Christchurch, Nelson,
Dunedin, and Whangārei
Postal address:
PO Box 1845,
Christchurch 8140

Our Reference: J16611

6 June 2025

Brittany Watson
Consents Planner
Otago Regional Council
Private Bag 1954
DUNEDIN 9054

Email: brittany.watson@orc.govt.nz

Dear Brittany

Waste Management NZ Limited – Fairfield Closed Landfill Application (RM24.098)
Response to the section 92 Request for Further Information

Overview – Application Status

Waste Management NZ Limited, now WM New Zealand[1] (**WM**), lodged a resource consent application with Otago Regional Council (**ORC**) on 28 February 2024[2]. The application sought four resource consents to authorise discharge and take activities at the Fairfield Closed Landfill (**the site**, **the landfill** or **the closed landfill**) during the landfill's aftercare period.

Upon lodgement, the application was placed on hold, at WM's request, until the Cultural Impact Assessment (**CIA**) was finalised and provided to ORC. The CIA was provided on 4 November 2024, and a document outlining the 'proposed response approach' to the CIA was provided to ORC on 31 January 2025.

In addition, since lodgement:

- ORC personnel, and the air quality specialist, visited the site on 2 May 2024.
- ORC issued a letter, dated 4 February 2025, advising that it was considered that two additional resource consents may be needed and therefore the further processing of the application was deferred in accordance with section 91 of the Resource Management Act 1991 (**RMA**). While WM disagreed with ORC's opinion, WM responded, by way of a letter dated 10 March 2025, seeking a land use consent for a 'defence against water' and a water permit for the diversion of water as a result of the establishment of a 'defence against water'. The potential 'defence against water' relates to a recommendation contained in the 'Effects from Natural Hazard Risks' (**Appendix 6** of the application document) to increase in the height of the closed landfill's perimeter access road, and associated armouring, as a potential mitigation measure for the effects from climate change. The proposed consent conditions, contained in **Appendix 8** of the

[1] Waste Management is now known as 'WM New Zealand'.
[2] As the application was lodged six months prior to the expiry of the site's existing resource consents (Consents 95008 and 93540 to 93542), Waste Management

application, provides for alternative solutions to be considered and assessed in relation to addressing potential effects from climate change.

- On 14 March 2025, WM forwarded a new technical report to ORC. The report is entitled 'Fairfield Landfill Ecological Assessment', dated 11 March 2025 and prepared by Pattle Delamore Partners Limited (PDP), hereafter called the 'March 2025 Ecological Assessment'. This report presents the baseline findings of the ecological and water quality status of the freshwater and estuarine environment adjoining the closed landfill.

Purpose of this Letter – section 92 Request for Further Information

On 21 March 2025, WM received a section 92 request for further information (RFI) from the ORC. This letter, and associated attachments, contains WM's collated response to the RFI.

This letter contains a 'collated response', as provided below, to the RFI questions (the RFI question and any additional background is provided in bold and italics font, with the response provided after the question). While the response is WM's response, it is noted that WM, PDP and Planz have had input into the various responses.

Ecology - Ecology Monitoring Programme Proposed (Q1 and Q2)

Q1: Please provide further detail of what the Ecology Monitoring will specifically entail. Your answer should include types of monitoring, locations, and frequencies.

Section 7 of the March 2025 Ecological Assessment provided an outline of the proposed receiving environment monitoring programme. This programme provides the detail that was not available at the time that the February 2024 resource consent application was lodged. Given this issue, at lodgement, proposed Condition 18 of the water permit[3] (Appendix 8 of the application) sought to provide a pathway for the programme's development.

As the baseline ecological assessment has now been completed, as reported in the March 2025 Ecological Assessment, it is now feasible to amend the proposed monitoring conditions, as contained in Conditions 17 and 18 of the proposed water permit's conditions (Appendix 8 of the application), to more fully identify the scope of the proposed receiving environment monitoring programme. To assist with the amendments to these two proposed conditions, PDP have provided more detail, beyond that outlined in Section 7 of the March 2025 Ecological Assessment. Given that the proposed ecological monitoring has now been identified and refined, the following amendments (shaded grey) to Conditions 17 and 18 of the water permit, are proposed:

Surface Water Quality

17. The Consent Holder must monitor the quality of surface water~~, upstream and downstream of the site,~~ as follows:

~~a) At either:~~

~~- The preliminary surface water sampling locations SW1, SW2, SW3, SW4, SW5, SW6 and SW7 shown on Plan [to insert]; or~~

~~- The relocated and confirmed surface water locations SW1, SW2, SW3, SW4, SW5, SW6 and SW7, which have been confirmed by suitably qualified persons, following site inspection to confirm access and their suitability with respect to the area of groundwater upwelling. If the~~

[3] The water permit for the take of groundwater containing leachate and other groundwater.

~~*sampling locations are relocated, as provided for by this condition, this will be advised in the annual report required by Condition 22.*~~

a) When the estuary mouth is open, and thus when sampling locations are accessible, as follows:

- *surface water samples are to be collected from SW2b, SW3b, SW4, SW5 and SW7 shown on Plan [to insert];*
- *in-situ monitoring for conductivity, pH, temperature and dissolved oxygen must be undertaken at each sample location;*
- *the surface water samples are to be analysed for BOD_5, salinity, alkalinity, calcium, sodium, chloride, potassium, sulphate, nitrate-nitrogen, nitrite-nitrogen, total ammoniacal-nitrogen, dissolved reactive phosphorus, total phosphorus, total nitrogen, magnesium (total and dissolved), iron (total and dissolved), lead (total and dissolved) and zinc (total and dissolved); and*
- *samples are to be collected a~~A~~t least monthly ~~quarterly, during January, April, July and October~~, unless Condition 19 of this consent applies.*

b) When the estuary mouth is closed, and thus when some sampling locations are not accessible, as follows:

- *surface water samples are to be collected from SW2b and SW3b and from the edge of wetland / estuary near SW4 and SW7 shown on Plan [to insert];*
- *in-situ monitoring for conductivity, pH, temperature and dissolved oxygen must be undertaken at each sample location;*
- *the surface water samples are to be analysed for BOD_5, salinity, alkalinity, calcium, sodium, chloride, potassium, sulphate, nitrate-nitrogen, nitrite-nitrogen, total ammoniacal-nitrogen, dissolved reactive phosphorus, total phosphorus, total nitrogen, magnesium (total and dissolved), iron (total and dissolved), lead (total and dissolved) and zinc (total and dissolved);*
- *for the first two years following the grant of this consent, three-rounds of monitoring in the 12-month period from 1 November to 31 October each year, with each round of monitoring being at least one-month apart (unless the estuary mouth has re-opened in which case Condition 17(a) applies); and*
- *thereafter, unless Condition 19 applies, once every two-years, with the monitoring event consisting of three-rounds of monitoring, with each round of monitoring being at least one-month apart (unless the estuary mouth has re-opened in which case Condition 17(a) applies).*

~~*c) The samples must be analysed for salinity, dissolved oxygen, BOD_5, total ammoniacal nitrogen, temperature, conductivity, pH, calcium, magnesium, sodium, potassium, chloride, alkalinity, sulphate, nitrate, phosphorus, dissolved reactive phosphorus, iron, zinc, lead.*~~

Ecology

18. *The Consent Holder must ~~ensure that an ecological monitoring programme, consisting of habitat assessment, macroinvertebrate community composition, vegetation survey, birds counts and fish surveys, is carried out at the following frequency:~~ monitor the ecology of nearby surface water features as follows:*

    a) *Samples are to be collected as follows:*

        - *Surficial sediments samples are to be collected from SW2b, SW3b, SW4, SW5 and SW7 shown on Plan [to insert] and analysed for total phosphorus, total nitrogen, total organic carbon, total recoverable iron, lead and zinc; and*

        - *Benthic infauna samples are to be collected from SW4, SW5 and SW7 and analysed for benthic community composition and abundance; and*

        - *Macroinvertebrate samples are to be collected, via a kicknet and at low tide, from SW2b and SW3 with a Macroinvertebrate Community Indices assessment completed for the samples collected.*

    b) *The benthic infauna and macroinvertebrate sampling required by part (a) of this condition is to occur at the same time as the surficial sediment sampling; and*

    c) *Annually (if sample locations are accessible), between the months of October to March, unless Condition 19 of this consent applies. ~~for the first three years following the grant of this consent; and~~*

    ~~*b) Thereafter, unless Condition 19 applies, once every five years, between the months of October to March.*~~

    ~~*At a minimum, sampling locations for the ecological monitoring programme must align with the locations for surface water monitoring required by Condition 17.*~~

It is noted that proposed Condition 19 (Appendix 8 of the February 2024 application) provides a mechanism for the reduction or cessation of the monitoring programme specified within the proposed consent conditions. Under this condition, at least two years of monitoring data must be available prior to any reduction or cessation of the monitoring programme being able to be sought. This timeframe correlates with the review of the monitoring programme recommended in Section 7 of the March 2025 Ecological Assessment (i.e., every two-years).

The monitoring locations are identified in the map provided on the next page of this letter.


SITE
Dunedin
SUNNYVALE
FAIRFIELD
ABBOTTS CREEK
EASTERN LANDFILL
WESTERN LANDFILL
HISTORICAL LANDFILL
CHRISTIES CREEK
SW1
SW2a
SW2b
SW3b
SW3a
SW4
KAIKORAI STREAM
KAIKORAI LAGOON SWAMP WETLAND
SW5
SW6
EGAL CREEK
SW7
KAIKORAI LAGOON ESTUARY
WALDRONVILLE
KEY:
SURFACE WATER SAMPLING LOCATION
REGIONALLY SIGNIFICANT WETLANDS
HISTORICAL LANDFILL EXTENT
WESTERN LANDFILL EXTENT
EASTERN LANDFILL EXTENT
WASTE MANAGEMENT NZ LTD
FIG 1: FAIRFIELD LANDFILL WATERWAYS AND MONITORING SITES
FAIRFIELD LANDFILL RECONSENTING

Q2: Please explain how the outcomes of the Ecology Monitoring will be used to inform future management, should adverse impacts be observed in the data. For adaptive management to be appropriate, trigger levels, or observations that would result in actions, need to be set for any monitoring, and the remedial actions that could be taken must be set out. Ultimately, these would need to be included in an updated Aftercare Management Plan, to be required as a condition of consent.

The proposed ecological monitoring, as outlined above in response to Q1, is proposed for an initial two-year period (at least) to establish baseline conditions in the receiving environment, including the upper estuary and surface waters.

In terms of how the monitoring data will be assessed, and considered, particularly in the context of evidence of adverse effects on the environment from the closed landfill's aftercare activities, and any resultant 'remedial actions' in response to such a 'environmental incident', please refer to the response provided to Q24 below.

This information is being requested to better understand the proposed management, including adaptive management, of adverse effects during the closure phase, and the remedial actions that are available.

Groundwater, Leachate, and Landfill Design (Q3 to Q6)

Q3: Please provide a consolidated table of monitoring well details, including their screened interval relative to the landfill waste profile i.e., screened within, across, below, or outside of the waste profile.

The table provided on the next page of this letter (p.7), prepared by PDP, shows the well details that are known. There is limited information available for the wells.

Q4: Please provide information on the groundwater quality sampling technique and methodology that was followed for the collection of groundwater samples, including the qualifications of the person who collected these samples.

The routine sampling required under the landfill's existing resource consents is undertaken by Fulton Hogan who utilise their field technicians from their laboratory in Dunedin. Fulton Hogan are overseen remotely by PDP.

PDP have completed an audit of the sampling methodology. The methodology adopted for the groundwater sampling uses a submersible pump and associated tubing to purge and then sample each well. Purging is undertaken by pumping out at least three times the volume of water contained in the well casing before samples are collected. In addition, field parameters, such as pH, conductivity, dissolved oxygen, and temperature are measured during purging, with sampling commencing once these parameters stabilise in accordance with standard protocols.

Q5: Please confirm if any of the monitoring wells, surface water locations, or leachate has had Perand polyfluoroalkyl substances (PFAS) analyses carried out on them? If so, please provide a copy of the results.

No testing for PFAS has been undertaken at this site, as testing / monitoring for this substance was not required by the conditions of the landfill's existing resource consents.

Area	Name	Diameter (mm)	Total Depth (m)	Screened Interval	Measuring Point (m RL)
Leachate interception drain monitoring wells	LS23	-	-		1.96
	LS24 (SUMP1)	1100	3.6		2.579
	LS25	185	2.9		1.967
	LS26 (SUMP2)	1100	3.2		2.258
	LGS27	185	3.9		1.991
	LS28 (SUMP 3)	1100	3.3		2.172
	LGS29	185	3.0		2.136
	LS30 (SUMP 4)	1100	3.0		2.402
	LS31	185	2.9		2.068
	LS32 (SUMP 5)	1100	3.1		2.186
	LS33	185	3.1		2.352
Monitoring Well - inside Landfill	LGS1	110	3.4		5.192
	LD5	100	5.8		5.379
	LS2	100	4.0		5.818
	LS6	-	-		3.026
	LS9	100	3.2		3.083
	LS14	100	3.9		6.216
	LD16	100	15.12		11.502
Monitoring Well - outside Landfill	LGS7	100	3.8		1.709
	LD8	100	8.1		1.648
	LS10	100	4.0		1.842
	LD11	100	10.0		1.689
	LS13	100	3.8		1.706
	LS15	100	3.0		2.094
	LD17	100	7.0		3.052
	LS19	100	3.5		2.073
	LD20	100	5.9		2.664
	LS21A				-
	LS22	100	3.4		2.589
Leachate Pumping Chamber	EPS42	1200	4.5		2.1

Q6: Please provide a current assessment of the cumulative impact of leachate contaminants on the receiving environment.

As noted at the beginning of this letter, the March 2025 Ecological Assessment was provided to the ORC on 14 March 2025. This report presents the baseline findings of the ecological and water quality status of the freshwater and estuarine environment adjoining the closed landfill. This assessment contains the most up to date assessment of impacts, from a range of sources, on the receiving environment. It also outlines a recommended monitoring programme, including ecological monitoring (as now expanded upon in response to Q.2 above), to assist in understanding longer-term trends in the condition of the area's waterbodies and to understand the different influences affecting the catchment, including from the closed Fairfield landfill.

In addition, in response to Q29 below, the most recent monitoring reports, prepared in accordance with the requirements of the existing resource consents have been provided in Attachment B of this letter.

At the time being it is not clear to what degree the adverse effects observable in the degraded receiving environment are attributable to the Fairfield landfill. The above information is requested to minimise the uncertainty in the effects assessment.

Long Term Landfill Management (Q7 to Q9)

Q7: Please describe what measures are proposed to reduce and manage leachate generation over time.

Landfilling, at the Eastern Landfill, ceased in June 2017 and since then various projects have been completed by WM to prepare for a steady state situation, and ultimately the closed landfill's aftercare period (as reflected within the application currently being processed by ORC). These projects include the following:

- The establishment, and ongoing maintenance, of the landfill cap.
- Vegetation of landfill surfaces and batters has been completed. The vegetative cover will be maintained to minimise erosion and promote evapotranspiration.
- Diverting stormwater runoff away from the waste mass as a result of cap establishment, and through the use of swales, cut-off drains, and reshaped slopes. These measures reduce the percolation of water through the waste mass.
- Ongoing weed control and maintenance will be carried out to maintain cover effectiveness throughout the site.

The proposed consent conditions (Appendix 8 of the application) specify a range of requirements which aim to ensure that these measures, along with other relevant measures, remain in place to reduce and manage leachate generation over time. They include, but are not limited to, the following:

- Operation of the landfill in accordance with an Aftercare Management Plan (AMP). The purpose of the AMP is to ensure that the landfill is appropriately managed so that adverse effects on the environment arising from the closed landfill's aftercare activities are avoided, remedied or mitigated. The AMP must also contain procedures for meeting site maintenance and inspection requirements and for ensuring that site infrastructure, including the leachate management system, are performing effectively.
- Ensuring that the integrity of the closed landfill is maintained, including by carrying out inspections, maintenance activities and associated risk modelling (as outlined in Conditions 2 to 5 of the discharge permit to discharge landfill leachate).

Q8: Please confirm the current head of leachate within the waste profile.

Figure 8 of PDP's 'Groundwater, Surface Water & Ecological Assessment', contained in Appendix 5 of the February 2024 consent application, is a plot of the fluid level (leachate) within those wells located within the extent of the landfill. This includes both the Western and Eastern Landfill areas. The levels are presented as relative levels, including comparison with the water level (also relative level) within the wetland / estuary.

Q9: In the event that you cannot measure the leachate head due to insufficient information, please provide a discussion on the risks and benefits of installing additional wells now versus after consent is granted, taking into account available information about the leachate head and the practicability of any actions that could be taken to reduce leachate head.

Some monitoring wells have been lost over time due to landfill operations, but sufficient wells remain to provide a reasonable understanding of leachate levels.

Whilst the current wells have limited coverage, the Eastern Landfill area has been capped so the rate of infiltration into the closed landfill will be limited meaning any future change in leachate levels would be expected to be minimal. Given the landfill has been capped and the existing drainage system is performing effectively, no further wells within the landfill footprints are considered necessary at this stage.

Furthermore, the generation and subsequent migration of leachate towards the wetland / estuary is being monitored and intercepted by the interception drainage system. The volume removed corresponds to the rate of inflow, which is also relative to the gradient (higher gradient would result in higher flow). As outlined in PDP's 'Groundwater, Surface Water & Ecological Assessment' (contained in Appendix 5 of the February 2024 consent application), and subsequent monitoring reports (as contained in Attachment B of this letter (In response to Q29)), the volume of leachate being intercepted and discharged to DCC's trade waste, on an annual basis, is reducing. This indicates that the flow into the drainage system is decreasing. This further supports the fact that the generation of leachate is reducing, which is in line with the capping works that have been undertaken.

This information is being requested as long term closed landfill management should seek to reduce leachate generation potential and manage the head of leachate on the base.

Western Landfill (Q10 to Q12)

The application notes that there is no stormwater control for the western landfill and that the western landfill has been covered but not formally capped. At this stage there is not sufficient evidence to justify that this is an acceptable long term leachate management approach for the site.

Q10: Please provide confirmation of the depth and type of cover applied to the western landfill.

Q11: In the absence of existing data, please complete a potholing exercise with permeability testing of cover materials.

In response to both Q10 and Q11, WM recently undertook a potholing exercise over the Western Landfill. This exercise identified a capping depth ranging between 0.5m to 0.7m, and a topsoil ranged from 0.1. to 0.2m, across the Western Landfill. During this exercise, WM also observed that the entire Western Landfill has good grass cover.

Q12: Please provide an assessment of changes in leachate volume that would occur if the western landfill was formally capped, and stormwater was cut-off/redirected. This will require the development of a water balance for the site, and a subsequent assessment of potential changes in leachate generation should additional capping of the western landfill be undertaken.

As outlined above in response to Q10 and Q11, the Western Landfill has been formally capped.

WM also consider that given the observed good vegetative cover and absence of ponding, the Western Landfill appears to be performing well from a hydrological perspective.

Surface Water – Long Term Assessments (Q13 and Q14)

Q13: Table H1 presents long term median and 95th percentile water quality data (5 year and 20-year summaries of the four monitoring sites). Please update Table H1 to include sample size.

The footnote of Table H1, as contained in PDP's 'Groundwater, Surface Water & Ecological Assessment' (Appendix 5 of the February 2024 consent application), has been updated to include the following – *'The number of samples collected over the monitoring periods are: FH38 – 72 samples, FH39 – 76 samples, EW43 – 73 samples, and FH40 – 74 samples'*. An updated version of the table is provided on the following pages of this letter (pp.11 and 12).

Q14: Please include a Time Trend analyses (e.g. NIWA Time Trends) to support the findings in the PDP report and to understand the trends over time of this data and discuss whether this analysis supports the broader statements that water quality in the wetland swamp and tributaries, whilst degraded, are relatively stable.

PDP carried out a time trends analysis in response to this question (as provided in the table on p.13 of this letter). The analysis is based on the data presented in Table H1 of PDP's 'Groundwater, Surface Water & Ecological Assessment' (Appendix 5 of the February 2024 consent application), and generally includes data from 2001 to 2020. The analysis is for a total of 19-years and 1 -month, not a complete 20-year dataset. In addition, some individual parameters may have been tested for a shorter period.

The table shows that most parameter-site combinations showed no significant change in water quality over time. Results show:

- Dissolved oxygen is decreasing at EW43.
- Temperature is increasing at FH38.
- pH and conductivity are changing slightly at some sites. However, change of direction could be seen as an improvement or decline in water quality depending on the site and desired outcomes.
- Total ammoniacal-nitrogen is decreasing at FH38 but increasing at FH39 and EW43.
- Nitrate-nitrogen, BOD_5, dissolved iron, dissolved lead, dissolved zinc and dissolved boron all show either no significant change, or declining concentrations (i.e., improving) over time.

In summary, these results generally support the broader statements around surface water quality being relatively stable. However, a small number of parameters may be showing some level of change (oxygen at EW43, temperature at FH38, and total ammoniacal-nitrogen at FH39 and EW43). The raw data files can be supplied on request.

Table H1: Long term median and 95th percentile water quality measured in the main tributaries of the Kaikorai Swamp and the tip of the estuary stream flowing through the swamp					
Parameter	**Site (n)[1]**	**5-year median (± s.d.)**	**5-year 95th percentile**	**20-year median (± s.d.)**	**20-year 95th percentile**
Dissolved oxygen (mg/L)	FH38	5.0 (± 2.1)	8.8	5.7 (± 2.4)	9.4
	FH39	7.2 (± 2.6)	8.7	7.5 (± 2.8)	11.4
	EW43	9.1 (± 1.5)	10.7	9.6 (± 1.9)	12.6
	FH40	8.2 (± 0.9)	9.5	8.5 (± 1.6)	11.3
Dissolved oxygen (%)	FH38	44 (± 18)	80	52 (± 20)	82
	FH39	64 (± 25)	82	67 (± 29)	119
	EW43	82 (± 8)	88	88 (± 14)	111
	FH40	80 (± 10)	101	84 (± 16)	112
pH	FH38	**5.9 (± 0.4)**	**6.4**	**5.9 (± 0.6)**	**6.7**
	FH39	**6.9 (± 0.3)**	7.4	**7.0 (± 0.4)**	7.7
	EW43	7.3 (± 0.3)	7.8	7.2 (± 0.4)	**7.9**
	FH40	7.3 (± 0.5)	**8.2**	7.2 (± 0.4)	7.7
Temperature (°C)	FH38	10.9 (± 2.7)	15.3	10.9 (± 3.0)	14.6
	FH39	11.2 (± 4.4)	17.0	11.4 (± 5.0)	19.5
	EW43	10.5 (± 4.9)	18.9	11.5 (± 4.7)	19.5
	FH40	13.6 (± 4.8)	19.8	13.1 (± 4.9)	20.7
Conductivity (mS/cm)	FH38	0.5 (± 0.2)	0.6	0.6 (± 1.1)	1.0
	FH39	1.6 (± 4.1)	11.0	1.1 (± 1.3)	4.0
	EW43	0.4 (± 1.9)	5.2	0.3 (± 1.2)	4.3
	FH40	6.2 (± 8.6)	26.9	6.1 (± 6.4)	19.1
Total ammoniacal nitrogen (mg/L)	FH38	0.8 (± 1.7)	**1.6**	**1.1 (± 2.3)**	**2.5**
	FH39	**1.3 (± 1.4)**	**4**	**1.1 (± 1.3)**	**4.0**
	EW43	0.1 (± 0.1)	0.3	0.1 (± 0.2)	0.3
	FH40	0.3 (± 0.9)	**2.1**	0.3 (± 0.8)	**2.3**
Nitrate-nitrogen (mg/L)	FH38	0.1 (± 0.2)	0.5	0.1 (± 0.2)	0.5
	FH39	0.6 (± 0.2)	1.0	0.7 (± 0.5)	1.8
	EW43	0.4 (± 0.3)	1.1	0.3 (± 0.3)	1.1
	FH40	0.20 (± 0.25)	0.63	0.22 (± 0.26)	0.81

Table H1: Long term median and 95th percentile water quality measured in the main tributaries of the Kaikorai Swamp and the tip of the estuary stream flowing through the swamp

Parameter	Site (n)[1]	5-year median (± s.d.)	5-year 95th percentile	20-year median (± s.d.)	20-year 95th percentile
BOD_5 (mg/L)	FH38	2 (± 1)	4	2 (± 1)	5
	FH39	2 (± 2)	6	2 (± 7)	6
	EW43	<2 (± 0)	<2	<2 (± 0)	<2
	FH40	2 (± 4)	9	2 (± 3)	9
Dissolved iron (mg/L)	FH38	5.9 (± 2.6)	9.4	6.0 (± 6.0)	18
	FH39	0.3 (± 0.4)	1.0	0.4 (± 0.9)	2.3
	EW43	0.39 (± 0.16)	0.61	0.42 (± 0.89)	1.09
	FH40	0.22 (± 0.11)	0.42	0.23 (± 0.65)	1.40
Dissolved lead (mg/L)	FH38	0.0001 (± 0.0002)	0.0007	0.0001 (± 0.0006)	0.0015
	FH39	0.0001 (± 0.00005)	0.0002	0.0003 (± 0.0022)	0.004
	EW43	0.0003 (± 0.0002)	0.0007	0.0005 (± 0.0007)	0.0023
	FH40	0.0003 (± 0.0006)	0.0021	0.0005 (± 0.0013)	0.0020
Dissolved zinc (mg/L)	FH38	**0.127 (± 0.062)**	**0.230**	**0.120 (± 0.079)**	**0.280**
	FH39	0.025 (± 0.017)	**0.066**	0.028 (± 0.016)	**0.062**
	EW43	0.017 (± 0.007)	0.028	0.017 (± 0.023)	**0.047**
	FH40	0.017 (± 0.028)	**0.07**	0.011 (± 0.021)	**0.044**
Dissolved boron (mg/L)	FH38	**0.38 (± 14)**	**0.54**	**0.39 (± 0.22)**	**0.67**
	FH39	**0.68 (± 0.27)**	**1.26**	**0.72 (± 0.21)**	**1.0**
	EW43	0.10 (± 0.12)	**0.41**	0.08 (± 0.09)	**0.29**
	FH40	**0.81 (± 0.57)**	**1.99**	**0.69 (± 1.60)**	**5.53**

Notes:

The number of samples collected over the monitoring periods: FH38 – 72 samples, FH39 – 76 samples, EW43 – 73 samples, and FH40 – 74 samples

Values in bold indicate exceedance of the ANZG (2018) default guideline values for the 95% protection level of freshwater species.

Values underscored indicate exceedance of the ANZG (2018) default guideline values for the 80% protection level of freshwater species.

Time trends analysis results showing percent annual change for all site-parameter combinations that showed significant ($p \leq 0.05$) change over time[1].				
	FH38	FH39	FH40	EW43
Dissolved oxygen (mg/L)	-	-	-	-1.7
Dissolved oxygen (%)	-	-	-	-
pH		-0.35	-0.25	-0.29
Temperature (°C)	1.06			
Conductivity	-1.1		4.74	2.76
Total ammoniacal-nitrogen	-3.96	3.1	-	3.86
Nitrate-nitrogen	-	-2.92	-	-
BOD_5	-	-	-	-
Dissolved iron	-	-7.73	-20.45	-
Dissolved lead	-6.08	-14.98	-26.37	-8.71
Dissolved zinc	-	-	-7.34	-5.07
Dissolved boron	-	-	-	-

Notes: - No trend detected

Prior to running trends analysis, a seasonality test was run (using Timetrends) on all parameters listed in Table H1, with seasonality set at four seasons (i.e., reflective of quarterly sampling). A Seasonal Kendall trend test was run on the site-parameter combinations that showed statistically significant ($p \leq 0.05$) seasonal trends, while those with non-significant seasonal trends were run using a Mann Kendall. Significant results with an annual slope = 0 but a percent annual change ≠ 0 were considered significant, as these generally related to sites with a high proportion of left censored data which had obscured underlying trends (i.e., creating too many pairwise ties for calculating median slope). One site/parameter was significant but with both the Sen slope and percent annual change at zero, in this case this site was not considered as showing a strong enough trend to present as significant change.

Surface Water - Table H1 Data (Q15 and Q16)

Q15: Referencing Table H1 data, please indicate if the dissolved zinc data was assessed against hardness modified Default Guideline Values.

Yes, the trigger level has been adjusted for hardness of water.

Q16: Referencing Table H1 date, please confirm if the ammoniacal-nitrogen measurements are pH adjusted assessments.

Yes, the ammoniacal-nitrogen measurements are pH adjusted, with the trigger level based on a pH of 8 and temperature of 20°C.

Surface Water - Cumulative Effects (Q17 only)

Q17: Please update the PDP Groundwater, Surface Water, and Ecological Assessment to include an assessment of actual and potential cumulative effects on surface water which takes into account the stormwater discharges and ongoing landfill closure operations, as well as the leachate discharges. This may require subsequent updates to the ecological assessment.

This information is required to understand the technical information that has been provided to make an assessment on the adverse effects the activity is having on surface water.

As a starting point, please refer to the response to Q6 above.

As further explanation, the effects of stormwater from the Eastern Landfill, where it is directed to the stormwater pond/s, before discharging to the downstream Kaikorai Stream and Kaikorai Lagoon Swamp, have been assessed collectively within the March 2025 Ecological Assessment. These effects have not been assessed separately from leachate discharges, as explained in Sections 1.2, 5.3 and 6 of the assessment.

Given the capping that is in place (as outlined above in relation to Q10 to Q12), rainfall landing on the Western Landfill will primarily result in overland flow). Therefore, overland flow from the Western Landfill ultimately enters Christies Creek, Coal Creek, and the upper Kaikorai Estuary—receiving environments where ecological assessments have already been undertaken (as contained in the March 2025 Ecological Assessment).

While the actual effects have been assessed, monitoring has been recommended to continue to gather more data to robustly explore these effects. This monitoring programme is outlined in Section 7 of the March 2025 Ecological Assessment, and is also discussed above in response to Q1 and Q2 of the s92 RFI.

Surface Water - Stormwater (Q18 to Q20)

Q18: Please provide additional information on where surface water is draining to if it is not draining to the Weighbridge Pond.

- *It is noted the PDP report states "A drainage channel was formed in the cap on the southern slope to direct stormwater runoff from the upper section of the landfill towards the 'Weighbridge Pond' but to date no water is entering the pond." From the provided description, it is not clear where the surface water is draining to. Is this a result of infiltration in the pond itself, or through the landfill cap?*

The capping layer installed over the Eastern Landfill will prevent any stormwater from entering the closed landfill, so infiltration is very unlikely.

Although a cutoff drain was installed on the slope of the landfill, it is likely that the cut-off drain is either partially disconnected or underperforming. As a result, stormwater runoff will flow, by overland flow, across the landform and enter either the adjacent drains or the wetland / estuary.

Q19: Please provide an assessment of stormwater volume for an annual basis. Please include a description of the capacity for the ponds and whether the current capacity of the ponds will be sufficient to accommodate future climate change effects on rainfall.

The stormwater ponds were initially designed to manage runoff, and thus capture and settle sediment and contaminants prior to discharge, from active landfill operations. Now that the landfill has been capped and vegetated, the primary need for treatment has diminished. However, the ponds continue to provide useful stormwater attenuation during heavy rainfall events, and no capacity constraints have been identified to date.

There is currently no intention to remove the ponds as they are now part of the landscape. In addition, the retention of the stormwater ponds, particularly the North Pond, has the advantage of providing for storage, and thus attenuation, of stormwater during heavy rainfall events.

Q20: Please provide an assessment of effects on Christies Creek and Coal Creek given there is no stormwater control on the Western Landfill area.

The cumulative effects on Christies and Coal Creeks have been provided in PDP's 'Groundwater, Surface Water & Ecological Assessment' (contained in Appendix 5 of the February 2024 consent application), and the subsequent March 2025 Ecological Assessment.

As stated in both these assessments, isolating effects of stormwater from the landfill is not feasible. However, given the capping and vegetation cover on both landfill areas, the risk of contaminants entering stormwater is considered low.

As further explanation, and as also noted in the assessments carried out, these creeks are influenced by a range of stressors, including physical channel modifications, urban and industrial stormwater inputs, and fluctuating salinity conditions near the estuarine interface. In this context, the monitoring that has been undertaken has identified elevated concentrations of total ammoniacal nitrogen (TAN) in the lower reaches of both Christies and Coal Creeks, an indicator that is consistent with the influence of landfill leachate and/or contaminated stormwater. Although this suggests an impact from the landfill area, the specific contribution of uncontrolled stormwater runoff from the Western Landfill has not been independently quantified.

This information is required to ensure that stormwater is being adequately managed on site and to ensure that the actual and potential adverse effects are understood.

Hazards (Q21 only)

Q21: Please provide a brief qualitative assessment of the cumulative effects associated with natural hazards that could be expected over the 30-year consent term with respect to the application site. Please include:

- *Commentary around the likelihood of cumulative hazards occurring.*
- *What the implications for the closed landfill site might be.*
- *Any additional hazard mitigation measures that might be warranted.*

This information is required to ensure that potential natural hazards have been appropriately accounted for in the long-term management of the landfill.

These matters have been assessed in PDP's 'Natural Hazard & Climate Assessment' contained in Appendix 6 of the February 2024 consent application. The assessment assessed climate change and natural hazard risks for time periods well beyond the 30-year consent term being sought by WM (i.e., up to 2090 / 2100).

Air Quality (Q22 to Q24)

To ensure any subsurface migration of landfill gas beyond the site boundary is appropriately monitored and managed, Mr Iseli recommends that two additional landfill gas monitoring wells, screened to at least 3 m deep, are installed along the northern site boundary of the Eastern Landfill, prior to any residential development occurring in this area. Suggested locations are at the site boundary to the north of MW1 and MW3 shown on the plan below, taken from the PDP report.

Q22: Noting that the drilling of contaminated land requires a land use consent under 5.6.1(1) of the Regional Plan: Waste for Otago, please confirm if the Applicant would like to include this drilling as part of this application RM24.098, or whether the Applicant would prefer to apply for these consents separately, should this application RM24.098 be granted. Please note, if a separate application is made and is not granted prior to the decision on RM24.098 then there will be less confidence that landfill gas is being monitored appropriately.

The additional LFG wells would be beneficial to the ongoing monitoring of landfill gas.

WM are comfortable with installing, for the purpose of landfill gas monitoring, additional wells between the footprint of the Eastern Landfill and the residentially zoned land that lies to the north of the site. However, PDP have advised that the existing well LS21A, which lies to the north of MW3 can be used as a landfilling gas monitoring well given it is screened above the water table. For this reason, WM are of the opinion that only one additional monitoring well is required (i.e., to be located to the north of MW1).

As a resource consent (land use consent) is required for the installation of the additional landfill gas monitoring well (as discussed below), this section of the RFI response letter also provides an assessment of the effects on the environment, a policy framework assessment and an assessment of relevant provisions of the RMA where relevant to the proposed monitoring well activity. In addition, an updated application form, seeking the additional resource consent, is also provided in **Attachment A** to this letter.

The Fairfield closed landfill is a contaminated site[4] and thus the rules of the Regional Plan: Waste for Otago (**Waste Plan**) and the regulations of the National Environmental Standards for Assessing and Managing Contaminants in Soil to Protect Human Health (**NES-CS**) are potentially relevant to the disturbance of land associated with establishing the proposed monitoring well. In addition, Regional Plan: Water for Otago (**Water Plan**) rules and rules in the Dunedin City Second Generation District Plan (**2GP**) are also relevant. An assessment of the rules and regulations of these planning documents is provided below:

- **Waste Plan**. There are no permitted activity rules that apply to the disturbance of contaminated land under this plan. Therefore, the installation (disturbance of contaminated land) of the proposed landfill gas monitoring well, outside of the Eastern Landfill's footprint, but within the landfill site, requires a land use consent in accordance with **Rule 5.6.1.1** of the **Waste Plan (discretionary activity)**. The application form contained in **Attachment A** of this

[4] Council's Listed Land Use Register (online map) site number for the closed landfill is 'HAIL.00503.01'.

letter has been updated to reflect the need for a land use consent, in accordance with this Waste Plan rule, for the proposed additional landfill gas monitoring well.

- **Water Plan**. Sections 14.1 and 14.2 of the Water Plan contain rules that apply to bore construction and the drilling of land respectively. The proposed additional landfill gas monitoring well will not entail the taking of groundwater and thus is not defined as a bore (under the Water Plan) and thus is not subject to the rules contained in Section 14.1 of the Water Plan. Rules 14.2.1.1, 14.2.2.1 and 14.2.3 provide for the drilling of land, other than for the purpose of creating a bore, as permitted, controlled and restricted discretionary activities respectively. These rules are therefore potentially relevant to the proposed installation of the landfill gas monitoring well. As the landfill (and thus the well) is not located over an aquifer identified in the C-series maps, and given that upon completion of the drilling activity the well will be sealed so that contaminants cannot enter it, both Conditions (a) and (b) of Rule 14.2.1.1 are met. On this basis, under the Water Plan, the installation of the well is a **permitted activity** in accordance with **Rule 14.2.2.1**.
- **NES-CS**. Regulation 8(3) of the NES-CS provides for the disturbance of contaminated land subject to complying with Conditions (a) to (g) of the regulation. As the landfill site as a whole is listed as a HAIL, investigations have not been undertaken to determine if the soils in the location of the proposed new well are contaminated. Therefore, in assessing compliance with Regulation 8 of the NES-CS, it has been assumed that the land is potentially contaminated (even though the well is to be located beyond the footprint of the Eastern Landfill). The area and volume of soil disturbance associated with installing the 3m deep well is conservatively estimated to be $0.04m^2$ and $0.12m^3$ respectively, which means that Condition (c) is complied with. The drilling activity is anticipated to take no more than a day, including site establishment and dis-establishment, meaning Condition (f) is complied with. The drilling activity will also be undertaken in a manner that ensures compliance with Conditions (a), (b), (d), (e) and (g). On this basis, the disturbance of soil during the installation of the proposed additional landfill gas monitoring well is a **permitted activity** in accordance with **Regulation 8(3)** of the **NES-CS**.
- **2GP**. The Fairfield closed landfill is zoned Rural, and there are no overlays in the part of the site where the well is to be installed. While the earthworks associated with the installation of the landfill gas monitoring well are not provided for by Rules 8A.5.1.1 or 8A.5.1.3(b), the 'small scale' earthworks associated with the well installation are a **permitted activity** in accordance with **Rule 8A.3.2.2**, as there will be no significant change to the ground level (thus Rule 8A.5.1.3(a)(ii) is complied with) and the earthworks, which will take place on a relatively flat part of the site, will be well below the volume limits specified in Rule 8A.5.1.5(a)(i).

The potential effects associated with the disturbance of potentially contaminated land during the installation of the monitoring well, given the small-scale of the activity and it's short term duration, in conjunction with the fact that the activity will comply with all of the permitted activity conditions of Regulation 8(3) of the NES-CS, are considered to be negligible (if not de minimis).

Given the confined and short-term nature of the well installation activity, and thus the fact that potential adverse effects have been assessed as being negligible, as well as the fact that the only consent trigger arises from the Waste Plan, it is considered that the Waste Plan's objectives and policies are of key relevance to the additional land use consent now being sought by WM. The relevant policy framework is contained in Chapter 5 (Contaminated Land) of the Waste Plan. **Objective 5.3.1** seeks to avoid, remedy or mitigate the adverse effects of contaminated sites, while **Objective 5.3.2** aims to avoid further contamination arising from contaminated land. It is noted that the policies, in support of these objectives, are not directly relevant to the well installation activity as

they largely relate to the identification and management of contaminated sites. Given the nature of the activity and its location (i.e., outside of the footprint of the Eastern Landfill), and the fact that the conditions attached to Regulation 8(3) of the NES-CS will be complied with (i.e., including the removal of contaminated soils, if identified during the drilling, and subsequent disposal at an approved facility), any further contamination from the landfill site will be avoided. On this basis, the well installation activity is consistent with the relevant policy framework of the Water Plan.

In relation to statutory considerations, the statutory framework relevant to WM's application has been assessed in Section 5 of the resource consent application (dated February 2024), with that assessment considering the closed landfill's aftercare activities as a whole (including, but not limited to, the monitoring programme as outlined in the proposed consent conditions (Appendix 8 of the application). The additional land use consent now being sought will authorise the installation of one additional landfill gas monitoring well which will form part of the gas monitoring programme for the closed landfill. Given the contribution that the well installation will play in the site's aftercare monitoring programme, and given that the installation of the well itself does not affect any of the matters listed in sections 6, 7 and 8 of the RMA, it is not considered necessary to carry out an additional Part 2 assessment for this now additional component of the application. In addition, it is considered that section 104 matters, as relevant to the proposed well installation activity, have been assessed, at a scale commensurate with the activity, within this section of the section 92 RFI response letter.

Finally, as a general outline, the nature of the proposed conditions that may be attached to the land use consent are as follows:

- The monitoring well is to be installed within 12 months of the land use consent being granted. This timeframe accommodates the possibility that contracting drillers, given their workloads, may be challenging.
- The monitoring well is to be located outside of the footprint of the Eastern Landfill, to the north of the well MW1 and on the southern side of the site boundary.
- The monitoring well is to be screened from 1m to at least 3m bgl or to a depth that intercepts the groundwater table at all times.
- If waste material and / or contaminated soils are encountered during well installation, the materials and /or soil is to be contained and removed from the site for disposal at an approved facility.
- Once the well is installed, the well is to be capped, and thus sealed, so that contaminants cannot enter the well.
- Within 20 workings days of the well being installed, WM are to provide the 'bore' log to ORC and advise ORC of the exact location of the well.

Q23: Please confirm if you agree to adopt the proposed condition changes below.

Additions are made in and blue and deletions are struck through in red.

4. *The Consent Holder may change to a passive landfill gas management system where the landfill gas at the Eastern Landfill is no longer flared, provided:*

    a) *A suitably qualified and experienced person must prepare a report which confirms that the criteria, or trigger levels, specified in the AMP for changing to a passive landfill gas management system are met; and*

b) *Written notice of the intended change has been given to the Consent Authority in the form of a report, at least one month prior to changing to a passive landfill gas management system; and*

c) *The Consent Holder has received written confirmation from the Consent Authority certifying that the proposed amended monitoring programme is appropriate.*

6. *Within three months of the commencement of this consent, and thereafter following any amendments to the AMP made in accordance with Condition 8(i), the Consent Holder must submit an AMP to the Consent Authority for certification. ~~If the Consent Holder has not received a response from the Consent Authority either certifying the AMP or refusing to certify the AMP within one month from the date of submission of the AMP, the AMP is deemed to be certified.~~*

Changes to condition 11: Monitoring wells G35 (cesspit) and G36 (basement) will need to be added to the list, plus the recommended two new monitoring wells along the northern boundary of the Eastern Landfill to complement current monitoring in G34. An updated monitoring location plan will be required from the applicant accordingly, for attachment to the discharge permit.

It is anticipated that as the resource consent application for the various aftercare activities at the Fairfield closed landfill continues to be processed by the ORC, refinements and amendments to the conditions proposed by WM, provided in Appendix 8 of the application document, will be a matter of discussion. Therefore, while it is considered that further refinement of the above suggested condition changes may be a matter of discussion as the further processing of this application occurs, WM's response to the above suggested changes to the proposed conditions to be attached to the 'Discharge Permit – Discharges to Air' are as follows:

- Condition 4. WM considers that the proposed changes to Parts (a) and (b) are appropriate and therefore they are willing to accept these proposed changes. While WM is willing to accept the intent of the proposed change to Part (c), as drafted above, the proposed amendment refers to an 'amended monitoring programme' whereas this proposed condition relates to a proposed change from a flared landfill gas management system to a passive system. On this basis, WM considers that Part (c) of Condition 4 should be amended, with the amendments shaded grey, as follows:

  c) *The Consent Holder has received written confirmation from the Consent Authority certifying that the proposed change to a passive landfill gas management system ~~amended monitoring programme~~ is appropriate.*

- Condition 6. This condition relates to the closed landfill's proposed Aftercare Management Plan (AMP), with the same condition having been included in the proposed conditions to be attached to five of seven resource consents now being sought by WM. The proposed deleted wording has been included as WM did not want to be a position where it cannot proceed with carrying out actions at the site, in accordance with an updated AMP, as a result of ORC not certifying the AMP in a timely manner. It is noted that WM, and its Consultants, are aware of similar timeframe related certification conditions being included in resource consent conditions by other councils for this exact reason. Given WM's concerns, WM would prefer to retain wording along the lines proposed for the various certification processes that form part of the resource consent conditions. While expressing this preference, WM is willing to discuss this matter further, if need be, as the further processing of the application takes place (i.e., maybe a different timeframe).

- Condition 11. WM are comfortable with adding G35 and G36 monitoring sites to the initial landfill gas monitoring programme. It is also acknowledged that an updated monitoring location plan will need to be attached to the air discharge permit. However, it is considered that this can be provided at a later date (i.e., when the further refinement of proposed conditions has been largely resolved with ORC).

Q24: Please confirm if you agree to adopt the proposed condition below. Specific wording can be agreed upon at a later stage.

X. The Aftercare Management Plan must be updated within [TIMEFRAME TO BE SPECIFIED], to include follow up actions to remedy observed adverse impacts following ecology monitoring.

This is required to ensure that any observed adverse effects on ecology are being addressed through the Aftercare Management Plan.

The purpose of the proposed condition is acknowledged and understood, and thus supported in principle. However, the proposed conditions (as contained in Appendix 8 of the February 2024 application) contain processes that, in Planz' opinion, strive to achieve the same outcome being sought by the above proposed condition. The proposed conditions, which are attached to the majority of the resource consents being sought by WM, and for the context of this assessment the condition numbers as attached to the 'Water Permit – Take of Groundwater Containing Leachate and Other Groundwater' are referred to, are as follows:

- AMP Condition (Condition 7). The condition requires the AMP to have procedures in place that ensure that the closed landfill is managed to ensure that adverse effects on the environment arising from the landfill's aftercare activities are avoided, remedied or mitigated. This condition also states that, as a minimum, the AMP must contain procedures that address:
  - Respond to (and record) complaints and incidents at the site (part (g)). As discussed below, in drafting the conditions, it was considered that 'incidents' would include 'environmental incidents' such as where monitoring, for example, ecological monitoring identified that the closed landfill's aftercare activities are adversely affecting the environment.
  - Minimum requirements for AMP reviews are also outlined in this condition (part (i)). The minimum requirements listed include at least every two years during the first 10 years, and thereafter every 5 years, and if there is a significant change in the nature of site operations.
- Complaints and Incident Register Condition (Condition 8). This condition outlines the processes that must be recorded on the register when there are complaints or incidents (i.e., including 'environmental incidents'). The process includes identifying the actions taken to avoid, remedy or mitigate the matter detected by the complainant or the incident, including any policies or methods put in place to avoid the matter or incident occurring again. It is possible that the 'method put in place' could include amendments or review of the AMP.
- Reporting Condition (Condition 22). Part (e) of this condition requires the annual report to discuss all the complaints and incidents logged in the complaints and incidents register during the preceding 12 months, and the actions taken in response to the complaints / incidents (which could include amendments or review of the AMP).

If more clarity is required, along the lines of the proposed condition put forward in Q.22, it is considered that the following amendments to the proposed conditions could be made:

- Amend Part (i) of the AMP condition as follows:
  - *within six months of identifying any management actions, methods or policies that are to be implemented, as identified by the process undertaken in accordance with Condition [Insert Complaint and Incident Register condition number], to avoid matters detected by complainants or incidents occurring in the future.*
  - *at least every two years during the first 10 years of this consent, and thereafter …*
- Amend the Complaints and Incident Register condition by adding the following advice note

  Advice Note: *An incident may include, but is not limited to, operational failures, natural hazard effects and environmental incidents where monitoring has identified that the landfill's aftercare activities are adversely affecting the environment.*

WM agrees with the proposed conditions amendments outlined above.

Defence against Water and Diversion of Water (Q25 and Q26)

Q25: Please provide modelling of any diverted surface water flows that will occur as a result of the increase in height of the landfill's perimeter access road.

Q26: Please provide an updated assessment of effects using the results of the modelling required by question 25.

It is considered that the matters outlined in Q25 and Q26, has already been discussed within WM's section 91 deferral letter (dated 10 March 2025). In this response, WM outlined that the potential 'defence against water' will only be implemented if, as outlined in the proposed 'Mitigation – Effects from Climate Change' consent condition, the results of the required modelling / assessment recommends that raising the height of the perimeter road is the best practicable option to mitigate future climate change (and natural hazard) risks on the closed landfill. On this basis, being required to undertake modelling to assess the effects[5] of any associated surface diversion, when the activity itself may or may not proceed, and even if it does proceed where it has not been designed, is considered onerous and inappropriate at this point in time.

However, it is acknowledged that an appropriate assessment of the proposal as a whole, including the effects of the activity (as part of identifying the best practicable option for mitigating the effects of climate change), is required before being able to proceed with the installation of the proposed 'defence against water' (if that is the solution identified). This requirement is reflected in the proposed 'Mitigation – Effects from Climate Change' conditions, as well as the outline of proposed conditions to be attached to the 'defence against water' land use consent. These conditions are provided in the section 91 deferral letter response provided to ORC on 10 March 2025.

On the above basis, and so as to provide clarity, in terms of identifying that an assessment and / or modelling of the effects of surface water diversion associated with the proposed 'defence against water' is to be provided to the ORC prior to any such works commencing, the following amendment

[5] It is noted that WM's section 91 deferral letter concluded, for the reasons outlined in the letter, that the effects of the 'defence against water', including the associated diversion of water, range from none to minimal.

(with grey shading) to the proposed conditions outlined in the 10 March 2025 letter to ORC is proposed:

> *If this consent is to be given effect to, the design of the 'defence against water', including a description of the construction methodology and timeframes, and an assessment and / or modelling of the effects of the associated surface water diversion, is to be provided to the ORC, for certification, prior to any construction works commencing.*

Cultural Impact Assessment (Q27 and Q28)

Q27: Please confirm if any updated solutions will be adopted to improve the existing leachate interception?

- *It is noted that the Applicant is proposing 5-yearly reviews of the existing management system. Has such a review of the system been undertaken recently and has it been identified that any improvements could be implemented.*

WM will always look at and assess updated solutions to improve the closed landfill's leachate interception system. It is for this reason that WM have committed, as outlined in its response to the recommendations of the CIA (document dated 31 January 2025), to the proposed 'effectiveness and technology' review condition whereby such assessments / reviews are carried out at least every 5-years.

In relation to whether any such reviews have been carried out since the closure of the landfill and / or the lodgement of the resource consent applications for the aftercare period, the short answer is no. WM considers that 5-year reviews, after the grant of the resource consents being sought by WM, reflect an appropriate time period for such assessments. This is particularly the case given that the current monitoring programme (as contained in the existing resource consents for the landfill) requires relatively limited monitoring of the effects on the receiving environment. In this context, WM considers that it is important that a more robust monitoring programme, and thus resultant assessment of the actual effects of any landfill leachate discharges on the receiving environment, are fully understood before initiating the proposed 'effectiveness and technology' reviews. This was the approach that has been agreed with Te Rūnanga o Ōtākou (**Te Rūnanga**) following the completion of the CIA (as outlined in the 'Cultural Impact Assessment Recommendations – Proposed Approach / Response (FINAL - 31 January 2025)' document that has been provided to ORC).

This does not mean that WM do not continually assess and review management procedures at the site. For example, as outlined in recent monitoring reports (as provided in **Attachment B** of this letter in response to Q29), issues have been identified with effectiveness of the alarm system attached to the leachate interception system advising when the pumps are off-line. Permanent solutions to this issue are being investigated and in the meantime the frequency of site inspections have been increased.

Q28: Has a Restoration Plan for the Kaikarae Estuary, Wetland and tributaries been drafted? And has this been developed in partnership with manawhenua. If not, do you have a time frame for this?

At present, a Restoration Plan has not been drafted, is not in place and there is no timeframe for its development.

As outlined in the 'Cultural Impact Assessment Recommendations – Proposed Approach / Response (FINAL - 31 January 2025)', which has been provided to ORC, WM agrees that any such plan should be led by manawhenua, and WM have committed to participate in, and contribute to, such a process (if established). The 'proposed approach / response' document also identified that as many parties have contributed to the degradation of these waterbodies, the development and implementation of any such Restoration Plan should be developed collaboratively with all adjacent activities and landowners. Te Rūnanga agreed with this potential approach.

Finally, and although not directly relevant to this question, although not yet in place, the development of the Memorandum of Understanding between WM and Te Rūnanga, as outlined in the 'proposed approach / response' document is progressing.

Other (Q29 and Q30)

Q29: Given the extended length of time since the lodgement of this application, please send through any additional data that may have been gathered since lodgement.

This is required to ensure that all relevant data is provided to facilitate with the assessment of the proposal.

Attached, in Attachment B of this letter, are three monitoring reports that have been prepared, and provided to ORC's compliance team, since the lodgement of this application in February 2024.

The monitoring reports consist of an annual report, and the most recent quarterly reports that cover the period after the 2024 annual monitoring report. The reports have been prepared in accordance with the relevant conditions of the landfill's existing resource consents, and report on the monitoring that has been carried out in accordance with these existing resource consents.

Q30: Please provide an assessment against the relevant policies and objectives of the New Zealand Coastal Policy Statement

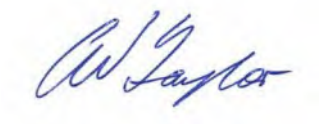
This is required as the Coastal Marine Area is in proximity to the closed landfill, and, it has been assessed that there are downstream adverse effects occurring.

Section 8.3 of the February 2024 application contains an assessment against the relevant objectives and policies of the New Zealand Coastal Policy Statement 2010 (NZCPS). This assessment was carried out in recognition of the fact that the closed landfill is located within the 'coastal environment', and that the closed landfill itself adjoins the Kaikorai Lagoon Swamp which is a 'coastal wetland' (but which is not within the coastal marine area (CMA)) which in turn adjoins the estuary which is located within the CMA. Figure 4 of the February 2024 application identifies the extent of the estuary and thus CMA. On this basis, it is considered that the information requested by this question has already been provided.

WM trusts, given the provision of the further information provided within this letter, that the further processing of the application can now proceed.

If you have any queries in relation to this letter, or WM's application, please feel free to contact the undersigned.

Yours sincerely
PLANZ CONSULTANTS LTD



Carmen Taylor
Consultant Planner (Partner)

Phone: 021 321 781
Email: carmen@planzconsultants.co.nz

Attachments: **Attachment A** – Updated (v2) Resource Consent Application Form.

Attachment B – Landfill Monitoring Results (post February 2024).

cc: Greg Nel, Regional Manager Otago & Southland, WM New Zealand (via email – gnel@wm.nz)

Richard Hyndman, Senior Project Manager – Engineering, Research & Development, WM New Zealand (via email – rhyndman@wm.nz)

Scott Wilson, Technical Director – Contaminated Land, Pattle Delamore Partners Limited (via email – scott.wilson@pdp.co.nz)

Attachment A – Updated (v2) Resource Consent Application Form

IMPORTANT NOTE:

This updated application form (v2) replaces the application form contained in the resource consent application document dated February 2024 and lodged with ORC on 28 February 2024, and the updated application form contained in Attachment A of WM New Zealand Limited's letter, dated 10 March 2025, in response to the section 91 deferral letter from the ORC.

This updated form (v2) seeks three additional resource consents, a land use consent and water permit, to authorise the potential 'defence against water', and a land use consent to install an additional landfill gas monitoring well.

The additional two resource consents being sought for the potential 'defence against water' may be required if the mitigation option of increasing the level of the site's perimeter access road, plus associated protection and armouring of the road, is implemented in the future to address the potential risks to the land fill arising from climate change effects. Waste Management do not agree that these two resource consents need to be sought now (for the reasons outlined in the letter to ORC dated 10 March 2025). However, in response to ORC's section 91 letter (dated 4 February 2025) and to ensure that the further processing of application RM24.098 continues, Waste Management has decided to proceed with seeking these two additional resource consents.

In relation to this updated application form (v2):

- All updates to the original application form (as contained within the February 2024 application document lodged with ORC) are shown in tracked changes mode (~~strikethrough~~ text for deletions and underlined text for additions) along with grey shading.
- All references to the AEE, or application, retained in the application form, refer to the February 2024 application document.

UPDATED APPLICATION FOR RESOURCE CONSENT (VERSION 2 (v2))

SECTION 88 OF THE RESOURCE MANAGEMENT ACT 1991

To: the Otago Regional Council

1. We, **Waste Management NZ Limited**[6] (**Waste Management**) (318 East Tamaki Road, East Tamaki, Auckland 2013) is seeking all necessary resource consents for the aftercare period of the Fairfield closed landfill. The specific requirements for the resource consents are:

   (a) **A discharge permit to discharge landfill gas, and associated odour, to air from the Fairfield closed landfill, in accordance with Rule 7.6.1.3 (discretionary activity) of the Regional Plan: Waste for Otago (Waste Plan)**[7]**.**

[6] Consent 95008, as contained in **Appendix 1,** refers to the consent holder as 'Waste Management Limited', previously known as 'Transpacific Industries Group New Zealand Limited'. Waste Management NZ Limited is the entity that was formerly known as Transpacific Industries Group New Zealand Limited, not Waste Management Limited, and is therefore considered to be the consent holder of this resource consent. It is acknowledged that Consents 93540 to 93542 correctly refer to Waste Management NZ Limited as the consent holder.

[7] The Waste Plan rules, rather than the rules of the Regional Plan: Air for Otago (as stated in Section 16.2.2 of the Regional Plan: Air for Otago), apply to the discharges to air from the closed landfill.

(b) A discharge permit to discharge landfill leachate to groundwater, by seepage, through the 21 hectare base of the Fairfield closed landfill which is bounded by the leachate interception drain:

a. in accordance with Rule 7.6.1.1 (discretionary activity) of the Waste Plan; and

b. in accordance with Regulation 45B(5) (discretionary activity) the Resource Management (National Environmental Standards for Freshwater) Regulations 2020 (NES-F) where the discharge occurs within 100m of the Kaikorai Lagoon Swamp[8].

(c) A water permit to take groundwater containing leachate and other groundwater, for the purpose of controlling landfill leachate and to maintain groundwater within the area bounded by the Fairfield closed landfill's leachate interception drain:

a. in accordance with Rule 10A.3.2.1 (non-complying activity) and Rule 12.2.4.1(i) (discretionary activity) of the Regional Plan: Water for Otago (Water Plan); and

b. in accordance with Regulation 45B(4) (discretionary activity) of the NES-F for the groundwater that is taken within 100m of the Kaikorai Lagoon Swamp.

(d) A discharge permit to discharge stormwater runoff diverted from the Fairfield closed landfill into the Kaikorai Stream and Kaikorai Lagoon Swamp, after treatment through the North and Weighbridge stormwater retention ponds:

a. in accordance with Rule 7.6.1.2 (discretionary activity) of the Waste Plan; and

b. in accordance with Regulation 45B(5) (discretionary activity) of the NES-F as the discharge is into the Kaikorai Lagoon Swamp.

(e) A land use consent for a defence against water associated with the extension (increase) of the height of the landfill perimeter access road, and the addition of armouring, in accordance with Rule 14.3.1.1 (discretionary activity) of the Water Plan.

(f) A water permit for the diversion of water, within the bed of the Kaikorai Stream and Kaikorai Lagoon Swamp, as a result of the establishment of a defence against water:

a. in accordance with Rule 12.3.1A.1 (non-complying activity) of the Water Plan; and

b. in accordance with Regulation 45B(4) (discretionary activity) of the NES-F as the defence against water should ensure that water is retained within the Kaikorai Lagoon Swamp.

(g) A land use consent for the installation of an additional landfill gas monitoring well, to be located beyond the Eastern Landfill's footprint and to the north of MW1, in accordance with Rule 5.6.1.1 (discretionary activity) of the Regional Plan: Waste for Otago.

A consent term of 30 years is sought for all of the above resource consents, except for the land use consent being sought for the additional landfill gas monitoring well. This time period reflects the expected aftercare time period for the closed landfill and the fact that the activities for which consent are being sought are interlinked (i.e., the water permit to take groundwater is directly connected to the need to manage the discharge of landfill leachate to groundwater, by seepage, through the base of the landfill).

A consent term of 12 months is requested for the land use consent being sought for the installation of the additional landfill gas monitoring well.

[8] The 'Kaikorai Lagoon Swamp' is a 'Regionally Significant Wetland' as identified in Schedule F of the Water Plan (Map F57).

Finally, the reason the above consent term is also being sought for the groundwater take, which is to be allocated as a surface water take in accordance with Policy 6.4.1A(b) of the Water Plan, is discussed in Sections 4.3 and 8.7 (Table 3 – refer to Policy 10A.2.3) of this application.

The overall activity status of the application is non-complying.

2. The activity to which the application relates (the activity) is as follows:

Tartan Industries Limited, a subsidiary of Waste Management, own the site associated with the Fairfield closed landfill, with Waste Management managing activities within the closed landfill. While the landfill is closed, and therefore no longer receiving waste material for disposal (waste disposal ceased in 2017), a number of activities, currently authorised by regional resource consents granted by the Otago Regional Council (ORC), will continue during the landfill's aftercare period as the material in the landfill continues to slowly decompose. These activities are as follows:

- The discharge of landfill gas, and associated odour, to air. The landfill gas, from part of the site, is currently flared (i.e., collected and combusted with a flame). This discharge is currently authorised by Consent 95008 as contained in Appendix 1 of this application.
- The discharge of landfill leachate to groundwater by seepage. This discharge is currently authorised by Consent 93540 as contained in Appendix 1 of this application.
- The taking of underground water containing leachate and other groundwater. This take is currently authorised by Consent 93541 as contained in Appendix 1 of this application. The leachate and groundwater, taken in accordance with this water permit, is discharged into Dunedin's wastewater network in accordance with a trade waste consent.
- The discharge of treated stormwater into the Kaikorai Stream and Kaikorai Lagoon Swamp. This discharge is currently authorised by Consent 93542 as contained in Appendix 1 of this application. Stormwater from the site's North Pond is discharged into the Kaikorai Stream, while the overflow discharge from the Weighbridge Pond is discharged into the Kaikorai Lagoon Swamp.

Consents 95008 and 93540 to 93542 expire on 1 September 2024. Waste Management are seeking to 'renew' these resource consents as the discharge and take activities currently authorised by these resource consents will continue during the closed landfill's aftercare period. That is, leachate and gas will continue to be generated as the waste in the landfill decomposes, although over time the levels of leachate and gas will reduce, and ultimately cease (i.e., when the organic material in the landfill has decomposed).

There is also potential mitigation measures associated with the closed landfill's aftercare period that may need additional resource consents before the mitigation measures can be implemented (i.e., the potential option of increasing the height of the landfill's perimeter access road, and associated armouring, as a effects from climate change mitigation measure). Where considered necessary by the ORC, these resource consents have also been sought.

In addition, as requested by ORC in its section 92 request for further information letter dated 21 March 2025, a land use consent for the installation of an additional landfill gas monitoring well is also being sought.

The activity for which resource consents are being sought by this application are more fully described in the attached AEE which forms part of this application.

3. The site at which the proposed activity is to occur is as follows:

Address:	Fairfield, adjacent to the Kaikorai Stream and Kaikorai Lagoon Swamp, approximately 1km off Old Brighton Road, Fairfield, Dunedin. The access into the landfill is at 125/127 Old Brighton Road.
Legal Description:	Tartan Industries Limited, which is a subsidiary of Waste Management, landholding consists of the following land parcels - Lot 2 DP566541 (RT 1021375 (prior to subdivision in March 2023, part of Part Lot C DP1685 (RT OT13B/390)), Part Lot B DP685 (RT OT8D/1045) and Part Section 41 Block VIII Dunedin & East Taieri Survey District and DP7227 (RT OT352/110). Copies of the Records of Title are provided in Appendix 9.
Area:	Tartan Industries Limited's, which is a subsidiary of Waste Management, total land holding is 65.6ha. The area covered by the Fairfield closed landfill is 21ha.

The location of the Fairfield closed landfill is identified in Figures 1 and 2 contained in the attached AEE which forms part of this application and in the figures and plans contained in the Aftercare Management Plan contained in Appendix 2 of this application.

4. The full name and address of each owner and occupier (other than the applicant) of the site to which the application relates are as follows:

Tartan Industries Limited, a subsidiary of Waste Management, is the owner of that land associated with the closed landfill site. Waste Management manage, and thus occupy, the closed landfill.

5. There are no other activities that are part of the proposal to which this application relates.

6. No additional resource consents are needed for the proposal to which this application relates.

The Resource Management (National Environmental Standards for Greenhouse Gas Emissions from Industrial Process Heat) Regulations 2023 came into effect on 27 July 2023. However, while landfill gas is a greenhouse gas, these regulations do not apply to the discharge of landfill gas to air, including the products of combustion from the flaring of the landfill gas, from the site, as these regulations only apply to industrial activities generating thermal energy as part of its processing operations.

7. We attach an assessment of the proposed activity's effect on the environment that—

   (a) includes the information required by clause 6 of Schedule 4 of the Resource Management Act 1991; and

   (b) addresses the matters specified in clause 7 of Schedule 4 of the Resource Management Act 1991; and

   (c) includes such detail as corresponds with the scale and significance of the effects that the activity may have on the environment.

8. We attach an assessment of the proposed activity against the matters set out in Part 2 of the Resource Management Act 1991.

9. We attach an assessment of the proposed activity against any relevant provisions of a document referred to in section 104(1)(b) of the Resource Management Act 1991, including the information required by clause 2(2) of Schedule 4 of that Act.

10. The value of the investment of the existing consent holder is:

As this application has been lodged six months prior to the expiry of Consents 95008 and 93540 to 93542 (Appendix 1), section 124 of the Resource Management Act 1991 (RMA) applies. As an application affected by section 124, section 104(2A) of the RMA requires the consent authority to have regard to the value of investment of the existing consent holder. In accordance with these provisions of the RMA, an overview of the value of Waste Management's investment at the site is outlined in Section 5.3 of the attached AEE.

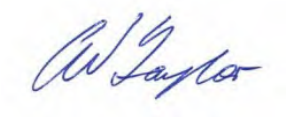
11. We attach the following further information required to be included in this application by the district plan, the regional plan, the Resource Management Act 1991, or any regulations made under that Act:

The statutory planning documents, ~~assessed in the attached AEE and~~ relevant to this application, are the National Policy Statement for Freshwater Management 2020, the New Zealand Coastal Policy Statement 2010, the Resource Management (National Environmental Standards for Air Quality) Regulations 2004, the Resource Management (National Environmental Standards for Freshwater) Regulations 2020, the Proposed Otago Regional Policy Statement 2021, the Partially Operative Otago Regional Policy Statement 2019, the Regional Plan: Waste for Otago, the Regional Plan: Water for Otago and the Regional Plan: Coast for Otago.

The above statutory planning documents are:

- assessed in the resource consent application dated February 2024 and lodged with ORC; and
- where relevant to the potential 'effects from climate change mitigation measure' these documents have been discussed in the letter to ORC dated 10 March 2025; and
- where relevant to the proposed additional landfill gas monitoring well relevant documents have been discussed in the letter to ORC dated 6 June 2025.

The deposit of $2,450 (incl. GST) (non-notified and limited notified multiple application which consists of $2,300 plus $150 compliance administration fee) has been paid by Waste Management, on 19 February 2024, using the ORC's Datacom secure credit card payment page (payment references are OTH240232488 / RCT240205300). This deposit also covers the three additional resource consents now being sought to authorise the potential 'effects from climate change mitigation measure' and the installation of the additional landfill gas monitoring well.



Carmen Taylor (Consultant Planner (Partner))
Planz Consultants Limited
On behalf of Waste Management NZ Limited

Address for Service (Electronic and Postal):	Address for Billing:*
Planz Consultants Limited C/o PO Box 1845 CHRISTCHURCH 8140 Attention: Carmen Taylor Consultant Planner (Partner) DDI: 03 929 1414 Mobile: 021 312 781 Email: carmen@planzconsultants.co.nz	~~Waste Management NZ Limited~~ WM New Zealand PO Box ~~11337~~ 2438 ~~Sockburn~~ South Dunedin ~~CHRISTCHURCH 8443~~ DUNEDIN 9044 Attention: Greg Nel Regional Manager Otago & Southland ***AND*** Richard Hyndman Senior Project Manager – Engineering, Research & Development ~~David Fitzmaurice~~ ~~Senior Project Engineer South Island – Operational & Technical Services~~ Mobile: Greg – 027 613 2350 Richard - 021 844 249 ~~021 507 031~~ Email: gnel@wm.nz rhyndman@wm.nz ~~dfitzmaurice@wastemanagement.co.nz~~

* Planz Consultants Limited accepts no liability for any Council costs or charges. Invoices for all such work are to be sent to the Applicant's address above for billing.

Attachment B – Landfill Monitoring Results (post February 2024)

The following monitoring reports (letters) are provided within this attachment:

- 'Fairfield Landfill – 2024 Annual Monitoring Results', dated 28 November 2024, and prepared by Pattle Delamore Partners Limited (PDP). This report covers the monitoring period from November 2023 to October 2024 inclusive.
- 'Fairfield Landfill Quarterly Monitoring Results (1st Quarter 2025)', dated 27 February 2025, and prepared by PDP. This report covers the monitoring period from November 2024 to January 2025 inclusive.
- 'Fairfield Landfill Quarterly Monitoring Results (2nd Quarter 2025)', dated 27 May 2025, and prepared by PDP. This report covers the monitoring period from February to April 2025 inclusive.

PATTLE DELAMORE PARTNERS LTD
Level 2, 134 Oxford Terrace
Christchurch Central, Christchurch 8011
PO Box 389, Christchurch 8140, New Zealand

Tel +64 3 **345 7100**
Web **www.pdp.co.nz**
Auckland Tauranga Wellington **Christchurch**

solutions for your environment

28 November 2024

Greg Nel
Otago Waste Services Limited
PO Box 6074
DUNEDIN 9059

Dear Greg

FAIRFIELD LANDFILL - 2024 ANNUAL MONITORING RESULTS

1.0 Introduction

Otago Waste Services Limited (OWS) has engaged Pattle Delamore Partners Limited (PDP) to review the monitoring data for Fairfield Landfill for the October 2024 sampling round, as well as the sampling rounds completed in the 2024 monitoring period to provide a more detailed annual review of the results.

The monitoring regime has been carried out for the purposes of satisfying the requirements of Resource Consents 93540 (Discharge leachate to groundwater), 93541 (To take groundwater), 93542 (Discharge to stormwater) and 95008 (Discharge to air) associated with the operation of Fairfield Landfill. OWS has also requested that a record of any odour complaints be included in the annual report to satisfy Condition 3 of Resource Consent 95008.

Since July 2017 Fairfield Landfill closed and no longer accepts waste. A Closed Landfill Closure Management Plan for Fairfield has been developed to outline the closed landfill aftercare programme to date. The landfill capping process was completed in 2022, as per the current closure plan. Now that the landfill is no longer accepting waste and has been fully capped, changes to the water levels, leachate composition and landfill gas will become apparent. This won't occur immediately, but we are likely to see some changes with time.

The current resource consents for the landfill expired in September 2024, and a renewal resource consent application for the ongoing management of the closed landfill was submitted and accepted by Otago Regional Council on 7 March 2024 and is currently being processed. Under s124 continuation rights of the RMA (1991), the existing consents are still operative and this report has been prepared to satisfy these consents.

This letter presents the analytical results and analysis of the monitoring data collected during the sampling rounds for the 2024 monitoring year as well as a comparison with the historical monitoring data (as far back as 1997[1] for some parameters) to provide longer term trends and potential indicators of any impacts to groundwater and the surrounding surface water bodies associated with the landfill activities. The monitoring data and laboratory results have been provided by Fulton Hogan Limited (FH) and landfill gas

[1] Some datasets only date back to 2001 or 2002.

measurements provided by OWS for the purposes of preparing this letter. A copy of the FH October 2024 report[2] is attached (Appendix H), whilst copies of the quarterly FH reports were appended to the associated quarterly reports (already provided to council). Information relating to the odour complaints presented in this annual report has been provided by OWS. This information has not been independently verified by PDP.

For the purposes of reporting, the landfilled areas are defined as the following (refer Figure 1, Appendix A):

- The 'Eastern Landfill' is the eastern most landfill which has recently closed and fully capped. The leachate interception drain extends around the eastern and southern sides of this landfill area.
- The 'Western Landfill' is the middle landfill area between the 'Eastern Landfill' and the internal road that bisects the landfilling area. This area is also serviced with the leachate interception drain on its southern side.
- The 'Historical Landfill' is the western most area extending to Old Brighton Road. This was the earliest area landfilled on the site. There is no leachate control in this area.

A landfill gas collection and flare system is currently in place with three candlestick-style flares capturing and flaring the LFG being generated in the Eastern Landfill. There is no LFG extraction in the Western Landfill area based on its age and insufficient LFG generation to enable flaring. Any LFG generated from this area is discharged passively (i.e., without flaring).

2.0 Consent 93540 – Discharge Leachate to Groundwater

2.1 Condition 8 – Groundwater/Surface Water Levels

Groundwater levels have been measured from the following wells during each of the monitoring rounds using a water level dipper (locations shown in Figure 2, Appendix A):

- Groundwater wells within the landfill (LGS1, LS2, LS6, LS9, LS14, LD5 and LD16)[3];
- Groundwater wells outside the landfill (LGS7, LS10, LS13, LS15, LS19, LS22, LD8, LD11, LD17 and LD20); and
- Leachate interception drain[4] wells (LS23, LS24, LS25, LS26, LGS27, LS28, LGS29, LS30, LS31, LS32 and LS33).

As described in the previous annual report, LS21 was recently decommissioned as it was located within a newly subdivided area of land to the north of the landfill. A new replacement well, LS21A, has been installed and will be included in the 2025 monitoring programme (see Figure 2).

Surface water levels have continued to be measured at permanent staging posts within Christie Creek (SP1), Kaikorai Stream (SP3) and immediately adjacent to the landfill within the Kaikorai Lagoon Swamp

[2] Environmental Monitoring Report – Otago Waste Services Landfill October 2024
[3] Well LS4 has been buried as part of the final capping process. Wells LS3, LS12 and LS18 have been destroyed and as they are not considered critical for the monitoring programme are not proposed to be reinstated. LS16 is bent and can no longer be sampled.
[4] The assumed leachate interception drain layout is shown in Figure 3.

'Wetland' (SP5) to satisfy Condition 8(c).[5] Monitoring location SP5 is the most meaningful of these surface water level monitoring points as it represents the level of the wetland, which has the greatest influence on the water levels in the monitoring wells.

The plots showing the most recent water levels together with the historical levels are presented in Figures 4-6, Appendix A.

Water level monitoring rounds were undertaken during the months of January, April, July and October in accordance with the consent conditions.

The groundwater levels are influenced by the levels being induced by the leachate interception drainage system around the Eastern and Western Landfill areas (refer Figure 2, Appendix A). During the January and October rounds the leachate pump (EPS42) was noted to be not operating when Fulton Hogan undertook their monitoring round. On both occasions OWS were contacted immediately, and they responded to reactivate the pump. The pump was restarted immediately in January, but there was a pump fault in October that needed repair so there was a slight delay before the system was operational again. For the October round OWS advised that they had undertaken a site inspection the week prior and the pump was operational at that time, which indicates that the pump was only off for a few days (i.e., not a prolonged period of time). OWS engaged contractors to investigate the cause of the pump failure, and it appears it was a pump fault. In addition, as recorded in the April 2024 quarterly report, there was no discharge from the leachate pump for the entire month of February because of a level switch shorting out. OWS has commented that the pump and alarm system is serviced every 6-months, so they were unsure why this fault occurred.

OWS recognises the importance of the leachate interception system and given the recent frequency of the pump failures will carry out investigations to determine the cause of the pump shutdowns and if required replace the pump and/or operating system. In the meantime, OWS has increased the frequency of site inspections to weekly until the system is more reliable.

Wells Within the Landfill Area

Groundwater levels measured within the accessible wells within the landfill are presented in Figures 4 and 4a, Appendix A.

In general, water levels over the past year showed fairly consistent water levels in these wells in comparison to the historical dataset. The biggest change was recorded at LS6, which recorded its highest level to date in the July round, however water levels dropped to more typical levels in the October round. The cause for this is unknown. Given other wells didn't show the same response, it is possible that this was a mis-measurement. In addition, well LS14 within the Eastern Landfill appears to have stabilised approximately 2.0 m above the surrounding surface water bodies and generally higher than it has been recorded in the past. The water level has very little variation between rounds since October 2022, which coincides with the final capping process.

The leachate pump not operating at the time of the January and October rounds does not appear to have any obvious influence on water levels inside of the landfill areas.

Long term, the majority of the wells have shown consistent water levels apart from the occasional spike. Previously, well LD16 showed the most variability of any of the wells. Due to a bend in the well pipe,

[5] The staging post within Coral Creek was broken, and therefore it was not possible to obtain surface water level measurements at Coral Creek (SP2).

measurements were unable to obtained in April or October, however when LD16 was able to be measured water levels were low (July) or dry (January). The low/dry conditions at LD16 may be a reflection of the landfill now being capped. The bend in the well is likely associated with settlement within the landfill waste. There is no intention to replace this well at this point in time.

Shallow water levels within the Western Landfill area (LGS1 and LS2) continue to show water levels approximately 1.5 m above the level of the surrounding surface water bodies (SP5) indicating that a natural water level gradient towards the surface water bodies around the Western Landfill area continues to exist. There is no obvious trend apparent, and this area appears to be in a natural equilibrium with environmental conditions (i.e. rainfall entering and seepage rates).

Wells Outside the Landfill Area

For the 2024 annual monitoring period, groundwater levels measured within wells outside of the landfill (Figures 5 and 5a, Appendix A) were generally within the range of historical data with no obvious trends observed.

Shallow wells LS10, LS13, LS15 and LS19 did show a water level increase in October, which is expected to be related to the leachate pump not operating at the time of the monitoring round. There does not appear to be a similar response for the January round, however, the pump was restarted immediately (i.e. during the water level monitoring round), so it influenced the results of the monitoring.

The deep wells (in particular LD11, LD17 and LD20) generally continue to have higher water levels than the shallow wells on the wetland side of the landfill. LD17 in particular has a water level above the surrounding water level in the wetland indicating positive water pressures in the deeper water bearing layer. The deeper wells appear to have remained generally stable since 2018. There are no longer term trends apparent and no obvious changes since the eastern landfill was capped.

Interception Drain Wells

The April and July monitoring rounds showed water levels in these interception drain wells to be within their typical operating range (Figures 6 and 6a, Appendix A). However, the January and October rounds when the leachate interception system was not operating show elevated water levels. What we have found in the past is that when the pump is reactivated, the water levels quickly drop back to normal operating levels.

Summary of Effectiveness of Interception Drain

When the leachate pumping system is operational the measured levels within the interception drainage system show a depression of the phreatic surface (saturation zone) along the length of the leachate interception drain. On this basis Condition 4 of Consent 93540 is considered to be met when the leachate pump is operating. The operation of the leachate pump is therefore critical in achieving compliance.

OWS has indicated that the pumping system does have a number of alarm systems in place to notify them of when a fault occurs, however, recently they have not been effective. On going work is being undertaken to resolve the pumping issues currently being observed. As mentioned above, OWS has increased the frequency of site inspections to weekly moving forward to catch any pumping issues as early as possible until the system is more reliable. An investigation to determine the cause of the recent pump shutdowns is being undertaken and the pump replaced if necessary.

2.2 Condition 10 – Monitoring Pumped Leachate/Groundwater Volume

A summary of the recorded leachate/groundwater volumes pumped to the Dunedin City Council reticulated sewer system between August 2024 and October 2024 (i.e. for the 4th quarter of 2024), as required by condition 10, is as follows:

Date	Time	Total Hours Since Last Reading (hr)	Pump Hours Since Last Reading (hr)	Discharge Total (m^3)	Discharge Since Last Reading (m^3/hr)	Average Discharge to DCC for that period (m^3/hr)	Typical Average Discharge for that Month (m^3/hr)	Lagoon Level
03/09/2024 (August)	14:30	677	143	168,448	2,260	3.3	4.2	Low Level
02/10/2024 (September)	11:00	693	131	170,270	1,822	2.6	3.7	Low Level
04/11/2024 (October)	12:00	793	406	176,941	6,671	8.4	3.4	Low Level

The monthly typical average discharges for the 4th quarter shows below average discharge[6] for the August and September 2024, and above average discharge for October 2024.

Tables 1, 2 and 3 (Appendix B) present the data for the four quarters (November 2023 to October 2024) and shows that only the month of October recorded average discharge rates above the calculated typical average discharge for all years for that month. This coincides with a large rainfall event that occurred at beginning of October 2024; 178 mm and 104.6 mm of rain were recorded at the NIWA's Musselburgh (Network Number 15752) and Dunedin Airport weather monitoring stations (Network Numbers 7339) respectively over the period a 3-day period (2-4 October 2024). This rainfall event would have been a contributing factor for the higher-than-average discharge for that month.

The total volume of leachate discharged for the year was recorded at 22,088 m^3. This is below the rolling average of 28,310 m^3 based on data dating back to 2003. Whilst higher than the total volume recorded for 2022 and 2023, this was likely due to the high flow recorded in October. In general, the total leachate volume discharged has been trending downwards since 2017 (from 32,799 m^3). The reduction in leachate volume is likely related to the closing of the landfill and capping process minimising rainfall entering the landfill and generating leachate. This trend will continue to be monitored as we observe changes as a result of the landfill closing and capping process.

2.3 Condition 11(a) – Leachate Sampling

During the October sampling round a representative sample was collected from the groundwater/leachate present within the pumping chamber (EPS42; representative of the material pumped to the DCC sewerage treatment plant). The sample was collected as a grab sample directly from the pumping chamber and sent to RJ Hill Laboratories (Hills) in Hamilton for analysis of the parameters outlined in Condition 11(a). It should be note that the sample was collected when the pump was not operating so is a reflection of the leachate present in the chamber.

[6] Typical average discharge based on the average of the pumped volume since 2003 for each respective month.

The results for the recent sample, together with any historical sampling of the leachate since June 2001, have been tabulated and graphically presented as the Leachate Chemistry Charts (Appendix B). The following observations were noted:

- Ammoniacal-nitrogen (ammoniacal-N; 112 mg/L) concentrations showed a drop in concentrations to the lowest recorded to date. Whilst this lower concentration may have been affected by the pump being off, there has been general decreasing trend since 2014. As the landfill is now closed (since 2017), the slowly decreasing trend is expected. The concentrations measured are still within the typical range for landfill leachate (between 30 mg/L and 3,000 mg/L; Landfill Guidelines, 2000).
- For the second consecutive year, nitrate-nitrogen (3.5 mg/L) showed a decrease in concentration in 2024 after a generally increasing trend since 2016 (with some fluctuation). The concentration is within the typical range for nitrate-N in landfill leachate of between 0.1 and 50 mg/L (Landfill Guidelines, 2000).
- Sulphate (161 mg/L) appears steady at between 100 and 160 mg/L over the past 12 years.
- The cation/anion ratio for the most recent round (1.02) is within the 10% range outlined in the consent condition indicating no major compounds have been missed in the analysis.
- pH is generally stable although a spike in concentration was noted in 2020. The average pH level is lower than the typical range for pH in landfill leachate (pH 7.5 and 9.0; Landfill Guidelines, 2000), although this is not considered to be of concern as typical background pH is low in the area.
- Zinc has in the past shown a large degree of variability between sampling rounds. The most recent round shows an increase in concentration and the second highest recorded to date.
- BOD (6 mg/L) and COD (154 mg/L) both showed their lowest concentrations recorded to date and continue to show a general declining trend since at least 2020.
- Sodium, chloride, magnesium, conductivity and bicarbonate all showed a sudden drop in concentrations. This is expected to be related to the pump being off.
- The remaining compounds were within the range of historical data.

The pump not operating at the time of the sample collection meant the sample was representative of idle water in the system as opposed to steady state pumping and may have influenced the results with slightly lower concentrations recorded for most parameters. Overall however, the sampling results continue to show fairly typical chemistry for leachate from a landfill of this age and deposition.

Effluent toxicity testing and analysis of the leachate for the USEPA priority pollutants was not undertaken as part of this assessment. These tests are carried out every two years so will be carried out during the October 2025 sampling round if the current reconsenting process has not been completed.

2.4 Condition 11(b) – Quarterly Groundwater Sampling

Groundwater sampling has been completed in the following wells during the 2024 sampling period (locations shown in Figure 1, Appendix A):

- Leachate interception drain wells (LS24, LS26, LS28, LS30 and LS32); and
- Groundwater wells outside the landfill (LGS1, LGS7, LS10, LS13, LS15, LS19, LS22, LD8, LD11, LD17 and LD20).

The sampling was carried out by FH on each occasion and followed the same sampling procedures used in the previous sampling rounds. The samples were collected into bottles provided by the analytical laboratory before being placed into a chilly bin and transported to Hills for chloride, conductivity and ammoniacal-N analysis. Conductivity, pH and temperature were measured in the field using hand held instruments. The laboratory results for the 2024 rounds together with historical sampling results from these wells dating back to 1997 for pH and conductivity and 2002 for temperature, ammoniacal-N and chloride have been tabulated and graphically presented as the Quarterly Groundwater Sampling Charts (Appendix C). A summary of the results for each of the parameters is as follows:

pH

pH during 2024 showed levels between pH 5.96 (LS10; April) and pH 8.1 (LD20; August) and generally within the historical dataset range. Of note:

- The majority of the wells showed lower (field measured) pH values in January. As described in the quarterly monitoring reports for January, April and July 2024, field measurements of pH were lower than expected (circa 1 pH unit), which appeared to be related to an equipment/calibration error, as opposed to a true reflection of water conditions. pH was added to the laboratory analysis from April onwards.
- (Laboratory) pH results from April onwards were recorded within the typical historical levels. No trends between deep and shallow wells are apparent.

Temperature

Temperature readings showed the typical seasonal variation throughout the year, with cooler temperatures in the winter months (as low as 6.8^{0}C) and warmer temperatures in the summer months (as high as 16.0 ^{0}C). The temperatures measured were considered typical based on previous monitoring data. The interception trench wells typically have higher temperatures than the monitoring wells further away from the landfill. This is not unexpected given the nature of a landfill and decomposition processes occurring within the landfill.

Total Ammoniacal-Nitrogen

Total ammoniacal-nitrogen (TAN) concentrations continue to remain higher (typically above 100 mg/L) in the leachate interception drain wells and the historical landfill well (LGS1). Wells LS28, LS30 and LS32 continue to show the highest concentrations of all of the interception drain wells (up to 410 mg/L in the latest year of monitoring). In October, the leachate pump was not operating for a short period (a couple of days) preceding the monitoring round, and concentrations of TAN in the leachate wells decreased (in the range of approximately 100-200 mg/L, compared to more typical values of up to 400 mg/L at these locations). On prior occasions where the pump was not operating, decreases in TAN concentrations were observed, and concentrations increased to typical levels once the pump was reactivated. Whilst this might suggest the results are better than when the pump was not operating, this is reflective of the flow gradient at the time (back towards the landfill). Once water levels in the wetland decreased the gradient would likely reverse. The interception drainage system removes a large volume of leachate from the landfill, which would otherwise enter the wetland area (PDP 2023). Overall, concentrations of TAN in the leachate interception drain wells and LGS1 show a general decreasing concentrations trend. Given the landfill no longer accepts waste, a declining trend is expected overtime.

With regards to the wells outside of the landfill, deep wells LD11 and LD17 continue to show high TAN concentrations, with concentrations measured between 23 mg/L (LD11; August 2024) and 31 mg/L (LD11; August 2024). Concentrations across these two deep wells show some fluctuation between rounds, but overall, there is no obvious trend either way (i.e. steady-state conditions) in these deep wells. LD11 and

LD17 are located in the south-eastern corner of the landfill area. Other deep wells LD8 and LD20 are located further north and west of the main landfill area (eastern landfill) and do not show the same level of TAN concentrations. Both of these wells in the past have shown the presence of TAN around 20 mg/L, however since 2010 the concentrations of TAN have typically been <5 mg/L, with LS20 showing concentrations <1 mg/L since 2016. LD8 did show a spike in concentration during the most recent October sampling round up to 10.2 mg/L. Occasional spikes in TAN concentrations are recorded in this well, but this will continue to be monitored for any change.

The shallow wells located beyond the perimeter of the interception drain adjacent to the wetland (LS10, LS13, LS15 and LS19) continue to show a high degree of variability, in particular LS13. In January and April 2024 LS13 showed a spike in concentration with concentrations recorded at 115 mg/L and 129 mg/L. This appears to be a common theme over the past few years. Previously this was one of the triggers to initiate the remedial works in the interception drainage system as LS13 is directly down gradient of LGS7. This will continue to be monitored as this well appears to be in a location with a strong hydraulic connection point with the interception drain. The most recent October round showed a decreased concentration of 3.8 mg/L. This is possibly associated with the pump not operating at the time.

The remainder of the shallow wells showed TAN concentrations within the typical dataset range (<5 mg/L).

The presence of TAN within the shallow and deep wells beyond the interception drain shows that there are leachate impacts in groundwater beyond the landfill. With the exception of LS13 showing spikes, concentrations have been relatively stable and have been around this level since 2002 when sampling began (i.e. no obvious change in concentrations). This suggests the groundwater system is mostly in an equilibrium with its surrounds. This is in contrast with the samples collected from the leachate interception system which shows a declining trend. It is expected that there will be a delay between seeing any changes in the groundwater quality outside of the landfill area. This will continue to be monitored.

The interaction between groundwater and surface water in the wetland is not fully known, however, water level monitoring indicates that positive water levels (i.e. water pressures above the surface water level) do exist beneath the wetland. The effect of groundwater on surface water in the wetland is discussed further in this report.

Chloride and Conductivity

As reported in previous annual reports, chloride and conductivity are not considered to be key leachate indicator compounds for this site due to the estuarine environment having a greater influence on the results. As such, no interpretation of the results has been carried out to determine whether any effect from the landfill is occurring. However, it was noted that conductivity and chloride in the shallow wells between the landfill and wetland (LS10, LS13, LS19 and LGS7) all showed a sudden drop in concentration during the October round. This is likely associated with the leachate pump not operating and no water was being pulled into the leachate system from the wetland area (i.e. based on the fact that the wetland area has higher conductivity levels associated with the brackish water quality than the leachate). This highlights the connectivity between the leachate interception system and wetland.

2.5 Condition 11(b) – Annual Groundwater Sampling

The consent condition requires more detailed annual groundwater sampling in the following deep groundwater wells during the October monitoring round:

- LD5, LD8, LD11, LD16, LD17 and LD20

The sampling was carried out by FH and collected as part of the routine sampling from wells LD8, LD11, LD17 and LD20. Wells LD5 and LD16 are only sampled annually, however well LD16 is bent/broken and the sampling equipment is no longer able to be lowered to obtain a sample. This well has not been able to be sampled since 2015 (water level only).

The collected samples were placed into bottles provided by the analytical laboratory before being placed into a chilly bin and transported to Hills for analysis of conductivity, calcium, potassium, alkalinity, sulphate, ammoniacal-N, iron, zinc, magnesium, sodium, chloride, BOD_5, nitrate and lead. A cation/anion balance has also been completed for each of the deep wells. Conductivity, pH and temperature were measured in the field using hand held instruments, with conductivity and pH also measured in the laboratory for confirmation of the results. The laboratory results together with historical annual sampling results from these wells dating back to 2004 have been tabulated and graphically presented as the Annual Sampling of Deep Wells Charts (Appendix D).

Well LD5 (deep well located in the Western Landfill area) has in the past shown different water chemistry to the other deep wells sampled (lower calcium, conductivity, magnesium, sodium and chloride concentrations and higher potassium, alkalinity, ammoniacal-N and BOD). The differences were expected to be associated with the separation distance from the saline environment and also impacts associated with leachate given the location within the landfill (other sampled deep wells located outside of the landfill areas). Over time and in particular since 2010, LD5 (and LD16 when it was able to be sampled) has shown a gradual change of some compounds trending back towards the other wells including a reduction in potassium, alkalinity, ammoniacal-N and BOD. The concentrations of these compounds are now similar to the other wells being analysed. Of particular note, the ammoniacal-N concentration in LD5 has reduced from a high of 339 mg/L in 2001 to 49 mg/L during the latest round and more in line with the other deep wells. This is an indication of improved water quality beneath the Western Landfill area. Other compounds such as sodium, chloride and magnesium are much lower than the other deep wells. This is an indicator of saline influences on groundwater quality in the area of well LD5 as opposed to landfill effects.

In general, the deep wells sampled (LD5, LD8, LD11, LD17 and LD20) generally showed heavy metal and ammoniacal-N (considered the key leachate indicator) concentrations within the previous range of values measured indicating relatively stable conditions (i.e. no trend either way and in a steady-state condition). While the ammoniacal-N result for LD8 (10.2 mg/L) was the highest result recorded to date for this location, it is only marginally above previously highest result (9.96 mg/L in 2006). As such, the LD8 is not considered to be of concern, however, will continue to be monitored for any changes.

The reduction of the leachate parameters in LD5 is a good sign that leachate impacts are decreasing with depth beneath the Western Landfill area, however, we are not seeing a large change in the deep wells outside of the landfill at this stage. This may take longer before we see a change.

Ammoniacal-N continues to be present at relatively steady concentrations in the deep wells indicating that leachate impacted groundwater has migrated beyond the influence of the interception drain and is present beneath the wetland area (in particular wells LD11 and LD17). There is no obvious trend apparent with relatively stable concentrations since 2001 indicating this has been occurring for a long period of time and appears to be in a steady-state. Although a change in ammoniacal-N is being observed within the leachate interception drainage system, this is yet to be observed in the downgradient wells, in particular the deep wells. Any change may take some time to be realised. The suspected source for these impacts is associated with the eastern landfill area, which is the most recent landfill area and contains the majority of the waste landfilled. An assessment of the potential risk to the nearby surface water bodies associated with the presence of these elevated concentrations in groundwater is discussed further on in the report.

2.6 Condition 12 – Surface Water Monitoring

Surface water sampling has been completed at the following locations (as shown in Figure 2, Appendix A):

- FH38 (upstream of the current and historical landfill areas within Christie Creek – note not included in the consent conditions but included in the assessment to provide further information of the surface water quality upstream of the site);
- FH39 (western end of the landfill just downstream of the convergence of Coal and Christie Creeks and prior to entering the wetland – this area is influenced during backwater effects in the wetland);
- FH40 (within the lagoon swamp (wetland), downstream of the landfill area – note during occasional high-water levels in the wetland, sample FH40 is collected in the vicinity of well LD11 as opposed to its normal location further out in the wetland); and
- EW43 (within Kaikorai Stream - this site is downstream of the confluence between Abbots Creek and Kaikorai Stream. It is located on the north-eastern boundary of Fairfield landfill).

On each occasion the samples were collected as grab samples directly into the laboratory supplied bottles using the same sampling procedures as the previous sampling rounds. Samples collected for dissolved metals were field filtered using laboratory supplied filter kits. Following collection, the samples were sent to Hills for laboratory analysis of conductivity, chloride, ammoniacal-N, dissolved iron, dissolved zinc, BOD_5, nitrate nitrogen, dissolved lead and dissolved boron. Conductivity, pH, temperature and dissolved oxygen were measured in the field using hand-held instruments.

The laboratory results together with historical annual sampling results from these wells dating back to 2001 have been tabulated and graphically presented as the Surface Water Sampling Charts (Appendix E). Applicable guideline/standards have changed over time and for completeness and to still be able to compare past results the old guideline values have been used and are present in the tables, but since 2019 the following water quality guideline values have been used to guide the assessment of surface water effects:

- Ministry for the Environment (MfE) National Policy Statement for Freshwater Management 2020 attributes (NPS-FM 2020).
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2018).

For physio-chemical parameters, the sites were categorised by their River Environment Classification code as 'Cool Dry Low-elevation' (REC; Snelder and Biggs, 2002). Sampling points FH39 and FH40 are located in the wetland. As such, wetlands are currently managed under the NPS-FM (2020), including water quality targets. A summary of the results for each of the parameters for the four sampling locations (FH38, FH39, FH40 and EW43) is as follows:

Conductivity and Chloride

As reported in previous annual reports, chloride and conductivity are not considered to be key leachate indicator compounds for this site due to the estuarine environment, but they do provide an indication when more saline conditions are present which can impact the general surface water quality. The April and October rounds showed an increase in chloride and conductivity concentrations, with the highest concentrations recorded at FH40 during the April round, however noting that the results were well within the typical range of concentrations previously recorded. The increases in chloride and conductivity levels highlight the effects of saline water intrusions in the wetland as opposed to leachate impacts (noting the leachate sampling shows a chloride concentration typically around 1,500 mg/L, which is lower than concentrations measured in the wetland (up to 10,300 mg/L).

Total Ammoniacal-Nitrogen (TAN)

Sampling location EW43 continues to show generally low TAN concentrations ranging from 0.24 mg/L to 0.38 mg/L for the 2024 monitoring period (pH corrected concentrations between 0.09 and 0.16 mg/L). This is consistent with the historical data set at this location. When compared against the NPS-FM (2020) ammonia attribute bands, the pH 8 corrected TAN concentrations were within Attribute Band B, meaning that TAN concentrations begin to impact on the 5% of most sensitive species. EW43 is collected within Kaikorai Stream upgradient to the landfill area so is representative of the water quality upstream of the estuary. Whilst representative of inputs entering the wetland, is not representative of background levels for Coal and Christy Creeks as they are from separate catchments.

Sampling locations FH38 and FH39 (located on Christie and Coal Creeks, which pass through the area of the historical landfilling) continued to show elevated TAN concentrations. FH38 is located upstream of the landfill area and FH39 is located downstream of the landfills immediately prior to entering the wetland area. TAN concentrations recorded at these two locations during the 2024 monitoring period ranged from 0.15 mg/L to 3.90 mg/L at FH38 and 0.26 mg/L to 3.2 mg/L at FH39. At FH38, TAN concentrations previously spiked in October 2022 (9 mg/L), and since then have shown considerable variability, however appear to show a general decreasing trend since then. TAN concentrations at FH39 have shown increasing concentrations for the past year increasing from 0.26 to 3.2 mg/L, but are still within the historical dataset range.

Sampling location FH40 (within the wetland area) also showed increasing concentrations over the 2024 sampling period (from 0.17 to 2.0 mg/L), but remained within the range of values previously recorded. The increase of concentrations between FH38 and FH39/FH40 indicate a source of TAN entering the surface water bodies from the Historical and Western Landfill areas.

The pH 8 corrected 2024 annual median and 95th percentile TAN concentrations at FH38, FH39 and FH40 (between 0.06 and 1.36 mg/L) were within Attribute Band C, meaning that TAN concentrations regularly start impacting on the 20% most sensitive species, resulting in reduced survival rates. These three sites were regarded as being below the national bottom limit for ammonia toxicity (NPS-FM 2020).

The results continue to show that there is some impact to neighbouring surface waterways, some of which is likely to be related to leachate seepage/migration from Fairfield Landfill (primarily the Western and Historical Landfill areas).

Temperature

Temperature continues to show seasonal variation with lower temperatures during the winter months (down to 6.2^{0}C) and higher temperatures during the summer months (up to 17.9^{0}C). Water temperature values are all generally within the typical historical range. Of note, the recorded temperature at FH38 continues to be generally recorded between 2 and 3.5 degrees different than FH39, FH40 and EW43, showing less seasonal variation than the other locations, recording temperatures typically lower during the summer and higher during the winter. This is likely as a result of the sampling location being close to where groundwater is emerging from the ground (i.e. less influence from air temperature).

pH

The pH levels at all four locations are shown to be fairly typical across sampling locations over the past ten years with some minor variations (increases and decreases). pH data has been plotted on a time trend analysis.

As described in the quarterly monitoring reports for January, April and July 2024, field measurements of pH were lower than expected (circa 1 pH unit), which appeared to be related to an equipment/calibration

error, as opposed to a true reflection of water conditions. Therefore, pH was added to the laboratory analysis from April 2024 onwards, and the lab pH results were adopted for April, July and October monitoring rounds.

FH38 previously showed a lower pH level than other locations (approximately 1 pH unit), which appeared to be attributable to upstream effects, possibly associated with an isolated area of overburden containing pyritic material, impacting on the groundwater in the area. During the current monitoring year, pH levels increased at FH38 and were not dissimilar to the other surface water monitoring locations (within 0.5 pH units). The reason for this recent change is unclear, and will continue to be monitored to assess whether this apparent change may be a longer term trend.

Comparison with the ANZG (2018) guidelines, shows that at FH38 for all 2024 sampling rounds, pH levels were recorded below the recommended range for aquatic health of pH 7.23 -7.8. This is consistent with previous years. It is noted that April and October 2024 (pH 7.1) were only marginally below the recommended range, however this may be reflective of using laboratory measured pH levels as opposed to the field measurements. The generally lower pH level at FH38 appears to be relatively isolated to this location and additional groundwater seepage entering the stream between FH38 and FH40 generally provides sufficient dilution to increase the pH to more acceptable levels before entering the more sensitive wetland/estuarine area. The impacts of the low pH however does result in dissolution of some heavy metals, which is apparent in the results below.

Of note, pH ranged by approximately 0.9 pH units at EW43, during the 2024 monitoring period. However, this variability was within the long-term pH range measured at this site and reflects the dynamics of the various ground and surface water inputs into this section of the stream.

Dissolved Metals (iron, zinc and lead)

Zinc and iron continue to show a degree of variability between sampling rounds, with the highest concentrations of iron detected at FH38. This is expected to be a function of the low pH at this location (i.e. increased solubility with decreasing pH). Iron concentrations have decreased recently at FH38, coinciding with an increase in pH levels. Iron precipitate/staining continues to be visible in the water body in the upper reaches (i.e. vicinity of FH38), but decreases with distance downstream. This is typical for this location and is likely to have been occurring for a long period of time. The highest concentration of zinc was detected at FH40 in October. The reason for this is not clear, and previously the highest concentrations of zinc (and iron) were typically detected at FH38. Nonetheless, the October zinc result at FH40 remained within the historical data set range, but was the second highest recorded at this location to date. Zinc is a common contaminant found in stormwater runoff from urban areas and the October round was completed following a period of high rainfall so may have contributed to the increased zinc concentrations recorded.

Dissolved lead continues to be measured at relatively low levels with some variability noted in the past. Concentrations ranged from below the laboratory detection limit (<0.00010 mg/L, FH40) to 0.00048 mg/L, EW43). Results were within the typical range of values previously detected at the surface water quality monitoring locations.

Comparison with the ANZG 2018 hardness adjusted trigger values shows that at FH38 dissolved zinc has exceeded the 95% level of protection criteria for the last ten years and FH39 for the last five years. FH40 exceeded the criteria in all sampling rounds this year. At EW43 generally the dissolved zinc concentrations exceed the criteria, however two out of four monitoring rounds this year were below the protection criteria. Lead was not recorded at concentrations exceeding the 95% level of protection criteria at any of the sampling locations. These results are consistent with previous sampling rounds. Without further

information it is not possible to ascertain whether this is directly linked to the landfill as there are a number of other sources for these heavy metals in the wider catchment.

BOD_5

BOD_5 was generally low across all sampling locations, at or around the limit of detection, with the exception of the July 2024 where a BOD_5 concentration of 20 mg/L was recorded at FH38. The reason for this is unclear, as other parameters did not show a similar increase at FH38, and instead generally decreased (e.g. TAN). The concentration of BOD subsequently decreased in October (4 mg/L) to more typical concentrations for this location. The cause for the July 2024 spike is unknown, however appears to have been an isolated occurrence and is therefore not a cause for concern. FH38 is also located on the upgradient end of the landfill so may have been related to an upstream source.

Nitrate Nitrogen

Nitrate-N concentrations continue to fluctuate but were within the historical dataset range. This year, the highest concentrations were observed in July at locations FH39 (1.9 mg/L) and FH40 (1.03 mg/L). The cause for the July increase at these locations is unknown. For the third year, the lowest concentration was recorded at FH38 (0.003 mg/L).

The long-term records show that there is some variability in concentrations being detected, particularly at FH39 and more recently EW43 indicating there are numerous sources of nitrate-N entering the surface water bodies.

Comparison with the NPS-FM (2020) showed that for all sites, the annual median and annual 95th percentile were within Attribute Band 'A', with the exception of annual 95th percentile value for FH39 which was within Attribute Band 'B'. This indicates that generally, nitrate-N concentrations were unlikely to have negatively affected sensitive species, but may have begun to impact on the 5% of most sensitive species, if present, at FH39.

Dissolved Oxygen

DO levels were measured between 2.25 mg/L (FH38, January 2024) and 9.46 mg/L (FH40, July 2023). The DO at all locations were within the range of historical levels and trends. In general, FH38 continues to show lower DO concentrations and more variability than the other locations. This level of variability is not unusual at FH38. FH38 is near the upper end of the site (upstream sampling location) where the low DO is suspected to be related to this point being close to where groundwater emerges from the ground. However, there are a number of other reason that low DO could be present.

Percentage DO was consistently below ANZG (2018) guideline values (81 -101%) for cool, dry low-elevation streams in all monitoring locations for all four monitoring rounds. DO outside of the ANZG (2018) guideline values may cause minor to moderate stress on a number of aquatic organisms, particularly sensitive fish and macroinvertebrates. Direct comparison with the NPS-FM (2020) is not possible due to the nature of the measurements undertaken as part of the consent monitoring compared to the NPS-FM (2020) requirements.

Dissolved Boron

Boron has been monitored since the start of 2009 at the request of ORC. Sampling locations recorded fluctuating dissolved boron levels with FH38 showing a general drop in values over the last few rounds following a period of increasing concentrations.

Previously in October 2023, boron concentrations spiked at EW43, FH39 and FH40, which corresponded to the highest, or near highest concentrations, recorded at these locations. Subsequently boron

concentrations decreased in 2024 to more typical values, and within the historical range of values, for these locations. The results continue to show variability between rounds. The boron concentrations increased and decreased in synchronicity with chloride, indicating the change is related to saline water which is naturally high in boron. This would explain the elevated boron concentrations detected and why the effect is primarily confined to FH39 and FH40.

In 2021, the ANZG (2018) default guideline value (DGV) for the 95% protection level in freshwater was updated, with the updated/current DGV being 0.940 mg/L (previously 0.340 mg/L). Comparison of the results with the updated DGV indicate that exceedances were recorded at FH40 only (April, July and October). Currently, there are no DGV for marine (saline) environments. Given the known saline effects, boron is not a good indicator for leachate impacts at this site.

3.0 Consent 93541 – To Take Groundwater

3.1 Condition 2 – Monitoring Pumped Leachate/Groundwater Volume

Refer to Consent 93540, Condition 10 for results.

4.0 Consent 93542 – Discharge to Stormwater

4.1 Condition 6 – Monitoring Silt Pond Discharge

The condition requires surface water samples to be collected from the two stormwater retention ponds ('North Pond' and 'Weighbridge Pond') as part of each of the quarterly sampling rounds to determine the suitability of the stormwater to be discharged to the nearby surface water bodies. This has been possible in the 'North Pond', but the 'Weighbridge Pond' has remained dry on every sampling round this year (last sampled July 2013).

The samples collected from the 'North Pond' were collected as grab samples in the area of the discharge point and sent to Hills for laboratory analysis of TAN, BOD_5, conductivity, total suspended solids and turbidity. In addition, conductivity and pH were measured in the field using hand held instruments. The laboratory results have been tabulated and presented in Appendix F. A summary of the results is detailed below together with comparison with the ANZG 2018 Guidelines. Reference to the NPS-FM 2020 has also been made. These guidelines are considered to be applicable given that any discharge would be to the ecologically sensitive Kaikorai Stream and the wetland.

The results for the 'North Pond' samples show a pH of between 7.8 (April 2024) and 8.7 (January 2024). The high pH recorded in January followed on from a high pH recorded in October 2023. The reason for the spike in pH over these two monitoring periods is unknown. There were no other indicator compounds at this time to suggest it was related to leachate.

Low levels of TAN are commonly detected at this location. Over the last year of monitoring, a spike in TAN was detected in April 2024 (2.2 mg/L), which was the highest concentration recorded to date at this location. This coincided with elevated conductivity (0.531 mS/cm, highest value recorded to date) and slightly elevated turbidity. However, pH was fairly typical (7.8 – lab measured) and BOD_5 was recorded below the laboratory limit of detection (<2 mg/L) in April. The reason for the elevated TAN and conductivity is unknown, however concentrations decreased in the subsequent rounds to typical levels. There was no evidence of leachate breaches/discharges from the landfill, and the April result was not indicative of a leachate seep (TAN would be expected to be significantly higher).

Other than the slightly elevated turbidity in April, turbidity and suspended solids did not show much variation this year.

On the basis of these results, no obvious signs of any leachate impacts in the stormwater collection pond (North Pond) are apparent for the 2024 monitoring period.

5.0 Consent 95008 – Discharge to Air

5.1 Condition 7 – Quarterly Monitoring of Methane Levels

Methane monitoring was undertaken at LGS1, LD5, LGS7, LGS27, LGS29, LS31, LS32, G34, G35, G36, G37 and G38 during each of the monitoring rounds undertaken in February, April, July and October 2024 using a GA5000 portable landfill gas analyser. As previously reported, LS4 was buried as part of the final capping works.

Three new monitoring wells MW1 – MW3 were installed in 2022 on the northern boundary of the landfill to monitor for any landfill gas migrating in that direction. These were installed within the footprint of the landfill (within identified waste) so are reflective of LFG in the landfill. The results for these wells from June 2022 onwards have been included.

Monitoring was carried out following the same procedures as detailed in previous reports, which included the measurement of all landfill gas compounds (methane, carbon dioxide, oxygen, hydrogen sulphide and carbon monoxide) to allow a more detailed assessment of landfill gas issues. A summary of the peak/minimum readings over a five minute period at each of the sampling locations are presented in the attached table (Appendix G).

A summary of the key observations based on the landfill gas (LFG) monitoring for this period is as follows:

- Elevated methane levels were previously recorded in LS32 (sump within the leachate drainage system; up to 55.5% in the previous year), however in 2024 levels of methane ranged from not recorded (0.0%) to 2.1%. Carbon dioxide remained elevated, ranging from not recorded to 21.2% in July 2024. Similarly, at LGS29 (also located in the leachate interception drain system) methane has previously been elevated (up to 54.3% in the previous year) however in 2024 ranged from not recorded to 0.2%. As previously reported, the presence of LFG at locations within the leachate interception drain system is not unexpected and not of any great concern. Overall, the latest recordings suggest the concentration of LFG is decreasing at these locations. Nevertheless, all access points in the interception drainage system are being considered to potentially contain LFG. This is continuing to be monitored and controls are in place when working in the area.
- Monitoring at the recently installed wells MW1 – MW3 has shown elevated levels of LFG as expected for monitoring wells within the landfill. The highest levels were recorded at MW3 in July 2024 recording methane of 65.1%, carbon dioxide of 35.0% and oxygen of 0.0%. Hydrogen sulphide was also elevated, recorded at 12 ppm, and carbon monoxide was not detected (0.0 ppm). These LFG readings are not unexpected given their location within the landfill footprint and highlight the levels of LFG still being generated.
- Methane was not detected during the past year above 0.3% at locations outside of the landfill or associated operating systems.
- Low level carbon dioxide continues to be detected in wells outside of the landfill, including sentinel wells G37 and G38, which show carbon dioxide concentrations up to 3.8 % during the last year. The detection of carbon dioxide in these wells does however appear to be stable between 0.5 – 4.2%. These low level detections are currently not considered to be of concern, but will continue to be monitored.

- Sampling location G36 at the residential property continues to show no indicators that landfill gas is present within the basement area.

5.2 Condition 3 – Odour Complaints

Condition 3 states that:

> *"Beyond the boundary of the landfill site there shall be no odour caused by discharges from the site which, in the opinion of an enforcement officer of the Otago Regional Council, is objectionable or offensive".*

OWS has stated that no complaints have been received since Fairfield Landfill closed (from receiving waste) on the 30 June 2017.

6.0 Summary of the Monitoring Results

The following is a summary of the results and site observations for the 2024 routine monitoring programme at Fairfield Landfill.

- During the periods that monitoring was undertaken when the leachate pump was operating, the measured levels within the interception drainage wells show a depression of the phreatic surface (saturation zone) along the length of the leachate interception drain. On this basis Condition 4 of Consent 93540 is considered to be met when the leachate pump is operating. However, there were two occasions (January and October) that the pump was found to be not operating when the site inspection took place, and records show the pump was not operating for the entire month of February. The operation of the leachate pump is critical in achieving compliance with this condition. On going work is being undertaken by OWS to resolve the pumping issues currently being observed. OWS has increased the frequency of site inspections to weekly moving forward to catch any pumping issues as early as possible until the system is more reliable.
- Sampling of the leachate at EPS42 and the leachate interception wells continue to show fairly typical leachate composition for a landfill of this age and deposition with no significant changes in composition noted. Some compounds are starting to show decreasing concentrations (e.g. ammoniacal-N), which is to be expected given the landfill is now closed and capped. Given the landfill no longer accepts waste, a declining trend is expected.
- Groundwater and surface water sampling in January and October showed no obvious effect from the leachate pump not operating at the time of sampling. Sampling from the interception drain well showed a decrease in leachate impacts suggesting the groundwater flow gradient was back towards the landfill at the time. This is consistent with previous occasions the pump not been operating. Whilst this might suggest the results are better than when the pump was not operating, the interception drainage system removes a large volume of leachate from the landfill which would otherwise eventually enter the wetland area so continues to be a critical system for managing leachate onsite.
- Groundwater sampling showed concentrations of key leachate indicators were generally recorded within the historical dataset range with no significant outliers. The results continue to show the presence of leachate impacts in groundwater beyond the leachate interception drain with the main source suspected to be associated with the Eastern Landfill. There are currently no obvious longer-term trends with impacts being detected in groundwater since monitoring began indicating relatively steady-state conditions. The exception being deep well LD5 (located in the Western Landfill area) which has shown improved water quality beneath the Western Landfill area over the past few years. The reduction of the leachate parameters in LD5 is a good sign that leachate

impacts are decreasing with depth beneath the Western Landfill area, however, we are not seeing a large change in the deep wells outside of the landfill at this stage.

- Surface water sampling continues to show leachate impacts within Coal and Christie Creeks from the Western and Historical Landfill areas and although there are dilution effects when it enters the wetland, impacts are still evident. TAN concentrations appear to an increasing trend over 2024 at FH39 and FH40, however concentrations remained within the range of values previously recorded at these locations.
- At FH38, FH39 and FH40, the 2024 annual median and 95th percentile TAN concentrations were in Attribute Band C of the NPS-FM (2020) meaning that TAN concentrations regularly start impacting on the 20% most sensitive species, resulting in reduced survival rates. Overall, the results continue to show that there is some impact to neighbouring surface waterways, some of which is likely to be related to leachate seepage/migration from Fairfield Landfill, although there appears to be other contributing sources.
- Sampling of the North Pond continues to show no obvious signs of any leachate impacts during the recent monitoring year. The Weighbridge Pond continues to be dry.
- Methane continues to be detected within the landfill and leachate interception drainage system. This is not unexpected given the landfill will continue to generate LFG for a number of years yet. No methane is being detected away from the landfill area or in sentinel wells/locations. Low level and intermittent carbon dioxide detections continue to be recorded in wells outside of the landfill, but are not considered to be of any concern.

The consented monitoring programme will continue as outlined in the existing resource consents until the consent renewal process has been completed under s124 continuation rights of the RMA (1991).

7.0 References

ANZECC, 2000. *Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Environment and Conservation Council (ANZECC), Agriculture and Resource Management Council of Australia and New Zealand*.

ANZG 2018. *Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia.*

MFE, 2020. *National Policy Statement for Freshwater Management 2020.*

NIWA, June 2009. A Review of Nitrate Toxicity to Freshwater Aquatic Species. Report prepared for Environment Canterbury (ECan) - Report No. R09/57, ECan June 2009

PDP, 27 February 2024, *Fairfield Landfill Quarterly Monitoring Results (1st Quarter 2024)*, Pattle Delamore Partners Limited.

PDP, 27 May 2024, *Fairfield Landfill Quarterly Monitoring Results (2nd Quarter 2024)*, Pattle Delamore Partners Limited.

PDP, 28 August 2023, Fairfield Landfill Quarterly Monitoring Results (3rd Quarter 2024), Pattle Delamore Partners Limited.

Centre for Advanced Engineering, April 2000. *Landfill Guidelines*. University of Canterbury Christchurch New Zealand.

8.0 Limitations

This report has been prepared by Pattle Delamore Partners Limited (PDP) on the basis of information provided by Otago Waste Services Limited and Fulton Hogan (not directly contracted by PDP for the work). PDP has not independently verified the provided information and has relied upon it being accurate and sufficient for use by PDP in preparing the report. PDP accepts no responsibility for errors or omissions in, or the currency or sufficiency of, the provided information.

This assessment is limited to collection and analysis of groundwater and surface water samples, and landfill gas measurements from discrete sampling locations. Interpretations of subsurface conditions, including contaminant concentrations, are not guaranteed at distance away from the specific points of sampling.

The information contained within this document applies to sampling undertaken on the dates stated in this document, or if none is stated, the date of this document. With time, the site conditions and environmental standards may change. Accordingly, the reported assessment and conclusions are not guaranteed to apply at a later date.

This report has been prepared by Pattle Delamore Partners Limited (PDP) on the specific instructions of Otago Waste Services for the limited purposes described in the document. PDP accepts no liability if the document is used for a different purpose or if it is used or relied on by any other person. Any such use or reliance will be solely at their own risk.

Yours sincerely

PATTLE DELAMORE PARTNERS LIMITED

Prepared by

Sebastian Kueng

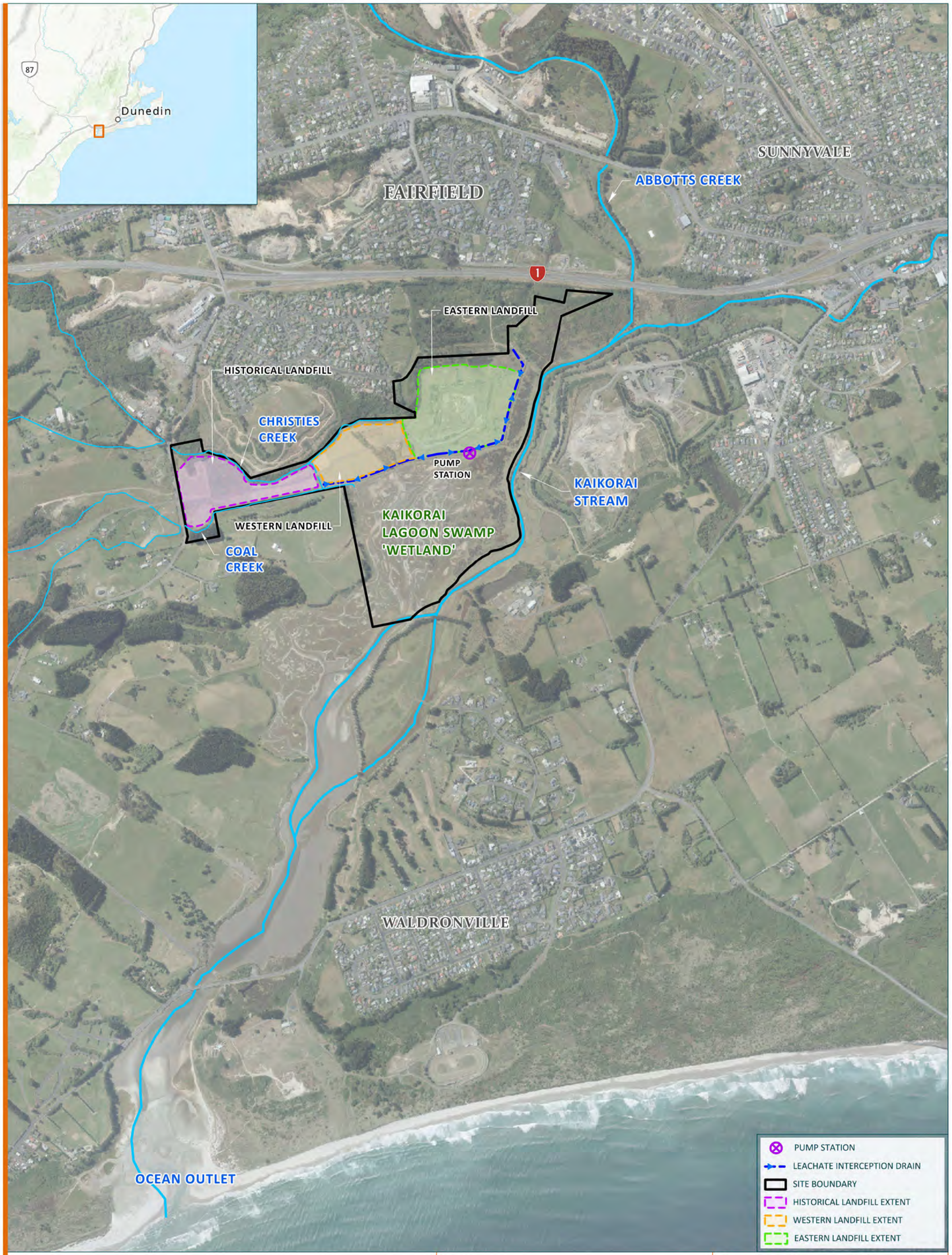
Environmental Scientist

Reviewed and Approved by

Scott Wilson

Technical Director - Contaminated Land

APPENDIX A
(Groundwater Level Monitoring)



pdp

FIGURE 1: SITE LOCATION

RECONSENSTING FOR FAIRFIELD LANDFILL

SOURCE:
1. AERIAL IMAGERY: EAGLE TECHNOLOGY, LINZ, STATSNZ, NIWA, NATURAL EARTH, © OPENSTREETMAP CONTRIBUTORS., EAGLE TECHNOLOGY, LAND INFORMATION NEW ZEALAND, EAGLE TECHNOLOGY, LAND INFORMATION NEW ZEALAND, GEBCO, COMMUNITY MAPS CONTRIBUTORS.

0 250 500
Meters
SCALE : 1:12,500 (A3)

N

REVISION: 04 | DATE: AUG 23 | BY: BR
CLIENT: WASTE MANAGEMENT (NZ) LTD.

C02187802_GIS001

DUNEDIN SOUTHERN MOTORWAY

ROBERT STREET

WALTON PARK AVENUE

ALFRED PLACE

HOGAN PLACE

EDITH STREET

ESTUARY CRESCENT

BLANC AVENUE

OLD BRIGHTON ROAD

NORTH POND (STORMWATER RETENTION)

WEIGHBRIDGE & KIOSK

WEIGHBRIDGE POND (STORMWATER RETENTION)

ADMIN BUILDING

EASTERN LANDFILL

WESTERN LANDFILL

HISTORICAL LANDFILL

WALTON PARK

CHRISTIES CREEK

COAL CREEK

KAIKORAI STREAM

KAIKORAI LAGOON SWAMP 'WETLAND'

G34 G35 (CESSPIT) G36 (BASEMENT OF HOUSE) G37 G38

MW1 MW2 MW3

LS21 LS21A LS22 LS33 LS32 (SUMP5) LD20 SP3 EW43

LS31 LS18 LS19

LS30 (SUMP4) LS4 LD17 LD16 LS14 LS3 LS29 LS15 LS12 LS27 LS13 EPS42 LS28 (SUMP3) SP5 LD11 LS2 LS26 (SUMP2) LS9 FH40 (OCT 09, JUL 11 & APR 13)

LS25 LS10 LD5 LS24 (SUMP1) LS6 LS23 LD8 LGS1 LGS7 FH39 SP1 SP2

FH37 (OCT 09 & APR 10) FH37 (JAN 10 & OCT 10) FH38 (JAN 10 & OCT 10)

FH40

N

KEY :

- PUMP STATION
- MONITORING POINT - LANDFILL GAS
- SURFACE WATER LEVEL STAGING POST
- MONITORING POINT - SURFACE WATER
- MONITORING POINT - WELLS INSIDE LANDFILL
- MONITORING POINT - MONITORING WELL OUTSIDE LANDFILL
- MONITORING POINT - LEACHATE INTERCEPTION DRAIN MONITORING WELL
- MONITORING WELL - DESTROYED
- LEACHATE INTERCEPTION DRAIN
- SITE BOUNDARY
- HISTORICAL LANDFILL EXTENT
- WESTERN LANDFILL EXTENT
- EASTERN LANDFILL EXTENT
- BUILDING
- STORMWATER RETENTION POND

pdp

0 100 200
METRES
SCALE : 1:5,000 (A3)

NO.	REVISION	DATE	BY
C	UPDATED	AUG 23	JR
B	UPDATED	MAY 23	BR
A	ISSUED	AUG 22	BR

SOURCE:
1. AERIAL IMAGERY (FLOWN 2017 - 2020) SOURCED FROM THE LINZ DATA SERVICE www.linz.govt.nz/about-linz/linz-data-service/help/using-linz-data/attributing-aerial-imagery-data AND LICENCED FOR RE-USE UNDER THE CREATIVE COMMONS ATTRIBUTION 4.0 INTERNATIONAL LICENCE.
2. CADASTRAL/TOPOGRAPHICAL INFORMATION AND INSET DERIVED FROM LINZ DATA.
3. ALL DATA DERIVED FROM CADASTRAL DRAWINGS (MAY NOT BE SPATIALLY ACCURATE).

CLIENT
WASTE MANAGEMENT (NZ) LTD.

FIGURE
FIGURE 2: SITE LAYOUT AND CURRENT MONITORING LOCATIONS

PROJECT
FAIRFIELD LANDFILL RECONSENTING

C2187800_FairField_LandFill.aprx - C02187800_G0001

SITE

HOGAN PLACE

BLANC AVENUE

EDITH STREET

VERTICAL RISER SECTION FOR HIGH FLOW DISCHARGE

NORTH POND (STORMWATER RETENTION)

SPILLWAY SECTION

EXTENT OF LANDFILL

LS33

LS32 (SUMP5)

LS31

EASTERN LANDFILL

LS30 (SUMP4)

LGS29

LS28 (SUMP3)

EPS42

DISCHARGE TO DCC WASTE WATER TREATMENT PLANT

LGS27

LS26 (SUMP2)

WEIGHBRIDGE & KIOSK

WEIGHBRIDGE POND (STORMWATER RETENTION)

ADMIN BUILDING

VERTICAL RISER SECTION

RETENTION POND OUTLET

WESTERN LANDFILL

LS25

LS24 (SUMP1)

LS23

CHRISTIES CREEK

COAL CREEK

KAIKORAI LAGOON SWAMP 'WETLAND'

KAIKORAI STREAM

N

KEY :

- PUMP STATION
- MONITORING WELL AT END OF LATERALS
- MONITORING SUMP (RECIEVING DISCHARGE FROM LATERALS)
- LEACHATE INTERCEPTION DRAIN
- LEACHATE DISCHARGE LINE FROM SUMPS TO PUMP STATION
- STORMWATER DRAINAGE
- BUILDING
- STORMWATER RETENTION POND
- SITE BOUNDARY
- WESTERN LANDFILL EXTENT
- EASTERN LANDFILL EXTENT

0 50 100
METRES
SCALE : 1:3,000 (A3)

NO.	REVISION	DATE	BY
D	UPDATED	FEB 24	JR
C	UPDATED	AUG 23	JR
B	UPDATED	MAY 23	BR
A	ISSUED	AUG 22	BR

SOURCE:
1. AERIAL IMAGERY (FLOWN 2017 - 2020) SOURCED FROM THE LINZ DATA SERVICE www.linz.govt.nz/about-linz/linz-data-service/help/using-linz-data/attributing-aerial-imagery-data AND LICENCED FOR RE-USE UNDER THE CREATIVE COMMONS ATTRIBUTION 4.0 INTERNATIONAL LICENCE.
2. CADASTRAL/TOPOGRAPHICAL INFORMATION AND INSET DERIVED FROM LINZ DATA.
3. ALL DATA DERIVED FROM CADASTRAL DRAWINGS (MAY NOT BE SPATIALLY ACCURATE)

CLIENT
WASTE MANAGEMENT NZ LTD

FIGURE
FIGURE 3: LEACHATE INTERCEPTION DRAIN AND DRAINAGE LAYOUT

PROJECT
FAIRFIELD LANDFILL RECONSENTING

C02187802_Landfill_Figures.aprx - C02187800_GIS002

Figure 4: Groundwater Level Chart
(Wells Within the Landfill)

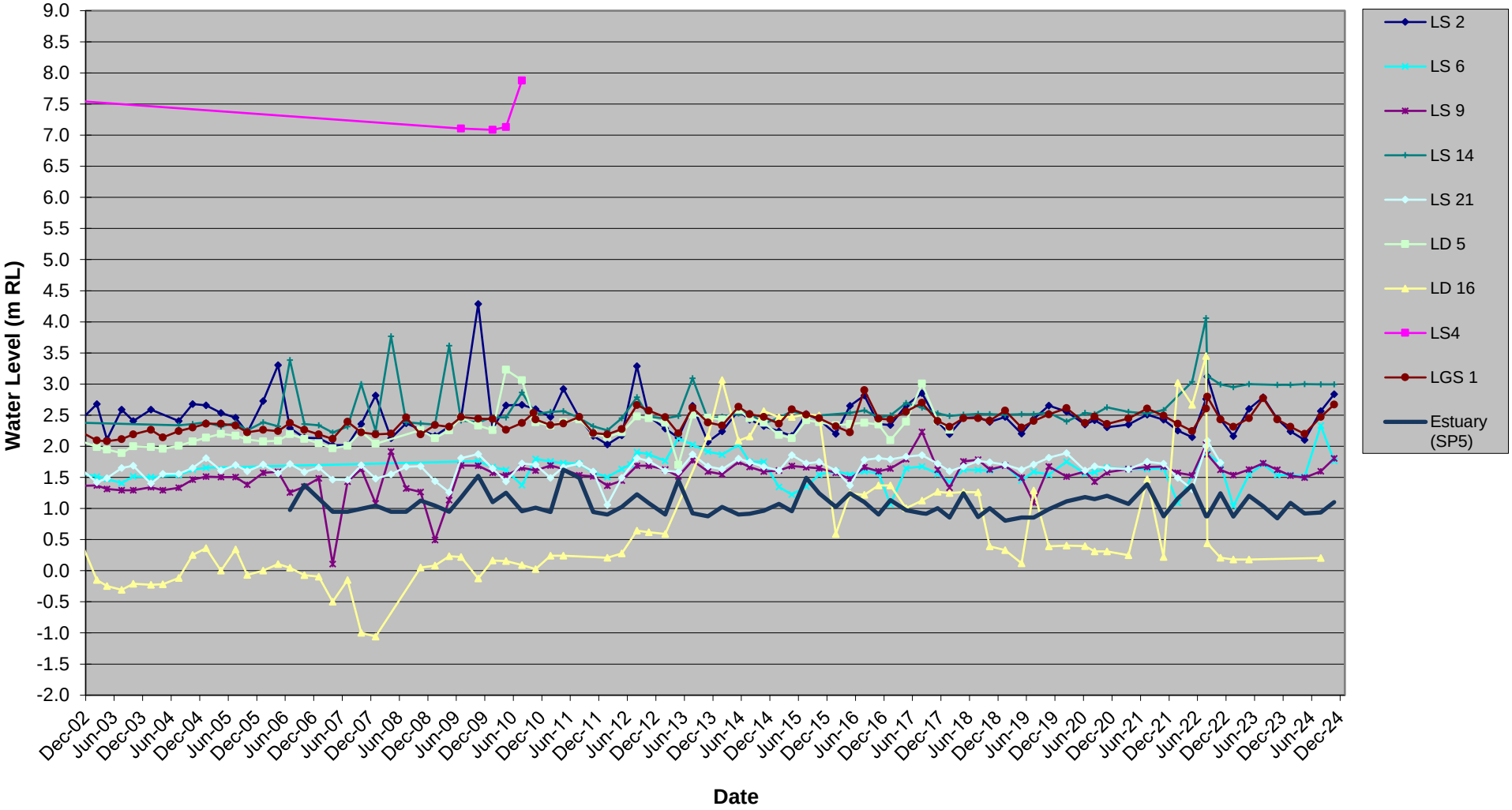


Figure 4a: Groundwater Level Chart
(Wells Within the Landfill)

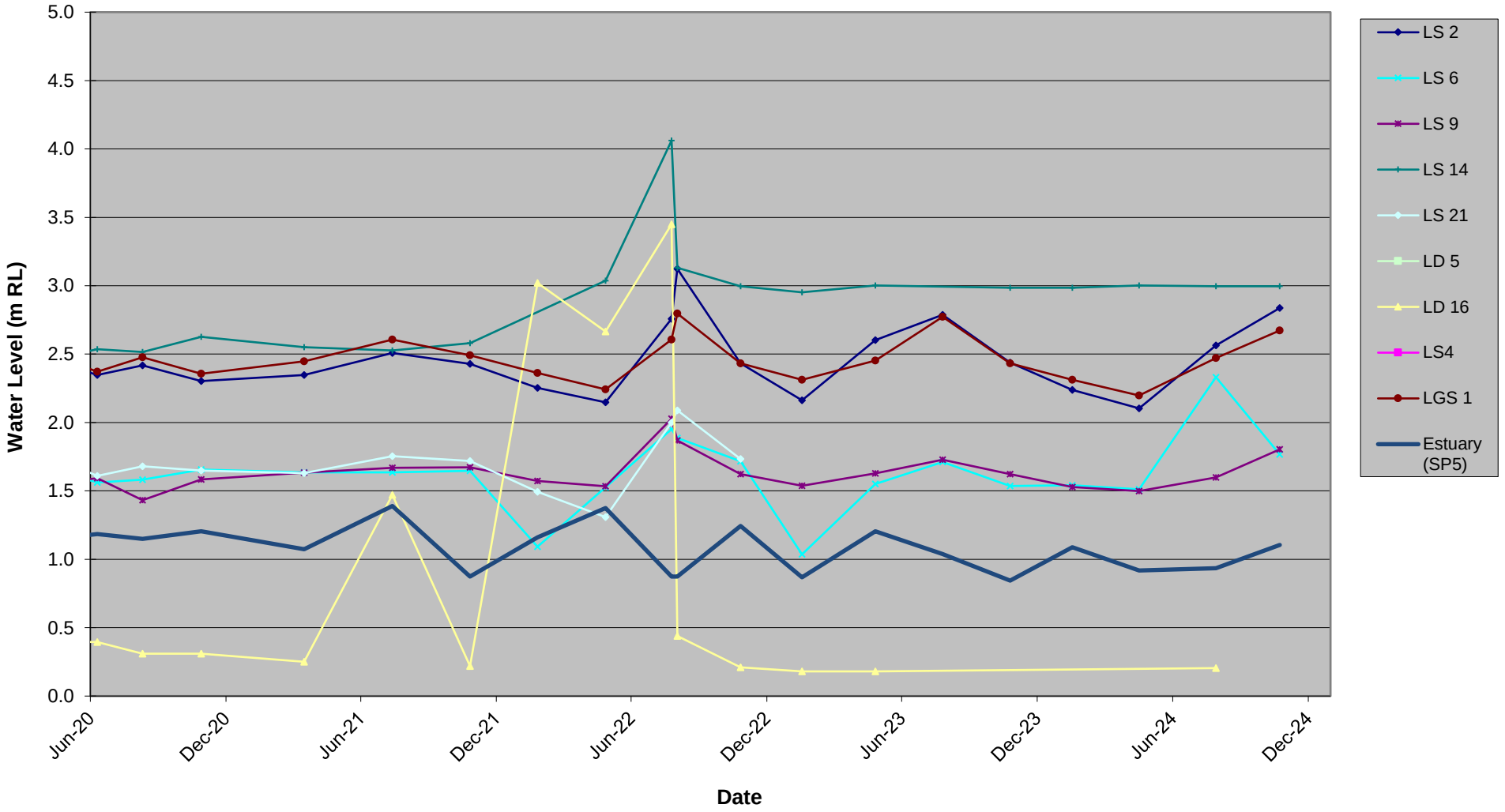


Figure 5: Groundwater Level Chart
(Wells Outside the Landfill)

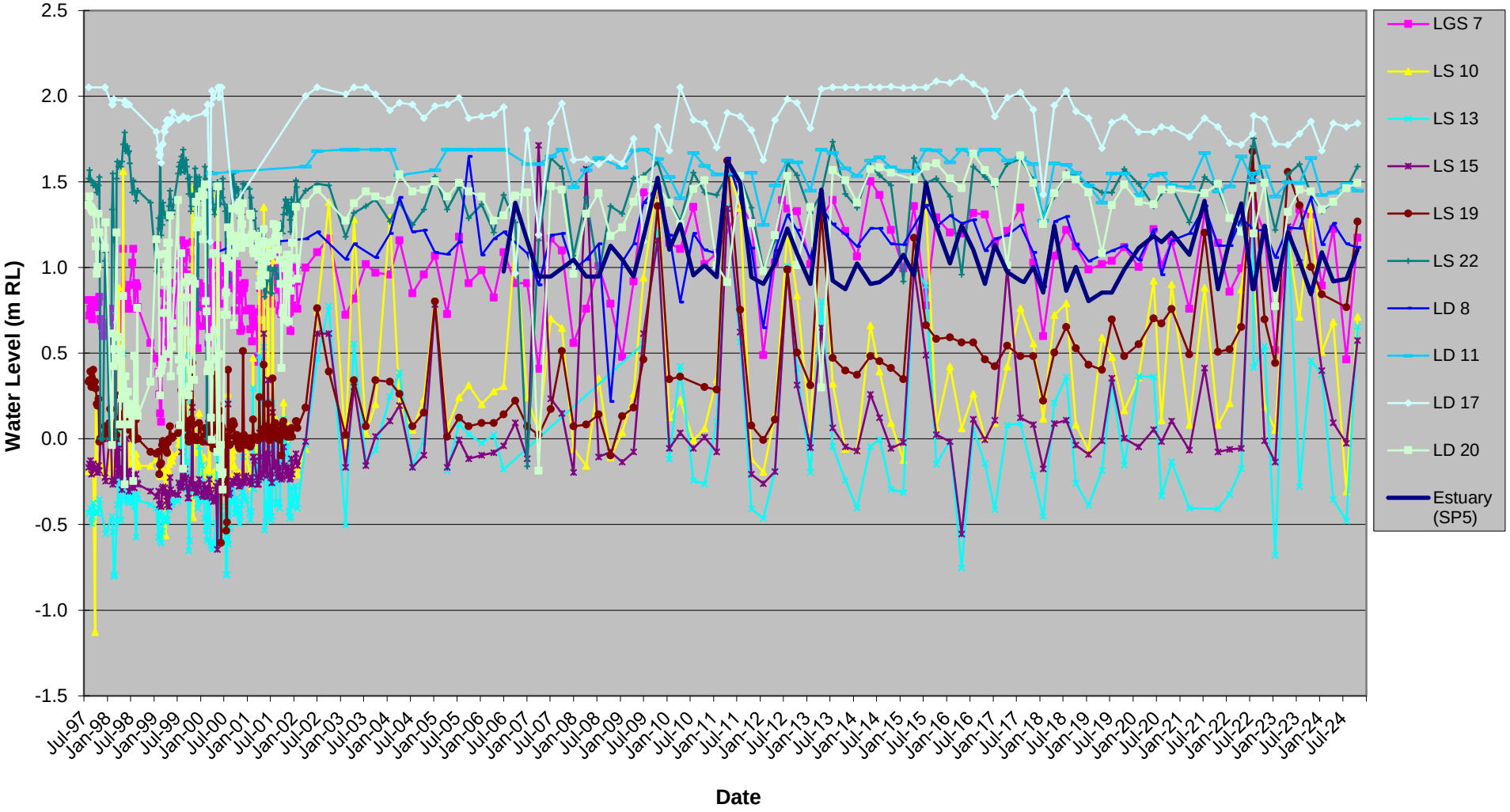


Figure 5a: Groundwater Level Chart
(Wells Outside the Landfill)

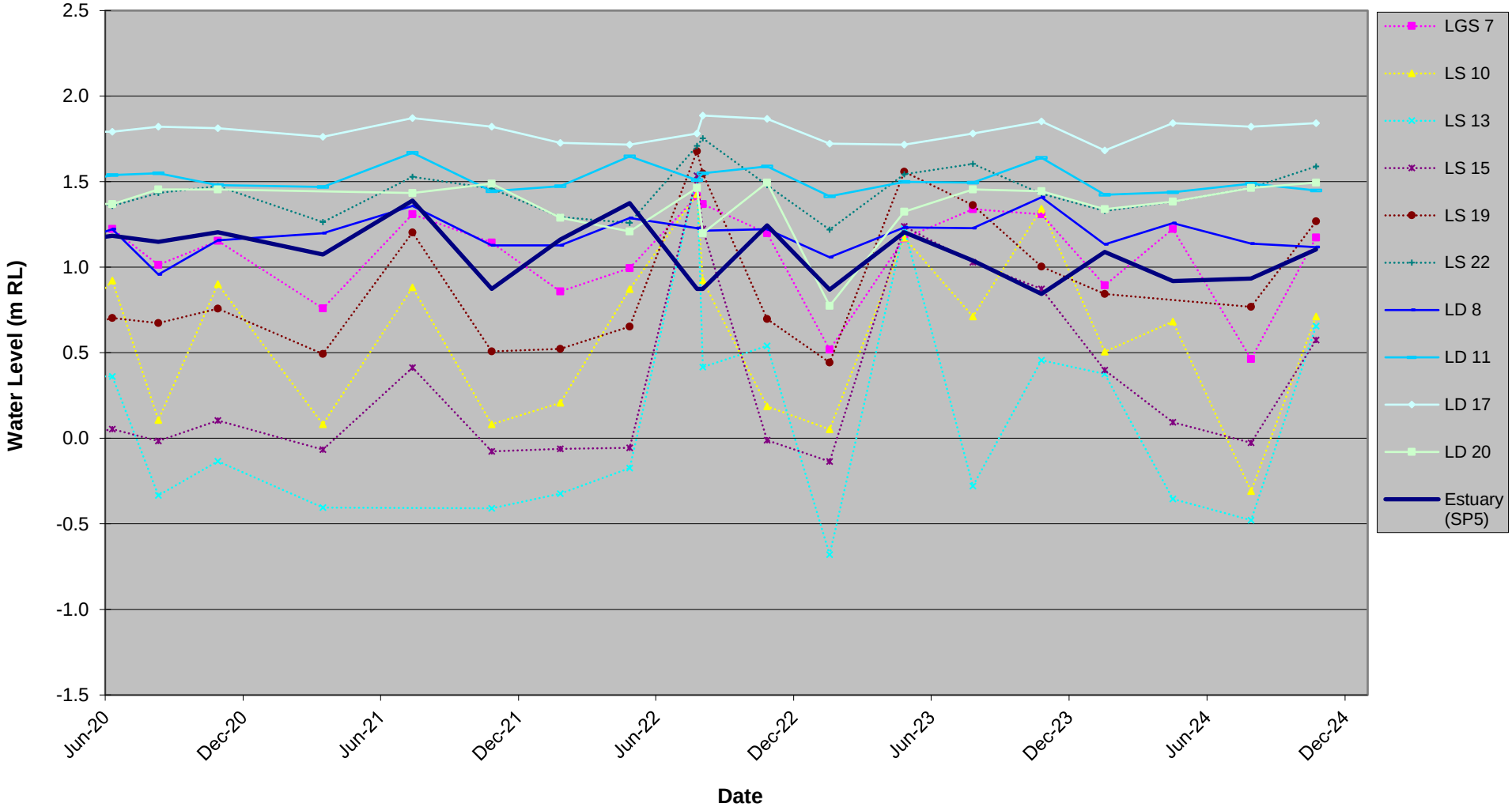


Figure 6: Groundwater Level Chart
(Leachate Interception Drain Wells)

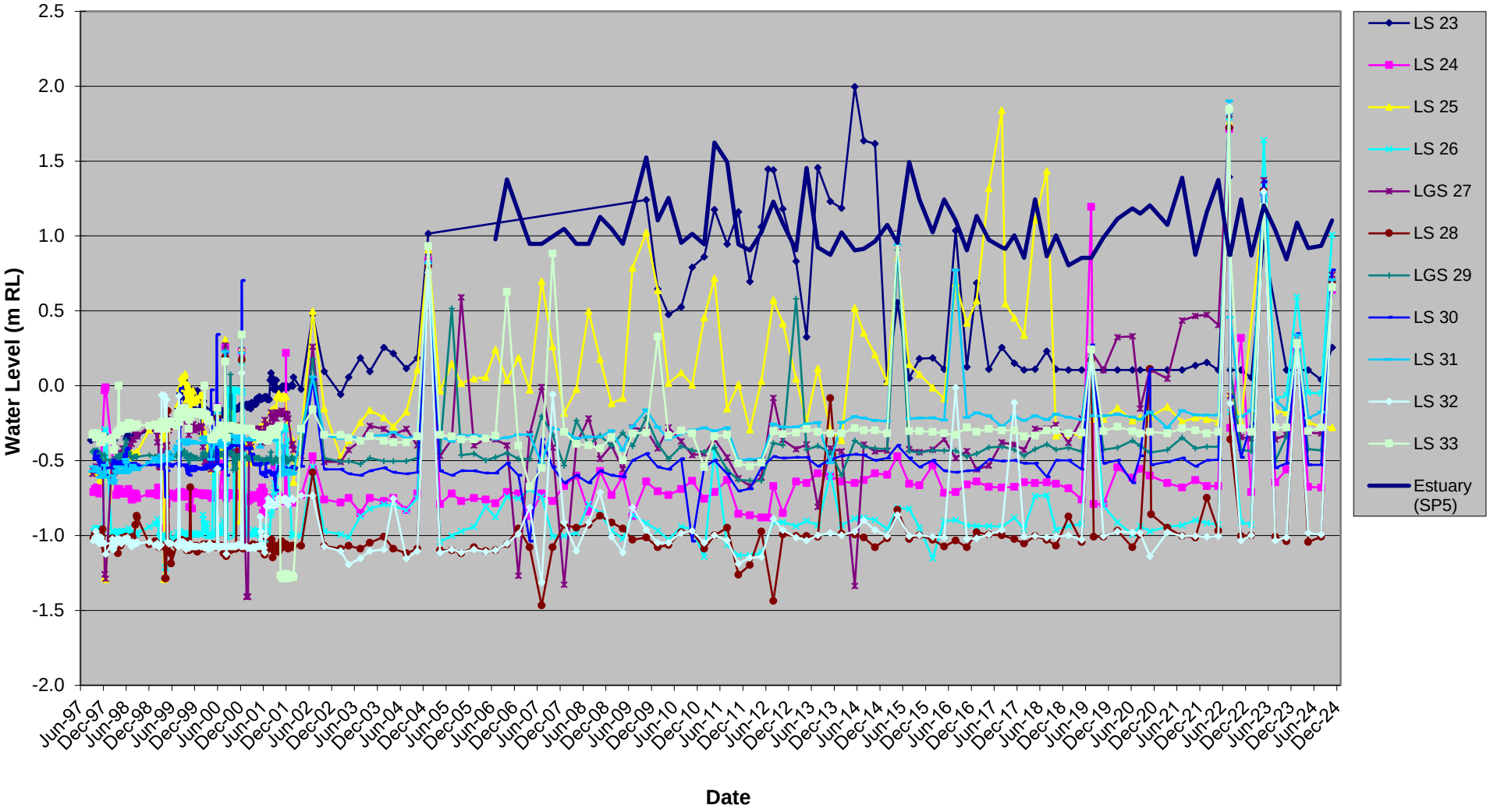
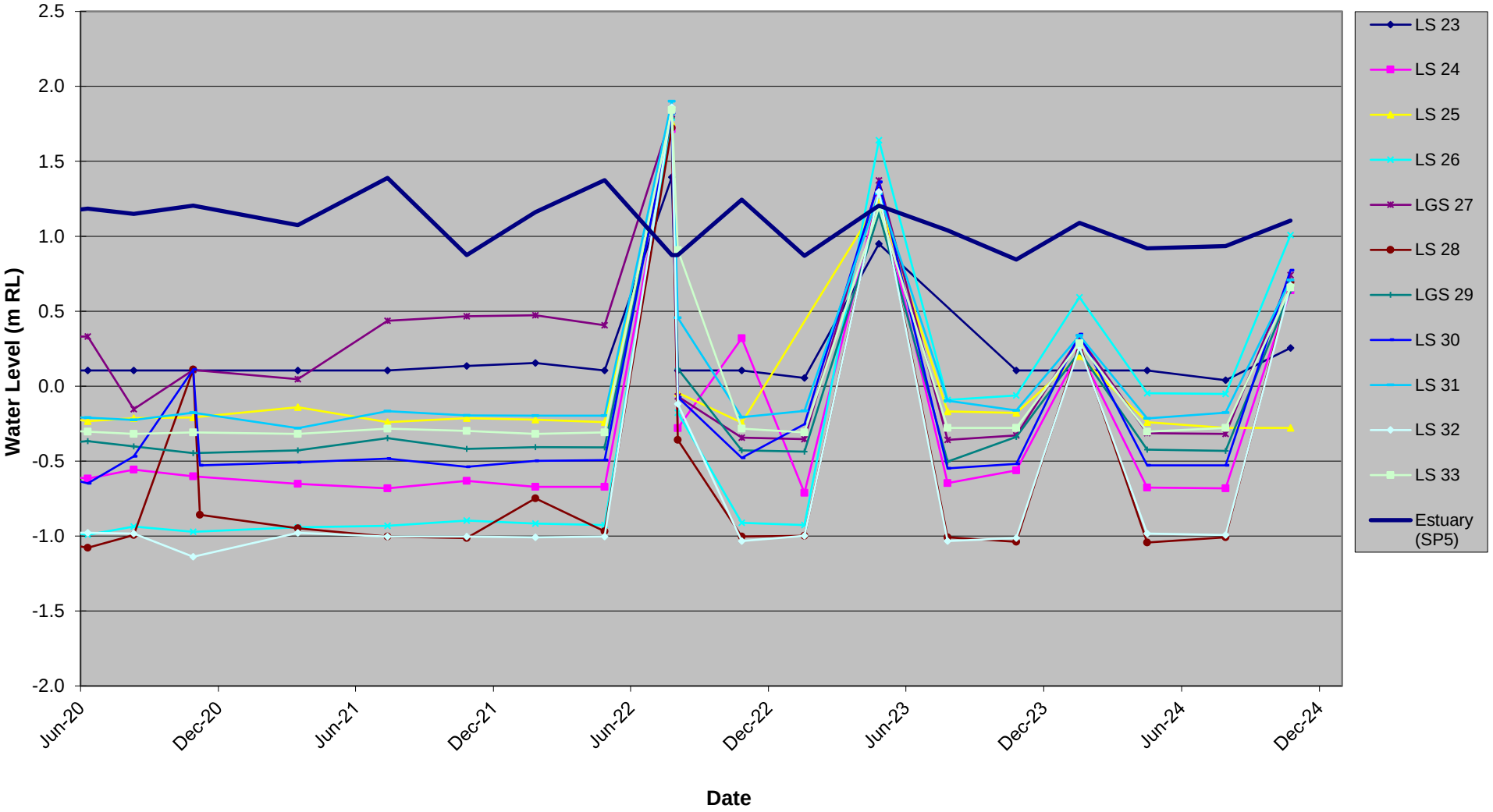


Figure 6a: Groundwater Level Chart
(Leachate Interception Drain Wells)



APPENDIX B
(Leachate Monitoring)

Table 1: Summary of Leachate Discharge from Site for 2024 (m^3/hr)

Date	Corresponding Month of data	Time	Total Hours Since Last Reading (hr)	Pump Hours Since Last Reading (hr)	Discharge Total Reading (m^3)	Average Discharge Flow Rate (m^3/hr)	Discharge Since Last Reading (m^3)	Average Discharge from the Interception Drain to the Pumping Chamber for that period (m^3/hr)	Estuary Level
01 Dec 2023	Nov-23	11:00	719	118	156099	11	1246	1.7	Very low
03 Jan 2024	Dec-24	09:20	790	74	156943	11	845	1.1	Very low
07 Feb 2024	Jan-24	09:10	840	104	158291	13	1348	1.6	High
01 Mar 2024	Feb-24	09:00	552	0	158304	0	13	0.0	Medium
02 Apr 2024	Mar-24	14:30	773	79	159797	19	1493	1.9	Low Level
06 May 2024	Apr-24	11:00	813	45	160711	20	914	1.1	Medium
05 Jun 2024	May-24	09:00	718	39	161539	21	827	1.2	Low Level
02 Jul 2024	Jun-24	11:00	650	74	163117	21	1578	2.4	Low Level
06 Aug 2024	Jul-24	09:15	838	150	166188	20	3071	3.7	Low Level
03 Sep 2024	Aug-24	14:30	677	143	168448	16	2260	3.3	Low Level
02 Oct 2024	Sep-24	11:00	693	131	170270	14	1822	2.6	Low Level
04 Nov 2024	Oct-24	12:00	793	406	176941	16	6671	8.4	Low Level
			Total	**1363**			**22088**	**2.4**	**-**

Data provided by Otago Waste Services

Table 2: Summary of Monthly Average Discharge from the Interception Drain since 2003 (m^3/hr)

Month	Monthly Average for all years	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
January	2.6		2.1	8.5	2.7	3.1	2.2	1.9	1.9	3.0	2.1	3.6	2.8	2.5	2.3	3.0	2.3	2.1	3.0	2.3	1.3	1.2	1.6
February	2.1		2.0		3.2	2.4	2.0	2.9	1.8	4.4	3.0	1.4	2.2	1.2	2.3	2.4	1.2	1.9	4.1	1.8	1.3	1.2	0.0
March	2.4		1.6	4.3	2.2	1.5	2.5	-	1.8	3.9	4.7	3.1	1.7	3.1	2.2	2.0	2.6	1.4	2.8	1.5	1.0	1.8	1.9
April	2.9		1.8	6.4	8.0	1.8	2.0	3.9	1.7	3.8	3.3	2.6	7.9	1.8	1.8	3.1	2.6	1.5	2.0	1.4	1.5	1.4	1.1
May	3.1		1.7	2.5	1.4	1.5	2.9	2.8	4.3	6.4	2.5	6.1	7.4	2.9	4.0	2.7	4.1	2.6	1.7	1.6	1.2	2.7	1.2
June	4.6		1.8	6.4	3.1	1.9	3.7	7.7	8.3	3.9	4.7	12.4	5.2	9.7	3.9	3.8	4.5	2.6	2.7	2.9	2.0	3.4	2.4
July	4.4	4.1	2.0	2.8	3.5	3.2	4.6	5.6	5.6	3.1	3.8	6.6	3.8	5.5	3.8	7.7	3.5	2.8	2.7	3.7	8.9	5.4	3.7
August	4.2	2.9	2.0	4.1	2.4	7.2	6.7	4.2	4.6	4.0	8.1	4.0	3.6	4.0	5.3	4.9	3.3	3.6	2.2	2.7	5.0	4.0	3.3
September	3.7	0.7	6.0	2.7	2.4	3.4	7.8	3.1	6.1	2.9	4.4	1.1	4.3	5.2	3.7	5.2	3.0	2.7	2.1	2.5	2.5	2.9	2.6
October	3.4	3.9	5.0	1.9	1.6	4.5	4.3	2.7	3.5	3.5	2.4	4.9	3.2	3.8	2.9	2.8	2.2	4.5	1.8	2.3	2.2	2.3	8.4
November	2.8	1.7	2.4	2.8	2.3	-	3.0	2.4	2.5	3.5	4.2	2.6	3.0	3.2	3.8	2.3	4.3	3.7	1.6	1.5	1.6	1.7	
December	2.4	2.3	6.3	3.1	1.1	3.2	2.4	2.0	2.4	2.7	1.4	2.6	3.1	2.8	3.1	1.2	2.9	3.0	1.5	1.5	1.3	1.1	

Table 3: Summary of Annual Discharge from the Interception Drain since 2003 (m^3)

Annual Discharge (November - October)	2003*	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Average
	8,618	21,915	35,550	26,426	23,525	33,441	32,927	32,175	31,982	32,632	37,433	34,605	34,064	27,874	32,799	25,603	24,470	22,924	19,415	21,258	21,403	22,088	29,725

* Only a part year

Data provided by Otago Waste Services

Table 4: EPS42 PUMP STATION CHEMICAL ANALYSIS - LEACHATE RESULTS

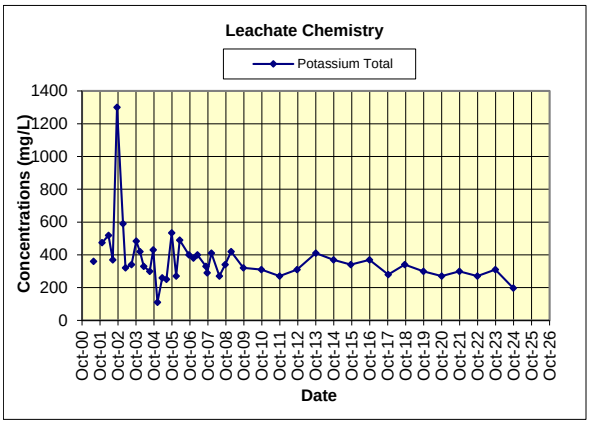
Parameter	Date	21/06/2001	13/09/2001	13/12/2001	24/04/2002	15/07/2002	9/10/2002	11/02/2003	3/04/2003	30/07/2003	6/11/2003	22/01/2004	7/04/2004	6/08/2004	15/10/2004	12/01/2005	18/04/2005	11/07/2005	25/10/2005	24/01/2006	6/04/2006
Bicarbonate	mg/L	3300	3900	710	3600	3450	3300	3700	3100	3700	3500	3200	3100	3500	3500	330	3700	3500	3500	3500	3500
BOD5	mg/L	22	210	52	190	240	150	44	45	63	120	60	38	46	64	17	78	170	170	68	53
Anion Sum	meq/L	-	-	89.98	137.48	91.72	134.65	145.31	156.73	162.13	136.21	145.64	148.51	129.46	123.26	31.96	112.09	116.84	129.82	118.38	131.93
Cation Sum	meq/L	-	-	99.6	123.33	80.13	133.78	127.41	132.84	129.93	137.23	126.2	132.3	101.16	60.96	39.64	97.61	78.95	87.872	101.79	121.31
Cation/ Anion Ratio	-	-	-	-	0.897	0.87	0.994	0.877	0.848	0.8	1.01	0.87	0.89	0.78	0.495	1.24	0.871	0.68	0.68	0.86	0.92
Chloride	mg/L	2400	-	2540	2610	1130	2670	2800	3740	3340	2590	3060	3220	2370	2150	725	1690	1960	2410	2010	2510
COD	mg/L	420	500	390	400	330	420	480	1900	470	450	450	440	450	480	200	500	520	450	530	500
Conductivity	mS/cm	12.0	10.0	10.0	10.0	7.0	10.0	12.0	14.0	12.0	11.0	11.0	11.0	9.6	8.4	2.6	2.7	10.0	11.0	11.0	12.0
pH	pH units	7.4	7.14	7.08	7.09	6.95	7.01	7.01	7.09	7.15	7.14	7.04	7.16	7.29	7.08	7.16	7.21	7.12	7.13	7.09	7.19
Sulphate	mg/L	400	317	311	255	147	238	262	377	339	262	320	320	244	248	288	175	194	204	201	174
Calcium Total	mg/L	220	180	19	179	170	170	110	150	160	175	170	120	87	80	110	170	100	174	110	160
Iron Total	mg/L	230	2.6	14	14.2	12	160	15	8.2	16	11.3	7.7	12	11	12	11	11	14	9.8	17	10
Lead Total	mg/L	-	0.08	0.07	0.004	0.04	0.05	0.0052	0.05	0.05	0.002	0.0015	0.06	0.0018	0.06	0.05	0.003	0.0021	0.0019	0.0025	0.001
Magnesium Total	mg/L	230	200	20	225	120	180	240	210	240	234	230	220	170	210	76	170	130	207	130	190
Potassium Total	mg/L	360	-	474	519	370	1300	590	320	340	484	420	330	300	430	110	260	250	534	270	490
Sodium Total	mg/L	1600	1100	1500	1430	810	1200	1560	1900	1700	1700	1600	1900	1200	180	390	1100	850	660	1300	1500
Zinc Total	mg/L	0.27	0.06	0.18	0.11	0.15	0.05	0.06	0.14	0.07	0.06	0.04	0.03	0.08	0.04	0.12	0.07	0.05	0.042	<0.03	0.06
Amoniacal nitrogen	mg/L	270	310	316	329	275	284	314	281	318	313	302	280	311	338	128	341	326	328	317	325
Nitrate Nitrogen	mg/L	1.6	0.288	1.26	0.344	0.057	1.8	0.609	0.824	1.28	2.33	2.17	1.19	1.19	0.092	0.505	0.079	0.081	0.377	0.11	0.066

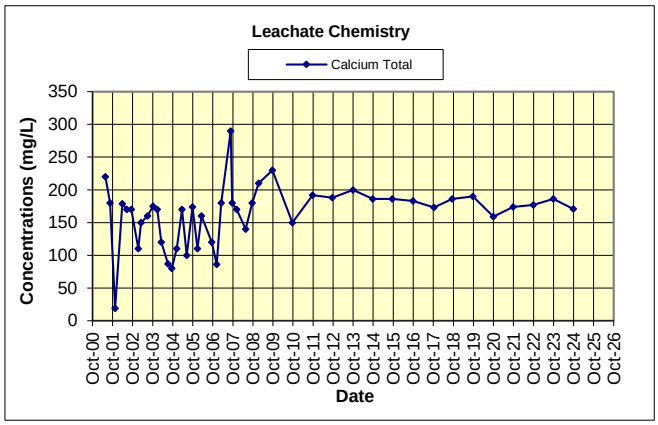
Parameter	Date	12/10/2006	11/01/2007	3/04/2007	20/09/2007	17/10/2007	10/01/2008	20/06/2008	15/10/2008	12/02/2009	20/10/2009	21/10/2010	25/10/2011	16/10/2012	30/10/2013	23/10/2014	12/10/2015	27/10/2016	10/11/2017	9/10/2018	23/10/2019
Bicarbonate	mg/L	3400	3300	3400	3300	2600	3400	3300	3200	3200	3200	3300	2900	3000	3600	3300	3100	3200	2900	2800	2500
BOD5	mg/L	130	120	50	46	58	61	160	120	30	23	500	13	13	16	15	16	14	14	13	8
Anion Sum	meq/L	116.6	114.1	131.01	110	81.58	115.68	108.14	100.71	135.2	94.45	96.13	83	85	98	105	94	100	92	90	73
Cation Sum	meq/L	115.3	108.3	135.63	124.31	75.28	118.36	97.91	88.87	125.7	94.92	86.93	83	87	83	102	96	105	82	91	79
Cation/ Anion Ratio	-	0.99	0.95	1.04	1.13	0.92	1.02	0.91	0.88	0.9	1.0	0.9	1.0	1.0	0.8	1.0	1.0	1.1	0.9	1.0	1.1
Chloride	mg/L	2010	1960	2540	1830	1150	1970	1800	1570	2760	1370	1370	1150	1160	1260	1730	1430	1600	1470	1470	1030
COD	mg/L	480	410	480	390	270	430	460	420	520	380	350	300	350	300	400	390	460	380	360	290
Conductivity	mS/cm	1.1	10.0	12.0	1.0	7.0	11.0	9.9	9.4	12	8.8	8.7	7.45	8.01	8.28	9.53	8.81	9.5	9.23	8.45	6.92
pH	pH units	7.28	7.23	7.21	7.08	6.96	7.21	7.23	7.18	7.11	7.11	7.17	7.1	7.4	7.5	7.3	7.4	7.2	7.3	7.3	7.08
Sulphate	mg/L	193	218	166	198	302	200	150	180	220	150	149	115	155	160	100	116	120	143	134	106
Calcium Total	mg/L	120	86	180	290	180	170	140	180	210	230	150	192	188	200	186	186	183	173	186	190
Copper Total	%	<0.03	<0.03	0.04	<0.03	<0.03	<0.03	<0.03	0.0082						0.0043						
Iron Total	mg/L	9.5	12	24	7.5	19	6.5	14	11	4.5	25	5.8	13	10.3	6.9	7	12.5	9.6	4	9.1	4.6
Lead Total	mg/L	0.0011	0.002	0.0017	0.0018	0.1	0.04	0.0031	0.0029	0.0012	0.0027	0.003	0.0027	0.001	0.0027	0.00098	0.00091	0.0011	0.00076	0.00056	< 0.00053
Magnesium Total	mg/L	180	170	220	340	120	200	160	160	270	170	150	142	145	158	158	155	156	126	156	134
Potassium Total	mg/L	400	380	400	330	290	410	270	340	420	320	310	270	310	410	370	340	370	280	340	300
Sodium Total	mg/L	1400	1100	1700	1200	720	1400	1100	860	1400	910	930	830	900	1010	1060	1010	1220	920	1020	750
Zinc Total	mg/L	0.05	0.06	0.21	0.04	0.12	0.05	0.07	0.063	0.1	0.16	0.058	0.21	0.075	0.047	0.054	0.031	0.026	0.076	0.33	0.119
Amoniacal nitrogen	mg/L	320	290	323	292	233	303	312	297	296	285	258	260	260	220	330	280	290	250	250	210
Nitrate Nitrogen	mg/L	0.472	0.056	0.53	0.46	1.43	0.507	0.439	0.93	1.03	2.08	0.296	0.35	0.44	0.24	0.09	1.03	0.71	2	3.6	1.94

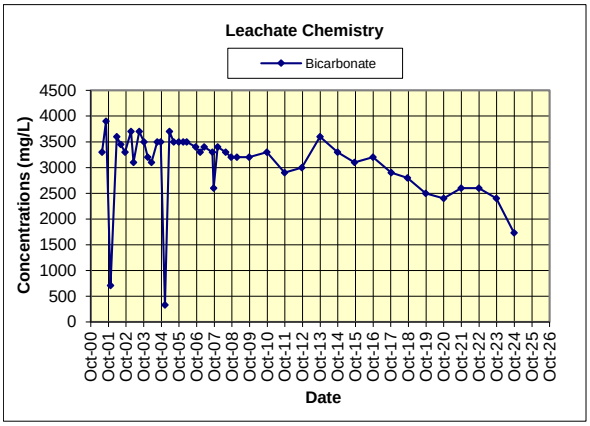
Parameter	Date	29/10/2020	26/10/2021	27/10/2022	26/10/2023	23/10/2024
Bicarbonate	mg/L	2400	2600	2600	2400	1730
BOD5	mg/L	10	8	10	9	6
Anion Sum	meq/L	89	87	86	84	41
Cation Sum	meq/L	94	89	89	87	42
Cation/ Anion Ratio	-	1.1	1.0	1.0	1.0	1.0
Chloride	mg/L	1610	1460	1420	1450	310
COD	mg/L	450	360	330	270	154
Conductivity	mS/cm	8.67	8.12	8.01	7.85	3.77
pH	pH units	7.8	7.1	7.3	7.2	7.2
Sulphate	mg/L	159	112	119	137	161
Calcium Total	mg/L	159	174	177	186	171
Iron Total	mg/L	10.2	5.7	5.4	3.8	7.1
Lead Total	mg/L	0.0027	0.00067	< 0.00053	< 0.00053	0.0024
Magnesium Total	mg/L	153	146	135	152	73
Potassium Total	mg/L	270	300	270	310	198
Sodium Total	mg/L	1060	1040	900	970	360
Zinc Total	mg/L	0.23	0.095	0.063	0.084	0.27
Amoniacal nitrogen	mg/L	200	194	200	178	112
Nitrate Nitrogen	mg/L	4.7	6	9.6	5.3	3.5

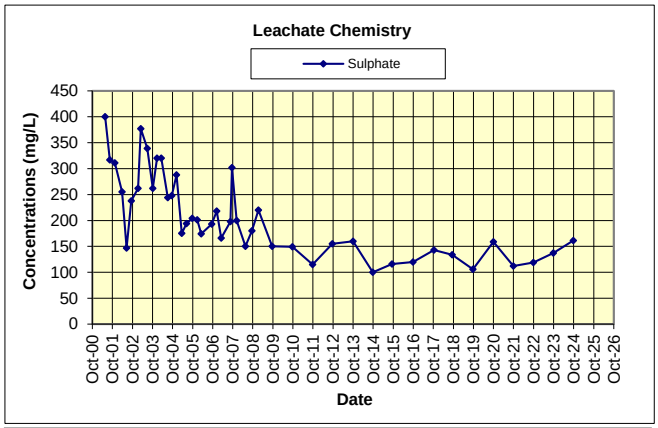
Leachate Chemistry Charts

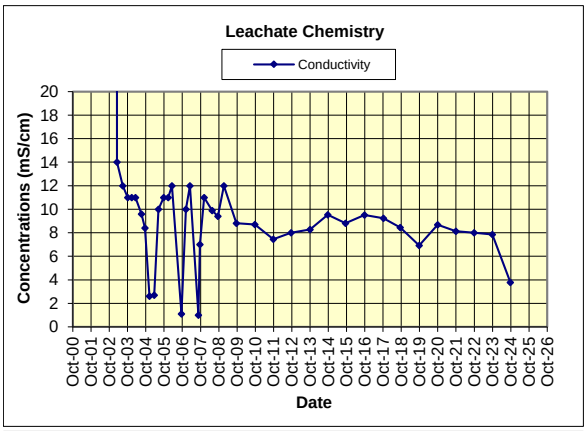
(Fairfield Landfill)

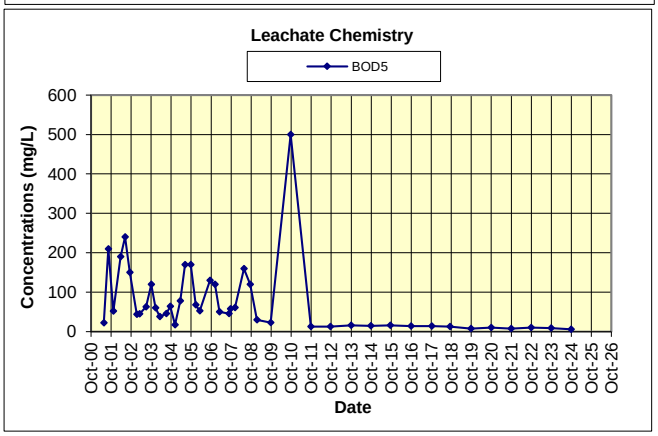


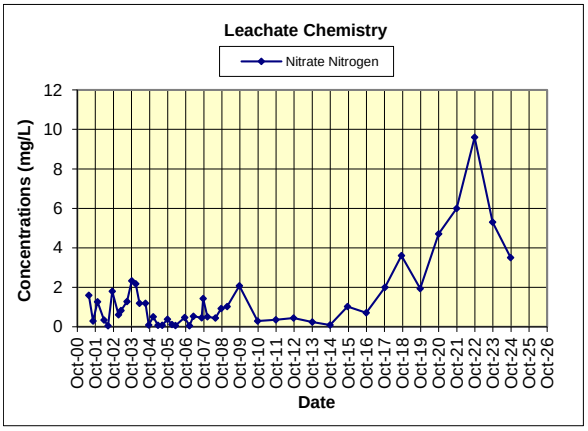


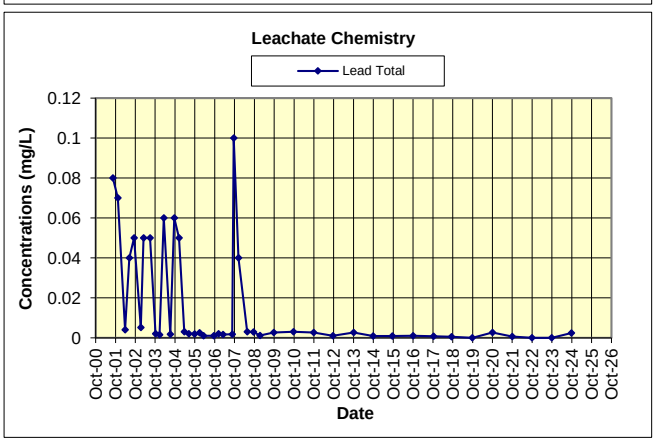






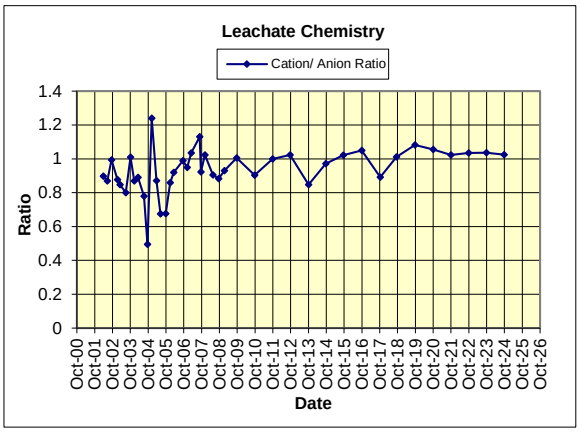


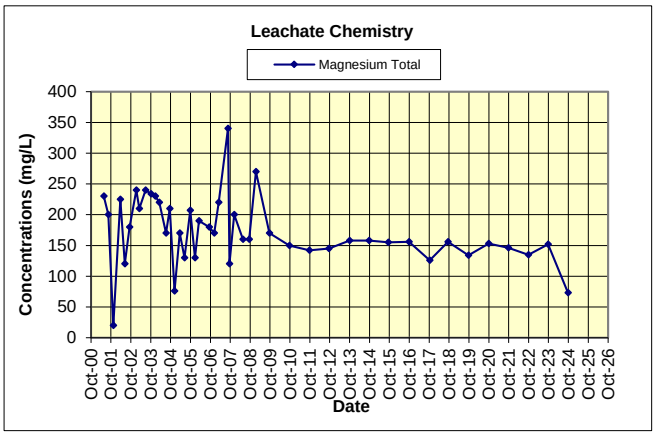


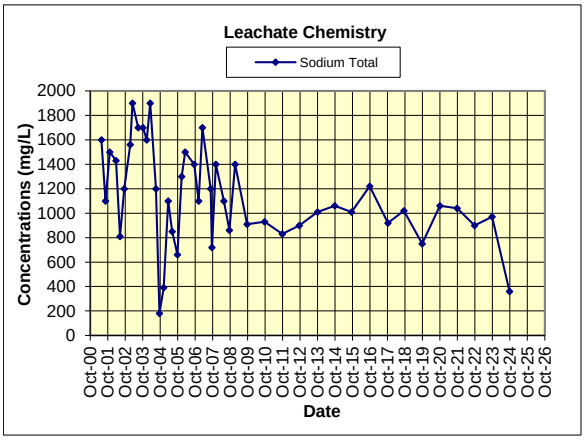


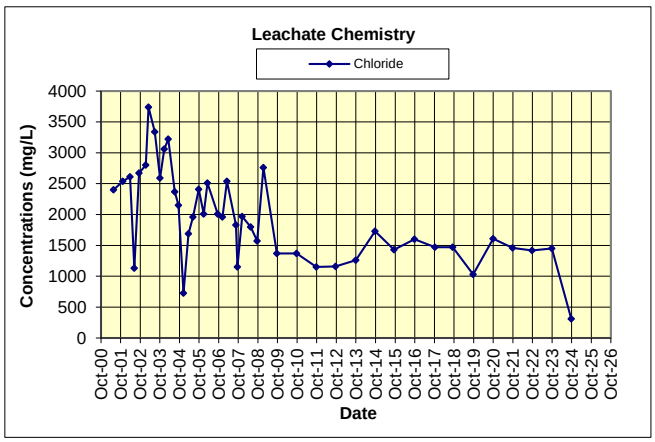
Leachate Chemistry Charts

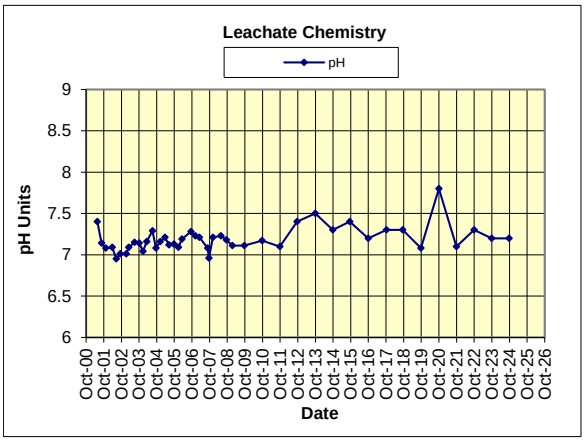
(Fairfield Landfill)

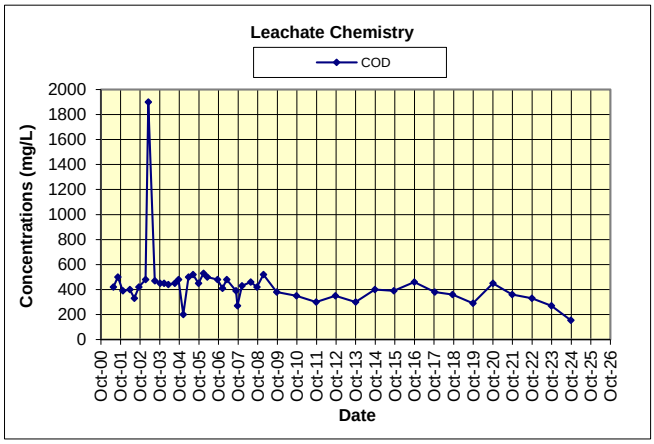


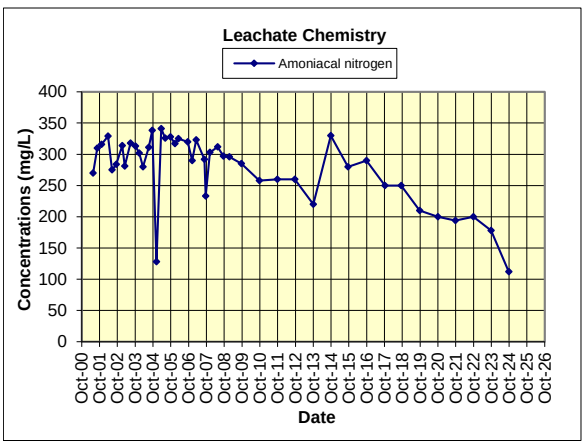


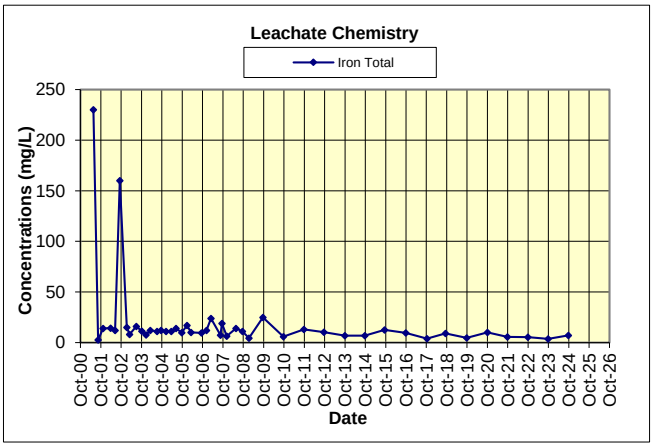






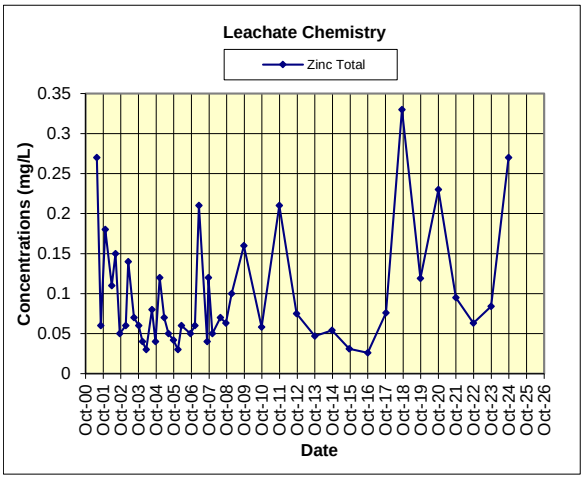




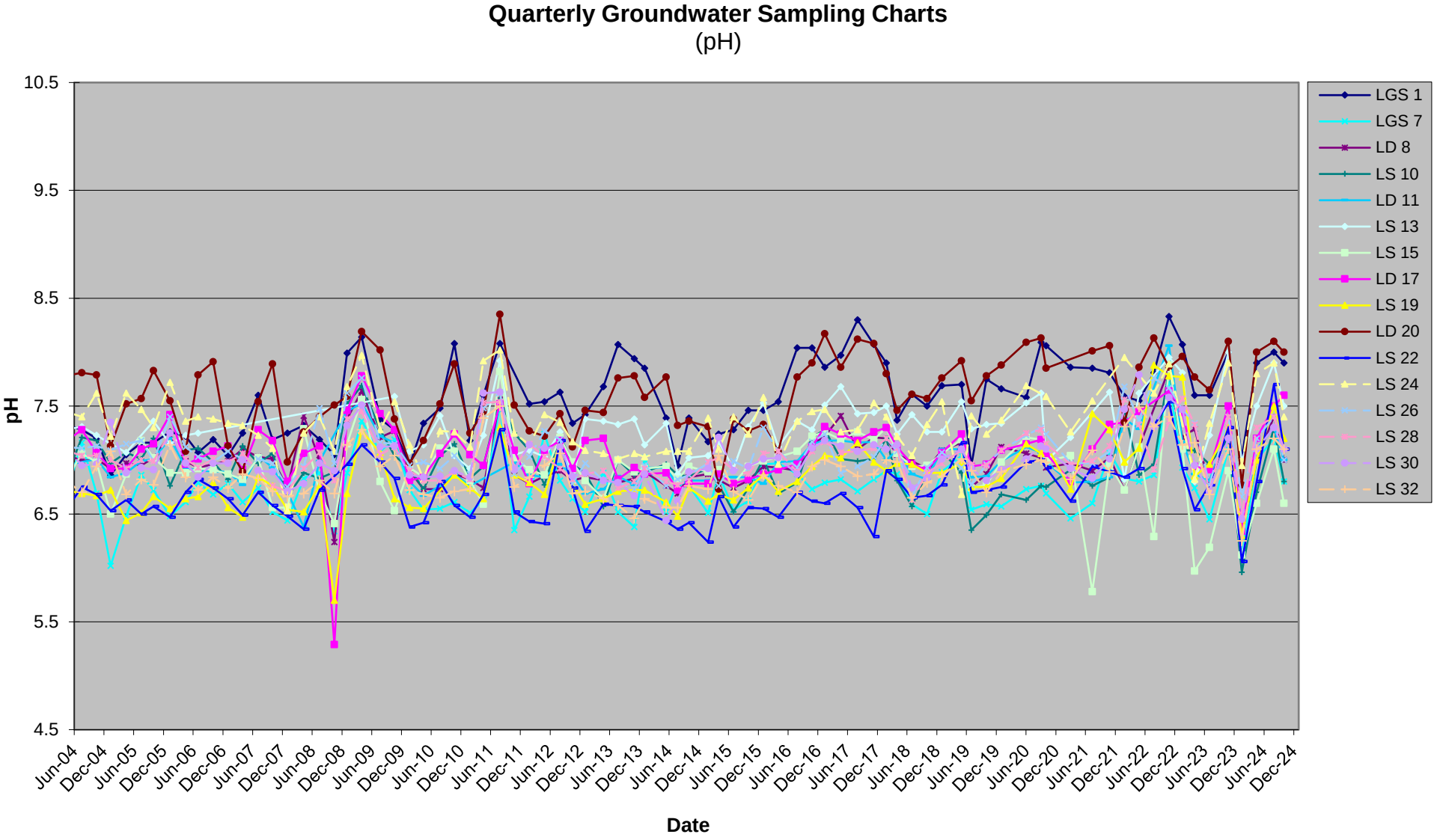


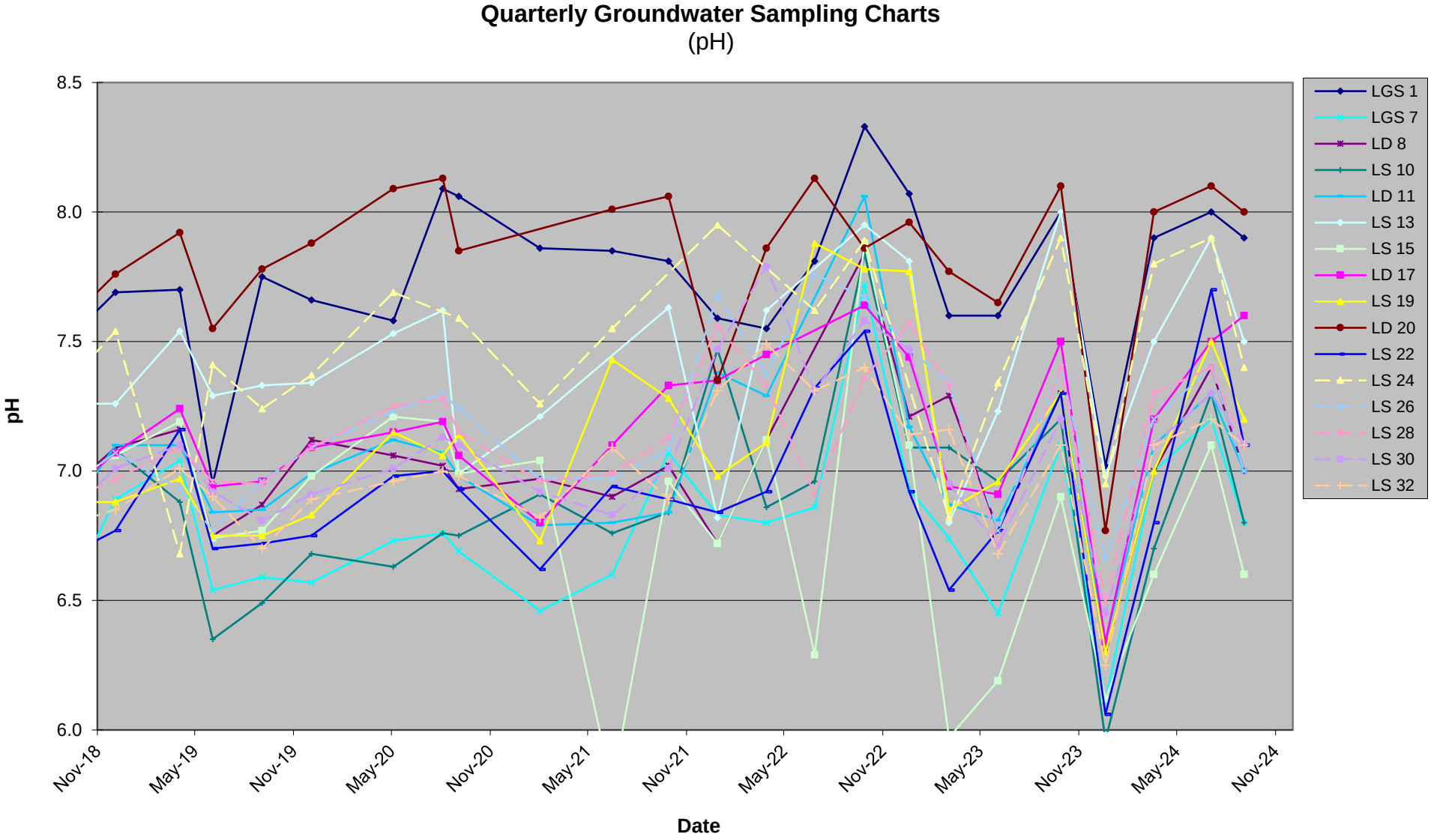
Leachate Chemistry Charts

(Fairfield Landfill)

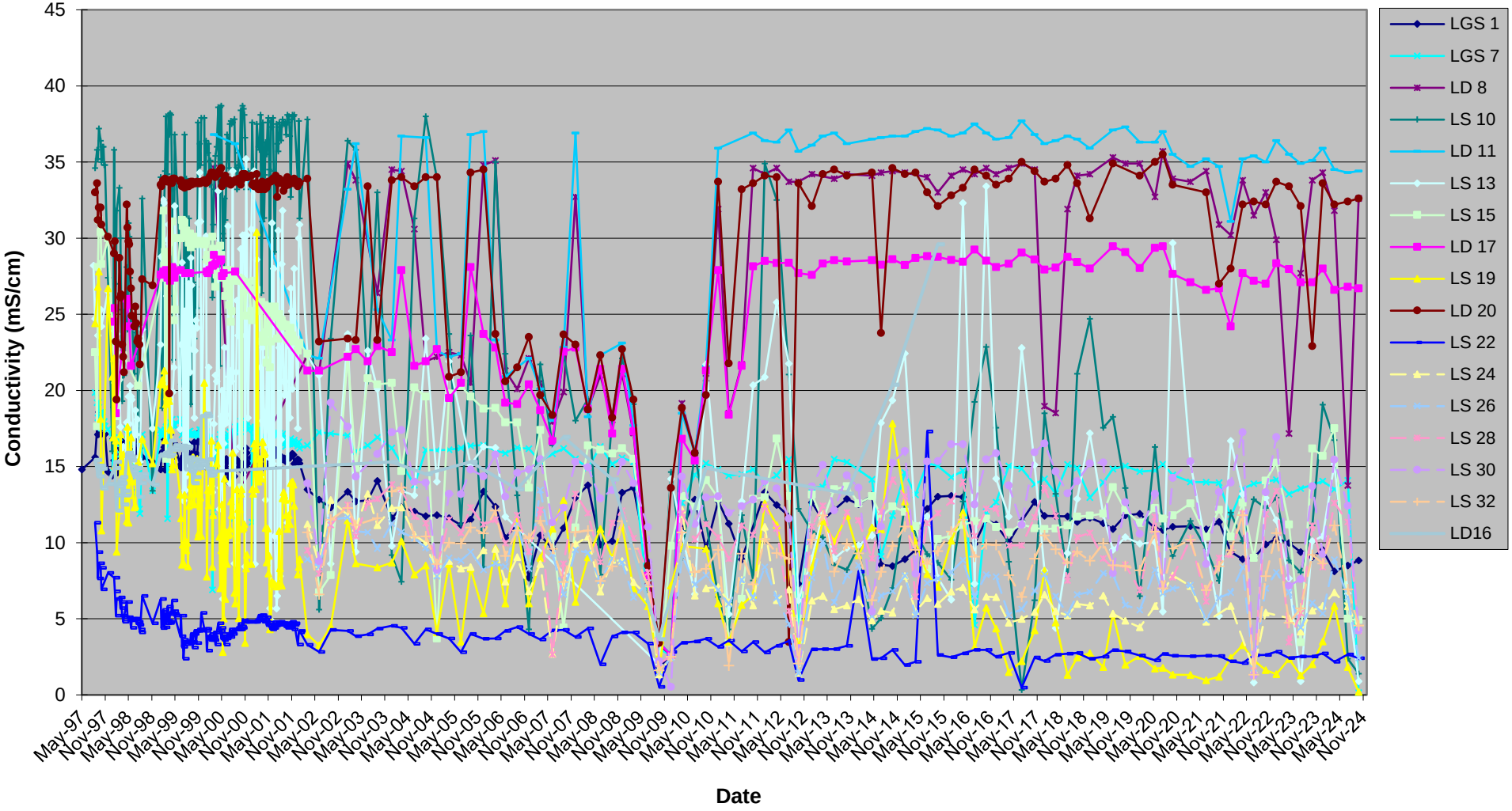


APPENDIX C
(Quarterly Groundwater Sampling)

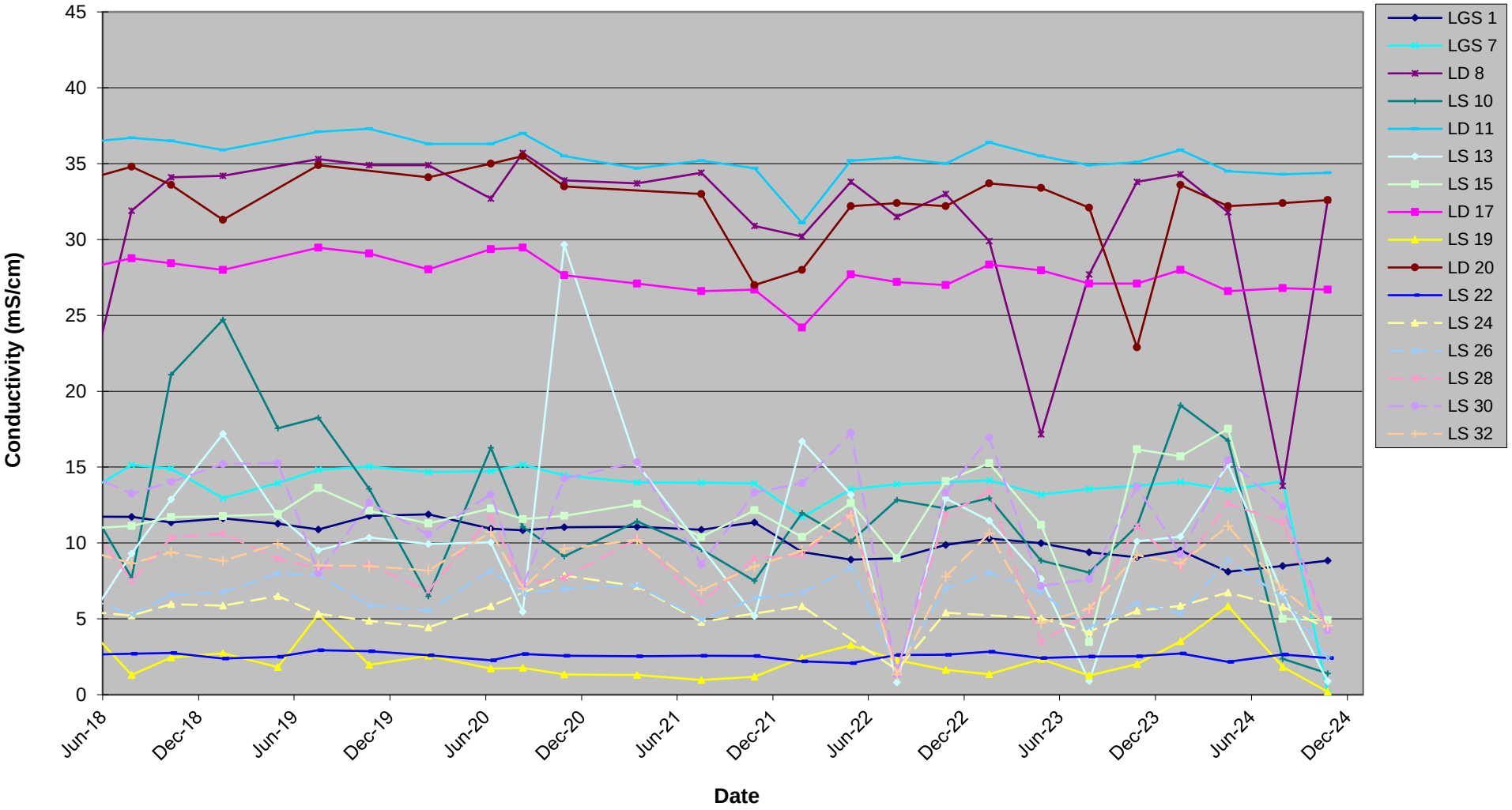

Quarterly Groundwater Sampling Charts
(pH)
pH
10.5
9.5
8.5
7.5
6.5
5.5
4.5
Jun-04
Dec-04
Jun-05
Dec-05
Jun-06
Dec-06
Jun-07
Dec-07
Jun-08
Dec-08
Jun-09
Dec-09
Jun-10
Dec-10
Jun-11
Dec-11
Jun-12
Dec-12
Jun-13
Dec-13
Jun-14
Dec-14
Jun-15
Dec-15
Jun-16
Dec-16
Jun-17
Dec-17
Jun-18
Dec-18
Jun-19
Dec-19
Jun-20
Dec-20
Jun-21
Dec-21
Jun-22
Dec-22
Jun-23
Dec-23
Jun-24
Dec-24
Date
LGS 1
LGS 7
LD 8
LS 10
LD 11
LS 13
LS 15
LD 17
LS 19
LD 20
LS 22
LS 24
LS 26
LS 28
LS 30
LS 32


Quarterly Groundwater Sampling Charts
(pH)
pH
8.5
8.0
7.5
7.0
6.5
6.0
Nov-18
May-19
Nov-19
May-20
Nov-20
May-21
Nov-21
May-22
Nov-22
May-23
Nov-23
May-24
Nov-24
Date
LGS 1
LGS 7
LD 8
LS 10
LD 11
LS 13
LS 15
LD 17
LS 19
LD 20
LS 22
LS 24
LS 26
LS 28
LS 30
LS 32

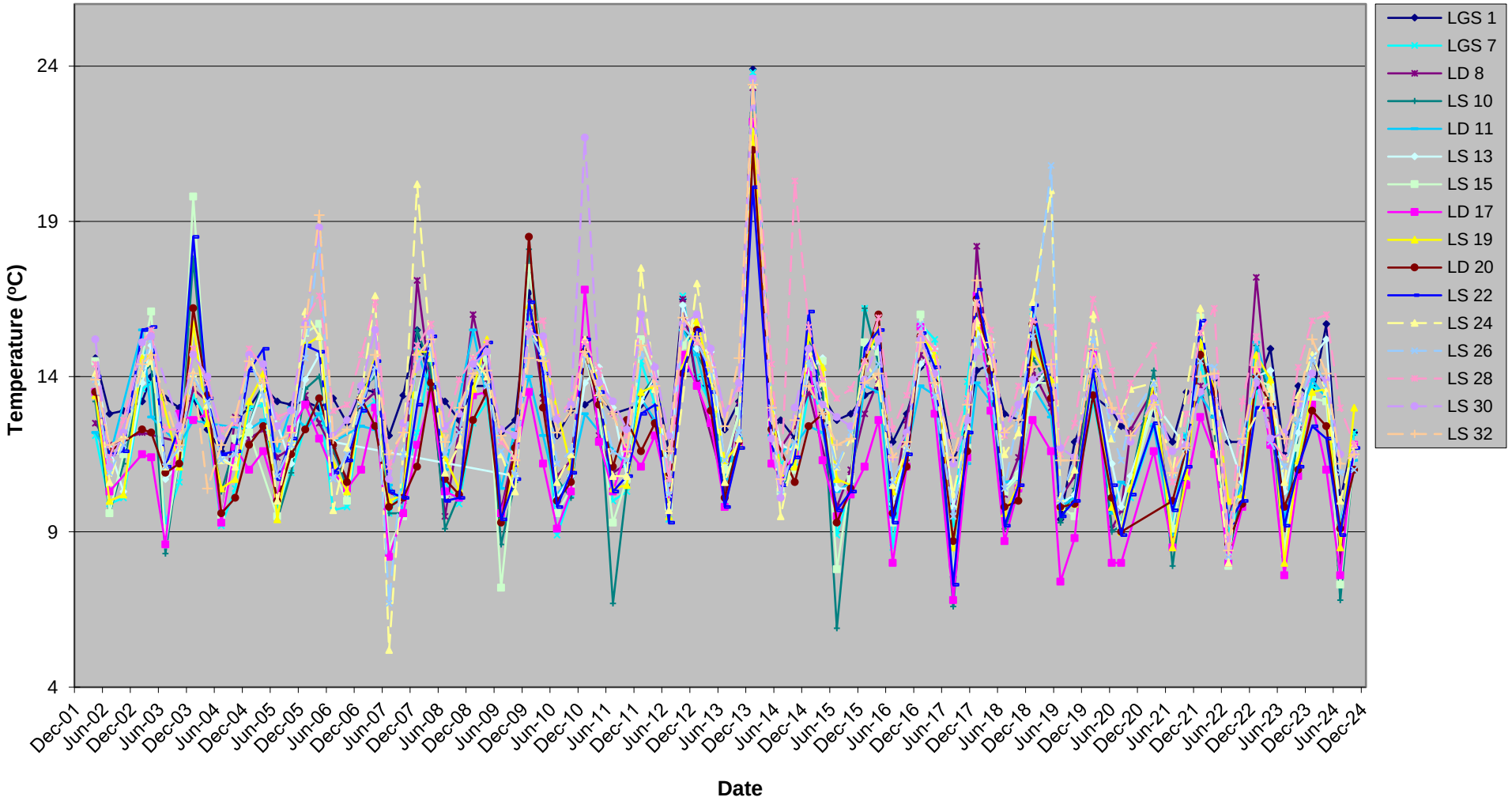
Quarterly Groundwater Sampling Charts
(Conductivity)



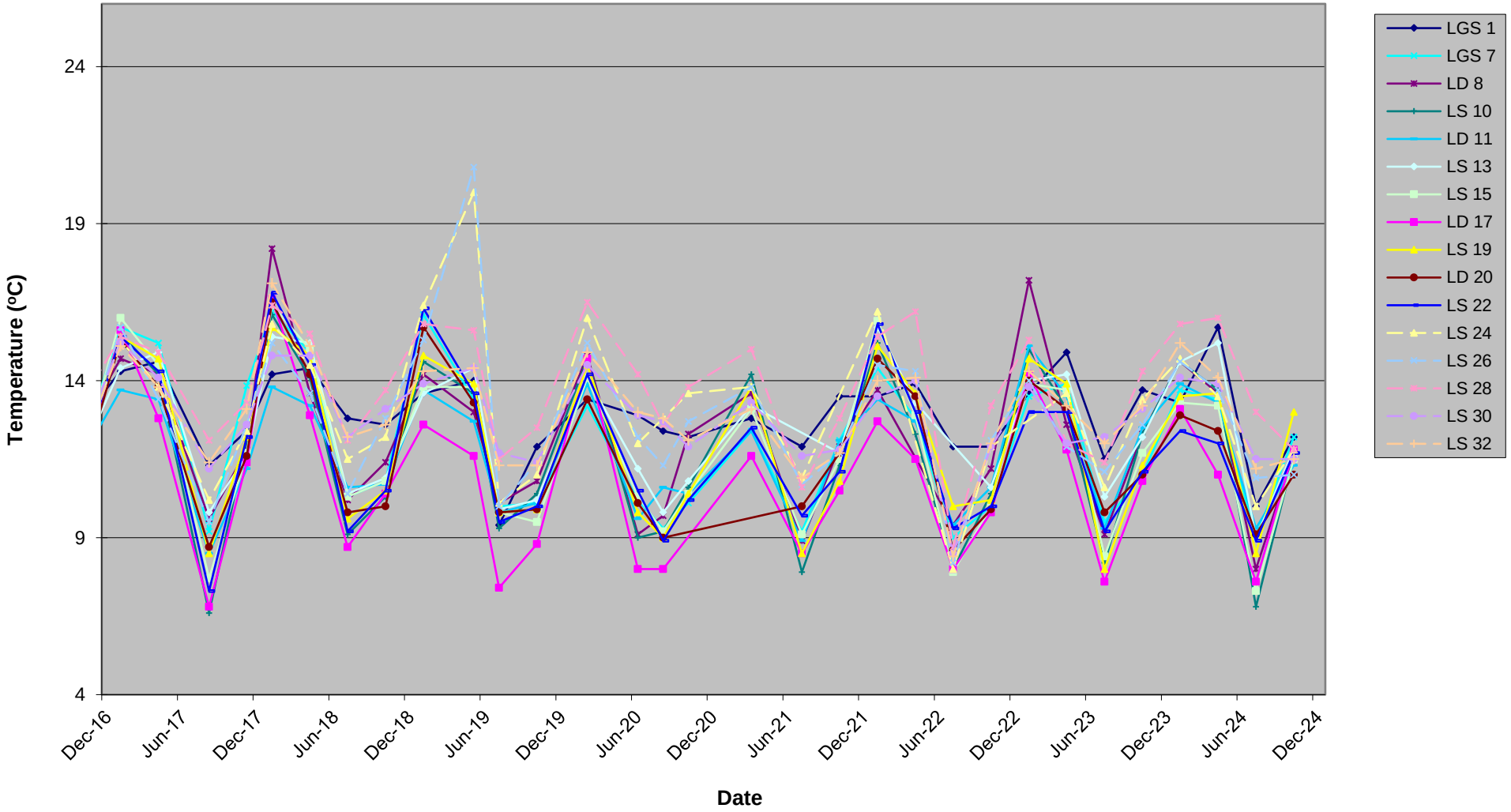
Quarterly Groundwater Sampling Charts
(Conductivity)



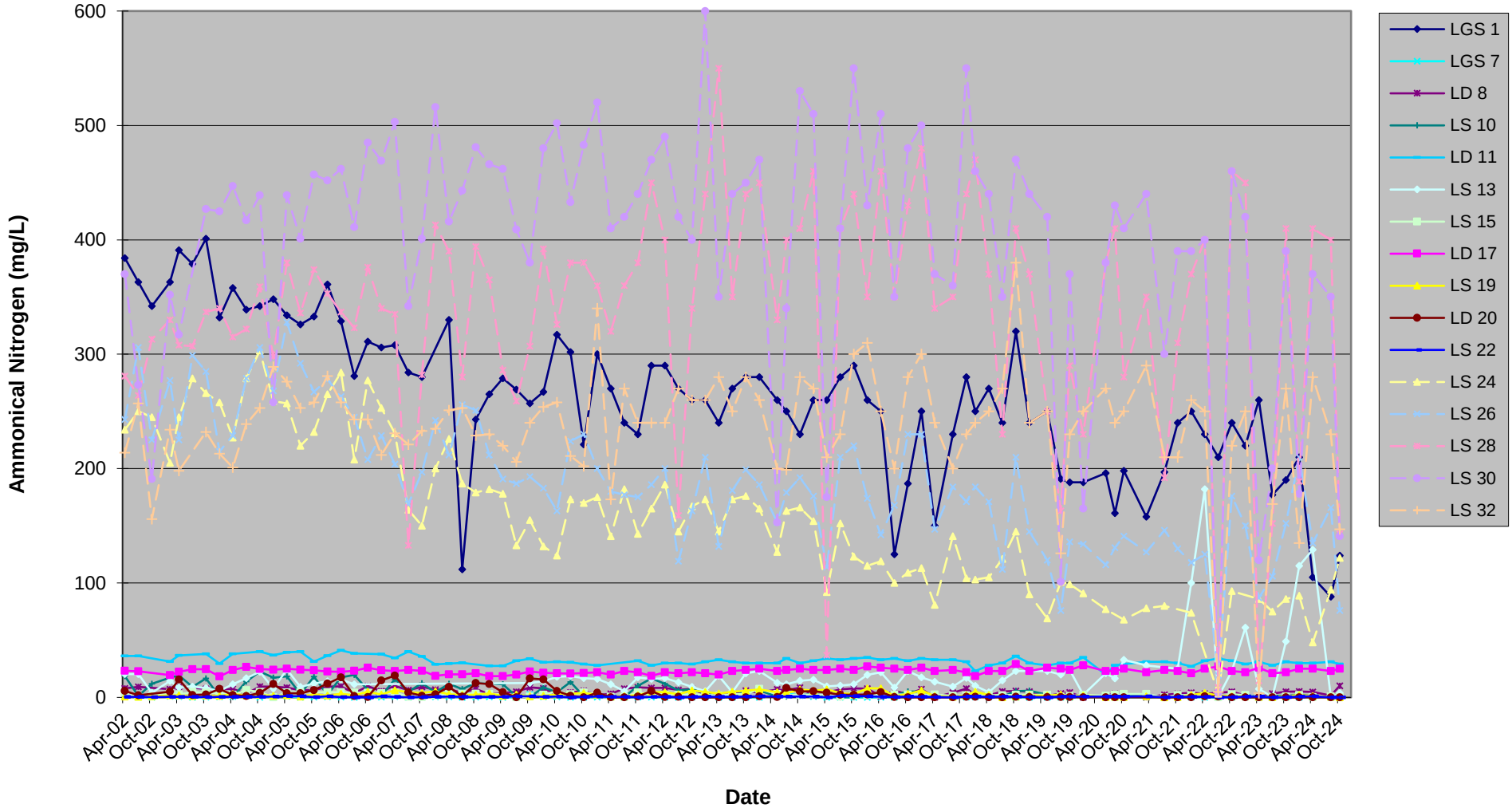
Quarterly Groundwater Sampling Charts
(Temperature)



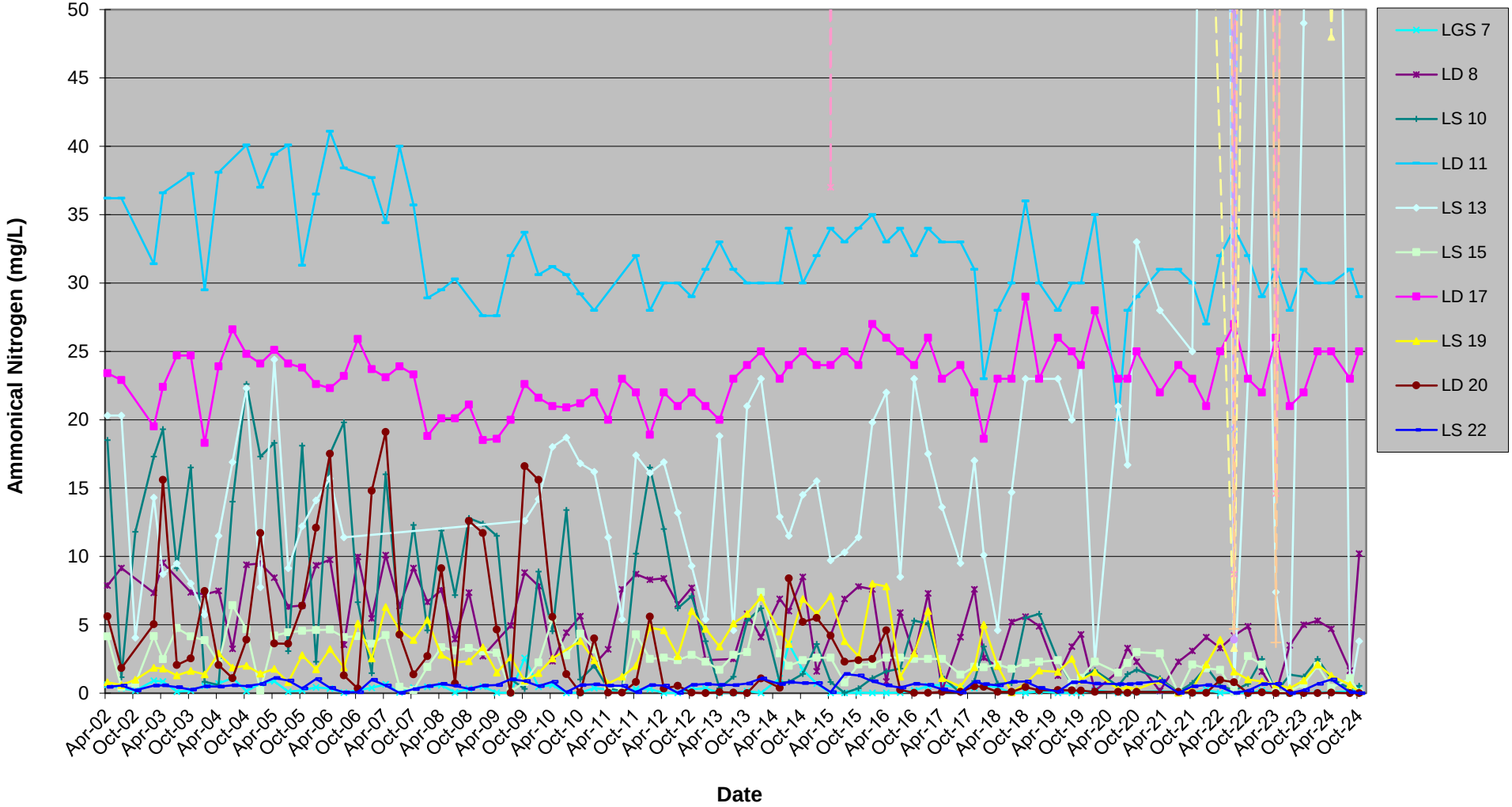
Quarterly Groundwater Sampling Charts
(Temperature)



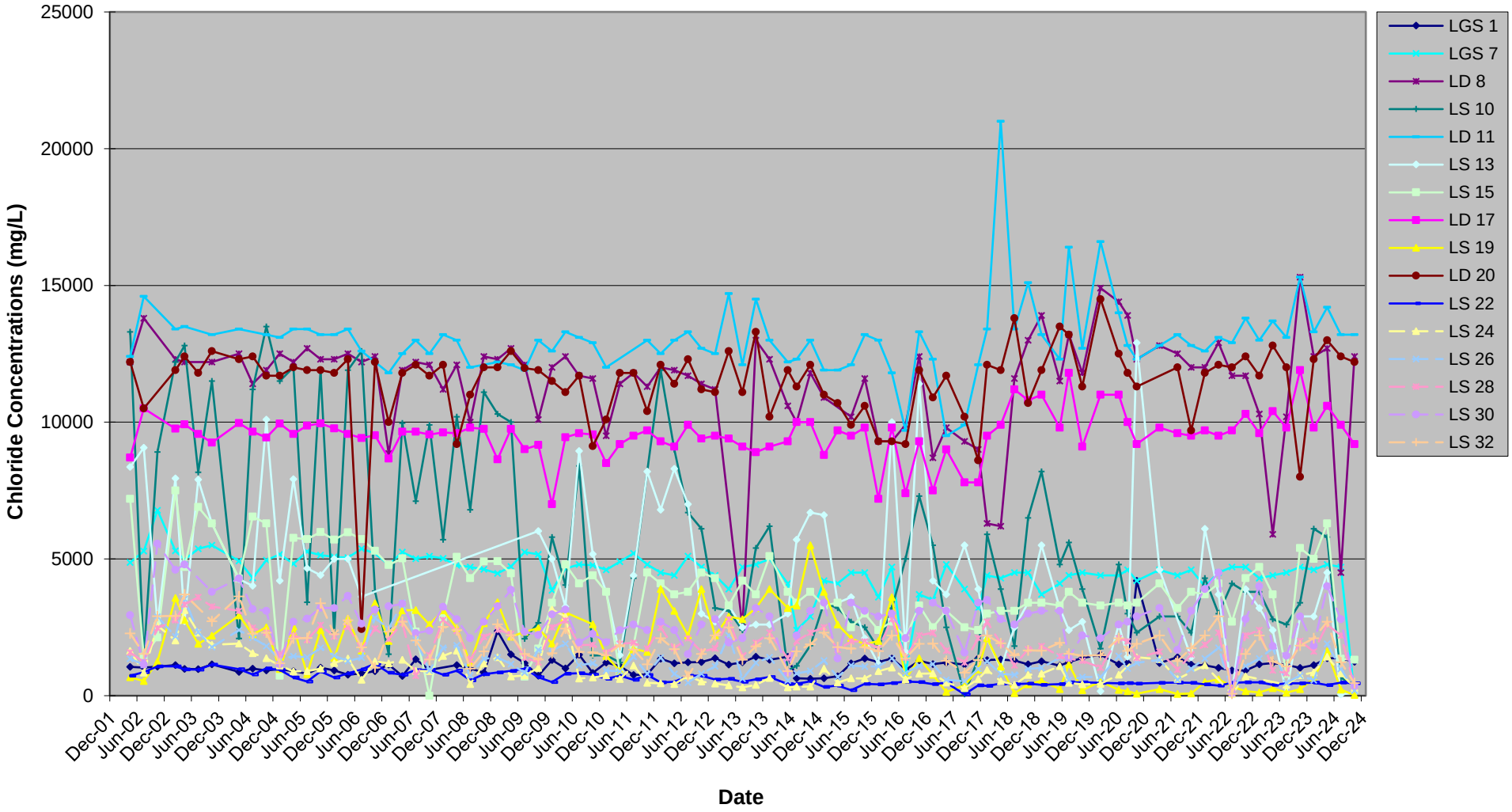
Quarterly Groundwater Sampling Charts
(Ammonical Nitrogen)



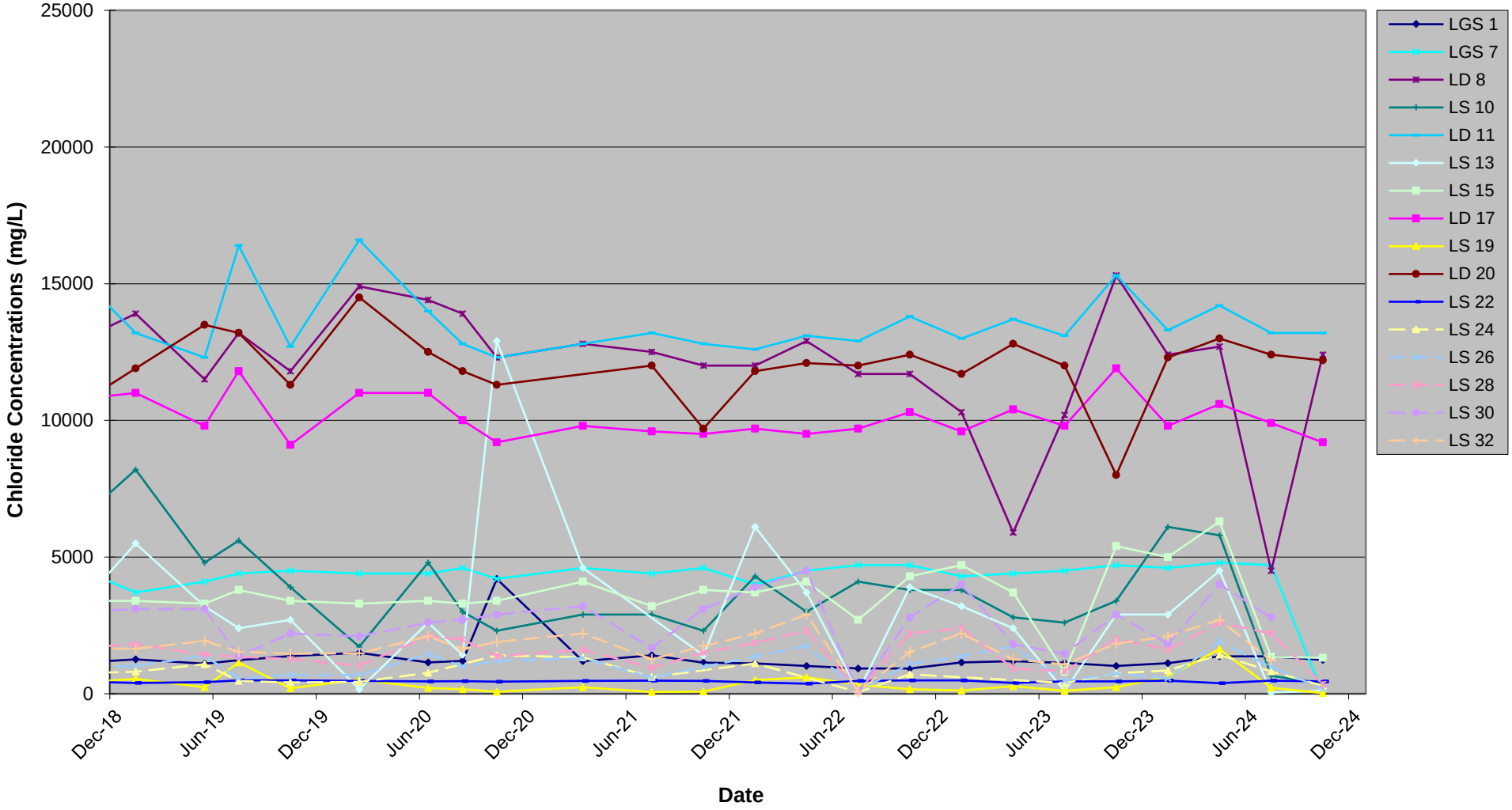
Quarterly Groundwater Sampling Charts
(Ammonical Nitrogen - Low Concentrations)



Quarterly Groundwater Sampling Charts
(Chloride)



Quarterly Groundwater Sampling Charts
(Chloride)



APPENDIX D
(Annual Groundwater Sampling)

ANNUAL SAMPLING OF DEEP WELLS RESULTS

Parameter		LD 8																				
	Date	18/10/2004	25/10/2005	12/10/2006	1/10/2007	16/10/2008	19/10/2009	22/10/2010	25/10/2011	16/10/2012	30/10/2013	22/10/2014	12/10/2015	27/10/2016	10/11/2017	10/10/2018	22/10/2019	29/10/2020	27/10/2021	27/10/2022	26/10/2023	24/10/2024
pH	pH units	7.01	7.02	6.96	7.01	6.24	7.27	6.87	6.86	7	7.1	7.0	6.8	7.1	7.2	7.2	7.3	7.5	7.5	6.8	7.3	7.0
Conductivity	mS/cm	21.9	20.5	20.1	19.9	18.07	3.29	20.8	34.6	33.7	34.5	33.4	33	34.6	34.5	34.1	32.7	33.8	30.9	33	33.8	32.6
Temp	°C	12.7	11.7	10.7	10	12.3	11.8	11.3	11.2	16.5	13.1	12.4	11	12.6	11.8	11.4	10.8	12.3	11.9	11.2	12.3	11.7
Alkalinity	mg/L as $CaCO_3$	410	200	400	260	380	400	360	390	560	360	370	380	340	390	380	360	320	320	360	370	380
BOD5	mg/L	2	7	8	1	5	5	3	2.7	<2	1	< 2	< 2	< 2	< 2	<2	<2	<2	<2	< 2	< 2	< 2
Cat/An Ratio	-	0.909	1.01	0.9	1.52	0.80	0.69	0.75	1.11	1.00	0.9	0.97	1.06	0.92	1.17	0.875	0.972	1.000	0.973	0.900	0.766	1.026
Chloride	mg/L	11900	12300	12400	12100	12400	10100	11600	11300	11400	13000	11800	11600	12400	9000	13000	11800	11800	12000	13000	15,300	12,400
Sulphate	mg/L	1190	1060	1120	1020	1100	1300	1050	1300	1220	1090	1120	1200	1070	1120	1090	1050	1070	1080	1130	1,370	1,130
Calcium	mg/L	680	960	820	1600	800	960	760	1010	1000	1020	1000	1020	960	960	970	1020	990	930	990	1,020	1,010
Iron	mg/L	25	34	21	32	50	21	11	32	35	21	25	26	38	33	31	16.1	8.7	10.1	22	25	25
Lead	mg/L	0.0033	0.005	0.003	<0.002	0.0034	<0.0021	<0.0011	<0.0021	0.0029	<0.0021	0.0033	< 0.0021	< 0.0021	< 0.0021	<0.0021	<0.0021	<0.0021	<0.011	< 0.0021	<0.0021	< 0.0021
Magnesium	mg/L	590	810	740	1300	730	760	650	850	800	800	820	860	780	680	710	750	830	810	820	830	860
Potassium	mg/L	110	140	120	200	140	110	130	138	130	144	126	135	127	139	136	136	134	130	129	137	141
Sodium	mg/L	5700	5900	5400	8500	4500	2400	3900	6000	5500	5600	5300	5800	5300	5100	5400	5300	5600	5600	5500	5,500	6,100
Zinc	mg/L	0	0.05	1.1	0.04	0.05	0.06	0.05	0.025	0.028	<0.0021	0.11	0.029	0.028	< 0.021	<0.021	0.023	<0.021	<0.11	0.022	<0.021	0.044
Ammoniacal Nitrogen	mg/L	9.39	6.41	9.96	9.16	7.35	8.81	5.63	8.7	7.7	5.8	8.5	7.8	2.7	7.6	5.6	4.3	2.3	3.1	4.9	5	10.2
Nitrate-Nitrogen	mg/L	0.02	0.005	0	0.043	0.041	<0.02	0.583	0.055	<0.02	0.02	< 0.02	0.024	1.32	< 0.10	0.053	0.084	1.9	0.051	0.014	0.005	0.03

Parameter		LD 17																				
	Date	18/10/2004	25/10/2005	12/10/2006	1/10/2007	16/10/2008	19/10/2009	22/10/2010	25/10/2011	16/10/2012	30/10/2013	23/10/2014	12/10/2015	27/10/2016	10/11/2017	10/10/2018	22/10/2019	29/10/2020	27/10/2021	27/10/2022	26/10/2023	24/10/2024
pH	pH units	7.07	7.15	7.08	7.18	5.29	7.28	7.24	7.09	7.1	7.2	7.2	6.8	7.1	7.3	7.5	7.4	7.5	7.7	7.2	7.5	7.6
Conductivity	mS/cm	21.9	28.1	19.1	22.54	17.17	3.44	21.3	28.15	27.7	28.4	27.8	28.77	28.5	28.6	28.4	26.7	27.3	26.7	27	27.1	26.7
Temp	°C	11.7	12.3	10.4	9.6	10.1	11.3	10.3	11.7	14.7	11.8	11.5	10.2	11.1	11.4	10.4	8.8	10.3	10.5	9.8	10.8	11.8
Alkalinity	mg/L as $CaCO_3$	1300	670	1200	1200	1300	1300	1300	1440	1360	1520	1480	1340	1340	1290	1220	1510	1220	1530	1420	1220	1210
BOD5	mg/L	2	9	6	<1	4	44	27	1.5	2	6	2	6	4	5	<2	<2	<2	<2	3	<2	< 2
Cat/An Ratio	-	0.929	1.02	0.92	0.9	0.8	1.02	0.83	0.97	0.97	1.04	1.03	1.03	0.97	0.96	0.88	0.93	1.04	1.00	0.94	0.83	1.07
Chloride	mg/L	9440	9960	9520	9550	9750	9170	9550	9700	9400	8900	10000	9800	9300	7800	10800	9100	9200	9500	10300	11900	9200
Sulphate	mg/L	0	<5	2	<0.5	<1	52	<5	<0.5	<0.5	<50	< 50	134	< 0.5	< 50	<5	<0.5	<5	<50	< 0.5	<0.5	<5
Calcium	mg/L	320	380	290	410	330	380	310	380	390	390	370	390	360	370	400	390	380	400	390	400	380
Iron	mg/L	17	27	9.8	12	5.1	7.8	4.8	8.6	13.6	14.1	8.8	9.1	8	11	10.6	-	12.2	10.3	23	10.9	2.8
Lead	mg/L	0	0.004	0.004	<0.002	<0.0021	<0.0021	<0.0011	<0.0021	0.0027	<0.021	< 0.0021	< 0.0021	< 0.0021	< 0.0021	<0.0021	<0.0021	<0.0021	<0.011	< 0.0021	<0.0021	<0.0021
Magnesium	mg/L	610	650	620	740	550	730	580	700	650	680	710	740	650	550	620	620	690	730	710	800	740
Potassium	mg/L	110	160	100	120	100	110	96	120	105	123	123	121	109	112	118	114	114	116	114	150	119
Sodium	mg/L	4600	5100	4600	4100	4000	4800	4100	4800	4700	4900	5400	5200	4600	4200	4900	4600	4800	4900	5,100	6,100	5,000
Zinc	mg/L	0	0.04	0.17	<0.03	0.03	<0.03	0.04	0.051	0.036	0.025	0.025	0.036	< 0.021	< 0.021	<0.021	0.023	<0.021	<0.11	0.031	0.026	<0.021
Amoniacal Nit	mg/L	24.8	23.8	25.9	23.3	21.1	22.6	21.2	22	22	24	25	24	24	22	29	24	25	23	23	22	25
Nitrate-Nitrogen	mg/L	0.02	<0.002	0	0.024	<0.008	0.009	<0.008	0.022	<0.010	<0.10	< 0.02	0.002	< 0.2	< 0.10	<0.002	<0.1	<0.02	0.008	< 0.02	<0.02	0.08

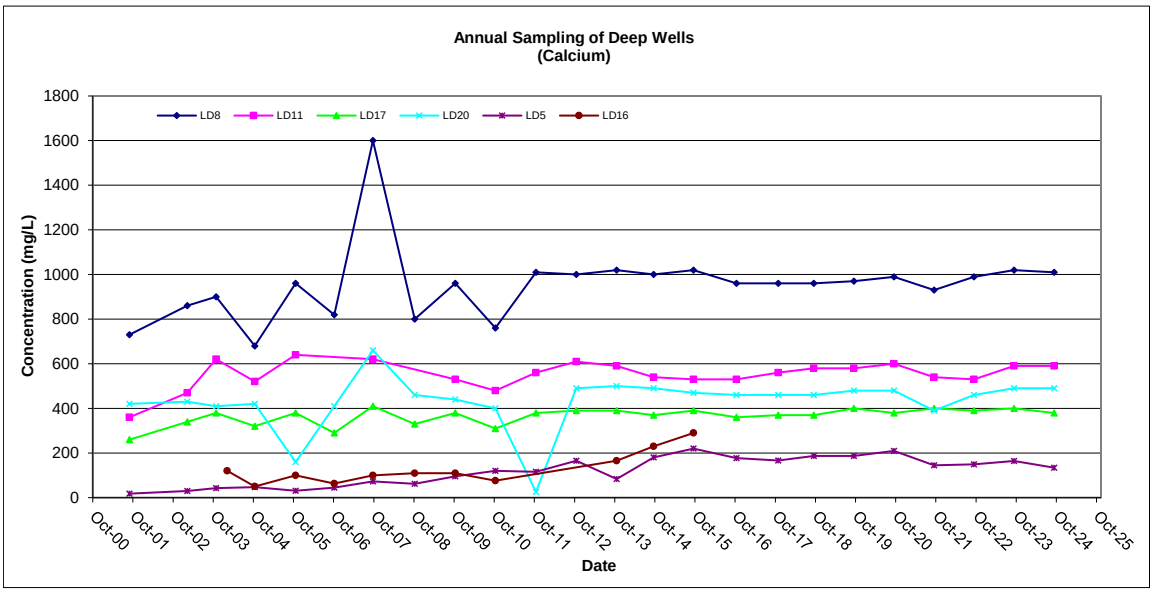
Parameter		LD 5																				
	Date	18/10/2004	25/10/2005	12/10/2006	1/10/2007	16/10/2008	20/10/2009	21/10/2010	25/10/2011	16/10/2012	30/10/2013	22/10/2014	12/10/2015	27/10/2016	10/11/2017	10/10/2018	22/10/2019	29/10/2020	27/10/2021	27/10/2022	26/10/2023	24/10/2024
pH	pH units	7.81	7.84	7.98	7.44	7.63	7.65	7.46	-	7.1	7.8	7.6	7.0	7.0	7.1	7.2	7.5	7.3	7.5	7.2	7.3	7.2
Conductivity	mS/cm	9.29	8.6	8.89	4.33	7.98	1.51	4.0	-	2.1	5.9	4.8	3.4	2.9	2.5	1.884	2.05	3.35	1.91	2.09	2.04	1.78
Temp	°C	13.1	13	12.8	16.8	12.3	12.1	15.2	-	16.6	13.8	14	12.4	12.5	12.5	12.6	11.3	12	12.6	11.7	13.1	12.5
Alkalinity	mg/L as $CaCO_3$	4100	2100	3800	3600	3300	3400	1800	1860	1190	2900	2300	1510	1390	1220	970	1250	1670	950	1180	1060	910
BOD5	mg/L	180	140	130	58	160	52	21	13	3	19	15	5	4	4	<2	5	3	<2	2	2	3
Cat/An Ratio	-	0.744	0.9	0.9	0.82	0.85	0.93	0.68	0.98	0.88	0.94	0.98	1.03	0.97	0.88	1.00	0.81	0.97	1.00	0.92	1.00	1.02
Chloride	mg/L	765	686	670	508	612	475	207	210	67	280	210	114	90	70	40	65	140	71	64	66	54
Sulphate	mg/L	13	10	19	63.9	24	4.9	59	66	42	8	114	79	23	12	17.7	22	10.4	7.1	27	5.5	2.4
Calcium	mg/L	47	31	45	73	62	95	120	116	165	84	181	220	177	166	187	138	210	145	149	164	134
Iron	mg/L	1.7	2.5	8.6	1.6	10	2.9	2.0	3.1	4	0.57	0.57	0.44	0.7	0.7	4.7	6.2	2	2.3	2.2	0.99	5.8
Lead	mg/L	0.0033	0.0078	0.0406	0.0109	0.033	0.003	0.020	0.0026	0.0037	0.0023	0.0025	0.00163	0.00032	0.00104	0.00051	0.00126	0.00108	0.00056	0.00138	0.00049	0.00096
Magnesium	mg/L	80	53	92	93	93	110	53	66	38	85	77	48	46	33	33	33	60	31	37	38	31
Potassium	mg/L	890	570	1000	850	900	860	4.3	430	183	750	510	260	220	151	92	160	290	146	175	151	151
Sodium	mg/L	610	390	650	510	460	500	240	250	96	390	310	169	139	96	77	89	184	90	101	99	86
Zinc	mg/L	0	0.08	1.2	0.1	2	0.2	0.29	0.052	0.039	0.039	0.058	0.0126	0.0073	0.0101	0.0086	0.0113	0.0149	0.0141	0.021	0.028	0.046
Amoniacal Nit	mg/L	317	305	291	229	255	258	115	132	56	196	166	91	84	69	58	56	87	44	61	51	49
Nitrate-Nitrogen	mg/L	0.006	<0.002	0.127	0.092	0.636	<0.008	<0.008	0.009	<0.002	<0.010	< 0.2	< 0.002	< 0.002	< 0.002	<0.10	0.004	0.04	0.017	< 0.002	<0.002	< 0.02

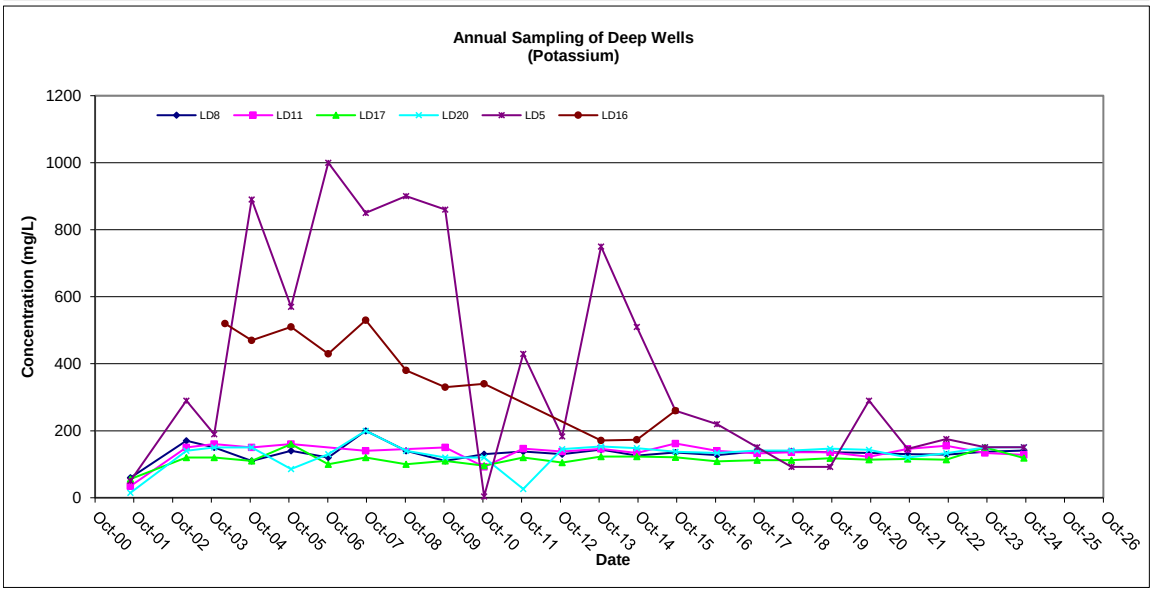
Parameter		LD 11																			
	Date	18/10/2004	25/10/2005	12/10/2006	1/10/2007	16/10/2008	21/10/2009	22/10/2010	25/10/2011	16/10/2012	30/10/2013	22/10/2014	12/10/2015	27/10/2016	10/11/2017	10/10/2018	22/10/2019	29/10/2020	27/10/2021	27/10/2022	26/10/2023	24/10/2024
pH	pH units	7.01	7.01	Not accessible - no sample collected	6.93	Not accessible - no sample collected	7.16	6.87	6.98	7	7.0	7.0	6.8	7.2	7.2	6.9	7.3	7.3	7.5	7.0	7.3	7.0
Conductivity	mS/cm	36.6	36.8		22.82		3.45	21.6	36.1	35.7	36.4	35.5	37.1	36.9	36.8	36.33	35.2	34.6	34.7	35	35.1	34.4
Temp	°C	13.3	13		9.7		12.3	10.8	11.3	15.5	12.0	11.8	10.6	11.6	11.2	10.7	10.1	10.4	12.1	10.6	12.5	11.3
Alkalinity	mg/L as $CaCO_3$	1300	680		1200		1400	1200	1320	1150	1240	1240	1390	1300	1080	1040	1330	960	950	1460	1060	1050
BOD5	mg/L	7	6		<1		46	41	2.3	3	1	< 2	5	< 2	5	<2	<2	<2	2	3	<2	< 2
Cat/An Ratio	-	0.979	1.18		0.95		1	0.65	1.05	1.00	0.9	0.97	1.00	0.93	0.92	0.80	0.97	1.00	0.97	1.00	0.87	0.97
Chloride	mg/L	13200	13200		12500		13000	12900	13000	12700	14500	13000	13200	13300	12100	15100	12700	12300	12800	13800	15300	13200
Sulphate	mg/L	0	<5		<0.5		<5.0	<5	<0.5	<5	2.5	< 50	149	0.7	< 50	<5	<0.5	<5	<50	< 30	<0.5	<30
Calcium	mg/L	520	640		620		530	480	560	610	590	540	530	530	560	580	580	600	540	530	590	590
Iron	mg/L	3.1	34		45		25	25	35	43	41	41	20	34	45	55	37	54	29	28	48	50
Lead	mg/L	0.001	0.003		<0.002		0.0034	<0.003	<0.0021	<0.0021	0.00105	< 0.0021	< 0.0021	< 0.0021	< 0.0021	<0.0021	<0.0021	<0.0021	<0.0021	<0.011	< 0.0021	<0.0021	<0.0021
Magnesium	mg/L	910	910		970		890	740	860	900	880	860	980	850	720	760	850	870	920	940	940	870
Potassium	mg/L	150	160		140		150	92	147	138	146	134	162	140	132	136	147	122	146	155	134	128
Sodium	mg/L	6500	7500		5500		6600	3700	6900	6300	5900	6300	6600	6200	5600	6100	6000	5900	6100	7,100	6,400	6,300
Zinc	mg/L	0	0.05		<0.03		0.05	0.04	0.025	<0.021	0.021	0.026	0.032	< 0.021	< 0.021	0.2	<0.021	<0.021	<0.11	0.025	<0.021	0.029
Amoniacal Nit	mg/L	40.1	31.3		35.7		33.7	29.2	32	29	30	30	34	32	31	36	30	29	30	32	31	29
Nitrate-Nitrogen	mg/L	0.005	0.002		0.026		<0.02	<0.008	<0.01	<0.010	0.05	< 0.02	0.004	< 0.2	< 0.10	0.009	<0.10	0.03	0.012	< 0.02	<0.02	<0.02

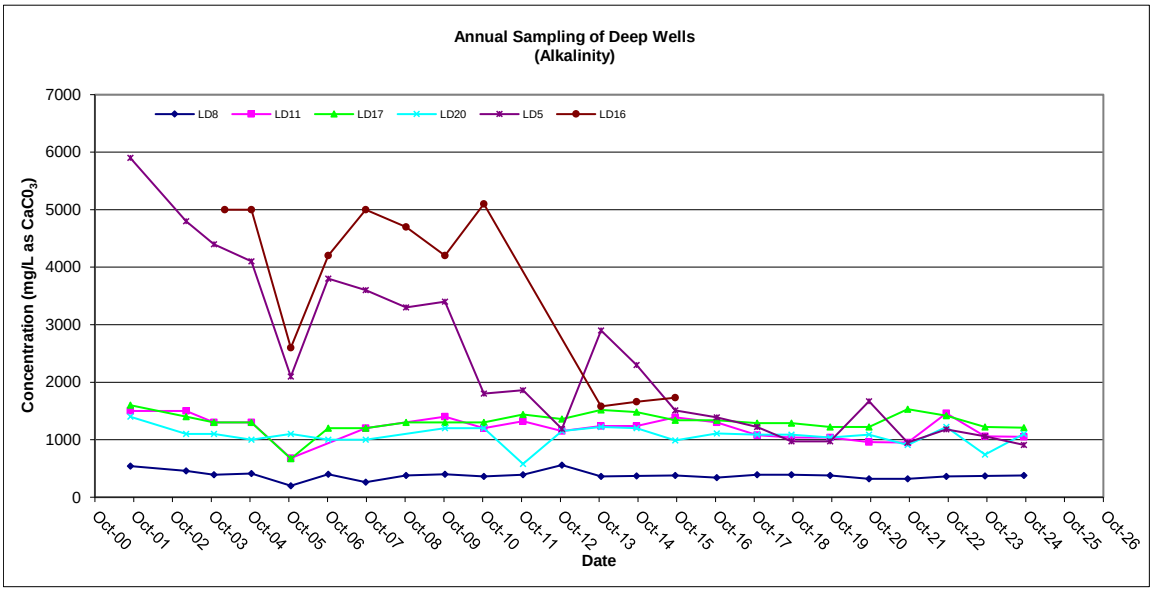
Parameter		LD 20																			
	Date	18/10/2004	25/10/2005	12/10/2006	1/10/2007	16/10/2008	19/10/2009	22/10/2010	25/10/2011	16/10/2012	30/10/2013	23/10/2014	12/10/2015	27/10/2016	10/11/2017	10/10/2018	22/10/2019	29/10/2020	27/10/2021	27/10/2022	26/10/2023	24/10/2024
pH	pH units	7.79	7.83	7.91	7.89	7.51	7.38	7.89	7.51	8	8	7.7	7.3	7.9	8.1	7.8	8.3	8.1	8.2	8.0	8.1	8.0
Conductivity	mS/cm	34	34.3	21.5	23.67	18.22	3.41	19.7	33.6	33.6	34.3	33.3	32.1	34.1	34.4	33.3	32.3	32.9	27	32.2	22.9	32.6
Temp	°C	10.1	11.5	10.6	10.1	10.2	11.7	10.6	12.6	14.4	11.9	10.6	10.4	11.1	11.6	10.0	9.9	9.9	11.7	9.9	11.0	11.0
Alkalinity	mg/L as $CaCO_3$	1000	1100	1000	1000	not enough sample to analyse	1200	1200	580	1150	1220	1200	990	1110	1090	1040	1270	1090	910	1220	740	1100
BOD5	mg/L	5	3	3	18	not enough sample to analyse	5	2	1.3	<2	<2	< 2	< 2	< 2	< 2	<2	<2	<2	2	< 2	<2	<2
Cat/An Ratio	-	0.971	0.52	0.91	1.07	0.94	0.87	0.98	0.94	1.06	0.90	1.00	1.09	0.94	1.15	1.06	0.97	1.00	0.97	0.89	1.44	1.05
Chloride	mg/L	11700	11900	12200	11700	12000	11900	9120	760	11200	13300	12100	10600	11900	8600	10700	11300	11300	9700	12400	8000	12200
Sulphate	mg/L	334	302	341	196	270	320	300	161	194	161	320	290	220	158	280	290	310	260	154	250	310
Calcium	mg/L	420	160	410	660	460	440	400	26	490	500	490	470	460	460	480	500	480	390	460	490	490
Iron	mg/L	30	0.62	5.4	83	1.1	2.3	0.45	21	<0.42	0.21	< 0.42	0.79	< 0.42	< 0.42	<0.42	<0.42	<0.42	5.4	< 0.42	<0.42	<0.42
Lead	mg/L	0.0108	0.002	0.015	0.204	<0.0021	0.0022	<0.003	0.007	0.0058	<0.021	< 0.0021	< 0.0021	< 0.0021	< 0.0021	< 0.0021	<0.0021	<0.0021	<0.011	< 0.0021	<0.0021	<0.0021
Magnesium	mg/L	770	390	750	1100	760	750	700	53	790	750	820	780	750	650	710	740	780	670	760	800	820
Potassium	mg/L	150	86	130	200	140	120	120	26	145	153	148	137	134	141	147	146	143	120	133	150	151
Sodium	mg/L	5900	3300	5800	5700	5400	5300	4600	640	6100	6100	6300	6000	5800	5200	6100	5800	5900	4900	5800	6100	6700
Zinc	mg/L	0.09	0.05	0.65	0.24	0.05	<0.03	0.04	0.44	0.115	0.083	0.029	0.036	< 0.021	< 0.021	0.184	<0.021	<0.021	<0.11	0.035	0.065	<0.021
Amoniacal Nit	mg/L	3.9	6.4	0.34	1.37	12.6	16.6	<0.04	0.82	0.04	<0.010	5.2	2.4	0.023	< 0.5	0.45	0.19	<0.1	<0.01	< 0.010	<0.010	<0.10
Nitrate-Nitrogen	mg/L	4.68	4	6.03	7.3	0.97	<0.02	6.91	0.006	<0.02	4.3	6.9	3.2	2.9	4.1	3.6	3.3	4.1	2.7	2.7	2.3	5

Parameter		LD 16																				
	Date	18/10/2004	25/10/2005	12/10/2006	1/10/2007	16/10/2008	19/10/2009	22/10/2010	25/10/2011	16/10/2012	30/10/2013	23/10/2014	12/10/2015	27/10/2016	10/11/2017	10/10/2018	22/10/2019	29/10/2020	27/10/2021	27/10/2022	26/10/2023	23/10/2024
pH	pH units	7.36	7.25	7.22	6.86	7.19	7.57	7.28	Not accessible - no sample collected	Not accessible with pump - no sample collected	7.6	7.3	6.7	Dry - no sample collected	Bend in pipe - no sample collected	Bend in pipe - no sample collected	Bend in pipe - no sample collected	Bend in pipe - no sample collected	Bend in pipe - no sample collected	Bend in pipe - no sample collected	Bend in pipe - no sample collected (also dry)	Bend in pipe - no sample collected
Conductivity	mS/cm	14.5	15.3	13.5	16.95	14.15	3.66	14.9			13.32	20.1	29.6									
Temp	°C	24.1	24.2	22.7	20.4	17.4	19.4	20.8			-	17.4	19.4									
Alkalinity	mg/L as $CaCO_3$	5000	2600	4200	5000	4700	4200	5100			1580	1660	1730									
BOD5	mg/L	30	180	150	29	66	28	120			47	10	< 2									
Cat/An Ratio	-	0.861	1.27	0.95	0.86	0.59	1.63	0.77			0.99	0.90	1.15									
Chloride	mg/L	2400	2840	2220	3420	4990	3670	2370			3100	6000	7500									
Sulphate	mg/L	79	83	265	40.5	130	150	340			510	740	950									
Calcium	mg/L	50	100	63	100	110	110	76			165	230	290									
Iron	mg/L	5.5	21	4.4	3.2	7	13	6.3			106	54	16.4									
Lead	mg/L	0.0117	0.0359	0.04	0.079	0.015	0.016	0.0167			0.26	0.075	0.0073									
Magnesium	mg/L	290	330	260	360	320	340	250			260	470	650									
Potassium	mg/L	470	510	430	530	380	330	340			171	173	260									
Sodium	mg/L	1600	2000	1500	1800	1600	5300	1400			1880	3000	5200									
Zinc	mg/L	0.06	0.37	0.25	0.04	0.04	0.09	0.07			2.5	1.34	0.13									
Amoniacal Nit	mg/L	639	620	601	598	432	531	568			183	153	129									
Nitrate-Nitrogen	mg/L	0.02	0.005	0	<0.008	<0.008	<0.02	<0.008			0.012	0.008	1.52									

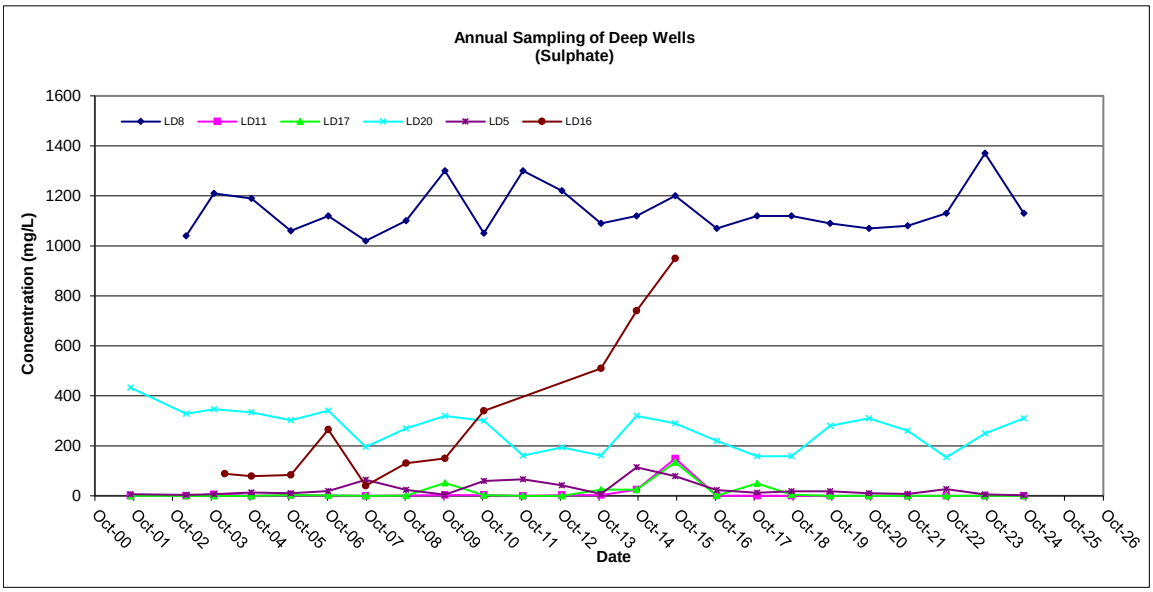
Annual Sampling of Deep Wells Charts
(Fairfield Landfill)

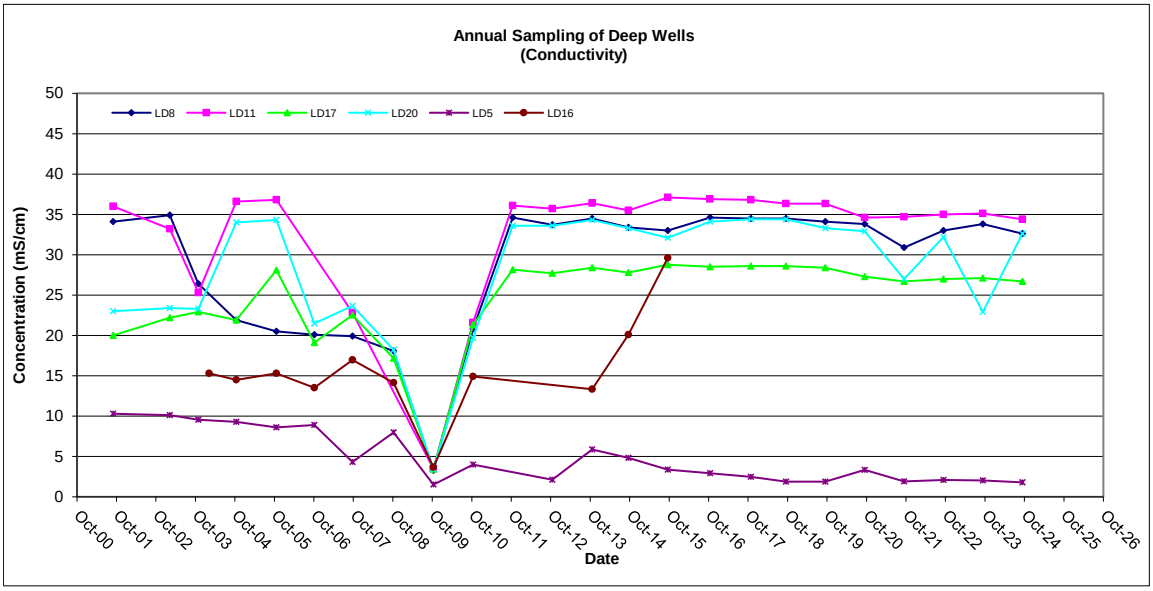


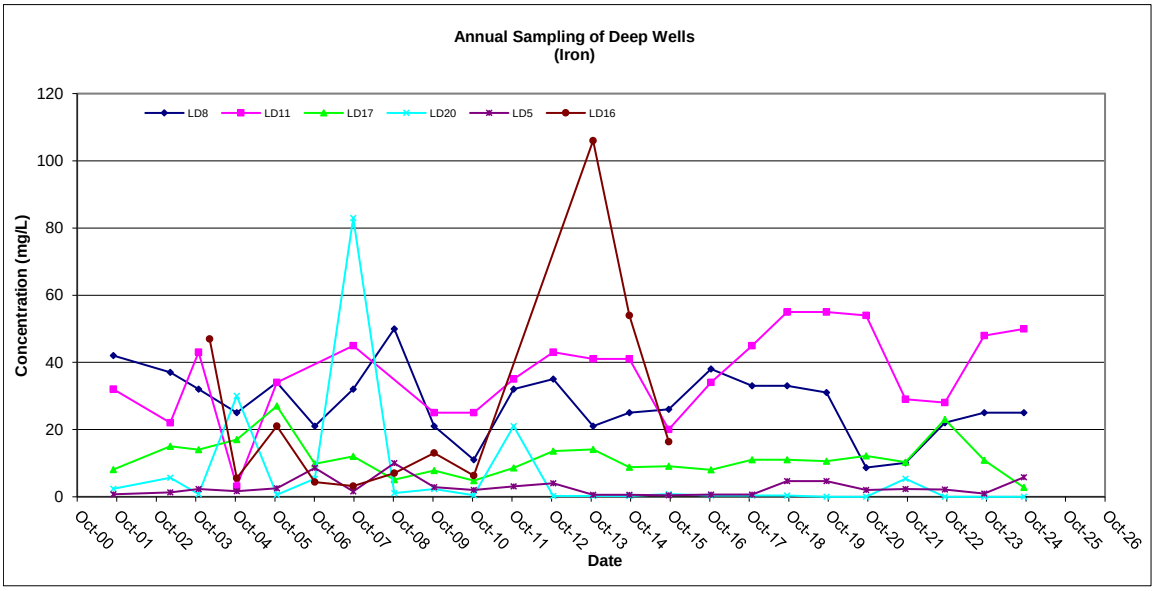




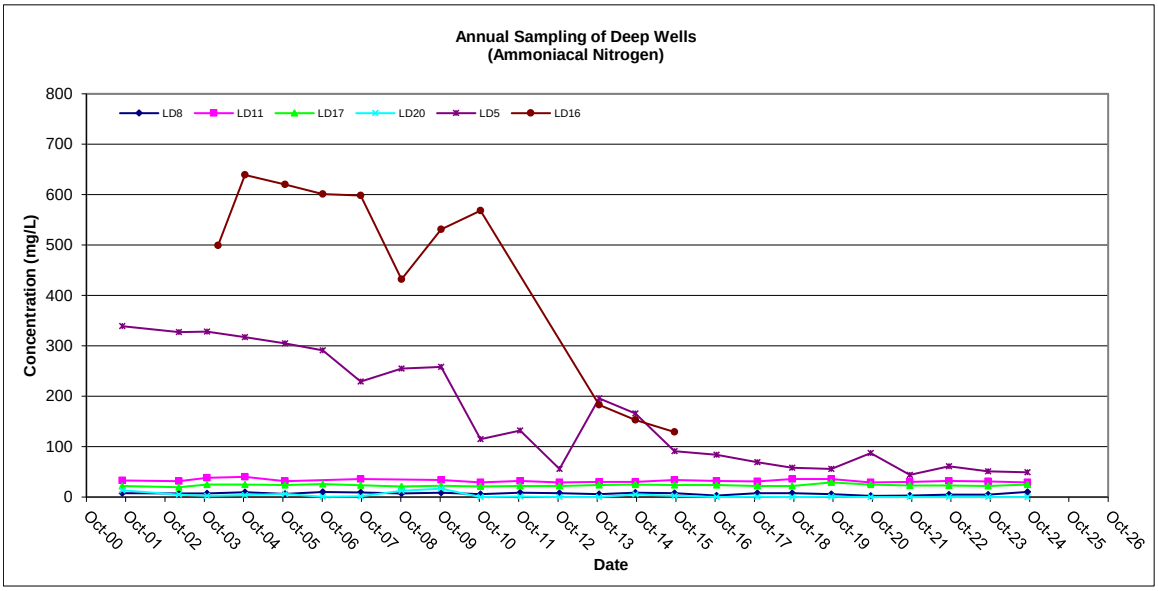
Annual Sampling of Deep Wells Charts
(Fairfield Landfill)

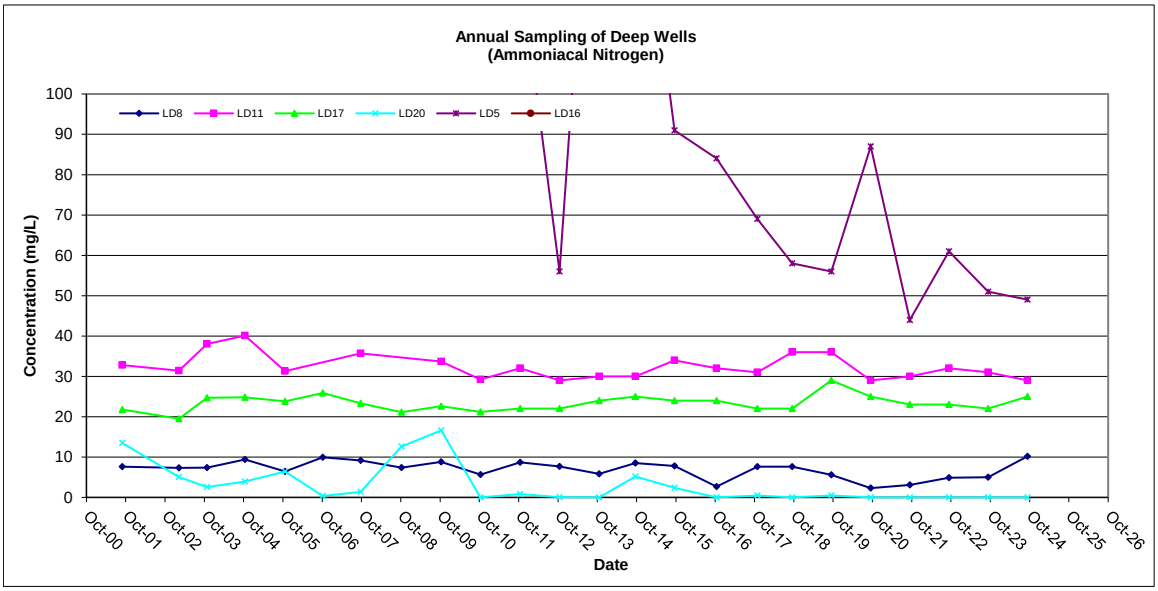


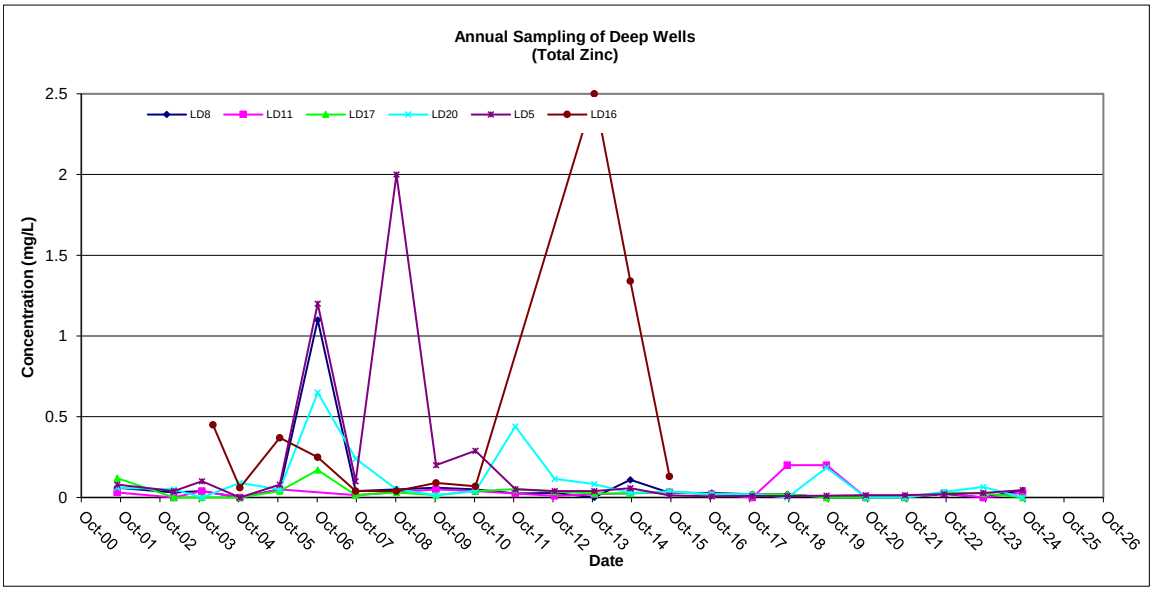




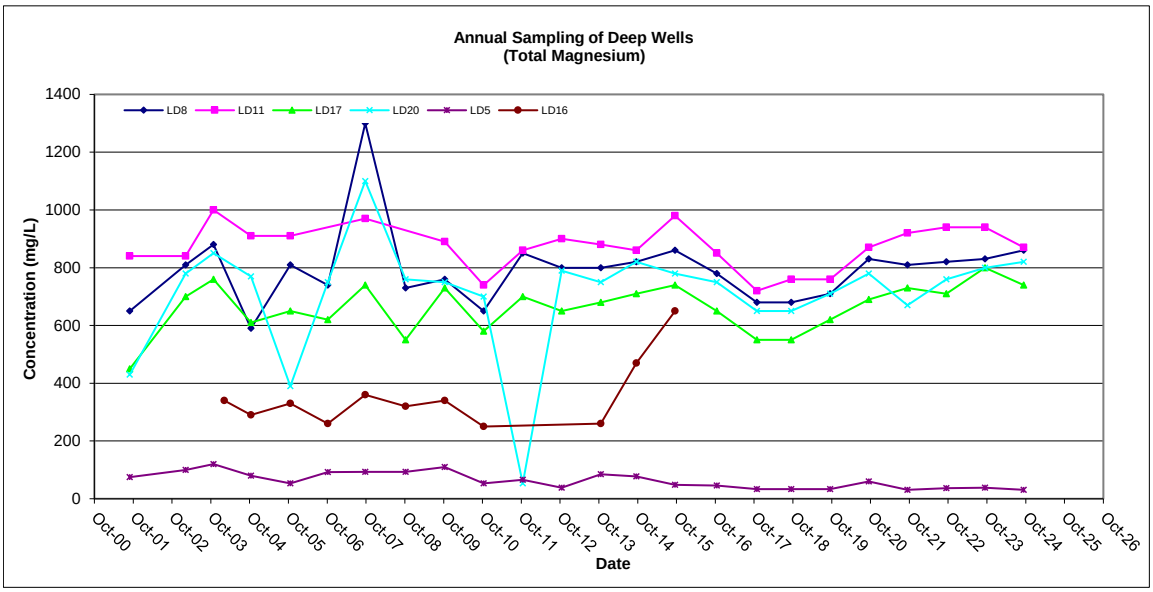
Annual Sampling of Deep Wells Charts
(Fairfield Landfill)

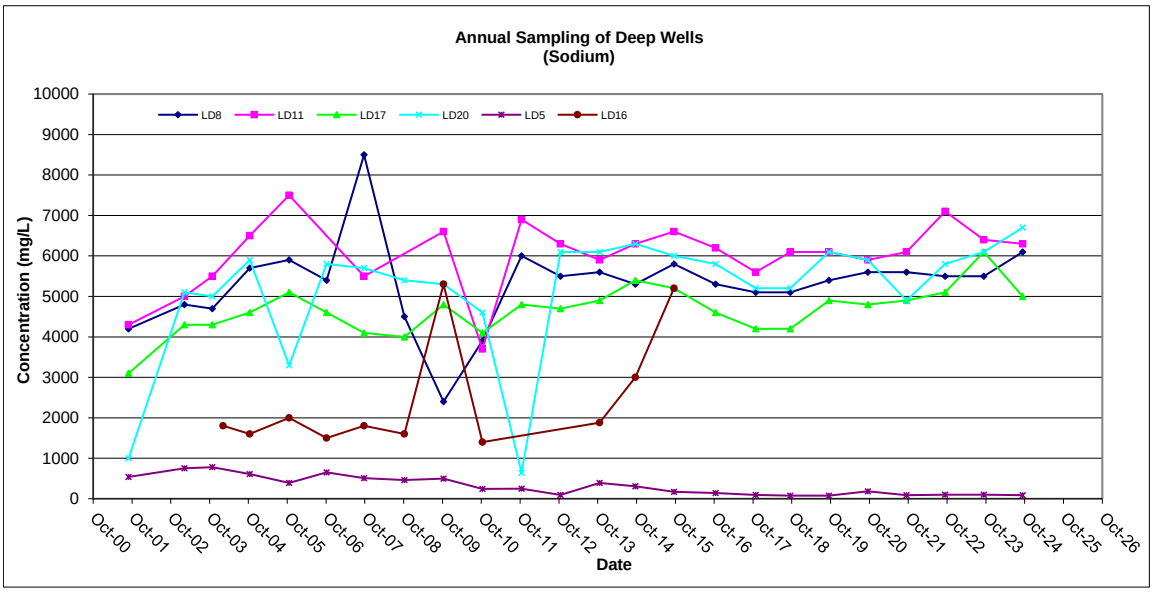


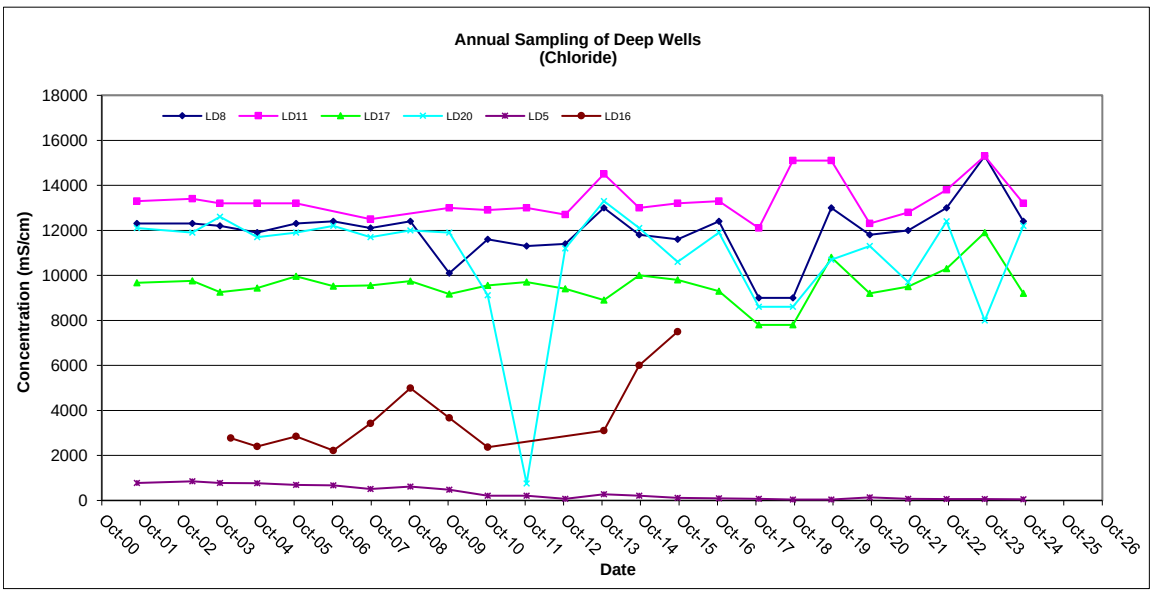




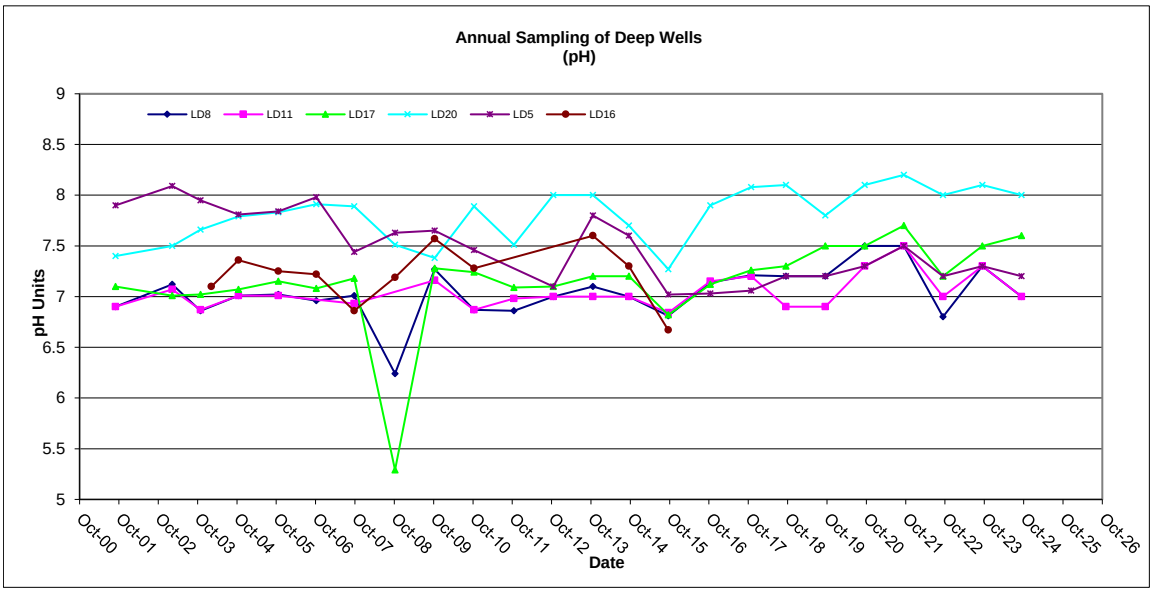
Annual Sampling of Deep Wells Charts
(Fairfield Landfill)

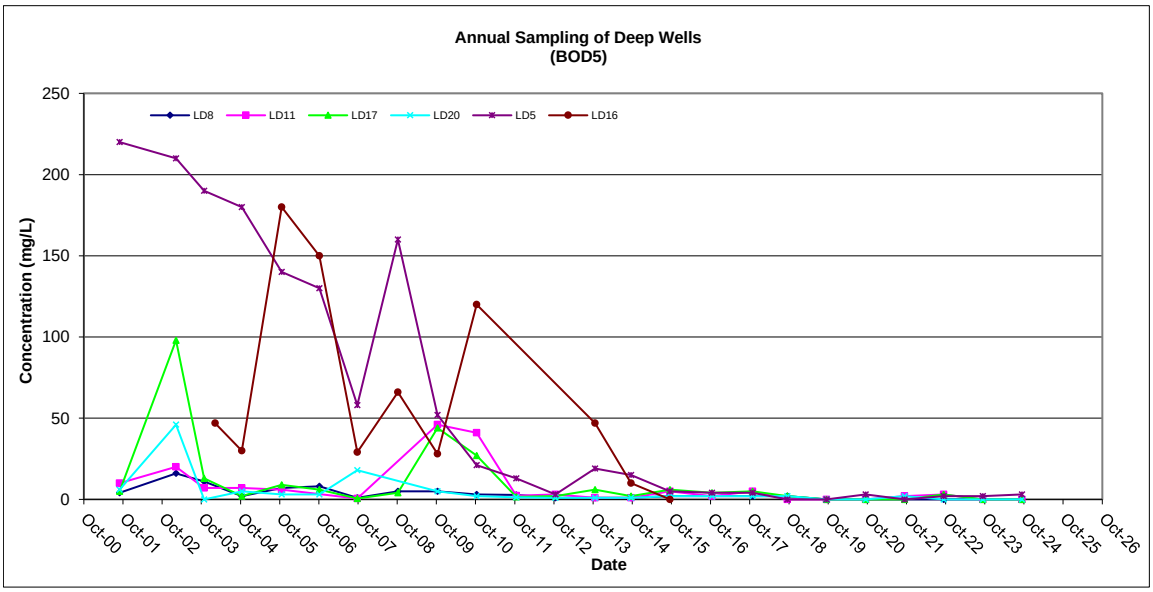


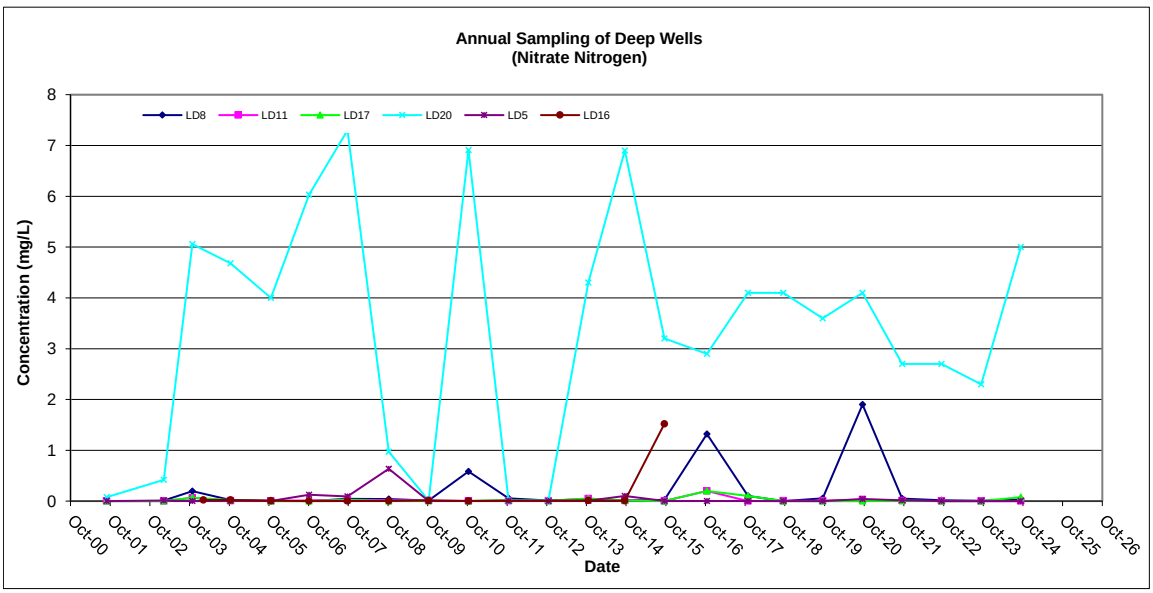




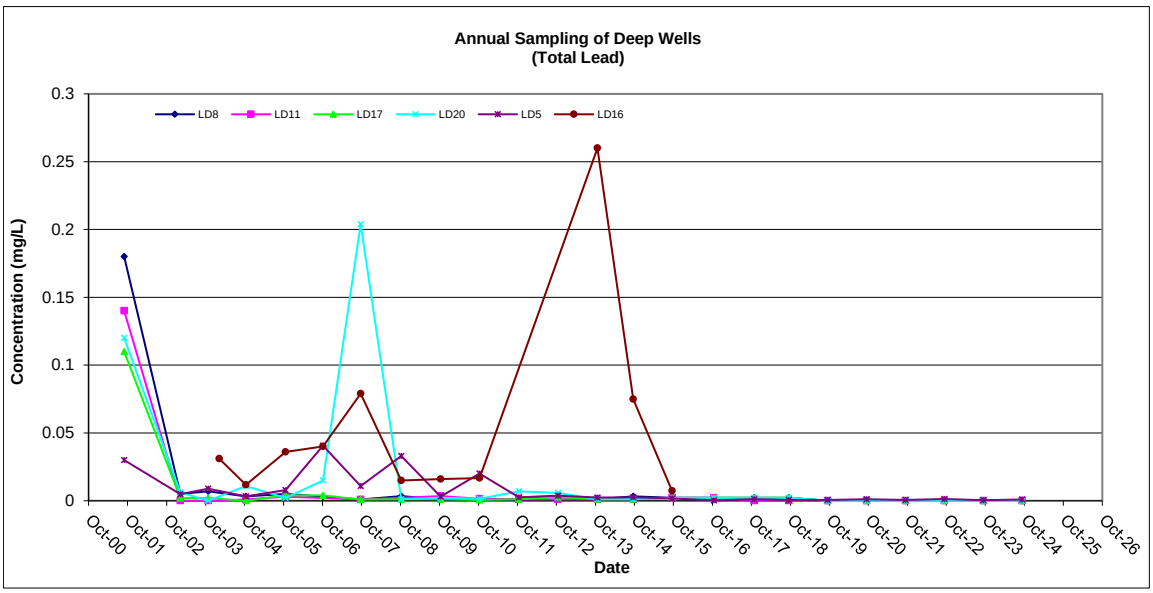
Annual Sampling of Deep Wells Charts
(Fairfield Landfill)

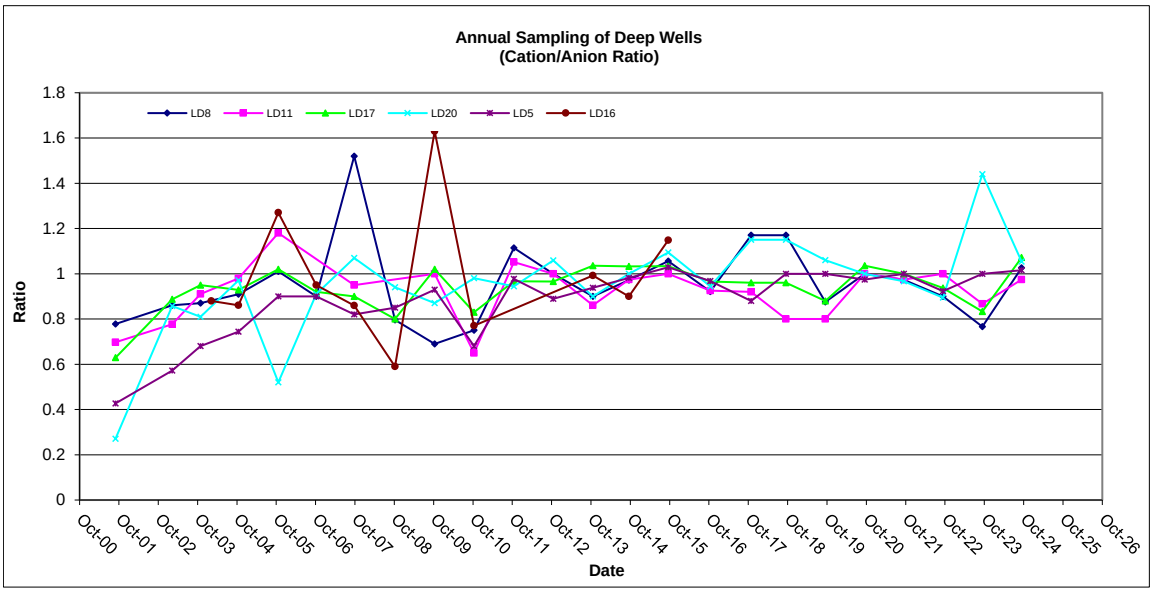


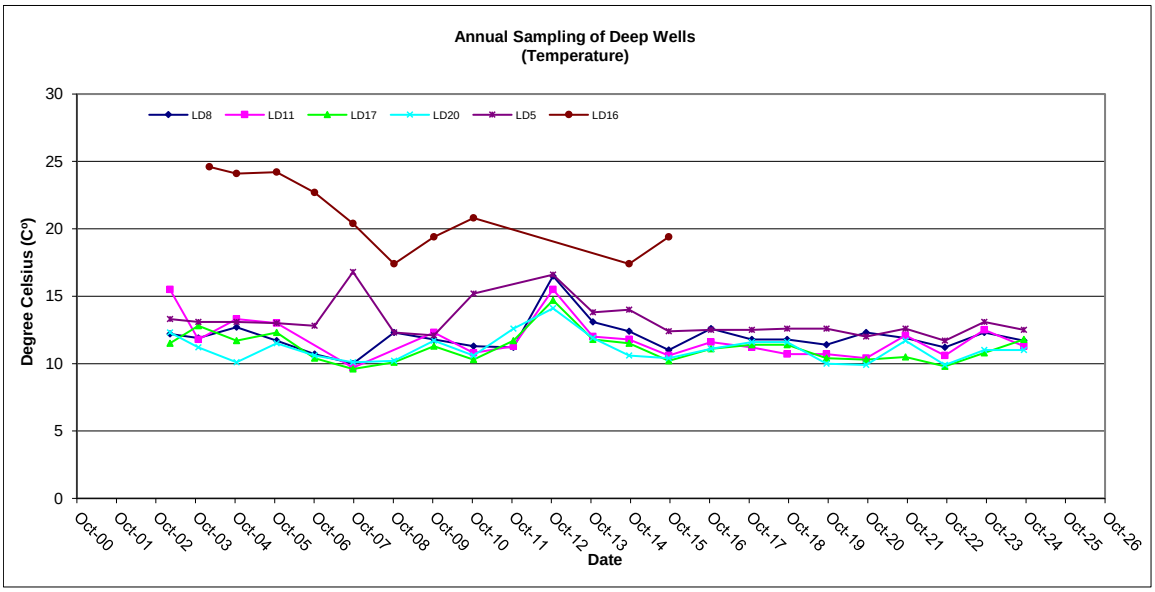




Annual Sampling of Deep Wells Charts
(Fairfield Landfill)







APPENDIX E
(Surface Water Sampling)

SURFACE WATER SAMPLING RESULTS

FH37

Parameter	FH37 Date	19/10/2009	20/01/2010	15/04/2010		21/10/2010	ANZECC Trigger Levels (1) (95% level of Protection - Fresh Water)	ECan - Review of Nitrate Toxicity to Freshwater Aquatic Species (95% level of Protection)
DO	ppm	7.92	3.64	8.1	No Sample Collected	0	-	-
pH	pH units	7.41	5.26	6.78		5.73	7.2 - 7.8 (2)	-
Conductivity	mS/cm	0.085	0.538	0.565		0.58	-	-
Temperature	°C	8.8	13.3	10.4		9.7	-	-
Ammoniacal Nitrogen	mg/L	0.06	1.48	0.13		1.33	0.9 (4)	-
Nitrate Nitrogen	mg/L	0.217	0.024	0.221		0.051	7.2	1.7
Chloride	mg/L	51	87	52		54	-	-
BOD_5	mg/L	5	3	2		2	-	-
Iron	mg/L	0.81 (9)	2 (9)	1.22 (9)		5.8 (9)	-	-
Lead	mg/L	0.00014 (9)	<0.00010 (9)	<0.0010 (9)		<0.00010 (9)	0.040 (7)	-
Zinc	mg/L	0.0046 (9)	0.17 (9)	0.0133 (9)		0.134 (9)	0.042 (7)	-
Boron	mg/L	0.09 (9)	0.48 (9)	0.069 (9)		0.48 (9)	0.37	-
Water Level-100m	m	0.62	0.60	0.65		0.59	-	-

FH37

Parameter	FH37 Date	25/01/2011	18/04/2011	28/07/2011	25/10/2011	25/01/2012	26/04/2012	18/07/2012	16/10/2012	29/01/2013	23/04/2013	22/07/2013	30/10/2013	28/01/2014	14/05/2014	24/07/2014	22/10/2014	27/01/2015	ANZECC Trigger Levels (1) (95% level of Protection - Fresh Water)	ECan - Review of Nitrate Toxicity to Freshwater Aquatic Species (95% level of Protection)
DO	ppm	No Sample Collected	Nop Sample Collected	No Sample Collected	No Sample Collected	No Sample Collected	No Sample Collected	No Sample Collected	No Sample Collected	No Sample Collected	No Sample Collected	No Sample Collected	No Sample Collected	No Sample Collected	No Sample Collected	No Sample Collected	No Sample Collected	No Sample Collected	-	-
pH	pH units																		7.2 - 7.8 (2)	-
Conductivity	mS/cm																		-	-
Temperature	°C																		-	-
Ammoniacal Nitrogen	mg/L																		0.9 (4)	-
Nitrate Nitrogen	mg/L																		7.2	1.7
Chloride	mg/L																		-	-
BOD_5	mg/L																		-	-
Iron	mg/L																		-	-
Lead	mg/L																		0.040 (7)	-
Zinc	mg/L																		0.042 (7)	-
Boron	mg/L																		0.37	-
Water Level-100m	m																		-	-

FH 38

Parameter	FH38 Date	1/06/2001	1/09/2001	1/12/2001	1/04/2002	1/07/2002	1/10/2002	13/02/2003	15/04/2003	30/07/2003	11/11/2003	10/02/2004	21/04/2004	28/05/2004
DO	ppm	No sample collected	No sample collected	No sample collected	5.88	10.3	8.5	3.92	5.07	8.01	5.24	3.32	7.71	No sample collected
pH	pH units				5.77	5.96	5.93	3.8	5.56	6.08	6.25	5.94	6.63	
Conductivity	mS/cm				0.62	0.378	0.516	0.827	0.728	0.643	0.636	0.799	0.661	
Temperature	°C				9.6	5.8	8.6	12.8	9.2	5.5	11.3	12.1	10.2	
Ammoniacal Nitrogen	mg/L				1.49	0.54	1.08	2.42	2.01	1.37	1.68	2.15	0.55	
Nitrate Nitrogen	mg/L				0.064	0.807	0.075	0.02	0.059	0.081	0.021	0.11	0.063	
Chloride	mg/L				58	44	51	57	66	65	60	66	65	
BOD_5	mg/L				0	1	0				4	0	1	
Iron	mg/L				6.49	4.4	4.2	5	7.9	5.3	8.2	9	4.3	
Lead	mg/L				0.0002	0.0007	0.0002	0.0001	0.0003	0.001	0.0003	0	0.0002	
Zinc	mg/L				0.185	0.05	0.1	0.35	0.23	0.12	0.09	0.16	-	
Boron	mg/L				-	-	-	-	-	-	-	-	-	
Water Level-100m	m				-	-	0.56	0.52	0.51	0.54	-	0.55	0.61	

Parameter	FH38 Date	30/07/2004	13/01/2005	1/04/2005	1/07/2005	1/10/2005	1/01/2006	6/04/2006	11/07/2006	11/10/2006	11/01/2007	4/04/2007	5/07/2007	1/10/2007	10/01/2008	9/04/2008
DO	ppm	10.65	3.59	4.16	8.17	6.2	5.25	6.39	9.07	7.83	7.85	7.46	9.75	8.48	3.53	8.6
pH	pH units	6.35	6.4	5.8	6.5	5.77	6.13	5.33	6.08	6.23	6.88	6.67	6.92	6.49	5.48	5.87
Conductivity	mS/cm	0.556	0.526	0.596	0.494	0.591	0.564	0.623	0.5	0.528	0.41	0.375	0.35	0.46	1.01	0.81
Temperature	°C	4.4	12.5	10.1	6.1	9.9	13.8	12.2	4.9	8.5	14.6	10.7	5.6	9.3	12.9	14.3
Ammoniacal Nitrogen	mg/L	0.62	0.87	1.32	0.88	1.4	1.33	1.44	1.13	0.97	0.29	0.7	0.27	0.74	4.49	3.15
Nitrate Nitrogen	mg/L	0.095	0.051	0.03	0.14	0.063	0.092	0.138	0.154	0.203	0.091	0.442	0.97	0.377	<0.008	<0.008
Chloride	mg/L	60	49	49	53	57	48	56	57	54	47	38	45	48	69	70
BOD_5	mg/L		1	1	<1	<1	4	1	<1	<1	2	3	<1	2	5	3
Iron	mg/L	3.6	11	10	4	6.9	8.6	4.2	4.7	5.2	5.7	6.3	2.1	7.1	31	21
Lead	mg/L	0.0023	0.0002	<0.0001	0.0003	0.0002	0.0002	<0.0001	0.0005	0.0004	0.0017	0.0014	0.0015	0.0006	<0.00011	<0.00011
Zinc	mg/L	0.05	0.03	0.09	0.06	0.1	0.1	0.13	0.06	0.09	-	0.3	<0.03	0.05	0.28	0.16
Boron	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Water Level-100m	m	0.57	0.52		0.33	0.31	0.39	0.41	0.51	0.51	0.57	0.58	0.71	0.55	0.5	0.46

Parameter	FH38 Date	15/07/2008	15/10/2008	13/01/2009	16/04/2009	24/07/2009	19/10/2009	20/01/2010	15/04/2010	27/07/2010	21/10/2010	ANZECC Trigger Levels (1) (95% level of Protection - Fresh Water)	ECan - Review of Nitrate Toxicity to Freshwater Aquatic Species (95% level of Protection)
DO	ppm	5.22	4.1	2.94	3.19	8.9	9.47	4.08	3.5	6.81	0	-	-
pH	pH units	6.15	5.06	5.27	6.04	6.52	6.24	5.3	5.3	6.59	5.75	7.2 - 7.8 (2)	-
Conductivity	mS/cm	0.65	0.63	0.67	0.7	0.38	0.122	0.609	0.685	0.539	0.6	-	-
Temperature	°C	7.1	12.2	13.8	12.3	6.8	10.1	13.3	11.9	7.9	9.8	-	-
Ammoniacal Nitrogen	mg/L	1.73	1.93	1.94	1.72	2.45	1.41	1.82	1.97	1.09	1.34	0.9 (4)	-
Nitrate Nitrogen	mg/L	0.245	0.029	0.040	0.087	1.08	0.107	0.008	0.024	0.145	0.049	7.2	1.7
Chloride	mg/L	50	54	48	53	40	51	70	70	55	53	-	-
BOD_5	mg/L	7	1	3	6	<1	5	3	2	1	2	-	-
Iron	mg/L	12	12	1.1	18	3.4	6.4 (9)	12 (9)	8.6 (9)	4.7 (9)	6.4 (9)	-	-
Lead	mg/L	0.00073	0.0002	<0.00011	0.00019	0.00065	<0.00010 (9)	<0.00010 (9)	<0.0010 (9)	<0.00010 (9)	<0.00010 (9)	0.040 (7)	-
Zinc	mg/L	0.12	0.24	<0.03	0.19	0.05	0.12 (9)	0.22 (9)	0.24 (9)	0.107 (9)	0.145 (9)	0.042 (7)	-
Boron	mg/L	-	-	-	0.57	-	0.42 (9)	0.61 (9)	0.63 (9)	0.36 (9)	0.46 (9)	0.37	-
Water Level-100m	m	0.1	0.56	0.525	0.52	0.57	0.62	0.60	0.65	0.63	0.59	-	-

FH38

Parameter	FH38 Date	25/01/2011	18/04/2011	28/07/2011	25/10/2011	25/01/2012	26/04/2012	18/07/2012	16/10/2012	29/01/2013	23/04/2013	22/07/2013	30/10/2013	28/01/2014
DO	ppm	3.49	9.36	9.44	5.74	5.41	4.32	9.18	6.98	3.16	8.75	7.04	7.38	2.75
pH	pH units	5.55	7.82	6.92	6.39	5.11	5.83	6.69	6.38	4.6	5.93	5.52	6.04	5.04
Conductivity	mS/cm	0.585	2.92	0.4	0.565	0.634	0.587	1.746	9.88	0.634	0.258	0.461	0.558	0.558
Temperature	°C	13.9	8.4	4.7	12.1	13.7	12.6	6.2	9.2	17.8	11.8	9.1	12	13.8
Ammoniacal Nitrogen	mg/L	1.5	0.173	0.55	1.0	1.70	1.30	19.50	0.66	1.90	0.12	0.69	1.20	1.30
Nitrate Nitrogen	mg/L	0.058	0.101	0.41	0.165	0.068	0.031	<0.002	0.114	0.021	0.38	0.121	0.032	0.02
Chloride	mg/L	50	32	47	57	51	53	56	43	52	29	44	50	50
BOD_5	mg/L	8	<1	<1	<1	1.2	<2	5	<2	<2	4	<2	<2	<2
Iron	mg/L	38 (9)	1.99 (9)	2.9 (9)	4.4 (9)	7.6 (9)	10 (10)	22 (10)	3.7 (10)	12.5 (10)	1.37 (10)	4.9 (10)	8.7 (10)	9.2 (10)
Lead	mg/L	0.00180 (9)	0.00053 (9)	<0.00010 (9)	<0.00010 (9)	0.00024 (9)	<0.00010 (10)	<0.00036 (10)	<0.00010 (10)	<0.00010 (10)	0.0046 (10)	< 0.00010 (10)	< 0.00010 (10)	< 0.00010 (10)
Zinc	mg/L	0.185 (9)	0.025 (9)	0.050 (10)	0.076 (10)	0.190 (10)	0.139 (10)	0.0092 (10)	0.078 (10)	0.26 (10)	0.032 (10)	0.087 (10)	0.187 (10)	0.184 (10)
Boron	mg/L	0.54 (9)	0.112 (9)	0.168 (10)	0.36 (10)	0.56 (10)	0.53 (10)	1.49 (10)	0.26 (10)	0.61 (10)	0.08 (10)	0.28 (10)	0.44 (10)	0.51 (10)
Copper	mg/L	0.0025 (9)	0.0022 (9)	0.0015 (10)	0.0022 (10)	0.0025 (10)	0.0034 (10)	0.0009 (10)	0.0013 (10)	-	-	-	-	-
Water Level-100m	m	0.62	0.75	0.61	0.52	0.53	0.43	0.75	0.44	0.38	0.68	0.48	0.36	0.39

Parameter	FH38 Date	14/05/2014	24/07/2014	22/10/2014	27/01/2015	21/04/2015	22/07/2015	12/10/2015	26/01/2016	28/04/2016	27/07/2016	26/10/2016	11/01/2017	20/04/2017	1/08/2017	28/08/2017
DO	ppm	6.84	7.67	3.81	2.31	7.08	7.85	4.21	2.68	8.59	8.57	6.29	3.36	5.42	5.43	3.32
pH	pH units	5.75	6.13	5.32	4.67	6.04	5.74	6.23	5.04	6.1	6.5	5.82	5.19	5.68	5.76	5.65
Conductivity	mS/cm	0.376	0.46	0.572	0.691	0.55	0.528	0.589	0.707	0.091	0.471	0.482	0.621	0.483	0.496	0.505
Temperature	°C	9.5	7.2	10.9	13.6	11	8.4	11.7	13	17.2	6.1	11.9	13.3	11.2	9.4	10.8
Ammoniacal Nitrogen	mg/L	0.36	0.60	1.00	1.70	0.65	0.66	1.10	2.00	1.40	0.38	0.63	1.20	0.53	0.66	0.78
Nitrate Nitrogen	mg/L	0.127	0.21	< 0.2	< 0.2	0.118	0.105	0.044	0.017	0.035	0.51	0.127	0.049	0.095	0.24	0.139
Chloride	mg/L	39	50	52	54	51	51	55	58	60	48	46	52	45	49	52
BOD_5	mg/L	<2	<2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	<2	<2	<2	<2
Iron	mg/L	3.2 (10)	3.8 (10)	7.6 (10)	16.4 (10)	5.8 (10)	5.4 (10)	8.2 (10)	15.7 (10)	11 (10)	2.8 (10)	4.2 (10)	9.0 (10)	1.86 (10)	2.7 (10)	4.5 (10)
Lead	mg/L	0.00030 (10)	< 0.00010 (10)	< 0.00010 (10)	0.00041 (10)	0.00031 (10)	0.00022 (10)	< 0.0001 (10)	0.00067 (10)	0.00016 (10)	< 0.0001 (10)	< 0.0001 (10)	< 0.0001 (10)	0.00012 (10)	<0.00010 (10)	<0.00010 (10)
Zinc	mg/L	0.034 (10)	0.064 (10)	0.141 (10)	0.28 (10)	0.088 (10)	0.098 (10)	0.158 (10)	0.32 (10)	0.24 (10)	0.073 (10)	0.084 (10)	0.184 (10)	0.043 (10)	0.089 (10)	0.079 (10)
Boron	mg/L	0.185 (10)	0.20 (10)	0.43 (10)	0.71 (10)	0.26 (10)	0.29 (10)	0.47 (10)	0.64 (10)	0.52 (10)	0.17 (10)	0.25 (10)	0.54 (10)	0.31 (10)	0.40 (10)	0.35 (10)
Copper	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Water Level-100m	m	0.55	0.47	0.39	0.40	-	0.60	0.40	0.41	0.40	0.50	0.46	0.47	0.50	0.50	0.50

Parameter	FH38 Date	9/11/2017	25/01/2018	24/04/2018	26/07/2018	9/10/2018	17/01/2019	1/05/2019	18/07/2019	22/10/2019	12/02/2020	ANZECC Trigger Levels (1) (95% level of Protection - Fresh Water)	ECan - Review of Nitrate Toxicity to Freshwater Aquatic Species (95% level of Protection)
DO	ppm	4.98	2.52	8.8	8.74	8.8	3.51	0	6.51	4.6	3.85	-	-
pH	pH units	5.94	4.9	5.91	6.24	5.91	6.4	5.98	5.55	5.7	5.77	7.2 - 7.8 (2)	-
Conductivity	mS/cm	0.451	0.565	0.488	0.405	0.501	0.539	0.525	0.588	0.507	0.477	-	-
Temperature	°C	11.2	15.7	10.8	7.2	10.8	15.3	11	8.4	11.2	13.4	-	-
Ammoniacal Nitrogen	mg/L	0.69	1.44	0.64	0.3	0.64	1.64	0.67	0.80	0.69	0.85	0.9 (4)	-
Nitrate Nitrogen	mg/L	0.52	0.051	0.133	0.56	0.133	0.105	0.29	0.003	0.065	0.039	7.2	1.7
Chloride	mg/L	46	52	48	41	48	41	46	56	45	44	-	-
BOD_5	mg/L	2	3	<2	<2	<2	<2	<2	<2	<2	<2	-	-
Iron	mg/L	4.0 (10)	8.6 (10)	7.8 (10)	2.5 (10)	4.6	0.8	4.5	6.4	5.9	6.0	-	-
Lead	mg/L	0.00054 (10)	<0.00010 (10)	<0.00010 (10)	0.0002 (10)	0.0001 (10)	0.00016 (10)	<0.00010 (10)	<0.00010 (10)	<0.00010 (10)	0.00011 (10)	0.040 (7)	-
Zinc	mg/L	0.173 (10)	0.184 (10)	0.196 (10)	0.041 (10)	0.1 (10)	0.044 (10)	0.127 (10)	0.144 (10)	0.125 (10)	0.2 (10)	0.042 (7)	-
Boron	mg/L	0.29 (10)	0.48 (10)	0.41 (10)	0.154 (10)	0.32 (10)	0.38 (10)	0.29 (10)	0.37 (10)	0.39 (10)	0.42 (10)	0.37	-
Copper	mg/L	-	-	-	-	-	-	-	-	-	-	0.0073 (7)	-
Water Level-100m	m	0.49	0.40	0.45	0.50	0.50	0.48	0.53	0.50	0.60	1.60	-	-

Notes:
1. Australian and New Zealand Guidelines for Fresh and Marine water Quality 2000 (ANZECC 2000).
2. Trigger level for physical and chemical stresses for a slightly disturbed system (lowland river)
3. Trigger level for physical and chemical stresses for a slightly disturbed system (Estuaries - South East Austrialia in the absence of any NZ trigger level)
4. Trigger level based on a pH of 8.0 and temperature of 20°C (Fresh Water)
5. Trigger level based on a pH of 8.0 and temperature of 20°C (Marine)
6. Trigger level adjusted for hardness of water (water 'soft' based on actual sampling)
7. Trigger level adjusted for hardness of water (water 'very hard' based on actual sampling)
8. Fresh water trigger level used in absence of a marine trigger level.
9. Dissolved fraction measured (laboratory filtered)
10. Dissolved fraction measured (field filtered)

- Concentration above the Ecan Trigger Value
- Concentration above the ANZECC Trigger Value
- Concentration exceeds the ANZECC 2000 'High Reliability' Trigger Value (based on a pH of 8.0), although is below the pH adjusted value as per Table 8.3.7 in the ANZECC 2000 Guidelines.

Parameter	FH 39	FH 39																																		ANZECC Trigger Levels [1,2] (95% level of Protection - Marine)	ECan - Review of Nitrate Toxicity to Freshwater Aquatic Species (95% level of Protection)
	Date	1/06/2001	1/09/2001	1/12/2001	1/04/2002	1/07/2002	1/10/2002	13/02/2003	15/04/2003	30/07/2003	11/11/2003	10/02/2004	21/04/2004	28/05/2004	30/07/2004	13/01/2005	1/04/2005	1/07/2005	1/10/2005	1/01/2006	6/04/2006	11/07/2006	11/10/2006	1/01/2007	4/04/2007	5/07/2007	1/10/2007	10/01/2008	9/04/2008	15/07/2008	15/10/2008	13/01/2009	16/04/2009	24/07/2009	19/10/2009	20/01/2010	15/04/2010	27/07/2010	21/10/2010		
DO	ppm	7.6	8.6	6	18.9	5.6	9.2	13.32	3.7	8.94	2.54	6.5	3.84	5.4	9.23	3.56	9.42	6.71	9.2	5.61	10.66	4.96	8.79	11.14	4.35	8.17	7.41	15.3	7.03	3.72	10.4	9.21	4.79	8.61	8.99	5.56	7.6	7.79	-	-	-
pH	pH units	6.9	6.7	6.5	6.95	6.53	7.14	7.85	7.23	7.11	7.18	7.54	7	7.13	7.25	6.87	7.18	7.2	7.21	7.47	7.28	6.74	7.59	7.84	7.24	6.91	7.04	7.42	7.89	7.15	6.78	7.68	7.58	7.13	7.43	7.16	7.15	7.34	7.18	7.0 - 8.5 [3]	-
Conductivity	mS/cm	1.07	0.95	0.476	4.03	0.478	4.56	1.088	2.45	1.03	0.863	3.23	4.54	1.084	3.01	0.659	0.822	0.878	0.828	0.709	0.938	0.89	2.5	0.76	0.952	0.3654	0.58	1.64	5.12	0.82	3.86	1.16	0.9	2.41	0.965	1.093	1.16	0.858	0.83	-	-
Temperature	°C	5	11.4	17.1	11.1	4.6	12	24.5	11.4	2.5	12.3	16.6	12.1	5.4	2.5	13.2	10.4	5.0	13.9	19.3	14.8	4.6	9.7	18.4	11.3	4.6	12.1	17.4	17.8	5.6	14.3	19.7	13.1	6.2	10.7	17.3	11.3	6.7	7.2	-	-
Ammoniacal Nitrogen	mg/L	0.99	2.61	0.49	0.04	1.17	0.41	0.43	1.16	0.33	1.57	0.6	0.63	0.85	2.23	1.88	4.03	4.45	0.85	1.69	0.1	2.85	0.2	0.72	1.16	0.36	1.19	0.56	<0.01	2.97	2.9	0.49	1.05	0.42	1.08	<0.01	0.39	6.22	3.79	0.91 [5]	-
Nitrate Nitrogen	mg/L	1.8	1.71	0.84	0.777	1.37	0.966	0.101	0.28	1.99	0.223	0.065	0.231	0.0002	1.73	0.574	0.685	1.44	1.07	0.453	1.02	2.38	1.53	0.584	1.07	1.46	1.81	0.382	0.018	1.94	1.26	0.128	1.56	0.42	1.02	0.314	0.79	1.34	1.23	7.2 [8]	1.7
Chloride	mg/L	170	108	1370	1460	44	1220	123	748	231	104	795	1140	1540	737	64	66	104	95	67	101	107	667	80	123	46	56	367	1680	83	1020	502	452	495	127	240	230	100	71	-	-
BOD_5	mg/L	3	0	4	6		1	-	-	-	1	5	1	4.6	0	0	0	<1	2	3	2	<1	1	4	1	<1	1	8	63	6	1	3	1	<1	3	6	2	1	1	-	-
Iron	mg/L	1.2	0.37	0.67	0.27	1.5	0.37	4	1.9	0.09	2.3	3.2	1.9	4.6	1.2	1.5	0.62	0.64	0.78	1.4	0.41	0.2	0.18	1.2	0.57	1	1.8	0.57	1.5	1.1	0.38	1.1	4	1.1	0.10 [9]	0.84 [9]	0.32 [9]	0.09 [9]	0.07 [9]	-	-
Lead	mg/L	0.002	-	0.004	0.0002	0.0009	-	0.005	0.0035	0.0003	0.0022	0.0041	0.0012	0.0009	0.0016	0.0009	0.0002	0.0004	0.0004	0.0009	0.0003	0.0001	0.0003	0.0005	0.0004	0.016	0.0009	0.0012	0.001	0.0053	0.00054	0.0014	0.0063	0.00075	<0.00050 [9]	<0.00010 [9]	<0.0010 [9]	<0.00010 [9]	<0.00010 [9]	0.052 [7]	-
Zinc	mg/L	0.044	0.05	-	0.011	0.06	-	0.04	-	-	-	-	-	-	-	-	<0.03	0.04	<0.03	<0.03	<0.03	0.03	<0.03	<0.003	<0.03	<0.03	0.04	<0.03	<0.03	0.08	0.08	<0.03	0.065	0.04	0.019 [9]	0.0044 [9]	0.047 [9]	0.036 [9]	0.00129 [9]	0.078 [7]	-
Boron	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.83	-	-	0.79 [9]	0.77 [9]	0.84 [9]	0.92 [9]	0.84 [9]	-	-
Water Level-100m	m	-	-	-	-	-	0.56	0.085	0.08	0.1	-	0.22	0.11	#N/A	0.08	-0.05		-0.1	0.23	-0.15	0.23	0.03	0.43	<0	<0	<0	<0	0.1	<0	<0	0.18	0.1	<0	0.23	0.57	0.15	0.29	0.00	0.40	-	-

Parameter	FH 39	FH39																																			ANZECC Trigger Levels [1,2] (95% level of Protection - Marine)	ECan - Review of Nitrate Toxicity to Freshwater Aquatic Species (95% level of Protection)
	Date	25/01/2011	18/04/2011	28/07/2011	25/10/2011	25/01/2012	26/04/2012	18/07/2012	16/10/2012	29/01/2013	23/04/2013	22/07/2013	30/10/2013	28/01/2014	14/05/2014	24/07/2014	22/10/2014	27/01/2015	21/04/2015	22/07/2015	12/10/2015	26/01/2016	28/04/2016	27/07/2016	26/10/2016	11/01/2017	20/04/2017	1/08/2017	29/08/2017	9/11/2017	25/01/2018	24/04/2018	26/07/2018	9/10/2018	17/01/2019	1/05/2019	17/07/2019	22/10/2019	12/02/2020		
DO	ppm	5.9	8.29	10.19	11.48	6.45	7.28	10.32	10.23	8.03	6.96	7.1	9.89	6.32	6.97	7.54	6.75	3.53	6.63	9.71	7.84	9.37	7.2	8.28	8.57	5.83	8.38	7.21	6.72	11.56	6.39	7.43	7.98	6.34	7.87	0	7.63	8.34	5.89	-	-
pH	pH units	6.89	7.72	7.39	7.42	7.01	6.76	7.07	7.08	6.72	6.21	6.37	7.11	6.92	6.41	6.86	6.49	6.8	6.57	6.63	6.89	7.23	6.6	6.84	6.74	6.94	6.17	6.19	6.53	6.97	7.4	6.97	6.62	6.74	7	7.04	6.88	6.72	6.65	7.0 - 8.5 [3]	-
Conductivity	mS/cm	2.85	2.49	9.57	1.304	2.9	0.991	2.279	69.3	0.798	4.21	0.736	0.787	0.841	0.465	0.825	1.049	0.927	12.93	4.95	3.72	4.03	3.29	0.909	0.937	3.28	0.849	0.828	0.835	6.58	0.89	5.1	0.545	2.71	0.722	0.7	15.4	0.737	1.185	-	-
Temperature	°C	17.6	8.5	3.3	13	15.8	11.1	5.3	9.8	18.1	12.6	8.7	17.8	19.6	9.2	5.7	11.2	18.9	12.1	6.6	12.8	19.8	12.9	5.2	14.7	18.1	11	8	10.9	14.9	20.8	12.1	6.9	11.6	17	11.2	5.8	11	15.7	-	-
Ammoniacal Nitrogen	mg/L	0.62	0.53	1.1	1.5	1	2.6	3.5	0.73	1.13	0.42	4.3	1.6	0.63	1.2	3.9	1.1	0.071	0.6	2.3	1.4	0.24	0.7	1.4	1.4	1.3	1.01	6.5	4.0	2.4	1.0	1.1	1.4	1.1	1.6	1.0	1.6	1.5	1.2	0.91 [5]	-
Nitrate Nitrogen	mg/L	0.31	0.34	0.51	0.65	0.83	1.02	0.86	0.57	1.04	0.65	0.97	0.89	0.35	0.83	1.35	0.98	0.064	0.74	0.69	0.91	0.175	0.71	1.11	0.74	0.66	0.49	0.47	0.96	0.78	0.43	0.55	1.02	0.6	0.64	0.77	0.66	0.62	0.58	7.2 [8]	1.7
Chloride	mg/L	700	870	2500	280	600	81	590	910	67	1200	66	69	87	47	103	130	97	1340	1360	920	730	800	131	117	770	118	66	76	1560	116	1330	51	680	69	93	4500	71	240	-	-
BOD_5	mg/L	2.2	1.8	<1	<1	2.3	<2	<2	<2	<2	2	<2	3	<2	<2	2	<2	2	3	<2	<2	6	< 2	<2	4	<2	4	<2	6	<2	10	<2	<2	<2	<2	<2	<2	<2	<2	-	-
Iron	mg/L	1.65 [9]	0.7 [9]	<0.2 [10]	0.14 [10]	2.0 [10]	0.18 [10]	0.18 [10]	0.41 [10]	0.46 [10]	0.19 [10]	0.26 [10]	0.14 [10]	0.33 [10]	1.02 [10]	0.25 [10]	0.19 [10]	0.97 [10]	0.13 [10]	0.35 [10]	0.18 [10]	1.8 [10]	0.12 [10]	0.38 [10]	0.24 [10]	0.09 [10]	0.61 [10]	0.95 [10]	0.41 [10]	1.84 [10]	0.62 [10]	<0.0005	0.0002	<0.0005	0.59 [10]	0.57 [10]	0.3 [10]	0.25 [10]	0.21 [10]	-	-
Lead	mg/L	0.0022 [9]	<0.0002 [9]	<0.0010 [10]	<0.00010 [10]	<0.0015 [10]	0.00011 [10]	0.00011 [10]	0.0002 [10]	0.00011 [10]	<0.0002 [10]	< 0.00010 [10]	<0.00010 [10]	0.00017 [10]	0.00029 [10]	<0.00010 [10]	0.00011 [10]	<0.00010 [10]	0.00055 [10]	<0.0002 [10]	< 0.0002 [10]	0.001 [10]	< 0.0005 [10]	0.00013 [10]	< 0.0001 [10]	< 0.0002 [10]	0.00013 [10]	0.00010 [10]	<0.00010 [10]	0.0016 [10]	0.00027 [10]	<0.00010	0.0002	<0.00010	0.00015 [10]	0.00010 [10]	0.00010 [10]	<0.00010 [10]	<0.00010 [10]	0.052 [7]	-
Zinc	mg/L	0.018 [9]	0.018 [9]	0.019 [10]	0.0092 [10]	0.018 [10]	0.018 [10]	0.018 [10]	0.013 [10]	0.0177 [10]	0.015 [10]	0.05 [10]	0.0112 [10]	0.0099 [10]	0.028 [10]	0.0182 [10]	0.0174 [10]	0.02 [10]	0.021 [10]	0.026 [10]	0.015 [10]	0.018 [10]	0.021 [10]	0.05 [10]	0.02 [10]	0.021 [10]	0.03 [10]	0.081 [10]	0.028 [10]	0.031 [10]	0.0068 [10]	0.013	0.025	0.02	0.0192 [10]	0.023 [10]	0.032 [10]	0.048 [10]	0.067 [10]	0.078 [7]	-
Boron	mg/L	0.63 [9]	0.46 [9]	0.88 [10]	0.63 [10]	0.75 [10]	0.90 [10]	0.90 [10]	0.46 [10]	0.82 [10]	0.58 [10]	0.64 [10]	0.75 [10]	0.72 [10]	0.30 [10]	0.63 [10]	0.7 [10]	0.85 [10]	0.63 [10]	0.7 [10]	0.85 [10]	0.77 [10]	0.66 [10]	0.36 [10]	0.68 [10]	0.90 [10]	0.59 [10]	0.79 [10]	0.72 [10]	0.90 [10]	0.59 [10]	0.98	0.58	0.99	0.59 [10]	0.42 [10]	1.47 [10]	0.6 [10]	0.62 [10]	-	-
Copper	mg/L	0.0013 [9]	<0.0010 [9]	<0.005 [10]	0.001 [10]	0.0026 [10]	0.0007 [10]	0.0007 [10]	<0.0010 [10]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0068 [7]	-
Water Level-100m	m	0.10	0.66	0.53	0.00	-0.10	0.09	0.27	0.10	-0.10	0.50	-0.10	-0.10	0.08	-0.03	-0.10	0.01	0.12	-	0.54	0.29	0.00	0.28	0.16	-0.08	0.17	-0.05	-0.05	-0.05	0.05		0.12	-0.10	0.16						-	-

Parameter	FH40	FH 40																																				ANZECC Trigger Levels [1,2] (95% level of Protection - Marine)	ECan - Review of Nitrate Toxicity to Freshwater Aquatic Species (95% level of Protection)
	Date	1/06/2001	1/09/2001	1/12/2001	1/04/2002	1/07/2002	1/10/2002	13/02/2003	15/04/2003	30/07/2003	11/11/2003	10/02/2004	21/04/2004	28/05/2004	30/07/2004	13/01/2005	1/04/2005	1/07/2005	1/10/2005	1/01/2006	6/04/2006	11/07/2006	11/10/2006	11/01/2007	4/04/2007	5/07/2007	1/10/2007	10/01/2008	9/04/2008	15/07/2008	15/10/2008	13/01/2009	16/04/2009	24/07/2009	19/10/2009	20/01/2010	15/04/2010	27/07/2010	21/10/2010		
DO	ppm	7.1	11.8	11.6	9.2	11.8	12.1	11.19	8.4	9.21	3.26	7.3	3.4	7.8	13.74	4.37	6.84	7.8	9.6	3.85	12.54	9.82	9.78	6.22	6.22	10.98	11.87	10.74	9.27	6.25		8.83	8.41	10.22	9.35	8.77	7.5	11.3	0	-	-
pH	pH units	6.6	7.6	6.6	6.94	6.72	7.69	8.65	7.42	6.96	7.55	7.61	6.91	7.27	7.08	7.14	7.3	7.49	7.76	7.71	7.25	7.01	6.96	7.8	7.66	6.89	7.46	8.08	8.79	7.36		7.79	8.36	7.21	7.31	7.41	7.22	7.8	7.19	7.0 - 8.5 [3]	-
Conductivity	mS/cm	1.82	1.71	0.804	9.61	0.395	7.55	2.56	0.807	1.316	1.949	1.229	12.34	1.084	0.587	0.868	1.032	3.24	2.5	0.865	3.39	7.02	5.25	1.13	0.263	2.06	0.87	2.54	8.29	1.21		1.65	1.8	9.89	2.54	1.054	2.23	1.743	0.81	-	-
Temperature	°C	6	17	20.1	12.6	6	11.7	22.2	11.1	4.3	13.1	16	12.9	5.1	3.2	14.3	9.1	6.2	15.6	19.7	19.2	4.5	10.3	21.4	12.6	3.2	18.5	18.1	16.9	6.5		20	16.4	6.4	13.3	17.4	13.2	10.2	7.3	-	-
Ammoniacal Nitrogen	mg/L	1.4	1.6	0.23	0.79	0.24	0.02	0.25	0.04	0.16	0.79	0.61	0.16	0.76	0.17	4.13	<0.01	1.1	0.01	0.51	1.91	0.01	0.51	0.78	0.41	1.61	0.19	<0.01	3.53			0.05	0.92	0.72	0.02	<0.01	0.06	4.83	0.38	0.91 [5]	-
Nitrate Nitrogen	mg/L	1	0.727	0.141	-	2.02	-	-	0.139	0.324	0.013	0.129	0.037	0.417	0.2	0.262	0.163	0.888	<0.002	0.026	<0.002	0.93	0.002	0.046	0.07	1.3	0.835	0.026	0.019	0.862		0.032	0.237	0.52	<0.008	0.024	0.058	0.915	0.42	7.2 [8]	1.7
Chloride	mg/L	340	347	2480	3200	60	2650	700	374	374	480	327	4000	785	1750	149	126	810	803	118	1010	1930	1600	202	1210	568	130	636	2600	180		432	392	3220	3690	340	640	370	147	-	-
BOD_5	mg/L	2	0	10	4	0	2	36	0	0	3	2	4	0	0	1	0	<1	11	3	2	<1	1	10	6	1	2	6	49	8		5	2	1	3	4	2	1	2	-	-
Iron	mg/L	1.8	3.1	1.6	0.26	1.1	0.56	8.6	1.2	0.53	3	4.8	7.2	2.8	5.2	2.7	1.7	1.4	0.34	3.2	0.8	0.92	0.67	8.7	4.6	1.6	3.2	0.7	1.1	0.92		0.42	3.3	0.87	<0.2 [9]	0.11 [9]	0.061 [9]	0.08 [9]	0.08 [9]	-	-
Lead	mg/L	0.002	-	0.004	0.0005	0.0013	0.001	0.0266	0.0035	0.0015	0.0071	0.0112	0.0222	0.0057	0.0097	0.0063	0.0032	0.0013	0.0009	0.0045	0.0004	0.0016	0.0019	0.0186	0.01	0.0016	0.0053	0.0022	0.0021	0.0014		0.0032	0.0079	<0.0021	<0.0010 [9]	0.00025 [9]	<0.0010 [9]	<0.00010 [9]	<0.00010 [9]	0.052 [7]	-
Zinc	mg/L	0.06	-	-	0.018	0.03	-	0.11	-	0.04	-	0.05	0.1	-	0.08	-	<0.03	0.04	<0.03	<0.03	<0.03	0.03	<0.03	0.08	0.04	0.04	0.04	<0.03	<0.03	0.22		<0.03	0.034	0.05	0.015 [9]	0.003 [9]	0.0062 [9]	0.0156 [9]	0.0053 [9]	0.078 [7]	-
Boron	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	0.76	-	0.9 [9]	0.17 [9]	0.28 [9]	0.95 [9]	0.38 [9]	-	-
Water Level-100m	m	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	0.62	0.78	0.93	0.63	0.69	-	-

Parameter	FH40	FH40																																				ANZECC Trigger Levels [1,2] (95% level of Protection - Marine)	ECan - Review of Nitrate Toxicity to Freshwater Aquatic Species (95% level of Protection)
	Date	25/01/2011	18/04/2011	28/07/2011	25/10/2011	25/01/2012	26/04/2012	18/07/2012	16/10/2012	29/01/2013	23/04/2013	22/07/2013	30/10/2013	28/01/2014	14/05/2014	24/07/2014	22/10/2014	27/01/2015	21/04/2015	22/07/2015	12/10/2015	26/01/2016	28/04/2016	27/07/2016	27/10/2016	11/01/2017	20/04/2017	1/08/2017	29/08/2017	9/11/2017	25/01/2018	24/04/2018	26/07/2018	9/10/2018	17/01/2019	1/05/2019	17/07/2019	22/10/2019	12/02/2020		
DO	ppm	7.61	8.69	11.32	10.83	9.14	12.61	10.76	10.53	10.99	7.21	8.62	10.21	7.58	6.84	8.82	7.48	5.2	9.07	12.26	8.86	9.73	7.38	9.84	6.42	7.24	9.3	8.76	7.95	8.46	8.07	7.51	7.81	8.08	7.74	0	8.35	8.35	7.4	-	-
pH	pH units	7.23	7.15	7.72	7.52	7.57	7.14	7.08	7.28	7.74	6.25	6.84	7.18	7.68	6.74	6.96	6.73	7.04	6.57	7.02	7.06	7.29	6.81	7.12	7.43	7.35	6.82	6.72	8.22	6.98	7.5	7.14	6.91	7.19	7.46	7.52	7.06	7.22	7.3	7.0 - 8.5 [3]	-
Conductivity	mS/cm	7.73	6.16	17.2	6.49	7.8	2.61	11.46	160.1	10.86	10.17	2.99	1.784	2.2	1.45	2.99	1.458	2.105	12.93	8.72	6.21	7.12	5.56	3.78	2.636	4.13	1.436	1.648	6.1	19.16	4.74	11.15	3.65	9.76	1.992	6.23	30.8	1.681	0.522	-	-
Temperature	°C	20.8	8.6	4.7	12.9	17	13.4	5.8	10.1	20.3	13.2	9.3	17.3	20.7	10.3	5.6	12.1	19	12.1	6.8	13.1	20.1	14.1	5.7	15.8	19.7	11	8.7	16.8	18	21.9	13	9.1	13.6	19.8	14.4	10.5	10.5	18.8	-	-
Ammoniacal Nitrogen	mg/L	0.141	0.094	0.32	0.66	0.99	0.032	0.89	0.159	0.45	0.36	2.3	0.67	0.185	1.1	2.3	0.165	0.33	0.28	0.085	0.025	0.152	0.27	0.32	0.87	0.042	0.99	4.1	0.84	0.76	0.177	0.28	1.12	0.35	1.03	0.53	0.44	0.88	<0.010	0.91 [5]	-
Nitrate Nitrogen	mg/L	0.044	0.106	0.22	0.48	0.102	0.013	0.27	0.32	0.048	0.26	0.46	0.46	0.02	0.44	0.91	0.41	0.029	0.118	0.22	0.005	0.02	0.06	1.06	0.44	0.062	0.41	0.48	0.117	0.33	0.005	0.16	0.81	0.23	0.41	0.4	0.22	0.62	<0.002	7.2 [8]	1.7
Chloride	mg/L	1960	1990	6000	2000	2400	660	3400	1930	155	4100	740	380	550	320	770	310	500	4100	2600	1880	1700	1620	750	610	990	290	300	1510	4900	1260	3400	900	2800	440	1560	10100	330	1580	-	-
BOD_5	mg/L	3.4	3.7	<1	9	10	7	<2	<2	4	2	<2	2	5	<2	<2	2	<2	3	<2	2	4	< 2	< 2	3	2	<2	2	7	5	9	<2	<2	<2	<2	<2	3	<2	<2	7	-	-
Iron	mg/L	2.3 [9]	0.51 [9]	<0.4 [10]	< 0.10 [10]	1.06 [10]	0.07 [10]	< 0.2 [10]	0.33 [10]	0.37 [10]	0.27 [10]	0.33 [10]	0.09 [10]	0.11 [10]	0.81 [10]	0.21 [10]	0.18 [10]	0.65 [10]	0.3 [10]	0.29 [10]	0.17 [10]	1.48 [10]	0.07 [10]	0.29 [10]	0.14 [10]	0.16 [10]	0.41 [10]	0.25 [10]	0.13 [10]	<0.2 [10]	0.11 [10]	<0.2 [10]	0.55	0.14	0.23	0.29	<0.4	0.22	0.22	-	-
Lead	mg/L	0.0085 [9]	<0.0005 [9]	<0.002 [10]	< 0.0005 [10]	0.0020 [10]	< 0.0002 [10]	< 0.0010 [10]	< 0.0005 [10]	0.00053 [10]	<0.0005 [10]	< 0.0002 [10]	0.00012 [10]	0.00032 [10]	0.00037 [10]	<0.00010 [10]	0.00034 [10]	0.00084 [10]	<0.0010 [10]	<0.0005 [10]	< 0.0005 [10]	0.0017 [10]	< 0.0002 [10]	0.0002 [10]	0.00016 [10]	<0.0002 [10]	0.00030 [10]	<0.00010 [10]	<0.0005 [10]	<0.0010 [10]	0.0003 [10]	<0.0010 [10]	0.0002	<0.0005	0.00017	<0.0005	<0.002	<0.0006	<0.0005	0.052 [7]	-
Zinc	mg/L	0.039 [9]	0.034 [9]	0.02 [10]	0.008 [10]	0.014 [10]	0.011 [10]	0.022 [10]	0.011 [10]	0.0053 [10]	0.038 [10]	0.018 [10]	0.0063 [10]	0.0053 [10]	0.022 [10]	0.010 [10]	0.0105 [10]	0.0078 [10]	0.024 [10]	0.009 [10]	< 0.005 [10]	0.017 [10]	0.011 [10]	0.031 [10]	0.0066 [10]	0.012 [10]	0.0095 [10]	0.0041 [10]	<0.005 [10]	<0.010 [10]	0.003 [10]	<0.010 [10]	0.025	0.02	0.0096	0.017	0.07	0.123	0.042	0.078 [7]	-
Boron	mg/L	0.66 [9]	0.59 [9]	1.33 [10]	0.73 [10]	0.91 [10]	0.48 [10]	0.99 [10]	0.60 [10]	0.78 [10]	0.72 [10]	0.67 [10]	0.74 [10]	0.48 [10]	0.43 [10]	0.61 [10]	0.45 [10]	0.48 [10]	0.94 [10]	0.69 [10]	0.58 [10]	0.69 [10]	0.47 [10]	0.32 [10]	0.74 [10]	0.68 [10]	0.57 [10]	0.73 [10]	1.53 [10]	1.58 [10]	0.81 [10]	1.58 [10]	0.58	0.99	0.66	0.8	2.4	0.68	0.54	-	-
Copper	mg/L	0.003 [9]	<0.003 [9]	<0.010 [10]	< 0.003 [10]	< 0.003 [10]	0.0020 [10]	< 0.005 [10]	< 0.003 [10]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0068 [7]	-
Water Level-100m	m	0.62	1.30	1.17	0.62	0.58	0.70	0.91	0.76	0.58	1.13	0.60	0.55	0.70	0.58	0.59	0.64	0.75	0.63	1.17	0.92	0.70	0.92	0.78	0.58	0.81	0.65	0.60	0.59	0.68	0.53	1.53	2.53	3.53	4.53	5.53				-	-

Notes:
1. Australian and New Zealand Guidelines for Fresh and Marine water Quality 2000 (ANZECC 2000).
2. Trigger level for physical and chemical stresses for a slightly disturbed system (lowland river)
3. Trigger level for physical and chemical stresses for a slightly disturbed system (Estuaries - South East Australia in the absence of any NZ trigger level)
4. Trigger level based on a pH of 8.0 and temperature of 20°C (Fresh Water)
5. Trigger level based on a pH of 8.0 and temperature of 20°C (Marine)
6. Trigger level adjusted for hardness of water (water 'soft' based on actual sampling)
7. Trigger level adjusted for hardness of water (water 'very hard' based on actual sampling)
8. Fresh water trigger level used in absence of a marine trigger level.
9. Dissolved fraction measured (laboratory filtered)
10. Dissolved fraction measured (field filtered)

Concentration above the Ecan Trigger Value
Concentration above the ANZECC Trigger Value
Concentration exceeds the ANZECC 2000 'High Reliability' Trigger Value (based on a pH of 8.0), although is below the pH adjusted value as per Table 8.3.7 in the ANZECC 2000 Guidelines.

Parameter	EW43	EW43																																				ANZECC Trigger Levels [1] (95% level of Protection - Fresh Water)	ECan - Review of Nitrate Toxicity to Freshwater Aquatic Species (95% level of Protection)
	Date	1/06/2001	1/09/2001	1/12/2001	1/04/2002	1/07/2002	1/10/2002	13/02/2003	15/04/2003	30/07/2003	11/11/2003	10/02/2004	21/04/2004	28/05/2004	30/07/2004	13/01/2005	1/04/2005	1/07/2005	1/10/2005	1/01/2006	6/04/2006	11/07/2006	11/10/2006	11/01/2007	4/04/2007	5/07/2007	1/10/2007	10/01/2008	9/04/2008	15/07/2008	15/10/2008	13/01/2009	16/04/2009	24/07/2009	19/10/2009	20/01/2010	15/04/2010	27/07/2010	21/10/2010		
DO	ppm	10.5	14.2	10	11	12.5	11.6	10.11	12.62	12.34	10.59	9.24	12.32	No sample collected	13.76	9.95	12.2	13.2	13.6	7.98	9.07	12.62	9.53	8.3	8.24	10.63	11.83	8.2	7.29	12.4	10.7	7.8	9.52	10.73	11.23	8.88	10.1	12.04	0	-	-
pH	pH units	6.8	8	6.8	7.22	6.6	6.74	7.47	7.62	7.25	7.31	7.7	7.38		7.09	7.18	7.00	7.48	8.0	7.45	7.09	7.03	7.4	7.52	7.35	7.19	7.27	7.43	7.19	7.37	6.89	7.34	7.86	7.18	7.18	7.43	7.67	8.18	7.34	7.2 - 7.8 [2]	-
Conductivity	mS/cm	0.34	0.192	0.19	2.45	0.265	0.738	0.242	0.1943	0.216	0.1859	0.149	0.578		0.244	0.236	0.182	0.212	0.106	0.115	0.171	0.35	0.202	0.24	0.278	0.46	0.32	0.2	0.76	0.24	1.58	0.19	0.2	0.6	0.607	0.158	0.222	0.284	0.16	-	-
Temperature	°C	9	10.9	17	11.6	4.8	9	19.9	11.4	6.6	12.7	17.5	12.3		3.8	13	10.2	7.1	13.6	20.1	13.7	3.9	9.8	16.2	13.3	3.9	11.2	18.8	14.2	6.1	12.9	19.6	13.6	6.7	9.2	17.3	12.6	7.8	8.5	-	-
Ammoniacal Nitrogen	mg/L	0.14	0.02	0.1	0.02	0.26	0.11	0.09	0.03	0.06	0.05	0.07	0.09		0.25	0.08	1.63	0.1	0.03	0.04	0.05	0.1	0.05	0.08	0.17	0.05	0.06	0.06	0.01	0.09	0.14	0.1	0.1	0.1	0.03	0.03	0.04	0.1	0.03	0.9 [4]	-
Nitrate Nitrogen	mg/L	1.1	0.171	0.267	0.207	1.87	0.361	0.148	0.148	0.329	0.175	0.226	0.098		0.341	0.442	0.223	0.216	0.138	0.008	0.054	0.365	0.221	0.257	0.288	1.4	0.933	0.088	0.189	0.545	0.224	0.057	0.186	0.759	0.163	0.128	0.159	0.452	0.16	7.2	1.7
Chloride	mg/L	520	16	18	745	26	155	21	22	29	20	15	133		24	25	14	25	8	9	27	63	20	26	31	79	37	20	178	33	415	90	90	178	785	55	22	45	14	-	-
BOD_5	mg/L	1	3	1	0	0	0	0	0	0	1	1	1		0	1	0	3	<1	2	1	<1	<1	2	1	<1	4	3	18	3	1	1	1	1	2	1	1	1	1	-	-
Iron	mg/L	0.53	0.31	0.64	0.39	1	0.54	0.85	0.27	0.33	0.73	0.65	0.45		0.49	0.88	0.41	0.28	0.24	0.68	0.36	0.45	0.39	1.2	1.1	1.2	1.1	0.38	0.56	0.57	0.66	8.3	0.74	0.56	0.13 [9]	0.21 [9]	0.171 [9]	0.46 [9]	0.15 [9]	-	-
Lead	mg/L	0.001	-	0.0016	0.0005	0.0008	0.0003	0.0036	0.0008	0.0014	0.0012	0.0012	0.0013		0.0023	0.0011	0.0008	0.0008	0.0007	0.0023	0.0011	0.0006	0.0017	0.0029	0.0029	0.0012	0.001	0.0015	0.0012	0.00056	0.00083	0.0010	0.0014	0.00057	<0.00020 [9]	0.00026 [9]	0.00105 [9]	0.00020 [9]	<0.00010 [9]	0.0034 [6]	-
Zinc	mg/L	0.029	-	-	0.016	-	-	-	0.04	-	-	-	-		0.05	-	-	0.03	<0.03	<0.03	<0.03	0.03	0.05	<0.03	0.03	<0.03	0.04	0.0015	<0.03	0.03	0.05	0.21	0.016	0.03	0.024 [9]	0.0094 [9]	0.0083 [9]	0.024 [9]	0.0124 [9]	0.008 [6]	-
Boron	mg/L	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	0.063	-	-	-	-	-	-	0.19 [9]	0.045 [9]	<0.04 [9]	0.063 [9]	0.039 [9]	0.37	-

Parameter	EW43	EW43																																					ANZECC Trigger Levels [1] (95% level of Protection - Fresh Water)	ECan - Review of Nitrate Toxicity to Freshwater Aquatic Species (95% level of Protection)
	Date	25/01/2011	18/04/2011	28/07/2011	25/10/2011	25/01/2012	26/04/2012	18/07/2012	16/10/2012	29/01/2013	23/04/2013	22/07/2013	30/10/2013	28/01/2014	14/05/2014	24/07/2014	22/10/2014	27/01/2015	21/04/2015	22/07/2015	12/10/2015	26/01/2016	28/04/2016	27/07/2016	27/10/2016	11/01/2017	20/04/2017	1/08/2017	28/08/2017	9/11/2017	25/01/2018	24/04/2018	26/07/2018	9/10/2018	17/01/2019	1/05/2019	17/07/2019	22/10/2019	12/02/2020		
DO	ppm	6.67	7.37	11.45	10.56	7.56	10.38	11.59	10.72	5.78	9.24	10.93	10.17	7.3	9.59	10.83	8.69	7.31	11.03	12.28	10.07	5.58	8.52	10.59	8.67	8.88	9.53	10.31	9.52	8.42	5.62	9.43	10.47	9.1	7.31	0	9.35	9.44	7.36	-	-
pH	pH units	6.98	7.42	7.78	7.17	6.97	6.79	7.42	7.83	6.76	6.46	6.62	6.84	6.9	6.64	6.11	6.46	6.66	6.36	6.75	6.67	6.93	6.89	6.81	6.8	6.57	6.29	6.57	7.06	6.67	7.4	6.91	7.12	7.15	7.33	7.28	7.03	7.15	7.48	7.2 - 7.8 [2]	-
Conductivity	mS/cm	0.27	0.32	1.65	0.439	0.185	0.403	0.502	4.49	0.404	0.591	0.28	0.352	0.214	0.229	0.164	0.19	0.382	0.347	3.39	0.402	0.81	0.163	0.416	0.279	0.215	0.331	0.445	0.344	0.32	0.403	4.43	0.326	0.968	0.341	0.147	5.53	0.376	0.327	-	-
Temperature	°C	18.4	9.1	4.3	12.5	16.3	11.7	5.3	8.6	21.1	12.1	7.9	14.7	17.6	9.7	5.2	13.8	18.4	10.3	6.8	11.7	18.2	12.6	4.7	13.2	15.2	10.7	5.8	10.3	13.5	22.4	10.7	6.9	11.4	18.4	10.2	5.5	10.5	18.9	-	-
Ammoniacal Nitrogen	mg/L	0.122	<0.010	0.037	0.024	0.084	0.039	0.089	0.022	0.24	0.05	0.142	0.124	0.055	0.117	0.076	0.078	0.048	0.081	0.045	0.067	1.1	0.011	0.198	0.128	0.026	0.179	0.5	0.168	0.131	0.3	0.018	0.084	0.114	0.192	0.045	0.29	0.182	0.182	0.9 [4]	-
Nitrate Nitrogen	mg/L	0.104	0.27	0.45	0.96	0.088	0.3	0.73	0.34	0.23	0.53	0.55	0.168	0.117	0.79	0.3	0.147	0.018	0.181	0.48	0.21	0.052	0.124	1.16	0.22	0.066	0.66	1.14	0.5	0.47	0.037	0.21	0.84	0.33	0.27	0.27	0.39	0.62	0.62	7.2	1.7
Chloride	mg/L	27	63	400	55	17.7	64	72	21	28	124	29	40	20	29	18.4	21	68	62	46	74	153	19.9	49	35	21	34	43	38	49	65	93	37	230	38	18.2	1450	44	25	-	-
BOD_5	mg/L	1.4	1.5	<1	<1	1.3	<2	<2	<2	<2	3	<2	<2	<2	<2	<2	< 2	<2	<2	<2	< 2	< 2	< 2	< 2	< 2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	-	-
Iron	mg/L	1.01 [9]	0.44 [9]	0.26 [10]	0.34 [10]	0.30 [10]	0.24 [10]	0.37 [10]	0.32 [10]	0.70 [10]	0.25 [10]	0.65 [10]	0.52 [10]	0.42 [10]	0.76 [10]	0.26 [10]	0.37 [10]	0.52 [10]	0.21 [10]	0.48 [10]	0.22 [10]	0.22 [10]	0.24 [10]	0.44 [10]	0.45 [10]	0.29 [10]	0.79 [10]	0.85 [10]	0.41 [10]	0.36 [10]	0.60 [10]	0.22	0.49	0.39	0.29	0.19	0.09	0.4	1.4	-	-
Lead	mg/L	0.00165 [9]	0.00061 [9]	0.00021 [10]	0.00122 [10]	0.00056 [10]	0.00027 [10]	0.00026 [10]	0.00020 [10]	0.00053 [10]	0.00066 [10]	0.00025 [10]	0.00054 [10]	0.00039 [10]	0.0004 [10]	0.00013 [10]	0.00037 [10]	0.00025 [10]	0.00015 [10]	0.0007 [10]	0.0002 [10]	0.0002 [10]	0.00038 [10]	0.00027 [10]	0.00034 [10]	0.0002 [10]	0.00038 [10]	0.00038 [10]	0.0002 [10]	0.00028 [10]	0.00108 [10]	0.00018	0.00034	0.00016	0.00055	0.00019	<0.0005	0.00025	0.00071	0.0034 [6]	-
Zinc	mg/L	0.021 [9]	0.023 [9]	0.023 [10]	0.0158 [10]	0.008 [10]	0.0149 [10]	0.022 [10]	0.0130 [10]	0.0140 [10]	0.039 [10]	0.021 [10]	0.0138 [10]	0.0137 [10]	0.025 [10]	0.0135 [10]	0.0124 [10]	0.005 [10]	0.02 [10]	0.0169 [10]	0.0130 [10]	0.0136 [10]	0.015 [10]	0.038 [10]	0.0148 [10]	0.0087 [10]	0.0158 [10]	0.028 [10]	0.014 [10]	0.0106 [10]	0.0042 [10]	0.0195	0.0174	0.0165	0.0091	0.0151	0.0220	0.0169	0.0240	0.008 [6]	-
Boron	mg/L	0.089 [9]	0.059 [9]	0.122 [10]	0.113 [10]	0.048 [10]	0.083 [10]	0.096 [10]	0.049 [10]	0.140 [10]	0.083 [10]	0.077 [10]	0.117 [10]	0.063 [10]	0.085 [10]	0.037 [10]	0.042 [10]	0.061 [10]	0.064 [10]	0.067 [10]	0.063 [10]	0.063 [10]	0.038 [10]	0.089 [10]	0.103 [10]	0.033 [10]	0.109 [10]	0.138 [10]	0.090 [10]	0.064 [10]	0.101 [10]	0.056	0.071	0.121	0.171	0.221	0.271	0.095	0.107	0.37	-
Copper	mg/L	0.0019 [9]	0.0025 [9]	0.0016 [10]	0.0019 [10]	0.0010 [10]	0.0017 [10]	0.0013 [10]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0073 [6]	-

Notes:
1. Australian and New Zealand Guidelines for Fresh and Marine water Quality 2000 (ANZECC 2000).
2. Trigger level for physical and chemical stresses for a slightly disturbed system (lowland river)
3. Trigger level for physical and chemical stresses for a slightly disturbed system (Estuaries - South East Australia in the absence of any NZ trigger level)
4. Trigger level based on a pH of 8.0 and temperature of 20°C (Fresh Water)
5. Trigger level based on a pH of 8.0 and temperature of 20°C (Marine)
6. Trigger level adjusted for hardness of water (water 'soft' based on actual sampling)
7. Trigger level adjusted for hardness of water (water 'very hard' based on actual sampling)
8. Fresh water trigger level used in absence of a marine trigger level.
9. Dissolved fraction measured (laboratory filtered)
10. Dissolved fraction measured (field filtered)

Concentration above the Ecan Trigger Value
Concentration above the ANZECC Trigger Value
Concentration exceeds the ANZECC 2000 'High Reliability' Trigger Value (based on a pH of 8.0), although is below the pH adjusted value as per Table 8.3.7 in the ANZECC 2000 Guidelines.

Parameter	FH38	FH38																		ANZECC Trigger Levels [1] (95% level of Protection - Fresh Water)	ANZG (2018) REC Physical and Chemical Stressor[2] and DGV[3] (95% Level of Protection) Trigger Level Concentrations (Freshwater)
	Date	17/01/2019	1/05/2019	18/07/2019	22/10/2019	12/02/2020	11/06/2020	10/08/2020	28/10/2020	17/03/2021	13/07/2021	27/10/2021	25/01/2022	26/04/2022	27/07/2022	26/10/2022	17/01/2023	26/04/2023	26/07/2023	26/10/2023		
DO	%	35.2	-	57.9	42.9	37.2	58.9	44.4	49.7	26.4	52.8	-	40.8	30.5	13.8	15	20.9	18.7	29.6	32.6	-	81-101%
DO	ppm	3.51	-	6.51	4.6	3.85	6.83	4.99	5.53	2.8	6.1	-	4.24	3.34	1.82	1.74	2.16	2.09	3.64	3.36	-	-
pH	pH units	**6.4**	**5.98**	**5.55**	**5.7**	**5.77**	**5.84**	**5.89**	**6.28**	**6.02**	**5.92**	**6.05**	**5.74**	**5.53**	**6.69**	**7.29**	**4.9**	**6.31**	**6.49**	**5.71**	7.2 - 7.8 [6]	7.23 - 7.8 [2]
Conductivity	mS/cm	0.539	0.525	0.588	0.507	0.477	0.545	0.542	0.471	0.584	0.33	0.362	0.426	0.635	1.15	1.26	0.73	0.823	0.76	0.604	-	0.116 [2]
Temperature	°C	15.3	11	8.4	11.2	13.4	8.6	9.5	10.9	11.8	7.6	12.3	13.1	11	4.1	8.7	13.8	10.5	6.4	13.6	-	-
Total Ammoniacal Nitrogen	mg/L	**1.64**	0.67	0.80	0.69	0.85	0.73	0.83	0.58	**1.17**	0.58	**0.91**	**1.19**	**1.27**	**8.50**	**9.00**	**1.81**	**5.40**	**4.50**	**1.13**	0.9 [7]	0.01 [2]
Total Ammoniacal Nitrogen[9]	mg/L	0.59	0.23	0.28	0.24	0.30	0.26	0.29	0.21	0.41	0.20	0.32	0.42	0.44	**2.97**	**3.15**	0.63	**1.93**	**1.62**	0.40	0.9 [7]	0.01 [2]
Nitrate Nitrogen	mg/L	0.105	0.29	0.003	0.065	0.039	0.151	0.117	0.134	0.052	0.131	0.096	0.047	0.002	<0.002	0.033	0.008	<0.002	0.019	0.031	7.2	0.265 [2]
Chloride	mg/L	41	46	56	45	44	54	53	41	49	45	50	59	59	52	55	55	48	35	54	-	-
BOD_5	mg/L	<2	<2	<2	<2	<2	<2	4	<2	2	<2	3	<2	<2	5	3	<2	2	3	<2	-	-
Iron[5]	mg/L	0.84	4.50	6.40	5.90	6.00	5.70	6.00	4.10	9.40	4.40	6.90	8.00	8.90	11.50	29.00	14.8	13.7	12.2	8.8	-	-
Lead[5]	mg/L	0.00016	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0003	<0.0004	<0.0005	<0.0006	<0.0007	<0.0008	<0.0009	<0.0001	0.00025	0.0009	<0.0001	0.040 [8]	0.0034 [3]
Zinc[5]	mg/L	**0.044**	**0.127**	**0.144**	**0.125**	**0.200**	**0.164**	**0.121**	**0.085**	**0.230**	**0.089**	**0.133**	**0.230**	**0.180**	0.013	0.016	**0.3**	0.0105	0.028	**0.174**	0.042 [8]	0.008 [3,4]
Boron[5]	mg/L	**0.38**	0.29	0.37	**0.39**	**0.42**	0.34	0.34	0.25	**0.530**	0.33	**0.39**	**0.54**	**0.51**	**0.87**	**0.98**	**0.7**	**0.59**	**0.45**	**0.48**	0.37	0.94 [3,10]

Notes:
1. Australian and New Zealand Guidelines for Fresh and Marine water Quality 2000 (ANZECC 2000).
2. ANZG 2018 REC Guideline Value - REC 2010 classification of "Cool Dry Low-elevation"
3. ANZG 2018 DGV for 95% protection of aquatic species
4. Trigger level dependent on hardness of water. Value presented based on hardness between 180 - 240 mg/L as CaCO3.
5. Dissolved fraction measured (field filtered)
6. Trigger level for physical and chemical stresses for a slightly disturbed system (lowland river)
7. Trigger level based on a pH of 8.0 and temperature of 20°C (Fresh Water)
8. Trigger level adjusted for hardness of water (water 'very hard' based on actual sampling)
9. pH corrected, when sample pH <6 a pH of 6 was used for the ratio
10. The ANZG 2018 DGV for boron (0.37 mg/L) was updated in July 2021 (0.94 mg/L). The updated DGV has been applied to data from July 2021 onwards.

6.4 Concentration exceeds the ANZECC Trigger Level
35.2 Concentration exceeds the ANZG Trigger Level

Parameter	FH38	FH38																		ANZECC Trigger Levels [1] (95% level of Protection - Fresh Water)	ANZG (2018) REC Physical and Chemical Stressor[2] and DGV[3] (95% Level of Protection) Trigger Level Concentrations (Freshwater)
	Date	17/01/2024	17/04/2024	30/07/2024	23/10/2024																
DO	%	20.7	22.5	58.8	25																-	81-101%
DO	ppm	2.25	2.54	7.31	2.65																-	-
pH	pH units	**6.02**	**6.8**	**7.1**	**7.1**																7.2 - 7.8 [6]	7.23 - 7.8 [2]
Conductivity	mS/cm	0.711	0.545	0.377	0.451																-	0.116 [2]
Temperature	°C	12.1	9.5	6.2	17.9																-	-
Total Ammoniacal Nitrogen	mg/L	**3.90**	**1.55**	0.15	0.85																0.9 [7]	0.01 [2]
Total Ammoniacal Nitrogen[9]	mg/L	**1.36**	0.55	0.06	0.06																0.9 [7]	0.01 [2]
Nitrate Nitrogen	mg/L	0.59	0.015	0.006	0.003																7.2	0.265 [2]
Chloride	mg/L	39	34	33	25																-	-
BOD_5	mg/L	4	<2	20	4																-	-
Iron[5]	mg/L	23	15.5	1.39	4.90																-	-
Lead[5]	mg/L	<0.00010	0.00015	0.0004	0.00012																0.040 [8]	0.0034 [3]
Zinc[5]	mg/L	0.0195	0.021	0.0076	0.014																0.042 [8]	0.008 [3,4]
Boron[5]	mg/L	**0.59**	0.31	0.171	0.20																0.37	0.94 [3,10]

Notes:
1. Australian and New Zealand Guidelines for Fresh and Marine water Quality 2000 (ANZECC 2000).
2. ANZG 2018 REC Guideline Value - REC 2010 classification of "Cool Dry Low-elevation"
3. ANZG 2018 DGV for 95% protection of aquatic species
4. Trigger level dependent on hardness of water. Value presented based on hardness between 180 - 240 mg/L as CaCO3.
5. Dissolved fraction measured (field filtered)
6. Trigger level for physical and chemical stresses for a slightly disturbed system (lowland river)
7. Trigger level based on a pH of 8.0 and temperature of 20°C (Fresh Water)
8. Trigger level adjusted for hardness of water (water 'very hard' based on actual sampling)
9. pH corrected, when sample pH <6 a pH of 6 was used for the ratio
10. The ANZG 2018 DGV for boron (0.37 mg/L) was updated in July 2021 (0.94 mg/L). The updated DGV has been applied to data from July 2021 onwards.

6.01 Concentration exceeds the ANZECC Trigger Level
22.5 Concentration exceeds the ANZG Trigger Level

Parameter	FH 39	FH39																			ANZECC Trigger Levels [1] (95% level of Protection - Fresh Water)	ANZG (2018) REC Physical and Chemical Stressor[2] and DGV[3] (95% Level of Protection) Trigger Level Concentrations (Freshwater)
	Date	17/01/2019	1/05/2019	17/07/2019	22/10/2019	12/02/2020	11/06/2020	10/08/2020	28/10/2020	17/03/2021	13/07/2021	27/10/2021	25/01/2022	26/04/2022	27/07/2022	26/10/2022	17/01/2023	26/04/2023	26/07/2023	26/10/2023		
DO	%	82.7	-	66	76.8	59.7	74.4	66.4	50.5	57.8	58.8	-	60.6	62.7	67.9	67.6	83.8	72.5	74.8	72.8	-	81-101%
DO	ppm	7.87	-	7.63	8.34	5.89	8.67	7.69	5.23	5.81	7.41	-	5.88	6.9	8.65	7.19	7.78	7.97	9.04	6.49	-	-
pH	pH units	**7.00**	**7.04**	**6.88**	**6.72**	**6.65**	**7.07**	7.47	7.23	**7.16**	**6.69**	**7.12**	**6.31**	**6.73**	**6.61**	7.27	7.39	**6.73**	6.42	**7.18**	7.2 - 7.8 [6]	7.23 - 7.8 [2]
Conductivity	mS/cm	0.722	0.7	15.4	0.737	1.185	10.98	6.29	1.575	9.24	4.63	0.538	2.29	5.66	0.64	1.97	0.876	0.587	0.57	14.12	-	0.116 [2]
Temperature	°C	17	11.2	5.8	11	15.7	6.9	7.6	14.3	13.3	3.9	14.8	16.3	10.4	5.4	12.1	19	10.3	6.9	18.3	-	-
Total Ammoniacal Nitrogen	mg/L	**1.6**	**1.0**	**1.6**	**1.5**	**1.2**	**1.3**	**1.4**	**0.8**	**1.0**	**1.0**	**1.5**	0.4	0.1	**1.9**	**1.4**	0.7	0.29	**1.24**	**0.95**	0.9 [7]	0.01 [2]
Total Ammoniacal Nitrogen[10]	mg/L	0.67	0.40	0.65	0.57	0.46	0.56	0.76	0.35	0.45	0.39	0.66	0.16	0.05	0.72	0.53	0.33	0.11	0.45	0.41	0.9 [7]	0.01 [2]
Nitrate Nitrogen	mg/L	0.64	0.77	0.66	0.62	0.58	0.56	0.7	0.45	0.34	0.62	0.62	0.31	0.186	0.61	0.65	0.68	0.49	1.07	0.55	7.2	0.265 [2]
Chloride	mg/L	69	93	4500	71	240	3100	1620	340	2600	1890	87	920	1720	65	420	86	1,740	51	4,500	-	-
BOD_5	mg/L	<2	<2	<2	<2	<2	3	<2	<2	<2	<2	<2	3	<2	<2	<2	2	<2	<2	<2	-	-
Iron[9]	mg/L	0.59	0.57	0.3	0.25	0.21	<0.1	0.11	0.9	0.38	0.15	0.25	0.33	0.17	0.11	0.15	0.140	0.400	0.600	<0.2	-	-
Lead[9]	mg/L	0.00015	0.0001	<0.00010	<0.0001	<0.0001	<0.0005	<0.0005	0.00018	0.0002	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00166	<0.0001	<0.001	N/A	<0.0010	0.040 [8]	0.0034 [3]
Zinc[9]	mg/L	0.0192	0.023	0.032	0.048	0.067	0.043	0.018	0.014	0.03	0.042	0.032	0.023	0.0081	0.066	0.043	0.018	0.023	**0.049**	0.038	0.042 [8]	0.008 [3,4]
Boron[9]	mg/L	**0.59**	**0.42**	**1.47**	**0.6**	**0.62**	**1.06**	**0.74**	**0.49**	**1.26**	**0.8**	**0.63**	**0.68**	**0.65**	**0.48**	**0.68**	**0.800**	**0.650**	0.330	**1.650**	0.37	0.94 [4,11]

Notes:
1. Australian and New Zealand Guidelines for Fresh and Marine water Quality 2000 (ANZECC 2000).
2. Trigger level for physical and chemical stresses for a slightly disturbed system (lowland river)
3. ANZG 2018 REC Guideline Value
4. ANZG 2018 DGV for 95% protection of aquatic species
5. Trigger level for physical and chemical stresses for a slightly disturbed system (Estuaries - South East Austrialia in the absence of any NZ trigger level)
6. Trigger level based on a pH of 8.0 and temperature of 20°C (Marine)
7. Fresh water trigger level used in absence of a marine trigger level.
8. Trigger level adjusted for hardness of water (water 'very hard' based on actual sampling)
9. Dissolved fraction measured (field filtered)
10. pH corrected
11. The ANZG 2018 DGV for boron (0.37 mg/L) was updated in July 2021 (0.94 mg/L). The updated DGV has been applied to data from July 2021 onwards.

1.6 Concentration exceeds the ANZECC Trigger Level
1.6 Concentration exceeds the ANZG Trigger Level

Parameter	FH 39	FH39																			ANZECC Trigger Levels [1] (95% level of Protection - Fresh Water)	ANZG (2018) REC Physical and Chemical Stressor[2] and DGV[3] (95% Level of Protection) Trigger Level Concentrations (Freshwater)
	Date	17/01/2024	17/04/2024	30/07/2024	23/10/2024																	
DO	%	73.7	45.3	75.3	59.4																-	81-101%
DO	ppm	7.53	4.8	9.37	6.07																-	-
pH	pH units	**6.24**	7.2	7.4	**6.9**																7.2 - 7.8 [6]	7.23 - 7.8 [2]
Conductivity	mS/cm	1.226	8.87	0.909	0.361																-	0.116 [2]
Temperature	°C	14.7	11.3	7.4	13.4																-	-
Total Ammoniacal Nitrogen	mg/L	**0.26**	**1.18**	**1.44**	**3.2**																0.9 [7]	0.01 [2]
Total Ammoniacal Nitrogen[10]	mg/L	0.09	0.42	0.74	0.74																0.9 [7]	0.01 [2]
Nitrate Nitrogen	mg/L	0.46	0.29	1.9	0.66																7.2	0.265 [2]
Chloride	mg/L	240	2,700	101	940																-	-
BOD_5	mg/L	3	<2	<2	< 2																-	-
Iron[9]	mg/L	0.590	0.370	0.150	0.12																-	-
Lead[9]	mg/L	0.00014	<0.0001	<0.00010	< 0.00010																0.040 [8]	0.0034 [3]
Zinc[9]	mg/L	0.029	0.012	**0.045**	**0.049**																0.042 [8]	0.008 [3,4]
Boron[9]	mg/L	**0.550**	**0.810**	**0.610**	**0.81**																0.37	0.94 [4,11]

Notes:
1. Australian and New Zealand Guidelines for Fresh and Marine water Quality 2000 (ANZECC 2000).
2. Trigger level for physical and chemical stresses for a slightly disturbed system (lowland river)
3. ANZG 2018 REC Guideline Value
4. ANZG 2018 DGV for 95% protection of aquatic species
5. Trigger level for physical and chemical stresses for a slightly disturbed system (Estuaries - South East Austrialia in the absence of any NZ trigger level)
6. Trigger level based on a pH of 8.0 and temperature of 20°C (Marine)
7. Fresh water trigger level used in absence of a marine trigger level.
8. Trigger level adjusted for hardness of water (water 'very hard' based on actual sampling)
9. Dissolved fraction measured (field filtered)
10. pH corrected
11. The ANZG 2018 DGV for boron (0.37 mg/L) was updated in July 2021 (0.94 mg/L). The updated DGV has been applied to data from July 2021 onwards.

6.3 Concentration exceeds the ANZECC Trigger Level
45.3 Concentration exceeds the ANZG Trigger Level

Parameter	FH40	FH40																			ANZECC Trigger Levels [1] (95% level of Protection - Fresh Water)	ANZG (2018) REC Physical and Chemical Stressor[2] and DGV[3] (95% Level of Protection) Trigger Level Concentrations (Freshwater)
	Date	17/01/2019	1/05/2019	17/07/2019	22/10/2019	12/02/2020	11/06/2020	10/08/2020	28/10/2020	17/03/2021	13/07/2021	27/10/2021	25/01/2022	26/04/2022	27/07/2022	26/10/2022	17/01/2023	26/04/2023	26/07/2023	26/10/2023		
DO	%	85.8	-	76	76.5	80.6	86.1	75.1	72.2	70.4	72.3	-	107.4	81.3	74.6	71.2	84.1	77.9	75.6	102.7	-	81-101%
DO	ppm	7.74	-	8.12	8.35	7.4	8.99	8.18	7.06	6.84	9.12	-	10.35	9.03	9.37	7.4	7.76	8.39	9.24	8.44	-	-
pH	pH units	7.46	7.52	**7.06**	7.22	7.3	7.61	7.61	7.87	7.43	7.21	**8.97**	7.27	**6.54**	7.55	7.46	7.82	**6.86**	**6.51**	7.21	7.2 - 7.8 [6]	7.23 - 7.8 [2]
Conductivity	mS/cm	1.992	6.23	30.8	1.681	0.522	26.86	18.9	7.32	18.59	9.17	10.27	4.75	5.26	0.81	5.17	1.168	1.124	0.648	28.65	-	0.116 [2]
Temperature	°C	19.8	14.4	6.5	10.5	18.8	9.4	9	16.1	14.1	3.6	17.5	16.2	10.1	6	12.7	19.3	10.5	6.6	19.9	-	-
Total Ammoniacal Nitrogen	mg/L	**1.03**	0.53	0.44	0.88	<0.010	0.011	0.02	0.061	0.29	0.116	<0.01	<0.01	0.025	**2.1**	0.69	0.7	0.27	**1.24**	<0.10	0.9 [7]	0.01 [2]
Total Ammoniacal Nitrogen[10]	mg/L	0.58	0.30	0.18	0.40	<0.010	0.01	0.01	0.05	0.15	0.05	<0.01	<0.01	0.01	**1.29**	0.39	0.53	0.10	0.45	0.05	0.9 [7]	0.01 [2]
Nitrate Nitrogen	mg/L	0.41	0.40	0.22	0.62	<0.002	0.18	<0.008	0.049	0.083	0.51	0.011	<0.002	<0.002	0.61	0.35	0.25	0.36	1.16	<0.02	7.2	0.265 [2]
Chloride	mg/L	440	1560	10100	330	1580	8700	6400	2100	6300	4000	5200	2100	1630	105	1,580	154	3,400	70	10,300	-	-
BOD_5	mg/L	<2	3	<2	<2	7	<2	<2	<2	3	<2	20	6	<2	<2	<2	3	<2	<2	<2	-	-
Iron[9]	mg/L	0.23	0.29	<0.4	0.22	0.22	<0.4	<0.2	0.25	0.2	0.07	<0.42	0.26	0.2	0.16	0.11	0.24	<0.4	0.55	<0.4	-	-
Lead[9]	mg/L	0.00017	<0.0005	<0.002	0.00018	<0.0005	<0.002	<0.0010	<0.0005	0.00048	<0.00010	<0.0021	0.00013	<0.00010	0.00028	<0.00010	<0.0001	<0.002	0.00039	<0.002	0.040 [8]	0.0034 [3]
Zinc[9]	mg/L	0.0096	0.017	**0.07**	0.025	0.042	0.040	0.015	0.008	0.027	0.022	<0.021	0.003	0.0059	0.045	0.078	0.006	0.030	0.044	0.020	0.042 [8]	0.008 [3,4]
Boron[10]	mg/L	**0.66**	**0.8**	**2.4**	**0.68**	**0.54**	**1.99**	**1.3**	**0.73**	**1.57**	**0.92**	**1.21**	**0.61**	**0.49**	0.075	**0.74**	**0.9**	**1.04**	0.35	**2.3**	0.37	0.94 [3,11]

Notes:
1. Australian and New Zealand Guidelines for Fresh and Marine water Quality 2000 (ANZECC 2000).
2. Trigger level for physical and chemical stresses for a slightly disturbed system (lowland river)
3. ANZG 2018 REC Guideline Value
4. ANZG 2018 DGV for 95% protection of aquatic species
5. Trigger level for physical and chemical stresses for a slightly disturbed system (Estuaries - South East Austrialia in the absence of any NZ trigger level)
6. Trigger level based on a pH of 8.0 and temperature of 20°C (Marine)
7. Fresh water trigger level used in absence of a marine trigger level.
8. Trigger level adjusted for hardness of water (water 'very hard' based on actual sampling)
9. Dissolved fraction measured (field filtered)
10. pH corrected, value of <0.10 conservatively adjusted to 0.10 mg/L prior to correction
11. The ANZG 2018 DGV for boron (0.37 mg/L) was updated in July 2021 (0.94 mg/L). The updated DGV has been applied to data from July 2021 onwards.

1.03 Concentration exceeds the ANZECC Trigger Level
1.03 Concentration exceeds the ANZG Trigger Level

Parameter	FH40	FH40																			ANZECC Trigger Levels [1] (95% level of Protection - Fresh Water)	ANZG (2018) REC Physical and Chemical Stressor[2] and DGV[3] (95% Level of Protection) Trigger Level Concentrations (Freshwater)
	Date	17/01/2024	17/04/2024	30/07/2024	23/10/2024																	
DO	%	63.2	48.9	75.9	62.2																-	81-101%
DO	ppm	6.39	5.14	9.46	6.2																-	-
pH	pH units	**6.43**	7.3	7.5	**7.0**																7.2 - 7.8 [6]	7.23 - 7.8 [2]
Conductivity	mS/cm	2.403	10.95	0.981	0.854																-	0.116 [2]
Temperature	°C	15.1	11.4	7.1	13.8																-	-
Total Ammoniacal Nitrogen	mg/L	0.17	**1.06**	**1.68**	**2.00**																0.9 [7]	0.01 [2]
Total Ammoniacal Nitrogen[10]	mg/L	0.06	0.51	**0.93**	**0.93**																0.9 [7]	0.01 [2]
Nitrate Nitrogen	mg/L	0.32	0.24	1.03	0.52																7.2	0.265 [2]
Chloride	mg/L	590	3,500	117	2600																-	-
BOD_5	mg/L	3	<2	<2	< 2																-	-
Iron[9]	mg/L	0.62	<0.4	0.160	< 0.2																-	-
Lead[9]	mg/L	0.00023	<0.002	<0.00010	< 0.0010																0.040 [8]	0.0034 [3]
Zinc[9]	mg/L	0.018	<0.02	0.0320	**0.173**																0.042 [8]	0.008 [3,4]
Boron[10]	mg/L	**0.65**	**1.06**	**1.68**	**2.0**																0.37	0.94 [3,11]

Notes:
1. Australian and New Zealand Guidelines for Fresh and Marine water Quality 2000 (ANZECC 2000).
2. Trigger level for physical and chemical stresses for a slightly disturbed system (lowland river)
3. ANZG 2018 REC Guideline Value
4. ANZG 2018 DGV for 95% protection of aquatic species
5. Trigger level for physical and chemical stresses for a slightly disturbed system (Estuaries - South East Austrialia in the absence of any NZ trigger level)
6. Trigger level based on a pH of 8.0 and temperature of 20°C (Marine)
7. Fresh water trigger level used in absence of a marine trigger level.
8. Trigger level adjusted for hardness of water (water 'very hard' based on actual sampling)
9. Dissolved fraction measured (field filtered)
10. pH corrected, value of <0.10 conservatively adjusted to 0.10 mg/L prior to correction
11. The ANZG 2018 DGV for boron (0.37 mg/L) was updated in July 2021 (0.94 mg/L). The updated DGV has been applied to data from July 2021 onwards.

1.03 Concentration exceeds the ANZECC Trigger Level
1.03 Concentration exceeds the ANZG Trigger Level

Parameter	EW43	EW43																		ANZECC Trigger Levels [1] (95% level of Protection - Fresh Water)	ANZG (2018) REC Physical and Chemical Stressor[2] and DGV[3] (95% Level of Protection) Trigger Level Concentrations (Freshwater)
	Date	17/01/2019	1/05/2019	17/07/2019	22/10/2019	12/02/2020	11/06/2020	10/08/2020	28/10/2020	17/03/2021	13/07/2021	27/10/2021	25/01/2022	26/04/2022	27/07/2022	26/10/2022	17/01/2023	26/04/2023	26/07/2023	26/10/2023		
DO	%	78.3	-	77.8	86.5	79.3	76.5	77.4	80.5	61.4	75	-	83	82.7	94.3	78.9	80.1	84.3	97.3	85.3	-	81-101%
DO	ppm	7.31	-	9.35	9.44	7.36	9.05	9.1	8.79	6.2	9.52	-	8.26	9.2	12.33	8.37	7.29	9.51	11.89	8.02	-	-
pH	pH units	7.33	7.28	**7.03**	**7.15**	7.48	7.29	7.78	7.52	7.33	**7.19**	7.58	7.35	**6.88**	**7.88**	**7.04**	7.45	**6.73**	**6.75**	**6.83**	7.2 - 7.8 [6]	7.23 - 7.8 [2]
Conductivity	mS/cm	0.341	0.147	5.53	0.376	0.327	5.24	0.6	0.171	4.83	2.023	0.302	0.324	0.543	0.33	1.41	0.698	0.427	0.314	6.13	-	0.116 [2]
Temperature	°C	18.4	10.2	5.5	10.5	18.9	7.2	7.8	11.9	13.5	4.2	15.7	15.1	10.5	5.9	12.3	20.2	10.1	6.6	17.1	-	-
Total Ammoniacal Nitrogen	mg/L	0.192	0.045	0.29	0.182	0.29	0.107	0.111	0.031	0.167	0.082	0.2	0.131	0.084	0.23	0.102	0.098	0.153	0.113	0.34	0.9 [7]	0.01 [2]
Total Ammoniacal Nitrogen[9]	mg/L	0.09	0.02	0.12	0.08	0.16	0.05	0.08	0.02	0.08	0.04	0.12	0.07	0.03	0.20	0.04	0.05	0.06	0.04	0.13	0.9 [7]	0.01 [2]
Nitrate Nitrogen	mg/L	0.27	0.27	0.39	0.62	0.47	0.48	0.48	0.16	0.38	0.8	0.27	0.127	0.078	1.26	0.31	0.046	0.39	1.97	0.35	7.2	0.265 [2]
Chloride	mg/L	38	18.2	1450	44	25	1390	98	29	1320	770	59	72	114	43	340	128	76	33	1770	-	-
BOD_5	mg/L	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	2	<2	<2	-	-
Iron[5]	mg/L	0.54	0.3	0.2	0.4	0.59	0.23	0.38	0.37	0.25	0.39	0.57	0.47	0.26	0.36	0.33	0.51	0.45	0.5	0.5	-	-
Lead[5]	mg/L	0.00055	0.00019	<0.0005	0.00025	0.00071	<0.0005	0.00028	0.00019	0.00024	0.00012	0.00042	0.00032	0.0002	0.00013	0.0003	0.00049	0.00043	0.00028	<0.0005	0.040 [8]	0.0034 [3]
Zinc[5]	mg/L	0.0091	0.0151	0.022	0.0169	0.024	0.035	0.022	0.0117	0.027	0.026	0.0131	0.0107	0.017	0.017	0.0194	0.0061	0.023	0.022	0.027	0.042 [8]	0.008 [3,4]
Boron[5]	mg/L	0.1	0.029	**0.4**	0.095	0.107	**0.42**	0.09	0.029	**0.41**	0.22	0.12	0.11	0.095	0.075	0.14	0.16	0.113	0.066	**0.53**	0.37	0.94 [3]

Notes:
1. Australian and New Zealand Guidelines for Fresh and Marine water Quality 2000 (ANZECC 2000).
2. ANZG 2018 REC Guideline Value - REC 2010 classification of "Cool Dry Low-elevation"
3. ANZG 2018 DGV for 95% protection of aquatic species
4. Trigger level dependent on hardness of water. Value presented based on hardness between 180 - 240 mg/L as CaCO3.
5. Dissolved fraction measured (field filtered)
6. Trigger level for physical and chemical stresses for a slightly disturbed system (lowland river)
7. Trigger level based on a pH of 8.0 and temperature of 20°C (Fresh Water)
8. Trigger level adjusted for hardness of water (water 'very hard' based on actual sampling)
9. pH corrected
10. The ANZG 2018 DGV for boron (0.37 mg/L) was updated in July 2021 (0.94 mg/L). The updated DGV has been applied to data from July 2021 onwards.

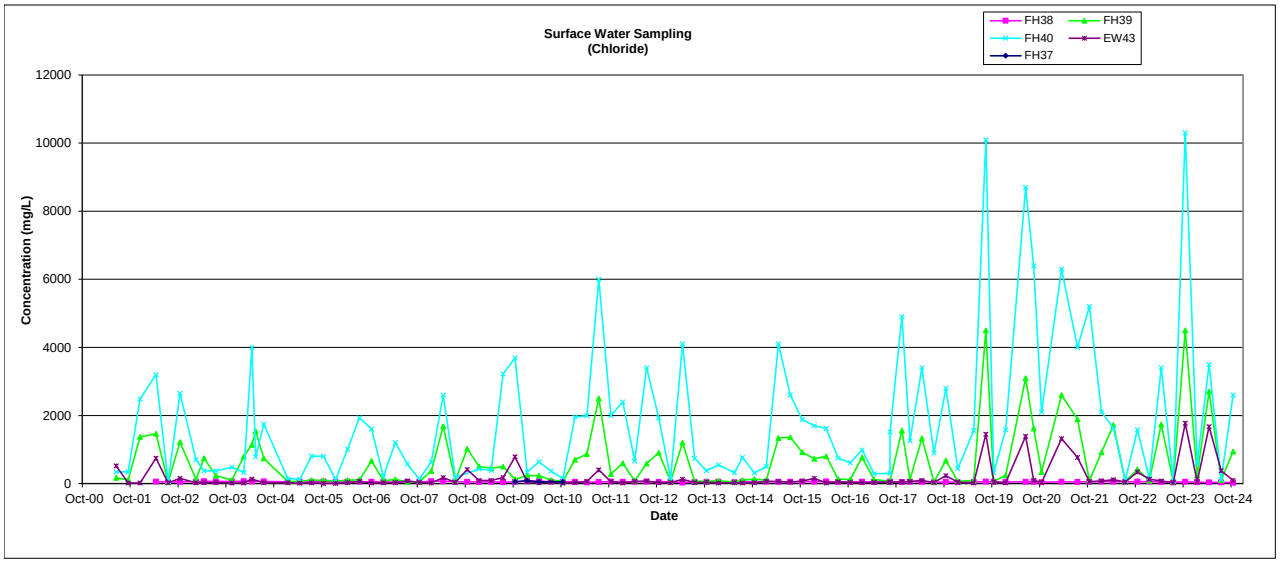
0.4 Concentration exceeds the ANZECC Trigger Level
0.341 Concentration exceeds the ANZG Trigger Level

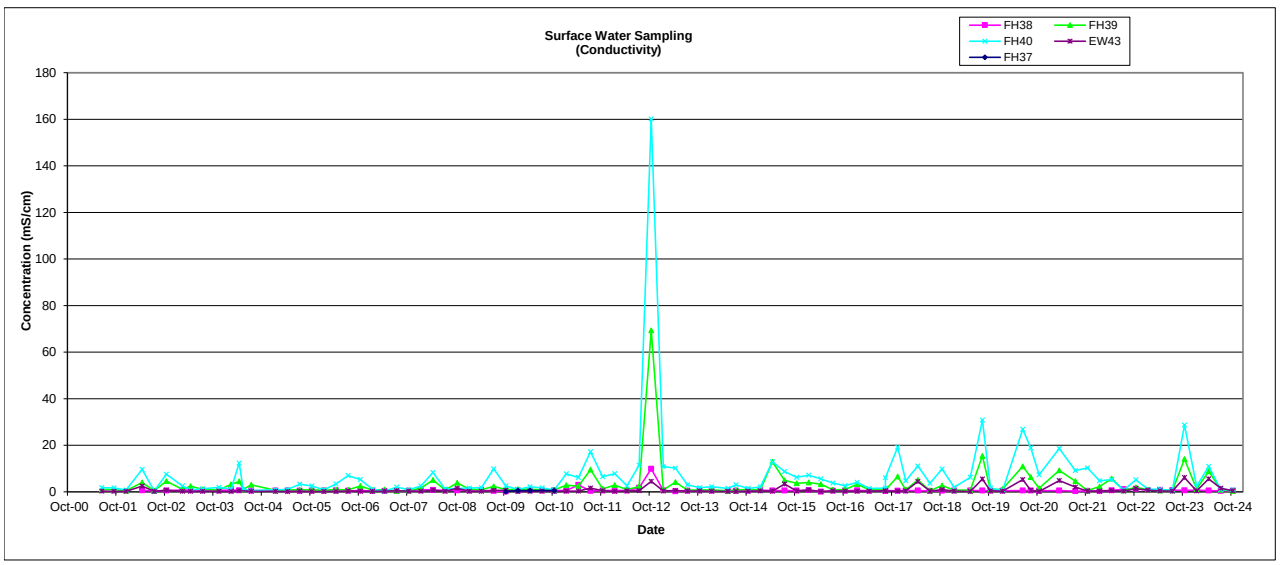
Parameter	EW43	EW43																		ANZECC Trigger Levels [1] (95% level of Protection - Fresh Water)	ANZG (2018) REC Physical and Chemical Stressor[2] and DGV[3] (95% Level of Protection) Trigger Level Concentrations (Freshwater)
	Date	17/01/2024	17/04/2024	30/07/2024	23/10/2024																
DO	%	72.2	68.8	75.2	74.5																-	81-101%
DO	ppm	7.06	7.37	9.3	7.58																-	-
pH	pH units	**6.47**	**7.0**	7.4	7.4																7.2 - 7.8 [6]	7.23 - 7.8 [2]
Conductivity	mS/cm	0.355	5.6	1.55	0.508																-	0.116 [2]
Temperature	°C	16.8	11.3	7.2	14																-	-
Total Ammoniacal Nitrogen	mg/L	0.25	0.38	0.24	0.25																0.9 [7]	0.01 [2]
Total Ammoniacal Nitrogen[9]	mg/L	0.09	0.16	0.12	0.12																0.9 [7]	0.01 [2]
Nitrate Nitrogen	mg/L	0.199	0.28	0.5	0.5																7.2	0.265 [2]
Chloride	mg/L	50	1,670	380	93																-	-
BOD_5	mg/L	<2	<2	<2	< 2																-	-
Iron[5]	mg/L	0.66	0.72	0.28	0.46																-	-
Lead[5]	mg/L	0.00048	0.00018	0.00012	0.00037																0.040 [8]	0.0034 [3]
Zinc[5]	mg/L	0.021	0.0182	0.0131	0.0129																0.042 [8]	0.008 [3,4]
Boron[5]	mg/L	**0.11**	**0.42**	0.136	0.109																0.37	0.94 [3]

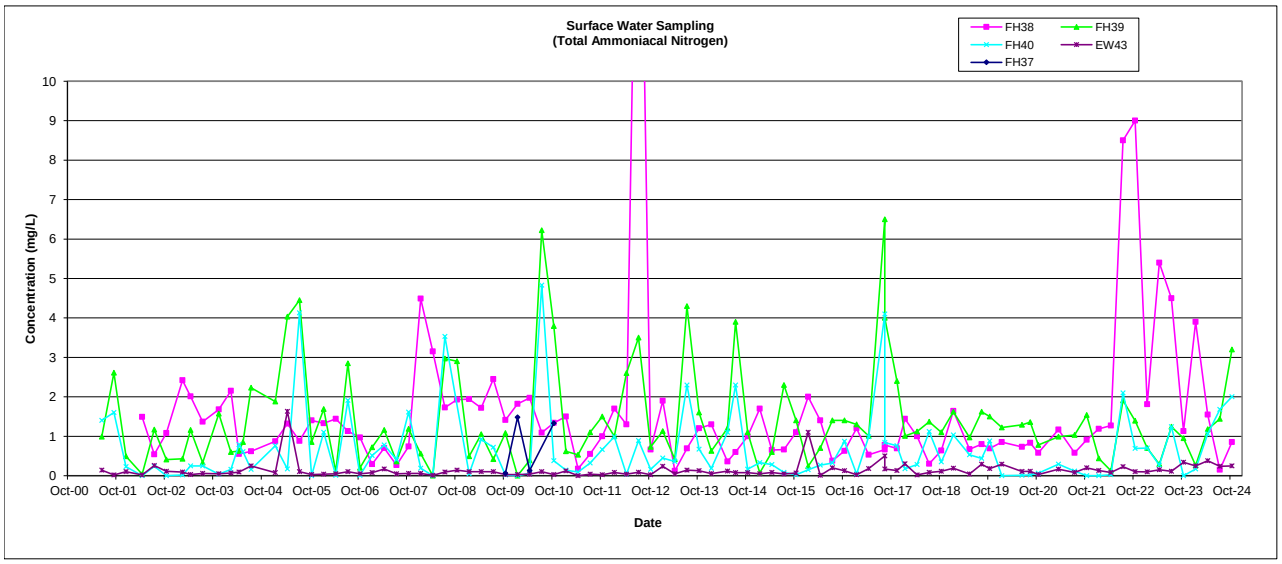
Notes:
1. Australian and New Zealand Guidelines for Fresh and Marine water Quality 2000 (ANZECC 2000).
2. ANZG 2018 REC Guideline Value - REC 2010 classification of "Cool Dry Low-elevation"
3. ANZG 2018 DGV for 95% protection of aquatic species
4. Trigger level dependent on hardness of water. Value presented based on hardness between 180 - 240 mg/L as CaCO3.
5. Dissolved fraction measured (field filtered)
6. Trigger level for physical and chemical stresses for a slightly disturbed system (lowland river)
7. Trigger level based on a pH of 8.0 and temperature of 20°C (Fresh Water)
8. Trigger level adjusted for hardness of water (water 'very hard' based on actual sampling)
9. pH corrected
10. The ANZG 2018 DGV for boron (0.37 mg/L) was updated in July 2021 (0.94 mg/L). The updated DGV has been applied to data from July 2021 onwards.

6.24 Concentration exceeds the ANZECC Trigger Level
68.8 Concentration exceeds the ANZG Trigger Level

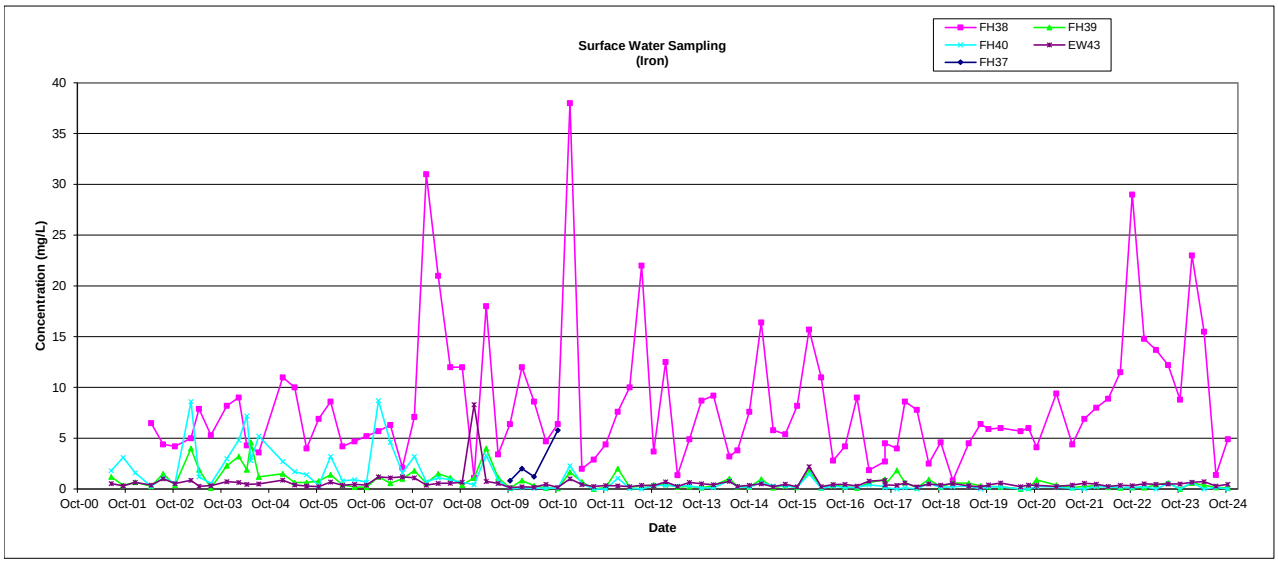
Surface Water Sampling Charts
(Fairfield Landfill)

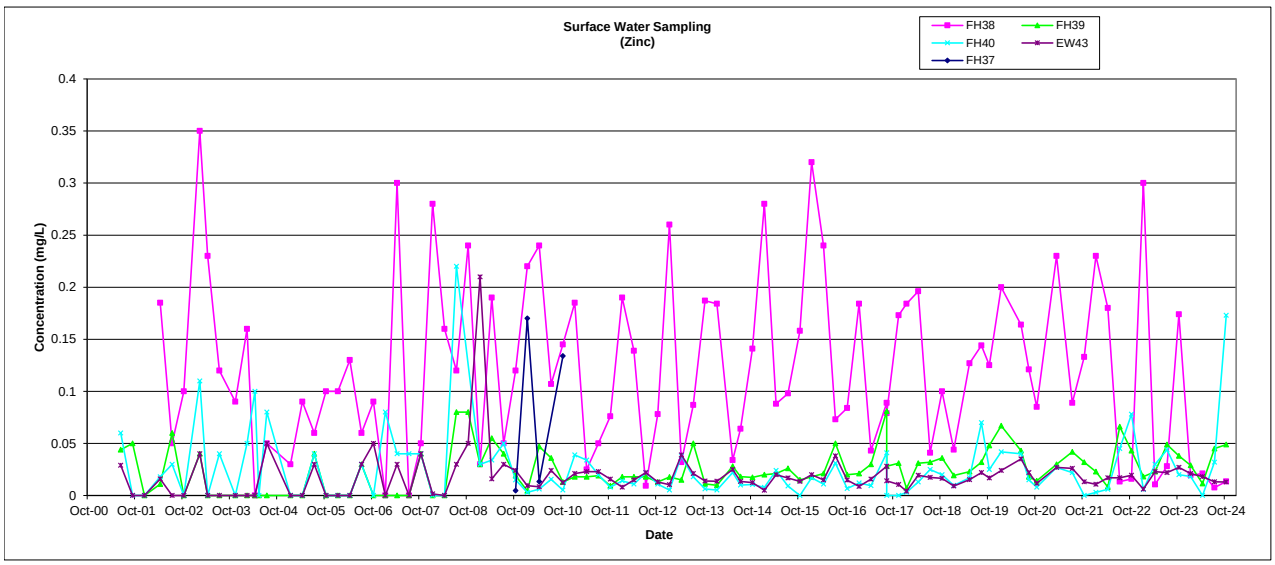


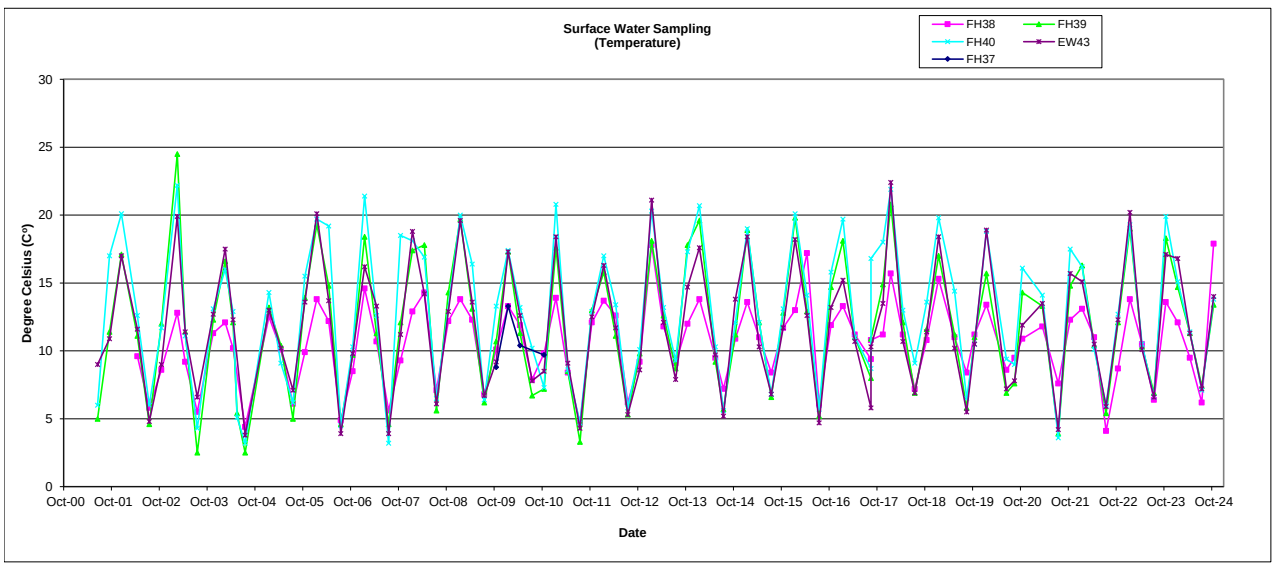




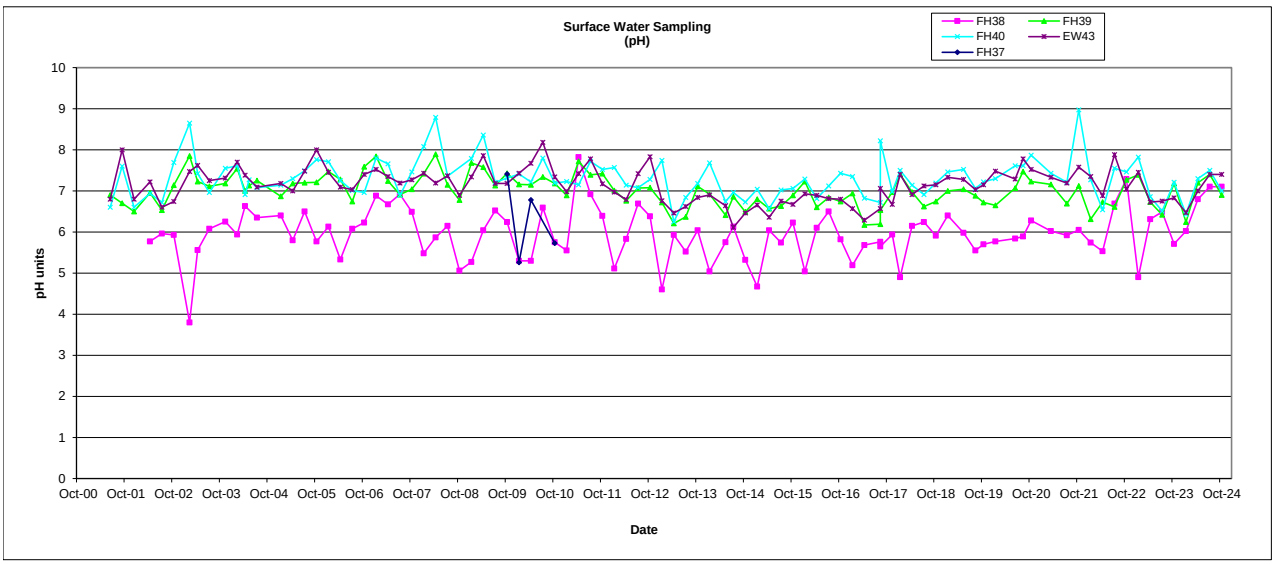
Surface Water Sampling Charts
(Fairfield Landfill)

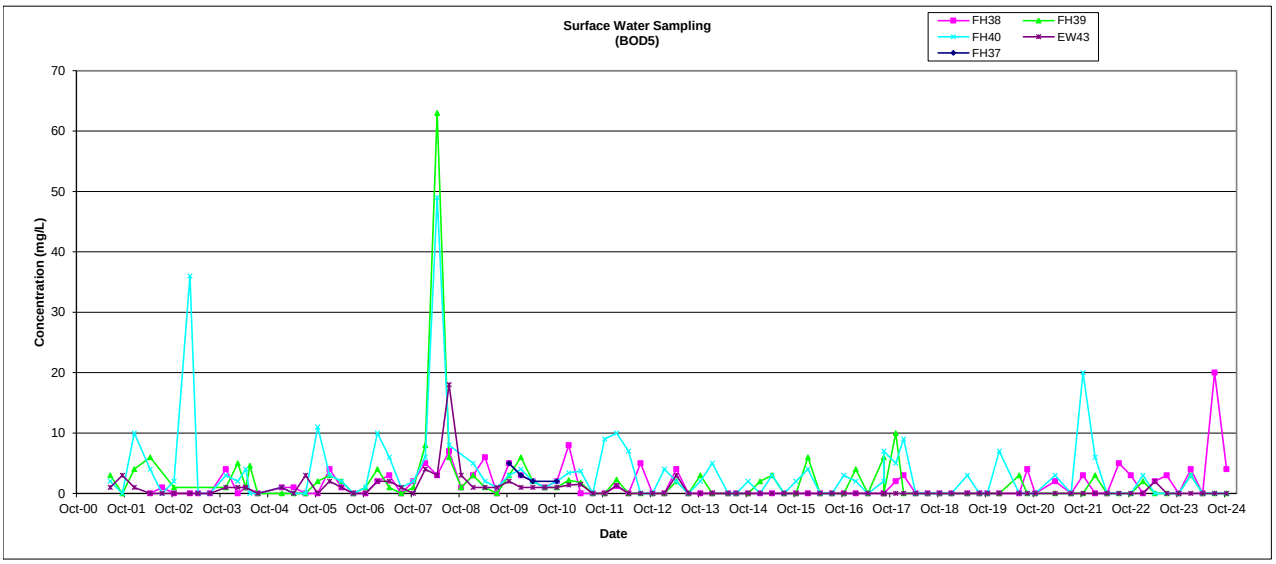


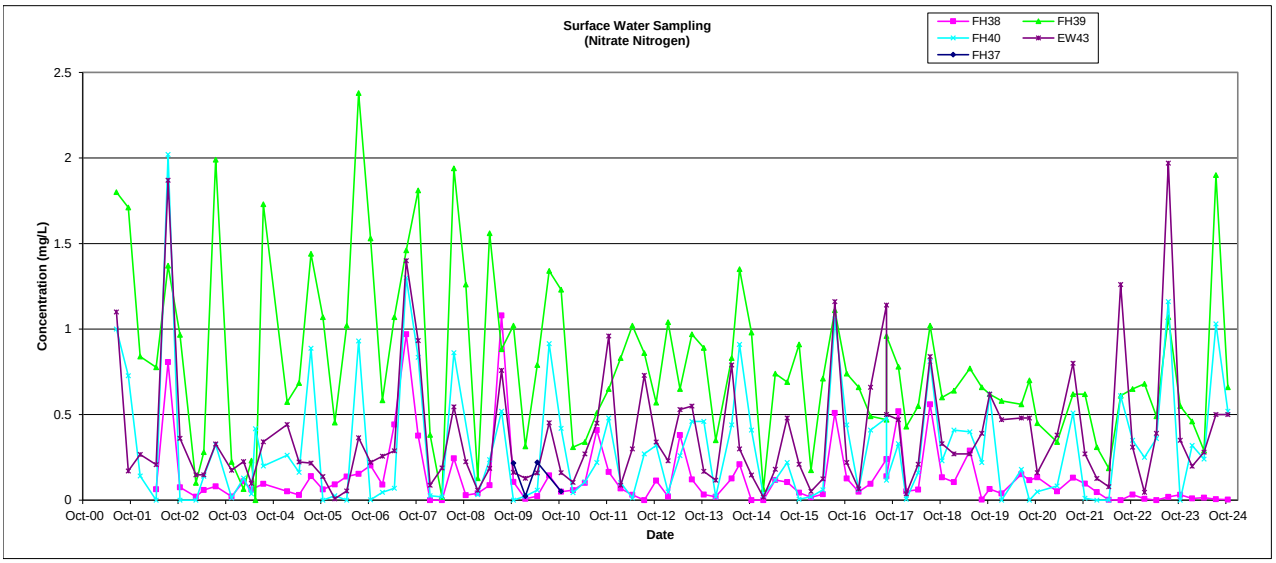




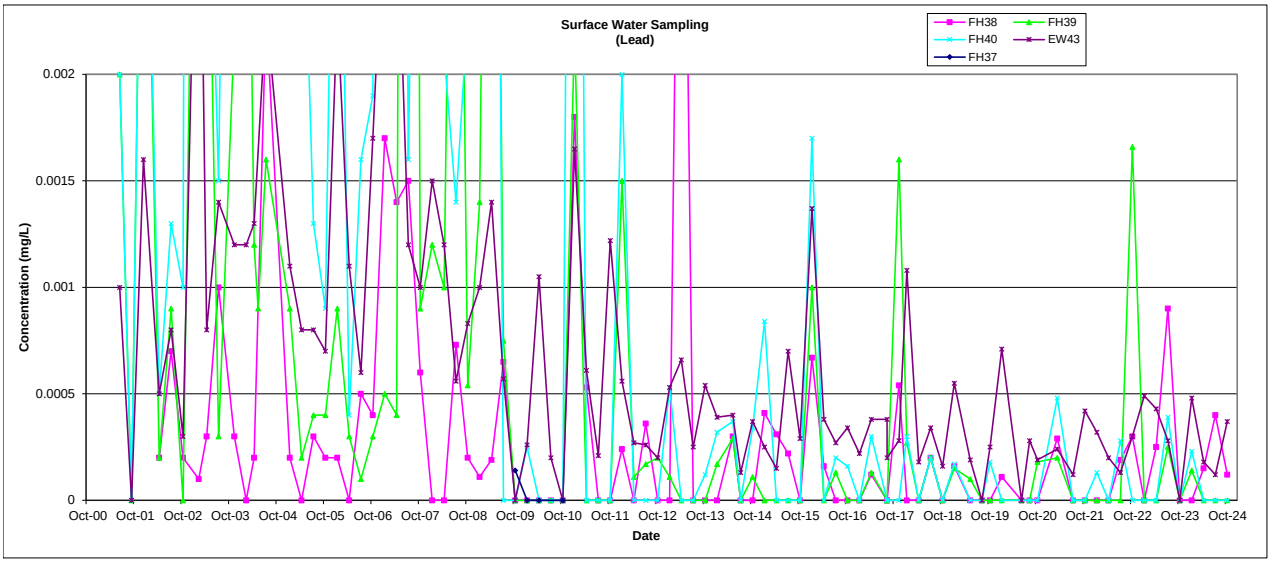
Surface Water Sampling Charts
(Fairfield Landfill)

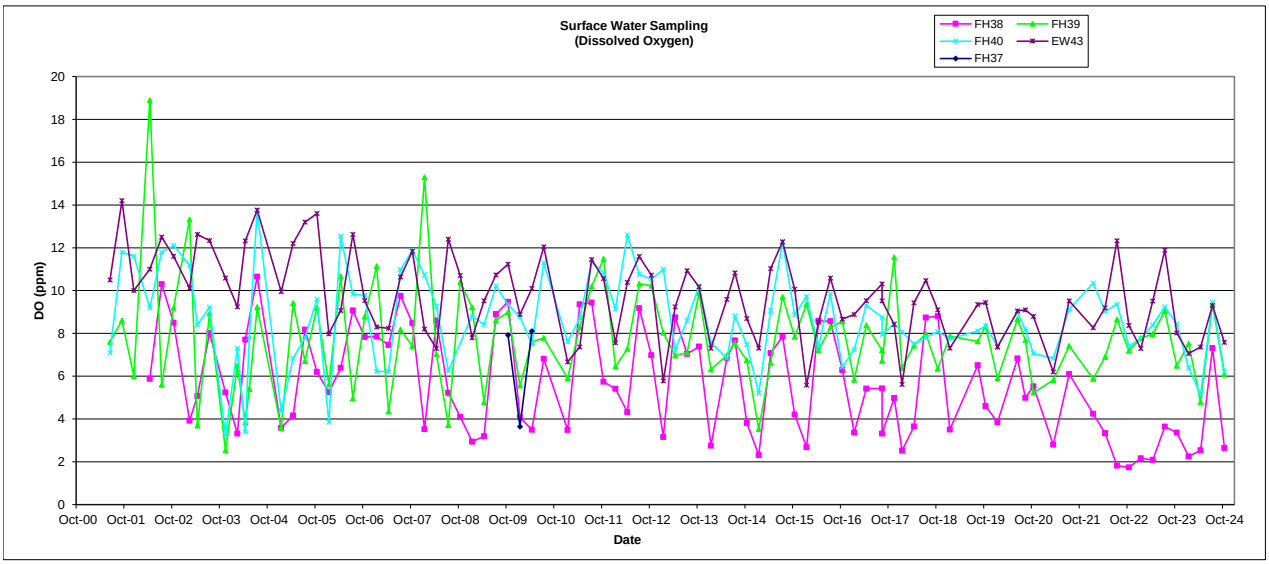


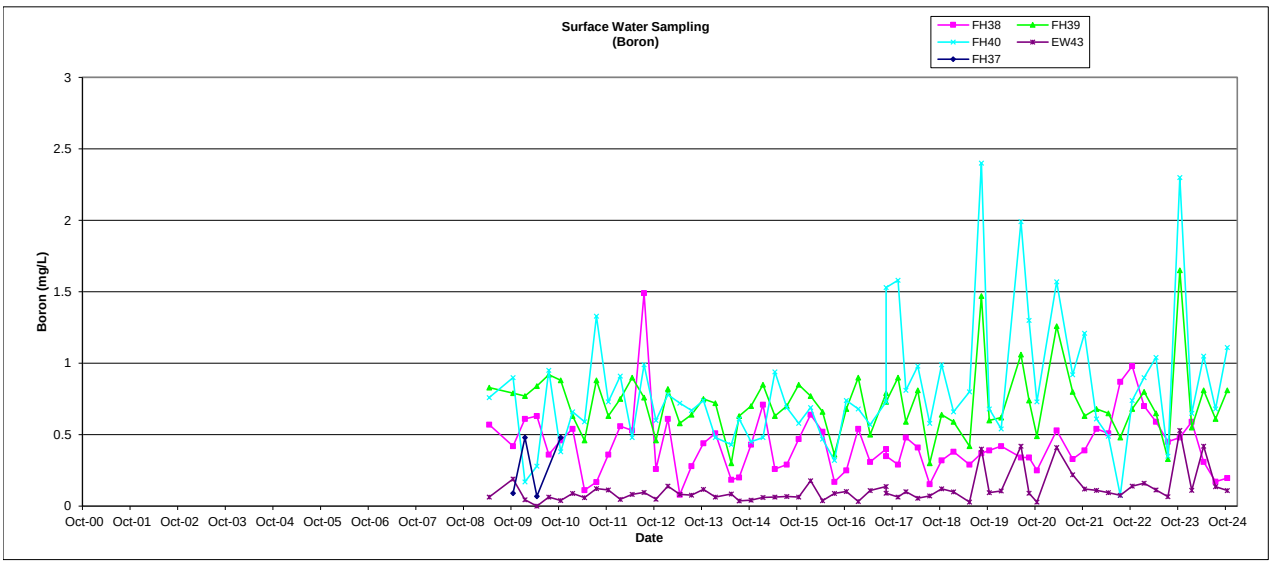




Surface Water Sampling Charts
(Fairfield Landfill)







APPENDIX F
(Stormwater Retention Pond Sampling)

NORTH POND STORMWATER WATER SAMPLING RESULTS

Parameter		North Pond																	ANZECC Trigger Levels [1] (95% level of Protection - Marine Water)	ANZG (2018) REC Physical and Chemical Stressor[5] and DGV[6] (95% Level of Protection) Trigger Level Concentrations
	Date	19/10/2009	21/01/2010	15/04/2010	27/07/2010	21/10/2010	25/01/2011	18/04/2011	29/07/2011	25/10/2011	25/01/2012	26/04/2012	18/07/2012	17/10/2012	29/01/2013	24/04/2013	22/07/2013	30/10/2013		
pH	pH units	7.81	7.89	7.66	7.3	7.46	7.47	7.61	7.78	7.26	7.32	6.98	7.13	7.93	7.41	7.17	8.16	7.85	7.0 - 8.5 [2]	-
Conductivity	mS/cm	0.32	0.35	0.38	0.31	0.30	0.31	0.27	0.30	0.27	0.33	0.24	0.40	9.3[4]	0.30	0.32	0.27	0.27	-	-
Ammoniacal Nitrogen	mg/L	0.08	0.14	<0.01	0.34	0.30	<0.010	0.049	0.07	0.031	0.048	0.03	0.031	0.066	<0.010	0.02	0.012	<0.010	0.91 [3]	0.91 [5]
BOD_5	mg/L	2	1	2	3	2	1.7	<1	<1	<1	<1	<2	<2	<2	<2	9	8	6	-	-
Turbidity	NTU	16	17	8.3	31	39	12.2	16.5	32	25	10.6	3.5	13.2	15.6	7.2	30	32	22		-
Suspended Solids	g/m^3	4	17	10	12	26	13	6	7	5	5	<3	<3	7	10	25	20	27	-	-

Parameter		North Pond																	ANZECC Trigger Levels [1] (95% level of Protection - Marine Water)	ANZG (2018) REC Physical and Chemical Stressor[5] and DGV[6] (95% Level of Protection) Trigger Level Concentrations
	Date	28/01/2014	14/05/2014	24/07/2014	22/10/2014	27/01/2015	20/04/2015	22/07/2015	12/10/2015	26/01/2016	26/10/2016	28/07/2016	26/10/2016	11/01/2017	20/04/2017	1/08/2017	9/11/2017	25/01/2018		
pH	pH units	8.92	6.78	6.8	6.57	6.82	6.47	6.62	6.79	7.32	6.85	6.53	6.78	7.45	6.62	6.54	7.81	7.8	7.0 - 8.5 [2]	-
Conductivity	mS/cm	0.29	0.27	0.27	0.29	0.31	0.31	0.33	0.34	0.37	0.39	0.40	0.38	0.38	0.36	0.38	0.36	0.41	-	-
Ammoniacal Nitrogen	mg/L	0.015	<0.010	0.25	0.38	0.049	0.111	0.155	0.089	<0.010	<0.010	<0.010	< 0.010	0.012	<0.010	0.047	<0.010	0.128	0.91 [3]	0.91 [5]
BOD_5	mg/L	11	11	7	<2	<2	<2	3	<2	2	<2	4	<2	<2	3	<2	2	<2	-	-
Turbidity	NTU	16.3	22	17.6	7.6	4.5	19.5	70	18.5	7.8	6.0	7	2.3	1.96	5.4	7.4	2.4	4.8		-
Suspended Solids	g/m^3	19	14	12	5	5	7	26	5	7	4	6	< 3	<3	8	5	<3	6	-	-

Parameter		North Pond																	ANZECC Trigger Levels [1] (95% level of Protection - Marine Water)	ANZG (2018) REC Physical and Chemical Stressor[5] and DGV[6] (95% Level of Protection) Trigger Level Concentrations (Freshwater)
	Date	24/04/2018	26/07/2018	9/10/2018	16/01/2019	1/05/2019	17/07/2019	22/10/2019	12/02/2020	11/06/2020	10/08/2020	28/10/2020	25/03/2021	14/07/2021	27/10/2021	25/01/2022	26/04/2022	26/07/2022		
pH	pH units	7.47	7.62	9.74	7.6	7.7	7.52	9	8.01	8.6	8.52	9.76	8.35	7.46	8.78	7.43	7.49	7.63	7.0 - 8.5 [2]	-
Conductivity	mS/cm	0.35	0.362	0.319	0.314	0.342	0.321	0.286	0.328	0.341	0.346	0.304	0.391	0.385	0.254	0.396	0.429	0.421	-	-
Ammoniacal Nitrogen	mg/L	<0.010	0.012	<0.010	0.053	0.012	0.022	0.021	0.063	<0.01	<0.01	0.024	0.042	0.181	0.013	0.38	<0.010	0.103	0.91 [3]	0.91 [5]
BOD_5	mg/L	<2	<2	5	<2	<2	<2	<2	3	<2	<2	3	<2	<2	<2	3	3	8	-	-
Turbidity	NTU	2.3	4.4	6.2	1.49	3.5	5.0	2.2	2.9	2.5	5	1.64	1.9	6.3	2.4	4.7	17.2	15.5		-
Suspended Solids	g/m^3	4	6	11	4	3	<3	<3	5	<3	4	<3	<3	6	<3	6	22	12	-	-

Parameter		North Pond																	ANZECC Trigger Levels [1] (95% level of Protection - Marine Water)	ANZG (2018) REC Physical and Chemical Stressor[5] and DGV[6] (95% Level of Protection) Trigger Level Concentrations (Freshwater)
	Date	26/10/2022	17/01/2023	26/04/2023	26/07/2023	26/10/2023	17/01/2024	17/04/2024	29/07/2024	23/10/2024										
pH	pH units	7.1	8.32	7.45	7.31	8.6	8.72	7.8	7.8	7.9									7.0 - 8.5 [2]	-
Conductivity	mS/cm	0.463	0.471	0.464	0.418	0.438	0.433	0.531	0.509	0.420									-	-
Ammoniacal Nitrogen	mg/L	0.57	0.025	<0.010	0.28	0.035	0.124	2.2	0.68	0.054									0.91 [3]	0.91 [5]
BOD_5	mg/L	<2	7	2	2	<2	<2	<2	<2	<2									-	-
Turbidity	NTU	4.3	4.4	5.6	9.7	2.9	4.6	11.9	3.9	2.9										-
Suspended Solids	g/m^3	<3	6	8	4	3	3	4	<3	<3									-	-

Notes:

1. Australian and New Zealand Guidelines for Fresh and Marine water Quality 2000 (ANZECC 2000).
2. Trigger level for physical and chemical stresses for a slightly disturbed system (Estuaries - South East Austrialia in the absence of any NZ trigger level)
3. Trigger level based on a pH of 8.0 and temperature of 20^{o}C (Marine Water)
4. Suspected to be a calibration error with the field meter
5. ANZG 2018 REC Guideline Value
6. ANZG 2018 DGV for 95% protection of aquatic species

Concentration above the ANZECC Trigger Value

WEIGHBRIDGE STORMWATER WATER SAMPLING RESULTS

Parameter		Weighbridge Pond																ANZECC Trigger Levels [1] (95% level of Protection - Marine Water)	ANZG (2018) REC Physical and Chemical Stressor[5] and DGV[6] (95% Level of Protection) Trigger Level Concentrations
	Date	19/10/2009	21/01/2010	15/04/2010	27/07/2010	21/10/2010	25/01/2011	18/04/2011	29/07/2011	25/10/2011	25/01/2012	26/04/2012	18/07/2012	17/10/2012	29/01/2013	24/04/2013	22/07/2013	30/10/2013		
pH	pH units	8.45	8.62	9.15	8.06	8.78	8.87	8.4	9.42	8.72		7.02	8.19	7.98		7.22	8.18		7.0 - 8.5 [2]	-
Conductivity	mS/cm	1.4	1.3	1.8	2.2	1.5	1.2	1.1	1.4	1.15		2.92	1.677	122.3[4]		0.752	2.72		-	-
Ammoniacal Nitrogen	mg/L	**11.3**	0.83	<0.04	**35.5**	**14.2**	0.021	**2.3**	**6.3**	**3.7**	Dry	0.56	**15.3**	0.89	Dry	0.2	**67**	Dry	0.91 [3]	0.91 [5]
BOD_5	mg/L	34	32	54	410	14	20	13	42	15		<2	2	4		11	32		-	-
Turbidity	NTU	90	310	300	140	14	59	88	69	168		31	59	49		390	44		-	-
Suspended Solids	g/m^3	90	200	340	47	25	26	83	126	138		41	47	41		270	62		-	-

Parameter		Weighbridge Pond																ANZECC Trigger Levels [1] (95% level of Protection - Marine Water)	ANZG (2018) REC Physical and Chemical Stressor[5] and DGV[6] (95% Level of Protection) Trigger Level Concentrations
	Date	28/01/2014	14/05/2014	24/07/2014	22/10/2014	27/01/2015	20/04/2015	22/07/2015	12/10/2015	26/01/2016	27/04/2016	28/07/2016	26/10/2016	11/01/2017	20/04/2017	1/08/2017	10/11/2017	25/01/2018		
pH	pH units																		7.0 - 8.5 [2]	-
Conductivity	mS/cm																		-	-
Ammoniacal Nitrogen	mg/L	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	0.91 [3]	0.91 [5]
BOD_5	mg/L																		-	-
Turbidity	NTU																		-	-
Suspended Solids	g/m^3																		-	-

Parameter		Weighbridge Pond																ANZECC Trigger Levels [1] (95% level of Protection - Marine Water)	ANZG (2018) REC Physical and Chemical Stressor[5] and DGV[6] (95% Level of Protection) Trigger Level Concentrations
	Date	24/04/2018	26/07/2018	9/10/2018	16/01/2019	1/05/2019	17/07/2019	22/10/2019	12/02/2020	11/06/2020	10/08/2020	28/10/2020	25/03/2021	14/07/2021	27/10/2021	25/01/2022	26/04/2022	26/07/2022		
pH	pH units																		7.0 - 8.5 [2]	-
Conductivity	mS/cm																		-	-
Ammoniacal Nitrogen	mg/L	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	0.91 [3]	0.91 [5]
BOD_5	mg/L																		-	-
Turbidity	NTU																		-	-
Suspended Solids	g/m^3																		-	-

Parameter		Weighbridge Pond																ANZECC Trigger Levels [1] (95% level of Protection - Marine Water)	ANZG (2018) REC Physical and Chemical Stressor[5] and DGV[6] (95% Level of Protection) Trigger Level Concentrations
	Date	26/10/2022	26/10/2023	23/10/2024																
pH	pH units																		7.0 - 8.5 [2]	-
Conductivity	mS/cm																		-	-
Ammoniacal Nitrogen	mg/L	Dry	Dry	Dry															0.91 [3]	0.91 [5]
BOD_5	mg/L																		-	-
Turbidity	NTU																		-	-
Suspended Solids	g/m^3																		-	-

Notes:

1. Australian and New Zealand Guidelines for Fresh and Marine water Quality 2000 (ANZECC 2000).
2. Trigger level for physical and chemical stresses for a slightly disturbed system (Estuaries - South East Austrialia in the absence of any NZ trigger level)
3. Trigger level based on a pH of 8.0 and temperature of 20^{0}C (Marine Water)
4. Suspected to be a calibration error with the field meter

Concentration above the ANZECC Trigger Value

11.3 Concentration above the ANZG Trigger Value

APPENDIX G
(Landfill Gas Monitoring)

LANDFILL GAS MONITORING RESULTS

Parameters	Type of sampling point	Date	Peak Methane (%)	Peak Carbon Dioxide (%)	Minimum Oxygen (%)	Peak Hydrogen Sulphide (ppm)	Peak Carbon Monoxide (ppm)
LGS1	Groundwater well (outside landfill)	6/01/2006	0.0	0.0	19.0	-	-
		5/04/2006	0.0	0.0	19.7	-	-
		25/07/2006	0.0	0.0	20.6	-	-
		28/11/2006	0.0	0.0	20.7	-	-
		23/02/2007	0.0	0.0	21.1	-	-
		17/02/2009	0.0	0.0	21.5	0	0
		29/04/2009	0.1	0.5	21.9	0	0
		23/07/2009	0.0	0.0	20.9	0	0
		19/10/2009	0.0	0.1	20.4	0	0
		20/01/2010	0.1	0.2	20.0	0	0
		23/04/2010	0.1	0.3	20.3	0	0
		28/07/2010	0.1	0.2	20.6	0	0
		8/10/2010	0.0	0.1	19.4	0	0
		31/01/2011	0.1	0.4	20.0	0	0
		6/05/2011	0.2	1.1	18.4	0	0
		2/09/2011	1.0	12.5	15.9	0	0
		25/11/2011	0.1	0.2	20.0	0	0
		26/01/2012	0.1	0.2	20.0	0	0
		27/04/2012	0.2	2.6	17.3	0	0
		10/07/2012	0.1	0.8	18.6	0	0
		3/10/2012	0.1	0.4	20.3	0	0
		16/01/2013	0.1	1.1	20.0	3	4
		10/04/2013	0.2	1.3	19.4	0	0
		29/07/2013	0.4	1.5	19.8	0	0
		18/10/2013	0.3	1.4	20.3	0	0
		28/01/2014	0.2	1.0	19.9	0	0
		14/05/2014	0.3	1.5	19.7	0	0
		26/11/2014	0.4	5.4	18.7	0	0
		27/01/2015	0.1	0.6	20.2	2	6
		19/05/2015	0.0	0.1	21.5	0	0
		10/07/2015	0.4	4.4	18.2	0	0
		20/10/2015	0.1	0.5	20.3	0	0
		12/01/2016	0.1	0.5	20.1	2	0
		6/04/2016	0.1	0.6	20.3	0	0
		11/07/2016	0.2	3.2	18.4	0	0
		19/10/2016	0.1	1.6	19.3	0	0
		24/01/2017	0.1	1.0	19.2	2	0
		22/05/2017	0.2	1.0	19.2	0	0
		26/07/2017	0.0	1.6	19.6	0	2
		18/12/2017	0.0	0.9	20.9	0	0
		25/01/2018	0.0	0.6	18.9	0	7
		1/05/2018	0.0	1.9	19.1	0	0
		16/07/2018	0.0	0.8	19.8	4	4
		17/10/2018	0.0	0.8	20.4	1	1
		10/01/2019	0.0	0.4	19.6	3	0
		23/01/2019	0.0	0.9	19.7	0	0
		1/05/2019	0.0	1.0	19.8	0	0
		20/08/2019	0.0	4.7	17.8	0	0
		30/10/2019	0.0	0.6	19.7	0	2
		26/02/2020	0.0	1.2	18.7	0	0
		16/06/2020	0.0	0.2	22.2	0	1
		21/08/2020	0.2	0.7	21.0	0	4
		16/10/2020	0.0	1.2	18.7	0	0
		25/02/2021	0.0	1.2	19.0	0	0
		15/04/2021	0.0	1.1	19.1	0	0
		14/07/2021	0.0	1.0	19.0	0	0
		5/10/2021	0.0	0.6	20.0	0	2
		9/12/2021	0.0	1.1	18.7	0	0
		15/02/2022	0.0	2.1	19.1	0	0
		9/03/2022	0.0	0.1	20.4	0	0
		10/06/2022	0.1	1.5	20.2	0	0
		27/09/2022	0.1	1.2	19.7	0	2
		17/01/2023	0.1	2.0	19.8	0	3
		26/04/2023	0.1	0.3	21.0	0	0
		31/07/2023	0.2	0.2	20.9	0	1
		22/11/2023	0.0	0.5	20.5	0	3
		23/02/2024	0.0	0.4	20.8	0	1
		23/04/2024	0.0	0.6	20.8	1	1
		26/07/2024	0.3	4.3	17.9	0	0
		18/10/2024	0.1	2.8	18.7	2	0

Parameters	Type of sampling point	Date	Peak Methane (%)	Peak Carbon Dioxide (%)	Minimum Oxygen (%)	Peak Hydrogen Sulphide (ppm)	Peak Carbon Monoxide (ppm)
LS4	Groundwater well (within landfill)	6/01/2006	7.4	4.7	17.3	-	-
		5/04/2006	51.2	36.2	1.4	-	-
		25/07/2006	28.1	21.5	9.6	-	-
		28/11/2006	61.8	40.1	0.0	-	-
		23/02/2007	61.7	39.9	0.0	-	-
		17/04/2007	61.5	39.3	0.0	-	-
		4/07/2007	63.6	40.6	0.1	-	-
		17/02/2009	56.1	38.0	1.3	51	4
		29/04/2009	50.3	32.1	4.9	48	2
		23/07/2009	59.8	42.1	0.4	55	1
		19/10/2009	58.3	37.9	0.7	47	11
		20/01/2010	54.6	36.9	2.0	40	7
		23/04/2010	54.5	36.7	1.2	39	5
		28/07/2010	56.0	35.2	1.3	36	3
		8/10/2010	62.6	34.8	0.7	28	6
		31/01/2011	62.4	37.7	0.6	27	16
		6/05/2011	61.5	35.9	0.7	36	12
		2/09/2011	45.8	26.0	5.5	10	0
		25/11/2011	54.0	34.3	3.5	71	14
		26/01/2012	56.6	40.1	0.9	106	19
		27/04/2012	Well not accessible				
		10/07/2012	24.4	20.2	10.9	62	43
		3/10//12	45.5	33.9	4.4	Over limit (>500)	80
		16/01/2013	56.7	41.7	0.4	Over limit (>500)	119
		10/04/2013	57.9	43.4	0.0	Over limit (>500)	111
		29/07/2013	62.1	42.6	0.0	Over limit (>500)	104
		18/10/2013	60.2	42.6	0.0	Over limit (>500)	84
		28/01/2014	60.5	42.1	0.0	Over limit (>500)	86
		14/05/2014	60.3	40.0	0.0	161	33
		26/11/2014	58.0	41.6	0.4	Over limit (>500)	104
		27/01/2015	53.3	38.7	1.1	192	72
		19/05/2015	61.7	40.4	0.3	181	3
		10/07/2015	65.0	41.0	0.0	Over limit (>500)	69
		20/10/2015	60.1	41.2	0.0	171	59
		12/01/2016	59.3	40.8	0.1	146	49
		6/04/2016	59.9	41.2	0.2	183	61
		11/07/2016	65.4	40.2	0.0	157	65
		19/10/2016	62.6	39.9	0.0	142	71
		24/01/2017	62.3	40.1	0.0	119	62
		22/05/2017	66.0	39.8	0.0	104	81
		26/07/2017	64.2	39.5	0.0	92	9
		18/12/2017	66.7	40.1	0.0	83	0
		25/01/2018	67.0	40.3	0.0	88	14
		1/05/2018	66.9	38.8	0.0	94	0
		16/07/2018	57.2	39.1	0.0	89	5
		17/10/2018	60.6	38.8	0.0	66	10
		10/01/2019	55.1	38.9	0.2	90	5
		23/01/2019	59.3	39.8	0.0	78	5
		1/05/2019	61.8	38.7	0.3	73	3
		20/08/2019	52.3	34.7	2.2	55	0
		30/10/2019	Buried - no longer able to be monitored				

Parameters	Type of sampling point	Date	Peak Methane (%)	Peak Carbon Dioxide (%)	Minimum Oxygen (%)	Peak Hydrogen Sulphide (ppm)	Peak Carbon Monoxide (ppm)
LD5	Groundwater well (outside operational landfill although installed within historical landfill - deep well)	6/01/2006	0.0	0.0	19.0	-	-
		5/04/2006	0.0	0.0	19.7	-	-
		25/07/2006	0.0	0.0	20.6	-	-
		28/11/2006	0.0	0.0	20.7	-	-
		23/02/2007	0.0	0.0	21.1	-	-
		17/04/2007	0.0	0.0	20.4	-	-
		17/02/2009	0.0	0.0	21.5	0	0
		29/04/2009	0.0	0.0	21.6	0	0
		23/07/2009	0.0	0.1	20.9	0	0
		19/10/2009	0.5	3.0	16.5	0	0
		20/01/2010	0.2	0.2	19.9	0	0
		23/04/2010	0.0	0.1		0	0
		28/07/2010	0.1	0.4	20.4	0	0
		8/10/2010	2.5	9.3	11.3	0	0
		31/01/2011	0.2	1.9	18.7	0	0
		6/05/2011	0.2	2.0	17.7	0	0
		2/09/2011	0.2	5.5	13.8	0	0
		25/11/2011	0.4	3.0	17.7	0	0
		26/01/2012	0.4	2.0	18.1	0	0
		27/04/2012	0.2	1.8	17.7	0	0
		10/07/2012	0.2	4.5	16.3	0	0
		3/10/2012	1.7	9.1	15.4	0	0
		16/01/2013	1.0	4.6	15.4	2	6
		10/04/2013	0.3	3.2	17.3	0	0
		29/07/2013	0.4	4.0	16.6	0	0
		18/10/2013	1.1	7.3	11.8	0	0
		28/01/2014	0.4	6.8	13.3	0	0
		14/05/2014	0.7	3.7	19.1	0	0
		26/11/2014	0.0	5.2	16.4	0	0
		27/01/2015	0.1	0.9	19.2	2	7
		19/05/2015	0.5	2.4	19.7	0	0
		10/07/2015	0.8	6.0	16.6	0	0
		20/10/2015	0.2	5.8	16.2	0	0
		12/01/2016	0.2	1.9	18.5	0	0
		6/04/2016	0.2	1.5	19.5	0	0
		11/07/2016	1.4	5.2	17.8	0	0
		19/10/2016	0.6	3.5	17.7	0	0
		24/01/2017	0.0	0.5	19.5	2	0
		22/05/2017	0.2	1.2	18.6	3	0
		26/07/2017	0.6	3.2	18.4	0	1
		18/12/2017	0.0	2.3	19.6	0	0
		25/01/2018	0.0	1.1	18.4	0	7
		1/05/2018	0.0	1.5	19.2	0	0
		16/07/2018	0.1	8.0	15.2	2	4
		17/10/2018	0.0	1.1	20.0	1	1
		10/01/2019	0.0	0.7	19.2	4	0
		23/01/2019	0.0	0.1	20.8	0	0
		1/05/2019	0.0	0.0	20.7	0	0
		20/08/2019	0.0	0.2	21.3	0	0
		22/10/2019	0.0	0.0	19.7	0	3
		26/02/2020	0.0	0.1	19.7	0	0
		16/06/2020	0.1	0.5	20.8	0	0
		21/08/2020	0.1	0.2	21.2	0	4
		16/10/2020	0.0	0.2	19.7	0	0
		25/02/2021	0.0	0.1	19.9	0	0
		15/04/2021	0.0	0.1	20.0	0	0
		14/07/2021	0.0	0.2	18.8	0	0
		5/10/2021	0.3	2.7	19.3	0	2
		9/12/2021	0.0	0.4	19.8	0	1
		15/02/2022	0.0	1.2	19.6	0	1
		9/03/2022	0.0	1.1	20.1	0	0
		10/06/2022	1.8	4.7	18.7	0	1
		27/09/2022	0.0	3.5	18.0	0	1
		17/01/2023	0.0	0.8	20.3	0	3
		26/04/2023	0.2	2.5	19.2	0	0
		31/07/2023	1.4	7.3	16.9	0	0
		22/11/2023	0.1	6.4	15.9	0	3
		23/02/2024	0.0	0.9	20.6	0	0
		23/04/2024	0.0	0.5	20.8	0	0
		26/07/2024	0.3	5.0	18.7	0	0
		18/10/2024	0.7	6.1	16.8	2	0

Parameters	Type of sampling point	Date	Peak Methane (%)	Peak Carbon Dioxide (%)	Minimum Oxygen (%)	Peak Hydrogen Sulphide (ppm)	Peak Carbon Monoxide (ppm)
LGS7	Groundwater well (outside landfill)	6/01/2006	0.0	0.0	19.5	-	-
		5/04/2006	0.0	0.0	19.7	-	-
		25/07/2006	0.0	0.0	20.2	-	-
		28/11/2006	0.0	0.0	20.2	-	-
		23/02/2007	0.0	0.0	20.3	-	-
		17/04/2007	0.0	0.0	20.0	-	-
		4/07/2007	0.0	0.0	19.9	-	-
		17/02/2009	0.0	0.0	20.9	0	0
		29/04/2009	0.0	0.0	21.2	0	0
		23/07/2009	0.0	2.0	20.7	0	0
		19/10/2009	0.0	0.2	20.4	0	0
		20/01/2010	0.2	2.4	19.3	0	0
		23/04/2010	0.0	1.1	20.2	0	0
		28/07/2010	0.1	0.8	20.3	0	0
		8/10/2010	0.1	0.4	19.3	0	0
		31/01/2011	0.0	0.5	20.2	0	0
		6/05/2011	0.2	7.1	16.9	0	0
		2/09/2011	0.1	1.7	18.8	0	0
		25/11/2011	0.1	0.7	19.6	0	0
		26/01/2012	0.1	0.9	18.8	0	0
		27/04/2012	0.1	0.9	18.3	0	0
		10/07/2012	0.1	0.9	19.2	0	0
		3/10/2012	0.1	0.3	20.4	0	0
		16/01/2013	0.0	0.3	20.3	2	5
		10/04/2013	0.1	1.1	20.3	0	0
		29/07/2013	0.1	2.7	19.7	0	0
		18/10/2013	0.1	1.0	20.8	0	0
		28/01/2014	0.2	0.4	20.4	0	0
		14/05/2014	0.2	3.4	19.9	0	0
		26/11/2014	0.0	0.4	20.6	0	0
		27/01/2015	0.0	0.2	20.2	2	2
		19/05/2015	0.0	2.4	21.1	0	0
		10/07/2015	0.3	3.9	18.9	0	0
		20/10/2015	0.1	1.7	20.2	0	0
		12/01/2016	0.0	0.4	20.5	1	0
		6/04/2016	0.1	0.6	20.6	0	0
		11/07/2016	0.2	0.1	21.0	0	0
		19/10/2016	0.1	0.1	20.1	0	0
		24/01/2017	0.0	0.3	19.7	1	0
		22/05/2017	0.1	0.5	19.0	3	0
		26/07/2017	0.0	1.6	19.6	0	1
		18/12/2017	0.0	0.1	21.3	0	0
		25/01/2018	0.0	0.0	19.7	0	3
		1/05/2018	0.0	0.9	20.2	0	0
		16/07/2018	0.0	3.8	19.3	1	4
		17/10/2018	0.0	0.6	20.6	1	1
		10/01/2019	0.0	0.1	19.7	4	0
		23/01/2019	0.0	0.1	20.7	0	0
		1/05/2019	0.0	0.1	20.7	0	0
		20/08/2019	0.0	2.1	20.8	0	0
		30/10/2019	0.0	0.5	19.5	0	3
		26/02/2020	0.0	0.2	19.7	0	2
		16/06/2020	0.0	4.5	19.5	0	0
		21/08/2020	0.1	1.3	21.0	0	4
		16/10/2020	0.0	0.2	19.7	0	2
		25/02/2021	0.0	0.2	20.0	0	1
		15/04/2021	0.0	0.2	19.7	0	1
		14/07/2021	0.0	0.2	18.6	0	1
		5/10/2021	0.2	1.6	19.8	0	4
		9/12/2021	0.0	0.1	20.3	0	1
		15/02/2022	0.0	0.4	20.7	1	1
		9/03/2022	0.0	0.4	20.3	0	0
		10/06/2022	0.0	4.7	19.4	0	0
		27/09/2022	0.0	0.3	19.9	0	2
		17/01/2023	0.0	0.2	20.5	0	3
		26/04/2023	0.1	3.0	20.5	0	0
		31/07/2023	0.2	0.3	21.0	0	0
		22/11/2023	0.0	2.8	19.0	0	3
		23/02/2024	0.0	0.1	21.1	0	0
		23/04/2024	0.0	1.3	20.9	2	1
		26/07/2024	0.0	5.2	19.3	1	0
		18/10/2024	0.0	0.1	20.8	2	2

Parameters	Type of sampling point	Date	Peak Methane (%)	Peak Carbon Dioxide (%)	Minimum Oxygen (%)	Peak Hydrogen Sulphide (ppm)	Peak Carbon Monoxide (ppm)
LGS27	Leachate collection system	6/01/2006	0.0	0.0	19.7	-	-
		5/04/2006	0.0	0.0	19.8	-	-
		25/07/2006	0.0	0.0	20.6	-	-
		28/11/2006	0.0	0.1	20.8	-	-
		23/02/2007	-	-	-	-	-
		17/04/2007	0.0	0.0	20.1	-	-
		4/07/2007	4.3	3.5	16.7	-	-
		17/02/2009	0.0	0.0	21.0	0	0
		29/04/2009	2.5	0.7	21.3	0	0
		23/07/2009	0.2	0.6	20.9	0	0
		19/10/2009	0.2	0.1	20.0	0	0
		20/01/2010	0.1	0.1	19.6	0	0
		23/04/2010	0.0	0.1	20.6	0	0
		28/07/2010	0.3	0.4	20.5	0	0
		8/10/2010	1.4	0.8	19.5	0	0
		31/01/2011	1.0	0.9	19.8	0	0
		6/05/2011	22.1	10.2	13.7	0	0
		2/09/2011	10.9	6.4	17.0	0	0
		25/11/2011	0.0	0.1	21.2	0	0
		26/01/2012	0.0	0.1	20.0	0	0
		27/04/2012	6.1	2.5	17.0	0	0
		10/07/2012	0.1	0.1	19.4	0	0
		3/10/2012	0.2	0.2	20.5	0	0
		16/01/2013	0.7	0.7	19.3	3	6
		10/04/2013	0.1	0.2	20.6	0	0
		29/07/2013	5.4	2.3	19.1	3	0
		18/10/2013	0.6	0.4	20.8	0	0
		28/01/2014	0.2	0.1	20.3	0	0
		14/05/2014	2.4	0.9	20.6	0	0
		26/11/2014	0.4	0.3	20.4	2	2
		27/01/2015	0.0	0.1	20.1	4	2
		19/05/2015	0.0	0.1	21.8	0	0
		10/07/2015	8.3	4.8	17.8	0	0
		20/10/2015	1.0	0.5	20.4	0	0
		12/01/2016	0.0	0.1	20.2	2	0
		6/04/2016	0.0	0.1	20.8	0	0
		11/07/2016	3.1	1.0	20.5	0	0
		19/10/2016	4.0	2.3	18.8	0	0
		24/01/2017	0.7	0.5	19.5	2	0
		22/05/2017	4.9	2.0	18.3	2	0
		26/07/2017	30.3	14.3	11.2	0	2
		18/12/2017	0.0	0.1	21.4	0	0
		25/01/2018	0.0	0.0	20.0	1	2
		1/05/2018	0.0	0.1	20.4	0	0
		16/07/2018	0.0	0.1	20.4	1	3
		17/10/2018	0.5	0.3	20.7	1	1
		10/01/2019	0.0	0.3	19.5	4	0
		23/01/2019	0.0	0.2	20.2	0	0
		1/05/2019	0.3	0.2	20.7	0	0
		20/08/2019	29.7	18.4	10.8	0	0
		30/10/2019	0.0	0.1	19.5	0	2
		26/02/2020	0.0	0.1	19.9	0	1
		16/06/2020	0.0	0.1	21.0	0	0
		21/08/2020	0.1	0.1	21.5	0	4
		16/10/2020	0.0	0.1	19.8	0	2
		25/02/2021	0.0	0.1	20.1	0	2
		15/04/2021	0.0	1.0	19.9	0	2
		14/07/2021	0.0	0.2	18.6	0	2
		5/10/2021	0.1	0.2	20.7	0	2
		9/12/2021	0.0	0.1	20.1	0	1
		15/02/2022	0.0	0.3	20.4	1	1
		9/03/2022	0.0	0.4	20.8	0	0
		10/06/2022	0.0	0.2	20.9	0	0
		27/09/2022	0.0	0.1	20.4	0	2
		17/01/2023	0.0	0.2	20.5	0	2
		26/04/2023	0.0	0.0	21.6	0	0
		31/07/2023	0.0	0.1	20.7	0	0
		22/11/2023	0.0	2.8	19.0	0	3
		23/02/2024	0.0	0.2	21.0	0	0
		23/04/2024	0.0	0.1	21.3	1	0
		26/07/2024	0.0	0.2	21.2	1	0
		18/10/2024	0.0	0.0	20.9	2	3

Parameters	Type of sampling point	Date	Peak Methane (%)	Peak Carbon Dioxide (%)	Minimum Oxygen (%)	Peak Hydrogen Sulphide (ppm)	Peak Carbon Monoxide (ppm)
LGS29	Leachate collection system	6/01/2006	0.0	0.0	19.2	-	-
		5/04/2006	0.0	0.0	19.8	-	-
		25/07/2006	23.8	12.9	12.1	-	-
		28/11/2006	9.9	5.6	17.1	-	-
		23/02/2007	0.0	0.0	20.8	-	-
		17/04/2007	0.2	0.1	20.1	-	-
		4/07/2007	22.3	11.7	12.9	-	-
		17/02/2009	7.2	7.2	15.9	0	0
		29/04/2009	0.5	0.6	21.6	0	0
		23/07/2009	0.0	0.0	21.1	0	0
		19/10/2009	0.1	0.1	20.7	0	0
		20/01/2010	0.3	0.2	19.7	0	0
		23/04/2010	0.0	0.1	20.6	0	0
		28/07/2010	0.5	0.4	20.5	0	0
		8/10/2010	0.1	0.0	20.1	0	0
		31/01/2011	0.0	0.0	20.6	0	3
		6/05/2011	0.3	0.2	19.3	0	0
		2/09/2011	0.5	0.3	19.8	0	0
		25/11/2011	0.5	0.3	20.9	0	0
		26/01/2012	0.1	0.1	20.2	0	0
		27/04/2012	0.6	0.3	19.1	0	0
		10/07/2012	0.1	0.2	19.2	0	0
		3/10/2012	0.3	0.2	20.5	0	0
		16/01/2013	0.0	0.0	20.3	3	7
		10/04/2013	0.1	0.1	20.7	0	0
		29/07/2013	0.5	0.3	20.5	2	0
		18/10/2013	0.2	0.2	20.9	0	0
		28/01/2014	0.2	0.2	20.3	0	0
		14/05/2014	0.2	0.1	21.3	0	0
		26/11/2014	0.0	0.0	20.5	1	2
		27/01/2015	0.1	0.1	20.0	2	5
		19/05/2015	0.1	0.1	21.7	0	0
		10/07/2015	0.3	0.5	19.7	0	0
		20/10/2015	0.9	0.6	20.3	0	0
		12/01/2016	0.4	0.3	20.3	2	1
		6/04/2016	0.1	0.1	20.7	0	0
		11/07/2016	0.3	0.2	21.0	0	0
		19/10/2016	0.8	0.5	19.8	0	0
		24/01/2017	0.0	0.1	19.8	2	0
		22/05/2017	2.1	1.2	18.8	2	0
		26/07/2017	0.0	0.1	20.3	0	2
		18/12/2017	5.2	3.3	19.7	0	0
		25/01/2018	10.0	5.5	17.3	2	3
		1/05/2018	0.8	0.6	20.3	0	0
		16/07/2018	0.0	0.1	20.5	1	3
		17/10/2018	0.3	0.1	20.8	1	1
		10/01/2019	57.2	36.5	0.2	23	10
		23/01/2019	0.8	0.4	20.3	0	0
		1/05/2019	63.8	37.4	0.3	13	1
		20/08/2019	53.4	32.3	2.6	18	0
		30/10/2019	63.7	35.5	0.0	0	2
		26/02/2020	0.0	0.2	19.8	0	2
		16/06/2020	0.1	0.1	21.0	0	1
		21/08/2020	0.5	0.3	21.7	0	4
		16/10/2020	0.0	0.1	19.8	0	2
		25/02/2021	0.0	0.1	20.1	0	2
		15/04/2021	0.0	0.1	19.7	0	2
		14/07/2021	0.0	0.1	20.2	0	2
		5/10/2021	0.1	0.1	20.8	0	3
		9/12/2021	0.0	0.0	19.7	0	1
		15/02/2022	0.2	0.1	20.5	1	1
		9/03/2022	61.0	37.2	2.0	1	5
		10/06/2022	0.3	0.2	21.0	0	1
		27/09/2022	56.2	30.9	2.6	12	4
		17/01/2023	54.3	30.9	2.2	23	4
		26/04/2023	0.1	0.1	21.6	0	0
		31/07/2023	0.5	0.2	20.8	0	0
		22/11/2023	0.4	0.4	21.0	0	3
		23/02/2024	0.2	0.5	20.7	0	1
		23/04/2024	0.2	0.2	20.6	3	1
		26/07/2024	0.2	0.3	21.1	1	0
		18/10/2024	0.0	0.1	21.2	3	1

Parameters	Type of sampling point	Date	Peak Methane (%)	Peak Carbon Dioxide (%)	Minimum Oxygen (%)	Peak Hydrogen Sulphide (ppm)	Peak Carbon Monoxide (ppm)
LS31	Leachate collection system	6/01/2006	0.0	0.0	20.3	-	-
		5/04/2006	0.0	0.0	19.9	-	-
		25/07/2006	0.0	0.0	20.6	-	-
		28/11/2006	0.0	0.0	20.8	-	-
		23/02/2007	0.0	0.0	20.8	-	-
		17/04/2007	0.0	0.0	20.4	-	-
		4/07/2007	0.1	0.0	20.1	-	-
		17/02/2009	0.0	0.0	21.0	0	0
		29/04/2009	0.0	0.0	21.8	0	0
		23/07/2009	0.0	0.0	21.2	0	0
		19/10/2009	0.1	0.1	19.0	0	0
		20/01/2010	0.1	0.1	19.6	0	0
		23/04/2010	0.0	0.1	20.7	0	0
		28/07/2010	0.1	0.2	20.7	0	0
		8/10/2010	0.0	0.0	20.4	0	0
		31/01/2011	0.0	0.0	20.9	0	3
		6/05/2011	0.1	0.1	19.3	0	0
		2/09/2011	0.1	0.1	20.1	0	0
		25/11/2011	0.1	0.0	21.3	0	0
		26/01/2012	0.0	0.1	20.2	0	0
		27/04/2012	0.3	0.1	19.6	0	0
		10/07/2012	0.1	0.1	19.1	0	0
		3/10/2012	0.1	0.1	20.6	0	0
		16/01/2013	0.0	0.0	20.2	3	8
		10/04/2013	0.1	0.1	20.8	0	0
		29/07/2013	0.1	0.1	20.6	2	0
		18/10/2013	0.1	0.1	20.9	0	0
		28/01/2014	0.2	0.1	20.3	0	0
		14/05/2014	0.4	0.2	21.2	0	0
		26/11/2014	0.0	0.1	20.4	1	3
		27/01/2015	0.1	0.0	20.1	3	7
		19/05/2015	0.0	0.1	21.8	0	0
		10/07/2015	0.2	0.1	20.2	0	0
		20/10/2015	0.1	0.1	20.6	0	0
		12/01/2016	0.1	0.0	20.5	2	2
		6/04/2016	0.0	0.0	20.8	0	0
		11/07/2016	0.2	0.1	21.0	0	0
		19/10/2016	0.1	0.1	20.0	0	0
		24/01/2017	0.0	0.2	19.9	2	0
		22/05/2017	0.1	0.2	19.5	0	0
		26/07/2017	0.0	0.1	20.3	0	2
		18/12/2017	0.0	0.1	21.5	0	0
		25/01/2018	0.0	0.0	20.2	1	2
		1/05/2018	0.0	0.2	20.7	0	0
		16/07/2018	0.0	0.3	20.5	1	1
		17/10/2018	0.0	0.1	20.8	1	1
		10/01/2019	0.0	0.1	19.8	4	96
		23/01/2019	0.0	0.1	20.6	0	0
		1/05/2019	0.2	0.2	20.8	0	0
		20/08/2019	0.0	0.3	21.6	0	0
		30/10/2019	0.0	0.9	18.9	1	0
		26/02/2020	0.0	0.2	20.1	0	1
		16/06/2020	0.0	0.1	21.1	0	0
		21/08/2020	0.0	0.1	21.7	0	4
		16/10/2020	0.0	0.2	19.8	0	2
		25/02/2021	0.0	0.2	19.9	0	2
		15/04/2021	0.0	0.2	20.0	0	2
		14/07/2021	0.0	0.2	19.9	0	2
		5/10/2021	0.1	0.1	21.0	0	1
		9/12/2021	0.0	0.4	19.5	0	1
		15/02/2022	0.0	0.2	19.8	1	2
		9/03/2022	0.3	0.2	20.5	0	0
		10/06/2022	0.0	0.2	21.0	0	1
		27/09/2022	0.1	0.6	19.6	0	2
		17/01/2023	0.4	1.4	19.4	0	3
		26/04/2023	0.1	0.9	21.1	0	0
		31/07/2023	0.3	1.8	20.0	0	0
		22/11/2023	0.0	0.6	20.9	0	2
		23/02/2024	0.2	0.8	20.2	0	1
		23./04/2024	0.0	1.0	19.6	3	1
		26/07/2024	0.0	1.8	19.8	1	0
		18/10/2024	0.0	1.1	20.0	3	2

Parameters	Type of sampling point	Date	Peak Methane (%)	Peak Carbon Dioxide (%)	Minimum Oxygen (%)	Peak Hydrogen Sulphide (ppm)	Peak Carbon Monoxide (ppm)
LS32	Leachate collection system	23/02/2007	0.1	0.0	21.1	-	-
		17/04/2007	0.0	0.0	20.2	-	-
		4/07/2007	0.0	0.0	20.1	-	-
		17/02/2009	0.9	2.4	19.9	0	0
		29/04/2009	4.9	6.5	19.2	0	0
		23/07/2009	12.8	14.6	15.2	0	0
		19/10/2009	0.1	0.2	21.0	0	0
		20/01/2010	12.1	10.6	13.5	0	0
		23/04/2010	2.9	5.9	17.8	0	0
		28/07/2010	0.8	6.4	18.8	0	0
		8/10/2010	19.0	20.6	11.9	0	4
		31/01/2011	0.1	0.3	20.7	0	2
		6/05/2011	1.6	13.6	16.1	0	0
		2/09/2011	0.9	8.6	18.1	0	0
		25/11/2011	0.1	0.5	21.7	0	4
		26/01/2012	0.4	1.1	19.7	0	0
		27/04/2012	0.3	2.0	19.3	0	0
		10/07/2012	0.1	0.3	19.1	0	0
		3/10/2012	0.9	1.0	20.2	0	0
		16/01/2013	3.3	18.7	14.9	5	11
		10/04/2013	0.1	0.1	20.7	0	0
		29/07/2013	0.4	4.4	19.5	2	0
		18/10/2013	0.8	1.4	20.3	0	0
		28/01/2014	0.2	0.3	20.1	0	0
		14/05/2014	2.8	11.3	17.4	0	0
		26/11/2014	0.0	0.2	20.3	2	3
		27/01/2015	24.2	16.7	11.9	5	12
		19/05/2015	34.1	24.6	8.7	4	1
		10/07/2015	42.2	30.6	5.8	0	0
		20/10/2015	50.5	32.5	3.2	2	0
		12/01/2016	16.2	23.5	11.9	5	12
		6/04/2016	3.2	2.0	19.7	0	0
		11/07/2016	40.2	26.9	6.7	0	0
		19/10/2016	62.3	37.9	0.0	0	0
		24/01/2017	43.2	28.7	5.2	5	4
		22/05/2017	51.0	33.8	2.6	0	0
		26/07/2017	0.6	6.8	18.8	0	2
		18/12/2017	60.4	35.8	1.6	0	0
		25/01/2018	1.8	1.8	19.8	2	6
		1/05/2018	33.1	24.7	8.6	0	0
		16/07/2018	57.5	37.1	0.3	3	4
		17/10/2018	50.2	31.6	2.4	2	3
		10/01/2019	56.4	37.5	0.1	23	10
		23/01/2019	54.2	35.9	1.2	3	2
		1/05/2019	6.9	4.1	18.7	0	0
		20/08/2019	51.1	32.1	3.0	0	0
		30/10/2019	39.7	28.3	5.4	7	3
		26/02/2020	34.6	22.2	7.8	0	5
		16/06/2020	54.1	32.2	3.0	1	1
		21/08/2020	48.7	32.7	3.6	3	8
		16/10/2020	35.6	22.3	7.7	0	5
		25/02/2021	20.4	18.8	8.8	0	0
		15/04/2021	32.6	21.7	7.9	0	4
		14/07/2021	32.2	18.1	7.8	0	4
		5/10/2021	37.6	22.5	9.0	0	3
		9/12/2021	62.1	35.1	0.4	1	3
		15/02/2022	54.1	35.7	2.9	9	4
		9/03/2022	27.5	17.2	11.6	1	0
		10/06/2022	0.9	9.5	18.2	2	2
		27/09/2022	45.8	29.9	4.3	6	3
		17/01/2023	44.7	26.5	4.8	3	4
		26/04/2023	Not measured				
		31/07/2023	6.6	27.1	13.0	1	2
		22/11/2023	55.5	32.4	1.8	0	5
		23/02/2024	0.0	0.1	20.8	0	1
		23/04/2024	0.6	4.4	18.9	3	1
		26/07/2024	2.1	21.2	15.6	1	0
		18/10/2024	0.0	0.0	21.0	2	2

Parameters	Type of sampling point	Date	Peak Methane (%)	Peak Carbon Dioxide (%)	Minimum Oxygen (%)	Peak Hydrogen Sulphide (ppm)	Peak Carbon Monoxide (ppm)
G34	Landfill gas well	6/01/2006	0.0	0.0	19.5	-	-
		5/04/2006	0.0	0.0	19.8	-	-
		25/07/2006	0.0	0.0	20.2	-	-
		28/11/2006	0.0	0.0	20.8	-	-
		23/02/2007	0.0	0.0	20.8	-	-
		17/04/2007	0.0	0.0	20.2	-	-
		4/07/2007	0.0	0.0	20.1	-	-
		17/02/2009	0.0	0.0	20.1	0	0
		29/04/2009	0.0	0.0	20.4	0	0
		23/07/2009	0.3	0.0	20.1	0	0
		19/10/2009	0.0	0.0	20.8	0	0
		20/01/2010	0.2	0.2	19.6	0	0
		23/04/2010	0.0	0.1	20.7	0	0
		28/07/2010	0.1	0.4	20.5	0	0
		8/10/2010	0.1	0.1	20.6	0	2
		31/01/2011	0.0	0.2	20.4	0	3
		6/05/2011	0.2	0.2	19.4	0	0
		2/09/2011	0.1	0.2	20.0	0	0
		25/11/2011	0.2	0.2	19.9	0	2
		26/01/2012	0.2	0.2	19.9	0	1
		27/04/2012	0.2	0.2	19.6	0	0
		10/07/2012	0.2	0.3	19.0	0	0
		3/10/2012	0.3	0.2	20.4	0	0
		16/01/2013	0.1	0.2	20.2	4	9
		10/04/2013	0.1	0.1	20.6	0	0
		29/07/2013	0.2	0.1	20.3	1	0
		18/10/2013	0.1	0.1	20.9	0	0
		28/01/2014	0.2	0.1	20.4	0	0
		14/05/2014	0.2	0.2	21.1	0	0
		26/11/2014	0.0	0.1	20.4	3	4
		27/01/2015	0.1	0.0	20.1	4	11
		19/05/2015	0.0	0.2	21.8	0	0
		10/07/2015	0.2	0.4	20.3	0	0
		20/10/2015	0.1	0.1	20.7	0	0
		12/01/2016	0.2	0.0	18.9	3	14
		6/04/2016	0.1	0.1	20.7	0	0
		11/07/2016	0.1	0.3	20.7	0	0
		19/10/2016	0.1	0.1	20.2	0	0
		24/01/2017	0.0	0.1	20.2	2	1
		22/05/2017	0.1	0.2	19.4	0	0
		26/07/2017	0.0	0.4	20.2	0	2
		18/12/2017	0.0	0.1	21.5	0	0
		25/01/2018	0.0	0.0	20.2	1	3
		1/05/2018	0.0	0.1	20.3	0	0
		16/07/2018	0.0	0.5	19.9	2	2
		17/10/2018	0.0	0.4	20.3	1	1
		10/01/2019	0.0	0.1	19.9	4	180
		23/01/2019	0.0	0.1	20.3	0	0
		1/05/2019	0.0	0.1	20.4	0	0
		20/08/2019	0.0	0.1	20.4	0	0
		30/10/2019	0.0				
		26/02/2020	0.0	0.1	19.9	0	2
		16/06/2020	0.1	0.2	21.1	0	0
		21/08/2020	0.1	0.1	21.3	0	0
		16/10/2020	0.0	0.1	19.8	0	2
		25/02/2021	0.0	0.2	19.9	0	1
		15/04/2021	0.0	0.1	20.0	0	2
		14/07/2021	0.0	0.1	19.9	0	2
		5/10/2021	0.1	0.2	20.8	0	1
		9/12/2021	0.0	0.1	20.0	0	3
		15/02/2022	0.0	0.1	19.8	0	1
		9/03/2022	0.0	0.2	20.1	0	2
		10/06/2022	0.0	0.2	20.0	1	1
		27/09/2022	0.0	0.3	18.9	0	2
		17/01/2023	0.0	0.1	20.2	1	3
		26/04/2023	0.1	0.2	21.4	0	0
		31/07/2023	0.2	0.1	21.0	0	0
		22/11/2023	0.0	0.1	20.9	0	3
		23/02/2024	0.0	0.1	20.7	0	1
		23/04/2024	0.0	0.1	20.1	0	1
		26/07/2024	0.0	0.2	21.1	1	0
		18/10/2024	0.0	0.0	32.0	3.0	2

Parameters	Type of sampling point	Date	Peak Methane (%)	Peak Carbon Dioxide (%)	Minimum Oxygen (%)	Peak Hydrogen Sulphide (ppm)	Peak Carbon Monoxide (ppm)
G35	Cesspit	6/01/2006	0.0	0.0	20.0	-	-
		5/04/2006	0.0	0.0	19.8	-	-
		25/07/2006	0.0	0.0	20.1	-	-
		28/11/2006	0.0	0.0	20.7	-	-
		23/02/2007	0.0	0.0	20.4	-	-
		17/04/2007	0.0	0.0	20.4	-	-
		4/07/2007	0.0	0.0	20.1	-	-
		17/02/2009	0.0	0.0	21.6	0	0
		29/04/2009	0.0	0.1	21.6	0	0
		23/07/2009	0.0	0.0	21.0	0	0
		19/10/2009	0.0	0.0	21.2	0	0
		31/01/2011	0.1	0.4	20.1	0	0
		6/05/2011	0.1	0.1	19.5	0	0
		2/09/2011	0.1	0.0	21.0	0	0
		25/11/2011	0.1	0.1	20.5	0	0
		26/01/2012	0.0	0.1	21.0	0	0
		27/04/2012	0.1	0.1	19.6	0	0
		10/07/2012	0.1	0.1	19.0	0	0
		3/10/2012	0.1	0.1	20.7	0	0
		16/01/2013	0.1	0.1	20.4	2	3
		10/04/2013	0.1	0.1	20.9	0	0
		29/07/2013	0.1	0.0	20.4	1	0
		18/10/2013	0.1	0.1	20.7	0	0
		28/01/2014	0.2	0.1	20.7	0	0
		14/05/2014	0.2	0.1	21.4	0	0
		26/11/2014	0.0	0.1	20.5	0	0
		27/01/2015	0.0	0.0	20.8	2	5
		19/05/2015	0.0	0.1	21.6	0	0
		10/07/2015	0.2	0.1	20.6	0	0
		20/10/2015	0.0	0.0	21.1	0	0
		12/01/2016	0.2	0.1	18.5	2	20
		6/04/2016	0.1	0.1	20.5	0	0
		11/07/2016	0.1	0.1	21.1	0	0
		19/10/2016	0.1	0.1	20.3	0	0
		24/01/2017	0.0	0.0	20.5	4	5
		22/05/2017	0.2	0.1	19.2	0	0
		26/07/2017	0.0	0.0	20.6	0	3
		18/12/2017	0.0	0.1	20.9	0	0
		25/01/2018	0.0	0.1	20.8	0	0
		1/05/2018	0.0	0.2	20.3	0	0
		16/07/2018	0.0	0.1	20.4	1	3
		17/10/2018	0.0	0.0	19.8	0	1
		10/01/2019	0.0	0.0	19.8	6	180
		23/01/2019	0.0	0.2	20.5	0	0
		1/05/2019	0.0	0.1	20.4	0	0
		20/08/2019	0.0	0.0	20.9	0	0
		30/10/2019	0.0	0.1	19.9	0	2
		26/02/2020	0.0	0.1	19.7	0	0
		16/06/2020	0.0	0.1	21.0	0	0
		21/08/2020	0.0	0.0	21.1	0	3
		16/10/2020	0.0	0.1	19.9	0	0
		25/02/2021	0.0	0.1	21.4	0	0
		15/04/2021	0.0	0.1	21.4	0	1
		14/07/2021	0.0	0.1	21.0	0	0
		5/10/2021	0.0	0.1	20.3	0	0
		9/12/2021	0.0	0.1	20.1	0	0
		15/02/2022	0.0	0.1	20.2	0	1
		9/03/2022	0.0	0.0	20.8	0	0
		10/06/2022	0.0	0.2	20.9	0	0
		27/09/2022	0.0	0.1	20.5	0	1
		17/01/2023	0.0	0.2	20.8	0	3
		26/04/2023	0.0	0.1	20.2	0	0
		31/07/2023	0.0	0.1	20.6	0	0
		22/11/2023	0.0	0.0	21.0	0	2
		23/02/2024	0.0	0.1	21.2	0	0
		23/04/2024	0.0	0.1	21.2	0	0
		26/07/2024	0.0	0.1	21.0	0	0
		18/10/2024	0.0	0.1	20.7	0	0

Parameters	Type of sampling point	Date	Peak Methane (%)	Peak Carbon Dioxide (%)	Minimum Oxygen (%)	Peak Hydrogen Sulphide (ppm)	Peak Carbon Monoxide (ppm)
G36	Basement of house	23/07/2009	0.0	0.0	20.8	0	0
		20/01/2010	0.1	0.1	20.1	0	0
		23/04/2010	0.0	0.1	20.7	0	0
		28/07/2010	0.1	0.1	20.3	0	0
		31/01/2011	-	-	-	-	-
		6/05/2011	0.1	0.1	19.4	0	0
		2/09/2011	0.1	0.0	20.8	0	0
		25/11/2011	-	-	-	-	-
		26/01/2012	0.1	0.1	20.7	0	0
		27/04/2012	-	-	-	-	-
		10/07/2012	0.1	0.1	19.0	-	-
		3/10/2012	-	-	-	-	-
		16/01/2013	0.1	0.1	20.0	2	2
		10/04/2013	0.1	0.1	21.0	0	0
		29/07/2013	0.1	0.0	20.5	1	0
		18/10/2013	0.1	0.1	20.9	0	0
		28/11/2014	0.2	0.1	20.8	0	0
		14/05/2014	0.2	0.1	21.4	0	0
		26/11/2014	0.0	0.1	20.7	0	0
		27/01/2015	0.0	0.0	20.7	2	6
		19/05/2015	0.1	0.1	20.9	0	0
		10/07/2015	0.2	0.1	20.6	0	0
		20/10/2015	0.0	0.0	21.1	0	0
		12/01/2016	0.2	0.0	19.6	2	22
		6/04/2016	0.1	0.1	20.5	0	0
		11/07/2016	0.1	0.1	21.1	0	0
		19/10/2016	0.1	0.0	20.2	0	0
		24/01/2017	-	-	-	-	-
		22/05/2017	0.1	0.1	19.2	0	0
		26/07/2017	0.0	0.0	20.7	0	3
		18/12/2017	0.0	0.1	20.9	0	0
		25/01/2018	0.0	0.0	21.2	2	7
		1/05/2018	0.0	0.2	20.5	0	0
		6/07/2018	0.0	0.1	20.4	2	2
		17/10/2018	0.0	0.1	19.8	0	0
		10/01/2019	0.0	0.0	20.0	5	58
		23/01/2019	0.0	0.2	20.4	0	0
		1/05/2019	0.0	0.1	20.2	0	0
		20/08/2019	0.0	0.1	20.2	0	0
		30/10/2019	0.0	0.1	20.1	0	1
		26/02/2020	0.0	0.1	19.9	0	0
		16/06/2020	0.0	0.1	21.9	0	0
		21/08/2020	0.0	0.0	21.0	0	2
		16/10/2020	0.0	0.1	19.9	0	0
		25/02/2021	0.0	0.1	21.5	0	0
		15/04/2021	0.0	0.0	21.2	0	1
		14/07/2021	0.0	0.2	20.0	0	0
		5/10/2021	0.0	0.1	20.3	0	0
		9/12/2021	0.0	0.1	20.2	0	0
		15/02/2022	0.0	0.0	20.3	0	1
		9/03/2022	0.0	0.1	20.9	0	0
		10/06/2022	0.0	0.2	20.9	0	0
		27/09/2022	0.0	0.1	20.7	0	0
		17/01/2023	0.0	0.2	21.0	0	2
		26/04/2023	0.0	0.1	20.3	0	0
		31/07/2023	0.0	0.1	20.5	0	0
		22/11/2023	0.0	0.1	21.1	0	2
		23/02/2024	0.0	0.1	21.3	0	0
		23/04/2024	0.0	0.1	21.2	0	0
		26/07/2024	0.0	0.1	21.0	0	0
		18/10/2024	0.0	0.1	20.7	0	0

Parameters	Type of sampling point	Date	Peak Methane (%)	Peak Carbon Dioxide (%)	Minimum Oxygen (%)	Peak Hydrogen Sulphide (ppm)	Peak Carbon Monoxide (ppm)
G37	Landfill gas well	6/01/2006	0.0	2.3	18.6	-	-
		5/04/2006	0.5	0.4	17.5	-	-
		25/07/2006	0.0	3.1	18.0	-	-
		28/11/2006	0.0	3.7	18.6	-	-
		23/02/2007	0.0	3.7	18.9	-	-
		17/04/2007	0.0	0.0	20.4	-	-
		4/07/2007	0.0	2.6	18.5	-	-
		17/02/2009	0.0	1.1	20.8	0	0
		29/04/2009	0.0	3.6	18.8	0	0
		23/07/2009	0.0	2.5	14.0	0	0
		19/10/2009	0.0	4.2	18.7	0	0
		20/01/2010	0.1	1.9	17.8	0	0
		23/04/2010	0.0	0.5	20.1	0	0
		28/07/2010	0.1	0.4	20.0	0	0
		8/10/2010	0.1	4.2	15.0	0	0
		31/01/2011	0.0	0.6	19.8	0	0
		6/05/2011	0.1	3.0	14.3	0	0
		2/09/2011	0.1	1.7	19.3	0	0
		25/11/2011	0.0	1.4	19.7	0	0
		26/01/2012	0.1	1.3	19.6	0	1
		27/04/2012	0.1	2.2	17.3	0	0
		10/07/2012	0.1	1.4	17.4	0	0
		3/10/2012	0.1	2.0	18.8	0	0
		16/01/2013	0.0	1.6	19.0	2	4
		10/04/2013	0.1	4.2	17.5	0	0
		29/07/2013	0.1	0.1	20.3	0	0
		18/10/2013	0.1	0.4	20.7	0	0
		28/01/2014	0.2	2.1	18.5	0	0
		14/05/2014	0.2	4.1	16.8	0	0
		26/11/2014	0.0	2.1	18.3	0	0
		27/01/2015	0.0	1.3	19.5	2	5
		19/05/2015	0.0	1.8	20.1	0	0
		10/07/2015	0.2	1.2	19.6	0	0
		20/10/2015	0.0	1.0	19.8	0	0
		12/01/2016	0.2	0.5	18.7	3	17
		6/04/2016	0.1	1.4	19.3	0	0
		11/07/2016	0.1	1.1	20.2	0	0
		19/10/2016	0.1	2.1	18.7	0	0
		24/01/2017	0.0	1.3	18.6	4	2
		22/05/2017	0.1	1.6	18.1	0	0
		26/07/2017	0.0	1.3	19.3	0	4
		18/12/2017	0.0	0.5	20.8	0	0
		25/01/2018	0.0	1.2	19.3	0	0
		1/05/2018	0.0	1.4	17.7	0	0
		16/07/2018	0.0	1.8	19.2	1	2
		17/10/2018	0.0	0.0	20.4	0	0
		10/01/2019	0.0	0.0	20.1	0	0
		23/01/2019	0.0	0.0	20.0	0	0
		1/05/2019	0.0	0.9	19.9	0	0
		20/08/2019	0.0	0.8	20.0	0	0
		30/10/2019	0.0	1.1	19.4	0	1
		26/02/2020	0.0	1.1	18.5	0	0
		16/06/2020	0.0	0.2	21.1	0	0
		21/08/2020	0.1	1.1	20.0	0	3
		16/10/2020	0.0	1.1	18.3	0	0
		25/02/2021	0.0	1.7	19.1	0	0
		15/04/2021	0.0	0.2	18.7	0	0
		14/07/2021	0.0	0.4	20.6	0	0
		5/10/2021	0.0	1.8	19.0	0	1
		9/12/2021	0.0	2.1	18.2	0	1
		15/02/2022	0.0	1.6	19.2	0	1
		9/03/2022	0.0	2.0	18.3	0	1
		10/06/2022	0.0	0.2	21.2	0	0
		27/09/2022	0.0	1.1	19.6	0	1
		17/01/2023	0.0	1.3	19.6	0	3
		26/04/2023	0.0	0.2	20.4	0	0
		31/07/2023	0.0	0.7	20.2	0	0
		22/11/2023	0.0	1.6	19.3	0	3
		23/02/2024	0.0	0.9	20.4	0	0
		23/04/2024	0.0	0.9	20.1	0	0
		26/07/2024	0.0	0.5	20.7	0	0
		18/10/2024	0.0	2.0	18.7	1	3

Parameters	Type of sampling point	Date	Peak Methane (%)	Peak Carbon Dioxide (%)	Minimum Oxygen (%)	Peak Hydrogen Sulphide (ppm)	Peak Carbon Monoxide (ppm)
G38	Landfill gas well	6/01/2006	0.0	0.2	19.5	-	-
		5/04/2006	0.0	0.0	17.5	-	-
		25/07/2006	-	-	-	-	-
		28/11/2006	0.0	3.7	16.7	-	-
		23/02/2007	0.0	2.0	17.1	-	-
		17/04/2007	0.0	0.0	20.1	-	-
		4/07/2007	0.0	0.0	20.1	-	-
		17/02/2009	0.0	4.8	18.7	0	0
		29/04/2009	0.1	5.1	19.1	0	0
		23/07/2009	0.0	4.9	18.3	0	0
		19/10/2009	0.0	3.0	17.9	0	0
		20/01/2010	0.1	4.7	17.6	0	0
		23/04/2010	0.0	4.4	18.2	0	0
		28/07/2010	0.1	4.0	17.6	0	0
		8/10/2010	0.1	4.0	17.8	0	0
		31/01/2011	0.0	1.6	19.3	0	0
		6/05/2011	0.1	3.7	19.1	0	0
		2/09/2011	0.1	4.8	18.3	0	0
		25/11/2011	0.3	4.6	18.7	0	0
		26/01/2012	0.2	4.7	18.2	1	1
		27/04/2012	0.1	4.4	17.1	0	0
		10/07/2012	0.1	3.4	16.9	0	0
		3/10/2012	0.1	2.1	19.7	0	0
		16/01/2013	0.1	1.8	19.4	3	4
		10/04/2013	0.1	4.2	18.6	0	0
		29/07/2013	0.1	4.5	16.5	1	0
		18/10/2013	0.1	1.4	20.1	0	0
		28/01/2014	0.2	2.5	18.5	0	0
		14/05/2014	0.2	5.5	15.7	0	0
		26/11/2014	0.0	4.7	15.8	0	0
		27/01/2015	0.0	3.5	17.9	2	6
		19/05/2015	0.0	2.1	20.0	0	0
		10/07/2015	0.2	2.6	17.9	0	0
		20/10/2015	0.0	1.7	20.0	0	0
		12/01/2016	0.2	1.7	17.9	2	20
		6/04/2016	0.1	0.8	20.1	0	0
		11/07/2016	0.1	2.0	20.2	0	0
		19/10/2016	0.1	1.8	20.2	0	0
		24/01/2017	0.0	1.8	20.1	2	1
		22/05/2017	0.1	1.8	18.2	0	0
		26/07/2017	0.0	3.3	17.8	0	4
		18/12/2017	0.0	2.8	19.4	0	0
		25/01/2018	0.0	2.4	18.6	0	5
		1/05/2018	0.0	1.7	18.4	0	0
		16/07/2018	0.0	2.6	18.0	1	2
		17/10/2018	0.0	0.0	20.6	0	1
		10/01/2019	0.0	0.0	20.0	0	0
		23/01/2019	0.0	0.0	20.0	0	0
		1/05/2019	0.0	0.1	20.4	0	0
		20/08/2019	0.0	0.1	20.4	0	0
		30/10/2019	0.0				
		26/02/2020	0.0	1.6	18.3	0	0
		16/06/2020	0.0	1.9	20.1	0	0
		21/08/2020	0.0	1.8	20.0	0	3
		25/02/2021	0.0	1.9	18.7	0	0
		15/04/2021	0.0	1.3	19.0	0	0
		14/07/2021	0.0	2.2	19.5	0	0
		5/10/2021	0.0	2.0	19.0	0	2
		9/12/2021	0.0	2.4	18.2	0	1
		15/02/2022	0.0	4.0	17.6	0	1
		9/03/2022	0.0	3.9	18.4	0	1
		10/06/2022	0.0	3.0	19.6	0	0
		27/09/2022	0.0	1.3	19.9	0	1
		17/01/2023	0.0	2.6	18.5	0	3
		26/04/2023	0.1	3.8	17.4	0	0
		31/07/2023	0.2	1.9	18.9	0	0
		22/11/2023	0.0	2.2	18.9	0	3
		23/02/2024	0.0	2.3	19.4	0	1
		23/04/2024	0.0	3.7	18.1	0	1
		26/07/2024	0.0	3.7	18.5	0	0
		18/10/2024	0.0	4.2	17.7	1	2

Parameters	Type of sampling point	Date	Peak Methane (%)	Peak Carbon Dioxide (%)	Minimum Oxygen (%)	Peak Hydrogen Sulphide (ppm)	Peak Carbon Monoxide (ppm)
MW1	Landfill gas well	20/06/2022	0.0	10.7	10.5	0	0
		27/09/2022	39.4	24.8	6.8	5	3
		17/01/2023	0.0	22.5	2.4	0	3
		26/04/2023	12.2	22.2	1.2	0	0
		31/07/2023	61.8	36.2	0.9	2	1
		22/11/2023	49.4	28.8	4.7	0	4
		23/02/2024	0.2	3.8	17.3	1	0
		23/04/2024	0.0	14.3	6.5	0	1
		26/07/2024	54.3	30.5	3.1	1	0
		18/10/2024	56.9	33.3	2.0	5	3
MW2	Landfill gas well	20/06/2022	64.2	38.1	1.3	2	7
		27/09/2022	0.1	16.3	7.9	3	2
		17/01/2023	0.0	10.9	10.5	1	3
		26/04/2023	19.1	28.2	0.2	1	0
		31/07/2023	11.5	9.8	13.7	1	2
		22/11/2023	2.4	12.5	9.5	0	3
		23/02/2024	0.0	5.2	16.4	0	0
		23/04/2024	0.0	17.3	4.6	0	1
		26/07/2024	9.1	24.0	3.0	1	0
		18/10/2024	10.7	8.3	0.9	6	2
MW3	Landfill gas well	20/06/2022	67.2	39.6	0.5	2	10
		27/09/2022	64.7	36.1	0.0	15	4
		17/01/2023	50.4	29.3	3.1	4	12
		26/04/2023	64.7	36.5	0.0	2	7
		31/07/2023	65.3	37.5	0.1	13	2
		22/11/2023	69.8	34.5	0.2	6	5
		23/02/2024	64.2	34.9	0.1	12	3
		23/04/2024	64.5	34.7	0.2	18	3
		26/07/2024	65.1	35.0	0.0	12	0
		18/10/2024	61.3	33.0	0.6	10	4

OWS
OTAGO WASTE SERVICES
A Division of Transpacific Industries Group NZ Ltd

Fairfield Landfill - DUNEDIN

Landfill Gas Measurements

Date: 18/10/2024

Technician: Michael Allen-Duff Signed: M P Allen-Duff

Notes Readings taken with GA5000 Conditions. Mild, calm, [redacted]. Clouds.

			Time	% CH_4	% CO_2	% O_2	ppm H_2S	ppm CO	
1	G35 Cesspit	1	11:12	0.0	0.1	20.7	0	0	Baro' pressure: 1024mb
		2	11:13	0.0	0.1	20.7	0	0	Diff' pressure:
		3	11:15	0.0	0.1	20.7	0	0	
		4	11:16	0.0	0.1	20.7	0	0	
		5	11:17	0.0	0.1	20.7	0	0	
		Peaks:		max 0.0	max 0.1	min 20.7			
2	G36 Basement	1	11:01	0.0	0.1	20.8	0	0	Baro' pressure: 1024.mb
		2	11:03	0.0	0.1	20.7	0	0	Diff' pressure:
		3	11:04	0.0	0.1	20.8	0	0	
		4	11:06	0.0	0.1	20.8	0	0	
		5	11:08	0.0	0.1	20.8	0	0	
		Peaks:		max 0.0	max 0.1	min 20.7			
3	G37	1	11:27	0.0	2.0	18.7	1	2	Baro' pressure: 1024mb
		2	11:29	0.0	2.0	18.7	1	3	Diff' pressure:
		3	11:30	0.0	2.0	18.7	1	2	
		4	11:31	0.0	2.0	18.7	1	2	
		5	11:32	0.0	2.0	18.7	1	2	
		Peaks:		max 0.0	max 2.0	min 18.7			
4	G38	1	11:40	0.0	4.2	17.7	1	2	Baro' pressure: 1024mb
		2	11:41	0.0	3.3	18.4	1	1	Diff' pressure:
		3	11:43	0.0	1.8	19.4	1	2	
		4	11:45	0.0	1.6	19.5	1	2	
		5	11:46	0.0	1.6	19.6	1	1	
		Peaks:		max 0.0	max 4.2	min 17.7			
5	LGS1	1	12:01	0.1	2.8	18.7	1	0	Baro' pressure: 1024mb
		2	12:02	0.1	2.6	18.9	1	0	Diff' pressure:
		3	12:03	0.1	2.6	18.9	2	0	
		4	12:04	0.1	2.5	19.0	1	0	
		5	12:05	0.1	2.5	19.0	1	0	
		Peaks:		max 0.1	max 2.8	min 18.7			
6	LD5	1	12:10	0.7	6.1	16.8	2	0	Baro' pressure: 1024mb
		2	12:11	0.6	6.0	16.9	2	0	Diff' pressure:
		3	12:13	0.6	5.9	17.0	2	0	
		4	12:14	0.6	5.8	17.1	2	0	
		5	12:15	0.6	5.7	17.2	2	0	
		Peaks:		max 0.7	max 6.1	min 16.8			

Graham & Kathryn Jones
Phone: 03 4886302 or 021735641

OWS
OTAGO WASTE SERVICES
A Division of Transpacific Industries Group NZ Ltd

Fairfield Landfill - DUNEDIN

Landfill Gas Measurements

Date: 18/10/2024

Technician: Michael Allen-Duff Signed: M.P. Allen-Duff

Notes Mild, calm, cloudy.

			Time	% CH_4	% CO_2	% O_2	ppm H_2S	ppm CO	
7	LGS7	1	12:30	0.0	0.1	20.8	2	1	Baro' pressure: 1024 Mb
		2	12:32	0.0	0.0	20.8	2	2	Diff' pressure:
		3	12:33	0.0	0.0	20.8	2	1	
		4	12:34	0.0	0.0	20.9	2	1	
		5	12:35	0.0	0.0	20.9	2	2	
		Peaks:		max 0.0	max 0.1	min 20.8			
8	LGS27	1	12:38	0.0	0.0	20.9	2	3	Baro' pressure: 1024 MB
		2	12:39	0.0	0.0	20.9	2	2	Diff' pressure:
		3	12:40	0.0	0.0	20.9	2	3	
		4	12:41	0.0	0.0	20.9	2	2	
		5	12:42	0.0	0.0	20.9	2	2	
		Peaks:		max 0.0	max 0.0	min 20.9			
9	LGS29	1	12:58	0.0	0.1	21.1	2	1	Baro' pressure: 1024 Mb
		2	12:59	0.0	0.1	21.2	1	1	Diff' pressure:
		3	1:01	0.0	0.1	21.2	3	1	
		4	1:02	0.0	0.1	21.2	2	1	
		5	1:03	0.0	0.0	21.2	2	1	
		Peaks:		max 0.0	max 0.1	min 21.1			
10	LS31	1	1:06	0.0	1.1	20.0	3	2	Baro' pressure: 1024 Mb
		2	1:07	0.0	1.1	20.0	2	2	Diff' pressure:
		3	1:08	0.0	1.0	20.1	2	2	
		4	1:09	0.0	1.0	20.1	2	2	
		5	1:10	0.0	1.0	20.1	2	1	
		Peaks:		max 0.0	max 1.1	min 20.0			
11	LS32	1	1:16	0.0	0.0	21.0	2	2	Baro' pressure: 1024 Mb
		2	1:18	0.0	0.0	21.0	2	2	Diff' pressure:
		3	1:19	0.0	0.0	21.0	2	2	
		4	1:20	0.0	0.0	21.0	2	1	
		5	1:21	0.0	0.0	21.0	2	1	
		Peaks:		max 0.0	max 0.0	min 21.0			
12	G34	1	1:30	0.0	0.0	21.0	3	2	Baro' pressure: 1024 MB
		2	1:31	0.0	0.0	21.0	2	2	Diff' pressure:
		3	1:32	0.0	0.0	21.0	2	1	
		4	1:33	0.0	0.0	21.0	2	2	
		5	1:34	0.0	0.0	21.0	3	1	
		Peaks:		max 0.0	max 0.0	min 21.0			

Fairfield landfill monitoring wells 1-3

Date 18/10/2024 **Time** 1:45pm **Conditions** warm, dry, cloudy **Engine** N/A
Temperature 15°c **Air Pressure** 1024mb **Flare** N/A

Gas Well	Temp	Flow	Pressure	Syst Press	CH4	CO2	O2	CO	H2S	Bal	Adj Made	Comments
MW 1					56.9	33.3	2.0	3	5	7.7		*Readings taken w/GEM5000
MW 2					10.7	8.3	8.9	2	6	72.2		*Engine-Landfill gas only
MW 3					61.3	33.0	0.6	4	10	5.1		
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
Breather												
16												
New 17												
18												
New 19												
20												
21												
22												
23												
24												
25												
26A												
27												
28												
29												
30												
LR30												
LR31A												
31												
34												
36												
37												
38												
39												
47												
52												
53												
57												
58												
68												
Ringmain												
Lower West RM												
Cond D/O												
Flare Inlet												
Engine Inlet												

APPENDIX H
(Fulton Hogan Monitoring Report – October 2024)

Dunedin Laboratory
200 Fryatt Street
Private Bag 1962, Dunedin
Telephone + 64 3 477 6511
Facsimile + 64 3 477 7664
www.fultonhogan.com

ENVIRONMENTAL MONITORING REPORT

OTAGO WASTE SERVICES LANDFILL

OCTOBER 2024

Lab Reference DUD24O-0143

CLIENT: OTAGO WASTE SERVICES

SCOPE

This report covers the environmental monitoring carried out at the Otago Waste Services Landfill Fairfield, Dunedin for Otago Waste Services in April 2024.

The scope of work performed includes:

3 Monthly

- Water levels (36 sites)
- Sampling and chemical analysis of water from:
  - Creeks (FH38, FH39)
  - Kaikorai Estuary (FH40)
  - Kaikorai Stream (EW43)
  - Shallow groundwater wells (LGS1, LGS7, LS10, LS13, LS15, LS19, LS22)
  - Leachate collection system sumps (LS24, LS26, LS26A, LS28, LS30, LS32, EPS42*)
  - Deep groundwater wells (LD5**, LD8, LD11, LD16**, LD17, LD20)
  - Weighbridge Pond and North Pond

  * Sampled April and October. EPS42.

  ** Sampled in October only.
- Water levels in Christie Creek, Coal Creek, Kaikorai Stream, Kaikorai Estuary at the road bridge and the level at LD11 bridge.

Sampling and Testing

FH Dunedin Laboratory undertook all sampling and site testing (pH, Conductivity, Dissolved Oxygen and Temperature). Chemical analysis was subcontracted to Hill Laboratories in Hamilton.

RESULTS

Estuary and Surface Water

Surface Water Monitoring
(Sampled 23/10/24)

Site	Dissolved Oxygen		pH	Conductivity (mS/cm)	Temperature (ºC)
	%	ppm			
FH 38	25.0	2.65	6.38	0.484	17.9
Note:	No detectable flow.				
FH 39	59.4	6.07	6.12	3.73	13.4
Note:	5 m/min				
FH 40	62.2	6.20	6.23	8.82	13.8
Note:	6 m/min				
EW 43	74.5	7.58	6.53	0.530	14.0
Note:	5 m/min				
North Pond	87.4	8.28	7.01	0.429	17.4
Note:	Overflowing				
Wbridge Pond	-	-	-	-	-
Note:	Dry. No Sample.				

Surface Water Level Markers
(Recorded on 23/10/24**)**

Marker Location	Level (m)
Christie Creek*	0.630
Coal Creek	Broken marker
Estuary level @ LD11 bridge	0.780
Estuary at Brighton bridge	1.275
Kaikorai Stream (ST4)	1.195

* This marker is not vertical, therefore hard to read accurately.

Groundwater (Deep and Shallow Bores)

Deep Groundwater Wells outside Landfill (4 sites)
(Dipped on 23/10/24)

Well *	Water Level Dip (m)	pH	Conductivity (mS/cm)	Temperature (°C)
LD 8	0.530	6.42	34.4	11.7
LD 11	0.240	6.41	36.3	11.3
LD 17	0.210	6.78	28.01	11.8
LD 20	1.170	7.28	34.1	11.0

Deep Groundwater Wells inside Landfill: (2 sites)
(Dipped on 23/10/24)

Well *	Water Level Dip (m)	pH	Conductivity (mS/cm)	Temperature (°C)
LD 5	2.770	6.57	1.848	12.5
LD16	*	-	-	-

*Kink in pipe and could not be dipped

Shallow Groundwater Wells: Groundwater levels (12 sites)
(Dipped on 23/10/24)

Well	Water Level Dip (m)	Well	Water Level Dip (m)
LS 2	2.980	LS 14	3.220
LS 6	1.260	LS 21	2.480
LS 9	1.280	LS 23	1.850

Well	Water Level Dip (m)	
LS 25	**A** 1.345	**B** 1.350
LGS 27	**A** 1.260	**B** 1.240
LGS 29	**A** 1.550	**B** 1.450
LS 31	**A** 1.365	**B** 1.355
LS 33	1.695	

* **Sample dates/times for each well are listed on the Hill Laboratories report.**

Shallow Groundwater Wells: Field Tests (7 sites)
(Dipped on 23/10/24)

Well *	Water Level Dip (m)	pH	Conductivity (mS/cm)	Temperature (ºC)
LGS 1	2.520	7.37	9.20	12.2
LGS 7	0.535	6.84	14.09	12.2
LS 10	1.130	6.64	1.455	11.6
LS 13	1.050	7.09	0.922	11.8
LS 15	1.520	6.25	5.07	11.5
LS 19	0.805	7.14	1.967	13.0
LS 22	1.000	6.89	2.472	11.7

Leachate Collection System Sumps (6 sites)
(Dipped on 23/10/24)

Well *	Water Level Dip (m)	pH	Conductivity (mS/cm)	Temperature (ºC)
LS 24	1.940	6.61	4.56	11.9
LS 26	1.540	6.33	2.588	11.0
LS 26A	1.340	No sample taken		
LS 28	1.480	6.49	4.40	11.8
LS 30	1.630	6.47	4.45	11.5
LS 32	1.515	6.43	4.77	11.5

Pump Station (EPS 42)
(Dipped on 23/10/24)

Well *	Water level Dip (m)	pH	Conductivity (mS/cm)	Temperature (°C)
EPS 42	1.060	6.53	3.90	11.7

* **Sample dates/times for each well are listed on the Hill Laboratories report.**

Issued By: Fulton Hogan Dunedin Laboratory

Issue date: 15/11/24
Approved: Tim Wagner Checked: Tim Wagner

Laboratory Technician Technician

R J Hill Laboratories Limited
28 Duke Street Frankton 3204
Private Bag 3205
Hamilton 3240 New Zealand

0508 HILL LAB (44 555 22)
+64 7 858 2000
mail@hill-labs.co.nz
www.hill-labs.co.nz

Certificate of Analysis

Client:	Pattle Delamore Partners Limited	**Lab No:**	3701703	SPv1
Contact:	S Wilson	**Date Received:**	25-Oct-2024	
	C/- Pattle Delamore Partners Limited	**Date Reported:**	04-Nov-2024	
	PO Box 389	**Quote No:**	46756	
	Christchurch 8140	**Order No:**		
		Client Reference:	Water Analyses	
		Submitted By:	S Wilson	

Sample Type: Aqueous

Sample Name:		LGS1 24-Oct-2024 10:00 am	LGS7 24-Oct-2024 10:15 am	LS10 24-Oct-2024 10:35 am	LS13 24-Oct-2024 11:00 am	LS15 24-Oct-2024 11:10 am
Lab Number:		3701703.1	3701703.2	3701703.3	3701703.4	3701703.5
pH	pH Units	7.9	6.8	6.8	7.5	6.6
Electrical Conductivity (EC)	mS/m	883	13.8	139.9	88.8	492
Chloride	g/m³	1,240	15.2	380	112	1,310
Total Ammoniacal-N	g/m³	124	0.36	0.54	3.8	0.043

Sample Name:		LS19 24-Oct-2024 11:30 am	LS22 24-Oct-2024 11:50 am	LS24 23-Oct-2024 1:50 pm	LS26 23-Oct-2024 1:35 pm	LS28 23-Oct-2024 12:55 pm
Lab Number:		3701703.6	3701703.7	3701703.8	3701703.9	3701703.10
pH	pH Units	7.2	7.1	7.4	7.0	7.1
Electrical Conductivity (EC)	mS/m	19.4	241	436	242	420
Chloride	g/m³	23	450	290	182	350
Total Ammoniacal-N	g/m³	0.081	< 0.010	122	76	143

Sample Name:		LS30 23-Oct-2024 12:30 pm	LS32 23-Oct-2024 12:10 pm	LD5 24-Oct-2024 10:10 am	LD8 24-Oct-2024 10:25 am	LD11 24-Oct-2024 10:50 am
Lab Number:		3701703.11	3701703.12	3701703.13	3701703.14	3701703.15
Sum of Anions	meq/L	-	-	19.7	380	390
Sum of Cations	meq/L	-	-	20	390	380
pH	pH Units	7.1	7.1	7.2	7.0	7.0
Total Alkalinity	g/m³ as $CaCO_3$	-	-	910	380	1,050
Bicarbonate	g/m³ at 25°C	-	-	1,110	460	1,280
Total Hardness	g/m³ as $CaCO_3$	-	-	460	6,100	5,000
Electrical Conductivity (EC)	mS/m	424	456	177.8	3,260	3,440
Dissolved Calcium	g/m³	-	-	134 #1	1,010	590
Total Iron	g/m³	-	-	5.8	25	50
Total Lead	g/m³	-	-	0.00096	< 0.0021	< 0.0021
Dissolved Magnesium	g/m³	-	-	31 #1	860	870
Dissolved Potassium	g/m³	-	-	151 #1	141	128
Dissolved Sodium	g/m³	-	-	86 #1	6,100	6,300
Total Zinc	g/m³	-	-	0.046	0.044	0.029
Chloride	g/m³	370	460	54	12,400	13,200
Total Ammoniacal-N	g/m³	141	147	49	10.2	29
Nitrite-N	g/m³	-	-	< 0.02	< 0.02	< 0.02
Nitrate-N	g/m³	-	-	< 0.02	0.030	< 0.02
Nitrate-N + Nitrite-N	g/m³	-	-	< 0.02	0.034	< 0.02
Sulphate	g/m³	-	-	2.4	1,130	< 30 #2
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	g O_2/m³	-	-	3	< 2	< 2

Sample Type: Aqueous						
Sample Name:		LD17 24-Oct-2024 11:15 am	LD20 24-Oct-2024 11:40 am	FH39 23-Oct-2024 10:25 am	FH40 23-Oct-2024 10:40 am	EW43 23-Oct-2024 10:50 am
Lab Number:		3701703.16	3701703.17	3701703.18	3701703.19	3701703.20
Sum of Anions	meq/L	280	370	-	-	-
Sum of Cations	meq/L	300	390	-	-	-
pH	pH Units	7.6	8.0	6.9	7.0	7.4
Total Alkalinity	g/m³ as $CaCO_3$	1,210	1,100	-	-	-
Bicarbonate	g/m³ at 25°C	1,480	1,330	-	-	-
Total Hardness	g/m³ as $CaCO_3$	4,000	4,600	480	960	111
Electrical Conductivity (EC)	mS/m	2,670	3,260	361	854	50.8
Dissolved Boron	g/m³	-	-	0.81	1.11	0.109
Dissolved Calcium	g/m³	380 #1	490	64	91	25
Dissolved Iron	g/m³	-	-	0.12	< 0.2	0.46
Total Iron	g/m³	2.8	< 0.42	-	-	-
Dissolved Lead	g/m³	-	-	< 0.00010	< 0.0010	0.00037
Total Lead	g/m³	< 0.0021	< 0.0021	-	-	-
Dissolved Magnesium	g/m³	740 #1	820	78	177	11.7
Dissolved Potassium	g/m³	119 #1	151	-	-	-
Dissolved Sodium	g/m³	5,000 #1	6,700	-	-	-
Dissolved Zinc	g/m³	-	-	0.049	0.173	0.0129
Total Zinc	g/m³	< 0.021	< 0.021	-	-	-
Chloride	g/m³	9,200	12,200	940	2,600	93
Total Ammoniacal-N	g/m³	25	< 0.10	3.2	2.0	0.25
Nitrite-N	g/m³	< 0.02	< 0.02	0.035	0.035	0.012
Nitrate-N	g/m³	0.08	5.0	0.66	0.52	0.50
Nitrate-N + Nitrite-N	g/m³	0.09	5.0	0.70	0.55	0.52
Sulphate	g/m³	< 5 #2	310	-	-	-
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	g O_2/m³	< 2	< 2	< 2	< 2	< 2
Dissolved Organic Carbon (DOC)	g/m³	-	-	9.3	7.9	7.1

Sample Name:		North Pond 23-Oct-2024 11:30 am	FH38 23-Oct-2024 9:40 am
Lab Number:		3701703.21	3701703.22
Turbidity	NTU	2.9	-
pH	pH Units	7.9	7.1
Total Hardness	g/m³ as $CaCO_3$	-	178
Electrical Conductivity (EC)	mS/m	42.0	45.1
Total Suspended Solids	g/m³	< 3	-
Dissolved Boron	g/m³	-	0.197
Dissolved Calcium	g/m³	-	51
Dissolved Iron	g/m³	-	4.9
Dissolved Lead	g/m³	-	0.00012
Dissolved Magnesium	g/m³	-	12.3
Dissolved Zinc	g/m³	-	0.0136
Chloride	g/m³	-	25
Total Ammoniacal-N	g/m³	0.054	0.85
Nitrite-N	g/m³	-	0.004
Nitrate-N	g/m³	-	0.003
Nitrate-N + Nitrite-N	g/m³	-	0.007
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	g O_2/m³	< 2	4 #3
Dissolved Organic Carbon (DOC)	g/m³	-	23

Analyst's Comments

Due to unexpected sample numbers and limited resources, we were unable to commence the carbonaceous Biochemical oxygen demand (cBOD5) analyses on the day that they arrived at the laboratory. The analyses were performed as soon as possible using an unpreserved aliquot which had been kept in refrigerated storage at approximately 4°C since the day of receipt at the laboratory.

#1 It should be noted that a precipitate was observed in the filtered nitric preserved fraction of this sample. In order to analyse this sample for dissolved metals, an additional digestion step was required on the filtrate to re-dissolve the precipitate prior to analysis.

#2 Due to the nature of this sample a dilution was performed prior to analysis, resulting in a detection limit higher than that normally achieved for the SO4 analysis.

#3 Due to unexpected sample numbers and limited resources, we were unable to commence the carbonaceous Biochemical Oxygen Demand (cBOD5) analysis on the day that they arrived at the laboratory. The analysis was performed as soon as possible using an unpreserved aliquot which had been kept in refrigerated storage at approximately 4°C since the day of receipt at the laboratory.

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request. Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-22
Total Digestion	Nitric acid digestion. APHA 3030 E (modified) : Online Edition.	-	13-17
Total Digestion after Filtration	Sample filtration through 0.45µm membrane filter followed by nitric acid digestion. Required for samples which precipitate after filtration. APHA 3030 E (modified) : Online Edition.	-	13, 16
Total anions for anion/cation balance check	Calculation: sum of anions as mEquiv/L calculated from Alkalinity (bicarbonate), Chloride and Sulphate. Nitrate-N, Nitrite-N. Fluoride, Dissolved Reactive Phosphorus and Cyanide also included in calculation if available. APHA 1030 E : Online Edition.	0.07 meq/L	13-17
Total cations for anion/cation balance check	Sum of cations as mEquiv/L calculated from Sodium, Potassium, Calcium and Magnesium. Iron, Manganese, Aluminium, Zinc, Copper, Lithium, Total Ammoniacal-N and pH (H^+) also included in calculation if available. APHA 1030 E : Online Edition.	0.05 meq/L	13-17
Turbidity	Analysis by Turbidity meter. APHA 2130 B (modified) : Online Edition.	0.05 NTU	21
pH	pH meter. APHA 4500-H^+ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-22
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. APHA 2320 B (modified for Alkalinity <20) : Online Edition.	1.0 g/m³ as $CaCO_3$	13-17
Bicarbonate	Calculation: from alkalinity and pH, valid where TDS is not >500 mg/L and alkalinity is almost entirely due to hydroxides, carbonates or bicarbonates. APHA 4500-CO_2 D : Online Edition.	1.0 g/m³ at 25°C	13-17
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B : Online Edition.	1.0 g/m³ as $CaCO_3$	13-20, 22
Electrical Conductivity (EC)	Conductivity meter, 25°C. APHA 2510 B : Online Edition.	0.1 mS/m	1-22
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. APHA 2540 D (modified) : Online Edition.	3 g/m³	21
Dissolved Boron	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.005 g/m³	18-20, 22
Dissolved Calcium	Filtered sample, nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.053 g/m³	13, 16
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m³	14-15, 17-20, 22
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m³	18-20, 22

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Total Iron	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.021 g/m³	13-17
Dissolved Lead	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00010 g/m³	18-20, 22
Total Lead	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition / US EPA 200.8.	0.00011 g/m³	13-17
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m³	14-15, 17-20, 22
Dissolved Magnesium	Filtered sample, nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.021 g/m³	13, 16
Dissolved Potassium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m³	14-15, 17
Dissolved Potassium	Filtered sample, nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.053 g/m³	13, 16
Dissolved Sodium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m³	14-15, 17
Dissolved Sodium	Filtered sample, nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.021 g/m³	13, 16
Dissolved Zinc	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m³	18-20, 22
Total Zinc	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition / US EPA 200.8.	0.0011 g/m³	13-17
Chloride	Filtered sample. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m³	1-20, 22
Total Ammoniacal-N	Phenol/hypochlorite colourimetry. Flow injection analyser. (NH_4-N = NH_4^+-N + NH_3-N). APHA 4500-NH_3 H (modified) : Online Edition.	0.010 g/m³	1-22
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I (modified) : Online Edition.	0.002 g/m³	13-20, 22
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - Nitrite-N. In-House.	0.0010 g/m³	13-20, 22
Nitrate-N + Nitrite-N	Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO_3^- I (modified) : Online Edition.	0.002 g/m³	13-20, 22
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m³	13-17
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	Incubation 5 days, DO meter, nitrification inhibitor added, seeded. APHA 5210 B (modified) : Online Edition.	2 g O_2/m³	13-22
Dissolved Organic Carbon (DOC)	Filtered sample, Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC. APHA 5310 C (modified) : Online Edition.	0.5 g/m³	18-20, 22

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 25-Oct-2024 and 04-Nov-2024. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

Ara Heron BSc (Tech)
Client Services Manager - Environmental

R J Hill Laboratories Limited
28 Duke Street Frankton 3204
Private Bag 3205
Hamilton 3240 New Zealand

0508 HILL LAB (44 555 22)
+64 7 858 2000
mail@hill-labs.co.nz
www.hill-labs.co.nz

Certificate of Analysis

Client:	Pattle Delamore Partners Limited	**Lab No:**	3701704 SPv1
Contact:	S Wilson	**Date Received:**	25-Oct-2024
	C/- Pattle Delamore Partners Limited	**Date Reported:**	14-Nov-2024
	PO Box 389	**Quote No:**	44476
	Christchurch 8140	**Order No:**	
		Client Reference:	6 monthly leachate
		Submitted By:	S Wilson

Sample Type: Aqueous

Sample Name:		EPS42 23-Oct-2024 1:10 pm
Lab Number:		3701704.1
Individual Tests		
Sum of Anions	meq/L	41
Sum of Cations	meq/L	42
pH	pH Units	7.2
Total Alkalinity	g/m³ as $CaCO_3$	1,420
Bicarbonate	g/m³ at 25°C	1,730
Total Hardness	g/m³ as $CaCO_3$	700
Electrical Conductivity (EC)	mS/m	377
Total Suspended Solids	g/m³	32
Total Aluminium	g/m³	0.109
Total Barium	g/m³	0.180
Dissolved Calcium	g/m³	162
Total Calcium	g/m³	171
Total Iron	g/m³	7.1
Dissolved Magnesium	g/m³	71
Total Magnesium	g/m³	73
Total Manganese	g/m³	0.58
Total Mercury	g/m³	< 0.00008
Dissolved Potassium	g/m³	189
Total Potassium	g/m³	198
Dissolved Sodium	g/m³	360 #2
Total Sodium	g/m³	360 #2
Total Cyanide	g/m³	< 0.02
Chloride	g/m³	310
Fluoride	g/m³	0.72
Total Ammoniacal-N	g/m³	112
Nitrite-N	g/m³	0.38
Nitrate-N	g/m³	3.5
Nitrate-N + Nitrite-N	g/m³	3.9
Total Sulphide	g/m³	< 0.10
Sulphate	g/m³	161
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	g O_2/m³	6 #1
Chemical Oxygen Demand (COD)	g O_2/m³	154
Total Phenols	g/m³	< 0.2
Absorbance at 254 nm	AU cm^{-1}	0.868
Transmittance at 254 nm*	%T, 1 cm cell	13.6

Sample Type: Aqueous		
Sample Name:		EPS42 23-Oct-2024 1:10 pm
Lab Number:		3701704.1
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn		
Total Arsenic	g/m³	< 0.0053
Total Cadmium	g/m³	0.00047
Total Chromium	g/m³	0.034
Total Copper	g/m³	0.082
Total Lead	g/m³	0.0024
Total Nickel	g/m³	0.026
Total Zinc	g/m³	0.27

Analyst's Comments

#1 Due to unexpected sample numbers and limited resources, we were unable to commence the carbonaceous Biochemical oxygen demand (cBOD5) analyses on the day that they arrived at the laboratory. The analyses were performed as soon as possible using an unpreserved aliquot which had been kept in refrigerated storage at approximately 4°C since the day of receipt at the laboratory.

#2 It has been noted that the result for the dissolved fraction was greater than that for the total fraction, but within analytical variation of the methods.

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request. Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B (modified) : Online Edition / US EPA 200.8.	0.000053 - 0.0011 g/m³	1
Filtration, Glass Fibre	Sample filtration through glass fibre filter.	-	1
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1
Total Digestion	Nitric acid digestion. APHA 3030 E (modified) : Online Edition.	-	1
Total anions for anion/cation balance check	Calculation: sum of anions as mEquiv/L calculated from Alkalinity (bicarbonate), Chloride and Sulphate. Nitrate-N, Nitrite-N. Fluoride, Dissolved Reactive Phosphorus and Cyanide also included in calculation if available. APHA 1030 E : Online Edition.	0.07 meq/L	1
Total cations for anion/cation balance check	Sum of cations as mEquiv/L calculated from Sodium, Potassium, Calcium and Magnesium. Iron, Manganese, Aluminium, Zinc, Copper, Lithium, Total Ammoniacal-N and pH (H^+) also included in calculation if available. APHA 1030 E : Online Edition.	0.05 meq/L	1
pH	pH meter. APHA 4500-H^+ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. APHA 2320 B (modified for Alkalinity <20) : Online Edition.	1.0 g/m³ as $CaCO_3$	1
Bicarbonate	Calculation: from alkalinity and pH, valid where TDS is not >500 mg/L and alkalinity is almost entirely due to hydroxides, carbonates or bicarbonates. APHA 4500-CO_2 D : Online Edition.	1.0 g/m³ at 25°C	1
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B : Online Edition.	1.0 g/m³ as $CaCO_3$	1
Electrical Conductivity (EC)	Conductivity meter, 25°C. APHA 2510 B : Online Edition.	0.1 mS/m	1
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. APHA 2540 D (modified) : Online Edition.	3 g/m³	1
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B : Online Edition.	-	1
Total Aluminium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition / US EPA 200.8.	0.0032 g/m³	1
Total Barium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition / US EPA 200.8.	0.0053 g/m³	1

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m^3	1
Total Calcium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.053 g/m^3	1
Total Iron	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.021 g/m^3	1
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m^3	1
Total Magnesium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.021 g/m^3	1
Total Manganese	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition / US EPA 200.8.	0.00053 g/m^3	1
Total Mercury	Bromine Oxidation followed by Atomic Fluorescence. US EPA Method 245.7, Feb 2005.	0.00008 g/m^3	1
Dissolved Potassium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m^3	1
Total Potassium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.053 g/m^3	1
Dissolved Sodium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m^3	1
Total Sodium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.021 g/m^3	1
Total Cyanide Screen	On-line distillation, colorimetry, screen level. ISO 14403:2012(E) (modified).	0.02 g/m^3	1
Chloride	Filtered sample. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m^3	1
Fluoride	Direct measurement, ion selective electrode. APHA 4500-F$^-$ C : Online Edition.	0.05 g/m^3	1
Total Ammoniacal-N	Phenol/hypochlorite colourimetry. Flow injection analyser. (NH_4-N = NH_4^+-N + NH_3-N). APHA 4500-NH_3 H (modified) : Online Edition.	0.010 g/m^3	1
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I (modified) : Online Edition.	0.002 g/m^3	1
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - Nitrite-N. In-House.	0.0010 g/m^3	1
Nitrate-N + Nitrite-N	Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO_3^- I (modified) : Online Edition.	0.002 g/m^3	1
Total Sulphide Screen	In-line distillation, segmented flow colorimetry. APHA 4500-S^{2-} E (modified) : Online Edition.	0.05 g/m^3	1
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m^3	1
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	Incubation 5 days, DO meter, nitrification inhibitor added, seeded. APHA 5210 B (modified) : Online Edition.	2 g O_2/m^3	1
Chemical Oxygen Demand (COD), screen level	Dichromate/sulphuric acid digestion, colorimetry. Screen Level method. APHA 5220 D : Online Edition.	25 g O_2/m^3	1
Total Phenols	In-line distillation, segmented flow colorimetry. NB: Does not detect 4-methylphenol. APHA 5530 B & D (modified) : Online Edition & Skalar Method I497-001 (modified).	0.02 g/m^3	1
Absorbance at 254 nm	Filtered sample. Spectrophotometry, 1cm cell. APHA 5910 B : Online Edition.	0.002 AU cm^{-1}	1
Transmittance at 254 nm*	Calculation from Absorbance at the specified wavelength.	0.5 %T, 1 cm cell	1

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 25-Oct-2024 and 11-Nov-2024. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

Kim Harrison MSc
Client Services Manager - Environmental

PATTLE DELAMORE PARTNERS LTD
Level 2, 134 Oxford Terrace
Christchurch Central, Christchurch 8011
PO Box 389, Christchurch 8140, New Zealand

Tel +64 3 **345 7100**
Web **www.pdp.co.nz**

27 February 2025

Greg Nel
Otago Waste Services Limited
PO Box 6074
DUNEDIN 9059

Dear Greg

FAIRFIELD LANDFILL QUARTERLY MONITORING RESULTS (1st QUARTER 2025)

1.0 Introduction

Please find attached the quarterly monitoring results of the routine monitoring carried out at Fairfield Landfill for the first quarter of 2025. The groundwater and surface water monitoring was carried out on 22 and 23 January 2025 and the landfill gas (LFG) monitoring was carried out on 10 January 2025.

Otago Waste Services Limited (OWS) has engaged Pattle Delamore Partners Limited (PDP) to review the monitoring data that has been collected by Fulton Hogan Limited (FH) and OWS to provide initial interpretation of the data and to satisfy the reporting requirements specified by Resource Consents 93540 (Discharge of leachate to water), 93541 (Take groundwater), 93542 (Discharge to stormwater) and 95008 (Discharge to air) associated with Fairfield Landfill. *Note that these resource consents expired in September 2024. A renewal resource consent application process is currently underway and until new consents are issued, under s124 continuation rights of the RMA (1991), the existing consents are still operative and this report has been prepared to satisfy these consents.*

A summary of the results and any notable trends for the monitoring that has been carried out for the first quarter of 2025 is provided below. This is based on information presented in the FH report entitled "Environmental Monitoring Report – Otago Waste Services Landfill January 2025" (attached) and landfill gas measurements carried out by OWS (attached). A site layout plan showing the locations of the monitoring points is attached. Full analysis of the monitoring data including any long-term trends will be discussed in more detail in the annual monitoring report for 2025, which will be prepared following the October 2025 monitoring round.

2.0 Consent 93540 – Discharge Leachate to Groundwater

2.1 Water Levels

Notable observations of the groundwater levels measured in accordance with condition 8 are as follows:

- The shallow wells outside of the landfill all showed a decrease in water level, which coincided with a decrease of water level in the Kaikorai Lagoon Swamp (estuary) area. Water levels in the estuary were noted to be relatively low at the time of monitoring.
- The wells within the landfill (i.e. inside of the leachate interception drainage system) either showed slight decreases in water level or remained the same, although all within the historical

dataset range. To date there are no obvious apparent trends or changes since the landfill capping was completed in 2022.

- The interception drain water levels were all below the estuary water level (SP5) suggesting that a depression in the phreatic surface (saturation zone) was being maintained along the leachate interception drain at the time of the water level monitoring round satisfying Condition 4 of resource consent 93540. There were no reports or indication of any pump failures over this period. All of the interception drainage wells showed water levels within their typical operating range.

2.2 Leachate Discharge

A summary of the recorded leachate/groundwater volumes pumped to the Dunedin City Council reticulated sewer system between November 2024 and January 2025, as required by condition 10, is as follows:

Date (month data representing)	Time	Total Hours Since Last Reading (hr)	Pump Hours Since Last Reading (hr)	Discharge Total (m^3)	Discharge Since Last Reading (m^3)	Average Discharge to DCC for that period (m^3/hr)	Typical Average Discharge for that Month (m^3/hr)	Estuary Level
2 December 2024 (November)	11:45	672	148	2,459	2,459	3.7	2.8	Low Level
6 January 2025 (December)	09:00	837	106	2,016	2,016	2.4	2.4	Low Level
4 February 2025 (January)	13:55	701	69	1,517	1,517	2.2	2.6	Low Level

The leachate interception drain system showed discharges equal to the average in December, and above average in November and January.

2.3 Groundwater Quality Sampling

A summary of points of note from the quarterly groundwater sampling round within the existing wells described under Condition 11b, are outlined below.

- Laboratory measured pH levels generally showed an increase this round towards the higher end of what is usually recorded in these wells. Field measured pH continued to be around 0.5-1 pH lower than the laboratory measurements. FH reported that the field meter they were using in previous round was faulty, which possibly explains the previous rounds measurements, but on this occasion, FH reported that they hired a field meter to support the field testing. There continues to be a discrepancy between field and laboratory pH readings.
- Conductivity levels were fairly typical in the deep wells (circa 30 mS/cm) and continue to be elevated in comparison to the shallow wells and interception drain wells. This is typical and there are no obvious changes observed.

- The shallow wells and interception drainage wells showed typical conductivity levels (between 1 and 15 mS/cm). The shallow wells alongside the eastern portion of estuary (LS13 and LS15) showed sudden conductivity increases of between 12.9 and 9.8 mS/cm respectively, whereas the shallow well along the western portion of the estuary (LS10) showed only a smaller increase of 2.7 mS/cm. These results are not uncommon, and they remain within their respective historical datasets. The variability in conductivity being observed appears to be related to their proximity to the estuary and saline environment that is occasionally present.
- Ammoniacal-N concentrations in the leachate interception drainage wells and wells within the landfill were recorded between 83 mg/L and 420 mg/L. The monitoring wells outside of the landfill and leachate interception drain also showed fairly typical concentrations for each of the wells, with the exception of LS13. Well LS13 showed a spike in concentration to 240 mg/L, similar to that of leachate, and also the highest concentration recorded at this location to date. Given that ammoniacal-N concentrations did not spike in any other of the monitoring wells, this appears to be localised around LS13. The leachate collection system is currently operating as expected, however, as described in the 2024 annual report,[1] the leachate pump (EPS42) was not operative for a period in October 2024 and LS13 has shown in the past to have a reasonable hydraulic connection to the leachate collection system. As such, it is possible that this is an effect of the previous pump stoppage (i.e. migration effect). This will continue to be monitored.
- The range of temperature readings were fairly typical for this time of year (13.6°C to 16.6°C). The highest concentrations continue to be within the leachate interception drain.

2.4 Surface Water Sampling Results

A summary of notable points from the surface water monitoring round at sampling points FH38, FH39, FH40 and EW43 (shown on Figure 1), as required by Condition 12, are as follows:

- The field measured surface water pH measurements were again lower than typically expected (circa 0.5-1 pH unit) so the laboratory pH levels have been used for the data analysis on this occasion. Using the lab pH levels, pH levels were recorded between 6.2 (FH38) and 7.2 (FH39 and EW43). FH38 continues to show the lowest pH levels.
- Dissolved oxygen levels at FH38 decreased slightly (down to 2.25 mg/L), and remains lower than the other locations (between 5.68 and 7.11 mg/L). Lower DO levels at FH38 are typical, although the levels are currently near the lowest levels recorded to date. As previously reported, this sampling location is at the upgradient end of the site so is possibly associated with former coal mines in the catchment.
- Temperatures ranged from 13.7ºC to 18.3ºC. This is typical for these locations.
- The total ammoniacal-N concentrations (TAN) showed a drop this round at FH38 (from 0.85 to 0.32 mg/L), FH39 (3.2 to 1.65 mg/L), FH40 (2.0 to 1.47 mg/L) and EW43 (0.29 to 0.107 mg/L). EW43 (upgradient location in Kaikorai Stream) continues to show generally low TAN concentrations (0.107 mg/L).
- BOD_5 was detected at 3 mg/L at FH38, with the remainder of the locations not recorded above the laboratory limit of detection. This is in line with the historical dataset.
- Nitrate-N showed relatively low concentrations at all locations (between 0.046 mg/L and 0.38 mg/L) and within the range of historical levels. The highest concentration was recorded at FH39.

[1] Pattle Delamore Partners Limited, 2024. *Fairfield Landfill – 2024 Annual Monitoring Results.*

- Dissolved metals, in particular iron and zinc continue to show a high degree of variability at FH38 and are more stable at FH39, FH40 and EW43. As previously reported, the variable concentrations being recorded at FH38 are most likely related to the variable pH levels being recorded and the increased solubility of metals at a lower pH. Some iron precipitate continues to be present in this area of the stream.

3.0 Consent 93541 – To Take Groundwater

Refer to Consent 93540, condition 10 (leachate discharge) for results.

4.0 Consent 93542 – Discharge to Stormwater

A discrete grab sample was collected from only one stormwater retention pond ("North Pond") as part of the recent sampling round as the "Weighbridge Pond" was again dry at the time of sampling and therefore no sample was able to be collected.

The recent results for the "North Pond" showed a slight increase in TAN to 0.088 mg/L (from 0.054 mg/L), which is lower than the ANZG 2018 high reliability trigger level (0.91 mg/L). Conductivity (0.421 mS/cm) and pH were fairly typical (7.8 – lab measured), a normal turbidity level was recorded and BOD_5 was recorded below the laboratory limit of detection at <2 mg/L. Previously a spike in TAN was recorded in April 2024 (2.2 mg/L), which appears to have dissipated and stabilised in the subsequent monitoring rounds. There is no evidence of any leachate breaches/discharges from the landfill and at this concentration is not indicative of a leachate seep (would be expected to be significantly higher). This will continue to be monitored.

5.0 Consent 95008 – Discharge to Air

LFG monitoring[2] was undertaken at wells LGS1, LD5, LGS7, LGS27, LGS29, LS31, G34, G35 (cesspit), G36 (basement of house), G37 and G38 on 26 July 2024 using a GEM5000 portable landfill gas analyser in accordance with the consent condition. In addition, LFG monitoring was undertaken within three LFG wells (MW1, MW2 and MW3) installed on the northern side of the landfill in June 2022 to better understand the subsurface LFG conditions in that area.

A summary of the readings over a five-minute period at each of the sampling locations are as follows:

Parameters	LGS1	LD5	LGS7	LGS27	LGS29	LS31
Type of sampling point	Groundwater well (historical landfill)	Groundwater well (historical landfill)	Groundwater well (outside landfill)	Leachate collection system	Leachate collection system	Leachate collection system
Methane (%) (max)	0.1	0.0	0.0	0.0	0.4	0.0
Carbon Dioxide (%) (max)	1.4	0.1	0.1	0.2	0.4	0.2
Oxygen (%) (min)	19.9	20.7	20.7	20.6	20.5	20.7
Carbon Monoxide (ppm) (max)	1	0	0	0	0	0
Hydrogen Sulphide (ppm) (max)	0	0	0	1	0	0

[2] Measurements of gas levels typically affected by decomposing landfills (oxygen (O_2), carbon dioxide (CO_2), methane (CH_4), carbon monoxide (CO) and hydrogen sulphide (H_2S))

Parameters	LS32	G34	G35	G36	G37	G38
Type of sampling point	Leachate collection system	Landfill gas monitoring well	Cesspit	Basement of house	Landfill gas monitoring well	Landfill gas monitoring well
Methane (%) (max)	4.6	0.0	0.0	0.0	0.0	0.0
Carbon Dioxide (%) (max)	9.0	0.1	0.1	0.1	2.7	4.7
Oxygen (%) (min)	15.1	21.0	19.7	20.6	18.2	16.5
Carbon Monoxide (ppm) (max)	0	0	0	0	0	1
Hydrogen Sulphide (ppm) (max)	1	0	0	0	0	0

Parameters	MW1	MW2	MW3
Type of sampling point	Landfill gas monitoring well – Northern end of Landfill	Landfill gas monitoring well – Northern end of Landfill	Landfill gas monitoring well – Northern end of Landfill
Methane (%) (max)	63.1	19.8	65.8
Carbon Dioxide (%) (max)	37.0	31.7	34.3
Oxygen (%) (min)	0.0	0.2	0.2
Carbon Monoxide (ppm) (max)	1	0	1
Hydrogen Sulphide (ppm) (max)	2	6	14

A summary of the key LFG measurements is as follows:

- The four interception drainage wells (manholes) showed some evidence of LFG (up to 4.6% methane and 9.0% carbon dioxide), however these levels are still low in comparison to previous rounds where high levels of LFG have been recorded. The intermittent detection of LFG in these wells (manholes) is common given its purpose and proximity to the landfill so this is not unexpected.
- The monitoring undertaken within the basement of the nearest house (G36) and nearby cesspit (G35) showed no signs of any LFG.
- Sentinel wells G37 and G38 located within Walton Park continue to show low levels of carbon dioxide (up to 4.7%), and within the range of historical data for these two locations. These levels are not considered to be of any concern.
- LFG wells (MW1, MW2 and MW3) installed on the northern side of the landfill continue to show the presence of LFG at concentrations typical to what would be expected within a landfill (methane approx. 60% and carbon dioxide approx. 40%). MW2 showed lower levels of 19.8% methane and 31.7% carbon dioxide. Given these wells were reportedly installed on the northern edge of the landfill within the landfill zone, the presence (albeit intermittent) of LFG in these three wells is not unexpected. LFG well G34 located further to the north of MW2 (installed outside of the landfill in natural soils), continues to show no strong evidence of any LFG (Methane 0.0% and carbon dioxide 0.1%) migrating to the north.

The monitoring programme will continue with the next routine quarterly round (2nd quarter) to be undertaken in April 2025 under the s124 continuation rights for the existing consents unless a decision for the consent renewal process has been granted.

6.0 Limitations

This report has been prepared by Pattle Delamore Partners Limited (PDP) on the basis of information provided by Otago Waste Services Limited and Fulton Hogan. PDP has not independently verified the provided information and has relied upon it being accurate and sufficient for use by PDP in preparing the report. PDP accepts no responsibility for errors or omissions in, or the currency or sufficiency of, the provided information.

This assessment is limited to collection and analysis of groundwater samples from discrete sampling locations. Interpretations of subsurface conditions, including contaminant concentrations, are not guaranteed at distance away from the specific points of sampling.

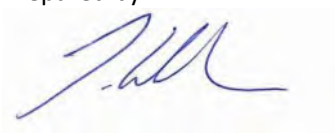
The information contained within this document applies to sampling undertaken on the dates stated in this document, or if none is stated, the date of this document. With time, the site conditions and environmental standards may change. Accordingly, the reported assessment and conclusions are not guaranteed to apply at a later date.

This report has been prepared by Pattle Delamore Partners Limited (PDP) on the specific instructions of Otago Waste Services for the limited purposes described in the document. PDP accepts no liability if the document is used for a different purpose or if it is used or relied on by any other person. Any such use or reliance will be solely at their own risk.

Yours faithfully

PATTLE DELAMORE PARTNERS LIMITED

Prepared by



Scott Wilson
Technical Director - Contaminated Land

DUNEDIN SOUTHERN MOTORWAY

ROBERT STREET

WALTON PARK AVENUE

ALFRED PLACE

HOGAN PLACE

EDITH STREET

ESTUARY CRESCENT

BLANC AVENUE

OLD BRIGHTON ROAD

NORTH POND (STORMWATER RETENTION)

LS22

LS21

LS33

LS21A

G34

LS32 (SUMP5)

LD20

SP3

MW1

MW2

MW3

EW43

G35 (CESSPIT)

LS31

LS18

LS19

G36 (BASEMENT OF HOUSE)

EASTERN LANDFILL

WALTON PARK

G37

LS30 (SUMP4)

LS4

LD17

WEIGHBRIDGE & KIOSK

WEIGHBRIDGE POND (STORMWATER RETENTION)

LD16

ADMIN BUILDING

LS14

LS3

LS29

LS15

LS12

WESTERN LANDFILL

LS2

LS28 (SUMP3)

LGS27

LS13

EPS42

KAIKORAI STREAM

FH37 (OCT 09 & APR 10)

FH37 (JAN 10 & OCT 10)

FH38 (JAN 10 & OCT 10)

G38

CHRISTIES CREEK

LS26 (SUMP2)

SP5

LD11

LS9

FH40 (OCT 09, JUL 11 & APR 13)

SP1

LS25

LS10

LD5

LS24 (SUMP1)

LS6

LS23

LD8

LGS1

LGS7

FH39

HISTORICAL LANDFILL

SP2

KAIKORAI LAGOON SWAMP 'WETLAND'

COAL CREEK

FH40

KEY :

- PUMP STATION
- MONITORING POINT - LANDFILL GAS
- SURFACE WATER LEVEL STAGING POST
- MONITORING POINT - SURFACE WATER
- MONITORING POINT - WELLS INSIDE LANDFILL
- MONITORING POINT - MONITORING WELL OUTSIDE LANDFILL
- MONITORING POINT - LEACHATE INTERCEPTION DRAIN MONITORING WELL
- MONITORING WELL - DESTROYED
- LEACHATE INTERCEPTION DRAIN
- SITE BOUNDARY
- HISTORICAL LANDFILL EXTENT
- WESTERN LANDFILL EXTENT
- EASTERN LANDFILL EXTENT
- BUILDING
- STORMWATER RETENTION POND

0 100 200
METRES
SCALE : 1:5,000 (A3)

NO.	REVISION	DATE	BY
C	UPDATED	AUG 23	JR
B	UPDATED	MAY 23	BR
A	ISSUED	AUG 22	BR

SOURCE:
1. AERIAL IMAGERY (FLOWN 2017 - 2020) SOURCED FROM THE LINZ DATA SERVICE www.linz.govt.nz/about-linz/linz-data-service/help/using-linz-data/attributing-aerial-imagery-data AND LICENCED FOR RE-USE UNDER THE CREATIVE COMMONS ATTRIBUTION 4.0 INTERNATIONAL LICENCE.
2. CADASTRAL/TOPOGRAPHICAL INFORMATION AND INSET DERIVED FROM LINZ DATA.
3. ALL DATA DERIVED FROM CADASTRAL DRAWINGS (MAY NOT BE SPATIALLY ACCURATE).

CLIENT
WASTE MANAGEMENT (NZ) LTD.

FIGURE
FIGURE 2: SITE LAYOUT AND CURRENT MONITORING LOCATIONS

PROJECT
FAIRFIELD LANDFILL RECONSENTING

C0218780D_FairfieldLandfill.aprx - C0218780D_GIS001

Dunedin Laboratory
200 Fryatt Street
Private Bag 1962, Dunedin
Telephone + 64 3 477 6511
Facsimile + 64 3 477 7664
www.fultonhogan.com

ENVIRONMENTAL MONITORING REPORT

OTAGO WASTE SERVICES LANDFILL

JANUARY 2025

Lab Reference DUD25O-0008

CLIENT: OTAGO WASTE SERVICES

SCOPE

This report covers the environmental monitoring carried out at the Otago Waste Services Landfill Fairfield, Dunedin for Otago Waste Services in January 2024.

The scope of work performed includes:

3 Monthly

- Water levels (36 sites)
- Sampling and chemical analysis of water from:
  - Creeks (FH38, FH39)
  - Kaikorai Estuary (FH40)
  - Kaikorai Stream (EW43)
  - Shallow groundwater wells (LGS1, LGS7, LS10, LS13, LS15, LS19, LS22)
  - Leachate collection system sumps (LS24, LS26, LS26A, LS28, LS30, LS32, EPS42*)
  - Deep groundwater wells (LD5**, LD8, LD11, LD16**, LD17, LD20)
  - Weighbridge Pond and North Pond

  * Sampled April and October. EPS42.

  ** Sampled in October only.
- Water levels in Christie Creek, Coal Creek, Kaikorai Stream, Kaikorai Estuary at the road bridge and the level at LD11 bridge.

Sampling and Testing

FH Dunedin Laboratory undertook all sampling and site testing (pH, Conductivity, Dissolved Oxygen and Temperature). Chemical analysis was subcontracted to Hill Laboratories in Hamilton.

RESULTS

Estuary and Surface Water

Surface Water Monitoring
(Sampled 22/1/25)

Site	Dissolved Oxygen		pH	Conductivity (mS/cm)	Temperature (ºC)
	%	ppm			
FH 38	22.7	2.25	6.06	0.553	13.7
Note:	No detectable flow.				
FH 39	60.9	5.68	6.36	0.730	17.9
Note:	6 m/min				
FH 40	76.5	7.11	6.44	0.752	18.3
Note:	3 m/min				
EW 43	70.8	6.58	6.72	0.437	18.2
Note:	6 m/min				
North Pond	78.2	6.81	6.60	0.429	21.6
Note:	Recent overflowing. Overflow point overgrown.				
Wbridge Pond	-	-	-	-	-
Note:	Dry. No Sample.				

Surface Water Level Markers
(Recorded on 22/1/25**)**

Marker Location	Level (m)
Christie Creek*	0.590
Coal Creek	Broken marker
Estuary level @ LD11 bridge	Below marker
Estuary at Brighton bridge	Below marker
Kaikorai Stream (ST4)	Below marker

* This marker is not vertical, therefore hard to read accurately.

Groundwater (Deep and Shallow Bores)

Deep Groundwater Wells outside Landfill (4 sites)
(Dipped on 22/1/25)

Well *	Water Level Dip (m)	pH	Conductivity (mS/cm)	Temperature (°C)
LD 8	0.580	6.58	34.0	16.6
LD 11	0.270	6.70	35.8	13.9
LD 17	1.300	6.92	27.75	15.5
LD 20	2.280	7.41	33.5	14.5

Deep Groundwater Wells inside Landfill: (2 sites)
(Dipped on 22/1/25)

Well *	Water Level Dip (m)	pH	Conductivity (mS/cm)	Temperature (°C)
LD 5	3.000	-	-	-
LD16	Dry	-	-	-

*LD16 has kink in pipe, unable to dip

Shallow Groundwater Wells: Groundwater levels (12 sites)
(Dipped on 22/1/25)

Well	Water Level Dip (m)	Well	Water Level Dip (m)
LS 2	3.380	LS 14	3.240
LS 6	1.420	LS 21A	2.460
LS 9	1.420	LS 23	Dry

Well	Water Level Dip (m)	
LS 25	**A** 2.000	**B** 2.215
LGS 27	**A** 2.305	**B** 2.315
LGS 29	**A** 2.550	**B** 2.555
LS 31	**A** 2.245	**B** 2.205
LS 33	2.645	

* **Sample dates/times for each well are listed on the Hill Laboratories report.**

Shallow Groundwater Wells: Field Tests (7 sites)
(Dipped on 22/1/25)

Well *	Water Level Dip (m)	pH	Conductivity (mS/cm)	Temperature (ºC)
LGS 1	2.710	7.68	8.85	15.4
LGS 7	0.705	7.14	0.458	14.5
LS 10	1.860	6.97	4.17	14.8
LS 13	2.220	7.02	14.04	15.1
LS 15	2.150	6.70	15.11	14.3
LS 19	1.510	6.78	2.062	14.4
LS 22	1.260	6.68	2.413	13.6

Leachate Collection System Sumps (6 sites)
(Dipped on 22/1/25)

Well *	Water Level Dip (m)	pH	Conductivity (mS/cm)	Temperature (ºC)
LS 24	3.255	7.48	5.36	16.6
LS 26	3.200	6.88	6.19	13.8
LS 26A	2.830	No sample taken		
LS 28	3.170	6.94	10.84	15.8
LS 30	2.920	6.84	11.64	13.6
LS 32	3.205	6.71	8.33	14.1

Pump Station (EPS 42)
(Dipped on 22/1/25)

Well *	Water level Dip (m)	pH	Conductivity (mS/cm)	Temperature (°C)
EPS 42	3.450	-	-	-

* **Sample dates/times for each well are listed on the Hill Laboratories report.**

Issued By: Fulton Hogan Dunedin Laboratory

Issue date: 18/02/25
Approved: Tim Wagner Checked: Tim Wagner

Laboratory Technician Technician

R J Hill Laboratories Limited
28 Duke Street Frankton 3204
Private Bag 3205
Hamilton 3240 New Zealand

0508 HILL LAB (44 555 22)
+64 7 858 2000
mail@hill-labs.co.nz
www.hill-labs.co.nz

Certificate of Analysis

Client:	Pattle Delamore Partners Limited	**Lab No:**	3762334	SPv1
Contact:	S Wilson	**Date Received:**	24-Jan-2025	
	C/- Pattle Delamore Partners Limited	**Date Reported:**	31-Jan-2025	
	PO Box 389	**Quote No:**	43319	
	Christchurch 8140	**Order No:**		
		Client Reference:		
		Submitted By:	S Wilson	

Sample Type: Aqueous

Sample Name:		LGS1 23-Jan-2025 10:50 am	LGS7 23-Jan-2025 10:45 am	LD8 23-Jan-2025 10:40 am	LS10 23-Jan-2025 10:30 am	LD11 23-Jan-2025 10:20 am
Lab Number:		3762334.1	3762334.2	3762334.3	3762334.4	3762334.5
pH	pH Units	8.0	7.0	7.2	7.1	7.2
Electrical Conductivity (EC)	mS/m	866	45.6	3,320	410	3,480
Chloride	g/m³	1,160	111	12,300	1,190	13,700
Total Ammoniacal-N	g/m³	110	0.021	4.9	0.80	31

Sample Name:		LS13 23-Jan-2025 10:15 am	LS15 23-Jan-2025 10:10 am	LD17 23-Jan-2025 9:40 am	LS19 23-Jan-2025 9:30 am	LD20 23-Jan-2025 9:25 am
Lab Number:		3762334.6	3762334.7	3762334.8	3762334.9	3762334.10
pH	pH Units	7.6	6.8	7.6	7.3	8.0
Electrical Conductivity (EC)	mS/m	1,377	1,468	2,710	200	3,290
Chloride	g/m³	3,900	4,500	10,200	280	12,100
Total Ammoniacal-N	g/m³	240	2.4	23	1.60	< 0.10 #1

Sample Name:		LS22 23-Jan-2025 9:10 am	LS24 22-Jan-2025 2:15 pm	LS26 22-Jan-2025 1:40 pm	LS28 22-Jan-2025 1:25 pm	LS30 22-Jan-2025 1:00 pm
Lab Number:		3762334.11	3762334.12	3762334.13	3762334.14	3762334.15
pH	pH Units	7.3	7.8	7.1	7.3	7.1
Electrical Conductivity (EC)	mS/m	235	530	597	1,062	1,134
Chloride	g/m³	470	690	860	1,930	2,500
Total Ammoniacal-N	g/m³	0.21	83	156	420	340

Sample Name:		LS32 22-Jan-2025 12:40 pm	FH38 22-Jan-2025 9:55 am	FH39 22-Jan-2025 10:30 am	FH40 22-Jan-2025 10:40 am	EW43 22-Jan-2025 11:15 am
Lab Number:		3762334.16	3762334.17	3762334.18	3762334.19	3762334.20
pH	pH Units	6.9	6.2	7.2	7.0	7.2
Total Hardness	g/m³ as $CaCO_3$	-	162	210	210	79
Electrical Conductivity (EC)	mS/m	811	53.4	72.3	73.3	43.2
Dissolved Boron	g/m³	-	0.42	0.68	0.66	0.092
Dissolved Calcium	g/m³	-	39	46	45	16.2
Dissolved Iron	g/m³	-	1.94	0.39	0.46	0.49
Dissolved Lead	g/m³	-	< 0.00010	< 0.00010	< 0.00010	0.00055
Dissolved Magnesium	g/m³	-	15.8	23	23	9.3
Dissolved Zinc	g/m³	-	0.027	0.033	0.022	0.0101
Chloride	g/m³	1,460	46	66	69	76
Total Ammoniacal-N	g/m³	250	0.32	1.65	1.47	0.145
Nitrite-N	g/m³	-	0.005	0.019	0.016	0.009
Nitrate-N	g/m³	-	0.046	0.38	0.35	0.141
Nitrate-N + Nitrite-N	g/m³	-	0.051	0.40	0.36	0.150

Sample Type: Aqueous						
Sample Name:		LS32 22-Jan-2025 12:40 pm	FH38 22-Jan-2025 9:55 am	FH39 22-Jan-2025 10:30 am	FH40 22-Jan-2025 10:40 am	EW43 22-Jan-2025 11:15 am
Lab Number:		3762334.16	3762334.17	3762334.18	3762334.19	3762334.20
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	g O_2/m^3	-	3 #2	< 2 #2	< 2 #2	< 2 #2

Sample Name:		North Pond 22-Jan-2025 11:30 am
Lab Number:		3762334.21
Turbidity	NTU	2.4
pH	pH Units	7.8
Electrical Conductivity (EC)	mS/m	42.1
Total Suspended Solids	g/m^3	< 3
Total Ammoniacal-N	g/m^3	0.088
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	g O_2/m^3	< 2 #2

Analyst's Comments

#1 Severe matrix interferences required that a dilution be performed prior to analysis, resulting in a detection limit higher than that normally achieved for the NH4N analysis.

#2 Due to unexpected sample numbers and limited resources, we were unable to commence the carbonaceous Biochemical oxygen demand (cBOD5) analysis on the day that they arrived at the laboratory. The analysis was performed, as soon as possible, on the frozen sample.

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request. Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-21
Turbidity	Analysis by Turbidity meter. APHA 2130 B (modified) : Online Edition.	0.05 NTU	21
pH	pH meter. APHA 4500-H^+ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-21
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B : Online Edition.	1.0 g/m^3 as $CaCO_3$	17-20
Electrical Conductivity (EC)	Conductivity meter, 25°C. APHA 2510 B : Online Edition.	0.1 mS/m	1-21
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. APHA 2540 D (modified) : Online Edition.	3 g/m^3	21
Dissolved Boron	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.005 g/m^3	17-20
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m^3	17-20
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m^3	17-20
Dissolved Lead	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00010 g/m^3	17-20
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m^3	17-20
Dissolved Zinc	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m^3	17-20
Chloride	Filtered sample. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m^3	1-20
Total Ammoniacal-N	Phenol/hypochlorite colourimetry. Flow injection analyser. (NH_4-N = NH_4^+-N + NH_3-N). APHA 4500-NH_3 H (modified) : Online Edition.	0.010 g/m^3	1-21
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I (modified) : Online Edition.	0.002 g/m^3	17-20

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - Nitrite-N. In-House.	0.0010 g/m^3	17-20
Nitrate-N + Nitrite-N	Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO_3^- I (modified) : Online Edition.	0.002 g/m^3	17-20
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	Incubation 5 days, DO meter, nitrification inhibitor added, seeded. APHA 5210 B (modified) : Online Edition.	2 g O_2/m^3	17-21

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 25-Jan-2025 and 31-Jan-2025. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

Ara Heron BSc (Tech)
Client Services Manager - Environmental

OTAGO WASTE SERVICES
A Division of Transpacific Industries Group NZ Ltd

Fairfield Landfill - DUNEDIN

Landfill Gas Measurements

Date: 10/1/25

Technician: Michael Allen-Duff

Signed: M. P. Allen-Duff

GEM 5000

Conditions damp, cool, overcast.

		Time	% CH_4	% CO_2	% O_2	ppm H_2S	ppm CO	Notes
1	G35 Cesspit	1 10:20am	0.0	0.1	20.7	0	0	Baro' pressure: 1019 mb
		2 10:21am	0.0	0.1	19.7	0	0	Diff' pressure:
		3 10:22am	0.0	0.1	20.6	0	0	
		4 10:23am	0.0	0.1	20.6	0	0	
		5 10:24am	0.0	0.1	20.6	0	0	
	Peaks:		max 0.0	max 0.1	min 19.7			
2	G36 Basement	1 10:10am	0.0	0.1	20.7	0	0	Baro' pressure: 1019mb
		2 10:12am	0.0	0.1	20.7	0	0	Diff' pressure:
		3 10:13am	0.0	0.1	20.7	0	0	Graham & Kathryn Jones
		4 10:14am	0.0	0.1	20.6	0	0	Phone: 03 4886302 or 021735641
		5 10:15am	0.0	0.1	20.7	0	0	
	Peaks:		max 0.0	max 0.1	min 20.6			
3	G37	1 10:33am	0.0	2.7	18.3	0	1	Baro' pressure: 1019 Mb
		2 10:34am	0.0	2.7	18.2	0	1	Diff' pressure:
		3 10:35am	0.0	2.7	18.2	0	0	
		4 10:36am	0.0	2.7	18.2	0	0	
		5 10:37am	0.0	2.7	18.2	0	0	
	Peaks:		max 0.0	max 2.7	min 18.2			
4	G38	1 10.40am	0.0	4.7	16.5	0	1	Baro' pressure: 1019 mb
		2 10:42am	0.0	3.6	17.5	0	1	Diff' pressure:
		3 10:43am	0.0	2.0	19.0	0	1	
		4 10:44am	0.0	2.1	19.0	0	1	
		5 10:45am	0.0	1.9	18.9	0	1	
	Peaks:		max 0.0	max 4.7	min 16.5			
5	LGS1	1 10:56am	0.1	1.4	19.9	0	1	Baro' pressure: 1019 Mb
		2 10:57am	0.1	1.2	20.0	0	1	Diff' pressure:
		3 10:57am	0.1	1.3	20.0	0	1	
		4 10:58am	0.1	1.2	20.0	0	1	
		5 10:59am	0.1	1.3	20.0	0	1	
	Peaks:		max 0.1	max 1.4	min 19.9			
6	LD5	1 11:04am	0.0	0.1	20.7	0	0	Baro' pressure: 1019 mb
		2 11:06am	0.0	0.1	20.7	0	0	Diff' pressure:
		3 11:09am	0.0	0.1	20.7	0	0	
		4 11:10am	0.0	0.1	20.7	0	0	
		5 11:11am	0.0	0.1		0	0	
	Peaks:		max 0.0	max 0.1	min 20.7			

OWS
OTAGO WASTE SERVICES
A Division of Transpacific Industries Group NZ Ltd

Fairfield Landfill - DUNEDIN

Landfill Gas Measurements

Date: 10/1/25

Technician: Michael Allen-Ruff Signed: M. P. Allen-Ruff

Notes: Samples taken with GEM 5000

		Time	% CH_4	% CO_2	% O_2	ppm H_2S	ppm CO	
7	LGS7	1 11:14am	0.0	0.1	20.7	0	0	Baro' pressure: 1019 mb
		2 11:15am	0.0	0.1	20.7	0	0	Diff' pressure:
		3 11:16am	0.0	0.1	20.7	0	0	
		4 11:17am	0.0	0.1	20.7	0	0	
		5 11:18am	0.0	0.1	20.7	0	0	
		Peaks:	max 0.0	max 0.1	min 20.7			
8	LGS27	1 11:20am	0.1	0.2	20.6	1	0	Baro' pressure: 1019 mb
		2 11:21am	0.0	0.2	20.6	0	0	Diff' pressure:
		3 11:22am	0.0	0.2	20.6	1	0	
		4 11:23am	0.0	0.2	20.7	1	0	
		5 11:24am	0.0	0.2	20.7	1	0	
		Peaks:	max 0.0	max 0.2	min 20.6			
9	LGS29	1 11:28am	0.4	0.4	20.5	0	0	Baro' pressure: 1019 mb
		2 11:29am	0.4	0.4	20.5	0	0	Diff' pressure:
		3 11:30am	0.4	0.3	20.6	0	0	
		4 11:31am	0.4	0.3	20.6	0	0	
		5 11:32am	0.4	0.3	20.6	0	0	
		Peaks:	max 0.4	max 0.4	min 20.5			
10	LS31	1 11:35am	0.0	0.2	20.8	0	0	Baro' pressure: 1019mb
		2 11:36am	0.0	0.2	20.8	0	0	Diff' pressure:
		3 11:37am	0.0	0.2	20.7	0	0	
		4 11:38am	0.0	0.2	20.8	0	0	
		5 11:39am	0.0	0.2	20.8	0	0	
		Peaks:	max 0.0	max 0.2	min 20.7			
11	LS32	1 11:43am	4.5	9.0	15.1	1	0	Baro' pressure: 1019mb
		2 11:44am	4.6	8.9	15.1	1	0	Diff' pressure:
		3 11:45am	4.5	9.0	15.1	1	0	
		4 11:46am	4.5	9.0	15.1	1	0	
		5 11:47am	4.5	9.0	15.1	1	0	
		Peaks:	max 4.6	max 9.0	min 15.1			
12	G34	1 11:54am	0.0	0.1	21.0	0	0	Baro' pressure: 1019mb
		2 11:55am	0.0	0.1	21.1	0	0	Diff' pressure:
		3 11:56am	0.0	0.1	21.1	0	0	
		4 11:57am	0.0	0.1	21.1	0	0	
		5 11:58am	0.0	0.1	21.0	0	0	
		Peaks:	max	max	min 21.0			

Fairfield landfill monitoring wells 1-3

Date	10/1/25		Time	12:10pm			Conditions	Cold, calm, damp		Engine	~~kW~~@	%(MT) =	kW,	m3/hr
Temperature	14?		Air Pressure	1019mb						Flare	—	m3/hr		
~~Gas~~ Well	Temp	Flow	Pressure	Syst Press	CH4	CO2	O2	CO	H2S	Bal	Adj Made	Comments		
MW 1					63.1	37.0	0.0	1	2	0.0		[redacted] w/GA5000		
MW 2					19.8	31.7	0.2	0	6	49.3		[redacted] gas only		
MW 3					65.8	34.3	0.2	1	14	2.5				
5														
6														
7														
8														
9														
10a														
11														
12														
13														
14														
15a														
LR16														
16														
New 17														
18														
19														
20														
21														
22														
23														
24														
25														
26A														
27														
28														
29														
30														
LR30														
LR31A														
31														
LR34														
35														
36														
37														
38														
39														
40														
LR46														
46														
47														
48														

PATTLE DELAMORE PARTNERS LTD
Level 2, 134 Oxford Terrace
Christchurch Central, Christchurch 8011
PO Box 389, Christchurch 8140, New Zealand

Tel +64 3 **345 7100**
Web **www.pdp.co.nz**

27 May 2025

Greg Nel
Otago Waste Services Limited
PO Box 6074
DUNEDIN 9059

Dear Greg

FAIRFIELD LANDFILL QUARTERLY MONITORING RESULTS (2nd QUARTER 2025)

1.0 Introduction

Please find attached the quarterly monitoring results of the routine monitoring carried out at Fairfield Landfill for the second quarter of 2025. The groundwater and surface water monitoring was carried out on 23 April 2025 and the landfill gas (LFG) monitoring was carried out on 11 April 2025.

Otago Waste Services Limited (OWS) has engaged Pattle Delamore Partners Limited (PDP) to review the monitoring data that has been collected by Fulton Hogan Limited (FH) and OWS to provide initial interpretation of the data and to satisfy the reporting requirements specified by Resource Consents 93540 (Discharge of leachate to water), 93541 (Take groundwater), 93542 (Discharge to stormwater) and 95008 (Discharge to air) associated with Fairfield Landfill. *Note that these resource consents expired in September 2024. A renewal resource consent application process is currently underway and until new consents are issued, under s124 continuation rights of the RMA (1991), the existing consents are still operative and this report has been prepared to satisfy these consents.*

A summary of the results and any notable trends for the monitoring that has been carried out for the second quarter of 2025 is provided below. This is based on information presented in the FH report entitled "Environmental Monitoring Report – Otago Waste Services Landfill April 2025" (attached) and landfill gas measurements carried out by OWS (attached). A site layout plan showing the locations of the monitoring points is attached. Full analysis of the monitoring data including any long-term trends will be discussed in more detail in the annual monitoring report for 2025, which will be prepared following the October 2025 monitoring round.

2.0 Consent 93540 – Discharge Leachate to Groundwater

2.1 Water Levels

Notable observations of the groundwater levels measured in accordance with condition 8 are as follows:

- The shallow wells outside of the landfill all showed an increase in water level, which coincided with an increase of water level in the Kaikorai Lagoon Swamp (estuary) area. In contrast, the deep wells outside of the landfill generally showed a slight decrease in water levels.

- The wells within the landfill (i.e. inside of the leachate interception drainage system) generally showed slight decreases in water level, exception for LS14 which showed a slight increase. All levels were within the historical dataset range. To date there are no obvious apparent trends or changes since the landfill capping was completed in 2022.
- The interception drain water levels were all measured at their operational depth indicating the system was operating at the time. The levels were also below the estuary water level (SP5) indicating that a depression in the phreatic surface (saturation zone) was being maintained along the leachate interception drain at the time of the water level monitoring round satisfying Condition 4 of resource consent 93540. There were no reports or indication of any pump failures over this period. All of the interception drainage wells showed water levels within their typical operating range.

2.2 Leachate Discharge

A summary of the recorded leachate/groundwater volumes pumped to the Dunedin City Council reticulated sewer system between February 2025 and April 2025, as required by condition 10, is as follows:

Date (month data representing)	Time	Total Hours Since Last Reading (hr)	Pump Hours Since Last Reading (hr)	Discharge Total (m^3)	Discharge Since Last Reading (m^3)	Average Discharge to DCC for that period (m^3/hr)	Typical Average Discharge for that Month (m^3/hr)	Estuary Level
3 March 2025 (February)	14:30	649	51	1011	20	1.6	2.1	Low Level
2 April 2025 (March)	11:45	717	50	996	20	1.4	2.3	Low Level
1 May 2025 (April)	13:45	698	44	911	21	1.3	2.8	Low Level

The leachate interception drain system showed discharges below the average in February, March and April.

2.3 Groundwater Quality Sampling

A summary of points of note from the quarterly groundwater sampling round within the existing wells described under Condition 11b, are outlined below.

- Laboratory measured pH levels generally showed an increase this round towards the higher end of what is usually recorded in these wells. Field measured pH continued to be around 1 pH lower than the laboratory measurements. FH reported that the field meter they were using in previous round was faulty, which possibly explains the previous rounds measurements, but on this occasion, FH reported that they hired a field meter to support the field testing. There continues to be a discrepancy between field and laboratory pH readings. The lab measured pH have been used in this assessment.

- Conductivity levels were fairly typical in the deep wells (circa 30 mS/cm) and continue to be elevated in comparison to the shallow wells and interception drain wells. This is typical and there are no obvious changes observed.
- The shallow wells and interception drainage wells showed typical conductivity levels (between 1 and 15 mS/cm). Conductivity levels generally increased in these wells, which remained within their respective historical datasets. LGS7 showed a sharp increase of 9.97 mS/cm to 10.43 mS/cm, however this is well within the range of levels observed at this location so is not of any concern.
- Ammoniacal-N concentrations in the leachate interception drainage wells and wells within the landfill were recorded between 65 mg/L and 450 mg/L. The monitoring wells outside of the landfill and leachate interception drain also showed fairly typical concentrations for each of the wells.

  During the previous round, well LS13 showed a spike in concentration to 240 mg/L (January 2025), Ammoniacal-N concentrations did not spike in any other of the monitoring wells, and therefore this appeared to be localised around LS13. The leachate collection system was operating as expected at the time, however, as described in the 2024 annual report,[1] the leachate pump (EPS42) was not operative for a period in October 2024 and LS13 has shown in the past to have a reasonable hydraulic connection to the leachate collection system. As such, it is possible that the January 2025 spike was is an effect of the previous pump stoppage (i.e. migration effect). LS13 was unable to be sampled in April 2025 due to insufficient water column in this well. Given the recorded base of the well is 3.8 m bgl and the water depth recorded was 2.2 m below top of casing, it appears that this well has silted up slightly. This well will be desilted before the next monitoring round.
- The range of temperature readings were fairly typical for this time of year (13.6°C to 16.6°C). The highest concentrations continue to be within the leachate interception drain.

2.4 Surface Water Sampling Results

A summary of notable points from the surface water monitoring round at sampling points FH38, FH39, FH40 and EW43 (shown on Figure 1), as required by Condition 12, are as follows:

- There continues to be a discrepancy between the laboratory and field measured pH results. The laboratory measured pH results were approximately 0.5 pH units (EW41) to 1.5 pH units (FH38) higher than the field measurements. FH38 is known to have lower pH and there may have been changes in the water quality between the field and lab, which might explain the large difference between field and lab pH levels. The field measured surface water pH were within the typically expected range, and therefore the field measured pH levels have been used for the data analysis. pH levels were recorded between 6.52 (FH38) and 7.1 (EW43). FH38 continues to show the lowest pH levels.
- Dissolved oxygen levels at FH39, FH40 and EW43 showed a sudden drop in April 2025 (down to 3.37 mg/L at FH40), and are at the lower end of the historical dataset range. FH38 showed a slight increase (to 2.85 mg/L), however, FH38 continues to show the lowest DO levels of the surface water monitoring locations. Lower DO levels at FH38 are typical, although the levels remain near the lowest levels recorded to date. As previously reported, this sampling location is at the upgradient end of the site so is possibly associated with former coal mines in the catchment.

[1] Pattle Delamore Partners Limited, 2024. *Fairfield Landfill – 2024 Annual Monitoring Results.*

- Temperatures ranged from 11.9ºC to 13.3ºC. This is typical for these locations.
- The total ammoniacal-N concentrations (TAN) showed a drop this round at FH39 (1.65 to 0.4 mg/L) and FH40 (1.47 to 0.87 mg/L), and increased at FH38 (Christie Creek, upgradient of the landfill; from 0.32 to 1.46 mg/L). EW43 (upgradient location in Kaikorai Stream) continues to show generally low TAN concentrations (0.117 mg/L).
- BOD_5 was detected at 5 mg/L at FH38 and 2 mg/L at FH39, with the remainder of the locations not recorded above the laboratory limit of detection. This is in line with the historical dataset.
- Nitrate-N showed relatively low concentrations at all locations (between 0.024 mg/L and 0.69 mg/L) and within the range of historical levels. The highest concentration was recorded at FH39.
- Dissolved metals, in particular iron and zinc continue to show a high degree of variability at FH38 and are more stable at FH39, FH40 and EW43. As previously reported, the variable concentrations being recorded at FH38 are most likely related to the variable pH levels being recorded and the increased solubility of metals at a lower pH. Some iron precipitate continues to be present in this area of the stream.

3.0 Consent 93541 – To Take Groundwater

Refer to Consent 93540, condition 10 (leachate discharge) for results.

4.0 Consent 93542 – Discharge to Stormwater

A discrete grab sample was collected from only one stormwater retention pond ("North Pond") as part of the recent sampling round as the "Weighbridge Pond" was again dry at the time of sampling and therefore no sample was able to be collected.

The recent results for the "North Pond" showed a slight decrease in TAN, which was not detected above the laboratory limit of detection, i.e. < 0.010 mg/L (from 0.088 mg/L in January 2025), which is lower than the ANZG 2018 high reliability trigger level (0.91 mg/L). Conductivity (0.42 mS/cm) and pH were fairly typical (8.4 – lab measured). BOD_5 was recorded at the laboratory limit of detection (2 mg/L). Turbidity (26 NTU) and total suspended solids (94 mg/L) were elevated.

There is no evidence of any leachate breaches/discharges from the landfill in the North Pond.

5.0 Consent 95008 – Discharge to Air

LFG monitoring[2] was undertaken at wells LGS1, LD5, LGS7, LGS27, LGS29, LS31, G34, G35 (cesspit), G36 (basement of house), G37 and G38 on 11 April 2025 using a GEM5000 portable landfill gas analyser in accordance with the consent condition. In addition, LFG monitoring was undertaken within three LFG wells (MW1, MW2 and MW3) installed on the northern side of the landfill in June 2022 to better understand the subsurface LFG conditions in that area.

A summary of the readings over a five-minute period at each of the sampling locations are as follows:

[2] Measurements of gas levels typically affected by decomposing landfills (oxygen (O_2), carbon dioxide (CO_2), methane (CH_4), carbon monoxide (CO) and hydrogen sulphide (H_2S))

Parameters	LGS1	LD5	LGS7	LGS27	LGS29	LS31
Type of sampling point	Groundwater well (historical landfill)	Groundwater well (historical landfill)	Groundwater well (outside landfill)	Leachate collection system	Leachate collection system	Leachate collection system
Methane (%) (max)	0.1	0.0	0.0	0.0	63.9	0.0
Carbon Dioxide (%) (max)	0.9	3.2	0.1	0.1	33.8	0.7
Oxygen (%) (min)	19.5	17.9	20.1	20.1	0.0	19.8
Carbon Monoxide (ppm) (max)	1	1	1	0	2	0
Hydrogen Sulphide (ppm) (max)	3	3	3	3	35	4

Parameters	LS32	G34	G35	G36	G37	G38
Type of sampling point	Leachate collection system	Landfill gas monitoring well	Cesspit	Basement of house	Landfill gas monitoring well	Landfill gas monitoring well
Methane (%) (max)	35.1	0.1	0.0	0.0	0.1	0.0
Carbon Dioxide (%) (max)	22.2	0.1	0.1	0.1	0.1	4.7
Oxygen (%) (min)	7.7	20.2	19.9	20.0	20.0	16.3
Carbon Monoxide (ppm) (max)	1	0	1	0	1	1
Hydrogen Sulphide (ppm) (max)	6	5	1	1	2	2

Parameters	MW1	MW2	MW3
Type of sampling point	Landfill gas monitoring well – Northern end of Landfill	Landfill gas monitoring well – Northern end of Landfill	Landfill gas monitoring well – Northern end of Landfill
Methane (%) (max)	29.6	0.0	62.0
Carbon Dioxide (%) (max)	17.8	24.5	33.6
Oxygen (%) (min)	9.6	0.9	0.1
Carbon Monoxide (ppm) (max)	0	0	1
Hydrogen Sulphide (ppm) (max)	5	4	18

A summary of the key LFG measurements is as follows:

- Two of the interception drainage wells (manholes) showed high levels of LFG at LGS29 and LS32 (up to 63.9% methane and 33.8% carbon dioxide). Similar levels have previously been recorded at these locations. The intermittent detection of LFG in these wells (manholes) is common given its purpose and proximity to the landfill so this is not unexpected.
- The monitoring undertaken within the basement of the nearest house (G36) and nearby cesspit (G35) showed no signs of any LFG.

- Sentinel wells G37 and G38 located within Walton Park continue to show low levels of carbon dioxide (up to 4.7%), and within the range of historical data for these two locations. These levels are not considered to be of any concern.
- LFG wells (MW1, MW2 and MW3) installed on the northern side of the landfill continue to show the presence of LFG at concentrations typical to what would be expected within a landfill (methane approx. 60% and carbon dioxide approx. 30%). MW2 showed lower levels of 0.0% methane and 24.5% carbon dioxide. Given these wells were reportedly installed on the northern edge of the landfill within the landfill zone, the presence (albeit intermittent) of LFG in these three wells is not unexpected. LFG well G34 located further to the north of MW2 (installed outside of the landfill in natural soils), continues to show no strong evidence of any LFG (Methane 0.1% and carbon dioxide 0.1%) migrating to the north.

The monitoring programme will continue with the next routine quarterly round (3rd quarter) to be undertaken in July 2025 under the s124 continuation rights for the existing consents unless a decision for the consent renewal process has been granted.

6.0 Limitations

This report has been prepared by Pattle Delamore Partners Limited (PDP) on the basis of information provided by Otago Waste Services Limited and Fulton Hogan. PDP has not independently verified the provided information and has relied upon it being accurate and sufficient for use by PDP in preparing the report. PDP accepts no responsibility for errors or omissions in, or the currency or sufficiency of, the provided information.

This assessment is limited to collection and analysis of groundwater samples from discrete sampling locations. Interpretations of subsurface conditions, including contaminant concentrations, are not guaranteed at distance away from the specific points of sampling.

The information contained within this document applies to sampling undertaken on the dates stated in this document, or if none is stated, the date of this document. With time, the site conditions and environmental standards may change. Accordingly, the reported assessment and conclusions are not guaranteed to apply at a later date.

This report has been prepared by Pattle Delamore Partners Limited (PDP) on the specific instructions of Otago Waste Services for the limited purposes described in the document. PDP accepts no liability if the document is used for a different purpose or if it is used or relied on by any other person. Any such use or reliance will be solely at their own risk.

Yours faithfully

PATTLE DELAMORE PARTNERS LIMITED

Prepared by

Scott Wilson
Technical Director - Contaminated Land

DUNEDIN SOUTHERN MOTORWAY

ROBERT STREET

WALTON PARK AVENUE

ALFRED PLACE

HOGAN PLACE

EDITH STREET

ESTUARY CRESCENT

BLANC AVENUE

OLD BRIGHTON ROAD

NORTH POND (STORMWATER RETENTION)

LS22

LS21

LS33

LS21A

G34

LS32 (SUMP5)

LD20

SP3

MW1

MW2

MW3

EW43

G35 (CESSPIT)

LS31

LS18

LS19

G36 (BASEMENT OF HOUSE)

EASTERN LANDFILL

WALTON PARK

G37

LS30 (SUMP4)

LS4

LD17

WEIGHBRIDGE & KIOSK

WEIGHBRIDGE POND (STORMWATER RETENTION)

LD16

ADMIN BUILDING

LS14

LS3

LS29

LS15

LS12

WESTERN LANDFILL

LS2

LS28 (SUMP3)

LGS27

LS13

EPS42

KAIKORAI STREAM

FH37 (OCT 09 & APR 10)

FH37 (JAN 10 & OCT 10)

FH38 (JAN 10 & OCT 10)

G38

CHRISTIES CREEK

LS26 (SUMP2)

SP5

LD11

LS9

FH40 (OCT 09, JUL 11 & APR 13)

SP1

LS25

LS10

LD5

LS24 (SUMP1)

LS6

LS23

LD8

LGS1

LGS7

FH39

HISTORICAL LANDFILL

SP2

KAIKORAI LAGOON SWAMP 'WETLAND'

COAL CREEK

FH40

KEY :

- PUMP STATION
- MONITORING POINT - LANDFILL GAS
- SURFACE WATER LEVEL STAGING POST
- MONITORING POINT - SURFACE WATER
- MONITORING POINT - WELLS INSIDE LANDFILL
- MONITORING POINT - MONITORING WELL OUTSIDE LANDFILL
- MONITORING POINT - LEACHATE INTERCEPTION DRAIN MONITORING WELL
- MONITORING WELL - DESTROYED
- LEACHATE INTERCEPTION DRAIN
- SITE BOUNDARY
- HISTORICAL LANDFILL EXTENT
- WESTERN LANDFILL EXTENT
- EASTERN LANDFILL EXTENT
- BUILDING
- STORMWATER RETENTION POND

0 100 200
METRES
SCALE : 1:5,000 (A3)

NO.	REVISION	DATE	BY
C	UPDATED	AUG 23	JR
B	UPDATED	MAY 23	BR
A	ISSUED	AUG 22	BR

SOURCE:
1. AERIAL IMAGERY (FLOWN 2017 - 2020) SOURCED FROM THE LINZ DATA SERVICE www.linz.govt.nz/about-linz/linz-data-service/help/using-linz-data/attributing-aerial-imagery-data AND LICENCED FOR RE-USE UNDER THE CREATIVE COMMONS ATTRIBUTION 4.0 INTERNATIONAL LICENCE.
2. CADASTRAL/TOPOGRAPHICAL INFORMATION AND INSET DERIVED FROM LINZ DATA.
3. ALL DATA DERIVED FROM CADASTRAL DRAWINGS (MAY NOT BE SPATIALLY ACCURATE).

CLIENT
WASTE MANAGEMENT (NZ) LTD.

FIGURE
FIGURE 2: SITE LAYOUT AND CURRENT MONITORING LOCATIONS

PROJECT
FAIRFIELD LANDFILL RECONSENTING

C0218780D_FairfieldLandfill.aprx - C0218780D_GIS001

Dunedin Laboratory
200 Fryatt Street
Private Bag 1962, Dunedin
Telephone + 64 3 477 6511
Facsimile + 64 3 477 7664
www.fultonhogan.com

ENVIRONMENTAL MONITORING REPORT

OTAGO WASTE SERVICES LANDFILL

APRIL 2025

Lab Reference DUD25O-0035

CLIENT: OTAGO WASTE SERVICES

SCOPE

This report covers the environmental monitoring carried out at the Otago Waste Services Landfill Fairfield, Dunedin for Otago Waste Services in January 2024.

The scope of work performed includes:

3 Monthly

- Water levels (36 sites)
- Sampling and chemical analysis of water from:
  - Creeks (FH38, FH39)
  - Kaikorai Estuary (FH40)
  - Kaikorai Stream (EW43)
  - Shallow groundwater wells (LGS1, LGS7, LS10, LS13, LS15, LS19, LS22)
  - Leachate collection system sumps (LS24, LS26, LS26A, LS28, LS30, LS32, EPS42*)
  - Deep groundwater wells (LD5**, LD8, LD11, LD16**, LD17, LD20)
  - Weighbridge Pond and North Pond

  * Sampled April and October. EPS42.

  ** Sampled in October only.
- Water levels in Christie Creek, Coal Creek, Kaikorai Stream, Kaikorai Estuary at the road bridge and the level at LD11 bridge.

Sampling and Testing

FH Dunedin Laboratory undertook all sampling and site testing (pH, Conductivity, Dissolved Oxygen and Temperature). Chemical analysis was subcontracted to Hill Laboratories in Hamilton.

RESULTS

Estuary and Surface Water

Surface Water Monitoring
(Sampled 22/4/25)

Site	Dissolved Oxygen		pH	Conductivity (mS/cm)	Temperature (ºC)
	%	ppm			
FH 38	36.8	2.85	6.52	0.601	12.5
Note:	No detectable flow.				
FH 39	41.9	4.47	6.84	0.584	12.2
Note:	5 m/min				
FH 40	30.8	3.37	6.89	1.028	12.2
Note:	5 m/min				
EW 43	54.1	6.00	7.10	0.282	11.9
Note:	4 m/min				
North Pond	63.0	6.61	9.15	0.437	13.3
Note:	Recent overflowing. Overflow point overgrown.				
Wbridge Pond	-	-	-	-	-
Note:	Dry. No Sample.				

Surface Water Level Markers
(Recorded on 22/4/25**)**

Marker Location	Level (m)
Christie Creek*	0.580
Coal Creek	Broken marker
Estuary level @ LD11 bridge	0.550
Estuary at Brighton bridge	Below marker
Kaikorai Stream (ST4)	Below marker

* This marker is not vertical, therefore hard to read accurately.

Groundwater (Deep and Shallow Bores)

Deep Groundwater Wells outside Landfill (4 sites)
(Dipped on 22/4/25)

Well *	Water Level Dip (m)	pH	Conductivity (mS/cm)	Temperature (ºC)
LD 8	0.585	6.44	36.3	12.5
LD 11	0.345	6.48	37.7	12.1
LD 17	1.325	6.51	25.2	10.6
LD 20	1.430	7.33	35.6	11.5

Deep Groundwater Wells inside Landfill: (2 sites)
(Dipped on 22/4/25)

Well *	Water Level Dip (m)	pH	Conductivity (mS/cm)	Temperature (ºC)
LD 5	3.120	-	-	-
LD16	Dry	-	-	-

*LD16 has kink in pipe, unable to dip

Shallow Groundwater Wells: Groundwater levels (12 sites)
(Dipped on 22/4/25)

Well	Water Level Dip (m)	Well	Water Level Dip (m)
LS 2	3.605	LS 14	3.180
LS 6	1.445	LS 21A	2.645
LS 9	1.535	LS 23	Dry

Well	Water Level Dip (m)	
LS 25	**A** 2.015	**B** 2.280
LGS 27	**A** 2.310	**B** 2.295
LGS 29	**A** 2.555	**B** 2.550
LS 31	**A** 2.250	**B** 2.195
LS 33	2.630	

* **Sample dates/times for each well are listed on the Hill Laboratories report.**

Shallow Groundwater Wells: Field Tests (7 sites)
(Dipped on 22/4/25)

Well *	Water Level Dip (m)	pH	Conductivity (mS/cm)	Temperature (ºC)
LGS 1	2.855	7.15	11.00	12.5
LGS 7	0.555	6.27	10.82	12.1
LS 10	1.255	6.30	8.02	12.5
LS 13*	2.135	-	-	-
LS 15	2.090	6.33	15.26	11.7
LS 19	1.260	6.45	3.04	12.3
LS 22	1.140	6.39	2.69	11.4

***LS 13- water level too low to sample**

Leachate Collection System Sumps (6 sites)
(Dipped on 22/4/25)

Well *	Water Level Dip (m)	pH	Conductivity (mS/cm)	Temperature (ºC)
LS 24	3.240	7.32	5.77	15.0
LS 26	3.185	6.69	7.56	14.1
LS 26A	2.840	No sample taken		
LS 28	3.160	6.77	12.00	15.2
LS 30	2.910	6.52	14.73	13.7
LS 32	3.020	6.50	10.48	13.5

Pump Station (EPS 42)
(Dipped on 22/4/25)

Well *	Water level Dip (m)	pH	Conductivity (mS/cm)	Temperature (°C)
EPS 42	3.510	6.73	8.96	14.5

* **Sample dates/times for each well are listed on the Hill Laboratories report.**

Issued By: Fulton Hogan Dunedin Laboratory

Issue date: 21/05/25
Approved: Tim Wagner Checked: Tim Wagner

Laboratory Technician Technician

R J Hill Laboratories Limited
28 Duke Street Frankton 3204
Private Bag 3205
Hamilton 3240 New Zealand

0508 HILL LAB (44 555 22)
+64 7 858 2000
mail@hill-labs.co.nz
www.hill-labs.co.nz

Certificate of Analysis

Client:	Pattle Delamore Partners Limited	**Lab No:**	3867713	SPv1
Contact:	S Wilson	**Date Received:**	24-Apr-2025	
	C/- Pattle Delamore Partners Limited	**Date Reported:**	05-May-2025	
	PO Box 389	**Quote No:**	43319	
	Christchurch 8140	**Order No:**		
		Client Reference:		
		Submitted By:	S Wilson	

Sample Type: Aqueous

Sample Name:		LGS1 23-Apr-2025 11:00 am	LGS7 23-Apr-2025 10:53 am	LD8 23-Apr-2025 10:50 am	LS10 23-Apr-2025 10:40 am	LD11 23-Apr-2025 10:35 am
Lab Number:		3867713.1	3867713.2	3867713.3	3867713.4	3867713.5
pH	pH Units	8.3	8.1	8.0	8.1	8.0
Electrical Conductivity (EC)	mS/m	1,039	1,043	3,310	762	3,450
Chloride	g/m³	1,360	3,500	12,600	2,100	13,300
Total Ammoniacal-N	g/m³	220	0.062	1.10	3.5	36

Sample Name:		LS15 23-Apr-2025 10:10 am	LD17 23-Apr-2025 10:05 am	LS19 23-Apr-2025 9:55 am	LD20 23-Apr-2025 9:50 am	LS22 23-Apr-2025 9:40 am
Lab Number:		3867713.6	3867713.7	3867713.8	3867713.9	3867713.10
pH	pH Units	8.0	8.1	8.1	8.3	8.2
Electrical Conductivity (EC)	mS/m	1,496	2,680	271	3,240	232
Chloride	g/m³	4,800	9,900	370	15,700	440
Total Ammoniacal-N	g/m³	3.9	26	2.5	< 0.010	0.99

Sample Name:		LS24 23-Apr-2025 1:20 pm	LS26 23-Apr-2025 1:10 pm	LS28 23-Apr-2025 12:40 pm	LS30 23-Apr-2025 12:15 pm	LS32 23-Apr-2025 12:00 pm
Lab Number:		3867713.11	3867713.12	3867713.13	3867713.14	3867713.15
pH	pH Units	8.3	7.8	7.9	7.5	7.8
Electrical Conductivity (EC)	mS/m	547	724	1,172	1,456	997
Chloride	g/m³	880	1,280	2,300	3,400	2,100
Total Ammoniacal-N	g/m³	65	174	450	400	290

Sample Name:		FH38 23-Apr-2025 9:30 am	FH39 23-Apr-2025 10:00 am	FH40 23-Apr-2025 10:15 am	EW43 23-Apr-2025 10:50 am	North Pond 23-Apr-2025 11:05 am
Lab Number:		3867713.16	3867713.17	3867713.18	3867713.19	3867713.20
Turbidity	NTU	-	-	-	-	26
pH	pH Units	8.0	8.0	8.0	7.6	8.4
Total Hardness	g/m³ as $CaCO_3$	200	147	200	69	-
Electrical Conductivity (EC)	mS/m	54.2	56.2	101.0	26.7	42.0
Total Suspended Solids	g/m³	-	-	-	-	94
Dissolved Boron	g/m³	0.34	0.41	0.52	0.071	-
Dissolved Calcium	g/m³	60	31	36	15.7	-
Dissolved Iron	g/m³	14.5	0.54	0.59	0.79	-
Dissolved Lead	g/m³	0.00013	< 0.00010	< 0.00010	0.00046	-
Dissolved Magnesium	g/m³	13.0	16.9	27	7.2	-
Dissolved Zinc	g/m³	0.0112	0.0113	0.0097	0.0197	-
Chloride	g/m³	35	63	182	32	-
Total Ammoniacal-N	g/m³	1.46	0.40	0.87	0.117	< 0.010
Nitrite-N	g/m³	0.004	0.029	0.022	0.007	-
Nitrate-N	g/m³	0.024	0.69	0.43	0.46	-

Sample Type: Aqueous						
Sample Name:		FH38 23-Apr-2025 9:30 am	FH39 23-Apr-2025 10:00 am	FH40 23-Apr-2025 10:15 am	EW43 23-Apr-2025 10:50 am	North Pond 23-Apr-2025 11:05 am
Lab Number:		3867713.16	3867713.17	3867713.18	3867713.19	3867713.20
Nitrate-N + Nitrite-N	g/m³	0.028	0.72	0.45	0.47	-
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	g O_2/m³	5 #1	2	< 2	< 2	2

Analyst's Comments

#1 The original results obtained for carbonaceous Biochemical Oxygen Demand ($cBOD_5$) on the various dilutions performed were not in good agreement. The analysis was therefore repeated using a sub-sample that had been stored frozen.

The cBOD5 result for this sample may be biased slightly low as evidenced by quality control samples analysed with the sample.

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request. Unless otherwise indicated, analyses were performed at Hill Labs, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-20
Turbidity	Analysis by Turbidity meter. APHA 2130 B (modified) : Online Edition.	0.05 NTU	20
pH	pH meter. APHA 4500-H^+ B (modified) : Online Edition. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-20
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B : Online Edition.	1.0 g/m³ as $CaCO_3$	16-19
Electrical Conductivity (EC)	Conductivity meter, 25°C. APHA 2510 B : Online Edition.	0.1 mS/m	1-20
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. APHA 2540 D (modified) : Online Edition.	3 g/m³	20
Dissolved Boron	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.005 g/m³	16-19
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.05 g/m³	16-19
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m³	16-19
Dissolved Lead	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.00010 g/m³	16-19
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.02 g/m³	16-19
Dissolved Zinc	Filtered sample, ICP-MS, trace level. APHA 3125 B : Online Edition.	0.0010 g/m³	16-19
Chloride	Filtered sample. Ion Chromatography. APHA 4110 B (modified) : Online Edition.	0.5 g/m³	1-19
Total Ammoniacal-N	Phenol/hypochlorite colourimetry. Flow injection analyser. (NH_4-N = NH_4^+-N + NH_3-N). APHA 4500-NH_3 H (modified) : Online Edition.	0.010 g/m³	1-20
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I (modified) : Online Edition.	0.002 g/m³	16-19
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - Nitrite-N. In-House.	0.0010 g/m³	16-19
Nitrate-N + Nitrite-N	Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO_3^- I (modified) : Online Edition.	0.002 g/m³	16-19
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	Incubation 5 days, DO meter, nitrification inhibitor added, seeded. APHA 5210 B (modified) : Online Edition.	2 g O_2/m³	16-20

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 26-Apr-2025 and 05-May-2025. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

This certificate of analysis must not be reproduced, except in full, without the written consent of the signatory.

Ara Heron BSc (Tech)
Client Services Manager - Environmental

OWS
OTAGO WASTE SERVICES
A Division of Transpacific Industries Group NZ Ltd

Fairfield Landfill - DUNEDIN

Landfill Gas Measurements

Date: 11.04.25

Technician: Emma Edwards Signed:

Notes GEM5000

Conditions Sunny, warm, dry

			Time	% CH_4	% CO_2	% O_2	ppm H_2S	ppm CO	
1	G35 Cesspit	1	2:03	0.0	0.1	19.9	1	0	Baro' pressure: 1018
		2	2:05	0.0	0.0	19.9	0	0	Diff' pressure:
		3	2:06	0.0	0.0	20.0	1	0	
		4	2:07	0.0	0.0	20.0	0	0	
		5	2:09	0.0	0.0	20.0	0	0	
		Peaks:		max 0.0	max 0.1	min 19.9			
2	G36 Basement	1	2:13	0.0	0.1	20.0	0	0	Baro' pressure: 1018
		2	2:14	0.0	0.1	20.0	1	0	Diff' pressure: 0
		3	2:15	0.0	0.1	20.0	0	0	
		4	2:16	0.0	0.1	20.0	0	0	
		5	2:17	0.0	0.1	20.0	0	0	
		Peaks:		max 0.0	max 0.1	min 20.0			
3	G37	1	2:28	0.0	0.0	20.0	2	1	Baro' pressure: 1016
		2	2:29	0.0	0.1	20.1	2	0	Diff' pressure: -2
		3	2:30	0.0	0.1	20.1	2	0	
		4	2:31	0.0	0.1	20.1	2	0	
		5	2:32	0.0	0.1	20.1	2	0	
		Peaks:		max 0.1	max 0.1	min 20.0			
4	G38	1	2:37	0.0	4.7	16.3	2	0	Baro' pressure: 1016
		2	2:38	0.0	12.2	17.6	2	0	Diff' pressure: 0
		3	2:39	0.0	2.1	18.5	2	0	
		4	2:40	0.0	1.8	18.7	2	0	
		5	2:41	0.0	1.6	18.9	0	0	
		Peaks:		max 0.0	max 4.7	min 16.3			
5	LGS1	1	2:49	0.1	0.9	19.5	3	0	Baro' pressure: 1016
		2	2:50	0.1	0.9	19.6	2	1	Diff' pressure: 0
		3	2:51	0.1	0.9	19.5	2	1	
		4	2:52	0.1	0.9	19.5	2	1	
		5	2:53	0.1	0.9	17.6	3	0	
		Peaks:		max 0.1	max 0.9	min 19.5			
6	LD5	1	2:55	0.0	3.2	17.9	2	0	Baro' pressure: 1016
		2	2:56	0.0	3.0	17.9	3	1	Diff' pressure: 0
		3	2:57	0.0	2.8	18.0	3	0	
		4	2:58	0.0	2.8	18.0	3	0	
		5	2:59	0.0	2.8	18.0	3	0	
		Peaks:		max	max	min			

Graham & Kathryn Jones
Phone: 03 4886302 or 021735641

OWS
OTAGO WASTE SERVICES
A Division of Transpacific Industries Group NZ Ltd

Fairfield Landfill - DUNEDIN

Landfill Gas Measurements

Date: 11-04-25

Technician: Emma Gluardy Signed: [signature]

Notes Taken GEM5000

Conditions sunny, warm, dry

			Time	% CH_4	% CO_2	% O_2	ppm H_2S	ppm CO	
7	LGS7	1	3:03	0.0	0.1	20.1	3	1	Baro' pressure: 1016
		2	3:04	0.0	0.1	20.2	3	0	Diff' pressure: 0
		3	3:05	0.0	0.1	20.2	3	0	
		4	3:06	0.0	0.1	20.2	3	0	
		5	3:07	0.0	0.1	20.2	3	0	
		Peaks:		max 0.0	max 0.0	min 20.1			
8	LGS27	1	3:12	0.0	0.1	20.0	1	0	Baro' pressure: 1016
		2	3:13	0.0	0.1	20.1	3	0	Diff' pressure: 0
		3	3:14	0.0	0.1	20.1	2	0	
		4	3:15	0.0	0.1	20.1	2	0	
		5	3:16	0.0	0.1	20.1	2	0	
		Peaks:		max 0.0	max 0.1	min 20.1			
9	LGS29	1	3:19	63.3	33.4	0.2	32	1	Baro' pressure: 1016
		2	3:20	63.7	33.6	0.1	35	1	Diff' pressure: 0
		3	3:21	63.9	33.6	0.0	36	2	
		4	3:22	63.4	33.8	0.0	34	1	
		5	3:23	63.3	33.4	0.2	35	1	
		Peaks:		max 63.9	max 33.8	min 0.0			
10	LS31	1	3:26	0.0	0.7	19.7	4	0	Baro' pressure: 1016
		2	3:27	0.0	0.6	19.9	3	0	Diff' pressure: 0
		3	3:28	0.0	0.7	19.8	4	0	
		4	3:29	0.0	0.6	19.9	3	0	
		5	3:30	0.0	0.6	19.7	4	0	
		Peaks:		max 0.0	max 0.7	min 19.8			
11	LS32	1	3:32	34.4	21.8	7.7	5	1	Baro' pressure: 1016
		2	3:33	35.0	22.1	7.8	5	1	Diff' pressure: 0
		3	3:34	34.9	22.0	7.7	6	0	
		4	3:35	34.6	21.9	7.7	5	0	
		5	3:36	35.1	22.2	7.8	6	1	
		Peaks:		max 35.1	max 22.2	min 7.7			
12	G34	1	3:41	0.1	0.1	20.2	5	0	Baro' pressure: 1016
		2	3:42	0.1	0.1	20.3	4	0	Diff' pressure: 0
		3	3:43	0.0	0.1	20.3	4	0	
		4	3:44	0.1	0.1	20.2	4	0	
		5	3:45	0.0	0.1	20.3	4	0	
		Peaks:		max	max	min			

Fairfield monitoring wells 1-3

Date 11.04.25 Time 3:50pm Conditions Sunny, calm, dry Engine
Temperature 23°C Air Pressure 1018mb Flare

Gas Well	Temp	Flow	Pressure	Syst Press	CH4	CO2	O2	CO	H2S	Bal	Gas Well	Adj Made	Comments
1					29.6	17.8	9.6	0	5	43.0	1		*Readings taken w/GA5000
#2					0.0	24.5	0.9	0	4	74.5	3		*Engine-Landfill gas only
#3					62.0	33.0	0.1	1	18	4.3	4		
5											5		
6											6		
7											7		
8											8		
9											9		
10a											10a		
11											11		
12											12		
13											13		
14											14		
15a											15a		
LR16											LR16		
16											16		
New 17											New 17		
18											18		
19											19		
20											20		
21											21		
22											22		
23											23		
24											24		
25											25		
26											26		
27											27		
28											28		
29											29		
30											30		
LR30											LR30		
LR31A											LR31A		
31											31		
LR34											LR34		
35											35		
36											36		
37											37		
38											38		
39											39		
40											40		