LEVIN LANDFILL JULY 2020 QUARTERLY GROUNDWATER, SURFACE WATER AND LEACHATE MONITORING REPORT

PREPARED FOR HOROWHENUA DISTRICT COUNCIL

September 2020

Stantec

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Executive Summary

Horowhenua District Council (HDC) is required to carry out quarterly compliance monitoring of groundwater and surface water at the Levin Landfill, as part of the conditions on Resource Consents DP6009, DP6010, DP6011 and DP102259. This report summarises the findings for the July 2020 quarterly monitoring event, including monitoring results for:

- Background (natural) groundwater
- The landfill leachate
- Groundwater bores within the new landfill and old irrigation area
- Shallow aquifers, down-gradient of the old landfill
- The deep aquifer,
- Hokio Stream, and
- The Tatana Property drain.

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

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

Samples were collected from 23 groundwater bores, the landfill leachate (at a manhole next to the leachate pond) and five surface water sites during July 2020 from around and on the Levin Landfill, and were analysed for the parameters set out in Discharge Permit 6010.

These samples were collected progressively over a 14-day period, which is a longer period than the normally accepted 7 days. Extending the sampling timeframe means that there is less confidence in comparing results from different parts of the site.

The resource consent for the landfill (namely discharge permit 6010) contains 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) and 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 Aquatic Ecosystems (ANZECC AE) 95% trigger values, as provided under the revised Resource Consent Condition approved in December 2019.

The July 2020 monitoring results have been assessed against these limits, where they are applicable.

Nine non-compliances with resource consent conditions were recorded at seven individual monitoring locations, as follows:

- Exceedance of the ANZECC LDW trigger value for nitrate-N (at bore B2) in the shallow aquifer. Nitrate-N is usually elevated for this bore, but not to the extent seen this sampling round (133 mg/L).
- Exceedance of DWSNZ MAV for manganese (at bore C2DD) in the deep gravel aquifer. This is a normal occurrence for this bore.
- The ANZECC AE 95% trigger values for nitrate-N and ammoniacal-N were exceeded at Tatana Property drain (TD1).
- The ANZECC AE 95% trigger value for dissolved copper was exceeded at one monitoring location within Hokio Stream (HS1A (new)). The value was slightly higher than normal but still within the historic range.
- The ANZECC AE 95% trigger value for nitrate-N was exceeded at four monitoring locations within Hokio Stream (HS1A (new), HS1, HS2, and HS3).

The July 2020 results were also considered within 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 aluminium and iron concentrations in the same bore indicate that groundwater could be being impacted by up-gradient activities unrelated to the landfill operations.

Results from a sample of leachate ,taken from a manhole next to the leachate pond, were within the range of data obtained from previous monitoring events at the leachate and are generally well below those recorded at typical Class 1 landfills in New Zealand.

Horowhenua District Council

Levin Landfill JULY 2020 Quarterly Groundwater, Surface Water and Leachate Monitoring Report

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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. Until recently, monitoring has been undertaken every three months at 27 locations, as required by the previous resource consent conditions (namely for discharge permit 6010). These sampling locations consist of 23 boreholes penetrating the sand and gravel aquifers; three surface water sampling locations within Hokio Stream and a leachate sampling point, as shown in the Site Plan in Appendix A. In addition, HDC had agreed to undertake voluntary surface water monitoring at four locations along the Tatana Property drain.

The Levin Landfill site is comprised of two landfills: one old, closed and unlined landfill and one new, lined and active landfill. The new landfill footprint is being developed in stages. The most recent stage is Stage 3C which was developed in 2017, though landfill operations are also now occurring over the top of Stages 1A, 2 and 3C.

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 advised 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.

The 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 is in the process of acting on all the changes. The sampling that was done in the July 2020 sampling round has been in line with what has been done previously, but different 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 2020 quarterly monitoring round.

2. Groundwater and Surface Water Monitoring

2.1 Sample Analysis

Samples were collected by Downer (a contractor to HDC) between 1 and 14 July 2020. Samples were couriered overnight and analysed by Eurofins ELS Ltd in Lower Hutt, Wellington, the following day.

The sampling programme for April 2020 - January 2023 is summarised in the schedule in Appendix B. From July 2019, faecal coliform 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 faecal coliform counts will be assessed more frequently throughout each year, as compared to past monitoring.

Groundwater samples taken from the boreholes were analysed for the indicator suite of parameters which are outlined in Table 2-1, whilst surface water samples from Hokio Stream, and samples of landfill leachate effluent were analysed for the comprehensive suite of parameters. Surface water samples collected from the Tatana Property drain were analysed based on a specific parameter list that has been included in the reviewed resource consent conditions. From the April 2020 monitoring round onward, sampling of the Tatana Drain will follow the comprehensive and indicator suites of parameters used for other surface water sampling.

Note that, following the revision of the resource consent conditions which were approved in December 2019, soluble carbonaceous BOD_5 ($scBOD_5$) and soluble mercury (Hg) have each been added to the indicator and comprehensive suites of parameters, and E. coli 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 has commenced from the April 2020 sampling round.

Table 2-1: Indicator Parameters

Type	Parameters
Characteristics	pH Electrical Conductivity (EC)
Oxygen demand	Chemical Oxygen Demand (COD), scBOD$_5$$^{++}$
Nutrients*	Nitrate nitrogen (NO_3-N), Ammoniacal-nitrogen (NH_4-N)
Metals*	Aluminium, Iron**, Lead, Manganese, Nickel
Other elements	Boron, Chloride, Sodium**, Mercury^{++}
Biological^{+}	Faecal coliforms

Note: *Analyses performed for nutrients and metals are for dissolved rather than total concentrations. **Selected bores as per stormwater consent 102559
+Faecal coliforms added from July 2019 onwards (see Appendix B)

++Soluble carbonaceous BOD_5 (scBOD$_5$) and Soluble Mercury added as per revised consent conditions for Discharge Permit 6010, December 2019.

Note regarding interpretation of results below detection limits

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

The laboratory detection limit for E. coli is 4 CFU/100mL (4 Colony Forming Units/100mL). As the resource consent requires that groundwater results for E. coli be compared against the DWSNZ (for compliance), which sets a value of NIL (I.e. 0 CFU/100mL), we have chosen to indicate where E. coli organisms were not detected, rather than calculating a median as we would for chemical constituents (described above). This method has been applied in all instances where E. coli numbers are assessed for compliance with the DWSNZ.

2.2 Background Groundwater Quality

Water quality from the natural background 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 were 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 (bores G1S and G1D, Site Plan, Appendix A). These two bores were constructed in late 2009 to sample background water quality from the two main hydrogeological units.

The results are presented in Table 2-2. Bore F3 is also included in the background table as it is near the southern boundary of the landfill site (and further west) and is unlikely to be impacted by landfill activities. A full laboratory report containing analytical results is presented in Appendix C.

Table 2-2: Background Monitoring Results for July 2020

Determinant	Units	DWSNZ MAV	ANZECC LDW	G1S	G1D	F3
Water level	mBGL	-	-	14.3	14.75	6.6
pH	-	7 to 8.5*	6 to 9	6.6	7.2	7.1
Conductivity	mS/m	-	-	65.7	27.9	23.5
scBOD5	mg/L	-	-	*0.5*	*0.5*	*0.5*
COD	mg/L	-	-	74	*7.5*	*7.5*
Faecal coliforms	CFU/100ml	NIL	100	ND	ND	ND
Chloride	mg/L	250*	-	139	33	22.2
Nitrate-N	mg/L	11.3	90.3	0.07	*0.005*	1.55

Determinant	Units	DWSNZ MAV	ANZECC LDW	G1S	G1D	F3
Ammoniacal-N	mg/L	1.17	-	0.04	0.1	*0.005*
Sodium	mg/L	200*	-	101	Not applicable	26.1
Dissolved Aluminium	mg/L	0.1*	5	0.075	*0.001*	*0.001*
Dissolved Boron	mg/L	1.4	5	0.02	0.04	0.02
Dissolved Iron	mg/L	0.2*	-	**4.29**	Not applicable	*0.005*
Dissolved Lead	mg/L	0.01	0.1	*0.00025*	*0.00025*	*0.00025*
Dissolved Manganese	mg/L	0.4	-	0.078	0.067	*0.00025*
Dissolved Mercury	mg/L	0.007	0.002	*0.00025*	*0.00025*	*0.00025*
Dissolved Nickel	mg/L	0.08	1	0.0012	*0.00025*	*0.00025*

Notes:
*denotes guideline values for aesthetic determinants (G.V.)
copper trigger values range from 0.4 mg/L for sheep, up to 5 mg/L for poultry
Bold – denotes an exceedance of the relevant DWSNZ guidelines.
Underlined – denotes an exceedance of the ANZECC LDW Trigger Values.
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.

The results in Table 2-2 indicate that all background bores (G1S, G1D and F3) contain groundwater that has concentrations of all monitored parameters within the ANZECC LDW trigger values.

There was only one exceedance of the DWSNZ limits during the July 2020 monitoring round for dissolved iron at G1S.

It is noted that bores G1S and G1D are background bores and therefore any exceedances of the DWSNZ in these bores do not constitute non-compliances with the consent conditions.

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 respectively.

2.3.1 Shallow Aquifer

Bores D1, D2, D3(r), D4, D5, D6 and E1S (Refer to Site Plan, Appendix A) are located hydraulically up-gradient of the old landfill, but down-gradient of the new landfill. This means they are not influenced by potential leaching from the old landfill and can act as a warning system for any leaching from the new landfill. Borehole D4 is likely to show evidence of any leaching from the new landfill. 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 unlikely that leachate from the new landfill will significantly affect groundwater quality due to the leachate collection system which is in place at the new landfill; however, these bores would still give early warning of any potential problems.

The results from the July 2020 monitoring round for these bores are presented in Table 2-3 . 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.

There were no **exceedances of the resource consent conditions** during the July 2020 monitoring round.

Table 2-3: D-Series and E1S Monitoring Bore Results for July 2020

Determinant	Units	ANZECC LDW	D1	D2	D3(r)	D4	D5	D6	E1S
Water level	mBGL	-	17.0	21.6	4.7	8.1	9.62	15.3	11.6
pH	-	6 to 9	6.7	6.4	6.8	6.9	7.1	6.8	7
Conductivity	mS/m	-	48.9	35.6	21.8	30.2	29.5	42.6	26.4
scBOD5	mg/L	-	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	5.9
COD	mg/L	-	*7.5*	48	16	*7.5*	*7.5*	*7.5*	19
Faecal coliforms	CFU/100ml	100	ND	32	ND	8	ND	ND	ND
Chloride	mg/L	-	28.9	34.6	22.1	43.9	29.8	22.1	28.7
Nitrate-N	mg/L	90.3	11.4	*0.005*	0.18	*0.005*	1.44	23.9	*0.005*
Ammoniacal-N	mg/L	-	*0.005*	0.62	0.18	0.22	*0.005*	*0.005*	0.18
Sodium	mg/L	-	Not applicable	32.6	25.7	33.4	Not applicable	Not applicable	29.2
Dissolved Aluminium	mg/L	5	*0.001*	0.013	*0.001*	*0.001*	*0.001*	*0.001*	0.009
Dissolved Boron	mg/L	5	0.05	0.04	0.03	0.08	0.03	0.05	0.02
Dissolved Iron	mg/L	-	Not applicable	10.9	2.6	0.38	Not applicable	Not applicable	4.83
Dissolved Lead	mg/L	0.1	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	0.0022
Dissolved Manganese	mg/L	-	*0.00025*	0.318	0.166	0.18	0.006	0.0006	0.229
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*

Notes:
Bold – denotes an exceedance of the ANZECC LDW trigger values.
All `<' values have been reported as half the detection limit for statistical purposes and are expressed in italics.
copper trigger values range from 0.4 mg/L for sheep, up to 5 mg/L for poultry
'ND' indicates where E. coli were not detected

2.3.2 Deep Gravel Aquifer

Bores E1D, C2DD, E2D and G1D 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.

Results for the July 2020 compliance monitoring round are presented in Table 2-4. The results have been compared with the DWSNZ as per the requirements of discharge consent 6010. The full laboratory report is included in Appendix C.

Table 2-4: Results for Monitoring Bores within the Deep Aquifer for July 2020

Determinant	Units	DWSNZ MAV	E1D	C2DD	E2D
Water level	mBGL	-	11.32	3.73	6.17
pH	-	7 to 8.5*	7.7	7.6	7.8
Conductivity	mS/m	-	44.3	52.9	36.4
scBOD5	mg/L	-	*0.5*	*0.5*	*0.5*
COD	mg/L	-	23	*7.5*	*7.5*
Faecal coliforms	CFU/100ml	NIL	ND	ND	ND
Chloride	mg/L	250*	40.1	40	48.1
Nitrate-N	mg/L	11.3	*0.005*	2.6	*0.005*
Ammonia-N	mg/L	1.17	0.22	0.3	0.3
Sodium	mg/L	200*	37.1	Not applicable	Not applicable
Dissolved Aluminium	mg/L	0.1*	0.003	*0.001*	*0.001*
Dissolved Boron	mg/L	1.4	0.05	0.06	*0.015*
Dissolved Iron	mg/L	0.2*	0.02	Not applicable	Not applicable
Dissolved Lead	mg/L	0.01	*0.00025*	*0.00025*	*0.00025*
Dissolved Manganese	mg/L	0.4	0.226	**0.6**	0.226
Dissolved Mercury	mg/L	0.007	*0.00025*	*0.00025*	*0.00025*
Dissolved Nickel	mg/L	0.08	*0.00025*	*0.00025*	*0.00025*

Notes:
* denotes guideline values for aesthetic determinants (G.V.).
Bold – denotes an exceedance of the relevant DWSNZ (2008) standard.
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.
'ND' indicates where E. coli were not detected.

There was **one exceedance of the resource consent conditions** in samples from the deep gravel aquifer during the July 2020 sampling round, i.e.

- Dissolved manganese concentration in bore C2DD was marginally above the DWSNZ MAV.

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 50 m 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 (See Site Plan, Appendix A).

The results from the July 2020 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 discharge consent 6010. The full laboratory report is included in Appendix C.

There was one exceedance of the ANZECC LDW trigger values during the July 2020 monitoring round at B2 for Nitrate-N contamination. Therefore, these **results show non-compliance with the resource consent conditions**.

Table 2-5: Monitoring Results for Shallow Boreholes Down-Gradient from the Old Landfill for July 2020

Determinant	Units	ANZECC LDW	E2S	B1	B2	B3	C1	C2	C2DS	G2S
Water level	mBGL	-	5.55	1	1.13	0.15	0.1	0.2	3.69	2.11
pH	-	6 to 9	7.4	6.8	6.6	7.0	6.7	6.9	6.8	7.2
Conductivity	mS/m	-	43.8	203	250	291	132	245	163	104
scBOD5	mg/L	-	*0.5*	*0.5*	*3*	*3*	*0.5*	*3*	*0.5*	*0.5*
COD	mg/L	-	*7.5*	87	76	198	54	105	94	40
Faecal coliforms	CFU/100ml	100	ND	ND	ND	ND	ND	ND	ND	ND
Chloride	mg/L	-	40.7	354	134	162	237	212	109	136
Nitrate-N	mg/L	90.3	*0.005*	6.6	**133**	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Ammoniacal-N	mg/L	-	0.26	12.4	30.7	177	6.52	140	1.6	0.02
Sodium	mg/L	-	43.4	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Dissolved Aluminium	mg/L	5	*0.001*	0.004	0.011	0.006	0.007	0.014	0.003	0.003
Dissolved Boron	mg/L	5	0.05	1.07	1.65	1.35	0.69	1.81	1.39	1.06
Dissolved Iron	mg/L	-	0.06	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Dissolved Lead	mg/L	0.1	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*
Dissolved Manganese	mg/L	-	0.377	10.7	4.8	3.4	0.4	0.0402	2.3	0.0838
Dissolved Mercury	mg/L	0.002	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*
Dissolved Nickel	mg/L	1	*0.00025*	0.0028	0.0026	0.0118	0.0009	0.0041	0.0029	0.0036

Notes:
Bold – denotes an exceedance of the ANZECC LDW trigger values.
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.
copper trigger values range from 0.4 mg/L for sheep, up to 5 mg/L for poultry
'ND' indicates where E. coli were not detected.

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. F2 and F3 boreholes are in an area that was set aside for leachate irrigation but never used as such. 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 the discharge consent 6010. The full laboratory report is included in Appendix C.

There were no **exceedances of the resource consent conditions** during the July 2020 monitoring round.

Table 2-6: Results from Monitoring Bores in the Irrigation Area for July 2020

Determinant	Units	ANZECC LDW	F1	F2	F3
Water level	mBGL	-	7.8	3.77	6.6
pH	-	6 to 9	6.9	7.1	7.1
Conductivity	mS/m	-	47.4	21.7	23.5
scBOD5	mg/L	-	*0.5*	*0.5*	*0.5*
COD	mg/L	-	26	*7.5*	*7.5*
Faecal coliforms	CFU/100ml	100	ND	ND	ND
Chloride	mg/L	-	48.7	23	22.2
Nitrate-N	mg/L	90.3	0.98	0.43	1.55
Ammoniacal-N	mg/L	-	*0.005*	*0.005*	*0.005*
Sodium	mg/L	-	Not applicable	Not applicable	26.1
Dissolved Aluminium	mg/L	5	0.002	*0.001*	*0.001*
Dissolved Boron	mg/L	5	0.03	0.04	0.02
Dissolved Iron	mg/L	-	Not applicable	Not applicable	*0.005*
Dissolved Lead	mg/L	0.1	*0.00025*	*0.00025*	*0.00025*
Dissolved Manganese	mg/L	-	0.018	0.004	*0.00025*
Dissolved Mercury	mg/L	0.002	*0.00025*	*0.00025*	*0.00025*
Dissolved Nickel	mg/L	1	0.0009	*0.00025*	*0.00025*

Notes:
Bold – denotes an exceedance of the ANZECC LDW trigger values.
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.
copper trigger values range from 0.4 mg/L for sheep, up to 5 mg/L for poultry
'ND' indicates where E. coli were not detected.

2.6 Leachate Effluent Results

Leachate effluent from the landfill is **not subject to any water quality consent conditions**. However, for comparison purposes, typical leachate characteristics for landfills, as published by the Waste Management Institute New Zealand (*Technical Guidelines for Disposal to Land*, August 2018, WasteMINZ), have been compared against the leachate quality monitoring results (Table 2-7). The full laboratory report is included in Appendix C. Table 2-7 shows that the concentrations of monitored parameters for leachate effluent samples collected in May, June and July 2020 were within the typical ranges to be expected for this type of landfill.

Table 2-7: Results from Leachate Effluent Monitoring for May, June and July 2020

Determinant	Units	Typical Leachate Characteristics*	Leachate Effluent		
		(range)	May	June	July
pH		5.9 - 8.5	8.2	7.9	7.7
Suspended Solids	mg/l	-	90	80	150
Phenol	mg/L	-	0.06	0.04	0.04
VFA	mg/L	-	6	4.9	36
TOC	mg/L	-	804	622	592
Alkalinity	mg CaCO3/L	-	6370	5780	5490
Conductivity	mS/m	308 – 27,900	1490	1420	135
COD	mg/L	84 – 5,090	1550	2200	2470
scBOD5	mg/L	-	81	79	73
E-Coli	CFU/100mL	-	200	100	65000
Chloride	mg/L	45 – 2,584	1150	1170	1050
Nitrate-N	mg/L	-	11.8	8.93	11.70
Sulphate	mg/L	-	210	294	216
Ammonia-N	mg/L	3.4 – 1,440	1300	1170	1140
Hardness	mg CaCO3/L	-	517	514	577
Calcium	mg/L	-	106	113	131
Magnesium	mg/L	-	61.4	55.9	60.6
Potassium	mg/L	-	7.85	832	625
Sodium	mg/L	50 – 4,000**	1050	887	913
D.R. Phosphorus	mg/L	-	9.71	6.99	8.73
Dissolved Aluminium	mg/L	-	0.026	0.577	0.402
Dissolved Arsenic	mg/L	-	0.001	0.405	0.306
Dissolved Boron	mg/L	0.54 – 20.1	0.07	8.06	5.57
Dissolved Cadmium	mg/L	-	*0.0001*	0.001	*0.0001*
Dissolved Chromium	mg/L	-	*0.0005*	0.697	0.506
Dissolved Copper	mg/L	-	0.0007	0.0225	0.0290
Dissolved Iron	mg/L	1.6 – 220	6.61	4.3	4.41
Dissolved Lead	mg/L	0.001 - 0.42	*0.00025*	0.0052	0.0028
Dissolved Manganese	mg/L	0.3 - 45***	0.0992	1.16	1.13
Dissolved Mercury	mg/L	0.2 - 50	*0.00025*	*0.00025*	*0.00025*
Dissolved Nickel	mg/L	0.02 – 2.05**	*0.00025*	0.147	0.111
Dissolved Zinc	mg/L	-	0.001	0.155	0.119

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

2.7 Tatana Property Drain

A drain is located on the Tatana property (see Site Plan in Appendix A). Since July 2015 HDC has agreed to sample surface water from the 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).

The revised consent conditions have now reduced the extent of sampling to one location. This is known as 'TD1' and it is the same sampling location as for the previous 'SW3'.

Results from the July 2020 sampling round are presented in Table 2-8 and have been compared with the ANZECC AE[1] 95% trigger values as per the revised resource consent conditions.

Table 2-8: Tatana Drain Monitoring Results for July 2020

Determinant	Units	ANZECC AE (95%)	TD1 (formerly SW3)
pH	-	-	7.0
Conductivity	mS/m	-	184
COD	mg/L	-	562
scBOD5	mg/L	2	*3*
E-Coli	CFU/100ml	-	7500
Chloride	mg/L	-	321
Nitrate-N	mg/L	0.16	**1.21**
Ammoniacal-N	mg/L	2.1	**43.2**
Dissolved Aluminium	mg/L	0.055	0.022
Dissolved Boron	mg/L	-	0.810
Dissolved Lead	mg/L	0.0034	*0.00025*
Dissolved Manganese	mg/L	1.9	0.36
Dissolved Mercury	mg/L	0.0006	*0.00025*
Dissolved Nickel	mg/L	0.011	0.0032

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

There were **two exceedance of the resource consent conditions** in samples from the Tatana Drain property at TD1 during the July 2020 sampling round as follows:

- Nitrate-N concentration was above the ANZECC AE 95% trigger value
- Ammoniacal-N concentration was above the ANZECC AE 95% trigger value

While ScBOD5 appears to be above the trigger level, it was actually below the detection limit of 6 mg/L which means that it is reported as being 3mg/L, and so cannot be confirmed as exceeding the trigger level.

2.8 Hokio Stream

Surface water grab samples are obtained from Hokio Stream at sites HS1A, HS1, HS2 and HS3 (refer to Appendix A) to investigate whether groundwater containing leachate is having an adverse environmental effect on the stream. Sites HS1A and HS1 are situated up-stream of the old landfill, HS2 is situated alongside the old landfill and up-stream of the Tatana Property Drain discharge, and HS3 is located approximately 50m down-stream of the landfill site property boundary and the Tatana Property Drain discharge. Samples from these monitoring locations on Hokio Stream are analysed for comprehensive parameters every month (as shown in Appendix B).

Results from the May, June and July 2020 sampling rounds are presented in Table 2-9 and have been compared with the ANZECC AE 95% trigger values as per the revised resource consent conditions.

Monitoring for scBOD5 and soluble mercury concentrations have now been added as per the revised Resource Consent conditions.

[1]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

The revised conditions have been recently implemented and monitoring of these additional parameters and at the new location commenced during the April 2020 monitoring round.

Table 2-9: Hokio Stream Monitoring Results for May, June and July 2020

Determinant	Units	ANZECC AE (95%)	Consent Trigger Values (Table C1)	HS1A (new)			HS1			HS2			HS3		
				May	June	July	May	June	July	May	June	July	May	June	July
pH	-	-	-	8.3	7.6	7.6	8.3	7.7	7.6	8.1	7.6	7.6	8.0	7.6	7.7
Suspended Solids	mg/l	-	-	36	20	23	36	52	21	33	87	29	31	85	20
Phenol	mg/L	0.320	-	*0.025*	*0.025*	*0.025*	*0.025*	*0.025*	*0.025*	*0.025*	*0.025*	*0.025*	*0.025*	*0.025*	*0.025*
VFA	mg/L	-	-	*2.5*	*2.5*	*2.5*	*2.5*	*2.5*	*2.5*	*2.5*	*2.5*	*2.5*	*2.5*	*2.5*	*2.5*
TOC	mg/L	-	-	8.4	6.3	7.2	9.0	6.0	7.1	8.7	6.1	7.7	9.5	6.1	6.7
Alkalinity	mg CaCO3/L	-	-	67	52	44	65	52	44	67	54	45	65	56	48
Conductivity	mS/m	-	-	25.2	23.6	23.4	25.0	23.9	23.8	26.2	24.7	23.9	25.8	25.0	24.7
COD	mg/L	-	-	35	22	27	27	33	24	25	24	22	33	36	25
scBOD5	mg/L	2	Monthly Ave. 2	*3*	*0.5*	*0.5*	*3*	*0.5*	*0.5*	*3*	*0.5*	*0.5*	*3*	*0.5*	1.0
E-Coli	CFU/100 ml	-	-	1700	92	1900	500	190	1500	900	220	400	600	150	350
Chloride	mg/L	-	-	24.3	23.9	25.3	24.0	24.2	24.7	25.9	25.7	25.2	25.2	25.8	25.6
Nitrate-N	mg/L	0.16	0.16	0.14	**0.44**	**0.66**	0.11	**0.44**	**0.63**	**0.17**	**0.5**	**0.71**	**0.2**	**0.54**	**0.63**
Sulphate	mg/L	-	-	14.4	18.1	20.0	14.5	18.2	19.9	14.7	18.6	19.2	14.5	18.4	19.3
Ammoniacal-N	mg/L	2.1	Max. 2.1 Ave. 0.400	0.01	0.02	0.09	0.02	0.09	0.01	0.1	0.07	0.09	0.04	0.14	0.11
Hardness	mg CaCO3/L	-	-	65	62	61	70	64	64	68	63	61	70	66	65
Calcium	mg/L	-	-	13.8	13.8	12.8	14.8	14.0	13.6	14.6	13.9	13.1	14.8	14.5	13.7
Magnesium	mg/L	-	-	7.4	6.8	6.9	7.99	7.07	7.31	7.76	6.87	6.96	7.93	7.27	7.35
Potassium	mg/L	-	-	2.88	2.78	3.17	2.96	2.78	2.93	3.11	2.88	3.09	3.05	3.32	3.15
Sodium	mg/L	-	-	20.4	21.0	18.5	21.7	20.3	20.7	21.7	21.3	19.8	21.9	23.2	20.8
D.R. Phosphorus	mg/L	-	-	0.005	0.004	0.005	0.006	*0.0025*	*0.0025*	0.009	0.004	0.006	0.005	0.004	0.005
Dissolved Aluminium	mg/L	0.055	Med. 0.055	0.008	0.015	0.023	0.007	0.014	0.014	0.005	0.021	0.015	0.009	0.012	0.014
Dissolved Arsenic	mg/L	0.024	Med. 0.024	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*	*0.0005*
Dissolved Boron	mg/L	0.370	-	0.05	0.06	0.04	0.06	0.06	0.04	0.06	0.06	0.04	0.06	0.06	0.04

Determinant	Units	ANZECC AE (95%)	Consent Trigger Values (Table C1)	HS1A (new)			HS1			HS2			HS3		
				May	June	July	May	June	July	May	June	July	May	June	July
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	0.0011	0.0007	**0.0017**	0.011	0.0007	0.0012	0.0009	0.0007	0.0012	0.001	0.0008	0.0012
Dissolved Iron	mg/L	-	-	0.014	0.027	0.036	0.028	0.044	0.032	0.021	0.026	0.049	0.018	0.037	0.046
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	-	0.0173	0.0062	0.0099	0.0158	0.0091	0.01	0.0232	0.012	0.015	0.0213	0.015	0.019
Dissolved Mercury	mg/L	0.0006	Med. 0.0006	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*
Dissolved Nickel	mg/L	0.011	Med. 0.011	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*
Dissolved Zinc	mg/L	0.008	Med. 0.008	*0.001*	*0.001*	0.005	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	*0.001*	0.003

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

There were **eleven exceedances of the resource consent conditions** in samples from the Hokio Stream during the May, June and July sampling rounds, of which five exceedances were for the July 2020 sampling round; these are:

- July 2020 sampling round for dissolved copper from HS1A (new).
- June 2020 and July 2020 sampling rounds for nitrate-N from HS1A (new) and HS1.
- May 2020, June 2020, and July 2020 sampling rounds for nitrate-N from HS2 and HS3.

While ScBOD5 for all four sites in the May 2020 sampling round appears to be above the trigger level, all results were actually below the detection limit of 6 mg/L which means that they have been reported as being 3mg/L, and so cannot be confirmed as exceeding the trigger levels.

3. Discussion

3.1 Sampling Quality Control and Assurance

The landfill extends over a significant area and there are many sampling locations. However, it is important that the length of the sampling period is kept as brief as possible because a sampling period that is too long may make comparisons of results between rounds and individual monitoring locations less valid. This current monitoring round was carried out over a 14-day period between 1 and 14 July 2020. This is a longer timespan than the previous monitoring round which was 8 days and is in line with October and July 2019 sampling rounds (11 and 20 days respectively). This monitoring period is not close to the recommended period (i.e. obtaining all samples within 7 days) and therefore the results must be interpreted with some caution.

3.2 Background Groundwater Quality

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

Results since 2010 from the background bores indicate that low pH values are representative of background water quality in the shallow sand aquifer (G1S) and during the July 2020 monitoring round, the pH level (6.6.) is slightly below the guideline level of 7 prescribed by DWSNZ MAV. The deeper gravel aquifer (G1D) has pH levels that are slightly higher.

Iron concentrations have fluctuated considerably at both the G1S and G1D bores since monitoring began and are occasionally above the DWSNZ GV. During the July 2020 sampling round, iron concentrations at G1S (4.29 mg/L) exceeded the DWSNZ GV of 0.2mg/L but were within the historical results ranges recorded at this bore. Elevated iron concentrations in groundwater are likely to be related to hydrogeological conditions found at the site and this phenomenon is common in groundwater in this area.

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 and therefore may not be suitable to use for reference background water quality in the future.

3.3 Shallow Aquifer Groundwater Quality

3.3.1 Hydraulically Up-gradient from the Old Landfill

Sampling results from the July 2020 monitoring round show that water quality in the shallow monitoring bores hydraulically up-gradient from the old landfill complies with the discharge consent conditions.

Previous quarterly and annual reports noted that nitrate nitrogen concentrations have been consistently elevated in bores D1 and D6 when compared to background (G1S) and bore D4, as shown in Figure 3-1. The concentration of nitrate nitrogen appeared to be steadily increasing until around October 2018 when the concentration began to fall. This recent decreasing trend has persisted throughout the 2019 quarterly monitoring rounds. However, nitrate nitrogen concentrations during the July 2020 monitoring rose to 23.9 mg/L from D6.

Bores D1 and D6 are located down gradient of the new landfill, with bore D1 located hydraulically up-gradient of the leachate effluent pond and bore D6 located down gradient of the leachate pond. Other

leachate indicators such as boron, chloride and ammoniacal nitrogen concentrations at D6 are all consistent with background concentrations and the historical record.

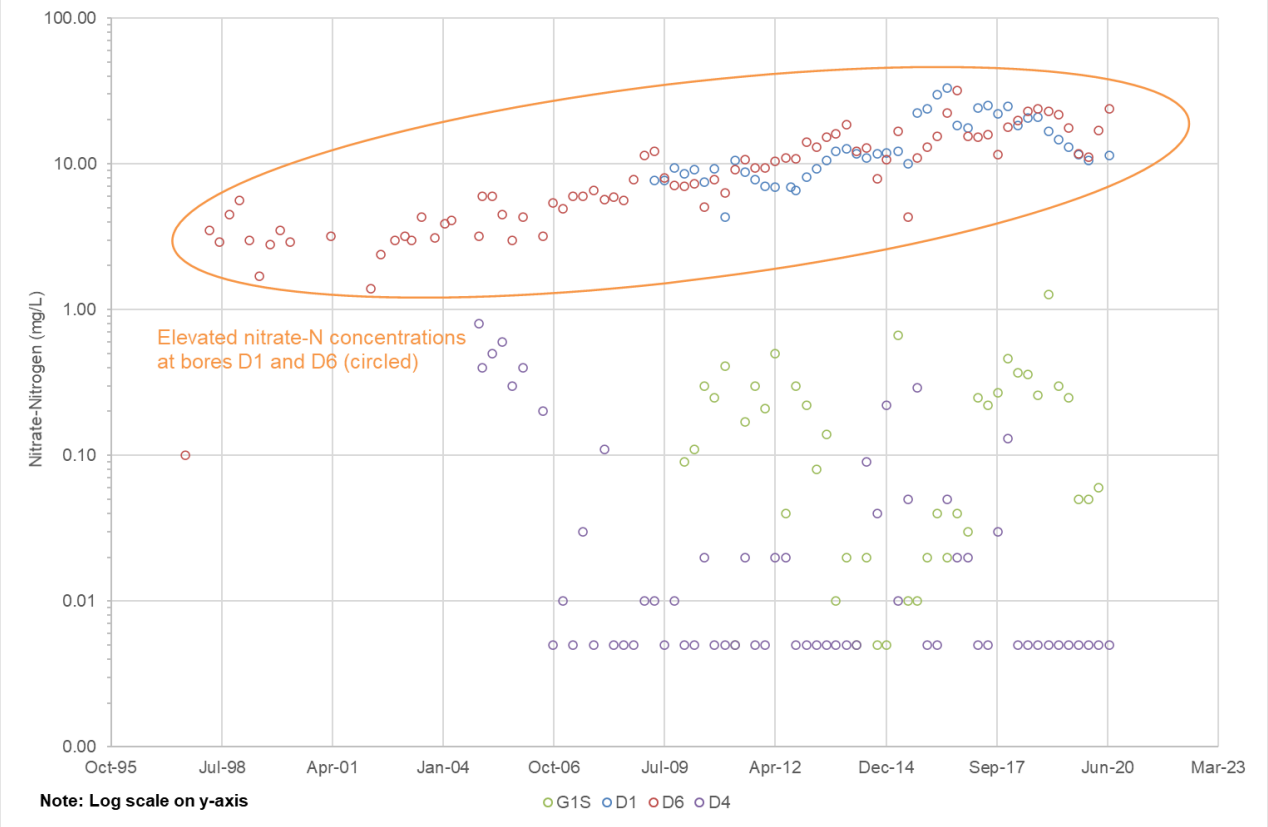


Figure 3-1: Nitrate Nitrogen Concentrations in the D-Series Bores

3.3.2 Irrigation Area

Sampling results from all shallow bores located hydraulically down-gradient of the irrigation area[2] (F series bores) are consistent with historical results and comply with the discharge consent conditions.

Historical trends with respect to the leachate indicators chloride, boron and ammoniacal nitrogen concentrations in the F-series bores are generally stable and do not show any indications of increasing trends. Boron concentrations at F1 have consistently been low, or sometimes below the laboratory detection limit (except for the April 2020 result of 345 mg/L which is considered to be an anomalous result).

3.3.3 Hydraulically Down-gradient from the Old Landfill

During the July 2020 sampling round there was one exceedance of the resource consent conditions for nitrate nitrogen concentrations in sample B2. No other exceedances occurred at the shallower bores.

Bores C1 and G2S are located down gradient of the old landfill to the east. These bores have consistently recorded low concentrations of ammoniacal nitrogen, with G2S often recording concentrations below the detection limit. The samples from C1 during the July 2020 and April 2020 monitoring rounds show a slight increase in concentrations compared to previous samples. These bores are likely to be located beyond the eastern edge of the leachate plume.

Bores B1, B2, B3 and C2 all appear to be located and screened within the leachate plume and consistently show significantly elevated concentrations of ammoniacal nitrogen. Historical results for all four bores are plotted in Figure 3-2 below. It is noted that the concentration of ammoniacal nitrogen in bore C2 has been increasing since 2009, while the concentration in B1 has fallen. It is possible that the leachate plume flow direction has "shifted", as a result of flow in one area (or direction) being slower than in others, resulting in

[2] Irrigation of leachate within this area ceased in October 2008

a time lag for flow to pass some of the bores. This may have resulted in a different spatial distribution of results from that being observed five years ago.

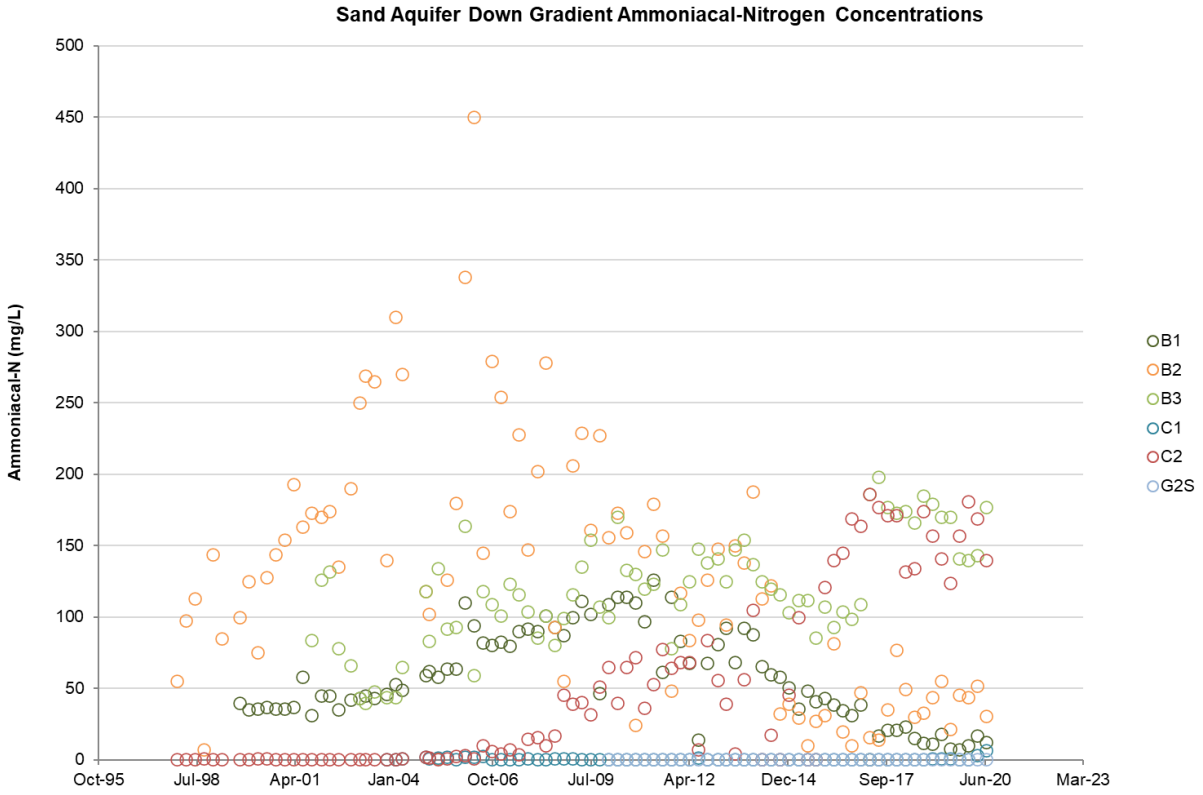


Figure 3-2: Ammoniacal Nitrogen Concentrations in Shallow Bores Screened in the Leachate Plume

Other key leachate indicators, boron, conductivity and chloride are also all elevated in concentrations within the bores that are located and screened in the leachate plume, as would be expected.

The leachate plume appears to have a confined radius northward and is not extending to the north-west or the north-east. The leachate plume width was estimated to be 300-500m in 2014.

3.4 Deep Aquifer Groundwater Quality

The concentration of manganese exceeded the DWSNZ MAV at C2DD within the deep gravel aquifer in the July 2020 monitoring round. However, it is noted that the manganese concentration at C2DD (0.6 mg/L) was consistent with historical results and is representative of background groundwater quality in the area.

3.5 Leachate Effluent

Monitoring results from the leachate effluent samples are not required to meet either the ANZECC LDW trigger values or DWSNZ standards. Results from the May, June and July 2020 monitoring round were all within the typical composition ranges for Class 1 landfills published in the WasteMINZ guidelines[3].

3.6 Tatana Property Drain

Under the revised resource consent conditions approved in December 2019, monitoring location 'SW3' is now re-designated as 'TD1', and sampling at locations 'SW2', 'SW3' and 'SW4' has been discontinued.

[3] Technical Guidelines for Disposal to Land, WasteMINZ, 2018

Under the revised conditions, the Tatana Property drain samples are now assessed against the ANZECC AE 95% trigger values.

During this July 2020 monitoring period, there were two exceedances of the resource consent conditions in samples from the Tatana Drain property at TD1 where the nitrate-N and ammoniacal-N concentrations exceeded the ANZECC AE 95% value.

The exceedances differed significantly to historical trends to the extent that the exact sampling location was confirmed with the monitoring contractor. There is potential that these concentrations arose from site activities (e.g. stock grazing in the paddock) and it is recommended that these contaminants are closely monitored in the next quarterly report.

3.7 Hokio Stream

Under the revised resource consent conditions, a new monitoring location (HS1A), located upstream of HS1, was added to the Hokio Stream monitoring locations.

Under the revised conditions, the Hokio Stream samples are now assessed against the ANZECC AE 95% trigger values.

During this July 2020 monitoring period, there were five exceedances of the resource consent conditions in samples from the Hokio Stream where:

- Dissolved copper concentration marginally exceeded the ANZECC AE 95% trigger value at HS1A (new).
- Nitrate-N concentration exceeded the ANZECC AE 95% trigger value at HS1A (new), HS1, HS2, and HS3.

3.8 Consent Compliance

Discharge permit 6010 states that quarterly and annual monitoring results should comply with the ANZECC LDW trigger values in the shallow groundwater aquifer (sand aquifer) and surface water bodies. Samples from the deep groundwater (gravel aquifer) should comply with the DWSNZ. Should any parameters exceed these standards, the permit holder shall report to the Regional Council as soon as practicable on the significance of the results and, where the change can be attributed to the influence of landfill leachate, consult with the Regional Council to determine if further investigations or remedial measures are required.

Shallow aquifer

There was **one exceedance** of the resource consent conditions during the July 2020 sampling round for samples obtained from the shallow aquifer:

- Nitrate-N concentration in bore B2 exceeded the ANZECC LDW trigger value.

Deeper gravel aquifer

There was **one exceedance** of the resource consent conditions in samples from the deep gravel aquifer during the July 2020 sampling round:

- Manganese concentration in bore C2DD exceeded the DWSNZ MAV.

Irrigation area

There were **no exceedances** of the resource consent conditions during the July 2020 sampling round for samples obtained from the irrigation area.

Tatana Property drain

There were **two exceedances** of the resource consent conditions during the July 2020 sampling round for samples obtained from the Tatana Drain sampling location at TD1:

- Nitrate-N concentration exceeded the ANZECC AE 95% trigger value
- Ammoniacal-N concentration exceeded the ANZECC AE 95% trigger value

Hokio stream

There were **five exceedances** of the resource consent conditions during the July 2020 sampling round for samples obtained from the Hokio Stream:

- Dissolved copper concentration marginally exceeded the ANZECC AE 95% trigger value at HS1A (new).
- Nitrate-N concentrations exceeded the ANZECC AE 95% trigger value at HS1A (new), HS1, HS2, and HS3.

4. Conclusions

Monitoring results obtained in the July 2020 sampling round suggest that the groundwater at the background monitoring sites is being impacted by local ground conditions and/or activities up-gradient of the landfill.

During the July 2020 monitoring period there were ten exceedances of the resource consent conditions, as summarised in the following paragraphs.

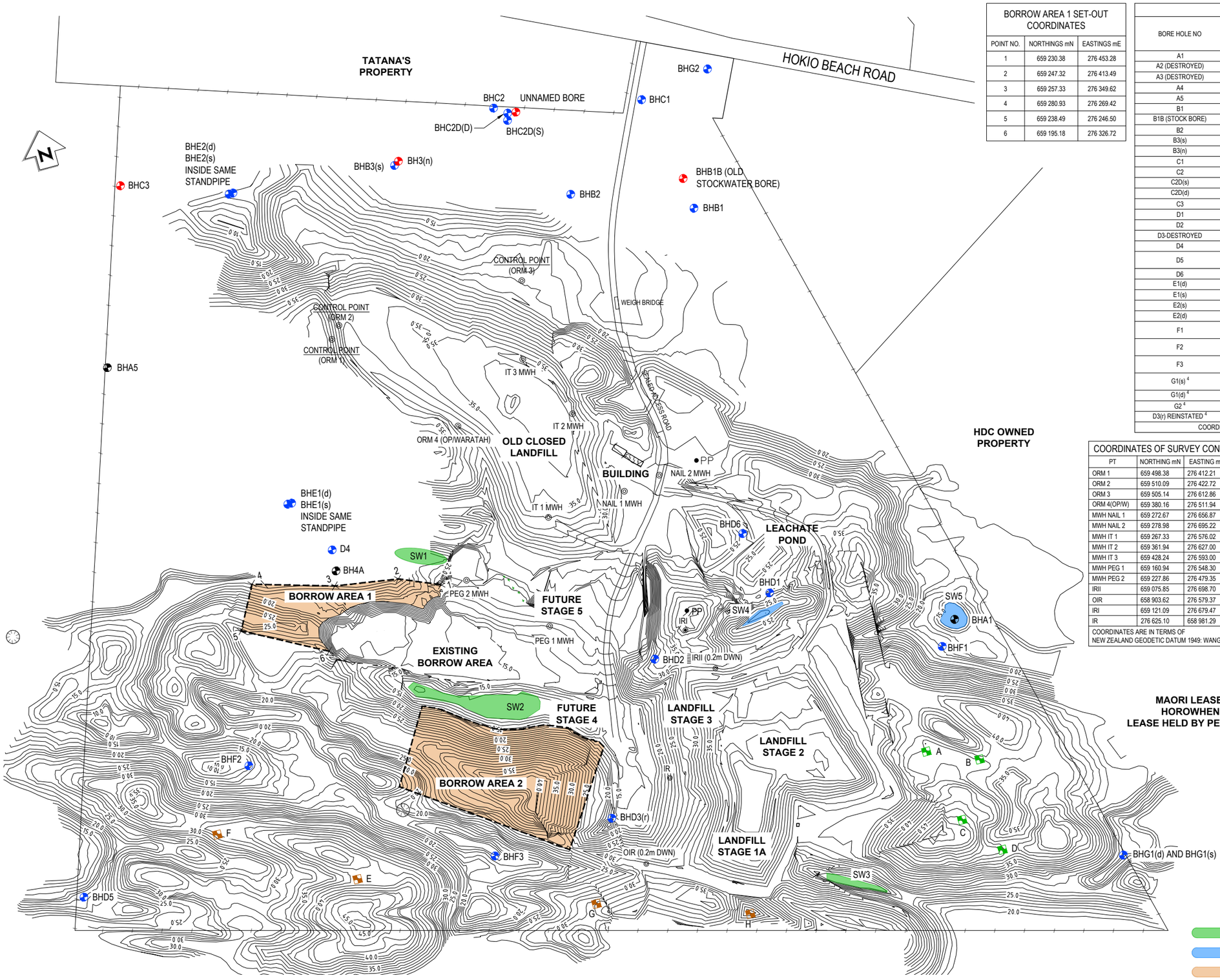
The deep-water bore C2DD located immediately down-gradient hydraulically of the old unlined landfill showed a manganese concentration above the DWSNZ MAV. The concentration of manganese at this bore is consistent with historical results and is representative of typical ground water quality in the area.

There were five exceedances of consent limits found in samples from surface water monitoring at the Hokio Stream; these were for dissolved copper concentrations at HS1A (new) and nitrate-N concentrations at HS1A (new), HS1, HS2, and HS3, with these all showing values above the ANZECC AE 95% trigger values.

Additionally, there were two exceedances of consent limits in samples from surface water monitoring at the Tatana Property drain (TD1) where the nitrate-N and ammoniacal-N concentrations exceeded the ANZECC AE 95% trigger values.

Appendices

Appendix A Site Plans



DO NOT SCALE - IF IN DOUBT, ASK

ORIGINAL SIZE A1

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	659 238.49	276 246.50
6	659 195.18	276 326.72

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
D3-DESTROYED						
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	658 951.7	276 434.0	16.70	10.5	50	SHALLOW AQUIFER LEACHATE IRRIGATION
G1(s) [4]	658 786	277 046	24	15	50	SHALLOW AQUIFER BACKGROUND
G1(d) [4]	658 786	277 046	24	31.5	50	DEEP AQUIFER BACKGROUND
G2 [4]	659 673	276 835	8	4	50	SHALLOW AQUIFER
D3(r) REINSTATED [4]	658 953	276 552	18	10	50	EARLY DETECTION
COORDINATES ARE IN TERMS OF NEW ZEALAND GEODETIC DATUM 1949: WANGANUI CIRCUIT						

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

MAORI LEASE BLOCK
HOROWHENUA 9A7
LEASE HELD BY PETER EVERTON

NOTES:

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

LEGEND

- 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

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE
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	22.09.20
APPROVED	Phil Landmark	22.09.20
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: **22.09.20**
Scales: 1:2000 (A1) 1:4000 (A3)
Drawing No.: 310101088-19-001-G001
Rev.: B

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

pw:\\asiavpwint05.mwhglobal.com:AP_PROJECTS\Documents\New Zealand Clients\Horowhenua District Council\80500724 (310101088) - Levin Landfill Volumes\2019\General\310101088-19-001-G001

Hokio Stream (“HS”) and Tatana’s Property Drain (“SW”) Monitoring Locations

Appendix B Sampling Schedule

LEVIN LANDFILL - SUMMARY OF SURFACE AND GROUNDWATER MONITORING REQUIREMENTS (April 2020 - January 2023).

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

Reports Due		Sampling Month	Table A (Condition 3, DP 6010)					Table B (Condition 3, DP 6010)																				Table C (Condition 3, DP 6010)						
			Deep Aquifer Bores					Shallow Aquifer Bores																				Irrigation Bores				Hokio Stream[4]				Tatana Drain	Leachate Pond[5]	
Annual	Quarterly		C2dd	E1d	E2d	G1d	Xd1[1]	C1	C2	C2ds	D4	B1	B2	B3s	E1s	E2s	D1[2]	D2[2]	D3r[2]	D6[2]	G1s	G2s	Xs1[1]	Xs2[1]	D5[3]	F1[3]	F2[3]	F3[3]	HS1	HS1A	HS2	HS3	TD1		
	May-20	Apr-20	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	Monthly Comprehensive for 2 Years	A
Sep-20	Aug-20	Jul-20	I	I + SW	I	I	C	I	I	I	I + SW	I	I	I	I + SW	I + SW	I	I + SW	I + SW	I	I + SW	I	C	C	I	I	I	I + SW					I		
	Nov-20	Oct-20	I	I + SW	I	I	C	I	I	I	I + SW	I	I	I	I + SW	I + SW	I	I + SW	I + SW	I	I + SW	I	C	C	I	I	I	I + SW					C		A
	Feb-21	Jan-21	I	I + SW	I	I	C	I	I	I	I + SW	I	I	I	I + SW	I + SW	I	I + SW	I + SW	I	I + SW	I	C	C	I	I	I	I + SW					I		
	May-21	Apr-21	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
Sep-21	Aug-21	Jul-21	I	I + SW	I	I	C	I	I	I	I + SW	I	I	I	I + SW	I + SW	I	I + SW	I + SW	I	I + SW	I	C	C	I	I	I	I + SW					I		
	Nov-21	Oct-21	I	I + SW	I	I	C	I	I	I	I + SW	I	I	I	I + SW	I + SW	I	I + SW	I + SW	I	I + SW	I	C	C	I	I	I	I + SW					C		A
	Feb-22	Jan-22	I	I + SW	I	I	C	I	I	I	I + SW	I	I	I	I + SW	I + SW	I	I + SW	I + SW	I	I + SW	I	C	C	I	I	I	I + SW					I		
	May-22	Apr-22	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A		C	C	C	C	C + A	
Sep-22	Aug-22	Jul-22	I	I + SW	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-22	Oct-22	I	I + SW	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-23	Jan-23	I	I + SW	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	

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) Bores to be developed by Consent Holder
(2) See table below
(3) If irrigation re-commences then the annual sampling is to change from comprehensive + 3 times indicator to bi-annual comprehensive + indicator (Clause D of Condition 3, DP 6010) .
(4) See table below
(5) See table below
C Comprehensive list (see below)
I Indicator list (see below)
A Pesticide and SVOC analysis
SW Add sodium and iron analysis (for stormwater consent 102559)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

+ E. coli added from April 2019 sampling onwards

Appendix C Analytical Results

Analytical Report

Downer EDI Levin - Landfill
P O Box 642
LEVIN 5540
Attention: Bruce Marshall

Report Number: 20/21899
Issue: 1
22 September 2020

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
20/21899-01	Levin C2dd		09/07/2020 00:00	10/07/2020 09:51	0

Notes: 182665-0 Levin Landfill

	Test	Result	Units	Test Date	Signatory
0001	pH	7.6		10/07/2020	Jennifer Mont KTP
0055	Conductivity at 25°C	52.9	mS/m	10/07/2020	Jennifer Mont KTP
0081	Chemical Oxygen Demand	< 15	g/m³	10/07/2020	Gordon McArthur KTP
0180	BOD5 - Soluble Carbonaceous	< 1	g/m³	10/07/2020	Gordon McArthur KTP
0602	Chloride	40.4	g/m³	17/07/2020	Amit Kumar KTP
0605	Nitrate - Nitrogen	2.60	g/m³	17/07/2020	Amit Kumar KTP
0760	Ammonia Nitrogen	0.34	g/m³	15/07/2020	Athena Cao KTP
6701	Aluminium - Dissolved	< 0.002	g/m³	13/07/2020	Shanel Kumar KTP
6707	Boron - Dissolved	0.06	g/m³	13/07/2020	Shanel Kumar KTP
6718	Lead - Dissolved	< 0.0005	g/m³	13/07/2020	Shanel Kumar KTP
6721	Manganese - Dissolved	0.631	g/m³	13/07/2020	Shanel Kumar KTP
6722	Mercury - Dissolved	< 0.0005	g/m³	13/07/2020	Shanel Kumar KTP
6724	Nickel - Dissolved	< 0.0005	g/m³	13/07/2020	Shanel Kumar KTP
M0104	E. coli	< 4	cfu/100mL	10/07/2020	Maria Norris KTP
P1859	Sample Filtration	Completed		10/07/2020	Robyn Madge .

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
20/21899-02	Levin E1d		13/07/2020 00:00	14/07/2020 14:53	0

Notes: 182666-0 Levin Landfill

	Test	Result	Units	Test Date	Signatory
0001	pH	7.7		13/07/2020	Gordon McArthur KTP
0055	Conductivity at 25°C	44.3	mS/m	13/07/2020	Gordon McArthur KTP
0081	Chemical Oxygen Demand	23	g/m³	14/07/2020	Gordon McArthur KTP
0180	BOD5 - Soluble Carbonaceous	< 1	g/m³	13/07/2020	Gordon McArthur KTP
0602	Chloride	40.1	g/m³	20/07/2020	Amit Kumar KTP
0605	Nitrate - Nitrogen	< 0.01	g/m³	21/07/2020	Amit Kumar KTP
0760	Ammonia Nitrogen	0.22	g/m³	15/07/2020	Athena Cao KTP
6701	Aluminium - Dissolved	0.003	g/m³	16/07/2020	Shanel Kumar KTP
6707	Boron - Dissolved	0.05	g/m³	16/07/2020	Shanel Kumar KTP
6717	Iron - Dissolved	0.02	g/m³	16/07/2020	Shanel Kumar KTP
6718	Lead - Dissolved	< 0.0005	g/m³	16/07/2020	Shanel Kumar KTP
6721	Manganese - Dissolved	0.226	g/m³	16/07/2020	Shanel Kumar KTP
6722	Mercury - Dissolved	< 0.0005	g/m³	16/07/2020	Shuyu Zhao KTP
6724	Nickel - Dissolved	< 0.0005	g/m³	16/07/2020	Shanel Kumar KTP
6731	Sodium - Dissolved	37.1	g/m³	21/07/2020	Shuyu Zhao KTP
M0104	E. coli	< 4	cfu/100mL	13/07/2020	Maria Norris KTP
P1859	Sample Filtration	Completed		14/07/2020	Robyn Madge .

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
20/21899-03	Levin E2d		13/07/2020 00:00	14/07/2020 14:53	0

Notes: 182667-0 Levin Landfill

	Test	Result	Units	Test Date	Signatory
0001	pH	7.8		13/07/2020	Gordon McArthur KTP
0055	Conductivity at 25°C	36.4	mS/m	13/07/2020	Gordon McArthur KTP
0081	Chemical Oxygen Demand	< 15	g/m³	14/07/2020	Gordon McArthur KTP
0180	BOD5 - Soluble Carbonaceous	< 1	g/m³	13/07/2020	Gordon McArthur KTP

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
20/21899-03	Levin E2d		13/07/2020 00:00	14/07/2020 14:53	0

Notes: 182667-0 Levin Landfill

	Test	Result	Units	Test Date	Signatory
0602	Chloride	48.1	g/m³	20/07/2020	Amit Kumar KTP
0605	Nitrate - Nitrogen	< 0.01	g/m³	21/07/2020	Amit Kumar KTP
0760	Ammonia Nitrogen	0.30	g/m³	15/07/2020	Athena Cao KTP
6701	Aluminium - Dissolved	< 0.002	g/m³	16/07/2020	Shanel Kumar KTP
6707	Boron - Dissolved	< 0.03	g/m³	16/07/2020	Shanel Kumar KTP
6718	Lead - Dissolved	< 0.0005	g/m³	16/07/2020	Shanel Kumar KTP
6721	Manganese - Dissolved	0.226	g/m³	16/07/2020	Shanel Kumar KTP
6722	Mercury - Dissolved	< 0.0005	g/m³	16/07/2020	Shuyu Zhao KTP
6724	Nickel - Dissolved	< 0.0005	g/m³	16/07/2020	Shanel Kumar KTP
M0104	E. coli	< 4	cfu/100mL	13/07/2020	Maria Norris KTP
P1859	Sample Filtration	Completed		14/07/2020	Robyn Madge .

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
20/21899-04	Levin G1D		01/07/2020 00:00	09/07/2020 14:19	0

Notes: 182668-0 Levin Landfill

	Test	Result	Units	Test Date	Signatory
0001	pH	7.2		10/07/2020	Jennifer Mont KTP
0055	Conductivity at 25°C	27.9	mS/m	10/07/2020	Jennifer Mont KTP
0081	Chemical Oxygen Demand	< 15	g/m³	10/07/2020	Gordon McArthur KTP
0180	BOD5 - Soluble Carbonaceous	< 1	g/m³	10/07/2020	Gordon McArthur KTP
0602	Chloride	33.0	g/m³	17/07/2020	Amit Kumar KTP
0605	Nitrate - Nitrogen	< 0.01	g/m³	17/07/2020	Amit Kumar KTP
0760	Ammonia Nitrogen	0.10	g/m³	15/07/2020	Athena Cao KTP
6701	Aluminium - Dissolved	< 0.002	g/m³	13/07/2020	Shanel Kumar KTP
6707	Boron - Dissolved	0.04	g/m³	13/07/2020	Shanel Kumar KTP
6718	Lead - Dissolved	< 0.0005	g/m³	13/07/2020	Shanel Kumar KTP
6721	Manganese - Dissolved	0.0670	g/m³	13/07/2020	Shanel Kumar KTP
6722	Mercury - Dissolved	< 0.0005	g/m³	13/07/2020	Shanel Kumar KTP
6724	Nickel - Dissolved	< 0.0005	g/m³	13/07/2020	Shanel Kumar KTP
M0104	E. coli	< 4	cfu/100mL	09/07/2020	Maria Norris KTP
P1859	Sample Filtration	Completed		10/07/2020	Robyn Madge .

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
20/21899-06	Levin C1		14/07/2020 00:00	15/07/2020 09:28	0

Notes: 182670-0 Levin Landfill

	Test	Result	Units	Test Date	Signatory
0001	pH	6.7		15/07/2020	Gordon McArthur KTP
0055	Conductivity at 25°C	132	mS/m	15/07/2020	Gordon McArthur KTP
0081	Chemical Oxygen Demand	54	g/m³	15/07/2020	Marylou Cabral KTP
0180	BOD5 - Soluble Carbonaceous	< 1	g/m³	15/07/2020	Gordon McArthur KTP
0602	Chloride	237	g/m³	21/07/2020	Amit Kumar KTP
0605	Nitrate - Nitrogen	< 0.01	g/m³	21/07/2020	Amit Kumar KTP
0760	Ammonia Nitrogen	6.52	g/m³	17/07/2020	Divina Lagazon KTP
6701	Aluminium - Dissolved	0.007	g/m³	17/07/2020	Shuyu Zhao KTP
6707	Boron - Dissolved	0.69	g/m³	22/07/2020	Shuyu Zhao KTP
6718	Lead - Dissolved	< 0.0005	g/m³	17/07/2020	Shuyu Zhao KTP
6721	Manganese - Dissolved	0.427	g/m³	17/07/2020	Shuyu Zhao KTP
6722	Mercury - Dissolved	< 0.0005	g/m³	17/07/2020	Shuyu Zhao KTP
6724	Nickel - Dissolved	0.0009	g/m³	17/07/2020	Shuyu Zhao KTP
M0104	E. coli	< 4	cfu/100mL	15/07/2020	Juana Tamayo KTP
P1859	Sample Filtration	Completed		17/07/2020	Robyn Madge .

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
20/21899-07	Levin C2		14/07/2020 00:00	15/07/2020 09:28	0

Notes: 182671-0 Levin Landfill

	Test	Result	Units	Test Date	Signatory
0001	pH	6.9		15/07/2020	Gordon McArthur KTP
0055	Conductivity at 25°C	245	mS/m	15/07/2020	Gordon McArthur KTP
0081	Chemical Oxygen Demand	105	g/m³	15/07/2020	Marylou Cabral KTP
0180	BOD5 - Soluble Carbonaceous	< 6	g/m³	15/07/2020	Gordon McArthur KTP
0602	Chloride	212	g/m³	21/07/2020	Amit Kumar KTP
0605	Nitrate - Nitrogen	< 0.10	g/m³	22/07/2020	Shanel Kumar KTP
0760	Ammonia Nitrogen	140	g/m³	17/07/2020	Divina Lagazon KTP
6701	Aluminium - Dissolved	0.014	g/m³	17/07/2020	Shuyu Zhao KTP
6707	Boron - Dissolved	1.81	g/m³	22/07/2020	Shuyu Zhao KTP
6718	Lead - Dissolved	< 0.0005	g/m³	17/07/2020	Shuyu Zhao KTP
6721	Manganese - Dissolved	0.0402	g/m³	17/07/2020	Shuyu Zhao KTP
6722	Mercury - Dissolved	< 0.0005	g/m³	17/07/2020	Shuyu Zhao KTP
6724	Nickel - Dissolved	0.0041	g/m³	17/07/2020	Shuyu Zhao KTP
M0104	E. coli	< 4	cfu/100mL	15/07/2020	Juana Tamayo KTP
P1859	Sample Filtration	Completed		17/07/2020	Robyn Madge .

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
20/21899-08	Levin C2ds		14/07/2020 00:00	15/07/2020 09:28	0

Notes: 182672-0 Levin Landfill

	Test	Result	Units	Test Date	Signatory
0001	pH	6.8		15/07/2020	Gordon McArthur KTP
0055	Conductivity at 25°C	163	mS/m	15/07/2020	Gordon McArthur KTP
0081	Chemical Oxygen Demand	94	g/m³	15/07/2020	Marylou Cabral KTP
0180	BOD5 - Soluble Carbonaceous	< 1	g/m³	15/07/2020	Gordon McArthur KTP
0602	Chloride	109	g/m³	21/07/2020	Amit Kumar KTP
0605	Nitrate - Nitrogen	< 0.10	g/m³	22/07/2020	Shanel Kumar KTP
0760	Ammonia Nitrogen	1.57	g/m³	17/07/2020	Divina Lagazon KTP
6701	Aluminium - Dissolved	0.003	g/m³	17/07/2020	Shuyu Zhao KTP
6707	Boron - Dissolved	1.39	g/m³	22/07/2020	Shuyu Zhao KTP
6718	Lead - Dissolved	< 0.0005	g/m³	17/07/2020	Shuyu Zhao KTP
6721	Manganese - Dissolved	2.34	g/m³	21/07/2020	Shuyu Zhao KTP
6722	Mercury - Dissolved	< 0.0005	g/m³	17/07/2020	Shuyu Zhao KTP
6724	Nickel - Dissolved	0.0029	g/m³	17/07/2020	Shuyu Zhao KTP
M0104	E. coli	< 4	cfu/100mL	15/07/2020	Juana Tamayo KTP
P1859	Sample Filtration	Completed		16/07/2020	Ruth Ashton .

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
20/21899-09	Levin D4		14/07/2020 00:00	15/07/2020 09:28	0

Notes: 182673-0 Levin Landfill

	Test	Result	Units	Test Date	Signatory
0001	pH	6.9		15/07/2020	Gordon McArthur KTP
0055	Conductivity at 25°C	30.2	mS/m	15/07/2020	Gordon McArthur KTP
0081	Chemical Oxygen Demand	< 15	g/m³	15/07/2020	Marylou Cabral KTP
0180	BOD5 - Soluble Carbonaceous	< 1	g/m³	15/07/2020	Gordon McArthur KTP
0602	Chloride	43.9	g/m³	21/07/2020	Amit Kumar KTP
0605	Nitrate - Nitrogen	< 0.01	g/m³	21/07/2020	Amit Kumar KTP
0760	Ammonia Nitrogen	0.22	g/m³	17/07/2020	Divina Lagazon KTP
6701	Aluminium - Dissolved	< 0.002	g/m³	17/07/2020	Shuyu Zhao KTP
6707	Boron - Dissolved	0.08	g/m³	22/07/2020	Shuyu Zhao KTP
6717	Iron - Dissolved	0.38	g/m³	17/07/2020	Shuyu Zhao KTP
6718	Lead - Dissolved	< 0.0005	g/m³	17/07/2020	Shuyu Zhao KTP
6721	Manganese - Dissolved	0.180	g/m³	17/07/2020	Shuyu Zhao KTP
6722	Mercury - Dissolved	< 0.0005	g/m³	17/07/2020	Shuyu Zhao KTP

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
20/21899-09	Levin D4		14/07/2020 00:00	15/07/2020 09:28	0

Notes: 182673-0 Levin Landfill

	Test	Result	Units	Test Date	Signatory
6724	Nickel - Dissolved	< 0.0005	g/m³	17/07/2020	Shuyu Zhao KTP
6731	Sodium - Dissolved	33.4	g/m³	21/07/2020	Shuyu Zhao KTP
M0104	E. coli	8	cfu/100mL	15/07/2020	Yuemei Yu KTP
P1859	Sample Filtration	Completed		17/07/2020	Robyn Madge .

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
20/21899-10	Levin B1		14/07/2020 00:00	15/07/2020 09:28	0

Notes: 182674-0 Levin Landfill

	Test	Result	Units	Test Date	Signatory
0001	pH	6.8		15/07/2020	Gordon McArthur KTP
0055	Conductivity at 25°C	203	mS/m	15/07/2020	Gordon McArthur KTP
0081	Chemical Oxygen Demand	87	g/m³	15/07/2020	Marylou Cabral KTP
0180	BOD5 - Soluble Carbonaceous	< 1	g/m³	15/07/2020	Gordon McArthur KTP
0602	Chloride	354	g/m³	22/07/2020	Shanel Kumar KTP
0605	Nitrate - Nitrogen	6.60	g/m³	22/07/2020	Shanel Kumar KTP
0760	Ammonia Nitrogen	12.4	g/m³	17/07/2020	Divina Lagazon KTP
6701	Aluminium - Dissolved	0.004	g/m³	17/07/2020	Shuyu Zhao KTP
6707	Boron - Dissolved	1.07	g/m³	22/07/2020	Shuyu Zhao KTP
6718	Lead - Dissolved	< 0.0005	g/m³	17/07/2020	Shuyu Zhao KTP
6721	Manganese - Dissolved	10.7	g/m³	23/07/2020	Shanel Kumar KTP
6722	Mercury - Dissolved	< 0.0005	g/m³	17/07/2020	Shuyu Zhao KTP
6724	Nickel - Dissolved	0.0028	g/m³	17/07/2020	Shuyu Zhao KTP
M0104	E. coli	< 4	cfu/100mL	15/07/2020	Juana Tamayo KTP
P1859	Sample Filtration	Completed		17/07/2020	Robyn Madge .

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
20/21899-11	Levin B2		14/07/2020 00:00	15/07/2020 09:28	0

Notes: 182675-0 Levin Landfill

	Test	Result	Units	Test Date	Signatory
0001	pH	6.6		15/07/2020	Gordon McArthur KTP
0055	Conductivity at 25°C	250	mS/m	15/07/2020	Gordon McArthur KTP
0081	Chemical Oxygen Demand	76	g/m³	15/07/2020	Marylou Cabral KTP
0180	BOD5 - Soluble Carbonaceous	< 6	g/m³	15/07/2020	Gordon McArthur KTP
0602	Chloride	134	g/m³	21/07/2020	Amit Kumar KTP
0605	Nitrate - Nitrogen	133	g/m³	22/07/2020	Shanel Kumar KTP
0760	Ammonia Nitrogen	30.7	g/m³	17/07/2020	Divina Lagazon KTP
6701	Aluminium - Dissolved	0.011	g/m³	17/07/2020	Shuyu Zhao KTP
6707	Boron - Dissolved	1.65	g/m³	22/07/2020	Shuyu Zhao KTP
6718	Lead - Dissolved	< 0.0005	g/m³	17/07/2020	Shuyu Zhao KTP
6721	Manganese - Dissolved	4.77	g/m³	21/07/2020	Shuyu Zhao KTP
6722	Mercury - Dissolved	< 0.0005	g/m³	17/07/2020	Shuyu Zhao KTP
6724	Nickel - Dissolved	0.0026	g/m³	17/07/2020	Shuyu Zhao KTP
M0104	E. coli	< 4	cfu/100mL	15/07/2020	Juana Tamayo KTP
P1859	Sample Filtration	Completed		16/07/2020	Ruth Ashton .

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
20/21899-12	Levin B3s		14/07/2020 00:00	15/07/2020 09:28	0

Notes: 182676-0 Levin Landfill

	Test	Result	Units	Test Date	Signatory
0001	pH	7.0		15/07/2020	Gordon McArthur KTP
0055	Conductivity at 25°C	291	mS/m	15/07/2020	Gordon McArthur KTP
0081	Chemical Oxygen Demand	198	g/m³	17/07/2020	Gordon McArthur KTP
0180	BOD5 - Soluble Carbonaceous	< 6	g/m³	15/07/2020	Gordon McArthur KTP
0602	Chloride	162	g/m³	21/07/2020	Amit Kumar KTP

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
20/21899-12	Levin B3s		14/07/2020 00:00	15/07/2020 09:28	0

Notes: 182676-0 Levin Landfill

	Test	Result	Units	Test Date	Signatory
0605	Nitrate - Nitrogen	< 0.10	g/m³	22/07/2020	Shanel Kumar KTP
0760	Ammonia Nitrogen	177	g/m³	17/07/2020	Divina Lagazon KTP
6701	Aluminium - Dissolved	0.006	g/m³	17/07/2020	Shuyu Zhao KTP
6707	Boron - Dissolved	1.35	g/m³	22/07/2020	Shuyu Zhao KTP
6718	Lead - Dissolved	< 0.0005	g/m³	17/07/2020	Shuyu Zhao KTP
6721	Manganese - Dissolved	3.42	g/m³	21/07/2020	Shuyu Zhao KTP
6722	Mercury - Dissolved	< 0.0005	g/m³	17/07/2020	Shuyu Zhao KTP
6724	Nickel - Dissolved	0.0118	g/m³	17/07/2020	Shuyu Zhao KTP
M0104	E. coli	< 4	cfu/100mL	15/07/2020	Juana Tamayo KTP
P1859	Sample Filtration	Completed		17/07/2020	Robyn Madge .

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
20/21899-13	Levin E1s		13/07/2020 00:00	14/07/2020 09:35	0

Notes: 182677-0 Levin Landfill

	Test	Result	Units	Test Date	Signatory
0001	pH	7.0		14/07/2020	Jennifer Mont KTP
0055	Conductivity at 25°C	26.4	mS/m	14/07/2020	Jennifer Mont KTP
0081	Chemical Oxygen Demand	19	g/m³	14/07/2020	Gordon McArthur KTP
0180	BOD5 - Soluble Carbonaceous	< 6	g/m³	15/07/2020	Gordon McArthur KTP
0602	Chloride	28.7	g/m³	20/07/2020	Amit Kumar KTP
0605	Nitrate - Nitrogen	< 0.01	g/m³	20/07/2020	Amit Kumar KTP
0760	Ammonia Nitrogen	0.18	g/m³	15/07/2020	Athena Cao KTP
6701	Aluminium - Dissolved	0.009	g/m³	16/07/2020	Shanel Kumar KTP
6707	Boron - Dissolved	< 0.03	g/m³	16/07/2020	Shanel Kumar KTP
6717	Iron - Dissolved	4.83	g/m³	16/07/2020	Shanel Kumar KTP
6718	Lead - Dissolved	0.0022	g/m³	16/07/2020	Shanel Kumar KTP
6721	Manganese - Dissolved	0.229	g/m³	16/07/2020	Shanel Kumar KTP
6722	Mercury - Dissolved	< 0.0005	g/m³	16/07/2020	Shuyu Zhao KTP
6724	Nickel - Dissolved	< 0.0005	g/m³	16/07/2020	Shanel Kumar KTP
6731	Sodium - Dissolved	29.2	g/m³	21/07/2020	Shuyu Zhao KTP
M0104	E. coli	< 4	cfu/100mL	14/07/2020	Maria Norris KTP
P1859	Sample Filtration	Completed		14/07/2020	Robyn Madge .

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
20/21899-14	Levin E2s		13/07/2020 00:00	14/07/2020 09:35	0

Notes: 182678-0 Levin Landfill

	Test	Result	Units	Test Date	Signatory
0001	pH	7.4		14/07/2020	Jennifer Mont KTP
0055	Conductivity at 25°C	43.8	mS/m	14/07/2020	Jennifer Mont KTP
0081	Chemical Oxygen Demand	< 15	g/m³	14/07/2020	Gordon McArthur KTP
0180	BOD5 - Soluble Carbonaceous	< 1	g/m³	15/07/2020	Gordon McArthur KTP
0602	Chloride	40.7	g/m³	20/07/2020	Amit Kumar KTP
0605	Nitrate - Nitrogen	< 0.01	g/m³	20/07/2020	Amit Kumar KTP
0760	Ammonia Nitrogen	0.26	g/m³	15/07/2020	Athena Cao KTP
6701	Aluminium - Dissolved	< 0.002	g/m³	16/07/2020	Shanel Kumar KTP
6707	Boron - Dissolved	0.05	g/m³	16/07/2020	Shanel Kumar KTP
6717	Iron - Dissolved	0.06	g/m³	16/07/2020	Shanel Kumar KTP
6718	Lead - Dissolved	< 0.0005	g/m³	16/07/2020	Shanel Kumar KTP
6721	Manganese - Dissolved	0.377	g/m³	16/07/2020	Shanel Kumar KTP
6722	Mercury - Dissolved	< 0.0005	g/m³	16/07/2020	Shuyu Zhao KTP
6724	Nickel - Dissolved	< 0.0005	g/m³	16/07/2020	Shanel Kumar KTP
6731	Sodium - Dissolved	43.4	g/m³	21/07/2020	Shuyu Zhao KTP
M0104	E. coli	< 4	cfu/100mL	14/07/2020	Maria Norris KTP

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
20/21899-14	Levin E2s		13/07/2020 00:00	14/07/2020 09:35	0

Notes: 182678-0 Levin Landfill

	Test	Result	Units	Test Date	Signatory
P1859	Sample Filtration	Completed		14/07/2020	Robyn Madge .

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
20/21899-15	Levin D1		13/07/2020 00:00	14/07/2020 09:35	0

Notes: 182679-0 Levin Landfill

	Test	Result	Units	Test Date	Signatory
0001	pH	6.7		14/07/2020	Jennifer Mont KTP
0055	Conductivity at 25°C	48.9	mS/m	14/07/2020	Jennifer Mont KTP
0081	Chemical Oxygen Demand	< 15	g/m³	14/07/2020	Gordon McArthur KTP
0180	BOD5 - Soluble Carbonaceous	< 1	g/m³	15/07/2020	Gordon McArthur KTP
0602	Chloride	28.9	g/m³	20/07/2020	Amit Kumar KTP
0605	Nitrate - Nitrogen	11.4	g/m³	20/07/2020	Amit Kumar KTP
0760	Ammonia Nitrogen	< 0.01	g/m³	15/07/2020	Athena Cao KTP
6701	Aluminium - Dissolved	< 0.002	g/m³	16/07/2020	Shanel Kumar KTP
6707	Boron - Dissolved	0.05	g/m³	16/07/2020	Shanel Kumar KTP
6718	Lead - Dissolved	< 0.0005	g/m³	16/07/2020	Shanel Kumar KTP
6721	Manganese - Dissolved	< 0.0005	g/m³	16/07/2020	Shanel Kumar KTP
6722	Mercury - Dissolved	< 0.0005	g/m³	16/07/2020	Shuyu Zhao KTP
6724	Nickel - Dissolved	< 0.0005	g/m³	16/07/2020	Shanel Kumar KTP
M0104	E. coli	< 4	cfu/100mL	14/07/2020	Maria Norris KTP
P1859	Sample Filtration	Completed		14/07/2020	Robyn Madge .

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
20/21899-16	Levin D2		13/07/2020 00:00	14/07/2020 09:35	0

Notes: 182680-0 Levin Landfill

	Test	Result	Units	Test Date	Signatory
0001	pH	6.4		14/07/2020	Jennifer Mont KTP
0055	Conductivity at 25°C	35.6	mS/m	14/07/2020	Jennifer Mont KTP
0081	Chemical Oxygen Demand	48	g/m³	14/07/2020	Gordon McArthur KTP
0180	BOD5 - Soluble Carbonaceous	< 1	g/m³	15/07/2020	Gordon McArthur KTP
0602	Chloride	34.6	g/m³	20/07/2020	Amit Kumar KTP
0605	Nitrate - Nitrogen	< 0.01	g/m³	20/07/2020	Amit Kumar KTP
0760	Ammonia Nitrogen	0.62	g/m³	15/07/2020	Athena Cao KTP
6701	Aluminium - Dissolved	0.013	g/m³	16/07/2020	Shanel Kumar KTP
6707	Boron - Dissolved	0.04	g/m³	16/07/2020	Shanel Kumar KTP
6717	Iron - Dissolved	10.9	g/m³	16/07/2020	Shanel Kumar KTP
6718	Lead - Dissolved	< 0.0005	g/m³	16/07/2020	Shanel Kumar KTP
6721	Manganese - Dissolved	0.318	g/m³	16/07/2020	Shanel Kumar KTP
6722	Mercury - Dissolved	< 0.0005	g/m³	16/07/2020	Shuyu Zhao KTP
6724	Nickel - Dissolved	< 0.0005	g/m³	16/07/2020	Shanel Kumar KTP
6731	Sodium - Dissolved	32.6	g/m³	21/07/2020	Shuyu Zhao KTP
M0104	E. coli	32	cfu/100mL	14/07/2020	Juana Tamayo KTP
P1859	Sample Filtration	Completed		14/07/2020	Robyn Madge .

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
20/21899-17	Levin D3r		13/07/2020 00:00	14/07/2020 09:35	0

Notes: 182681-0 Levin Landfill

	Test	Result	Units	Test Date	Signatory
0001	pH	6.8		14/07/2020	Jennifer Mont KTP
0055	Conductivity at 25°C	21.8	mS/m	14/07/2020	Jennifer Mont KTP
0081	Chemical Oxygen Demand	16	g/m³	14/07/2020	Gordon McArthur KTP
0180	BOD5 - Soluble Carbonaceous	< 1	g/m³	15/07/2020	Gordon McArthur KTP
0602	Chloride	22.1	g/m³	20/07/2020	Amit Kumar KTP
0605	Nitrate - Nitrogen	0.18	g/m³	20/07/2020	Amit Kumar KTP

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
20/21899-17	Levin D3r		13/07/2020 00:00	14/07/2020 09:35	0

Notes: 182681-0 Levin Landfill

	Test	Result	Units	Test Date	Signatory
0760	Ammonia Nitrogen	0.18	g/m³	15/07/2020	Athena Cao KTP
6701	Aluminium - Dissolved	< 0.002	g/m³	16/07/2020	Shanel Kumar KTP
6707	Boron - Dissolved	0.03	g/m³	16/07/2020	Shanel Kumar KTP
6717	Iron - Dissolved	2.60	g/m³	16/07/2020	Shanel Kumar KTP
6718	Lead - Dissolved	< 0.0005	g/m³	16/07/2020	Shanel Kumar KTP
6721	Manganese - Dissolved	0.166	g/m³	16/07/2020	Shanel Kumar KTP
6722	Mercury - Dissolved	< 0.0005	g/m³	16/07/2020	Shuyu Zhao KTP
6724	Nickel - Dissolved	< 0.0005	g/m³	16/07/2020	Shanel Kumar KTP
6731	Sodium - Dissolved	25.7	g/m³	16/07/2020	Shanel Kumar KTP
M0104	E. coli	< 4	cfu/100mL	14/07/2020	Maria Norris KTP
P1859	Sample Filtration	Completed		14/07/2020	Robyn Madge .

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
20/21899-18	Levin D6		13/07/2020 00:00	14/07/2020 09:35	0

Notes: 182682-0 Levin Landfill

	Test	Result	Units	Test Date	Signatory
0001	pH	6.8		14/07/2020	Jennifer Mont KTP
0055	Conductivity at 25°C	42.6	mS/m	14/07/2020	Jennifer Mont KTP
0081	Chemical Oxygen Demand	< 15	g/m³	14/07/2020	Gordon McArthur KTP
0180	BOD5 - Soluble Carbonaceous	< 1	g/m³	15/07/2020	Gordon McArthur KTP
0602	Chloride	22.1	g/m³	20/07/2020	Amit Kumar KTP
0605	Nitrate - Nitrogen	23.9	g/m³	20/07/2020	Amit Kumar KTP
0760	Ammonia Nitrogen	< 0.01	g/m³	15/07/2020	Athena Cao KTP
6701	Aluminium - Dissolved	< 0.002	g/m³	16/07/2020	Shanel Kumar KTP
6707	Boron - Dissolved	0.05	g/m³	16/07/2020	Shanel Kumar KTP
6718	Lead - Dissolved	< 0.0005	g/m³	16/07/2020	Shanel Kumar KTP
6721	Manganese - Dissolved	0.0006	g/m³	16/07/2020	Shanel Kumar KTP
6722	Mercury - Dissolved	< 0.0005	g/m³	16/07/2020	Shuyu Zhao KTP
6724	Nickel - Dissolved	< 0.0005	g/m³	16/07/2020	Shanel Kumar KTP
M0104	E. coli	< 4	cfu/100mL	14/07/2020	Maria Norris KTP
P1859	Sample Filtration	Completed		14/07/2020	Robyn Madge .

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
20/21899-19	Levin G1S		01/07/2020 00:00	09/07/2020 14:19	0

Notes: 182683-0 Levin Landfill

	Test	Result	Units	Test Date	Signatory
0001	pH	6.6		10/07/2020	Jennifer Mont KTP
0055	Conductivity at 25°C	65.7	mS/m	10/07/2020	Jennifer Mont KTP
0081	Chemical Oxygen Demand	74	g/m³	10/07/2020	Gordon McArthur KTP
0180	BOD5 - Soluble Carbonaceous	< 1	g/m³	10/07/2020	Gordon McArthur KTP
0602	Chloride	139	g/m³	17/07/2020	Amit Kumar KTP
0605	Nitrate - Nitrogen	0.07	g/m³	17/07/2020	Amit Kumar KTP
0760	Ammonia Nitrogen	0.04	g/m³	15/07/2020	Athena Cao KTP
6701	Aluminium - Dissolved	0.075	g/m³	13/07/2020	Shanel Kumar KTP
6707	Boron - Dissolved	< 0.03	g/m³	13/07/2020	Shanel Kumar KTP
6717	Iron - Dissolved	4.29	g/m³	13/07/2020	Shanel Kumar KTP
6718	Lead - Dissolved	< 0.0005	g/m³	13/07/2020	Shanel Kumar KTP
6721	Manganese - Dissolved	0.0780	g/m³	13/07/2020	Shanel Kumar KTP
6722	Mercury - Dissolved	< 0.0005	g/m³	13/07/2020	Shanel Kumar KTP
6724	Nickel - Dissolved	0.0012	g/m³	13/07/2020	Shanel Kumar KTP
6731	Sodium - Dissolved	101	g/m³	14/07/2020	Shanel Kumar KTP
M0104	E. coli	< 4	cfu/100mL	09/07/2020	Maria Norris KTP
P1859	Sample Filtration	Completed		10/07/2020	Robyn Madge .

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
20/21899-20	Levin G2s		01/07/2020 00:00	09/07/2020 14:19	0

Notes: 182684-0 Levin Landfill

	Test	Result	Units	Test Date	Signatory
0001	pH	7.2		10/07/2020	Jennifer Mont KTP
0055	Conductivity at 25°C	104	mS/m	10/07/2020	Jennifer Mont KTP
0081	Chemical Oxygen Demand	40	g/m³	10/07/2020	Gordon McArthur KTP
0180	BOD5 - Soluble Carbonaceous	< 1	g/m³	10/07/2020	Gordon McArthur KTP
0602	Chloride	136	g/m³	17/07/2020	Amit Kumar KTP
0605	Nitrate - Nitrogen	< 0.01	g/m³	17/07/2020	Amit Kumar KTP
0760	Ammonia Nitrogen	0.02	g/m³	15/07/2020	Athena Cao KTP
6701	Aluminium - Dissolved	0.003	g/m³	13/07/2020	Shanel Kumar KTP
6707	Boron - Dissolved	1.06	g/m³	13/07/2020	Shanel Kumar KTP
6718	Lead - Dissolved	< 0.0005	g/m³	13/07/2020	Shanel Kumar KTP
6721	Manganese - Dissolved	0.0838	g/m³	13/07/2020	Shanel Kumar KTP
6722	Mercury - Dissolved	< 0.0005	g/m³	13/07/2020	Shanel Kumar KTP
6724	Nickel - Dissolved	0.0036	g/m³	13/07/2020	Shanel Kumar KTP
M0104	E. coli	< 4	cfu/100mL	09/07/2020	Maria Norris KTP
P1859	Sample Filtration	Completed		10/07/2020	Robyn Madge .

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
20/21899-21	Levin D5		09/07/2020 00:00	10/07/2020 09:51	0

Notes: 182685-0 Levin Landfill

	Test	Result	Units	Test Date	Signatory
0001	pH	7.1		10/07/2020	Jennifer Mont KTP
0055	Conductivity at 25°C	29.5	mS/m	10/07/2020	Jennifer Mont KTP
0081	Chemical Oxygen Demand	< 15	g/m³	10/07/2020	Gordon McArthur KTP
0180	BOD5 - Soluble Carbonaceous	< 1	g/m³	10/07/2020	Gordon McArthur KTP
0602	Chloride	29.8	g/m³	17/07/2020	Amit Kumar KTP
0605	Nitrate - Nitrogen	1.44	g/m³	17/07/2020	Amit Kumar KTP
0760	Ammonia Nitrogen	< 0.01	g/m³	15/07/2020	Athena Cao KTP
6701	Aluminium - Dissolved	< 0.002	g/m³	13/07/2020	Shanel Kumar KTP
6707	Boron - Dissolved	0.03	g/m³	13/07/2020	Shanel Kumar KTP
6718	Lead - Dissolved	< 0.0005	g/m³	13/07/2020	Shanel Kumar KTP
6721	Manganese - Dissolved	0.0060	g/m³	13/07/2020	Shanel Kumar KTP
6722	Mercury - Dissolved	< 0.0005	g/m³	13/07/2020	Shanel Kumar KTP
6724	Nickel - Dissolved	< 0.0005	g/m³	13/07/2020	Shanel Kumar KTP
M0104	E. coli	< 4	cfu/100mL	10/07/2020	Maria Norris KTP
P1859	Sample Filtration	Completed		10/07/2020	Robyn Madge .

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
20/21899-22	Levin F1		09/07/2020 00:00	10/07/2020 09:51	0

Notes: 182686-0 Levin Landfill

	Test	Result	Units	Test Date	Signatory
0001	pH	6.9		10/07/2020	Jennifer Mont KTP
0055	Conductivity at 25°C	47.4	mS/m	10/07/2020	Jennifer Mont KTP
0081	Chemical Oxygen Demand	26	g/m³	10/07/2020	Gordon McArthur KTP
0180	BOD5 - Soluble Carbonaceous	< 1	g/m³	10/07/2020	Gordon McArthur KTP
0602	Chloride	48.7	g/m³	17/07/2020	Amit Kumar KTP
0605	Nitrate - Nitrogen	0.98	g/m³	17/07/2020	Amit Kumar KTP
0760	Ammonia Nitrogen	< 0.01	g/m³	15/07/2020	Athena Cao KTP
6701	Aluminium - Dissolved	0.002	g/m³	13/07/2020	Shanel Kumar KTP
6707	Boron - Dissolved	0.03	g/m³	13/07/2020	Shanel Kumar KTP
6718	Lead - Dissolved	< 0.0005	g/m³	13/07/2020	Shanel Kumar KTP
6721	Manganese - Dissolved	0.0180	g/m³	13/07/2020	Shanel Kumar KTP
6722	Mercury - Dissolved	< 0.0005	g/m³	13/07/2020	Shanel Kumar KTP
6724	Nickel - Dissolved	0.0009	g/m³	13/07/2020	Shanel Kumar KTP

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
20/21899-22	Levin F1		09/07/2020 00:00	10/07/2020 09:51	0

Notes: 182686-0 Levin Landfill

	Test	Result	Units	Test Date	Signatory
M0104	E. coli	< 4	cfu/100mL	10/07/2020	Maria Norris KTP
P1859	Sample Filtration	Completed		10/07/2020	Robyn Madge .

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
20/21899-23	Levin F2		09/07/2020 00:00	10/07/2020 09:51	0

Notes: 182687-0 Levin Landfill

	Test	Result	Units	Test Date	Signatory
0001	pH	7.1		10/07/2020	Jennifer Mont KTP
0055	Conductivity at 25°C	21.7	mS/m	10/07/2020	Jennifer Mont KTP
0081	Chemical Oxygen Demand	< 15	g/m³	10/07/2020	Gordon McArthur KTP
0180	BOD5 - Soluble Carbonaceous	< 1	g/m³	10/07/2020	Gordon McArthur KTP
0602	Chloride	23.0	g/m³	17/07/2020	Amit Kumar KTP
0605	Nitrate - Nitrogen	0.43	g/m³	17/07/2020	Amit Kumar KTP
0760	Ammonia Nitrogen	< 0.01	g/m³	15/07/2020	Athena Cao KTP
6701	Aluminium - Dissolved	< 0.002	g/m³	13/07/2020	Shanel Kumar KTP
6707	Boron - Dissolved	0.04	g/m³	13/07/2020	Shanel Kumar KTP
6718	Lead - Dissolved	< 0.0005	g/m³	13/07/2020	Shanel Kumar KTP
6721	Manganese - Dissolved	0.0040	g/m³	13/07/2020	Shanel Kumar KTP
6722	Mercury - Dissolved	< 0.0005	g/m³	13/07/2020	Shanel Kumar KTP
6724	Nickel - Dissolved	< 0.0005	g/m³	13/07/2020	Shanel Kumar KTP
M0104	E. coli	< 4	cfu/100mL	10/07/2020	Maria Norris KTP
P1859	Sample Filtration	Completed		10/07/2020	Robyn Madge .

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
20/21899-24	Levin F3		09/07/2020 00:00	10/07/2020 09:51	0

Notes: 182688-0 Levin Landfill

	Test	Result	Units	Test Date	Signatory
0001	pH	7.1		10/07/2020	Jennifer Mont KTP
0055	Conductivity at 25°C	23.5	mS/m	10/07/2020	Jennifer Mont KTP
0081	Chemical Oxygen Demand	< 15	g/m³	10/07/2020	Gordon McArthur KTP
0180	BOD5 - Soluble Carbonaceous	< 1	g/m³	10/07/2020	Gordon McArthur KTP
0602	Chloride	22.2	g/m³	17/07/2020	Amit Kumar KTP
0605	Nitrate - Nitrogen	1.55	g/m³	17/07/2020	Amit Kumar KTP
0760	Ammonia Nitrogen	< 0.01	g/m³	15/07/2020	Athena Cao KTP
6701	Aluminium - Dissolved	< 0.002	g/m³	13/07/2020	Shanel Kumar KTP
6707	Boron - Dissolved	< 0.03	g/m³	13/07/2020	Shanel Kumar KTP
6717	Iron - Dissolved	< 0.01	g/m³	13/07/2020	Shanel Kumar KTP
6718	Lead - Dissolved	< 0.0005	g/m³	13/07/2020	Shanel Kumar KTP
6721	Manganese - Dissolved	< 0.0005	g/m³	13/07/2020	Shanel Kumar KTP
6722	Mercury - Dissolved	< 0.0005	g/m³	13/07/2020	Shanel Kumar KTP
6724	Nickel - Dissolved	< 0.0005	g/m³	13/07/2020	Shanel Kumar KTP
6731	Sodium - Dissolved	26.1	g/m³	14/07/2020	Shanel Kumar KTP
M0104	E. coli	< 4	cfu/100mL	10/07/2020	Maria Norris KTP
P1859	Sample Filtration	Completed		10/07/2020	Robyn Madge .

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
20/21899-27	Levin TD1		07/07/2020 00:00	07/07/2020 14:49	0

Notes: 182691-0 Levin Landfill

	Test	Result	Units	Test Date	Signatory
0001	pH	7.0		08/07/2020	Gordon McArthur KTP
0055	Conductivity at 25°C	184	mS/m	08/07/2020	Gordon McArthur KTP
0081	Chemical Oxygen Demand	562	g/m³	08/07/2020	Gordon McArthur KTP
0180	BOD5 - Soluble Carbonaceous	< 6	g/m³	08/07/2020	Gordon McArthur KTP
0602	Chloride	321	g/m³	20/07/2020	Amit Kumar KTP

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
20/21899-27	Levin TD1		07/07/2020 00:00	07/07/2020 14:49	0

Notes: 182691-0 Levin Landfill

	Test	Result	Units	Test Date	Signatory
0605	Nitrate - Nitrogen	1.21	g/m³	20/07/2020	Amit Kumar KTP
0760	Ammonia Nitrogen	43.2	g/m³	08/07/2020	Athena Cao KTP
6701	Aluminium - Dissolved	0.022	g/m³	09/07/2020	Shanel Kumar KTP
6707	Boron - Dissolved	0.81	g/m³	09/07/2020	Shanel Kumar KTP
6718	Lead - Dissolved	< 0.0005	g/m³	09/07/2020	Shanel Kumar KTP
6721	Manganese - Dissolved	0.360	g/m³	09/07/2020	Shanel Kumar KTP
6722	Mercury - Dissolved	< 0.0005	g/m³	09/07/2020	Shanel Kumar KTP
6724	Nickel - Dissolved	0.0032	g/m³	09/07/2020	Shanel Kumar KTP
M0104	E. coli	7,500	cfu/100mL	08/07/2020	Maria Norris KTP
P1859	Sample Filtration	Completed		08/07/2020	Robyn Madge .

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
20/21899-28	Levin Leachate Pond		07/07/2020 00:00	07/07/2020 14:49	0

Notes: 182692-0 Levin Landfill Sample

	Test	Result	Units	Test Date	Signatory
0001	pH	7.7		08/07/2020	Gordon McArthur KTP
0002	Suspended Solids - Total	150	g/m³	08/07/2020	Jennifer Mont KTP
0040	Total (NP) Organic Carbon	592	g/m³	08/07/2020	Sharon van Soest KTP
0052	Alkalinity - Total	5,470	g CaCO3/m³	08/07/2020	Jennifer Mont KTP
0055	Conductivity at 25°C	135	mS/m	08/07/2020	Gordon McArthur KTP
0081	Chemical Oxygen Demand	2,470	g/m³	08/07/2020	Gordon McArthur KTP
0180	BOD5 - Soluble Carbonaceous	73	g/m³	08/07/2020	Gordon McArthur KTP
0602	Chloride	1,050	g/m³	17/07/2020	Shanel Kumar KTP
0605	Nitrate - Nitrogen	11.7	g/m³	17/07/2020	Shanel Kumar KTP
0607	Sulphate	216	g/m³	17/07/2020	Shanel Kumar KTP
0760	Ammonia Nitrogen	1,140	g/m³	10/07/2020	Divina Lagazon KTP
1642	Total Hardness	577	g CaCO3/m³	08/07/2020	Shanel Kumar KTP
1810	Calcium - Dissolved	131	g/m³	08/07/2020	Shanel Kumar KTP
1819	Iron - Dissolved	4.41	g/m³	08/07/2020	Shanel Kumar KTP
1822	Magnesium - Dissolved	60.6	g/m³	08/07/2020	Shanel Kumar KTP
1834	Sodium - Dissolved	913	g/m³	08/07/2020	Shanel Kumar KTP
2088	Dissolved Reactive Phosphorus	8.73	g/m³	08/07/2020	Athena Cao KTP
6701	Aluminium - Dissolved	0.402	g/m³	09/07/2020	Shanel Kumar KTP
6703	Arsenic - Dissolved	0.306	g/m³	09/07/2020	Shanel Kumar KTP
6707	Boron - Dissolved	5.57	g/m³	09/07/2020	Shanel Kumar KTP
6708	Cadmium - Dissolved	< 0.0002	g/m³	09/07/2020	Shanel Kumar KTP
6711	Chromium - Dissolved	0.506	g/m³	09/07/2020	Shanel Kumar KTP
6713	Copper - Dissolved	0.0290	g/m³	09/07/2020	Shanel Kumar KTP
6718	Lead - Dissolved	0.0028	g/m³	09/07/2020	Shanel Kumar KTP
6721	Manganese - Dissolved	1.13	g/m³	09/07/2020	Shanel Kumar KTP
6722	Mercury - Dissolved	< 0.0005	g/m³	09/07/2020	Shanel Kumar KTP
6724	Nickel - Dissolved	0.111	g/m³	09/07/2020	Shanel Kumar KTP
6726	Potassium - Dissolved	625	g/m³	09/07/2020	Shanel Kumar KTP
6738	Zinc - Dissolved	0.119	g/m³	09/07/2020	Shanel Kumar KTP
M0104	E. coli	65,000	cfu/100mL	08/07/2020	Maria Norris KTP
MO-5001	Volatile Fatty Acids	36 *	g/m³		Lizzie Addis Transcribed by
MO-5002	Total Halogenated Phenolics	< 0.05	g/m³		Lizzie Addis Transcribed by
P1859	Sample Filtration	Completed		08/07/2020	Robyn Madge .

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
20/21899-29	Levin HS1		07/07/2020 00:00	07/07/2020 14:49	0

Notes: 182693-0 Levin Landfill Sample

	Test	Result	Units	Test Date	Signatory
0001	pH	7.6		08/07/2020	Marylou Cabral KTP
0002	Suspended Solids - Total	21	g/m³	07/07/2020	Gordon McArthur KTP
0040	Total (NP) Organic Carbon	7.1	g/m³	08/07/2020	Sharon van Soest KTP
0052	Alkalinity - Total	44	g CaCO3/m³	08/07/2020	Marylou Cabral KTP
0055	Conductivity at 25°C	23.8	mS/m	08/07/2020	Marylou Cabral KTP
0081	Chemical Oxygen Demand	24	g/m³	08/07/2020	Gordon McArthur KTP
0180	BOD5 - Soluble Carbonaceous	< 1	g/m³	08/07/2020	Gordon McArthur KTP
0602	Chloride	24.7	g/m³	17/07/2020	Shanel Kumar KTP
0605	Nitrate - Nitrogen	0.63	g/m³	17/07/2020	Shanel Kumar KTP
0607	Sulphate	19.9	g/m³	17/07/2020	Shanel Kumar KTP
0760	Ammonia Nitrogen	0.01	g/m³	10/07/2020	Divina Lagazon KTP
1642	Total Hardness	64	g CaCO3/m³	08/07/2020	Shanel Kumar KTP
1810	Calcium - Dissolved	13.6	g/m³	08/07/2020	Shanel Kumar KTP
1819	Iron - Dissolved	0.032	g/m³	08/07/2020	Shanel Kumar KTP
1822	Magnesium - Dissolved	7.31	g/m³	08/07/2020	Shanel Kumar KTP
1834	Sodium - Dissolved	20.7	g/m³	08/07/2020	Shanel Kumar KTP
2088	Dissolved Reactive Phosphorus	< 0.005	g/m³	10/07/2020	Divina Lagazon KTP
6701	Aluminium - Dissolved	0.014	g/m³	09/07/2020	Shanel Kumar KTP
6703	Arsenic - Dissolved	< 0.001	g/m³	09/07/2020	Shanel Kumar KTP
6707	Boron - Dissolved	0.04	g/m³	09/07/2020	Shanel Kumar KTP
6708	Cadmium - Dissolved	< 0.0002	g/m³	09/07/2020	Shanel Kumar KTP
6711	Chromium - Dissolved	< 0.001	g/m³	09/07/2020	Shanel Kumar KTP
6713	Copper - Dissolved	0.0012	g/m³	09/07/2020	Shanel Kumar KTP
6718	Lead - Dissolved	< 0.0005	g/m³	09/07/2020	Shanel Kumar KTP
6721	Manganese - Dissolved	0.0100	g/m³	09/07/2020	Shanel Kumar KTP
6722	Mercury - Dissolved	< 0.0005	g/m³	09/07/2020	Shanel Kumar KTP
6724	Nickel - Dissolved	< 0.0005	g/m³	09/07/2020	Shanel Kumar KTP
6726	Potassium - Dissolved	2.93	g/m³	09/07/2020	Shanel Kumar KTP
6738	Zinc - Dissolved	< 0.002	g/m³	09/07/2020	Shanel Kumar KTP
M0104	E. coli	1,500 *	cfu/100mL	08/07/2020	Maria Norris KTP
MO-5001	Volatile Fatty Acids	< 5	g/m³		Lizzie Addis Transcribed by
MO-5002	Total Halogenated Phenolics	< 0.05	g/m³		Lizzie Addis Transcribed by
P1859	Sample Filtration	Completed		08/07/2020	Robyn Madge .

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
20/21899-30	Levin HS1A		07/07/2020 00:00	07/07/2020 14:49	0

Notes: 182694-0 Levin Landfill Sample

	Test	Result	Units	Test Date	Signatory
0001	pH	7.6		08/07/2020	Marylou Cabral KTP
0002	Suspended Solids - Total	23	g/m³	07/07/2020	Gordon McArthur KTP
0040	Total (NP) Organic Carbon	7.2	g/m³	08/07/2020	Sharon van Soest KTP
0052	Alkalinity - Total	44	g CaCO3/m³	08/07/2020	Marylou Cabral KTP
0055	Conductivity at 25°C	23.4	mS/m	08/07/2020	Marylou Cabral KTP
0081	Chemical Oxygen Demand	27	g/m³	08/07/2020	Gordon McArthur KTP
0180	BOD5 - Soluble Carbonaceous	< 1	g/m³	08/07/2020	Gordon McArthur KTP
0602	Chloride	25.3	g/m³	17/07/2020	Shanel Kumar KTP
0605	Nitrate - Nitrogen	0.66	g/m³	17/07/2020	Shanel Kumar KTP
0607	Sulphate	20.0	g/m³	17/07/2020	Shanel Kumar KTP
0760	Ammonia Nitrogen	0.09	g/m³	08/07/2020	Athena Cao KTP
1642	Total Hardness	61	g CaCO3/m³	08/07/2020	Shanel Kumar KTP
1810	Calcium - Dissolved	12.8	g/m³	08/07/2020	Shanel Kumar KTP
1819	Iron - Dissolved	0.036	g/m³	08/07/2020	Shanel Kumar KTP

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
20/21899-30	Levin HS1A		07/07/2020 00:00	07/07/2020 14:49	0

Notes: 182694-0 Levin Landfill Sample

	Test	Result	Units	Test Date	Signatory
1822	Magnesium - Dissolved	6.94	g/m³	08/07/2020	Shanel Kumar KTP
1834	Sodium - Dissolved	18.5	g/m³	08/07/2020	Shanel Kumar KTP
2088	Dissolved Reactive Phosphorus	0.005	g/m³	08/07/2020	Athena Cao KTP
6701	Aluminium - Dissolved	0.023	g/m³	09/07/2020	Shanel Kumar KTP
6703	Arsenic - Dissolved	< 0.001	g/m³	09/07/2020	Shanel Kumar KTP
6707	Boron - Dissolved	0.04	g/m³	09/07/2020	Shanel Kumar KTP
6708	Cadmium - Dissolved	< 0.0002	g/m³	09/07/2020	Shanel Kumar KTP
6711	Chromium - Dissolved	< 0.001	g/m³	09/07/2020	Shanel Kumar KTP
6713	Copper - Dissolved	0.0017	g/m³	09/07/2020	Shanel Kumar KTP
6718	Lead - Dissolved	< 0.0005	g/m³	09/07/2020	Shanel Kumar KTP
6721	Manganese - Dissolved	0.0099	g/m³	09/07/2020	Shanel Kumar KTP
6722	Mercury - Dissolved	< 0.0005	g/m³	09/07/2020	Shanel Kumar KTP
6724	Nickel - Dissolved	< 0.0005	g/m³	09/07/2020	Shanel Kumar KTP
6726	Potassium - Dissolved	3.17	g/m³	09/07/2020	Shanel Kumar KTP
6738	Zinc - Dissolved	0.005	g/m³	09/07/2020	Shanel Kumar KTP
M0104	E. coli	1,900	cfu/100mL	08/07/2020	Maria Norris KTP
MO-5001	Volatile Fatty Acids	< 5 *	g/m³		Lizzie Addis Transcribed by
MO-5002	Total Halogenated Phenolics	< 0.05	g/m³		Lizzie Addis Transcribed by
P1859	Sample Filtration	Completed		08/07/2020	Robyn Madge .

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
20/21899-31	Levin HS2		07/07/2020 00:00	07/07/2020 14:49	0

Notes: 182695-0 Levin Landfill Sample

	Test	Result	Units	Test Date	Signatory
0001	pH	7.6		08/07/2020	Marylou Cabral KTP
0002	Suspended Solids - Total	29	g/m³	07/07/2020	Gordon McArthur KTP
0040	Total (NP) Organic Carbon	7.7	g/m³	08/07/2020	Sharon van Soest KTP
0052	Alkalinity - Total	45	g CaCO3/m³	08/07/2020	Marylou Cabral KTP
0055	Conductivity at 25°C	23.9	mS/m	08/07/2020	Marylou Cabral KTP
0081	Chemical Oxygen Demand	22	g/m³	08/07/2020	Gordon McArthur KTP
0180	BOD5 - Soluble Carbonaceous	< 1	g/m³	08/07/2020	Gordon McArthur KTP
0602	Chloride	25.2	g/m³	17/07/2020	Shanel Kumar KTP
0605	Nitrate - Nitrogen	0.71	g/m³	17/07/2020	Shanel Kumar KTP
0607	Sulphate	19.2	g/m³	17/07/2020	Shanel Kumar KTP
0760	Ammonia Nitrogen	0.09	g/m³	08/07/2020	Athena Cao KTP
1642	Total Hardness	61	g CaCO3/m³	08/07/2020	Shanel Kumar KTP
1810	Calcium - Dissolved	13.1	g/m³	08/07/2020	Shanel Kumar KTP
1819	Iron - Dissolved	0.049	g/m³	08/07/2020	Shanel Kumar KTP
1822	Magnesium - Dissolved	6.96	g/m³	08/07/2020	Shanel Kumar KTP
1834	Sodium - Dissolved	19.8	g/m³	08/07/2020	Shanel Kumar KTP
2088	Dissolved Reactive Phosphorus	0.006	g/m³	08/07/2020	Athena Cao KTP
6701	Aluminium - Dissolved	0.015	g/m³	09/07/2020	Shanel Kumar KTP
6703	Arsenic - Dissolved	< 0.001	g/m³	09/07/2020	Shanel Kumar KTP
6707	Boron - Dissolved	0.04	g/m³	09/07/2020	Shanel Kumar KTP
6708	Cadmium - Dissolved	< 0.0002	g/m³	09/07/2020	Shanel Kumar KTP
6711	Chromium - Dissolved	< 0.001	g/m³	09/07/2020	Shanel Kumar KTP
6713	Copper - Dissolved	0.0012	g/m³	09/07/2020	Shanel Kumar KTP
6718	Lead - Dissolved	< 0.0005	g/m³	09/07/2020	Shanel Kumar KTP
6721	Manganese - Dissolved	0.0150	g/m³	09/07/2020	Shanel Kumar KTP
6722	Mercury - Dissolved	< 0.0005	g/m³	09/07/2020	Shanel Kumar KTP
6724	Nickel - Dissolved	< 0.0005	g/m³	09/07/2020	Shanel Kumar KTP
6726	Potassium - Dissolved	3.09	g/m³	09/07/2020	Shanel Kumar KTP

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
20/21899-31	Levin HS2		07/07/2020 00:00	07/07/2020 14:49	0

Notes: 182695-0 Levin Landfill Sample

	Test	Result	Units	Test Date	Signatory
6738	Zinc - Dissolved	< 0.002	g/m³	09/07/2020	Shanel Kumar KTP
M0104	E. coli	400	cfu/100mL	08/07/2020	Maria Norris KTP
MO-5001	Volatile Fatty Acids	< 5 *	g/m³		Lizzie Addis Transcribed by
MO-5002	Total Halogenated Phenolics	< 0.05	g/m³		Lizzie Addis Transcribed by
P1859	Sample Filtration	Completed		08/07/2020	Robyn Madge .

Sample	Site	Map Ref.	Date Sampled	Date Received	Order No.
20/21899-32	Levin HS3		07/07/2020 00:00	07/07/2020 14:49	0

Notes: 182696-0 Levin Landfill Sample

	Test	Result	Units	Test Date	Signatory
0001	pH	7.7		08/07/2020	Marylou Cabral KTP
0002	Suspended Solids - Total	20	g/m³	07/07/2020	Gordon McArthur KTP
0040	Total (NP) Organic Carbon	6.7	g/m³	08/07/2020	Sharon van Soest KTP
0052	Alkalinity - Total	48	g CaCO3/m³	08/07/2020	Marylou Cabral KTP
0055	Conductivity at 25°C	24.7	mS/m	08/07/2020	Marylou Cabral KTP
0081	Chemical Oxygen Demand	25	g/m³	08/07/2020	Gordon McArthur KTP
0180	BOD5 - Soluble Carbonaceous	1	g/m³	08/07/2020	Gordon McArthur KTP
0602	Chloride	25.6	g/m³	17/07/2020	Shanel Kumar KTP
0605	Nitrate - Nitrogen	0.63	g/m³	17/07/2020	Shanel Kumar KTP
0607	Sulphate	19.3	g/m³	17/07/2020	Shanel Kumar KTP
0760	Ammonia Nitrogen	0.11	g/m³	08/07/2020	Athena Cao KTP
1642	Total Hardness	65	g CaCO3/m³	08/07/2020	Shanel Kumar KTP
1810	Calcium - Dissolved	13.7	g/m³	08/07/2020	Shanel Kumar KTP
1819	Iron - Dissolved	0.046	g/m³	08/07/2020	Shanel Kumar KTP
1822	Magnesium - Dissolved	7.35	g/m³	08/07/2020	Shanel Kumar KTP
1834	Sodium - Dissolved	20.8	g/m³	08/07/2020	Shanel Kumar KTP
2088	Dissolved Reactive Phosphorus	0.005	g/m³	08/07/2020	Athena Cao KTP
6701	Aluminium - Dissolved	0.014	g/m³	09/07/2020	Shanel Kumar KTP
6703	Arsenic - Dissolved	< 0.001	g/m³	09/07/2020	Shanel Kumar KTP
6707	Boron - Dissolved	0.04	g/m³	09/07/2020	Shanel Kumar KTP
6708	Cadmium - Dissolved	< 0.0002	g/m³	09/07/2020	Shanel Kumar KTP
6711	Chromium - Dissolved	< 0.001	g/m³	09/07/2020	Shanel Kumar KTP
6713	Copper - Dissolved	0.0012	g/m³	09/07/2020	Shanel Kumar KTP
6718	Lead - Dissolved	< 0.0005	g/m³	09/07/2020	Shanel Kumar KTP
6721	Manganese - Dissolved	0.0190	g/m³	09/07/2020	Shanel Kumar KTP
6722	Mercury - Dissolved	< 0.0005	g/m³	09/07/2020	Shanel Kumar KTP
6724	Nickel - Dissolved	< 0.0005	g/m³	09/07/2020	Shanel Kumar KTP
6726	Potassium - Dissolved	3.15	g/m³	09/07/2020	Shanel Kumar KTP
6738	Zinc - Dissolved	0.003	g/m³	09/07/2020	Shanel Kumar KTP
M0104	E. coli	350	cfu/100mL	08/07/2020	Maria Norris KTP
MO-5001	Volatile Fatty Acids	< 5 *	g/m³		Lizzie Addis Transcribed by
MO-5002	Total Halogenated Phenolics	< 0.05	g/m³		Lizzie Addis Transcribed by
P1859	Sample Filtration	Completed		08/07/2020	Robyn Madge .

Comments:

* Not an accredited test.

Sampled by customer using ELS approved containers.

Test Methodology:

Test	Methodology	Detection Limit
pH	Dedicated pH meter following APHA Online Edition Method 4500-H B.	0.1

Test	Methodology	Detection Limit
Suspended Solids - Total	APHA Online Edition Method 2540 D	3 g/m³
Total (NP) Organic Carbon	Total Non-Purgeable Organic Carbon using TOC analyser. APHA Online Edition 5310 B.	0.1 g/m³
Alkalinity - Total	APHA Online Edition Method 2320 B	1 g CaCO3/m³
Conductivity at 25°C	APHA Online Edition Method 2510 B.	0.1 mS/m
Chemical Oxygen Demand	APHA Online Edition Method 5220 D.	15 g/m³
BOD5 - Soluble Carbonaceous	APHA Online Edition Method 5210 B. The sample is filtered through Whatman GFC and treated with nitrification inhibitor.	1 g/m³
Chloride	Ion Chromatography following APHA 4110B.	0.02 g/m³
Nitrate - Nitrogen	Ion Chromatography following APHA 4110B.	0.01 g/m³
Sulphate	Ion Chromatography following APHA 4110B.	0.02 g/m³
Ammonia Nitrogen	Flow Injection Autoanalyser following APHA Online Edition Method 4500 NH3-H.	0.01 g/m³
Total Hardness	ICP-OES following APHA Online Edition Method 3120 B (modified).	1 g CaCO3/m³
Calcium - Dissolved	ICP-OES following APHA Online Edition Method 3120 B (modified).	0.01 g/m³
Iron - Dissolved	ICP-OES following APHA Online Edition Method 3120 B (modified).	0.005 g/m³
Magnesium - Dissolved	ICP-OES following APHA Online Edition Method 3120 B (modified).	0.01 g/m³
Sodium - Dissolved	ICP-OES following APHA Online Edition Method 3120 B (modified).	0.02 g/m³
Dissolved Reactive Phosphorus	Flow Injection Autoanalyser following APHA Online Edition Method 4500-P G.	0.005 g/m³
Aluminium - Dissolved	ICP-MS following APHA Online Edition method 3125 (modified).	0.002 g/m³
Arsenic - Dissolved	ICP-MS following APHA Online Edition method 3125 (modified).	0.001 g/m³
Boron - Dissolved	ICP-MS following APHA Online Edition method 3125 (modified).	0.03 g/m³
Cadmium - Dissolved	ICP-MS following APHA Online Edition method 3125 (modified).	0.0002 g/m³
Chromium - Dissolved	ICP-MS following APHA Online Edition method 3125 (modified).	0.001 g/m³
Copper - Dissolved	ICP-MS following APHA Online Edition method 3125 (modified).	0.0005 g/m³
Iron - Dissolved	ICP-MS following APHA Online Edition method 3125 (modified).	0.01 g/m³
Lead - Dissolved	ICP-MS following APHA Online Edition method 3125 (modified).	0.0005 g/m³
Manganese - Dissolved	ICP-MS following APHA Online Edition method 3125 (modified).	0.0005 g/m³
Mercury - Dissolved	ICP-MS following APHA Online Edition method 3125 (modified).	0.0005 g/m³
Nickel - Dissolved	ICP-MS following APHA Online Edition method 3125 (modified).	0.0005 g/m³
Potassium - Dissolved	ICP-MS following APHA Online Edition method 3125 (modified)	0.01 g/m³
Sodium - Dissolved	ICP-MS following APHA Online Edition method 3125 (modified)	0.01 g/m³
Zinc - Dissolved	ICP-MS following APHA Online Edition method 3125 (modified).	0.002 g/m³
E. coli	APHA 9222I:Online Edition	1 cfu/100mL
Volatile Fatty Acids	Performed by Eurofins Melbourne following APHA 22nd Edition Method 5560C. Results are reported as acetic acid equivalent.	5 g/m³
Total Halogenated Phenolics	Analyses at Eurofins Melbourne following Method USEPA 8270 Phenols.	0.01 g/m³
Sample Filtration	Sample filtered through 0.45 micron filter following APHA Online Edition Method 3030B.	n/a

Unless otherwise stated, all tests are performed in Wellington.

The laboratory is not responsible for the information provided by the customer which can affect the validity of the results.

"<" means that no analyte was found in the sample at the level of detection shown. Detection limits are based on a clean matrix and may vary according to individual sample.

g/m3 is the equivalent to mg/L and ppm.

Samples will be retained for a period of time, in suitable conditions appropriate to the analyses requested.

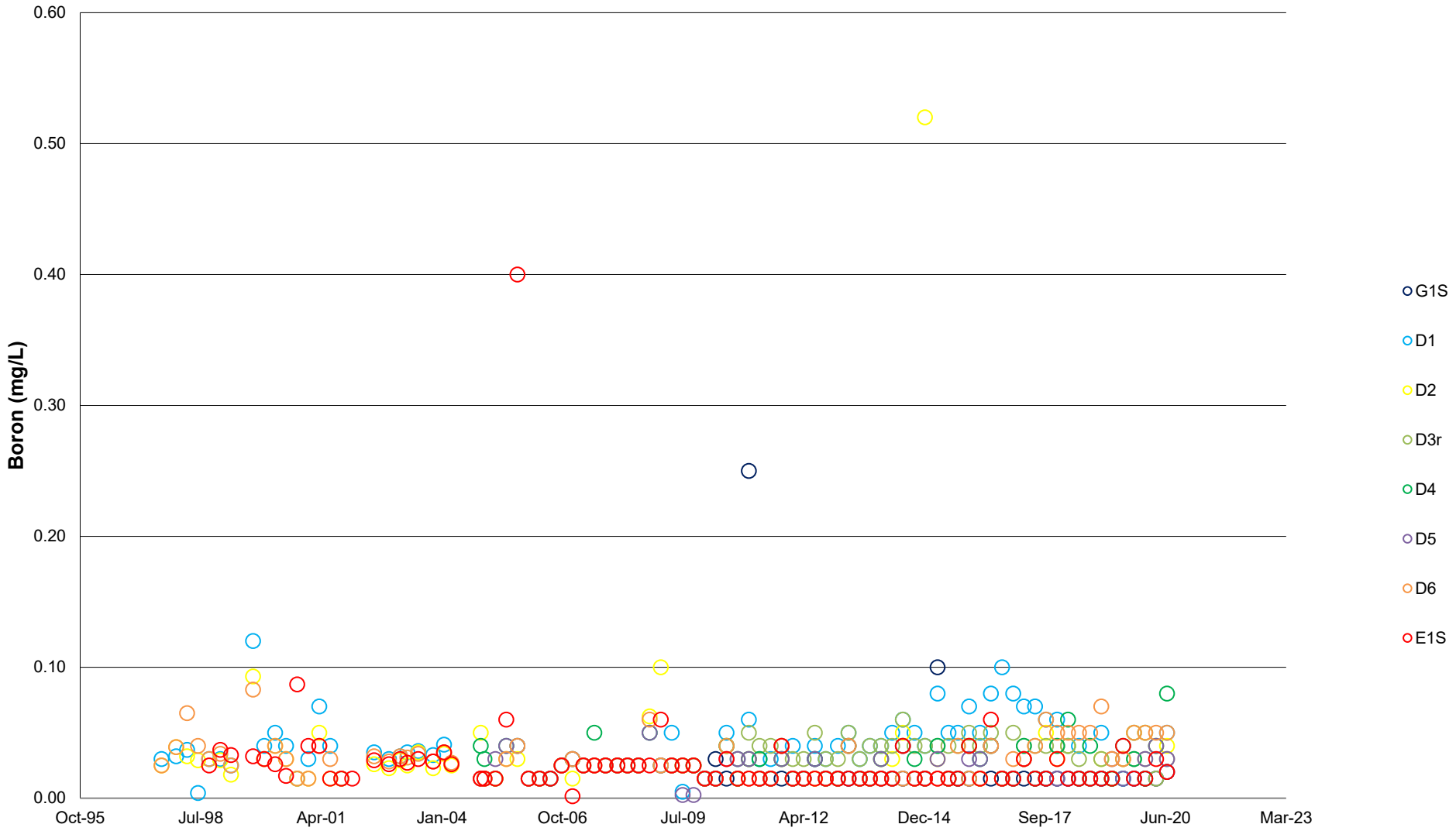
Report Released By

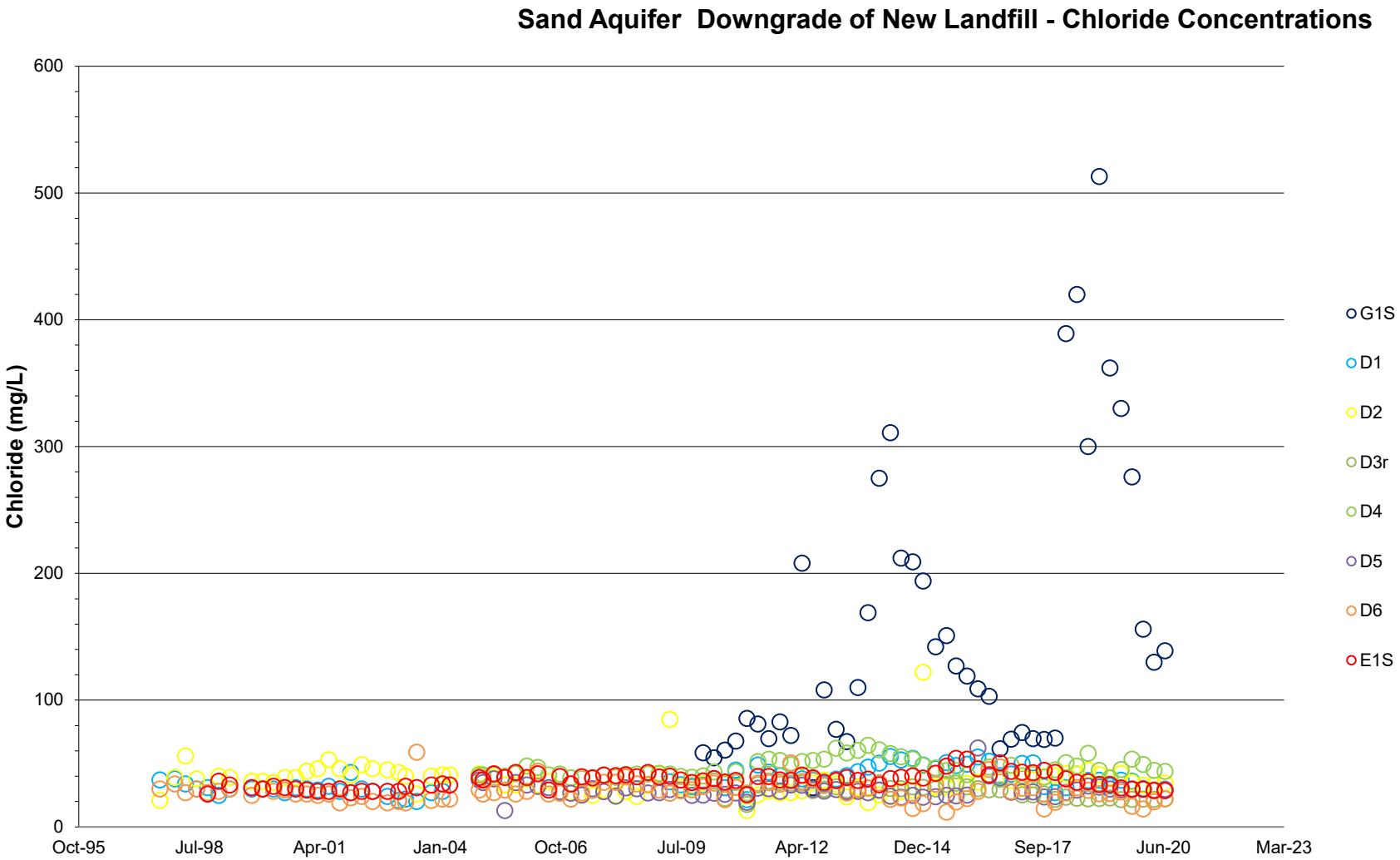
Rob Deacon

This laboratory is accredited by International Accreditation New Zealand and its reports are recognised in all countries affiliated to the International Laboratory Accreditation Co-operation Mutual Recognition Arrangement (ILAC-MRA). The tests reported have been performed in accordance with our terms of accreditation, with the exception of tests marked "not an accredited test", which are outside the scope of this laboratory's accreditation.

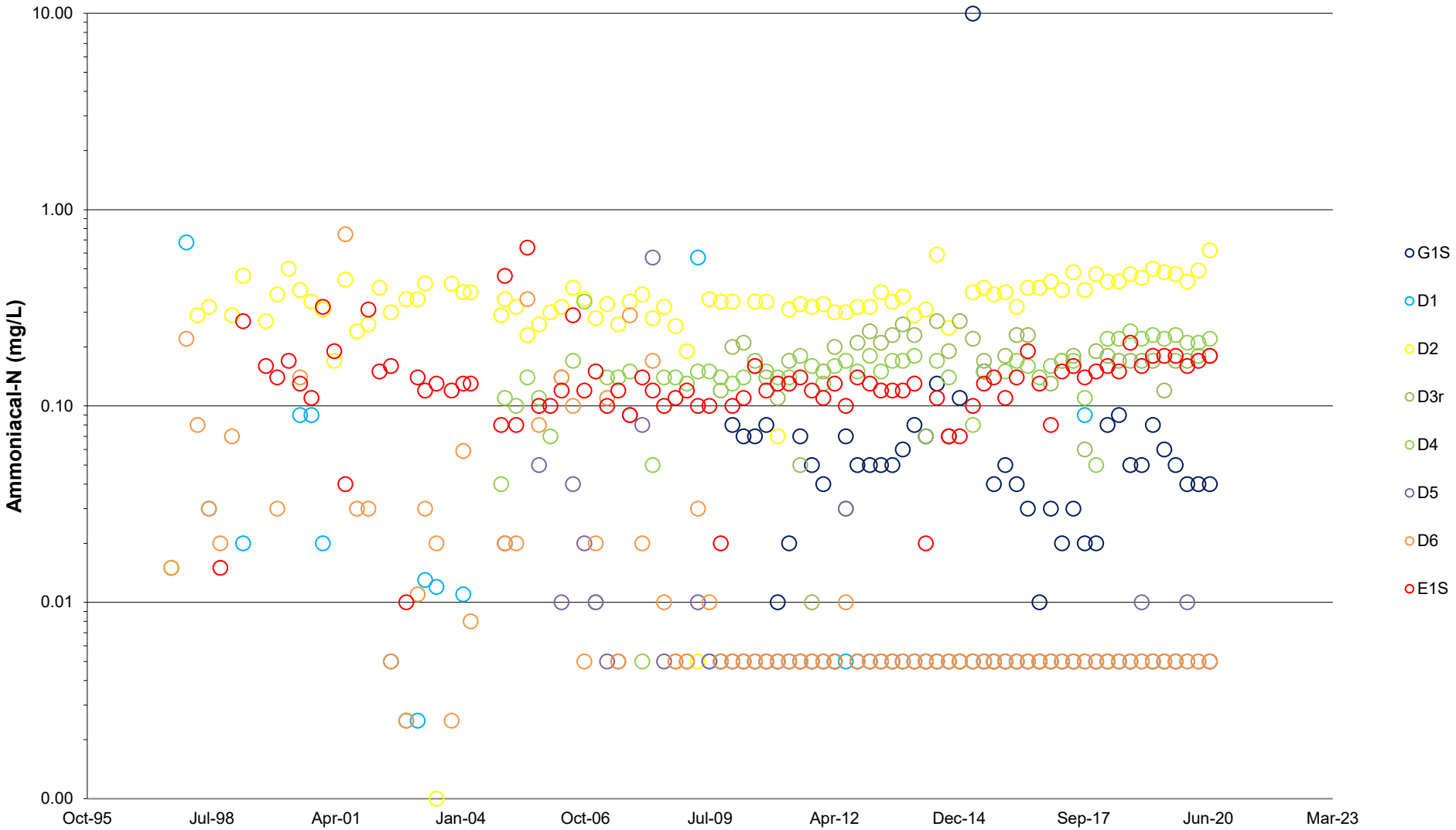
Appendix D Historical Result Graphs

Sand Aquifer Downgrade of New Landfill - Boron Concentrations

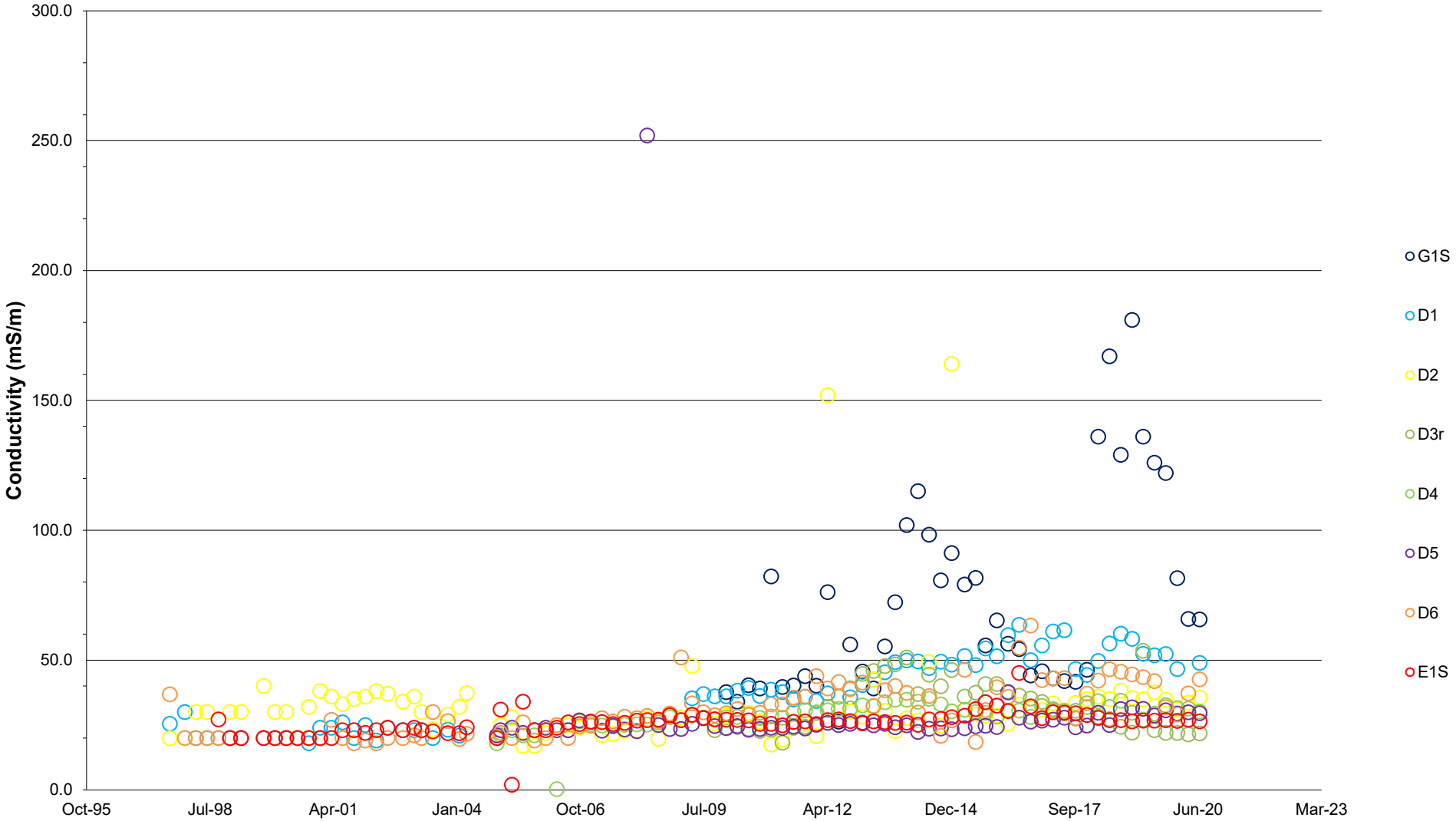



Sand Aquifer Downgrade of New Landfill - Chloride Concentrations
Chloride (mg/L)
600
500
400
300
200
100
0
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
G1S
D1
D2
D3r
D4
D5
D6
E1S

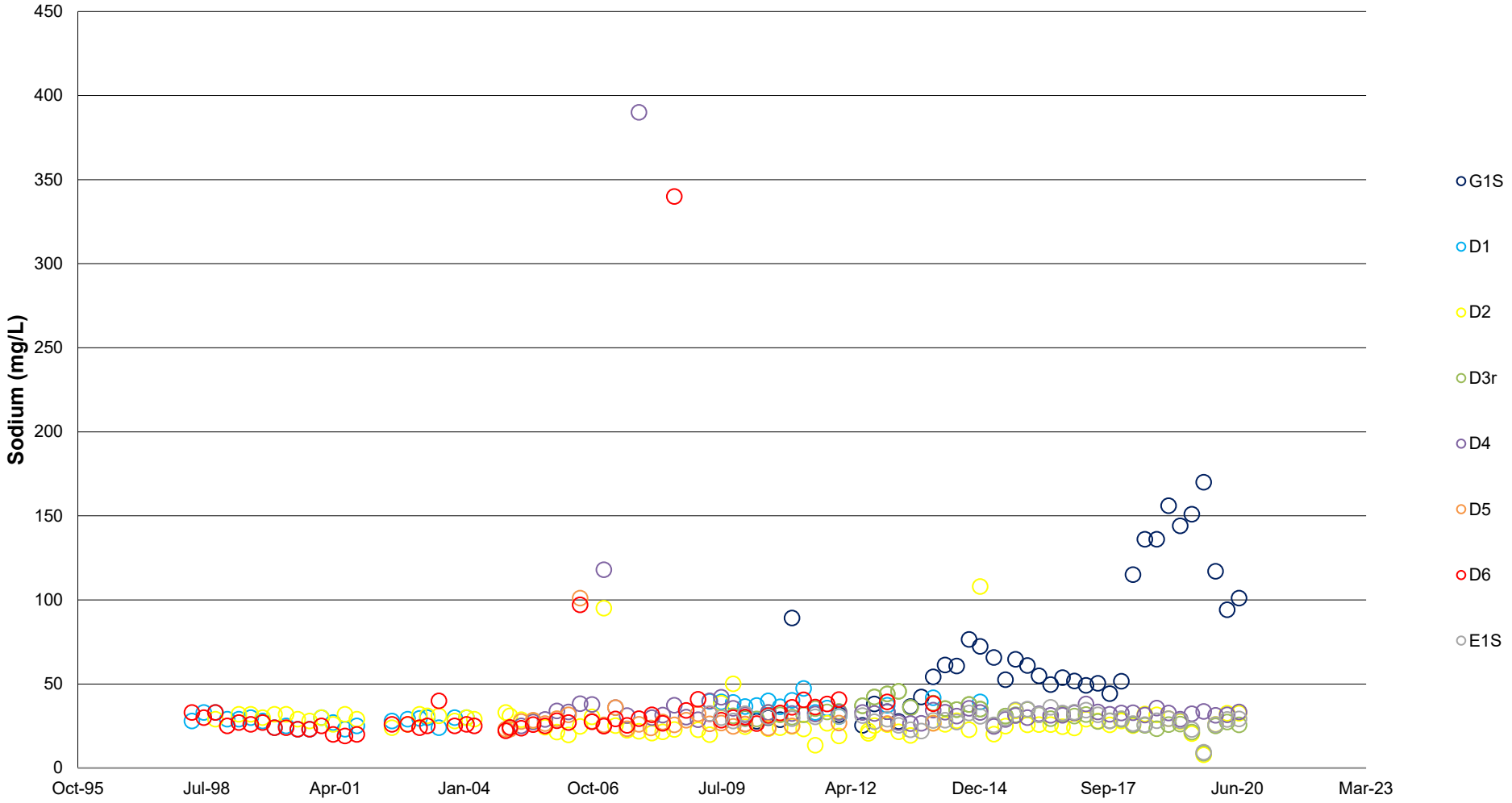
Sand Aquifer Downgrade of New Landfill - Ammoniacal-Nitrogen Concentrations

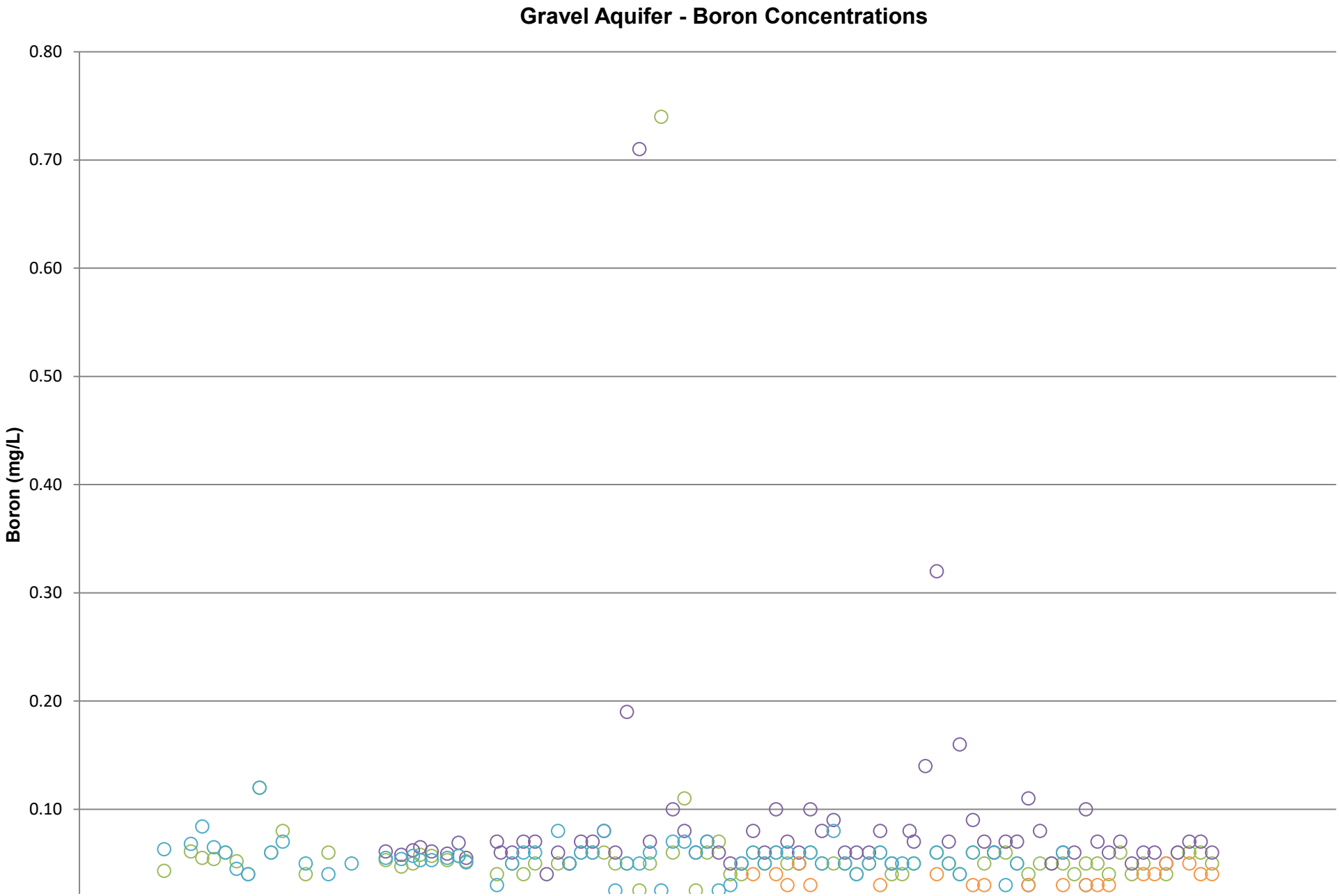


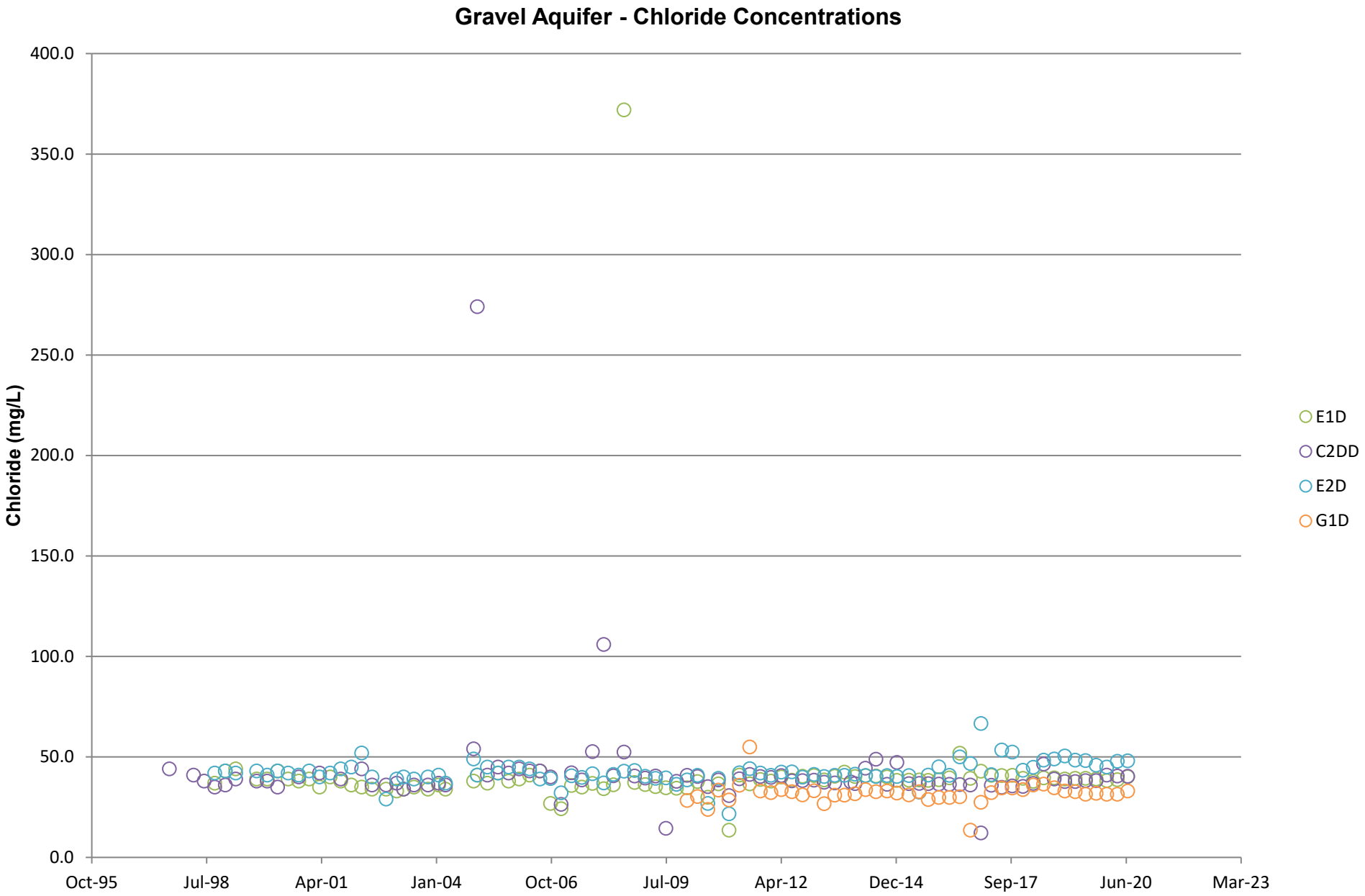
Sand Aquifer Downgrade of New Landfill - Conductivity Levels

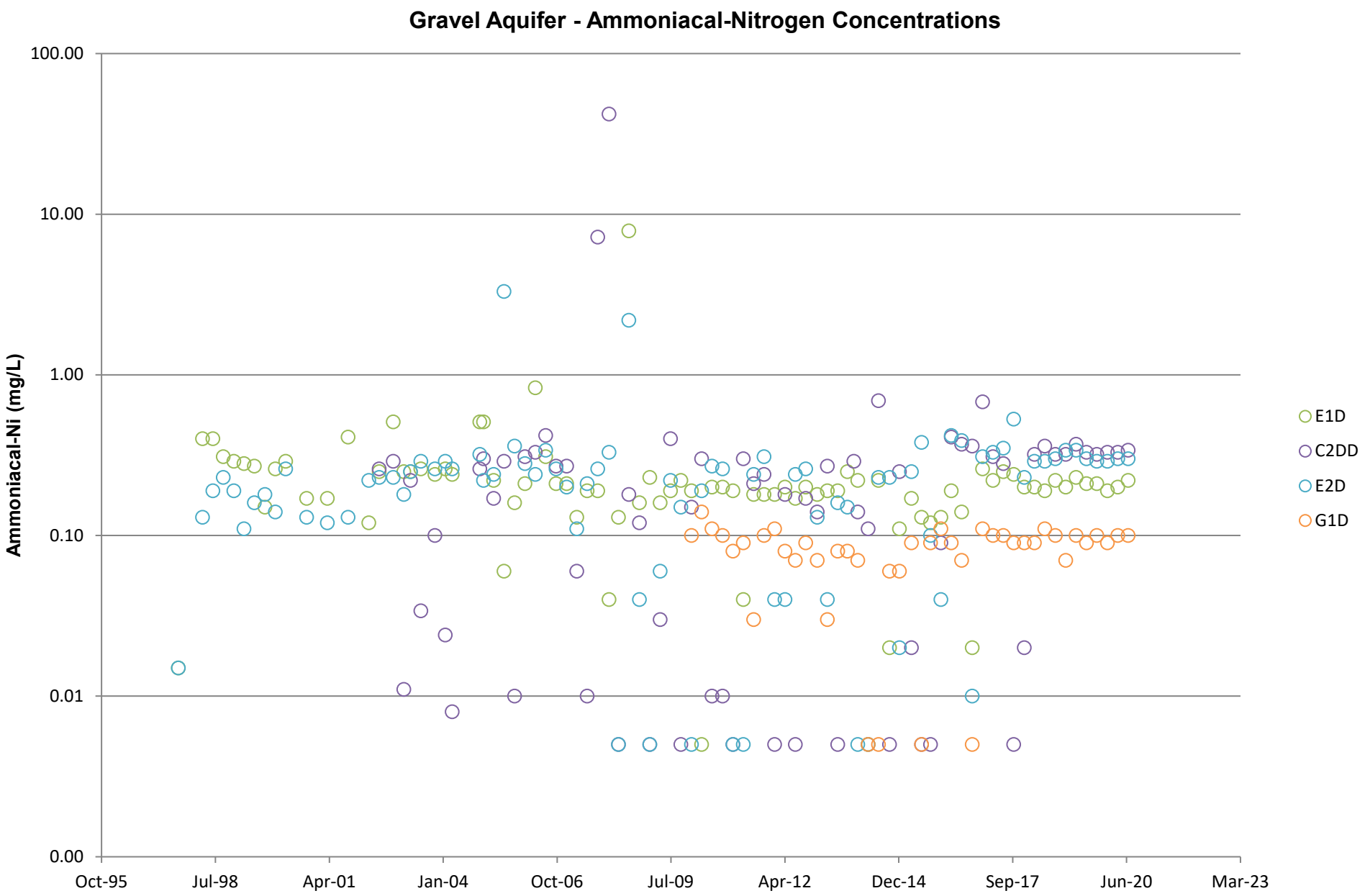


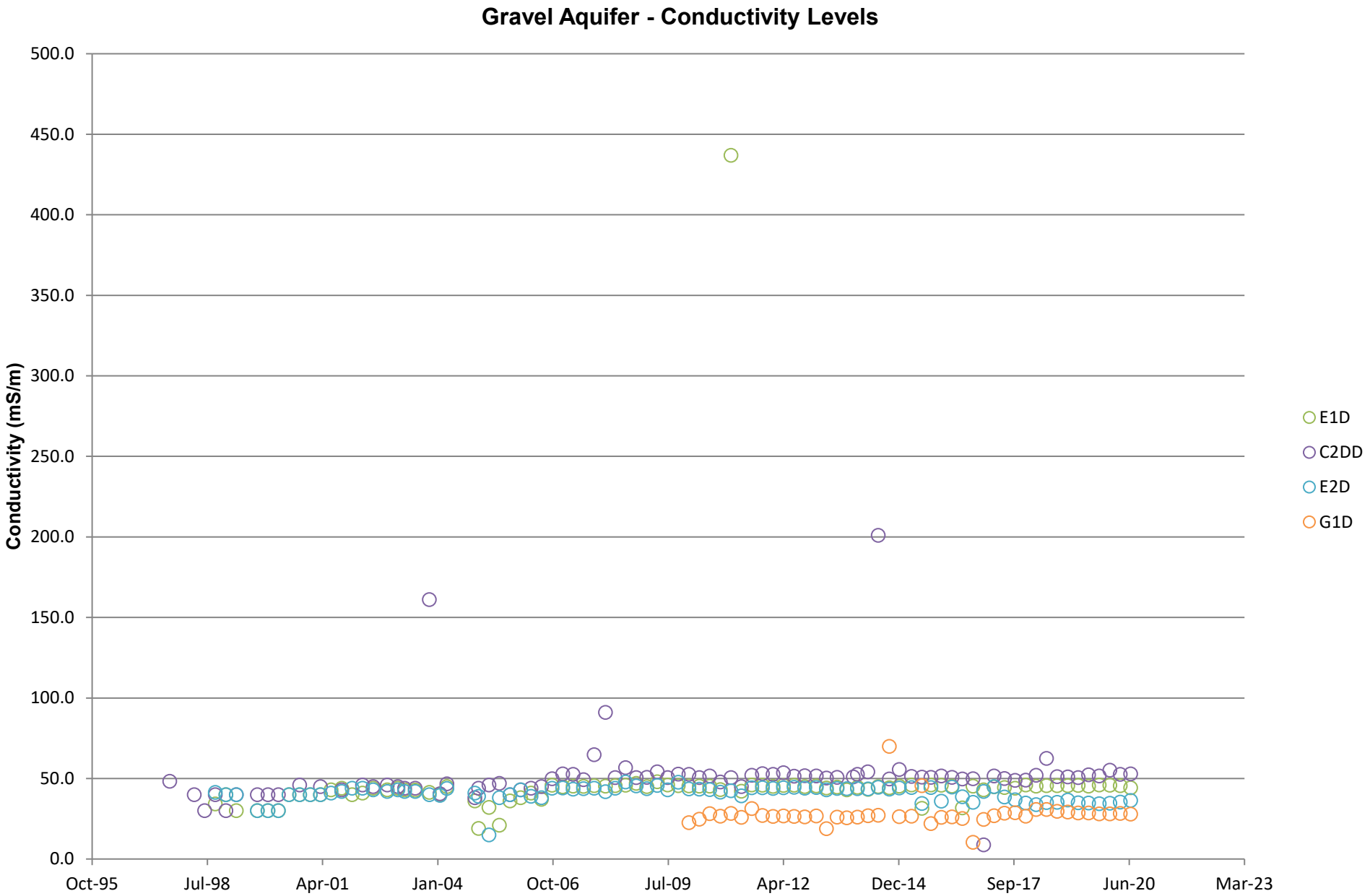
Sand Aquifer Downgrade of New Landfill - Sodium Concentrations

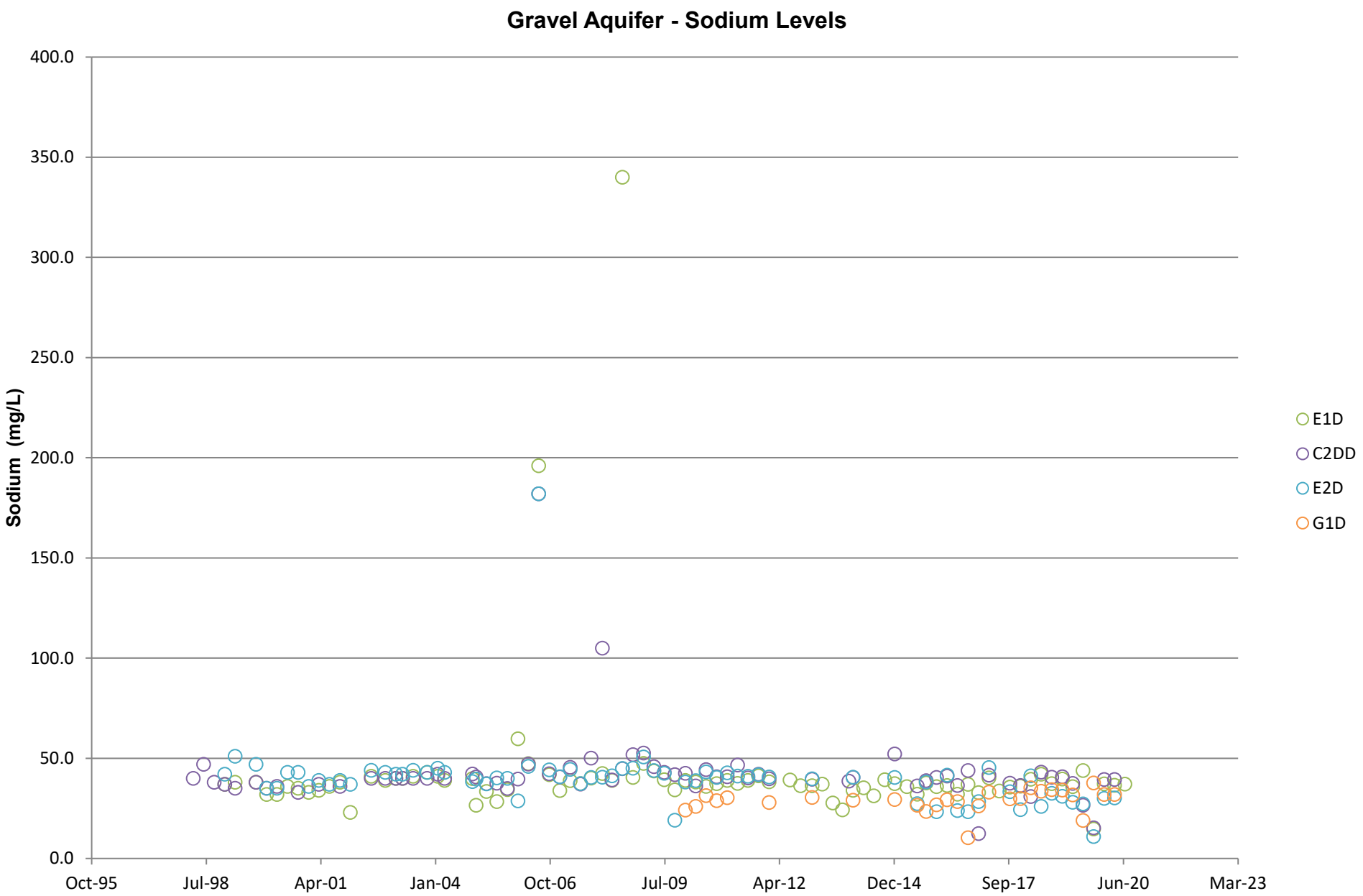


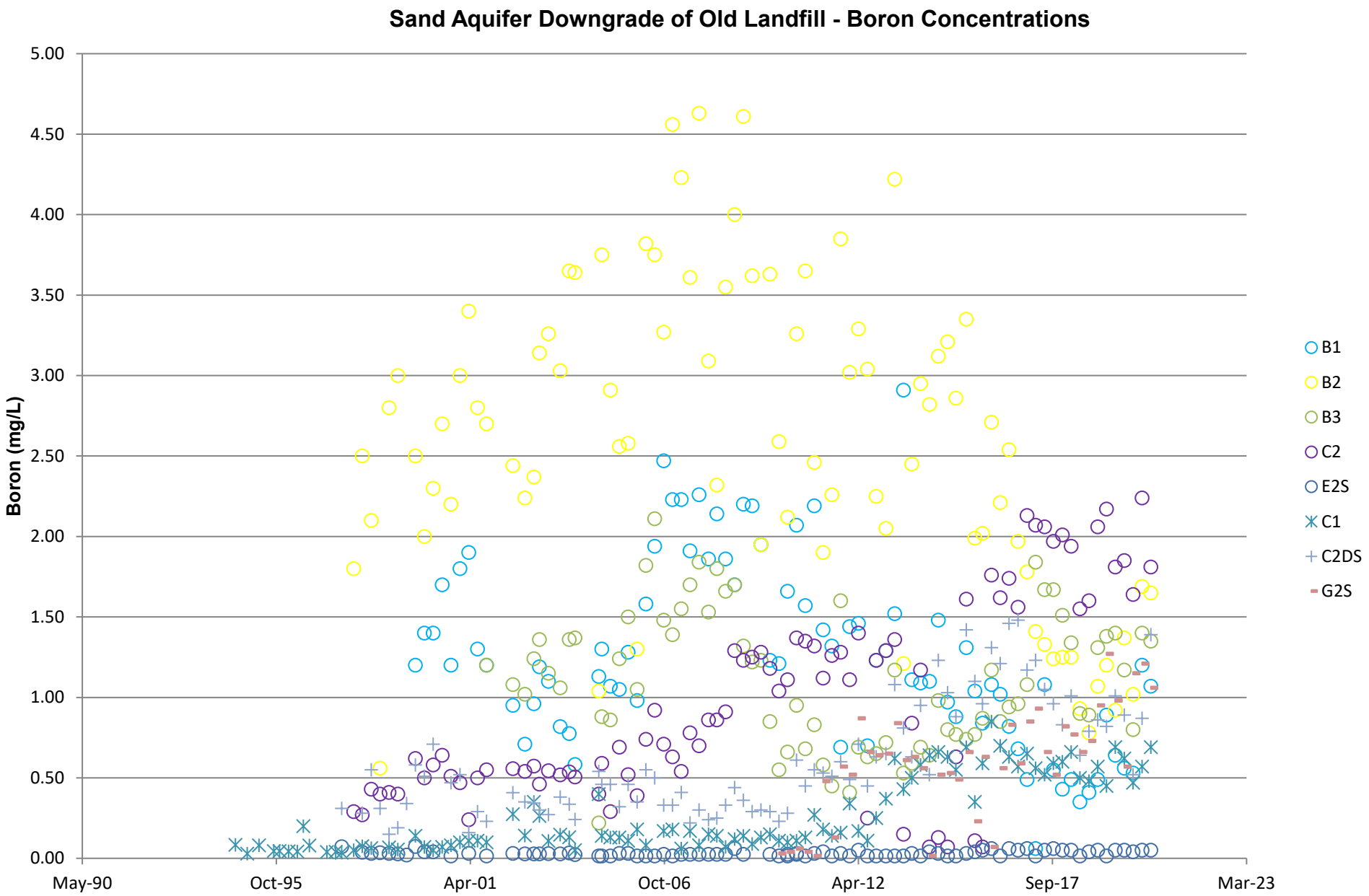

Gravel Aquifer - Boron Concentrations
Boron (mg/L)
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10

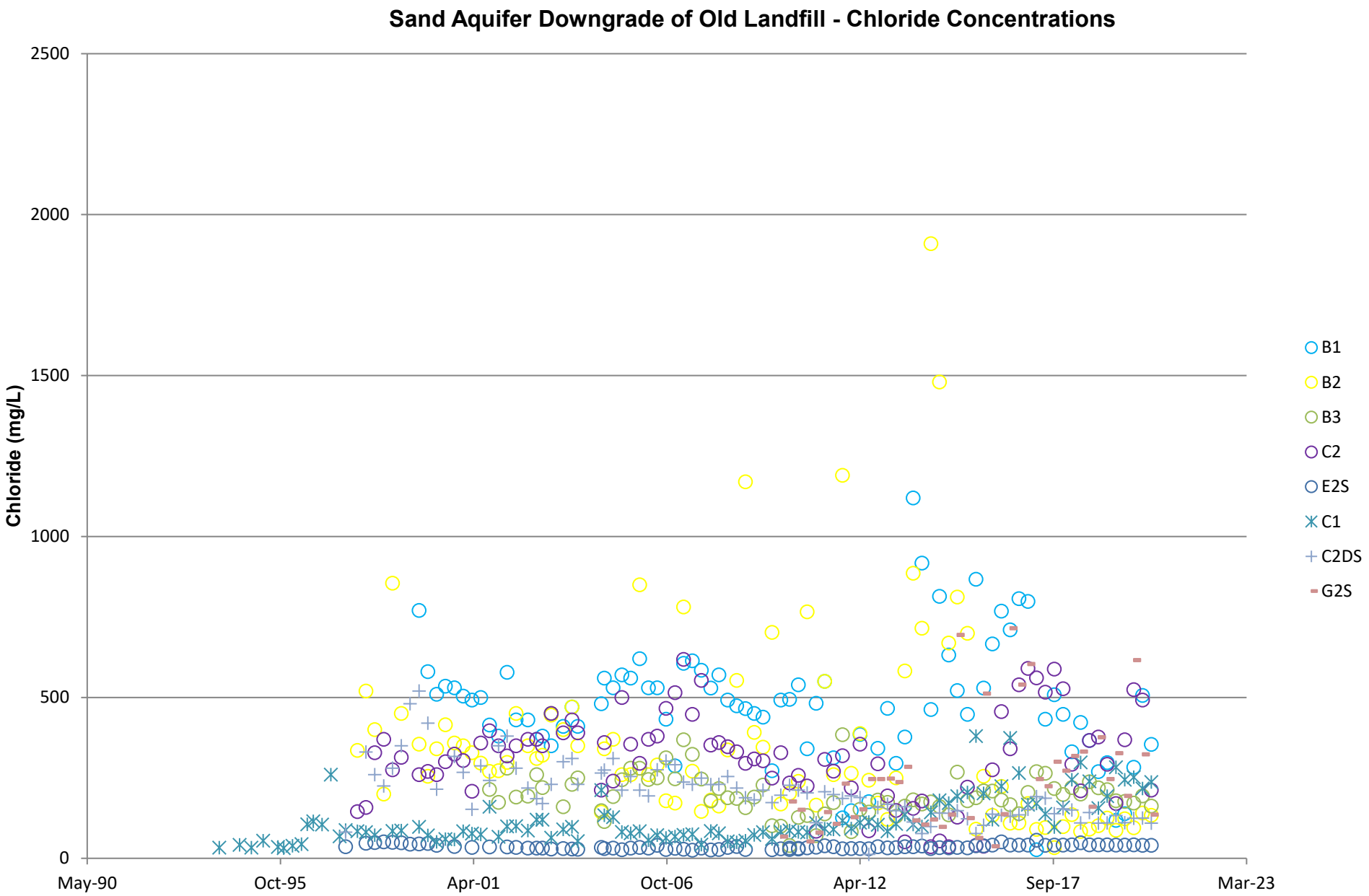

Gravel Aquifer - Chloride Concentrations
Chloride (mg/L)
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
E1D
C2DD
E2D
G1D

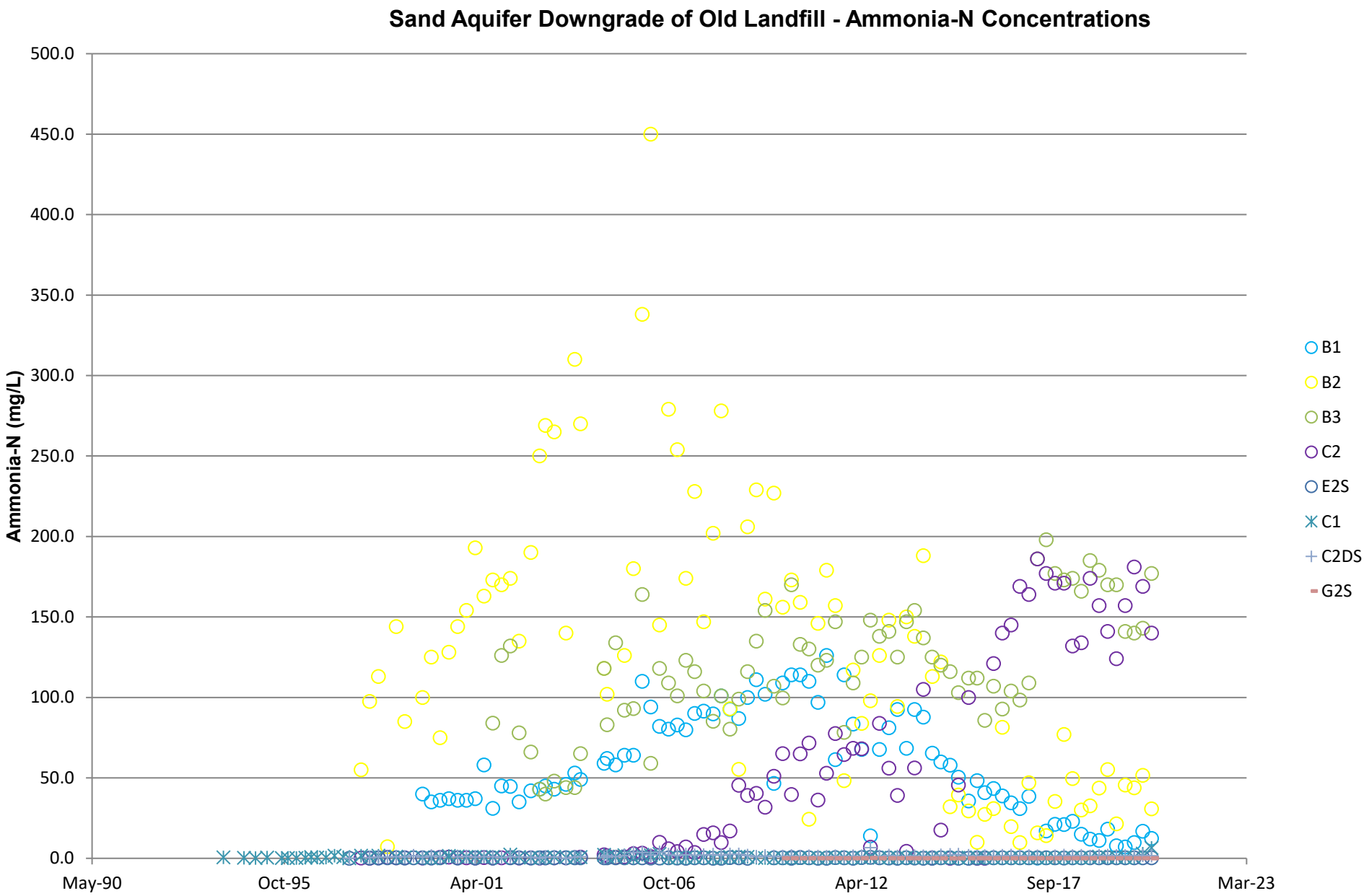

Gravel Aquifer - Ammoniacal-Nitrogen Concentrations
Ammoniacal-Ni (mg/L)
100.00
10.00
1.00
0.10
0.01
0.00
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
E1D
C2DD
E2D
G1D

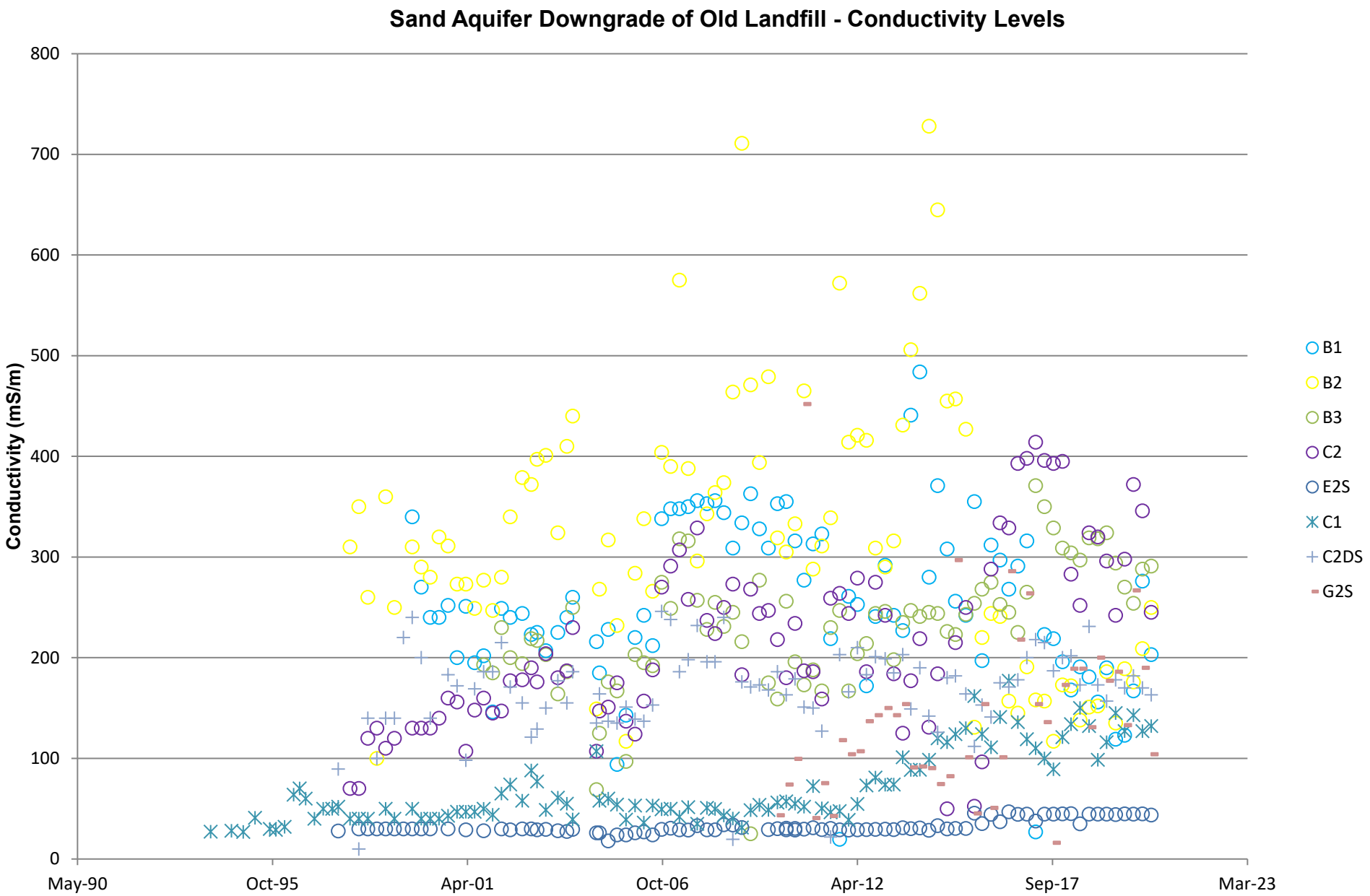

Gravel Aquifer - Conductivity Levels
Conductivity (mS/m)
500.0
450.0
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
E1D
C2DD
E2D
G1D

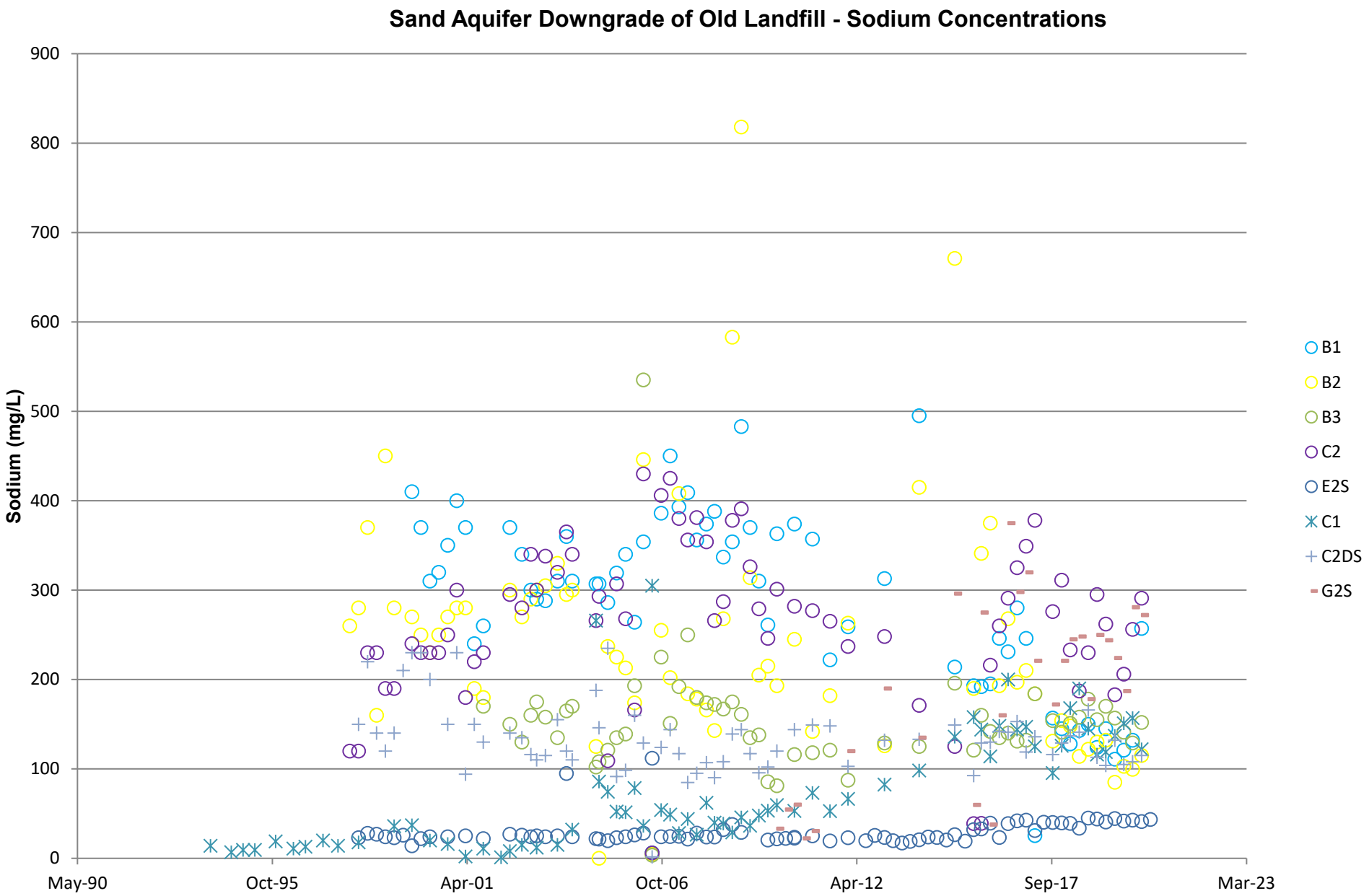

Gravel Aquifer - Sodium Levels
Sodium (mg/L)
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
E1D
C2DD
E2D
G1D

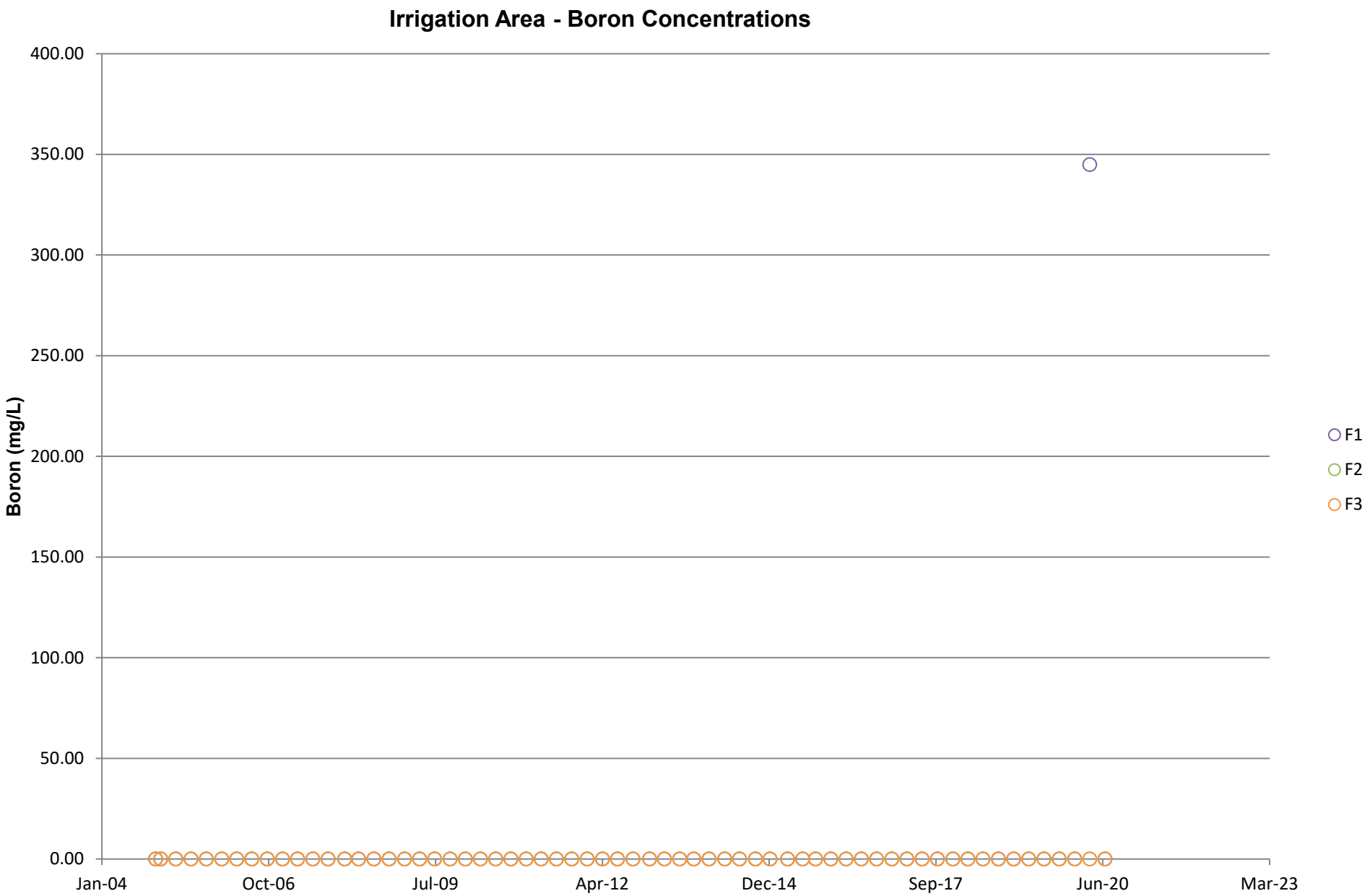

Sand Aquifer Downgrade of Old Landfill - Boron Concentrations
Boron (mg/L)
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
May-90
Oct-95
Apr-01
Oct-06
Apr-12
Sep-17
Mar-23
B1
B2
B3
C2
E2S
C1
C2DS
G2S

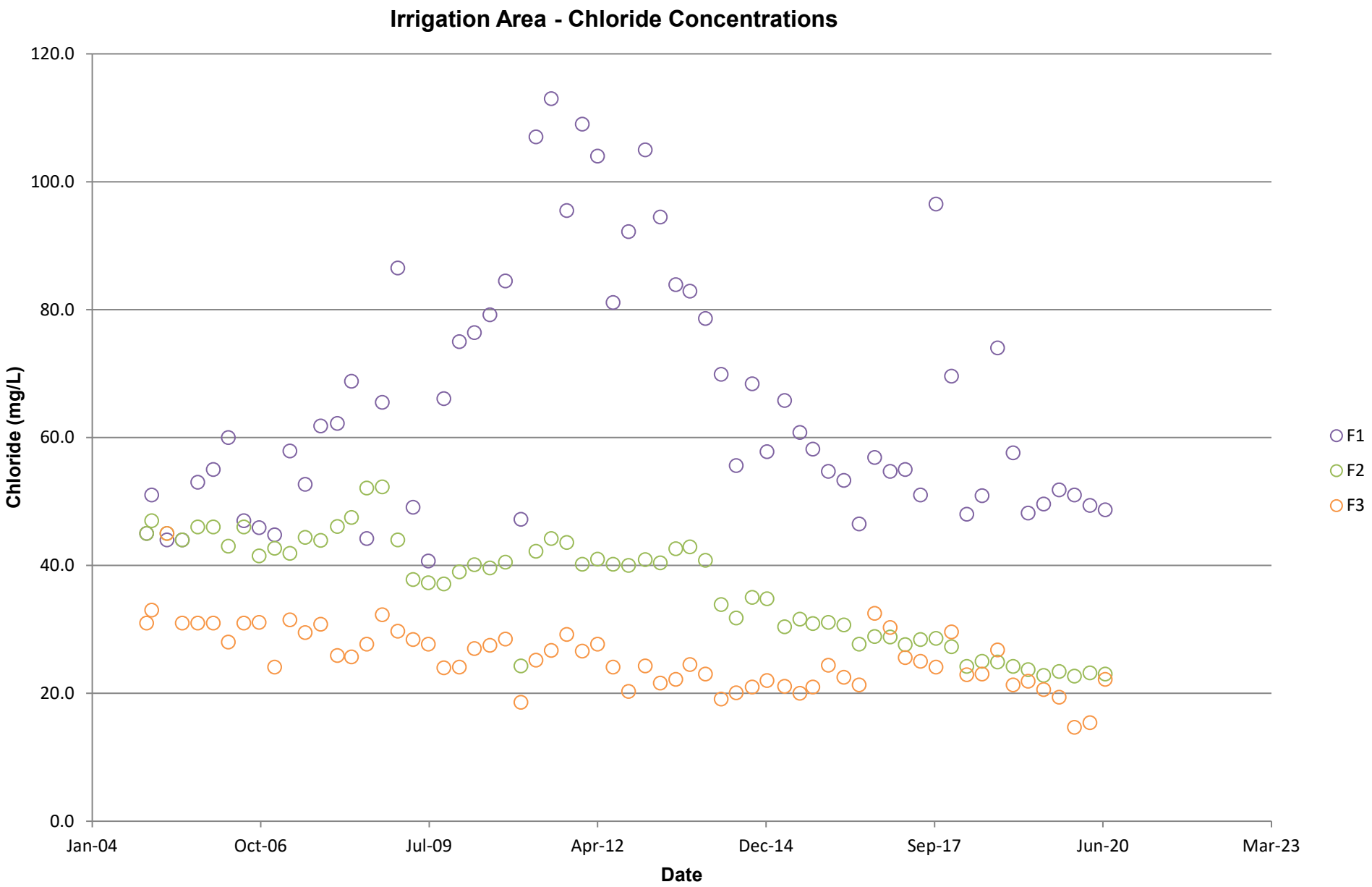

Sand Aquifer Downgrade of Old Landfill - Chloride Concentrations
Chloride (mg/L)
2500
2000
1500
1000
500
0
May-90
Oct-95
Apr-01
Oct-06
Apr-12
Sep-17
Mar-23
B1
B2
B3
C2
E2S
C1
C2DS
G2S

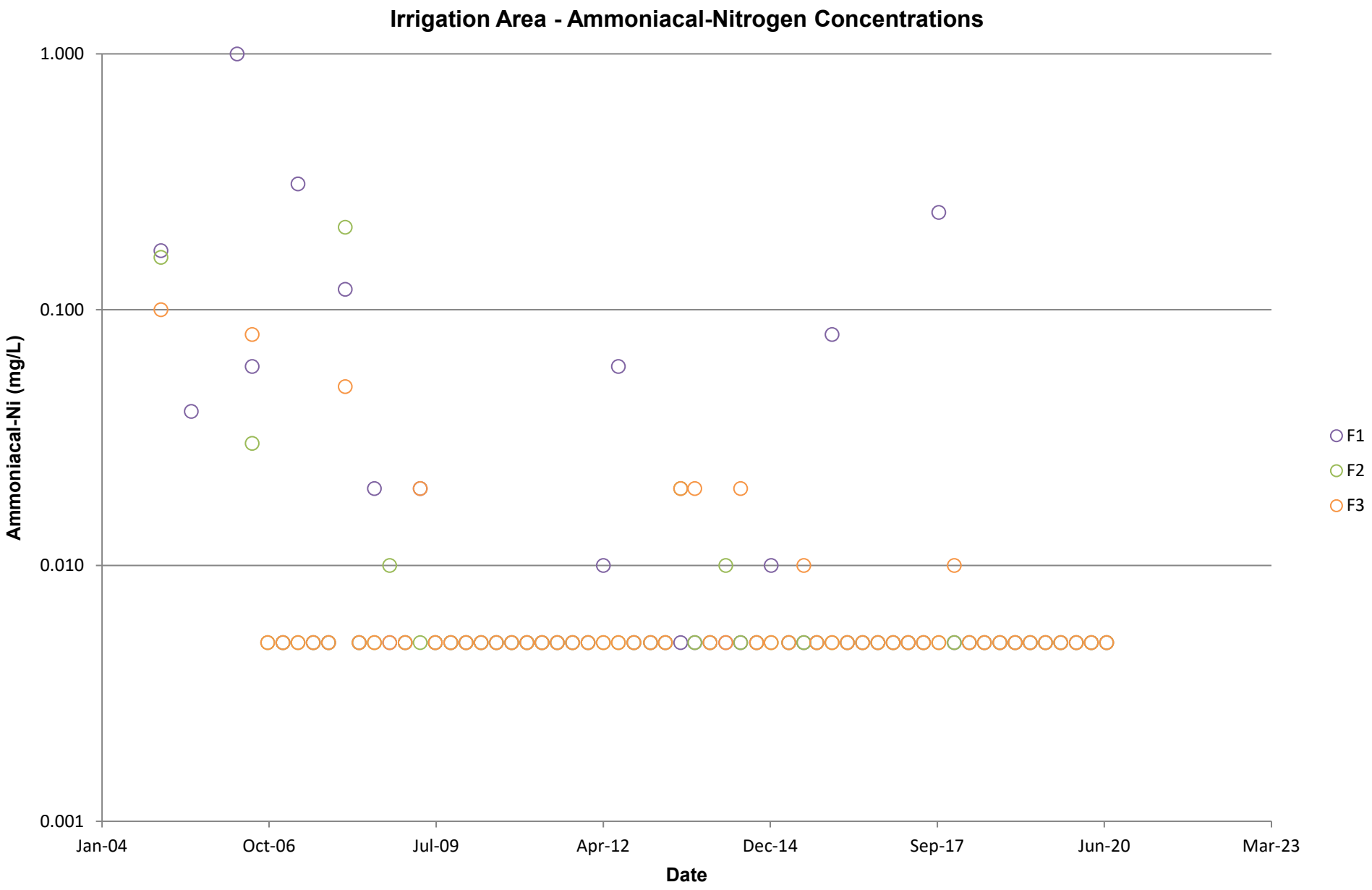

Sand Aquifer Downgrade of Old Landfill - Ammonia-N Concentrations
Ammonia-N (mg/L)
500.0
450.0
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
May-90
Oct-95
Apr-01
Oct-06
Apr-12
Sep-17
Mar-23
B1
B2
B3
C2
E2S
C1
C2DS
G2S

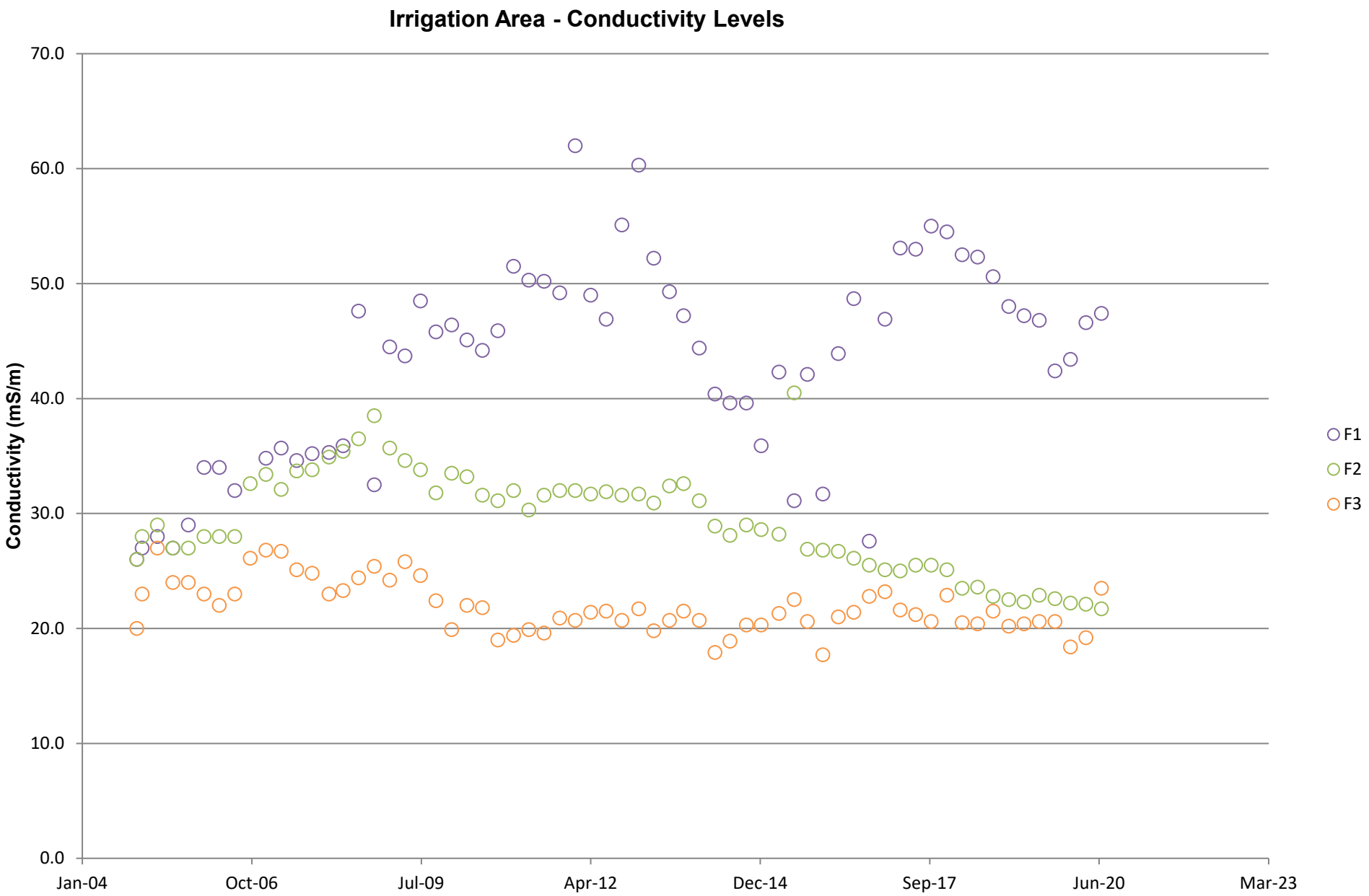

Sand Aquifer Downgrade of Old Landfill - Conductivity Levels
Conductivity (mS/m)
800
700
600
500
400
300
200
100
0
May-90
Oct-95
Apr-01
Oct-06
Apr-12
Sep-17
Mar-23
B1
B2
B3
C2
E2S
C1
C2DS
G2S

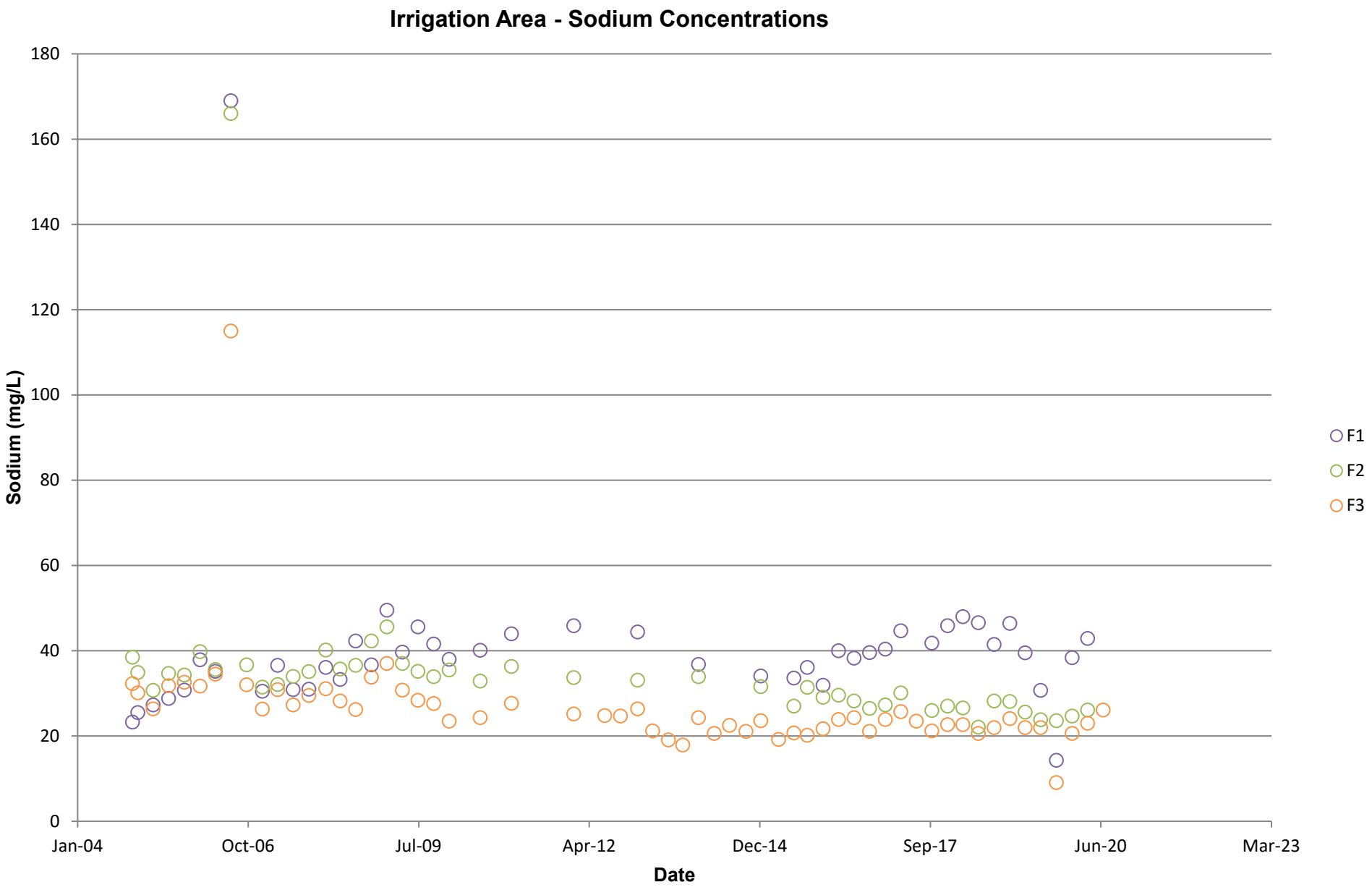

Sand Aquifer Downgrade of Old Landfill - Sodium Concentrations
Sodium (mg/L)
900
800
700
600
500
400
300
200
100
0
May-90
Oct-95
Apr-01
Oct-06
Apr-12
Sep-17
Mar-23
B1
B2
B3
C2
E2S
C1
C2DS
G2S

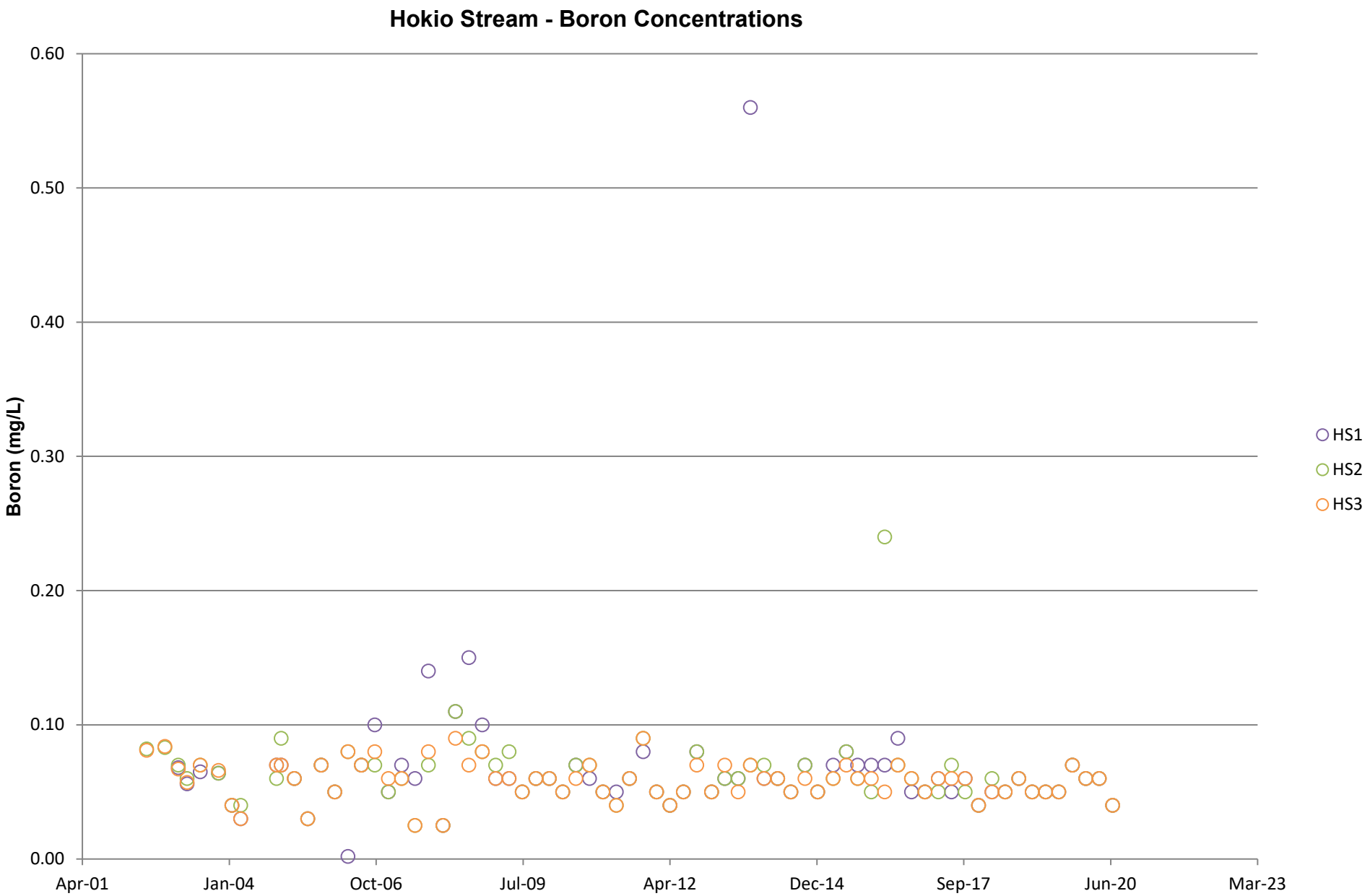

Irrigation Area - Boron Concentrations
Boron (mg/L)
400.00
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
F1
F2
F3

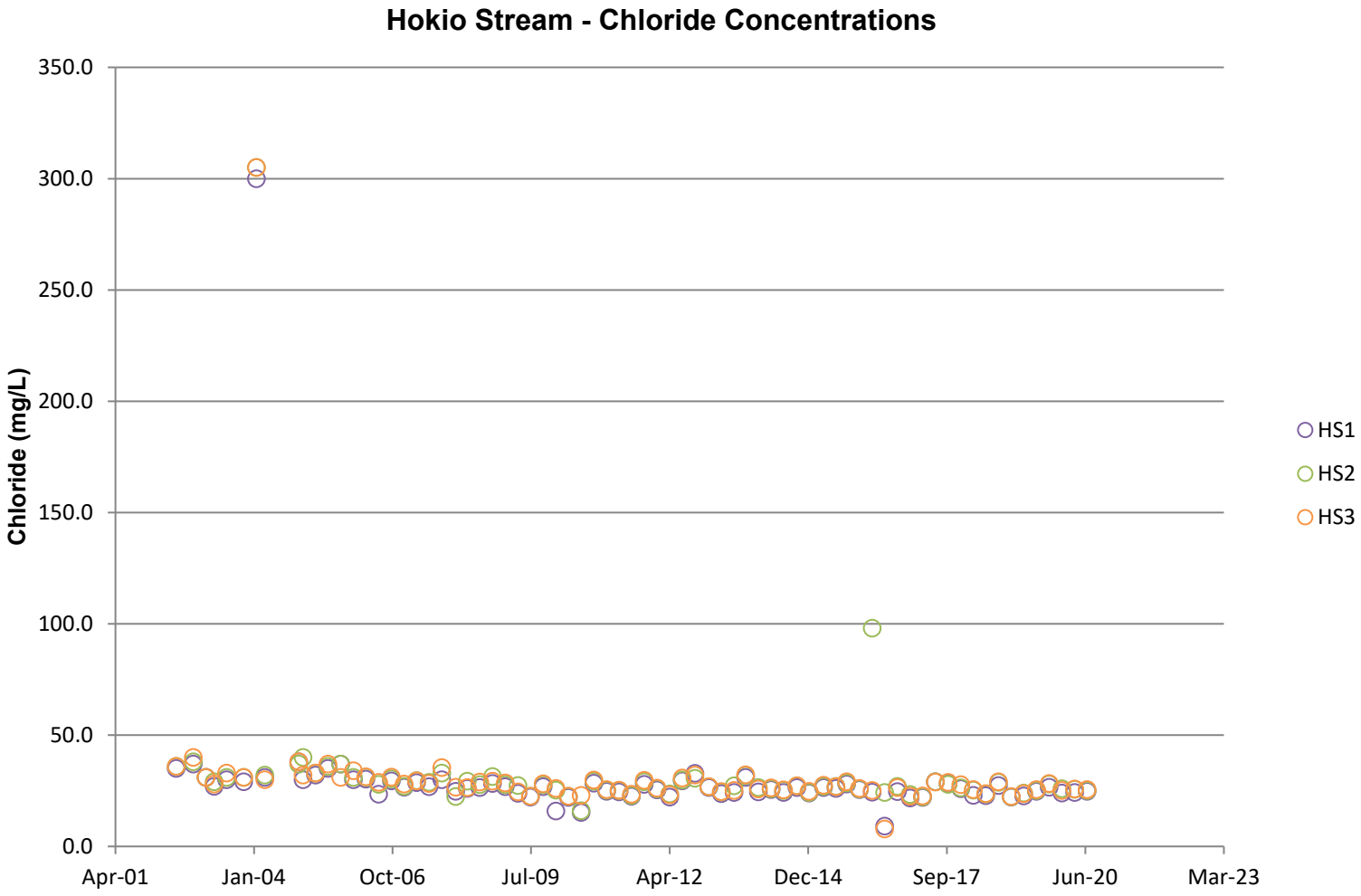

Irrigation Area - Chloride Concentrations
120.0
100.0
80.0
60.0
40.0
20.0
0.0
Chloride (mg/L)
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
Date
F1
F2
F3

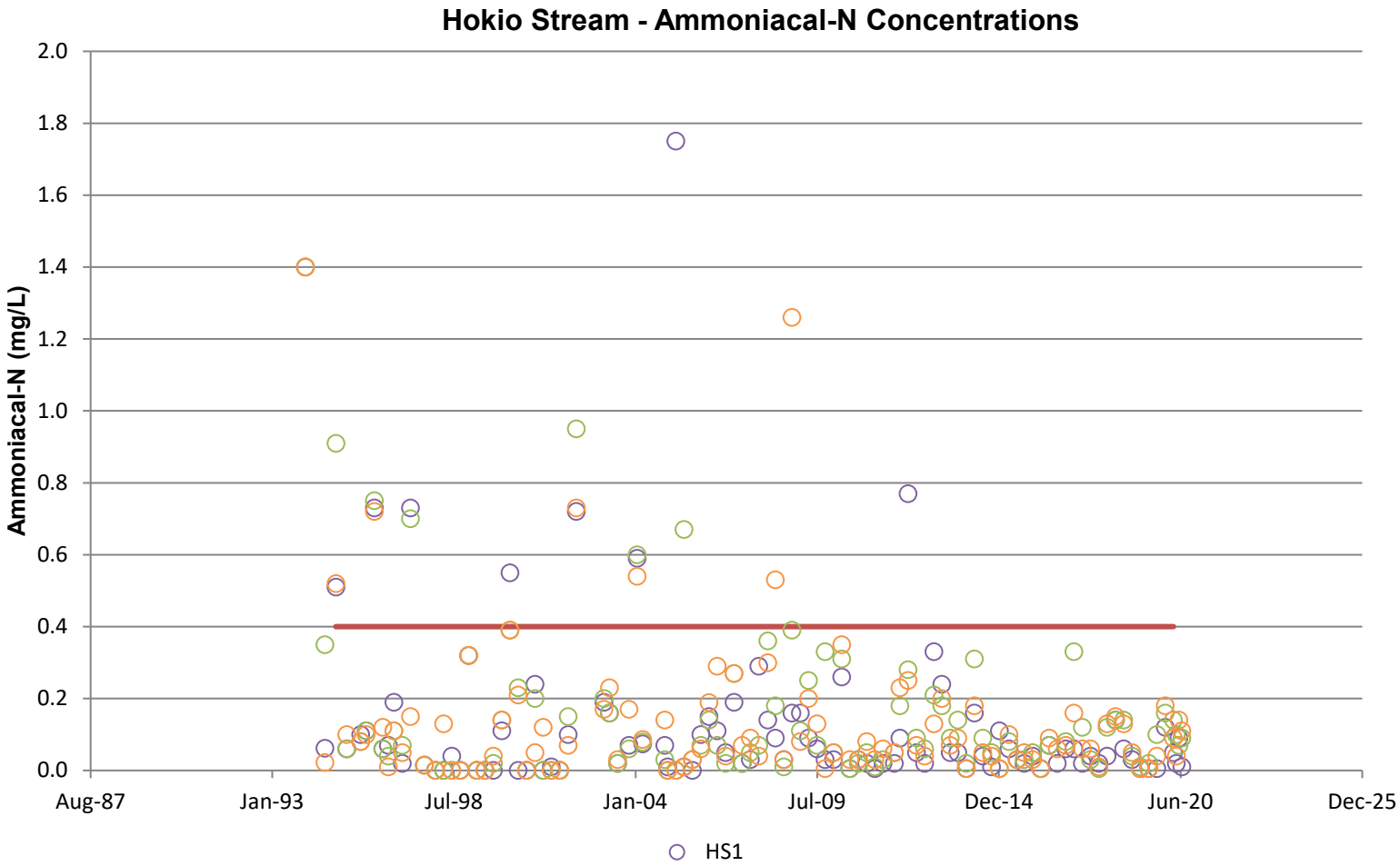

Irrigation Area - Ammoniacal-Nitrogen Concentrations
1.000
0.100
0.010
0.001
Ammoniacal-Ni (mg/L)
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
Date
F1
F2
F3

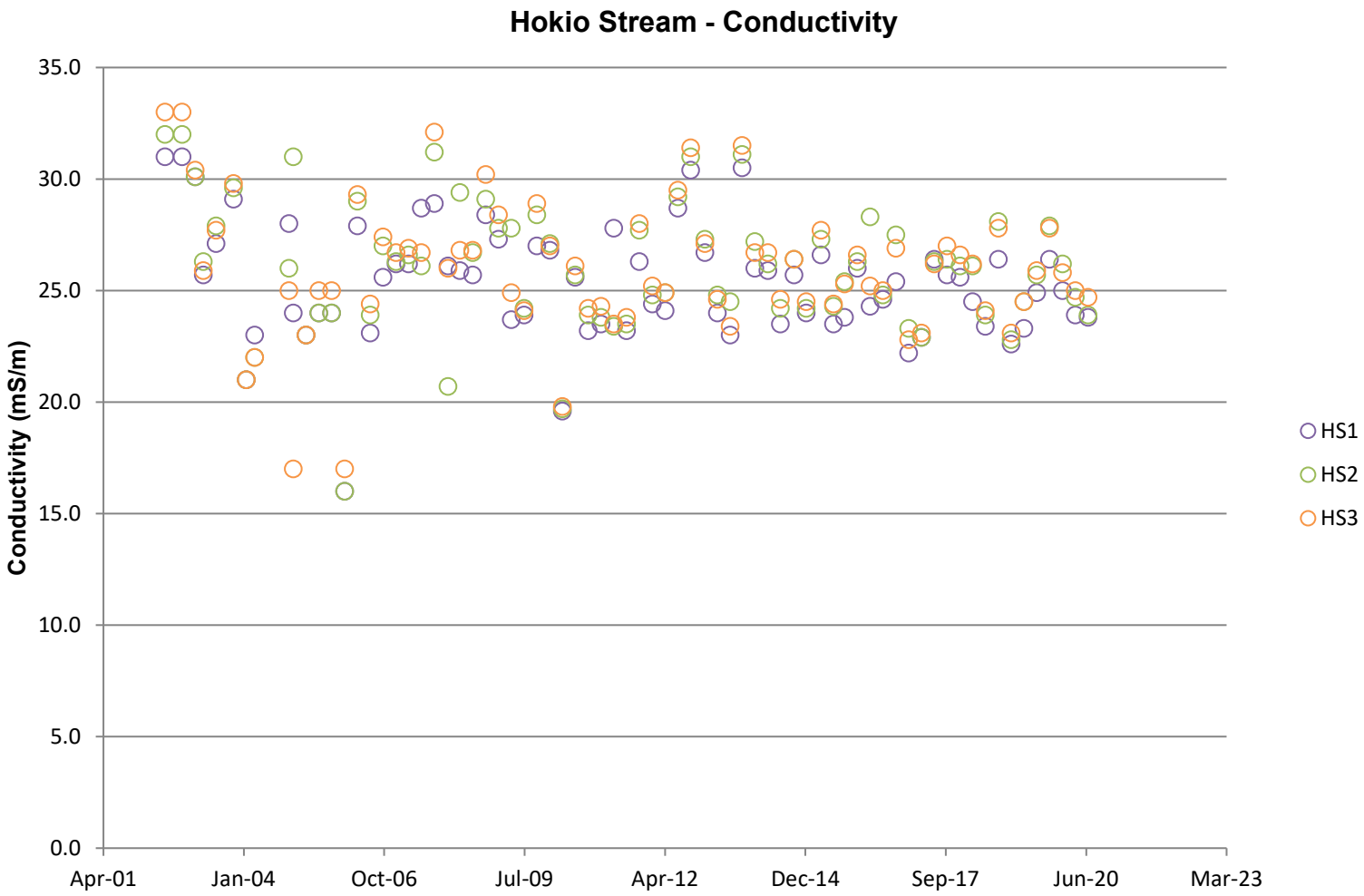

Irrigation Area - Conductivity Levels
Conductivity (mS/m)
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
F1
F2
F3

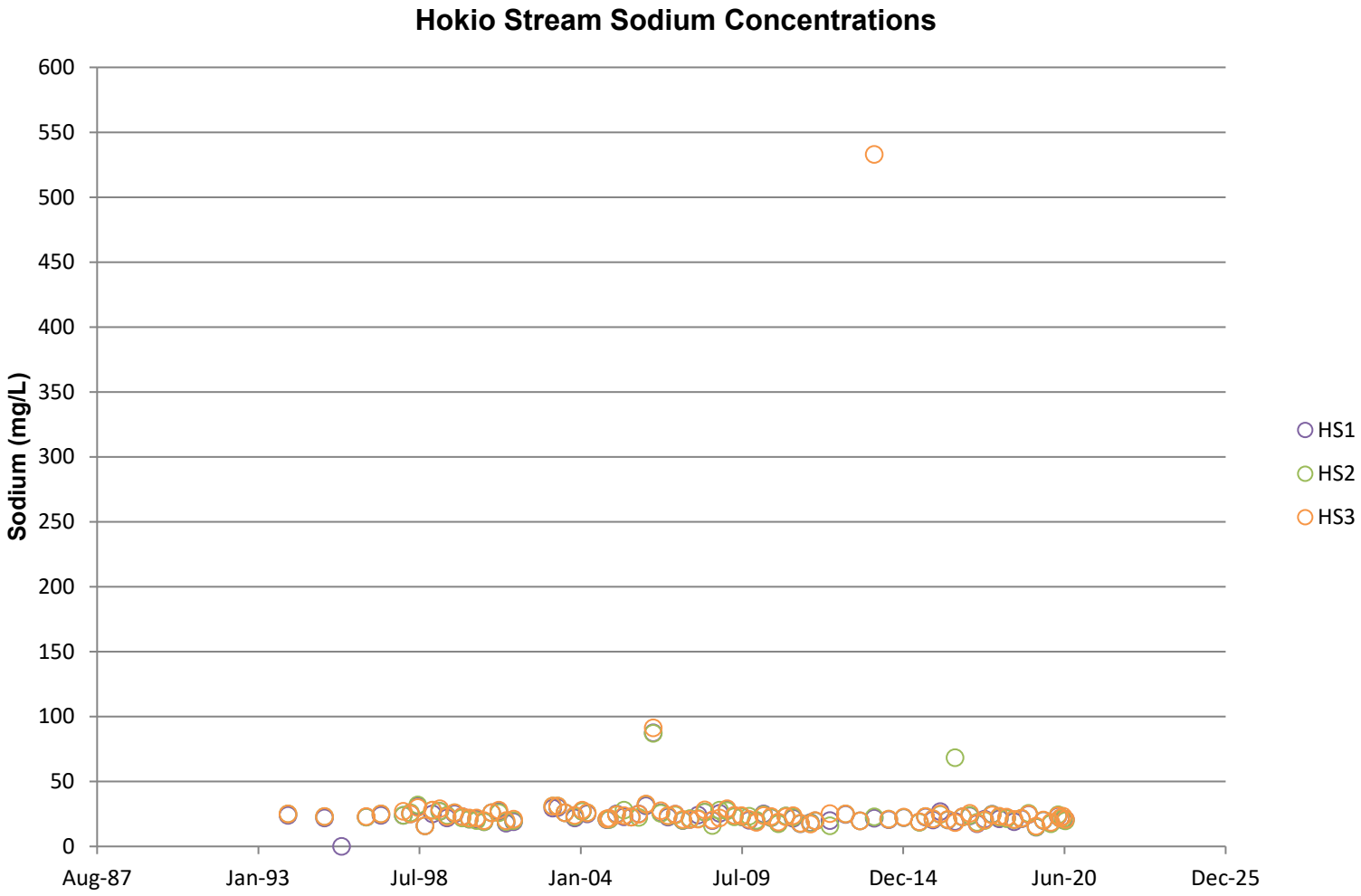

Irrigation Area - Sodium Concentrations
Sodium (mg/L)
180
160
140
120
100
80
60
40
20
0
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
Date
F1
F2
F3


Hokio Stream - Boron Concentrations
Boron (mg/L)
0.60
0.50
0.40
0.30
0.20
0.10
0.00
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
HS1
HS2
HS3


Hokio Stream - Chloride Concentrations
Chloride (mg/L)
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
HS1
HS2
HS3


Hokio Stream - Ammoniacal-N Concentrations
Ammoniacal-N (mg/L)
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Aug-87
Jan-93
Jul-98
Jan-04
Jul-09
Dec-14
Jun-20
Dec-25
HS1


Hokio Stream - Conductivity
Conductivity (mS/m)
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
HS1
HS2
HS3


Hokio Stream Sodium Concentrations
Sodium (mg/L)
600
550
500
450
400
350
300
250
200
150
100
50
0
Aug-87
Jan-93
Jul-98
Jan-04
Jul-09
Dec-14
Jun-20
Dec-25
HS1
HS2
HS3

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Please visit **www.stantec.com** to learn more about how Stantec design with community in mind.

Stantec