli (CFU/mL)
6000
5000
4000
3000
2000
1000
0
Oct-95
Apr-01
Oct-06
Apr-12
Sep-17
Mar-23
HS1A (from Apr 2020)
HS1
HS2
HS3

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

Entry Date	Borehole	Methane (CH_4) %	Carbon Dioxide (CO_2) %	Hydrogen Sulphide (H_2S) ppm	Oxygen (O_2) %	AIR TEMPERATURE °C
3/07/2023	Levin Landfill: Levin F2	0.00	0.06	0.00	20.8	12
3/07/2023	Levin Landfill: Levin G2s	0.00	0.1	0.00	20.6	9
3/07/2023	Levin Landfill: Levin F1	0.00	0.02	0.00	21.1	13
3/07/2023	Levin Landfill: Levin G1d	0.00	0.02	0.00	20.5	13
3/07/2023	Levin Landfill: Levin G1s	0.00	0.04	0.00	20.5	13
3/07/2023	Levin Landfill: Levin D2	0.00	0.17	0.00	20.4	13
3/07/2023	Levin Landfill: Levin D1	0.00	0.11	0.00	20.8	13
3/07/2023	Levin Landfill: Levin D6	0.00	0.34	0.00	21	13
3/07/2023	Levin Landfill: Levin D5	0.00	0.02	0.00	21.1	12
3/07/2023	Levin Landfill: Levin D4	0.00	0.04	0.00	21	12
3/07/2023	Levin Landfill: Levin E1s	0.00	0.03	0.00	21	12
3/07/2023	Levin Landfill: Levin E1d	0.00	0.06	0.00	21	12
3/07/2023	Levin Landfill: Levin F3	0.00	0.02	0.00	20.7	12
3/07/2023	Levin Landfill: Levin D3rd	0.00	0.04	0.00	20.7	12
3/07/2023	Levin Landfill: Levin D3rs	0.00	0.05	0.00	208	9
3/07/2023	Levin Landfill: Levin B2	0.00	0.67	0.00	18.9	8
3/07/2023	Levin Landfill: Levin C2ds	0.00	0.12	0.00	20.2	8
3/07/2023	Levin Landfill: Levin C2dd	0.00	0.11	0.00	20.3	8
3/07/2023	Levin Landfill: Levin C2	0.00	0.21	0.00	20.3	8
3/07/2023	Levin Landfill: Levin B3s	0.00	0.13	0.00	20.4	8
3/07/2023	Levin Landfill: Levin E2s	0.00	0.14	0.00	20.4	8
3/07/2023	Levin Landfill: Levin E2d	0.00	0.13	0.00	20.5	8
3/07/2023	Levin Landfill: Levin B1	0.00	0.6	0.00	20.1	8
3/07/2023	Levin Landfill: Levin C1	0.00	0.59	0.00	20.7	9
3/07/2023	Levin Landfill: Levin Xd1	0.00	0.11	0.00	20.8	8
3/07/2023	Levin Landfill: Levin Xs1	0.00	0.2	0.00	20.7	8
3/07/2023	Levin Landfill: Levin Xs2	0.00	0.18	0.00	20.9	8

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.

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