

NPDC Colson Road Landfill
Monitoring Programme
Annual Report
2022-2023

Technical Report 2023-01



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Taranaki Regional Council
Private Bag 713
Stratford

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Executive summary

The New Plymouth District Council (NPDC) operates a regional landfill located on Colson Road, New Plymouth, in the Waiwhakaiho catchment. Stage 3 of the site has a design capacity of approximately 800,000 m³. Stage 3 ceased accepting waste in the 2020-2021 year and is now in the process of being capped. There is capacity remaining within the design volume and NPDC have indicated that this may be used for contingency disposal. Stages 1 and 2 have been closed and are fully reinstated.

This report for the period July 2022 to June 2023 describes the monitoring programme implemented by the Taranaki Regional Council (the Council) to assess NPDC's environmental and consent compliance performance during the period under review. The report also details the results of the monitoring undertaken and assesses the environmental effects of NPDC's activities.

During the monitoring period, NPDC demonstrated an overall good level of environmental performance and improvement was required in their administrative performance.

NPDC holds ten resource consents, which include a total of 135 conditions setting out the requirements that NPDC must satisfy. NPDC holds one consent to discharge uncontaminated stormwater into the Puremu Stream, two consents to discharge contaminated stormwater and minor amounts of leachate into the Puremu Stream, two consents to discharge emissions into the air, one consent to discharge solids onto and into land and three consent to discharge stormwater and sediment from earthworks. NPDC also holds one consent to divert water.

The Council's monitoring programme for the year under review included 12 routine compliance monitoring inspections, six stormwater/discharge samples, 21 surface water samples, 20 groundwater samples, two biomonitoring surveys of receiving waters, and two ambient air quality surveys. NPDC collected nine leachate samples and four under liner drainage samples for physicochemical analysis as part of their routine monitoring of the site. NPDC also collected additional samples at the time of a leachate overflow to the Puremu Stream.

Inspection found that the site was generally well managed during the year under review, however continued attention to the installation and maintenance of localised erosion and sediment controls is required, along with ensuring that adequate site stabilisation is undertaken before 1 May each year.

The issue of cap management and maintenance on Stage 2 was resolved during the year under review. Extensive investigations into the cap depth and compaction were carried out during the 2018-2019 year and the remediation necessary was identified. It was found that there were areas where the cap depth needed to be increased. An abatement notice was issued allowing NPDC until March 2020 to complete the work so that the appropriate methodology could be developed and then be undertaken during the next dry weather construction season. It was agreed that this could be delayed to prioritise working on the Stage 3 cap following the landfill closure to municipal waste (August 2019) and special waste (October 2020) on the basis that this would minimise the potential discharge of contaminants from the site as a whole. Work was completed and the abatement notice was found to have been complied with at the April 2023 inspection.

Groundwater and under liner drainage sampling indicated that although there is no significant contamination occurring in the local aquifer as a result of the landfill's presence, there are emerging trends of increasing, but still low level, concentrations of chloride and nitrate/nitrite nitrogen in some bores and a number of parameters in the under liner drainage. An abatement notice has been issued and the monitoring programme been expanded so that the potential for future adverse effects can be evaluated. The abatement notice has an extended date of 31 January 2024 so that these potential effects can be taken into account during the early application for the replacement of the consents and to allow for the preparation of a Cultural Impact Assessment by Ngati Tawhirikura and Te Kotahitanga o Te Atiawa.

Chemical and bacteriological monitoring of the Puremu and Manganaha Streams found that the receiving water quality criteria on the consents were met for the majority of parameters at the time of the three

scheduled sampling surveys. The exceptions to this were faecal coliform concentrations that were above the consent limit at the time of two of the three surveys. In each case, the faecal coliform count was elevated in the upstream samples, so this was not considered to be a consent non-compliance. During the year under review there were no non-compliances with the manganese concentrations in the receiving waters, however these did remain elevated in the discharge from the large silt pond, and further investigation may be required to ensure continued consent compliance. Additional discharge and receiving environment monitoring undertaken by NPDC during a leachate overflow to the Puremu Stream from 20 to 30 August 2022. This monitoring showed that the consent conditions on the water quality of the Puremu Stream below the mixing zone were complied with.

Overall, both biological monitoring surveys indicated that the discharge of treated stormwater and leachate discharges from the Colson Road landfill site had not had any significant detrimental effect on the macroinvertebrate communities of the Puremu and Manganaha Streams. In the unnamed tributary, no significant detrimental effects were found. However at the time of both surveys, the results suggested poor preceding water quality that may be indicative of adverse effects associated with the landfill leachate.

Air quality monitoring showed that there were no significant adverse effects in relation to suspended particulates, dust deposition rates or odour beyond the site boundary.

An enclosed gas flare system was installed for air quality control during the 2017-2018 monitoring period. This was well managed during the year under review and there were no substantiated odour complaints received during the 2022-2023 period that were associated with the Colson Road landfill. Based on the analysis of the approximate volume of methane directed to the flare in the three years from 2019-2020 to 2022-2023, although there has been no significant reduction in the annual volume of landfill gas produced since site closure, it is possible that this peaked in the 2021-2022 year.

Overall, NPDC demonstrated a good level of environmental performance, however an improvement is required in their administrative performance and compliance with the resource consents as defined in Appendix II. In relation to the on-going non-compliance of the cap on Stage 2, the abatement notice in place requiring the works to be undertaken by 1 May 2023 was complied with. The abatement notice issued during the 2020-2021 year in relation to water quality changes in the groundwater in the under liner drain, and monitoring plan requirements are still in effect with works required to be undertaken by 31 January 2024. There appear to be some legacy issues that are affecting the water quality in the receiving environment. These have resulted in some consent non-compliances, however, they have not resulted in any non-compliant results in the surface waters or had significant adverse effects on the receiving waters during the year under review. Monitoring requirements have been revised and evaluation is on-going. Additional investigations are also being undertaken by NPDC, when required, to ensure that any appropriate interventions are implemented where improvements are required.

For reference, in the 2022-2023 year, consent holders were found to achieve a high level of environmental performance and compliance for 878 (87%) of a total of 1007 consents monitored through the Taranaki tailored monitoring programmes, while for another 96 (10%) of the consents a good level of environmental performance and compliance was achieved. A further 27 (3%) of consents monitored required improvement in their performance, while the remaining one (<1%) achieved a rating of poor.

In terms of overall environmental and compliance performance by the consent holder over the last several years, this report shows that the consent holder's performance has improved. However, in the year under review and in the previous three years, there is still an improvement required with their administrative performance and compliance with some consent conditions.

This report includes recommendations for the 2023-2024 year, including a recommendation relating to an optional review opportunity of Consent 10804-1.0 in June 2024.

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1 Introduction

1.1 Compliance monitoring programme reports and the Resource Management Act 1991

1.1.1 Introduction

This report is for the period July 2022 to June 2023 by the Taranaki Regional Council (the Council) on the monitoring programme associated with resource consents held by New Plymouth District Council (NPDC). NPDC operated a regional landfill situated on Colson Road, New Plymouth, in the Waiwhakaiho catchment that ceased accepting waste during the year 2020-2021 year and is now in the process of being capped.

The report includes the results and findings of the monitoring programme implemented by the Council in respect of the consents held by NPDC that relate to discharges of water, discharge to land, a stream diversion within the Waiwhakaiho catchment, and the two air discharge permits held by NPDC to cover emissions to air from the Colson Road landfill.

One of the intents of the *Resource Management Act 1991* (RMA) is that environmental management should be integrated across all media, so that a consent holder's use of water, air, and land should be considered from a single comprehensive environmental perspective. Accordingly, the Council generally implements integrated environmental monitoring programmes and reports the results of the programmes jointly. This report discusses the environmental effects of NPDC's use of water, land and air, and is the 22nd site specific Annual Report by the Council for NPDC covering only this site. Prior to this, during the period from 1990-1999, the Council produced ten combined NPDC landfills' Annual Reports that included the Colson Road landfill.

1.1.2 Structure of this report

Section 1 of this report is a background section. It sets out general information about:

- consent compliance monitoring under the RMA and the Council's obligations;
- the Council's approach to monitoring sites through annual programmes;
- the resource consents held by NPDC in the Waiwhakaiho catchment that relate to the Colson Road landfill;
- the nature of the monitoring programme in place for the period under review; and
- a description of the activities and operations conducted at the Colson Road landfill.

Section 2 presents the results of monitoring during the period under review, including scientific and technical data.

Section 3 discusses the results, their interpretations, and their significance for the environment.

Section 4 presents recommendations to be implemented in the 2020-2021 monitoring year.

A glossary of common abbreviations and scientific terms, and a bibliography, are presented at the end of the report.

1.1.3 The Resource Management Act 1991 and monitoring

The RMA primarily addresses environmental 'effects' which are defined as positive or adverse, temporary or permanent, past, present or future, or cumulative. Effects may arise in relation to:

- a. the neighbourhood or the wider community around an activity, and may include cultural and social-economic effects;

- b. physical effects on the locality, including landscape, amenity and visual effects;
- c. ecosystems, including effects on plants, animals, or habitats, whether aquatic or terrestrial;
- d. natural and physical resources having special significance (for example recreational, cultural, or aesthetic); and
- e. risks to the neighbourhood or environment.

In drafting and reviewing conditions on discharge permits, and in implementing monitoring programmes, the Council is recognising the comprehensive meaning of 'effects' inasmuch as is appropriate for each activity. Monitoring programmes are not only based on existing permit conditions, but also on the obligations of the RMA to assess the effects of the exercise of consents. In accordance with Section 35 of the RMA, the Council undertakes compliance monitoring for consents and rules in regional plans, and maintains an overview of the performance of resource users and consent holders. Compliance monitoring, including both activity and impact monitoring, enables the Council to continually re-evaluate its approach and that of consent holders to resource management and, ultimately, through the refinement of methods and considered responsible resource utilisation, to move closer to achieving sustainable development of the region's resources.

1.1.4 Evaluation of environmental and administrative performance

Besides discussing the various details of the performance and extent of compliance by the consent holders, this report also assigns a rating as to each Company's environmental and administrative performance during the period under review. The rating categories are high, good, improvement required and poor for both environmental and administrative performance. The interpretations for these ratings are found in Appendix II.

For reference, in the 2022-2023 year, consent holders were found to achieve a high level of environmental performance and compliance for 878 (87%) of a total of 1007 consents monitored through the Taranaki tailored monitoring programmes, while for another 96 (10%) of the consents a good level of environmental performance and compliance was achieved. A further 27 (3%) of consents monitored required improvement in their performance, while the remaining one (<1%) achieved a rating of poor.¹

1.2 Process description

The site no longer accepts wastes and is in the process of being closed in accordance with the conditions of the consent and the Colson Road Regional Landfill Management Plan, prepared by NPDC, and approved by Council.

General and municipal waste was discharged to Stage 3 of the operation until early August 2019, with the site re-opening for special waste only later that month. The Council was informed early of NPDC's intent to continue to use the site for the disposal of special waste only (within the existing conditions of the various consents), and a significant amount of consultation occurred during the 2018-2019 year around how this could be managed in such a way as to continue to comply with the conditions of the existing consents. During the 2020-2021 year, the site accepted special waste only, with this activity ceasing in October 2020.

The special waste disposal cell is located on top of the Stage 3 towards the southern end of the landfill. A two metre deep clay cell was constructed that contained leachate collection lines, which were linked to the Stage 3 leachate collection system. Prior notification was required for the customers wanting to dispose of

¹ The Council has used these compliance grading criteria for 19 years. They align closely with the 4 compliance grades in the MfE Best Practice Guidelines for Compliance, Monitoring and Enforcement, 2018

special waste. Pits, which were generally sized to take only a single day's waste, were dug into the clay cell. The cell was covered at the end of the day.

Daily operations at the site are governed by the requirements contained in the Colson Road Regional Landfill Management Plan (CRLMP), which is written to ensure operations comply with the requirements of the consent and that effects are minimised. The CRLMP is reviewed annually and updated as required.

When the landfill was fully operational, wastes originating from municipal refuse kerbside collection, the Colson Road transfer station, other municipal transfer stations around the region and commercial operators were discharged to the landfill. As of December 2007 Colson Road was the sole operating landfill in the Taranaki region. Once the waste was discharged it was compacted and covered daily with clay or a suitable alternative as per the requirements of the management plan. The composting area was operational from the 1996-1997 year and ceased in February 2022.

An aerial plan of the site is shown in Figure 1.



Figure 1 Aerial view of the Colson Road landfill

The leachate from Stages 1, 2 and 3 is collected and directed to the New Plymouth wastewater treatment plant, along with contaminated stormwater from Stage 3.

Contouring, preparation work and the application and stabilisation of areas of the final cap has continued during the year under review (Photo 1 and Photo 2). A site closure plan (CP) has been prepared for NPDC that has been reviewed and accepted by Council, which NPDC is continuing to follow. This is discussed further in Section 2.1.3.



Photo 1 Stabilised northern toe of Stage 3, May 2023



Photo 2 Top of Stage 3 cap looking south, June 2023

To enable sufficient cover material to be accessed from within the property boundary, works have been undertaken in the south-eastern area of the site, which was the former composting area. These works included installing drainage around the composting area previously occupied by Return2Earth and Revital. Sediment discharges from the borrow area are treated by a separate sediment pond (Photo 3), with the

catchment area to this pond having been expanded to enable treatment of the stormwater from the Stage 2 cap remediation works (Photo 4).



Photo 3 Borrow area sediment pond, November 2020



Photo 4 Amended drainage and access during capping works for Stage 2 remediation, June 2023

The sediment treatment system for Stage 3 was upgraded during the 2020-2021 year. This was undertaken following an analysis of the erosion and sediment control measures in place at the site and associated recommendations. These upgrades included the addition of a pretreatment pond (Photo 5) prior to the large silt pond and floating decants in the large silt pond (Photo 6).



Photo 5 Pretreatment pond for large silt pond, June 2023



Photo 6 Floating decant system in the large silt pond, May 2023

1.2.1 Operational history relevant to on-going discharges and emissions

Waste disposal at this site occurred from the 1970s to October 2020, with the site developed for use in a number of stages. Efforts are continuing to establish a clear three dimensional conceptual model for the entire site, in terms of potential sources of contaminants from leachate, flow paths and receptors, in order to inform the consent replacement applications. A recommendation reflecting this intent is presented in Section 4. An outline of the current understanding of the isolation, collection and treatment systems in place at the site is outlined below, which will be updated as the elements required for the conceptual model are investigated and confirmed.

Stage 1A is on the western side of the central access road, filling a valley on the western side of the property. This Stage was operational in the 1970's and 1980's. Landfilling methodology was in accordance with the then NPDC's Operative District Plan. The area was not lined, but does have a leachate drainage system that discharges to the leachate system.

Stage 1B is on the eastern side of the central access road between the northern ends of Stage 1A and Stage 3. This stage involved the development of a valley directly to the east of the site weighbridge, and was developed to provide additional landfilling space to cover the period between the closure of Stage 1A and the granting of the consents for Stages 2 and/or Stage 3. Landfilling methodology was in accordance with the conditions applying to the development of Stage 1A. The finished landform was capped and profiled consistent with modern landfilling practice and was subsequently planted with pine trees to act as a visual barrier for Stage 3. The depth of the cap in this area was not recorded.

Stage 2 was an overlay of Stage 1 and was established on top of a 300 mm Taranaki ash (clay) liner. Leachate collection drains were installed to drain leachate to the leachate pump station. This area was operational in the mid to late 1990's. At the time of closure Stage 2 was capped, with Stage 1 being recapped and reshaped with excess cut from the Stage 3 valley. This ensured that the entire landfill footprint on the western side of the property was capped and profiled consistent with modern landfill practice.

Construction of Stage 3 began in 1999, with filling commencing in June 2002. This stage has a fully engineered liner consisting of high density polyethylene (HDPE) laid over compacted clay. Under liner groundwater drainage was also installed. This discharges to a large stormwater detention pond at the northern end of the site. Leachate is collected in porous pipes that have been put down in herring bone configuration over the polyethylene liner. On 12 July 2005, the waste at the southern end of Stage 3 slumped a distance of 8 to 10 m, with the waste also rotating within the lined area. The slip involved 50,000 tonnes of compacted refuse. An operator on site at the time of the slip described the motion of the waste as "sloshing backwards and forwards for about 30 seconds". This resulted in a number of tears in the liner that were visible above the level of the settled refuse. All but one of the tears were considered to be due to items in the refuse puncturing and ripping the liner during the slump, with only one tear that may have been as a result of the liner tearing due to being stretched. All of the visible tears were repaired. With the 300 mm clay cover over acting to protect the liner in the lower area of the landfill, it was considered reasonable to assume that damage under the waste lower down may have been less severe. It was agreed that 18 months of monitoring of the water quality in the under liner drainage would occur prior to attempting to remove the waste to visually inspect the liner. This monitoring did not detect any changes that would indicate contaminants escaping the landfill through the liner. Therefore removal of the waste and a visual inspection was not considered necessary at that time, but that monitoring of the under liner groundwater quality would continue. In terms of the leachate collection system, it was found that movement of the refuse resulted in issues with the integrity of the leachate system. Although the leachate line was in good condition up to 130 m from the northern end of the landfill, under the north eastern segment beyond that, it was compromised. These factors resulted in wet conditions developing in two areas within the landfill footprint. Bentonite matting was utilised and a secondary leachate drainage system was constructed on top of the clay

cover over the slumped refuse in the southern end of the landfill. The layout of the leachate drains, as surveyed in September 2006, are shown in Figure 2.

During the 2013-2014 year, the lining of Stage 3 was completed so that the liner covered Stage 3's entire footprint (Photo 7). From this point on, there was an increase in the amount of potentially contaminated stormwater generated due to the increase in the lined and filled area, and this was therefore directed to the leachate collection system for discharge via the New Plymouth wastewater treatment plant. From this point in time, the volumes of leachate/contaminated stormwater generated exceeded the instantaneous capacity of the pipe to the waste water treatment plant on occasion. Therefore the flow from Stage 3 to the leachate system is controlled via a shut off valve to minimise the potential for overflows to the Puremu Stream, when required. Under these circumstances excess leachate/contaminated stormwater is stored within Stage 3 of the landfill.

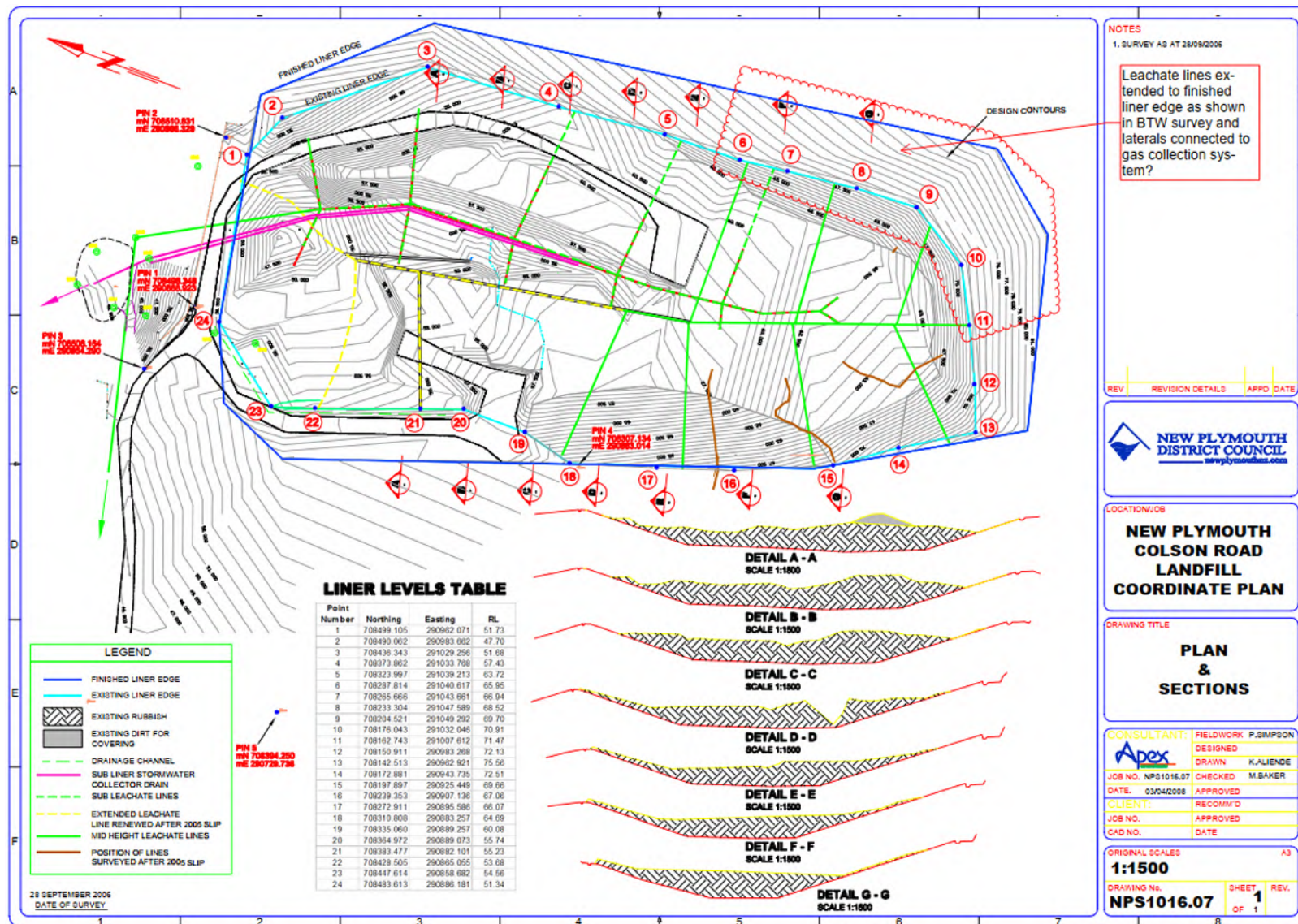


Figure 2 Location of Stage 3 leachate and under liner groundwater collection lines



Photo 7 Stage 3 extension works, February 2011

With respect to air discharges from the site, the landfill had been operated for most of its life without significant off site problems, but during the 2014-2015 period, 20 complaints were received regarding odours from the landfill. The Council worked with NPDC to target on site odour sources, whilst a consultant was engaged by NPDC to provide expert advice on remedial actions and longer term solutions. A range of mitigations measures were implemented by NPDC that had been recommended by the consultant as a staged approach to addressing the odour issue, these included remediation in areas of the intermediate cover, capping the open ends of the lateral leachate lines, improved management of the special waste pits and the installation of fixed deodorant sprayers and an automated spray system.

During 2017-2018 a fully enclosed gas flare was installed at the site. It is noted that although the landfill is no longer accepting waste, the landfill could continue to produce potentially odorous gas for up to 30 years post closure.

Commissioning of the landfill gas management system occurred during January to March 2018, with operational and monitoring procedures developed to ensure the gas system was managed effectively. NPDC operations staff have been provided with training in order to carry out operation of the system in a safe and effective manner, while ongoing support and maintenance is provided by consultants.



Photo 8 Leachate pipes feeding into the gas collection system



Figure 3 As built drawing of the stage 1 landfill gas collection system

There has been a noticeable reduction in odour around the landfill perimeter since all of the above measures have been initiated and the operation of the flare began.



Photo 9 The fully enclosed flare

1.3 Resource consents

NPDC holds ten resource consents in relation to the Colson Road landfill, the details of which are summarised in the table below. Summaries of the conditions attached to each permit are set out in Section 3 of this report.

A summary of the various consent types issued by the Council is included in Appendix I, as are copies of all permits held by NPDC during the period under review.

Table 1 Consents held by NPDC that relate to the Colson Road landfill

Consent number	Purpose	Granted	Review	Expires
<i>Water discharge permits</i>				
2370-3	To discharge leachate and contaminated stormwater from area A to the Puremu Stream	March 2003	-	June 2026
4619-1	To discharge treated stormwater and minor amounts of leachate from areas B1, B2, C1 & C2 to groundwater and the Puremu Stream	March 1999	-	1 June 2025
4620-1	To discharge uncontaminated stormwater from areas B1, B2, C1 and C2 into the Puremu Stream	March 1999	-	1 June 2025
6177-2.0	To discharge stormwater and sediment from earthworks associated with the capping of Stage 3 of the Colson Road landfill onto land and into an unnamed tributary of the Puremu Stream	October 2021	-	1 June 2025
10804-1.0	To discharge stormwater and sediment arising from earthworks into an unnamed tributary of the Puremu Stream	February 2020	-	1 June 2026
10912-1.0	To discharge stormwater and sediment from earthworks associated with the capping of Stage 2 of the Colson Road landfill onto land and into an unnamed tributary of the Puremu Stream	October 2021	-	1 June 2025
<i>Air discharge permit</i>				
4622-1	To discharge emissions to air from composting	March 1999	-	1 June 2025
4779-1.1	To discharge emissions to air from landfilling	January 2017*	-	June 2026
<i>Discharges of waste to land</i>				
4621-1.1	To discharge contaminants onto and into land in areas B1, C1 and C2	May 2021*		1 June 2025
<i>Land use permits</i>				
0226-1	To divert the Puremu Stream by placing a culvert to provide road access	October 1986	-	October 2026

Key *Commencement date of varied consent

1.4 Monitoring programme

1.4.1 Introduction

Section 35 of the RMA sets obligations upon the Council to gather information, monitor and conduct research on the exercise of resource consents within the Taranaki region. The Council is also required to assess the effects arising from the exercising of these consents and report upon them.

The Council may therefore make and record measurements of physical and chemical parameters, take samples for analysis, carry out surveys and inspections, conduct investigations and seek information from consent holders.

The monitoring programme for the 2021-2023 years is significantly different from that of the 2020-2021 and previous years.

In the 2020-2021 year, following a number of investigations undertaken by NPDC, it was confirmed that there were some changes in parameters in the groundwater in the under liner drain that likely exceeded the maximum natural background variation. It was also found that the “trigger values” that should have been included in the site’s monitoring plan had not been identified and documented. This was recorded as an unauthorised incident on the Council’s incident register. An outline of the findings of the investigations is presented in Section 2.6, with the on-going matters that have impacted on the Council’s monitoring programme for the site outlined below.

It was agreed that additional monitoring would be undertaken and that early consent replacements would be sought to ensure compliance with Abatement Notice EAC-23544 by the revised date of 31 January 2024.

A number of discussions took place focusing on ensuring that any monitoring programme addressed:

- current consent conditions; and
- the identification and evaluation of potential adverse effects on the environment in preparation for the application for early replacement of the landfill discharge consents; and
- the concerns raised by the submitters (including the Te Atiawa Tribal Council) during the processing of the application for the current consents.

Following these discussion Council developed the methodology that would be applied to the development of the monitoring programme during the transition of the site from a closing site with a recently emerged trend of increases in some of the indicator parameters, to a closed site with a clear conceptual model. The methodology is outlined in Table 2.

Table 2 Monitoring programme objectives and programme development methodology

On-going monitoring	Baseline and site characterisation	Post closure monitoring
<i>Objective:</i> <i>Compliance monitoring of discharges and effects in relation to current consent conditions</i>	<i>Objective:</i> <i>Investigation of emerging contamination issue and information gathering for the re-consenting Assessment of Environmental Effects (AEE)</i>	<i>Objective:</i> <i>Compliance monitoring of discharges and effects in relation to consent conditions on the closed site consent(s)</i>
Monitoring of the existing site against the current consent conditions	<u>Step 1.</u> Baseline characterisation of contaminants in the actual or potential discharges from the site at the time of closure, as per the recommendation in “A Guide to the Management of Closed and Closing Landfills in New Zealand” and international best practice landfills. Presence or absence of seasonal variation needs to be understood	

On-going monitoring	Baseline and site characterisation	Post closure monitoring
	<u>Step 2.</u> Determination of groundwater flow directions and appropriate on-going groundwater monitoring locations (may be prior to or concurrent with step 1. This is required to enable the following steps)	
Appropriate modification of compliance monitoring programme against the current consent conditions	<u>Step 3.</u> Review results from Steps 1 and 2 and determine appropriate on-going monitoring locations and parameters for groundwater and surface water discharges and receiving water sites with respect to actual or potential adverse effects and current consent conditions	
	<u>Step 4.</u> Determine appropriate consultation, consent conditions and consent limits during the re-consenting process	Monitoring of the closed site against the new consent conditions with an understanding of the potential environmental effects and a clear conceptual model

It is noted that the final programme developed for the monitoring of the closed site will need to include the "contingency comprehensive monitoring" and details of the contaminants and levels at which more comprehensive monitoring will need to be undertaken based on "indicator" results.

The first year of baseline and site characterisation monitoring commenced in the 2021-2022 year.

The monitoring programme for the Colson Road landfill site for the 2022-2023 year consisted of six primary components, as described in Sections 1.4.2 to 1.4.7. A summary of the monitoring undertaken by the Council is also provided in Table 3.

Table 3 Summary of monitoring activity for 2022-2023

Activity	Number
Inspections	12
Stormwater samples	6
Receiving water samples	21
Groundwater samples	20
Air deposition samples	12
Ambient methane readings	0
Ambient hydrogen sulphide readings	0
Ambient PM ₁₀ readings	0
Biomonitoring surveys	2

1.4.2 Programme liaison and management

There is generally a significant investment of time and resources by the Council in:

- ongoing liaison with resource consent holders over consent conditions and their interpretation and application;

- in discussion over monitoring requirements;
- preparation for any consent reviews, renewals or new consent applications;
- advice on the Council's environmental management strategies and content of regional plans; and
- consultation on associated matters.

During the year under review NPDC commissioned a consultant to prepare a number of plans that were provided to Council. These included:

- A number of updates to the Erosion and Sediment Control Plan.
- Draft Aftercare Plan's, October 2022 and April 2023.

1.4.3 Site inspections

Twelve routine monitoring inspections were undertaken at the Colson Road landfill during the monitoring period. With regard to consents for the discharge to water, the main points of interest were plant processes with potential or actual discharges to receiving watercourses, including contaminated stormwater and process wastewaters. Air inspections focused on site processes with associated actual and potential emission sources and characteristics, including potential odour, dust, noxious or offensive emissions. Sources of data being collected by the NPDC were identified and accessed, so that performance in respect of operation, internal monitoring, and supervision could be reviewed by the Council. The neighbourhood was surveyed for environmental effects.

1.4.4 Consent holder submitted data

1.4.4.1 Water quality

Historically NPDC has collected samples of the combined leachate from the site at a point where the leachate discharges from Stages 1, 2 and 3 are combined. NPDC has also collected samples from the under liner groundwater drainage. The number of samples per year collected and the parameters determined have been as required by the relevant Colson Road Landfill Management Plan. The data was provided to Council on an annual basis and generally consisted of:

- A minimum of four samples of the combined leachate from the site analysed for indicator parameters that included pH, biochemical oxygen demand, suspended solids, conductivity, turbidity, alkalinity, ammoniacal nitrogen, cadmium, chromium, chloride, copper, iron, lead, manganese, nickel, and zinc; and
- A minimum of four samples of the under liner groundwater drainage analysed for indicator parameters that included pH, chemical and/or biochemical oxygen demand, suspended solids, faecal coliforms, conductivity, turbidity, alkalinity, ammoniacal nitrogen, cadmium, chromium, chloride, copper, iron, lead, manganese, nickel, and zinc.

Following the review of the monitoring programme in the 2020-2021 year, it was agreed that samples would be taken at quarterly intervals for the under liner groundwater drainage and twice a year for leachate from Stage 3 and combined leachate from Stages 1 & 2.

In addition, two sets of samples per year from the under liner groundwater drainage and the two samples from each of the leachate collection points were to be tested for an extended range of parameters to enable characterisation of the leachate discharges and to establish whether any of these contaminants are entering the under liner groundwater drainage.

This revised self-monitoring schedule was implemented in the 2021-2022 year, but reverted to the historical monitoring protocol during the year under review. The results of the 2021-2022 monitoring have been included in Appendix III for comparison purposes. The revised monitoring schedule will be implemented

again in the 2023-2024 year, with the extended range of parameters analysed and reviewed annually. Consideration will also need to be given to medium term monitoring of separate leachate samples (the Stages 1 & 2 and the Stage 3 leachate lines) for selected parameters on a biannual basis due to the different discharge pathways.

1.4.4.2 Flare monitoring data

NPDC monitors the feed gas to the flare, the flare temperature and maintains an operational log as required by the conditions of the consent. This information is provided to the Council on an annual basis and the results of this monitoring are presented in Section 2.5.1.

1.4.5 Chemical sampling

The Council undertook sampling of both the discharges from the site and the water quality upstream and downstream of the discharge points and mixing zones. Water quality and discharge sampling sites are shown in Figure 4.

The Puremu Stream, Manganaha Stream, and stormwater were all sampled on three occasions during the period under review.

One survey is scheduled to be undertaken at the start of or following a period of wet weather that focuses on potential effects from surface water discharges. Samples collected during this survey are analysed for the indicator parameters of pH, temperature, suspended solids, faecal coliforms, conductivity, turbidity, alkalinity, ammoniacal nitrogen, chloride. This survey was undertaken on 1 June 2023.

Two surveys are scheduled to be undertaken during periods of dry weather, one during a period of high groundwater levels and one during a period of low groundwater levels. These surveys are focused on the potential discharges of contaminants from groundwater and any discharges from the stormwater network occurring under these conditions. These surveys were undertaken on 23 January 2022 and 18 April 2023.

In terms of the Manganaha Stream sampling, the consents prohibit the direct discharges to the Manganaha Stream. The samples collected from this stream, under these dry weather conditions, were analysed for a small range of indicator parameters to confirm that the discharges from the site are not impacting on the water quality of the Manganaha Stream.

The Puremu Stream samples were analysed for a range of indicator parameters and the parameters required to be able to confirm compliance with specific limits given in the consent conditions. The stormwater discharges to the Puremu Stream and tributary are permitted to contain minor amounts of leachate. The stormwater samples were therefore analysed for the above parameters, and in addition, a more comprehensive range of parameters to get a better understanding the water quality of these discharges in terms of the potential influence of leachate.

The groundwater monitoring aspect of the programme was revised prior to the start of the 2021-2022 year, with nine bores in the vicinity of the landfill scheduled to be sampled on two occasions during the year under review at the locations identified in Figure 5. In the 2021-2022 year, one of the monitoring bores (GND0572) was not sampled as the bore was found to be compromised. Investigation found that this bore could not be re-instated. Two replacement bores (GND3182 and GND3183) were installed down gradient of GND0573 and these replacement bores were sampled during both surveys in the 2022-2023 year. The groundwater sampling sites are described in Table 13.

One of the groundwater surveys is programmed to be undertaken under high groundwater level conditions. Samples collected during this survey are analysed for a range of indicator parameters, inorganic nitrogen species, dissolved metals, volatile and semi-volatile organic compounds. This survey was undertaken over two days in December 2022.

The second survey is scheduled to be carried out under low groundwater level conditions. Samples collected during this survey are analysed for a range of indicator parameters, inorganic nitrogen species, and a reduced range of dissolved metals. This survey was undertaken over four days in May 2023.

1.4.6 Ambient air quality

The Council undertook sampling of the ambient air quality in the neighbourhood. The air monitoring sites are shown in Figure 6.

Six deposition gauges were placed at selected sites in the vicinity of the landfill and at the landfill on two occasions, and the collected samples analysed for solids.

The three programmed ambient suspended particulate, methane and hydrogen sulphide surveys were not undertaken due to equipment failure.

1.4.7 Biomonitoring surveys

Biological surveys were performed on two occasions in the Puremu Stream (four sites) and Manganaha Stream (two sites) to determine whether or not the discharges from the site have had a detrimental effect upon the communities of the streams.

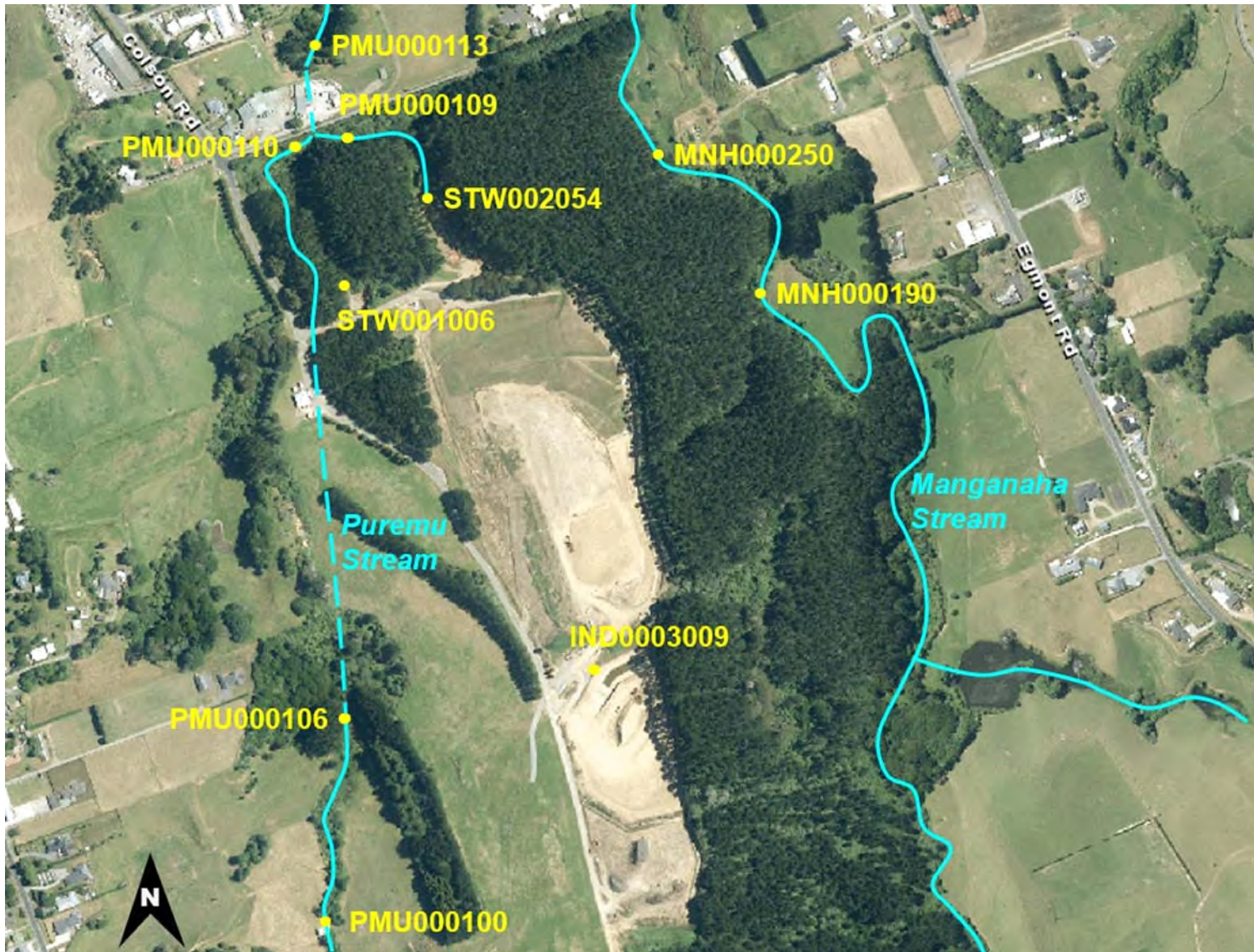


Figure 4 Aerial photo showing the stormwater and receiving water sampling sites at Colson Road landfill

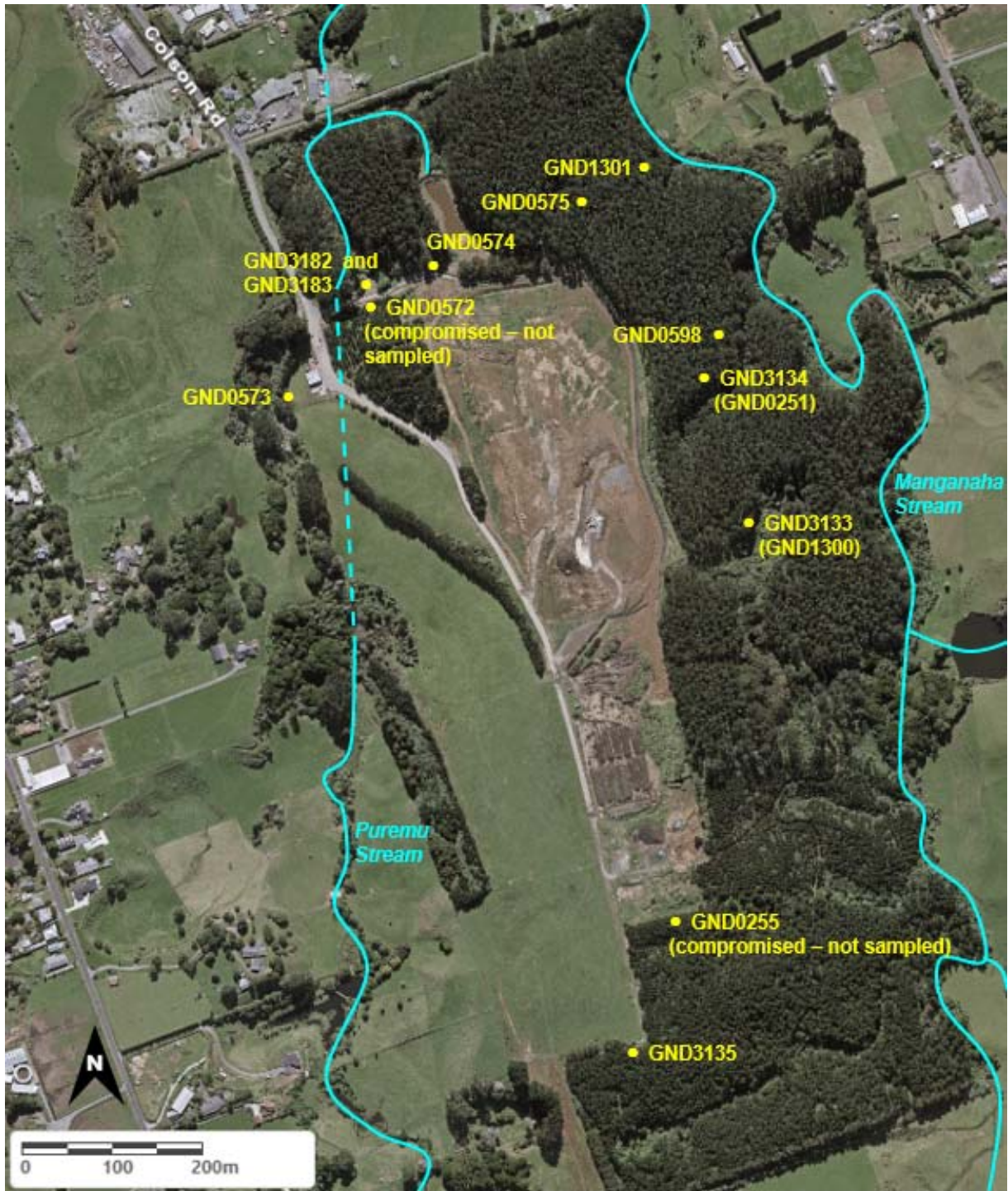


Figure 5 Aerial view showing the groundwater sampling sites at Colson Road landfill

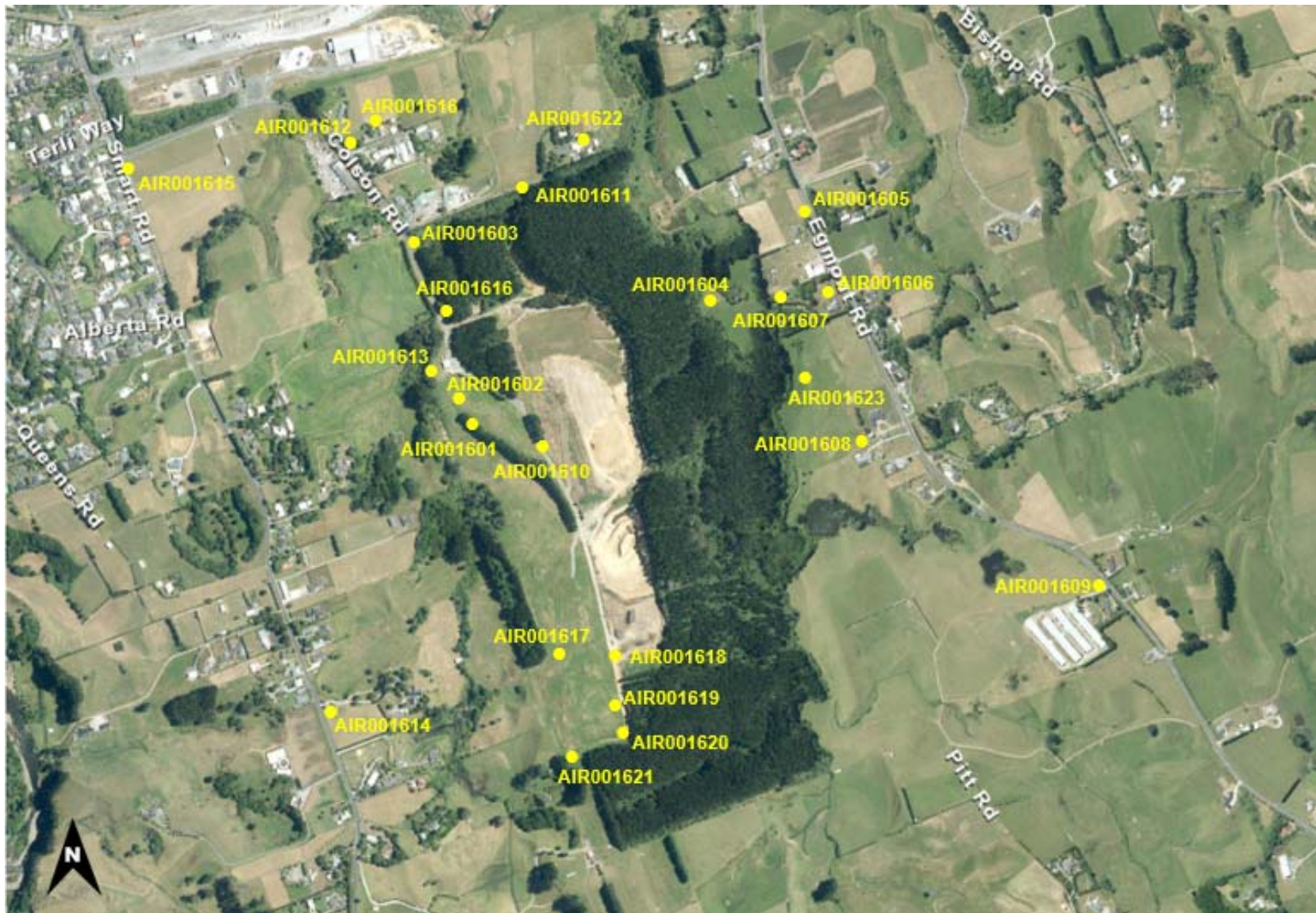


Figure 6 Aerial view showing the positions of air quality monitoring sites at and around Colson Road landfill

2 Results

2.1 Programme liaison and management

2.1.1 Erosion and sediment control plans

The consents that provide for the discharge of stormwater from earthworks at the site contain various conditions that relate to the provision and maintenance of an Erosion and Sediment Control Plan (ESCP), and require NPDC to manage the activities in accordance with the plan. The ESCP that was in place for the site during the year under review is dated July 2022, and was received by Council on 3 August 2022. Minor amendments to the ESCP were made following inspection action items from the 19 July 2022 inspection and a meeting with NPDC staff on 26 October 2022. The most recent version of the ESCP was received on 15 November 2022, however it is noted that the version number and date of issue of the ESCP were not updated.

2.1.2 Landfill management and contingency plans

Daily operations at the site are governed by the requirements contained in the CRLMP, which the consents require to be updated at not less than yearly intervals.

NPDC reviewed the CRLMP early in the 2021-2022 year, with the draft plan provided in September 2021. The Council requested that some minor changes and/or clarifications be made to the draft CRLMP. This included updating the details around the stormwater management requirements to ensure that the installation and maintenance of the additional treatment systems recommended in the erosion and sediment control analysis was covered in the CRLMP. During the year under review NPDC approached the Council to enquire as to whether principal documents could become as below:

1. Aftercare Plan (AP) becomes the principal operational document
2. CRLMP becomes the operational document should NPDC re-open the landfill in an emergency, and also covers final capping specification (currently being completed)

It is noted that the site is being transitioned towards being a closed landfill, with only site closure activities being undertaken during the year under review. Capping activities will be continuing in the 2023-2024 year, and it is anticipated that an application will be submitted for early replacement of the consents issued for the construction and operation of Stage 3. It has been signalled to the Council that the application will be to provide for the discharges and emissions from the landfill as a closed site. The AP is currently under development. A draft AP dated April 2023 was provided to Council for review. It was noted that this was a preliminary draft with some aspects of the plan that were yet to be fully developed or that would be updated following the replacement of the consents. Feedback was also provided regarding additional matters that need to be incorporated into the plan. The AP is likely to evolve over the coming years as the matters outlined in Section 2.1.4 are addressed.

The contingency planning for the Colson Road landfill is included in the NPDC Infrastructure Group Resource Recovery Incident Response Plan (IRP). The IRP in place during the year under review was updated by NPDC in July 2021. It is noted that this plan is due for a major review in the first quarter of 2024.

2.1.3 Stage 3 closure plan

The draft CP was provided to Council on 22 December 2020. Due to the technical nature of the plan, it was agreed that this would be subject to an external independent expert peer review. The principal finding of the review was that the proposed overall capping depth is likely to prove insufficient for the long term

function of the site, given the absence of an intermediate drainage layer². It was recommended that NPDC look to increase the cap depth and in particular include a subsoil layer between the compacted clay and the topsoil. Additional suggestions were made around stormwater drains and landfill gas collection. In other respects the proposals were considered to be good practice and functional. NPDC provided additional clarification where requested and additional discussion on the suitability of design for local conditions. It was confirmed that the concerns raised about potential issues that could have an impact on the long term function of the cap were either not relevant given the local conditions and experience with the Stage 2 cap or could be adequately addressed as part of the monitoring, maintenance, contingency planning and restrictions that would be specified in the AP for the site. It had been agreed with NPDC that the AP will be provided prior to the completion of the capping activities.

The final version of the CP (October 2021) was provided to Council. This version of the plan included a number of appendices containing a copy of the discussion documents between the peer reviewer and Tonkin and Taylor (NPDC consultants). The appendices also included the correspondence confirming Council's conclusion that, in summary;

- the potential risks raised during the peer review could be mitigated by specific consent conditions around the on-going land use and maintenance, rather than them only appearing in the After Care plan; and
- Council would be able to require works to be undertaken to repair the cap should this become necessary; and
- this would ensure the mitigation measures would remain in place for the duration of the 30-50 year post closure care period.

Prior to the re-issuing of the consents, it is expected that these matters will be addressed in the AP.

The remedial work on the Stage 2 cap was completed during the year under review. Capping of Stage 3 also continued during the year under review in accordance with the phasing indicated in Figure 7. The area between phases 2 and 3 and the large silt pond was completed in the 2020-2021 year. Phase 1 was completed in the 2021-2022 year, with phase 2 completed during the year under review.

² As per the "enhanced minimum" cover design in the Technical Guidelines for the Disposal to Land (WasteMINZ, 2018)

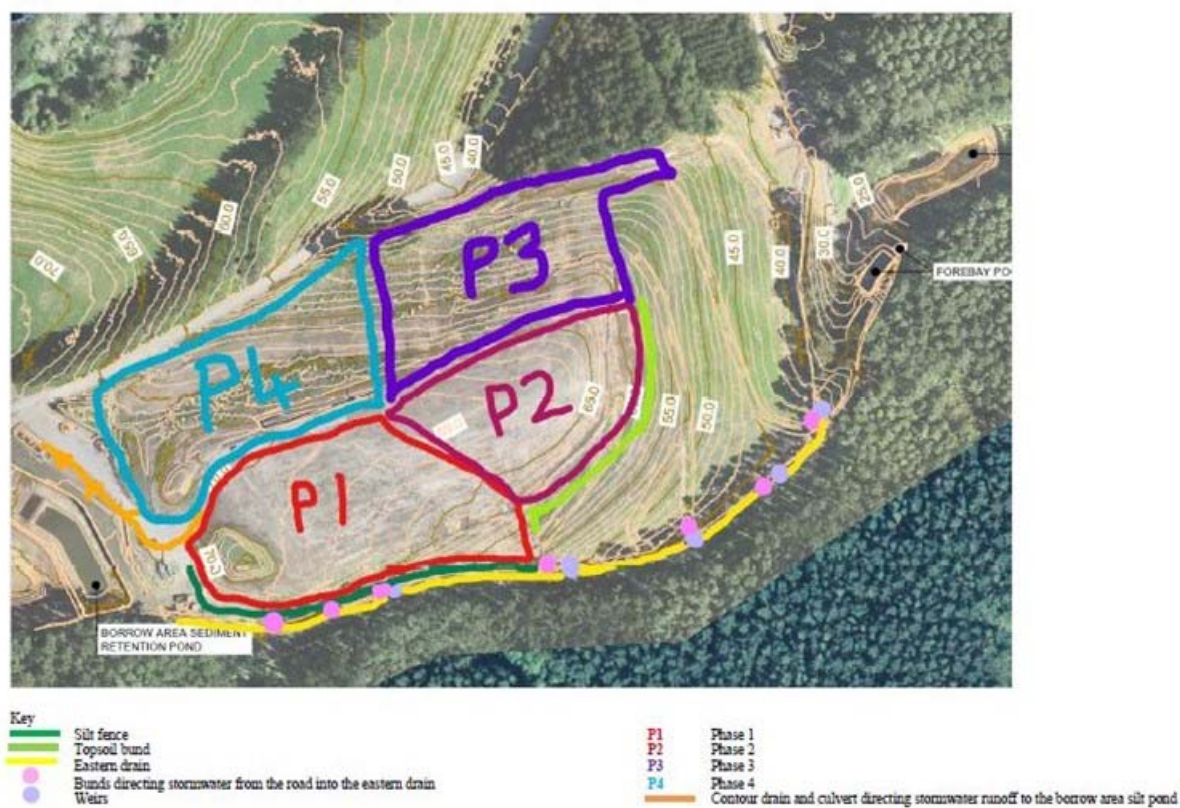


Figure 7 Plan of phases of work for Stage 3 final cap construction.

2.1.4 Aftercare plan

An initial draft AP was provided in October 2022. The contents of the plan were discussed with NPDC at a meeting on 26 October 2022. A revised and expanded AP was drafted in April 2023 that was provided to Council for review. It was indicated in the AP that there were a number of matters that would be updated following the consent re-issue and that there were aspects of the end use of the site that were still under discussion with the community. The fundamental requirements around ensuring the stability and integrity of the cap and how any remediation would be undertaken as the site settles were addressed in the AP. A few matters were raised with NPDC, including leachate management and noting that the projected end of the aftercare period for parts of Area A of 2025 and 2032 may not be appropriate.

2.1.5 Colson Road Landfill Liaison Committee

A liaison committee comprising representatives of NPDC, the Council, landfill contractor, and neighbours of the landfill was set up in 1999 as required by condition 32 of the land use consent for Colson Road landfill. The purpose of the committee is to facilitate the raising of concerns by the neighbours in relation to the landfill operations and to ensure that the landfill's neighbours are kept abreast of the development of the landfill site.

It is also a requirement of condition 11 of Consent 4779 that the consent holder, staff of the Council, submitters to the application and any other party (at the Council's discretion) meet at least once per year. The liaison committee meetings also fulfil this consent requirement.

During the period under review, the committee met on 16 November 2022 and 22 February and 14 June 2023. This periodicity of meetings was agreed by all parties, with the intent that two meetings be held during the construction season and one shortly following the activities ceasing at the site for the winter period. The meetings covered site development progress, operations at the landfill, and future activities. It is also an opportunity for submitters and neighbours to be kept informed of any issues arising at the site, and mitigation measures NPDC is putting in place. Attendees of the meeting agree that they are worthwhile and provide a useful forum for neighbours to provide feedback to NPDC.

The Colson Road landfill liaison committee has been very successful to date.

2.1.6 Independent consultant's reports

During the operational phase of the landfill's life, the inspections by the independent consultant were carried out three times per year. In the 2020-2021 year, the Consultant recommended a reduction in the frequency of visits going forward. It was recommended that, as it was proposed to close the landfill in October 2020, this frequency be reduced to once a year, with a requirement for the NPDC's Engineering Manager to report any major changes in refuse acceptance levels or earthworks which may trigger an additional visit. NPDC consulted with the Council prior to accepting this recommendation. It was confirmed that there are no specific requirements in the Council's consents in relation to the independent consultant's inspections, therefore the Council had no objection to this reduction in frequency.

A site inspection was undertaken by WAI Environmental (independent consultant) on 9 November 2022.

This was the Consultant's second visit to the site since its closure. There was still some remedial work to be carried out for the cover of Stage 2, and the cover to Stage 3 still has to be completed. It was reported that the site was generally clean and tidy.

The Consultant noted that progress on the capping work had been hampered by wet weather.

A number of bunds and benches had been constructed to control the movement of surface water over the landfill and this was to be commended. Collapsible drains that expand to accommodate the flow direct the rainwater to the stormwater cut-off drains. Although significant surface erosion was still apparent in the eastern drain, this was being repaired during the Consultant's visit.

It was reported that there was adequate dust control at the time of the visit.

2.2 Inspections

Twelve routine inspections were undertaken during the 2022-2023 monitoring period. Photos were taken on each inspection and these were shared with relevant NPDC staff and the landfill contractor following each inspection. The inspections were undertaken on 19 July, 5 August, 28 September, 10 October, 11 November, and 8 December 2022 and 12 January, 17 February, 27 March, 28 April, 18 May and 9 June 2023.

The pre-season site meeting with NPDC and the contractor took place on 28 September 2022. Activities at the site during the year under review related to the capping of Stage 3 and progressing the remedial work required on the Stage 2 cap. The material for the capping was obtained from the borrow area. Localised erosion and sediment controls were installed as required during the progression of the works.

At each inspection it was noted that there were no significant visible effects in the Puremu Stream downstream below the confluence of the eastern landfill tributary and the Puremu Stream, at the inlet to the SPCA culvert. There was slight localised turbidity noted immediately downstream of the confluence of the eastern tributary, within the mixing zone, at the time of the October and November inspections. At the time of the May inspection it was noted that the SPCA driveway culvert grate contained a small amount of debris. A small patch of scum formed due to this, but no sheens, foams or other visible effects were noted in the

receiving water at this time. The stream was at a moderate flow and was mostly clear. The inspecting officer cleared most of the debris at time of inspection.

The stormwater ponds were found to be well managed, with no unacceptable levels of retained silt found in any of the ponds at the time of the inspections. This discharge from the pond was also reported to be visually compliant with consent conditions at the time of each of the inspections.

The water contained in, and discharging from, the small western silt pond continued to be significantly improved following the October 2021 diversion of the groundwater/leachate infiltration into the stormwater pipework that drained into these ponds (Photo 10, Photo 11, Photo 12, Photo 13).

For the majority of the year under review the leachate pond was found to be empty, or at a low level, at the time of the inspections. At the time of the 5 August inspection it was noted that the leachate pond was very full but not overflowing. The inspecting officer was informed by NPDC that the pond had been full for around a week but had not reached overflow point. NPDC were continuing to monitoring this closely. On 20 August, NPDC notified the Council that leachate had overflowed to the stream. The follow-up actions, including the results of sampling undertaken by NPDC are reported in Section 2.6.



Photo 10 Western small silt pond, 13 September 2021



Photo 11 Western small silt pond, 27 March 2023



Photo 12 Eastern small silt pond and tributary, 13 September 2021



Photo 13 Eastern small silt pond and tributary, 27 March 2023

At the inspection on 16 July 2022 it was found that the majority of the site had been seeded following the previous construction season, with hay mulch applied and grass growth starting to establish. It was noted however that there were still some bare patches on the northern end of Stage 3. The inspecting officer was informed that stabilisation of this area was planned, but so far the weather had prevented this from being carried out. There was very good grass growth over the northern face. There was clear water in the northern bunds but no flowing water. There was a very small area of ponding on the bottom north eastern corner (Photo 14). The contractor advised that this area would be built up during the next construction season, when the cap was dry enough for machinery to access the area. This was found to have been done at the time of the October inspection.



Photo 14 Small area of ponding, 19 July 2022

Changes to the stormwater drainage and erosion and sediment controls were discussed at the time of the September inspection. It was noted that the current manhole, soft drain and bunds on the north eastern side were to be removed and a new contour drain would be put in place to better capture and direct stormwater from the north eastern side. A new soil bund was being constructed around to the north face as the silt fencing had been removed ready for the tie-in between the new capping and the existing capping. This work was found to have been completed at the time of the October inspection. The inspecting officer was informed that the capping would stop before reaching the western side and all bunds and other silt controls were to remain unchanged on that side of the site. It was noted that motorbikes had been ridden over the capped area, ripping it up in places. The inspecting officer was informed that new gates and/or locks were being installed at all points of entry to prevent this from occurring again.

At the time of the December inspection it was found that extra silt fences had been installed along the north-eastern side and an extra temporary bund was in place on the Stage 3 area to protect the erosion-prone area below with rain anticipated in the next couple of days. The drain along the north eastern side had been dug out a couple of weeks prior and all stockpiled material had been removed.

The inspecting officer noted that maintenance such as sediment removal and/or silt fence repair were needed at the time of the inspections in August, December, March, and April, with it noted that the silt controls along the north-eastern boundary were due to be cleaned out on the day of the June inspection.

At the end of the construction period, in terms of progressing site stabilisation for the winter period, it was found that capping works were completed by the time of the inspection on 28 April with drill seeding taking place at the time of this inspection and hay blowing scheduled for the following day. Hydroseeding and grass matting had been installed between Stage 2 and the borrow area. A polymer was scheduled to be applied to the borrow area over winter. At the time of the inspection on 18 May it was found that the summer work season had been completed and there was a no activity occurring, although there were

contractor staff on site in the workshop area. Drill seeding had been completed on Stage 2 and hay had been blown across the area, with grass starting to peak through on the top of the fill area. Grass was also establishing well on the sides and bund below this area.

Capping activities had also been finished for the season on Stage 3 with drill seeding and hay blowing undertaken across the top area.

NPDC contacted Council regarding the removal of some trees that had been identified as posing a risk to the leachate pumping station, flare, and odour spray system due to their age and condition. The area was viewed by the inspecting officer at the inspection on 8 December 2022. The tree removal commenced in June 2023.

NPDC continued to keep the Council informed regarding the planned tree removal alongside a dish drain in the Puremu Stream below the site, on Stage 1B and on the eastern side of the main access road. Plans were developed and provided to Council to limit the potential for damage to the dish drain and to minimise the discharge of sediment from the site as a result of these activities. At the time of the June inspection it was noted that tree felling was being undertaken on the left hand side by the entrance. The majority of the trees had already been cleared from this area and the operation would move to the section around the concrete apron and small ponds next. It was confirmed that the activity was being well managed and that the concrete dish drain carrying the Puremu Stream was not damaged.

The action items identified at inspection during the year under review were:

19 July 2022

- Please continue to work towards complying with Abatement Notice EAC-22506.
- Please ensure the remaining exposed areas on the top of Stage 3 are stabilised as per condition 14 of Consent 6177-2.0. 'Except as provided for in condition 15 no earthworks shall occur, and all exposed areas shall be stabilised between 1 May and 1 October.'
- Please ensure that site is managed as per the ESCP required by condition 2 of Consent 6177-2.0.
- Please update ESCP to ensure that corrective actions are identified for the contingency matters that may arise (including in wet weather conditions) as per condition 2 of Consent 6177-2.0.

5 August 2022

- Please continue to work towards complying with Abatement Notice EAC-22506.
- Please ensure the remaining exposed areas on the top of Stage 3 are stabilised as per condition 14 of Consent 6177-2.0. 'Except as provided for in condition 15 no earthworks shall occur, and all exposed areas shall be stabilised between 1 May and 1 October.'
- Please ensure that site is managed as per the ESCP required by condition 2.

28 September 2022

- Please continue to work towards complying with Abatement Notice EAC-22506.
- Please ensure that site is managed as per the ESCP required by condition 2.
- Please confirm that any contaminated soil from the old compost area will be utilised beneath the cap.

10 October 2022

- Please continue to work towards complying with Abatement Notice EAC-22506.
- Please maintain silt fences as required.

11 November 2022

- Please continue to work towards comply with Abatement Notice EAC-22506.

8 December 2022

- Please continue to work towards comply with Abatement Notice EAC-22506.
- Please ensure silt fences are erected and maintained as designed. – This related to one silt fence where there the silt/ground level did not provide the 400 mm geotextile cloth above the ground.

12 January 2023

- Please continue to work towards comply with Abatement Notice EAC-22506.

17 February 2023

- Please continue to work towards comply with Abatement Notice EAC-22506.

27 March 2023

- Please continue to work towards comply with Abatement Notice EAC-22506.
- Please ensure silt fences are maintained.

28 April 2023

- Please ensure silt fences are maintained.

18 May 2023

- Please ensure silt fences are maintained through winter.

9 June 2023

- Please ensure silt fences are maintained through winter.

2.3 Water

2.3.1 NPDC monitoring results

2.3.1.1 Leachate

Historically (between the 2010 and 2021 years) NPDC collected between four and 12 samples of leachate per monitoring year. These samples were collected from the combined leachate discharge from all three stages landfill, with analyses being carried out for a range of indicator parameters. The leachate is pumped to, and treated at the New Plymouth wastewater treatment plant.

In the 2020-2021 year it was identified that it was likely that the under liner groundwater drain was being impacted by minor amounts of leachate. This drain discharges to the tributary of the Puremu Stream via the large silt pond. Whilst discharges of minor amounts of leachate are permitted along with the stormwater discharge covered by Consent 4619-1, contamination of the groundwater under the landfill requires that NPDC remedy, mitigate and if practicable prevent the continuation of any effects (condition 5 of Consent 4621-1). An abatement notice was issued and NPDC provided timetable for the programme of works that are to be undertaken to resolve the non-compliance. As a result of a separate leachate overflow incident during the 2020-2021 year it was also identified by NPDC that the cause of the overflow was cumulative high rainfall at the site and high groundwater levels affecting the older parts of the landfill. The Stage 1 of the landfill has leachate drains, but is not lined. Stage 2 areas of the Landfill (Area A) has a clay liner rather than a geomembrane liner. The leachate discharge flow rates from this area can therefore be impacted by rising groundwater levels entering the leachate drainage network. This means that, conversely, during lower groundwater levels, minor amounts of leachate are likely to be discharging to groundwater through the leachate drainage network.

As a result of these findings the NPDC leachate monitoring was amended. In addition, the Council requested that the results of earlier leachate monitoring be provided to Council as had been done previously for NPDC's monitoring data for the under liner groundwater drainage. At the time of writing this report, the data had not been received.

Going forward, samples would continue to be collected from the combined leachate discharge to be analysed for the usual indicator parameters. NPDC undertook this sampling on nine occasions during the 2022-2023 year. The results of this monitoring are given in Table 4, with any notable trends discussed.

In addition to the on-going monitoring of the indicator parameters, in the 2021-2022 year, two samples were collected from each of the Stage 1 & 2 leachate and the Stage 3 leachate that were analysed for a comprehensive range of parameters in order to characterise the quality of the leachate from the two leachate network. The intent of this monitoring was to allow assessment of the potential effects from the two separate areas and to assess the potential for seasonal variation in the leachate quality given that:

- Stages 1 & 2 and Stage 3 are in distinctly different phases of waste degradation; and
- there are different likely preferential pathways for the discharge of leachate from the two areas.

In the case of Stages 1 & 2, the pathways are discharge to groundwater through the permeable leachate network and direct discharge to the Puremu Stream during high rainfall and high groundwater levels. One such event occurred during the year under review from 20 to 30 August 2022. This is discussed further in Section 2.6.

In the case of Stage 3, the discharge pathways are discharges to surface water and groundwater, including the under liner drainage network that is directed to the large silt pond, due to:

- leachate escaping from the areas of the liner that were likely to have been damaged in the slip of the 50,000 m³ of compacted waste in 2005
- increased seepage through the undamaged areas of the liner as a result of the increased depth of leachate that occurs when the Stage 3 leachate valve is closed to mitigate the potential of effects of leachate overflows³; and
- increased potential for leachate breakouts under the same conditions.

Further details relating to the investigations and progress on the programme of works to be undertaken in relation to the early consent replacement and compliance with the abatement notice are also discussed in Section 2.6.

This monitoring will be repeated in the 2023-2024 year. The data from the 2021-2022 year analyses is presented in Appendix III for comparison purposes.

Table 4 Chemical analysis of Colson Road landfill combined site leachate discharge

Parameter	Unit	Date								
		22-Jul-22	28-Jul-22	04-Aug-22	27-Oct-22	01-Dec-22	11-Jan-23	08-Feb-23	11-May-23	25-May-23
pH	pH	7.2	6.6	6.9	7.0	6.9	7.3	7.0	7.0	7.0
CBOD	g/m ³	12	3	17	16	13	45	16	9	6
Suspended solids	g/m ³	44	41	68	42	32	45	56	78	38

³ Noting that slow seepage occurs through geotextile liners and therefore the best practice is to ensure that the leachate head on the liner does not exceed 300mm

Parameter	Unit	Date								
		22-Jul-22	28-Jul-22	04-Aug-22	27-Oct-22	01-Dec-22	11-Jan-23	08-Feb-23	11-May-23	25-May-23
Conductivity	mS/m	258.2	109.6	306.9	316	266	531	307	218	-
Alkalinity	g/m ³	924	430	1249	1370	1085	1762	1268	919	878
Ammoniacal N	g/m ³	176	49	202	244	178	374	202	147	140
Cadmium	g/m ³	<0.005	-	-	-	-	-	-	-	-
Chromium	g/m ³	0.02	<0.005	0.02	0.02	0.02	0.07	0.03	0.02	0.01
Chloride	g/m ³									
Copper	g/m ³	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	g/m ³	18.1	30	23	17	16.6	20.3	21	33	15.8
Lead	g/m ³	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Manganese	g/m ³	3.22	2.48	3.14	3.16	3.38	3.10	2.86	3.49	3.8
Nickel	g/m ³	0.007	<0.005	0.009	0.010	0.008	0.025	0.009	0.007	0.009
Zinc	g/m ³	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

The results gathered by NPDC during the year under review reflect typical leachate quality. It appears that there may be a trend of decreasing leachate strength in recent years (Figure 8). However, it is noted that the concentration variations within each parameter are also likely to reflect seasonal variations in leachate quality and the dilution afforded by the contaminated stormwater that is diverted through this system.

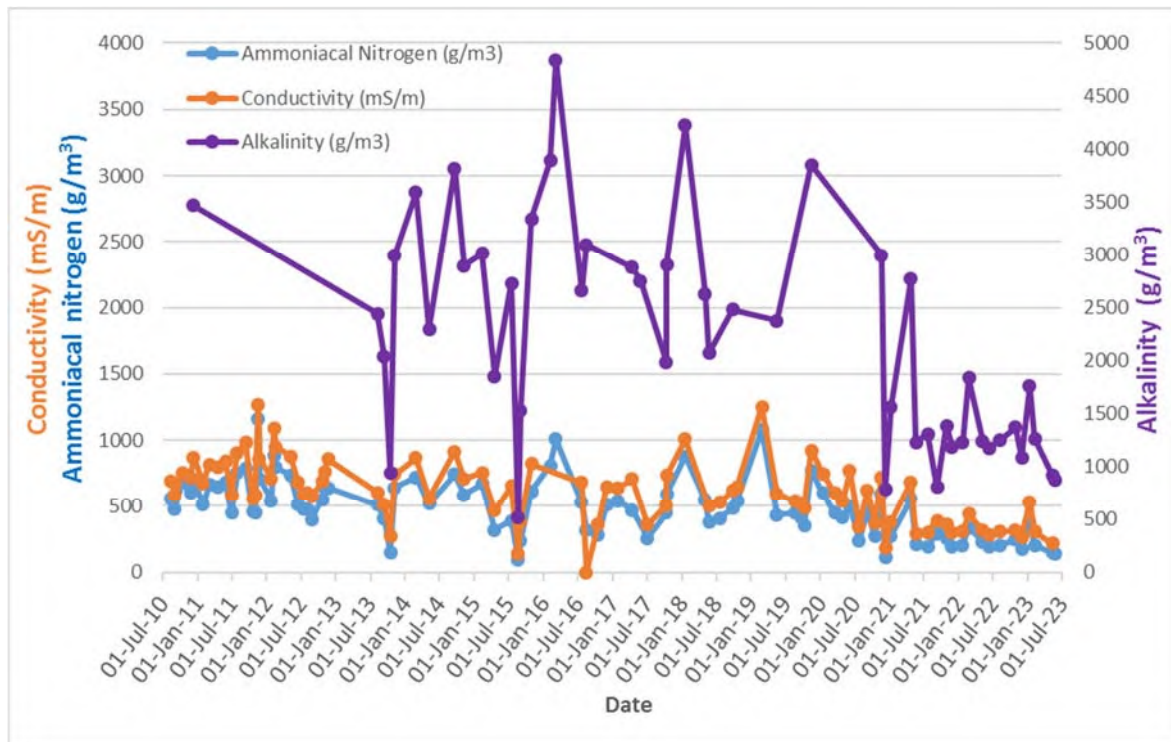


Figure 8 Combined site leachate discharge alkalinity, conductivity and ammoniacal nitrogen, July 2010 to date

The wide variation in contaminant concentrations will also be as a result of differing volumes of leachate from Stages 1 & 2 and from Stage 3 in the combined discharge samples. The lowest strength leachate was the sample collected on 28 July 2022. At this time the leachate indicator species of alkalinity and ammoniacal nitrogen were lower than was found in the separate Stage 1 & 2 leachate samples collected in the 2021-2022 year and slightly higher than was found in the leachate overflow samples (29 to 40 g/m³; Table 20, Table 21, and Table 22). The highest strength leachate was found in the sample collected on 11 January 2023. At this time the concentration of these indicator species were higher than in the Stage 1 & 2 leachate but lower than the Stage 3 leachate as would be expected at time of little stormwater dilution.

2.3.1.2 Under liner groundwater drainage

NPDC collects samples of the groundwater that drains from a network of pipes under the liner. The quality of this water is a useful indicator of whether leachate is passing through the liner. The water collected by this system is currently discharged to the unnamed tributary of the Puremu Stream via the large silt pond. Assessing the quality of this discharge is especially important in view of the slip that occurred in 2005, which ripped the liner in several places on the western side of Stage 3. The rips that were visible above the height of the settled waste were repaired, but it was not known if the liner had ripped underneath the slipped refuse. As outlined in Section 1.2.1, early monitoring of the water quality in the under liner groundwater indicated that there was no contamination occurring as a result of this incident, however more recent results indicate that this is no longer the case.

Rips in the liner at the edge of the landfill footprint were found at inspection in June 2017. The rips were small, but in an open drainage channel that (at that time) was capturing leachate breakouts from the south eastern area of the landfill. These were appropriately repaired early in July 2017.

Monitoring of the groundwater in the under liner drain has been undertaken on at least a quarterly basis as specified in the Colson Road Landfill Management Plan. In July 2020, a report prepared for NPDC confirmed that there were some parameters for which 2018-2019 sample results were exceeding the calculated natural variation in the under liner drain. Condition 5 of Consent 4621-1 requires that in this event, NPDC should implement such measures as to remedy, mitigate and if practicable prevent the continuation of this effect on the groundwater. This was logged as an incident on Council's unauthorised incidents register and is discussed further in Section 2.6.

The monitoring undertaken by NPDC was expanded during the 2021-2022 year as a result of this incident. During the year under review, NPDC continued to collect four samples per year that were analysed for the usual parameters. In addition to this, samples were collected under high and low groundwater conditions and these were analysed for a comprehensive range of parameters. The results for the standard range of parameters are given in Table 5, followed by a discussion on trends observed for these indicator parameters.

The results for the additional parameters determined to better quantify potential contaminants of concern that may be discharging to the environment, and any seasonal variation in concentrations, for the samples collected on 27 October 2021 (high groundwater level) and 15 June 2022 (lower groundwater level). The additional parameters will be determined again in the 2023-2024 year. The results obtained in the 2021-2022 monitoring year are given in Appendix III for comparison purposes.

Table 5 Results of analysis of under liner drainage for the year under review.

Parameter	Unit	Date			
		04-Aug-22	28-Oct-22	08-Feb-23	26-May-23
pH	pH	6.4	6.4	6.7	6.4
CBOD	gO ₂ /m ³	<3	5	<3	<3

Parameter	Unit	Date			
		04-Aug-22	28-Oct-22	08-Feb-23	26-May-23
Suspended solids	g/m ³	10	13	65	6
Faecal coliforms	/100 ml	16	<1	50	-
Conductivity	mS/m	48.4	62.0	47.0	39.5
Alkalinity	g/m ³	113	135	132	101
Ammoniacal nitrogen	g/m ³ -N	2.00	3.00	3.10	2.80
Dissolved cadmium	g/m ³	<0.005	<0.005	<0.005	<0.005
Dissolved chromium	g/m ³	<0.005	<0.005	<0.005	<0.005
Chloride	g/m ³	68.0	73.0	61.0	52.0
Dissolved copper	g/m ³	<0.005	<0.005	<0.005	<0.005
Dissolved iron	g/m ³	5.88	5.19	3.92	4.14
Dissolved lead	g/m ³	<0.05	<0.05	<0.05	-
Dissolved manganese	g/m ³	3.07	2.89	1.90	1.63
Dissolved nickel	g/m ³	<0.005	<0.005	<0.005	<0.005
Dissolved zinc	g/m ³	<0.05	<0.05	<0.05	<0.05

Earlier Annual Reports typically reviewed each year's data in isolation. When viewed in this way it was considered that the results had shown that little, if any, contamination had been occurring in the groundwater immediately below the liner.

The initial review of time series data carried out by the Council from the 2017-2018 to the 2019-2020 Annual Reports compared the data collected from 1 June 2010 onwards only.

On the basis of these reviews, in the Annual Reports covering this period of time it was concluded that, although the level of key indicator species such as zinc and chloride appeared to have been relatively stable over the last several years (as per the example of the chloride results presented in Figure 9), there may have been an emerging trend of very slight increasing contaminants. In particular, the results for the 2017-2020 years indicated that some contaminant concentrations such as ammoniacal nitrogen had increased more noticeably.

Following the provision of the consultant's report in July 2020, the Council requested that the results of all of NPDC's under liner groundwater monitoring samples be provided to Council. These results were provided and the data to 30 June 2023 for selected parameters is illustrated in Figure 11 to Figure 14. It is noted that NPDC's monitoring of the under liner drainage commenced in the month following the July 2005 refuse slip, with no earlier or background data available.

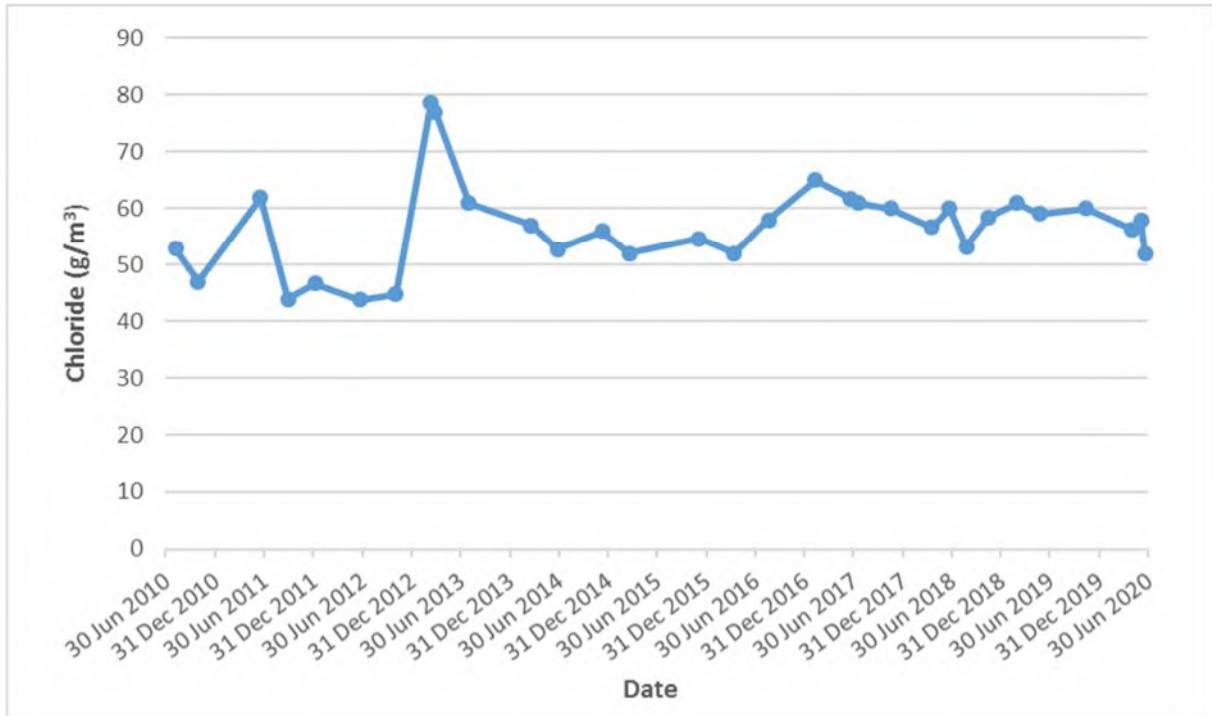


Figure 9 Chloride concentration in the under liner drainage, June 2010 to June 2020

A review of the expanded time series data indicates that the trend of increasing levels of parameters may have started soon after the July 2005 slip.

The chloride results (as shown in Figure 10) indicate that although there was a trend of increasing chloride concentration in the 2005 to 2017 years, this may have stabilised somewhat in more recent years.

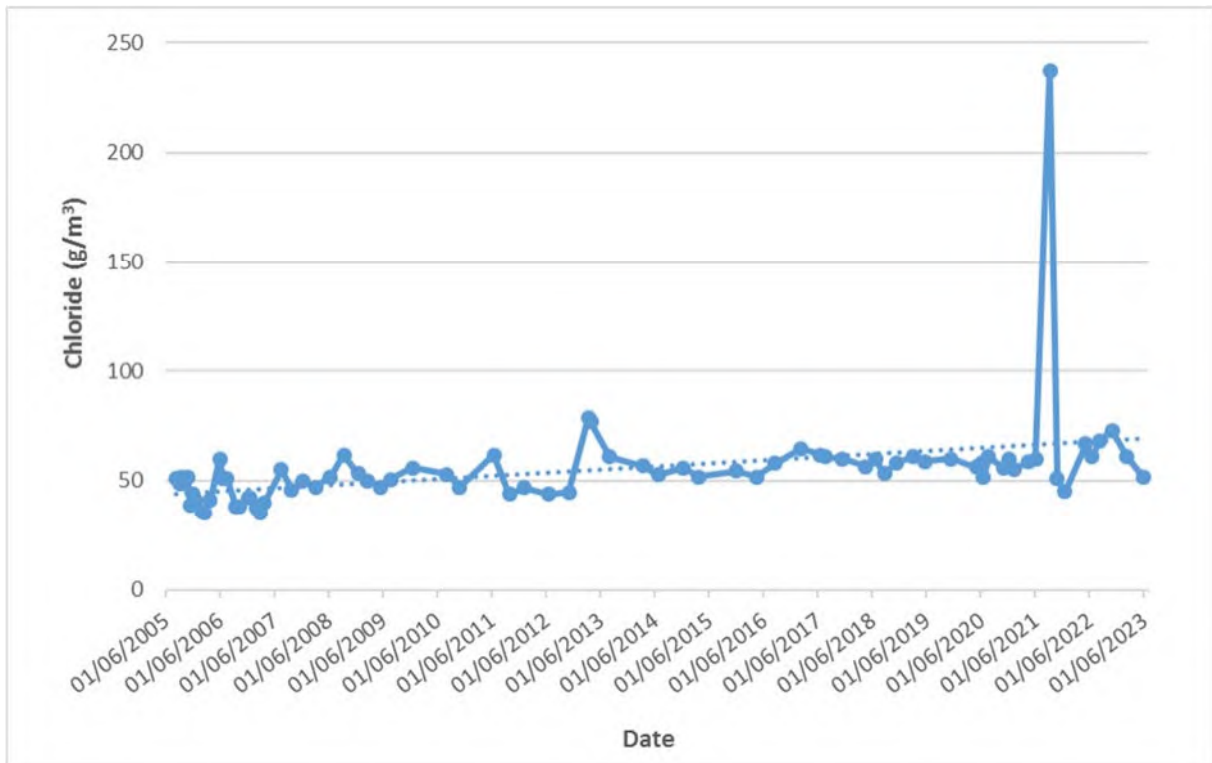


Figure 10 Full time series data for the chloride concentration of the under liner drainage

The trend of increasing conductivity continued during the year under review (Figure 11).

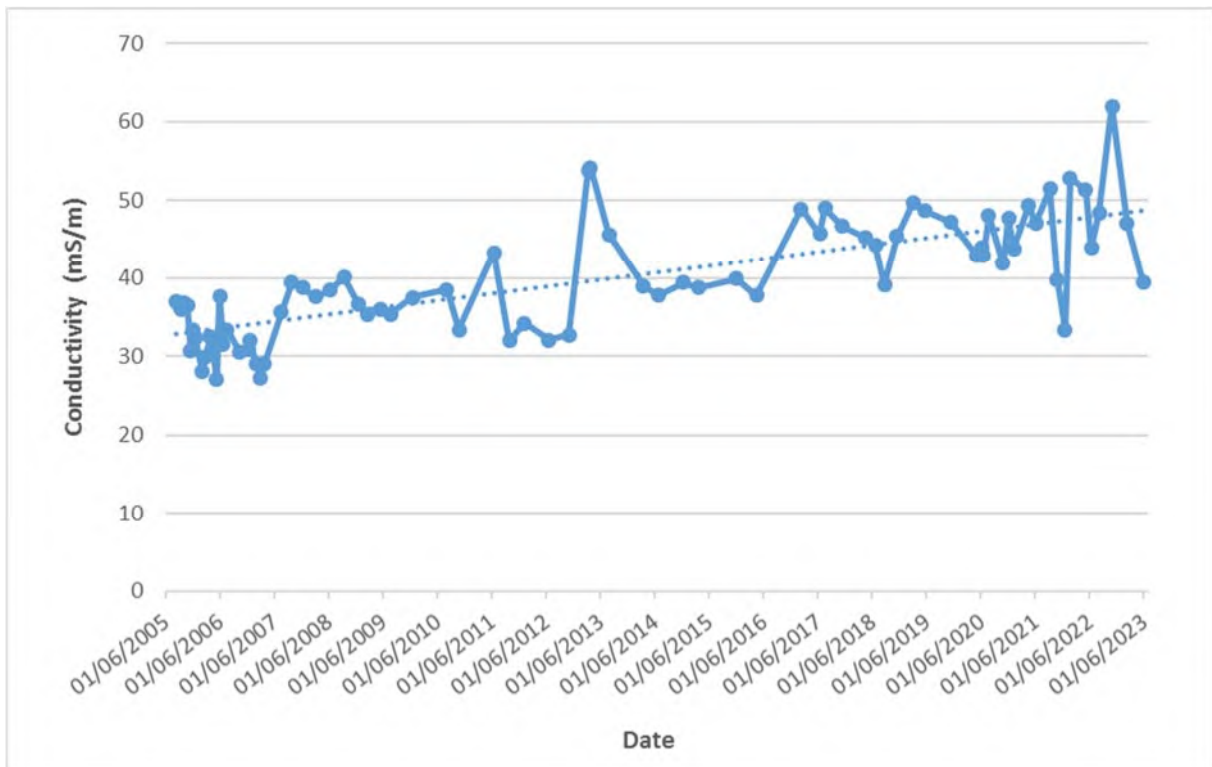


Figure 11 Full time series data for the conductivity of the under liner drainage

The ammoniacal nitrogen concentration of the under liner groundwater drainage was generally somewhat lower than it had been in the samples collected between February 2019 and September 2021 (Figure 12).

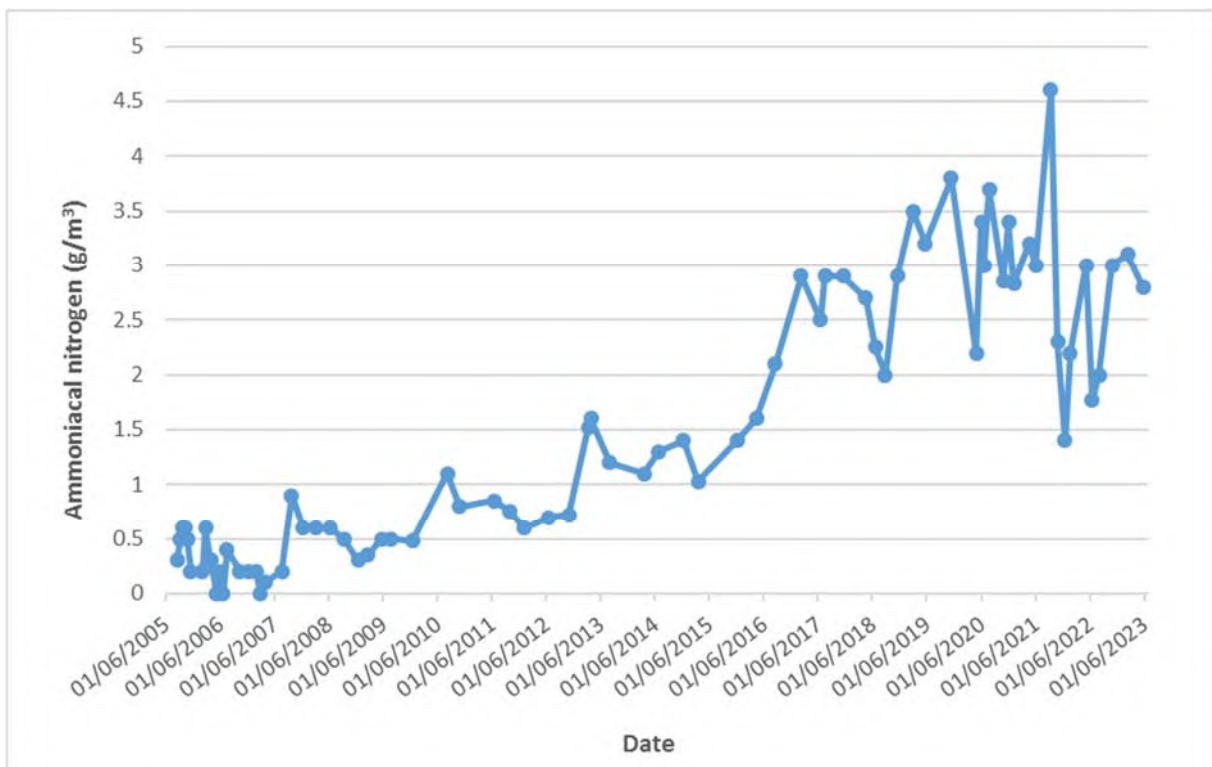


Figure 12 Full time series data for the ammoniacal nitrogen concentration of the under liner drainage

The alkalinity of the under liner groundwater drainage may have stabilised in recent years following the trend of increasing alkalinity that was apparent in the 2005 to 2021 years (Figure 13).

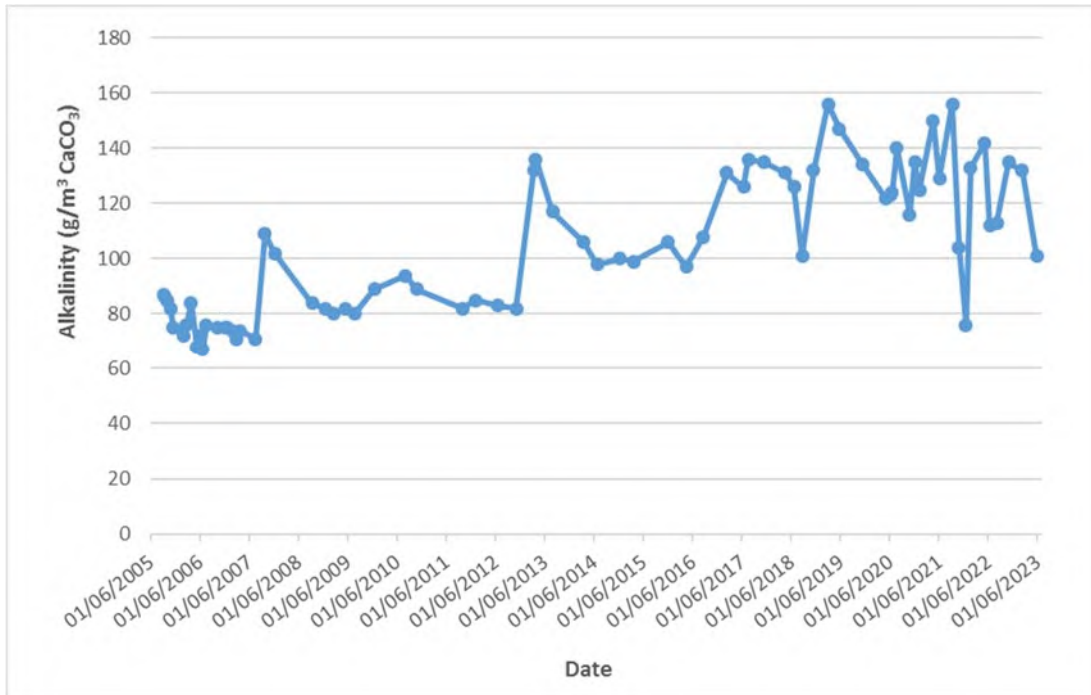


Figure 13 Full time series data for the alkalinity of the under liner drainage

When looking the potential continuation in the trend for manganese concentration that may have occurred in more recent years, the change from determining the total manganese concentration to determining the dissolved manganese concentration has made this more difficult to evaluate. It is clear, however, that there have again been significant (potentially) seasonal variations.

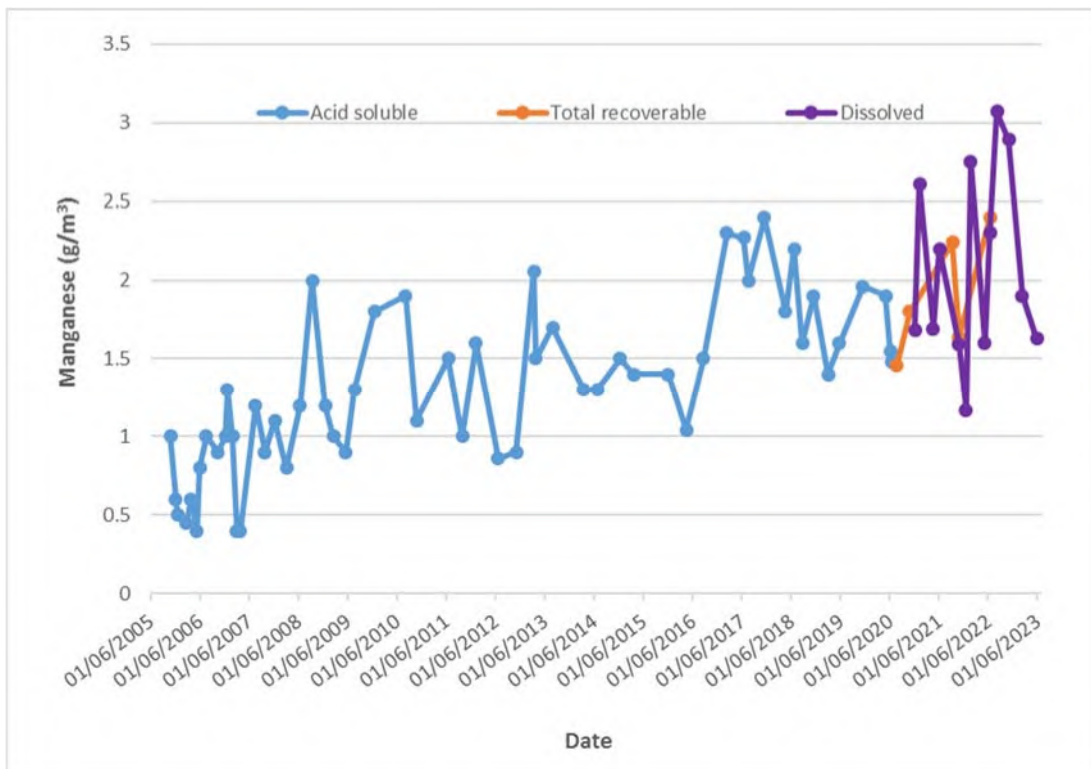


Figure 14 Full time series data for the manganese concentration of the under liner drainage

Although these indicator constituents show potential contamination of the groundwater and/or springs under the landfill, the levels are not currently of immediate environmental concern and would, for the most part, be considered minor. The concentration found in the sample collected on 4 August 2022 is a new maximum for this monitoring site at 3.07 g/m³. The concentration range found during the year under review was similar to that found in the Stage 3 leachate in the 2021-2022 year (Appendix III). The concentrations in the under liner groundwater drainage are comparatively higher than any of the monitoring bores surrounding the landfill, with the possible exception of GND0575 (Section 2.4).

At this stage it is difficult to assess whether the changes in the contaminant concentrations in the under liner drainage are as a result of changes in the leachate strength, or an increasing amount of leachate getting through the liner. It is possible that the practice of using Stage 3 as storage at times when the amount of leachate and contaminated stormwater being generated is greater than the system carrying this discharge to the wastewater treatment plant may impact on the amount of leachate escaping into the under liner groundwater drainage system. This may be as a result of the water level of the leachate rising above any potential damage to the liner, or as a result of the increased head of water. It is noted that the maximum recommended leachate head given in Table 5-6 of the Technical Guidelines for Disposal to Land (WasteMINZ, 2022) is 300 mm. NPDC are currently unable to monitor the height of the leachate level contained by the Stage 3 liner.

2.3.2 Results of wet weather stormwater and receiving environment monitoring

A survey was conducted following a rainfall event and the results are given in the tables below. Table 6 shows the results for discharges and receiving water into which the discharges from within the landfill catchment flow (Puremu Stream). Table 7 shows the results for the Manganaha Stream, which lies adjacent to the landfill site and has no surface water discharges from the landfill directed to it.

The Puremu Stream system receives discharges from two stormwater ponds on the site. STW001006 discharges stormwater and minor amounts of leachate from Stages 1 and 2, and STW002054 discharges stormwater from Stage 3, some of the eastern forest of the site and the composting pad. STW001006 also receives leachate in the event that the leachate pumping system is overloaded, or fails. It is noted that Consent 2370 provides only for minor amounts of leachate to be present in this discharge.

The results show that during this wet weather period, the site was complying with consent conditions in regards to the water quality parameters in both the Puremu and Manganaha Streams, with the exception of faecal coliforms at site PMU000113. It is noted however that the faecal coliform count was elevated upstream of the landfill site at both PMU000100 and PMU000106.

Table 6 Results of rain event monitoring – discharge and Puremu Stream samples, 1 June 2023

Site	Alkalinity g/m ³ CaCO ₃	Chloride g/m ³	Condy mS/m @25°C	Faecal Coliforms cfu/100 ml	Unionised ammonia g/m ³ -N	Ammoniacal nitrogen g/m ³ -N	pH	Suspended solids g/m ³	Temp. Deg.C	Turbidity NTU
IND003009*	-		-	-	-	-	-	-	-	-
STW001006	47	42	26.2	< 10	0.000185	0.23	6.5	< 3	15.0	3.9
STW002054	93	54	38	440	0.0042	1.04	7.2	15	15.3	31
PMU000100	25	21	13.6	200	0.000056	0.032	6.8	< 3	14.6	1.4
PMU000106	24	19.5	14.1	200	0.00017	0.036	7.2	< 3	14.8	3.5
PMU000109	82	52	34.3	4100	0.0024	0.67	7.1	8	14.7	12.4
PMU000110	37	27	18.6	300	0.006	0.81	7.4	< 3	14.7	4.4
PMU000113	42	29	20.5	1100	0.0035	0.77	7.2	< 3	15.1	3.7

Site	Alkalinity g/m ³ CaCO ₃	Chloride g/m ³	Condy mS/m @25°C	Faecal Coliforms cfu/100 ml	Unionised ammonia g/m ³ -N	Ammoniacal nitrogen g/m ³ -N	pH	Suspended solids g/m ³	Temp. Deg.C	Turbidity NTU
Limits PMU000110	NA		NA	NA	NA	2.5	[within ±0.5]		≤ 17.2 [+2]	NA (visual)
Limits PMU000113	NA		NA	≤ 1000	NA	2.0 at pH < 7.75	≥ 6.5 & ≤ 8.5	13 [+10]		NA (visual)

Key: [] indicates this is a maximum permitted change from the upstream value at PMU000100
+ no discharge occurring

As stated earlier, the Manganaha Stream receives no direct discharges from the landfill catchment, but it is a useful indicator for any groundwater contamination.

Additionally, the consents state that the water quality in the Manganaha Stream shall not be changed as a result of discharges from the landfilling activities.

The results show that water quality in the stream is quite high and there is negligible difference in water quality when comparing the results from the two Manganaha Stream sites. These results are comparable to those obtained in previous monitoring periods.

Table 7 Results of rain event monitoring - Manganaha Stream, 1 June 2023

Parameter	Unit	Site	
		MNH000190	MNH000250
Ammoniacal nitrogen	g/m ³ -N	0.016	0.018
Conductivity	mS/m@25 °C	14.1	14.3
pH	-	7.3	7.4
Suspended solids	g/m ³	6	7
Temperature	Deg C	14.7	14.7
Turbidity	NTU	3.1	4.5
Unionised ammonia	g/m ³	0.00008	0.00011

2.3.3 Results of dry weather stormwater and receiving environment monitoring

The Colson Road landfill site has two streams associated with it.

The Manganaha Stream follows alongside the eastern boundary of the site and is approximately 200 m away from the landfill (at its closest point). As required by the landfill's water discharge permits, there are no direct discharges into the Manganaha Stream from the landfill. Dry weather samples were collected from two monitoring sites in the Manganaha Stream on two occasions during the year under review. The results of the Manganaha Stream monitoring are presented in Section 2.3.3.1.

The Puremu Stream has been culverted to run under the north-western quadrant of the landfill site. It emerges from the culvert near the driveway to the landfill entrance, and then flows approximately 300 m to a second culvert that takes it under two other properties. Just upstream of the second culvert, the unnamed tributary that carries the discharge from the large settling pond (STW002054), flows into the main stream stem. The smaller silt pond (STW001006) discharges directly into the main stream stem just upstream of the confluence. Dry weather samples were collected from the stormwater pond discharges, the Puremu Stream

and the Puremu Stream tributary upstream and/or downstream of the discharges on two occasions during the year under review at the locations shown in Figure 15.

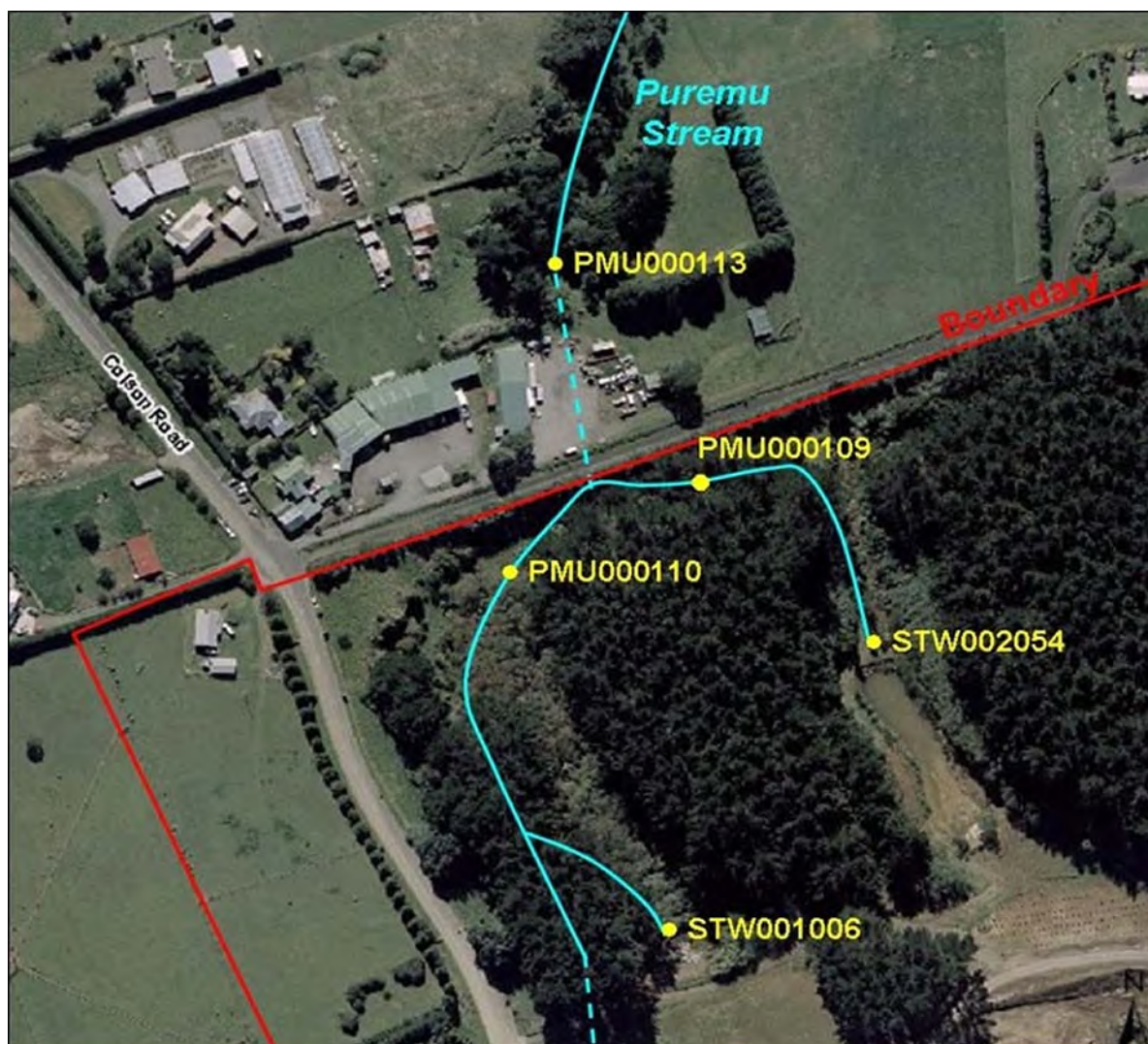


Figure 15 Sampling sites on the Puremu Stream downstream of the landfill

During the lifetime of the landfill, the catchment areas within the landfill footprint that drained through each of the stormwater ponds has changed as the active filling areas, and those areas with intermediate and/or final cover changed. The compost pond discharge and the Stage 3 under liner groundwater drainage discharge via the large silt pond. In the 2020-2021 year, NPDC commenced an investigation into the elevated levels of contaminants found in the discharge from the small eastern silt pond. During this investigation it was identified that groundwater seepages from underneath Stage 1B had been discharging into the small eastern silt pond via infiltration into subsurface piped drains. The Council was advised that drainage works would be undertaken to divert clean stormwater away from these drains and to divert the groundwater seepages from underneath Stage 1B area to the leachate system. This work was completed in October 2021.

As outlined in Section 1.4.1, the sampling associated with the NPDC Colson Road landfill monitoring programme for the year under review had two primary objectives:

- Compliance monitoring of discharges and effects in relation to current consent conditions; and
- Investigation of the emerging contamination issue and information gathering for the re-consenting AEE.

The results of the site discharges and Puremu Stream monitoring associated with compliance monitoring of the current consents are presented in Section 2.3.3.2. The additional monitoring related to the investigation of the emerging contamination issue in the Puremu Stream catchment and information gathering for the re-consenting AEE is presented in Section 2.3.3.3.

2.3.3.1 Manganaha Stream

On both sampling occasions the Manganaha Stream showed no adverse effects from the landfilling operation.

For the most part the upstream and downstream results showed little, if any, difference in water quality. There were small changes in the acid soluble iron and ammoniacal nitrogen concentrations, which are expected in a stream that has groundwater infiltration and runs through an agricultural area. All results were comparable to background levels, and were similar to those found over the last ten years.

Table 8 Chemical analysis of the Manganaha Stream

Parameter	Units	23-Jan-2023		18-Apr-2023	
		MNH000190 u/s of landfill	MNH000250 d/s of landfill	MNH000190 u/s of landfill	MNH000250 d/s of landfill
Alkalinity	g/m ³ – CaCO ₃	30	31	30	31
Conductivity	mS/m@25°C	15.5	15.9	15.1	15.3
Acid soluble iron	g/m ³	0.80	1.04	0.62	0.79
Ammonia (unionised)	g/m ³	0.00016	0.00021	0.00007	0.00014
Ammoniacal nitrogen	g/m ³ -N	0.021	0.024	0.013	0.030
pH	pH	7.3	7.4	7.3	7.2
Suspended solids	g/m ³	< 3	< 3	< 3	5
Temperature	Deg C	18.3	18.3	15.2	15.2
Turbidity	NTU	1.68	3.10	1.77	2.1
Dissolved zinc	g/m ³	<0.001	0.0011	<0.001	0.0040

There are no specific consent conditions in regards to the Manganaha Stream water quality other than the requirements that the authorised discharges to land and to the Puremu Stream from the landfill shall not affect water quality in the Manganaha Stream.

Based on these results, and those from previous monitoring periods, the landfill's presence is having no measurable effect on water quality in the Manganaha Stream.

2.3.3.2 Dry weather Puremu Stream and discharge sampling – compliance monitoring

There are no consent limits on the discharges from the stormwater ponds, rather the effects of the activity are controlled by contaminant concentration limits on the receiving waters. However, the results of the stormwater monitoring aid in the interpretation of the receiving water results, and give a better understanding of the potential for environmental effects, as both of the stormwater discharges are permitted to contain minor amounts of leachate.

In stream limits are given for a range of parameters for Stage 2 (2370-3), which has the compliance point at PMU000110, and for Stage 3 (4619-1), where the compliance point is at PMU000113. For certain constituents, the limit placed on the consent is in the form of a maximum change from the upstream value,

which is determined at site PMU000100. These requirements are indicated within the square brackets in the following tables.

The Puremu Stream was sampled on two occasions in dry weather under low to moderate flow conditions. The results of the routine compliance monitoring parameters from these surveys are presented in Table 9 and Table 10.

The samples collected at the time of both surveys returned results that were below the contaminant concentrations specified on the consents, with the exception of faecal coliforms at the time of the survey on 23 January 2023. At the time of this survey, the faecal coliforms were already above the permitted level at the intermediate upstream site PMU000106. It is also noted that the count obtained for both of the landfill stormwater discharges were below the detection limit. In the 2019-2020 year it was found that the wildlife population in the wetland area below the landfill can affected faecal coliform counts. Therefore NPDC has continued to monitor this contaminant, so that appropriate actions can be undertaken as and when required.

Contaminants of note in the pond discharges are acid soluble iron, alkalinity, ammoniacal nitrogen, and manganese. Historically, in the case of acid soluble iron, alkalinity and ammoniacal nitrogen, these had tended to be higher in the discharge from the eastern small silt pond, whereas manganese tends to be higher in the discharges from the large silt pond.

An investigation was undertaken by NPDC following a non-compliance with the ammoniacal nitrogen concentration in the 2020-2021 year. This investigation identified that it was likely that leachate and/or contaminated groundwater from under Stage 1B was discharging to the STW001006 pond, via underground stormwater pipes. In October 2021, the clean stormwater was diverted away from the underground pipes, and the leachate/contaminated stormwater was diverted away from the stormwater pond to the leachate system. Figure 16 shows the significant reduction in the ammoniacal nitrogen concentration of the stormwater pond discharge samples collected following these diversions. The start date of June 2014 has been chosen for use in the following graphs due to the increased number of stormwater results for comparison with the receiving environment monitoring.

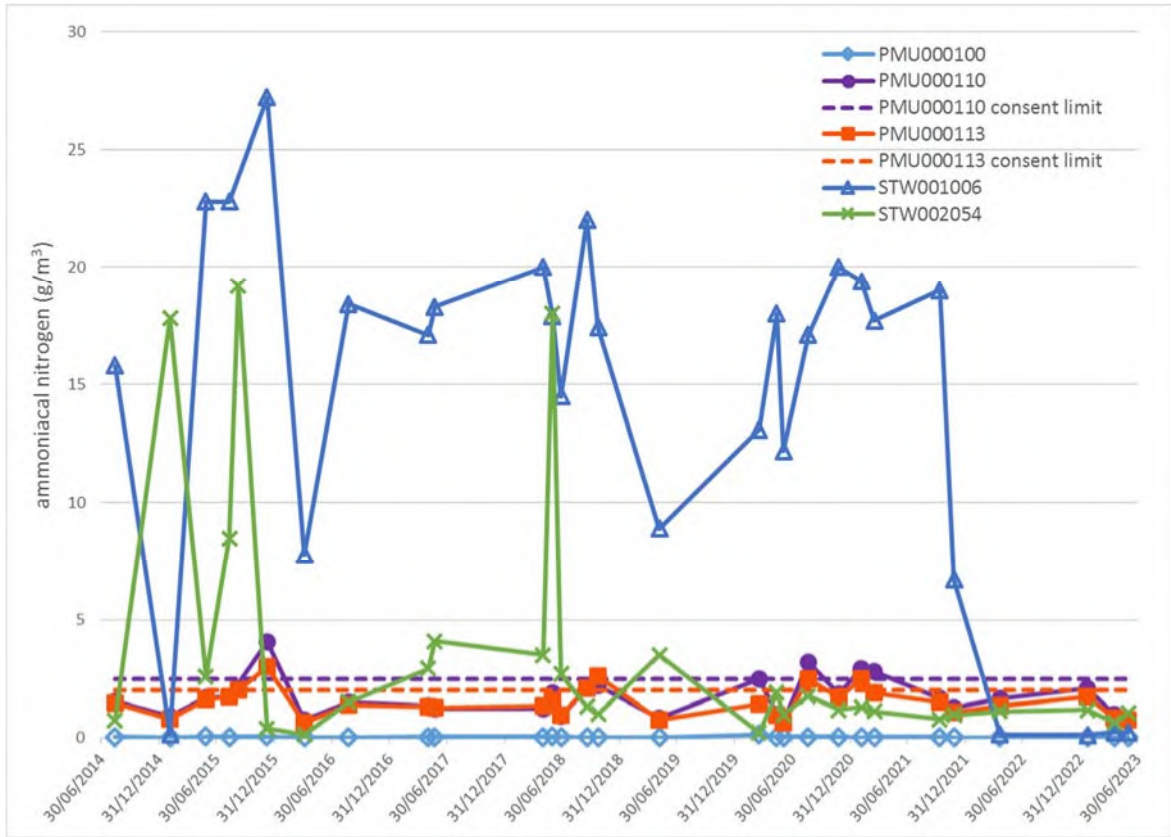


Figure 16 Ammoniacal nitrogen concentration in the Puremu Stream and stormwater discharge samples, June 2014 to date (includes wet weather samples)

Table 9 Chemical analysis of the Puremu Stream and discharges, sampled on 23 January 2023

Parameter	Unit	PMU000100 500 m u/s of landfill	PMU000106 u/s of landfill culvert	STW001006 Small western silt pond	PMU000110 d/s landfill culvert	Consent limit at PMU000110	STW002054 Large silt pond	PMU000109 Trib d/s large silt pond	PMU000113 d/s SPCA drive culvert	Consent limits at PMU000113
Total Ammoniacal-N	g/m ³	0.021	0.045	0.122	2.1	2.5	1.18	0.59	1.72	2.0 [at pH<7.75; limit is pH dependant]
Free Ammonia	g/m ³ N	0.00016	0.00018	0.00018	0.0146		0.0097	0.0039	0.0114	
Turbidity	NTU	-	-	2.9	-		21	-	-	
pH	g/m ³	6.9	7.1	6.5	7.3	[within ± 0.5]	7.4	7.3	7.3	≥ 6.5 & ≤ 8.5
Total Alkalinity	g/m ³ CaCO ₃	33	32	45	61		124	104	69	
Electrical Conductivity (EC)	mS/m@25°C	15.1	15.8	26.5	26.4		47.8	42.2	29.8	
Total Suspended Solids	g/m ³	4	< 3	< 3	< 3		10	< 3	< 3	14 [+10]
Sample Temperature	°C	19.0	198.1	17.9	18.1	≤ 19.0 [+2]	18.7	18.6	17.2	
Dissolved Aluminium	g/m ³	0.005	0.005	< 0.003	< 0.003		< 0.003	< 0.003	< 0.003	0.105 [+0.1]
Total Aluminium	g/m ³	0.0135	0.050	0.042	0.0177	5.0	0.031	0.030	0.0105	5.0
Dissolved Arsenic	g/m ³	< 0.0010	< 0.0010	< 0.0010	< 0.0010		< 0.0010	< 0.0010	< 0.0010	0.05 [+0.05]
Total Arsenic	g/m ³	< 0.0011	< 0.0011	< 0.0011	< 0.0011	0.1	< 0.0011	< 0.0011	< 0.0011	0.2
Dissolved Boron	g/m ³	0.017	0.019 ^a	0.031 ^a	0.031		0.027 ^a	0.025	0.030	
Total Boron	g/m ³	0.0178	0.0185 ^a	0.029 ^a	0.031	0.5	0.026 ^a	0.025	0.030	5.0
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	< 0.00005	< 0.00005		< 0.00005	< 0.00005	< 0.00005	0.001 [+0.001]

Parameter	Unit	PMU000100 500 m u/s of landfill	PMU000106 u/s of landfill culvert	STW001006 Small western silt pond	PMU000110 d/s landfill culvert	<i>Consent limit at PMU000110</i>	STW002054 Large silt pond	PMU000109 Trib d/s large silt pond	PMU000113 d/s SPCA drive culvert	<i>Consent limits at PMU000113</i>
Total Cadmium	g/m ³	< 0.000053	< 0.000053	< 0.000053	< 0.000053	0.01	< 0.000053	< 0.000053	< 0.000053	0.05
Dissolved Chromium	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005		< 0.0005	< 0.0005	< 0.0005	0.02 [+0.02]
Total Chromium	g/m ³	< 0.00053	< 0.00053	< 0.00053	< 0.00053	0.1	< 0.00053	< 0.00053	< 0.00053	1.0
Dissolved Cobalt	g/m ³	0.0007	0.0008	< 0.0002	0.0009		0.0057	0.0026	0.0012	
Total Cobalt	g/m ³	0.00095	0.00091	< 0.00021	0.00103	0.05	0.0062	0.0028	0.00138	1
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005		0.0005	< 0.0005	< 0.0005	0.007 [+0.002]
Total Copper	g/m ³	< 0.00053	0.00061	< 0.00053	0.00057	0.2	0.00108	< 0.00053	0.00055	0.5
Dissolved Iron	g/m ³	1.22	1.01	< 0.202	1.25		0.02	0.07	0.90	1.52 [+0.3]
Total Iron	g/m ³	2.0	1.82	0.92	2.4	5.0	3.5	2.0	2.3	10
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010		< 0.00010	< 0.00010	< 0.00010	0.002 [+0.002]
Total Lead	g/m ³	< 0.00011	< 0.00011	< 0.00011	< 0.00011	0.1	< 0.00011	< 0.00011	< 0.00011	0.1
Dissolved Manganese	g/m ³	0.32	0.020	0.097	0.72 ^a		13.7 ^a	9.4 ^a	2.6 ^a	
Total Manganese	g/m ³	0.36	0.20	0.098	0.71 ^a	1.0	12.5 ^a	8.4 ^a	2.3 ^a	5.0
Dissolved Zinc	g/m ³	< 0.0010	0.0018	< 0.0010	< 0.0010		< 0.0010	< 0.0010	0.0012	0.030 [+0.03]
Total Zinc	g/m ³	0.0011	0.0020	< 0.0011	0.0018	2.0	< 0.0011	< 0.0011	0.0013	2.4
Chloride	g/m ³	21	21	39	33		66	58	39	
Nitrite-N	g/m ³	< 0.002	0.003	0.002	0.008		0.010	0.020	0.010	0.06
Nitrate-N + Nitrite-N	g/m ³	0.049	0.49	0.116	0.63	100	0.49	0.43	0.64	10

Parameter	Unit	PMU000100 500 m u/s of landfill	PMU000106 u/s of landfill culvert	STW001006 Small western silt pond	PMU000110 d/s landfill culvert	Consent limit at PMU000110	STW002054 Large silt pond	PMU000109 Trib d/s large silt pond	PMU000113 d/s SPCA drive culvert	Consent limits at PMU000113
Dissolved Reactive Phosphorus	g/m ³	< 0.004	< 0.004	< 0.004	< 0.004		< 0.004	< 0.004	< 0.004	
Sulphate	g/m ³	2.2	4.7	12.4	5.0	500	4.3	4.1	4.8	1,000
Dissolved Oxygen	g/m ³ O ₂	6.58	8.46	-	7.86	≥ 5.0	-	5.11	7.65	≥ 5.58 [-1]
Total Biochemical Oxygen Demand	g/m ³ O ₂	< 2	< 2	< 2	< 2		2	< 2	< 2	
Faecal Coliforms	cfu/100 ml	370	1,300 ^b	<10	4,400		<10	2,500	2,800	≤ 1,000

- Key:** [-1] indicates this is a maximum permitted change from the upstream value at PMU000100
- a It is noted that the result for the dissolved fraction was greater than that for the total fraction, but within analytical variation of the methods
- b Sample over 24 hours old at time of analysis – interpret result with caution

Table 10 Chemical analysis of the Puremu Stream and discharges, sampled on 18 April 2023

Parameter	Unit	PMU000100 500 m u/s of landfill	PMU000106 u/s of landfill culvert	STW001006 Small western silt pond	PMU000110 d/s landfill culvert	Consent limit at PMU000110	STW002054 Large silt pond	PMU000109 Trib d/s large silt pond	PMU000113 d/s SPCA drive culvert	Consent limits at PMU000113
Total Ammoniacal-N	g/m ³	0.017	0.067	0.23	1.01	2.5	0.65	0.44	0.85	2.0 [at pH<7.75; limit is pH dependant]
Free Ammonia	g/m ³ N	0.00004	0.00016	0.00030	0.0037		0.0030	0.0056	0.0037	
Turbidity	NTU	-	-	2.9	-		13.6	-	-	
pH	g/m ³	6.9	6.9	7.1	7.1	[within ± 0.5]	7.2	7.7	7.7	≥ 6.5 & ≤ 8.5

Parameter	Unit	PMU000100 500 m u/s of landfill	PMU000106 u/s of landfill culvert	STW001006 Small western silt pond	PMU000110 d/s landfill culvert	<i>Consent limit at PMU000110</i>	STW002054 Large silt pond	PMU000109 Trib d/s large silt pond	PMU000113 d/s SPCA drive culvert	<i>Consent limits at PMU000113</i>
Total Alkalinity	g/m ³ CaCO ₃	26	26	43	47		90	86	55	
Electrical Conductivity (EC)	mS/m@25°C	13.5	14.7	23.3	21.9		37.0	34.8	24.7	
Total Suspended Solids	g/m ³	11	13	< 3	< 3		9	11	< 3	21 [+10]
Sample Temperature	°C	15.5	15.5	15.1	15.4	≤ 18.4 [+2]	16.5	115.6	15.3	
Dissolved Aluminium	g/m ³	0.006	0.005	< 0.003	< 0.003		0.004	< 0.003	< 0.003	0.106 [+0.1]
Total Aluminium	g/m ³	0.027	0.085	0.0048	0.068	5.0	0.091	0.118	0.0121	5.0
Dissolved Arsenic	g/m ³	< 0.0010	< 0.0010	< 0.0010	< 0.0010		< 0.0010	< 0.0010	< 0.0010	0.05 [+0.05]
Total Arsenic	g/m ³	< 0.0011	< 0.0011	< 0.0011	< 0.0011	0.1	< 0.0011	< 0.0011	< 0.0011	0.2
Dissolved Boron	g/m ³	0.019 ^a	0.019 ^a	0.028 ^a	0.030 ^a		0.026 ^a	0.024	0.028 ^a	
Total Boron	g/m ³	0.0189 ^a	0.0182 ^a	0.029 ^a	0.029 ^a	0.5	0.025 ^a	0.026	0.026 ^a	5.0
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	< 0.00005	< 0.00005		< 0.00005	< 0.00005	< 0.00005	0.001 [+0.001]
Total Cadmium	g/m ³	< 0.000053	< 0.000053	< 0.000053	< 0.000053	0.01	< 0.000053	< 0.000053	< 0.000053	0.05
Dissolved Chromium	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005		< 0.0005	< 0.0005	< 0.0005	0.02 [+0.02]
Total Chromium	g/m ³	< 0.00053	< 0.00053	< 0.00053	< 0.00053	0.1	< 0.00053	< 0.00053	< 0.00053	1.0
Dissolved Cobalt	g/m ³	0.0003	0.0006	< 0.0002	0.0004		0.0020 ^a	0.0015	0.0007	
Total Cobalt	g/m ³	0.00046	0.00068	< 0.00021	0.00051	0.05	0.00195 ^a	0.00173	0.00070	1.0
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005		0.0007	< 0.0005	< 0.0005	0.007 [+0.002]
Total Copper	g/m ³	< 0.00053	< 0.00053	< 0.00053	< 0.00053	0.2	0.00094	0.00076	< 0.00053	0.5

Parameter	Unit	PMU000100 500 m u/s of landfill	PMU000106 u/s of landfill culvert	STW001006 Small western silt pond	PMU000110 d/s landfill culvert	Consent limit at PMU000110	STW002054 Large silt pond	PMU000109 Trib d/s large silt pond	PMU000113 d/s SPCA drive culvert	Consent limits at PMU000113
Dissolved Iron	g/m ³	0.90	0.77	0.10	0.98		0.16	0.20	0.77	1.20 [+0.3]
Total Iron	g/m ³	1.90	1.71	0.61	1.98	5.0	1.77	4.4	1.95	10
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	0.00015 ^a	< 0.00010		< 0.00010	< 0.00010	< 0.00010	0.002 [+0.002]
Total Lead	g/m ³	< 0.00011	< 0.00011	< 0.00011 ^a	< 0.00011	0.1	< 0.00011	< 0.00011	< 0.00011	0.1
Dissolved Manganese	g/m ³	0.129 ^a	0.154	0.059	0.49 ^a		7.1 ^a	5.4	1.52	
Total Manganese	g/m ³	0.167 ^a	0.168	0.065	0.47 ^a	1.0	7.0 ^a	5.5	1.52	5.0
Dissolved Zinc	g/m ³	< 0.0010	< 0.0010	< 0.0010	< 0.0010		< 0.0010	< 0.0010	0.0037	0.030 [+0.03]
Total Zinc	g/m ³	0.0065	0.0040	0.0020	0.0036	2.0	0.0054	< 0.0011	0.0055	2.4
Chloride	g/m ³	20	22	36	31		54	51	35	
Nitrite-N	g/m ³	< 0.002	0.002	0.004	0.019		0.015	0.014	0.017	0.06
Nitrate-N + Nitrite-N	g/m ³	0.150	0.22	0.150	0.93	100	0.78	0.52	0.86	10
Dissolved Reactive Phosphorus	g/m ³	< 0.004	< 0.004	< 0.004	< 0.004		< 0.004	< 0.004	< 0.004	
Sulphate	g/m ³	5.2	7.3	10.9	6.5	500	5.2	5.0	6.2	1,000
Dissolved Oxygen	g O ₂ /m ³	7.30	9.04	-	8.02	≥ 5.0	-	5.55	8.13	≥ 6.30 [-1]
Total Biochemical Oxygen Demand	g O ₂ /m ³	< 2	< 2	< 2	< 2		< 2	< 2	< 2	
Faecal Coliforms	cfu/100 ml	2,500 ^b	360 ^b	12 ^b	140 ^b		220 ^b	310 ^b	140 ^b	≤ 1,000

Key: [] indicates this is a maximum permitted change from the upstream value at PMU000100
a It is noted that the result for the dissolved fraction was greater than that for the total fraction, but within analytical variation of the methods
b Sample over 24 hours old at time of analysis – interpret result with caution

In previous years there have been exceedances of the manganese concentration in the Puremu Stream at the compliance point for Consent 2370-3 (PMU000110). This monitoring location is downstream of the small silt pond discharge STW001006. Monitoring of the manganese concentrations in the discharges from the ponds at STW001006 and STW002054 commenced in the 2020-2021 year. During the year under review it was found that the manganese concentration in the discharge from the small silt pond was elevated only at the time of the November survey. The manganese concentration was elevated in the discharge from the large silt pond (STW002054) at the time of both of the dry weather surveys. There were no exceedances of the receiving water manganese limits on either of the consents.

A reduction in the total alkalinity (Figure 17) and conductivity (Figure 18) of the discharge from the small eastern silt ponds has also occurred following the diversion below Stage 1B. Historically, the influence of both the small western and large silt ponds had been notable at PMU000113.

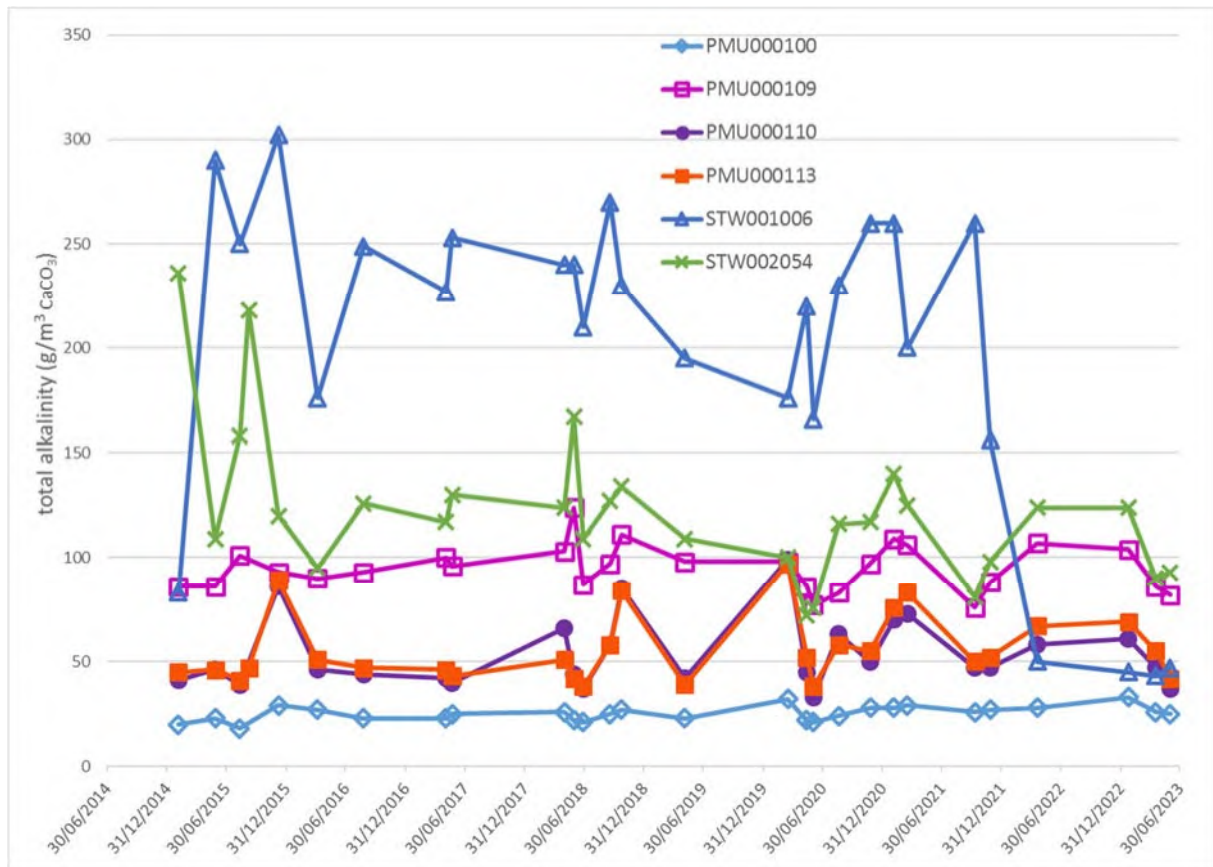


Figure 17 Total alkalinity in the Puremu Stream and stormwater discharge samples, June 2014 to date (includes wet weather samples)

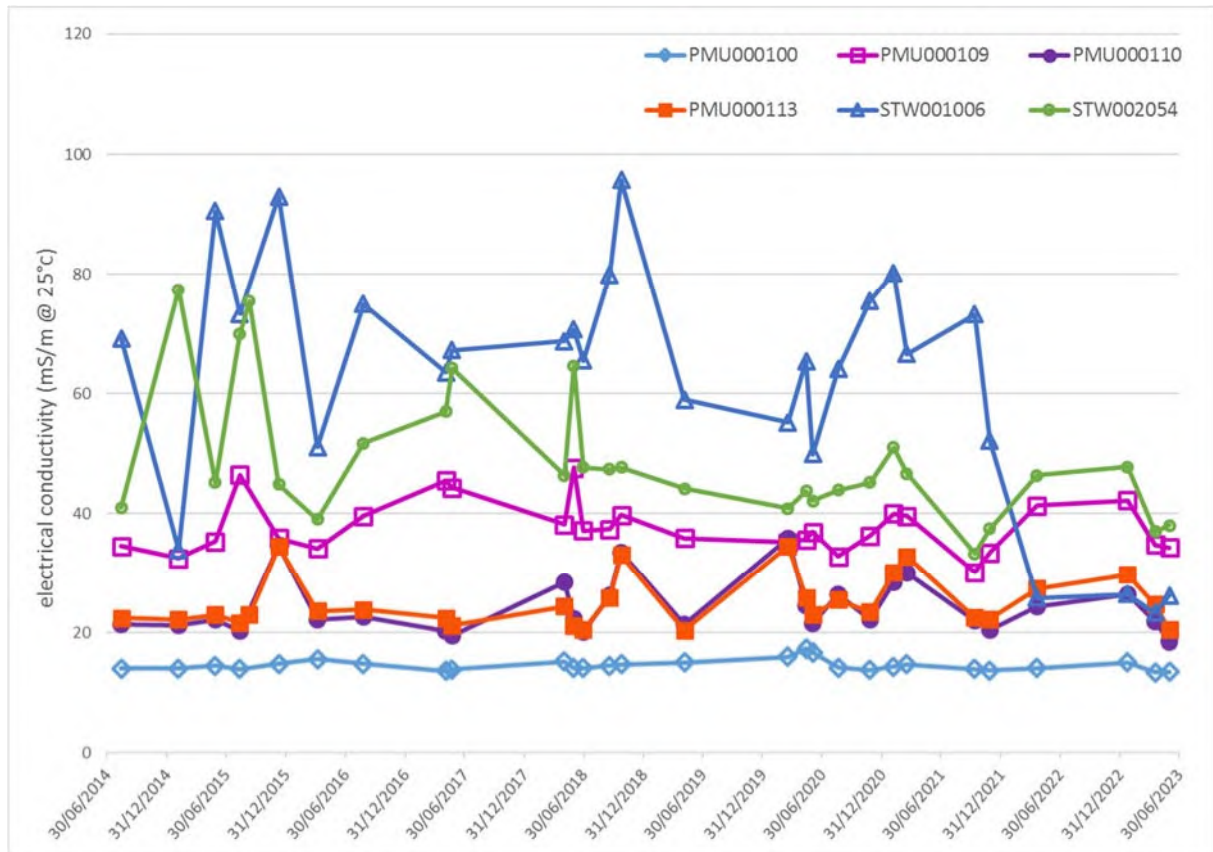


Figure 18 Conductivity in the Puremu Stream and stormwater discharge samples, June 2014 to date (includes wet weather samples)

The results from the dry weather sampling during the year under review indicate that discharges from the landfill were not resulting in any significant adverse effect at the time of the surveys.

2.3.3.3 Dry weather baseline characterisation of contaminants

During the year under review, the baseline characterisation focused on identifying the concentrations of a wider range of indicator parameters, the presence or absence of potential contaminants in the surface water discharges, and the potential for seasonal variation. The purpose of this monitoring is to establish reliable data that will enable consideration to be given to the most effective range of contaminants to be monitored in the discharges and receiving environment as the site transitions to a fully capped and closed site. The results of this monitoring are given in Table 11.

Table 11 Results for the dry weather stormwater pond discharge characterisation

Parameter	Unit	STW001006 Small western silt pond		STW002054 Large silt pond	
		23 Jan 2023	18 April 2023	23 Jan 2023	18 April 2023
		Sum of Anions	meq/L	2.3	2.1
Sum of Cations	meq/L	2.5	2.1	4.8	3.5
Bicarbonate	g/m ³ at 25°C	54	52	151	110
Total Hardness	g/m ³ CaCO ₃	62	51	118	87
Total Dissolved Solids (TDS)	g/m ³	259	146	260	220

Parameter	Unit	STW001006 Small western silt pond		STW002054 Large silt pond	
		23 Jan 2023	18 April 2023	23 Jan 2023	18 April 2023
		Dissolved Calcium	g/m ³	12.3	10.7
Dissolved Magnesium	g/m ³	7.6	5.9	17.7	11.8
Dissolved Mercury	g/m ³	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Dissolved Potassium	g/m ³	4.8	5.0	4.7	5.3
Dissolved Sodium	g/m ³	26	22	40	31
Fluoride	g/m ³	<0.05	< 0.05	<0.05	0.07
Total Kjeldahl Nitrogen (TKN)	g/m ³	0.21	0.32	1.3	0.88
Phosphate	g/m ³	< 0.013	< 0.013	< 0.013	< 0.013
Total Phosphorus	g/m ³	< 0.002	0.004	0.013	0.017
Total Ammoniacal-N	g/m ³	0.122	0.23	1.18	0.65
Nitrite-N	g/m ³	0.002	0.004	0.010	0.004
Nitrate-N	g/m ³	0.114	0.146	0.48	0.76
Reactive Silica	g/m ³ as SiO ₂	21	19.5	29	23
Dissolved carbonaceous biochemical oxygen demand	g O ₂ /m ³	< 2	< 2	< 2	< 2
Carbonaceous biochemical oxygen demand	g O ₂ /m ³	< 2	< 2	< 2	< 2
Chemical oxygen demand	g O ₂ /m ³	20	< 6	< 6	< 6
Total organic carbon	g/m ³	1.5	2.0	3.0	2.9
Escherichia coli	cfu/100 mL	30 ^a	6 ^a	180	220 ^a
Dissolved Nickel	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Total Nickel	g/m ³	< 0.00053	< 0.00053	< 0.00053	< 0.00053
Organo nitrogen & phosphorus pesticides^b					
Hexazinone	g/m ³	< 0.00002	0.00002	0.00004	<0.00002
Terbutylazine	g/m ³	0.00002	0.00022	0.00009	0.0026
Terbutylazine-desethyl	g/m ³	< 0.00004	0.00005	< 0.00004	0.00032
Semi volatile organic compounds		ND	ND	ND	ND
Volatile organic compounds		ND	ND	ND	ND

Key: a Sample over 24 hours old at time of analysis – interpret result with caution
b Any compounds of this classification that were detected are listed below this heading
ND None detected

In the 2021-2022 year, there were some notable differences in a number of the parameters determined in the samples collected from the small western silt pond (STW001006) when comparing the sample collected in November 2021 and the sample collected in April 2022. The work to divert the contaminated discharge from the pipework under the Stage 1B area commenced in October 2021, and therefore at that point in time it was unclear if these differences were due to seasonal variation or whether the water quality had not

reached a stable state following the changes to the drainage. The water quality of the discharge from this pond has continued to show a significant improvement between the samples collected before the diversion (for example median ammoniacal nitrogen to October 2021 of 17.9 g/m³) and following the diversion (median November 2021 to June 2023 of 0.23 g/m³). The improvements in some of the parameters determined are illustrated in Figure 16 to Figure 18. The potential seasonal variation in the samples collected from the large silt pond were much less pronounced than in the western pond during the year under review. Monitoring will need to continue to establish any baseline seasonal variation in the quality of these discharges.

With respect to the other aim of characterising the water quality in relation to identifying the contaminants in the discharge that have the potential to have an adverse effect on the environment, it is noted that no semi volatile organic compounds were detected.

In the 2022-2023 year, the only compounds under the organo-nitrogen & phosphorus pesticide classification that were detected were hexazinone and terbuthylazine.

Hexazinone is a non-selective contact herbicide that has a low reliability trigger level of 0.075 g/m³ in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (Australian and New Zealand Environment and Conservation Council (ANZECC), 2000). The concentrations detected in the stormwater discharges were well below this trigger value during the year under review.

Terbutylazine is also a herbicide. An ANZECC trigger value has not been determined for this contaminant, however there is a drinking water maximum acceptable value (MAV) of 0.008 g/m³. The concentrations detected in the stormwater discharges were well below this value during the year under review. The previously undetected terbuthylazine-desethyl is a degradation compound from terbuthylazine.

There were no volatile or semi volatile compounds detected during the year under review. This is in contrast to the 2021-2022 year, when at the time of the November 2021 survey, the volatile organic compounds monochlorobenzene and 1,4-dichlorobenzene were detected in the sample collected from the small silt pond at the very low concentrations of 0.0008 and 0.0004 g/m³ respectively. To put these values in perspective, in the case of monochlorobenzene, the ANZECC trigger value for a slight to moderately disturbed eco system is 0.055 g/m³. The Canadian Water Quality Guidelines for the Protection of Aquatic Life (Canadian Council of Ministers of the Environment) has an interim guideline of 0.0013 g/m³ for long term exposure. The concentration detected in the discharge from the small western silt pond in November 2021 was below the acute and chronic levels.

In the case of 1,4-dichlorobenzene there is a moderately reliable ANZECC trigger value of 0.060 g/m³. The Canadian Water Quality Guidelines for the Protection of Aquatic Life (Canadian Council of Ministers of the Environment) has an interim guideline of 0.0026 g/m³ for long term exposure. The concentration detected in the discharge from the small western silt pond in November 2021 was below the acute and chronic levels.

2.3.4 Biological monitoring

2.3.4.1 Macroinvertebrate surveys

Two macroinvertebrate surveys were conducted during the year under review. Summaries of the surveys' findings are given below and a full copy of the reports can be obtained from the Council upon request.

Biological surveys have been undertaken on the Puremu Stream since 1986, to assess potential adverse effects of leachate from the landfill on the macroinvertebrate communities of the stream. Further to this, biological monitoring has been undertaken on the Manganaha Stream since 1994 to assess the effects of seepage from the landfill site on the macroinvertebrate communities in the stream.

Results of freshwater biological surveys performed in relation to the Colson Road landfill since the 2000-2001 monitoring year are discussed in numerous biomonitoring reports listed in the biomonitoring report reference lists.

The Council's 'kick-sampling' technique and a combination of the 'kick-sampling' and 'vegetation-sweep' sampling techniques, along with a combination of the two techniques, were used at seven sites to collect streambed macroinvertebrates from the Manganaha Stream, Puremu Stream and an unnamed tributary of the Puremu Stream. This has provided data to assess any potential adverse effects of leachate from the landfill on the macroinvertebrate communities of these streams. Samples were processed to provide number of taxa (richness), MCI, and SQMCI scores for each site.

The MCI is a measure of the overall sensitivity of the macroinvertebrate community to the effects of nutrient pollution in streams. It is based on the presence/absence of taxa with varying degrees of sensitivity to pollution. The SQMCI takes into account taxa abundance as well as sensitivity to pollution, and may reveal more subtle changes in communities. Significant differences in either the MCI or the SQMCI between sites indicate the degree of adverse effects (if any) of the discharges being monitored and enable the overall health of the macroinvertebrate communities to be determined.

The sites sampled are described in Table 12 and their locations are shown in Figure 19. During the year under review, the surveys were undertaken on 20 October 2022 and 16 February 2023.

Overall, both surveys indicated that the discharge of treated stormwater and leachate discharges from the Colson Road landfill site had not had any significant detrimental effect on the macroinvertebrate communities of the Puremu and Manganaha Streams. The results for the unnamed tributary of the Puremu Stream from both surveys suggested poor preceding water quality and may be indicative of adverse effects associated with the landfill leachate, however these impacts were localised with improvements recorded downstream at site 3 (PMU000113), which is located downstream of the confluence of the Puremu Stream and the unnamed tributary. If the leachate were to be causing detrimental effects, it would be expected for some change to also be detected site 3, however the opposite was found. A significant increase in both MCI and SQMCI was recorded at site 3 when compared to site PT1. Additionally, the site 3 results were very similar to the 'control' site 1b.

No undesirable biological growths were detected at any of the monitoring sites at the time of these surveys.

Table 12 Biomonitoring sites in the Puremu and Manganaha Streams related to the Colson Road Landfill

Stream	Site number	Site Code	Grid reference (NZTM)	Location
Puremu Stream	1b	PMU000106	E1697019 N5675802	Immediately downstream of farm bridge
	2	PMU000110	E1696974 N5676405	400 m downstream landfill
	3	PMU000113	E1696986 N5676534	Downstream of the SPCA driveway
Unnamed tributary of Puremu Stream	PT1	PMU000108	E1697046 N5676450	60 m upstream of the confluence with Puremu Stream
Manganaha Stream	M4	MNH000190	E1697483 N5676284	10 m downstream of an unnamed tributary of the Manganaha Stream
	M6	MNH000260	E1697371 N5676665	500 downstream of site M4

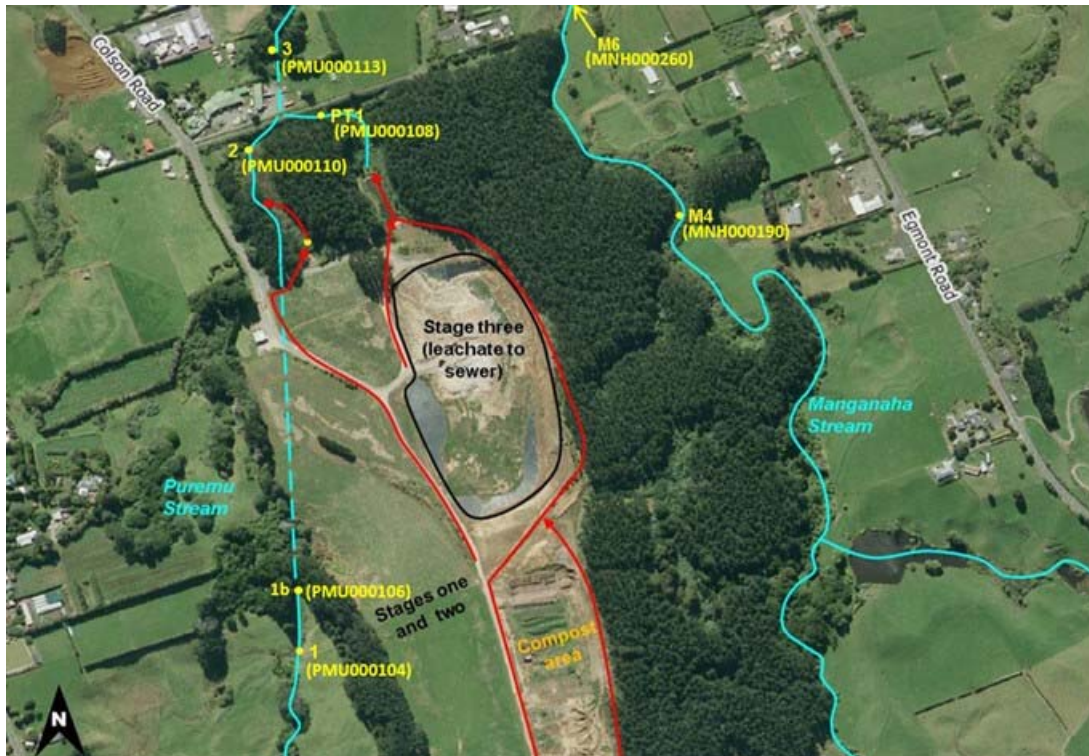


Figure 19 Biomonitoring sites related to the Colson Road landfill, New Plymouth. The red lines on the aerial photograph indicate the direction of stormwater runoff from the landfill site

20 October 2022

Following recommendations from the previous survey, a newly established site (1b) was monitored in replacement of the original 'control' site 1, as this site has more comparable habitat with the downstream habitat.

Taxa richness was low to moderately low in the current survey, ranging between six and 14 taxa across all sites. All sites recorded lower numbers of taxa than their respective site medians. Site 3 recorded six taxa, which is the lowest value to date.

In the Pūremu Stream and tributary, MCI scores were reflective of 'poor' macroinvertebrate community health at sites 2 and PT1, and 'fair' health at sites 1b and 3. The MCI score of site 3 was significantly higher than sites 2 and PT1, however no other significant differences were found. The MCI scores for sites 3 and PT1 was significantly higher than the previous survey (by 12 units and 28 units respectively). The remaining sites did not differ much from the previous survey. 'Fair' macroinvertebrate community health was recorded at both sites in the Manganaha Stream, and MCI results were not significantly different to one another. In comparison to site medians, all sites recorded higher than their respective medians except for site M4 which recorded four units lower.

SQMCI scores ranged between 2.2 units and 6.1 units across the six sites surveyed. In the Pūremu Stream and tributary, SQMCI scores were reflective of 'very poor' macroinvertebrate community health at site PT1, 'poor' health at site 2, and 'fair' health at site 1b and 3. There was a significant decrease in SQMCI from the 'control' site 1b to both site 2 and site PT1, but an increase at site 3 (although not significant). Site PT1 recorded the lowest SQMCI score of 2.2 units, reflective of 'very poor' health. In the Manganaha Stream, site M4 reflected 'fair' macroinvertebrate community health, while site M6 reflected 'very good' health. Site M6 has a significantly higher SQMCI score than the upstream site M4. Four of the six sites (1b, 2, 3, M6) scored higher than or equal to their respective site medians, while the remaining sites (PT1 and M4) scored lower than their medians.

Overall, the results of this survey indicated that the discharge of treated stormwater and leachate discharges from the Colson Road landfill site had not had any recent significant detrimental effects on the macroinvertebrate communities of the Puremu Stream or Manganaha Stream. However, results for the unnamed tributary of the Puremu Stream suggested poor preceding water quality and may be indicative of adverse effects associated with the landfill leachate. No undesirable biological growths were detected at any of these sites during this October 2022 survey.

16 February 2023

Taxa richness was low to moderately low in the current survey, ranging between seven and 17 taxa. Four sites (2, PT1, M4, and M5) recorded lower numbers of taxa than their respective site medians. In comparison to the previous survey results, all sites except site 2 recorded slightly higher numbers of taxa. All taxa numbers were within the range of those recorded previously, although site 2 recorded 7 taxa which was equal to the lowest number recorded for the site to date.

In the Puremu stream and unnamed tributary, MCI scores were reflective of 'poor' macroinvertebrate community health at all sites. In comparison to site medians, only site 2 recorded a significantly lower score (by 13 units). The remaining sites recorded MCI scores that were not significantly different to historic site medians. MCI scores for sites 2, 3, and PT1 were significantly lower than the previous survey scores. Site 2 was the only site of the Puremu Stream and unnamed tributary sites that was significantly lower than the 'control' site 1b. In the Manganaha Stream, both sites recorded MCI scores that were not significantly different to site medians and previous survey scores. MCI scores at both sites in the Manganaha Stream were reflective of 'fair' macroinvertebrate community health.

SQMCI scores ranged between 2.6 and 6.5 units across the six sites surveyed. In the Puremu Stream and unnamed tributary, site PT1 recorded the lowest SQMCI of 2.6 units, reflective of 'very poor' health. Sites 1b, 2, and 3 all recorded 'poor' health. Site M4 reflected 'fair' health, and site M6 reflected 'very good' health and was the highest recorded for the survey at 6.5 units. In the Puremu stream, there were no significant differences to the 'control' site 1b, however the SQMCI score for the unnamed tributary at site PT1 was significantly lower than the 'control' site score. Sites M4 and M6 in the Manganaha stream recorded significantly different SQMCI scores of 4.7 and 6.5 respectively.

Overall, the results of this survey indicated that the discharge of treated stormwater and leachate discharges from the Colson Road landfill site had not had any recent significant detrimental effects on the macroinvertebrate communities of the Puremu Stream or Manganaha Stream. However, results for the unnamed tributary of the Puremu Stream suggested poor preceding water quality and may be indicative of adverse effects associated with the landfill leachate. No undesirable biological growths were detected at any of these sites during this February 2023 survey.

2.4 Groundwater

As outlined in Section 1.4.5, the monitoring programme for the 2022-2023 year was a continuation of the revised programme that had been altered from that undertaken up to June 2021. The bores that have been sampled under this monitoring programme are described in Table 13. The monitoring bores that have been monitored previously have been included in this table to add context to the time series data shown in the figures presented later in this section.

During the 2019-2020 year it was found that the bore depths of three of the bores had reduced from that provided in the original bore logs. The affected bores were GND0251, GND0255 and GND1300 (highlighted in blue). During the 2020-2021 year replacement bores were installed. The impact bores GND0251 and GND1300 were replaced by GND3134 and GND3133 respectively. These replacement bores were located adjacent to the compromised bores. It was agreed that the compromised control bore (GND0255) would be replaced with a control bore that was also up gradient of the Stage 2 area (GND3135). Any additional bores

that were identified as being accessible and available for sampling were added to the groundwater monitoring surveys during the 2021-2022 year. This was done to support the on-going investigation into the extent of environmental effects that might be occurring due to the changes in the groundwater quality that has been observed in the Stage 3 under liner groundwater drainage and some of the groundwater monitoring bores. Bores GND0572 (highlighted in green) and GND0574 (highlighted in orange) were the bores added to the scheduled monitoring from the start of the 2021-22 year, however it was identified that bore GND0572 had been compromised. During the year under review two new monitoring bores (GND3182 and GND3183) were installed down gradient of the compromised bore. These bores were first sampled in December 2022.

The results for the samples collected during the year under review are given in Table 14.

Table 13 Groundwater sampling sites

Bore	Location description	Easting	Northing	Bore depth (mbgl)	Relative level (masl)	Screened depth (mbgl)
GND0251 ^a	Original L2, pine forest east of landfill	1697412	5676148	22.6		21.6 – 22.6
GND0572 ^b	WQC, north of Stage 1B	1697041	567622	8.7		4 - 9
GND0255 ^c (control bore)	L8, south of composting area	1697388	5675542	20.8		19.8 – 20.8
GND0573	WQA, north and east of Stage 2	1696949	5676126	10		5 - 10
GND0574 ^d	AH7, north of eastern side of Stage 3	1697113	5676278	11.7		8 - 12
GND0575	AH1, north of eastern side of Stage 3	1697283	5676349	12		7 - 12
GND0598	WQD, pine forest east of northern toe	1697415	5676245	20.5		18.6 – 20.6
GND1300 ^e	AH3, pine forest east of landfill	1697451	5675966	26		19 - 21
GND1301	AH2, eastern property boundary north of landfill	1697415	5676373	15.3		unknown
GND3133	AH3, pine forest east of landfill	1697460	5675967	18.3		9 – 18
GND3134	L2, pine forest east of landfill	1697424	5676150	23		8 - 23
GND3135 (control bore)	L9, southern end of landfill, up gradient of Stage 2	1697322	5675396	15.0		6 - 15
GND3182	Deep bore between Stage 1B and eastern stormwater ponds	1697029	5676259	19.5		14 -19.5
GND3183	Shallow bore between Stage 1B and eastern stormwater ponds	1697033	5676256	4		1.5 - 4

- Key:**
- a Bore collapsed as at 18/6/19 depth to base 19.52 m, replaced by GND3134
 - b Bore added to the 2021-2022 programme, but found to be compromised at the time of sampling
 - c Bore collapsed as at 18/6/19 depth to base 17.4 m, new control bore GND3135 in different location
 - d monitoring of this bore recommenced in the 2021-2022 year.
 - e Bore collapsed as at 18/6/19 depth to base 19.71 m, replaced by GND3133

Table 14 Chemical analysis of the groundwater samples collected during the year under review

Parameter name	Units	GND0573		GND0574		GND0575		GND0598		GND1301	
		07 Dec 2022	30 May 2023	07 Dec 2022	29 May 2023	07 Dec 2022	29 May 2023	08 Dec 2022	31 May 2023	07 Dec 2022	30 May 2023
Water Level	m	4.66	4.56	7.91	8.85	7.67	7.23	10.04	9.75	7.86	8.01
Bicarbonate	g/m ³ at 25°C	36	36	40	41	83	53	193	181	100	106
Carbonate	g/m ³ at 25°C	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloride	g/m ³	105	109	57	46	53	24	37	22	24	26
Dissolved oxygen	g/m ³	3.01	2.01	3.44	4.05	2.68	3.94	0.39	0.39	2.15	0.55
Dissolved Oxygen Saturation %	%	31.3	20.4	36.7	42.6	27.6	39.6	3.7	3.9	21.9	5.5
Electrical Conductivity (EC)	mS/m at 25°C	42.7	45.9	27.1	25.3	33.4	19.8	36.0	35.0	26.5	27.6
pH	pH units	6.1	5.7	6.3	6.0	6.7	6.4	8.2	7.4	7.6	7.1
Sulphate	g/m ³	6.9	5.5	4.9	4.9	3.1	4.5	<0.5	0.6	5.8	3.9
Total Alkalinity	g/m ³ CaCO ₃	30	30	32	33	68	43	160	149	82	87
Total Dissolved Solids (TDS)	g/m ³	260	270	172	164	198	138	230	200	145	173
Total Hardness	g/m ³ CaCO ₃	108	104	73	63	80	37	107	102	80	80
Temperature	°C	16.6	15.9	18.0	17.6	15.9	15.5	14.7	15.2	15.7	15.4
Dissolved COD, trace level	g O ₂ /m ³	<6	<6	<6	<6	<6	<6	7	< 6	<6	<6
Dissolved Total Biochemical Oxygen Demand (TBOD5)	g O ₂ /m ³	<0.4	-	<0.4	-	<0.4	-	6.4	-	<0.4	-
Nitrate-N	g/m ³	0.49	0.59	0.77	0.58	2.3	2.1	<0.002	0.125	1.81	1.80
Nitrate-N + Nitrite-N	g/m ³	0.49	0.59	0.77	0.58	2.3	2.1	<0.002	0.128	1.81	1.80
Nitrite-N	g/m ³	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.003	<0.002	<0.002
Total Ammoniacal-N	g/m ³	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	1.23	1.18	<0.010	<0.010
Total Kjeldahl Nitrogen (TKN)	g/m ³	<0.10	<0.10	<0.10	0.19	<0.10	<0.10	1.20	1.37	<0.10	<0.10
Total Nitrogen	g/m ³	0.54	0.62	0.78	0.78	2.3	2.2	1.23	1.50	1.81	1.84
Dissolved Aluminium	g/m ³	0.004	-	0.004	-	0.003	-	0.003	-	<0.003	-
Dissolved Arsenic	g/m ³	<0.0010	-	<0.0010	-	<0.0010	-	<0.0010	-	<0.0010	-
Dissolved Boron	g/m ³	0.023	0.025	0.022	0.023	0.017	0.019	0.052	0.051	0.021	0.021
Dissolved Cadmium	g/m ³	<0.00005	-	<0.00005	-	<0.00005	-	<0.00005	-	<0.00005	-
Dissolved Calcium	g/m ³	16.2	16.0	11.8	11.0	16.0	7.6	22	21	16.3	16.4
Dissolved Chromium	g/m ³	<0.0005	<0.0005	0.0009	<0.0005	0.0009	0.0021	<0.0005	<0.0005	0.0010	0.0012
Dissolved Cobalt	g/m ³	<0.0002	-	<0.0002	-	<0.0002	-	<0.0002	-	<0.0002	-

Parameter name	Units	GND0573		GND0574		GND0575		GND0598		GND1301	
		07 Dec 2022	30 May 2023	07 Dec 2022	29 May 2023	07 Dec 2022	29 May 2023	08 Dec 2022	31 May 2023	07 Dec 2022	30 May 2023
Dissolved Copper	g/m ³	<0.0005	-	<0.0005	-	0.0006	-	<0.0005	-	<0.0005	-
Dissolved Iron	g/m ³	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.26	0.09	<0.02	<0.02
Dissolved Lead	g/m ³	<0.00010	-	<0.00010	-	<0.00010	-	<0.00010	-	<0.00010	-
Dissolved Magnesium	g/m ³	16.4	15.5	10.5	8.7	9.7	4.4	12.6	11.8	9.6	9.6
Dissolved Manganese	g/m ³	0.0052	0.0061	0.0044	0.087	0.0017	0.0014	0.075	0.072	0.0011	0.0016
Dissolved Nickel	g/m ³	<0.0005	-	<0.0005	-	<0.0005	-	<0.0005	-	<0.0005	-
Dissolved Potassium	g/m ³	1.84	1.88	1.04	0.99	2.6	1.77	4.8	4.4	2.1	2.0
Dissolved Sodium	g/m ³	41	42	24	21	37	25	37	33	26	26
Dissolved Zinc	g/m ³	0.0071	0.0027	0.0123	0.0118	0.0085	<0.0010	0.0026	<0.0010	0.0057	0.0054
Semi volatile organic compounds		ND	-	ND	-	ND	-	ND	-	ND	-
Volatile organic compounds^a											
Toluene	g/m ³	<0.0003	-	0.0017	-	<0.0003	-	0.0016	-	0.0005	-

Parameter name	Units	GND3133		GND3134		GND3135		GND3182		GND3183	
		07 Dec 2022	30 May 2023	08 Dec 2022	01 Jun 2023	08 Dec 2022	30 May 2023	08 Dec 2022	26 May 2023	08 Dec 2022	26 May 2023
Water Level	m	12.62	12.13	12.84	12.68	5.57	8.88	2.85	0.70	0.86	2.5
Bicarbonate	g/m ³ at 25°C	33	35	51	75	27	28	193	200	125	141
Carbonate	g/m ³ at 25°C	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	< 1.0
Chloride	g/m ³	32	27	21	21	63	96	23	23	36	35
Dissolved oxygen	g/m ³	3.09	3.92	6.58	4.39	5.18	6.14	4.35	0.17	0	0.15
Dissolved Oxygen Saturation %	%	31.9	39.5	66.1	44.4	53.1	61.5	44.3	1.7	0	1.5
Electrical Conductivity (EC)	mS/m at 25°C	18.2	16.9	16.4	19.9	29.0	38.9	37.2	38.0	31.2	35.6
pH	pH units	6.4	6.0	6.6	6.2	6.4	5.7	8.0	7.5	6.8	6.7
Sulphate	g/m ³	5.4	3.1	3.0	4.0	3.7	3.7	<0.5	0.5	<0.5	<05
Total Alkalinity	g/m ³ CaCO ₃	27	29	42	61	22	23	160	165	103	116
Total Dissolved Solids (TDS)	g/m ³	111	94	103	174	151	210	220	250	169	181
Total Hardness	g/m ³ CaCO ₃	34	31	23	48	33	33	121	119	64	69
Temperature	°C	16.6	15.7	15.3	15.5	16.0	15.0	15.7	15.8	16.3	15.7
Dissolved COD, trace level	g O ₂ /m ³	<6	<6	6	<6	<6	<6	7	11	<6	<6

Parameter name	Units	GND3133		GND3134		GND3135		GND3182		GND3183	
		07 Dec 2022	30 May 2023	08 Dec 2022	01 Jun 2023	08 Dec 2022	30 May 2023	08 Dec 2022	26 May 2023	08 Dec 2022	26 May 2023
Dissolved Total Biochemical Oxygen Demand (TBOD5)	g O ₂ /m ³	<0.4	-	0.4	-	<0.4	-	1.0	-	1.6	-
Nitrate-N	g/m ³	1.53	1.08	0.067	0.056	0.56	0.43	<0.002	0.045	<0.02	<0.02
Nitrate-N + Nitrite-N	g/m ³	1.53	1.08	0.067	0.056	0.56	0.43	<0.02	0.046	<0.02	<0.02
Nitrite-N	g/m ³	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.02	<0.02
Total Ammoniacal-N	g/m ³	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	1.08	1.08	3.6	3.4
Total Kjeldahl Nitrogen (TKN)	g/m ³	<0.10	<0.10	<0.10	1.14	<0.10	<0.10	1.10	1.15	<0.10	3.6
Total Nitrogen	g/m ³	1.56	1.11	<0.11	1.19	<0.10	0.51	1.10	1.20	3.4	3.6
Dissolved Aluminium	g/m ³	0.012	-	0.016	-	0.011	-	<0.003	-	0.007	-
Dissolved Arsenic	g/m ³	<0.0010	-	<0.0010	-	<0.0010	-	<0.0010	-	<0.0010	-
Dissolved Boron	g/m ³	0.018	0.020	0.015	0.017	0.015	0.016	0.033	0.033	0.029	0.038
Dissolved Cadmium	g/m ³	<0.00005	-	<0.00005	-	<0.00005	-	<0.00005	-	<0.00005	-
Dissolved Calcium	g/m ³	6.4	5.7	4.3	12.0	6.3	6.2	26	27	10.8	11.9
Dissolved Chromium	g/m ³	<0.0005	<0.0005	0.0011	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Dissolved Cobalt	g/m ³	<0.0002	-	<0.0002	-	<0.0002	-	<0.0002	-	0.0034	-
Dissolved Copper	g/m ³	<0.0005	-	<0.0005	-	<0.0005	-	<0.0005	-	0.056	-
Dissolved Iron	g/m ³	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.55	0.04	20	20
Dissolved Lead	g/m ³	<0.00010	-	<0.00010	-	<0.00010	-	<0.00010	-	0.00108	-
Dissolved Magnesium	g/m ³	4.4	4.0	3.1	4.4	4.3	4.2	13.7	12.7	9.1	9.6
Dissolved Manganese	g/m ³	0.0133	0.0008	0.0046	0.129	0.0063	0.0113	0.30	0.29	1.74	1.95
Dissolved Nickel	g/m ³	<0.0005	-	<0.0005	-	<0.0005	-	<0.0005	-	<0.0005	-
Dissolved Potassium	g/m ³	1.83	1.70	1.19	1.28	2.2	2.5	5.1	5.1	7.4	7.1
Dissolved Sodium	g/m ³	22	21	25	25	43	61	33	33	29	28
Dissolved Zinc	g/m ³	0.0093	0.0014	0.0120	0.0070	0.0039	0.0032	0.0030	<0.0010	0.037	<0.0010
Semi volatile organic compounds		ND	-	ND	-	ND	-	ND	-	ND	-
Volatile organic compounds^a											
Toluene	g/m ³	<0.0003	-	0.0130	-	0.0014	-	0.0009	-	<0.0003	-

Key: a Any compounds of this classification that were detected are listed below this heading
ND None detected

In terms of continuing to monitor the effects being observed in the groundwater in the vicinity of the site, historically, GND0598 has shown some elevation in alkalinity, conductivity, ammoniacal nitrogen, pH, dissolved manganese and dissolved iron when compared to the other bores. On the whole, the results have remained relatively consistent in this bore since the monitoring of each of these parameters began, which for the most part, was prior to the construction of Stage 3. The elevated levels of these parameters in this bore are therefore not considered to be a result of leachate contamination.

It is noted that the new bores that are down gradient of Stage 1B (GND3182 and GND3183) also contain elevated levels of alkalinity, conductivity, ammoniacal nitrogen, dissolved manganese and dissolved iron, with the dissolved manganese, iron and ammoniacal nitrogen concentrations being higher in the shallower bore (GND3183). The groundwater in this bore also contained dissolved copper at 0.056 g/m³ at the time of the December survey. This sample was described as being slightly brown and turbid with a landfill odour. The sample collected from this bore in the May survey was noted as having a "rubbishy" odour.

The December samples were analysed for SVOCs (semi-volatile organic compounds) and VOC's (volatile organic compounds). There were no SVOC's found to be above detection limits. The only VOC detected was a low concentration of toluene found in GND0574, GND0598, GND3134 and GND3135. This compound is highly volatile and have relatively low water solubility. This means that should the toluene enter a surface water body, it would be rapidly lost to the atmosphere. The concentrations detected were also well below the low reliability trigger levels for these compounds given in the ANZECC Guidelines (2000). A copy of the full SVOC and VOC results is available on request.

Although the NPDC subsurface drainage samples (Section 2.3.1.2) are showing slight contamination from the impact of leachate for some parameters, on the whole, the groundwater results show little evidence of leachate contamination. During the year under review, all parameters measured for all the bores, were well within the ranges expected in Taranaki groundwater. However, the changes in recent years, particularly in the chloride, conductivity and nitrate/nitrite nitrogen concentrations, are indicative of recently emerging trends.

It had been found that the chloride concentration and conductivities in bore GND0255 (up gradient of the landfill) had been stabilising at a decreased level since the spike found in April 2008. However, this bore was confirmed as having become compromised during the 2021-2022 year. The new up gradient bore (GND3135) is in a different location, being up gradient of Stages 1 & 2, rather than Stage 3. Following the elevated conductivity and chloride found in the new control bore in the February 2022 sample, the historical information on file at the Council was reviewed. During this review a site plan/drawing was found, that indicated that the area where the new bore is located may have been impacted by special waste disposal and storage of materials for recycling. This is to be investigated further to clarify where these historic activities took place in relation to the current Stage 1 & 2 landfill boundaries.

It is noted that the nitrate/nitrite nitrogen concentration in the replacement control bore is significantly lower than that in the original control bore.

In bores GND0573 (down gradient of Stages 1 and 2) and GND0575 (down gradient of Stage 3) there had been an emerging trend of increasing chloride concentrations and conductivity in the groundwater at these locations. It was thought that this may be indicative of some minor leachate contamination. These trends have continued in GND0573, but not in GND0575. In the case of chloride at GND0575, there has been successive reductions in this parameter in the samples collected during the last three sampling surveys.

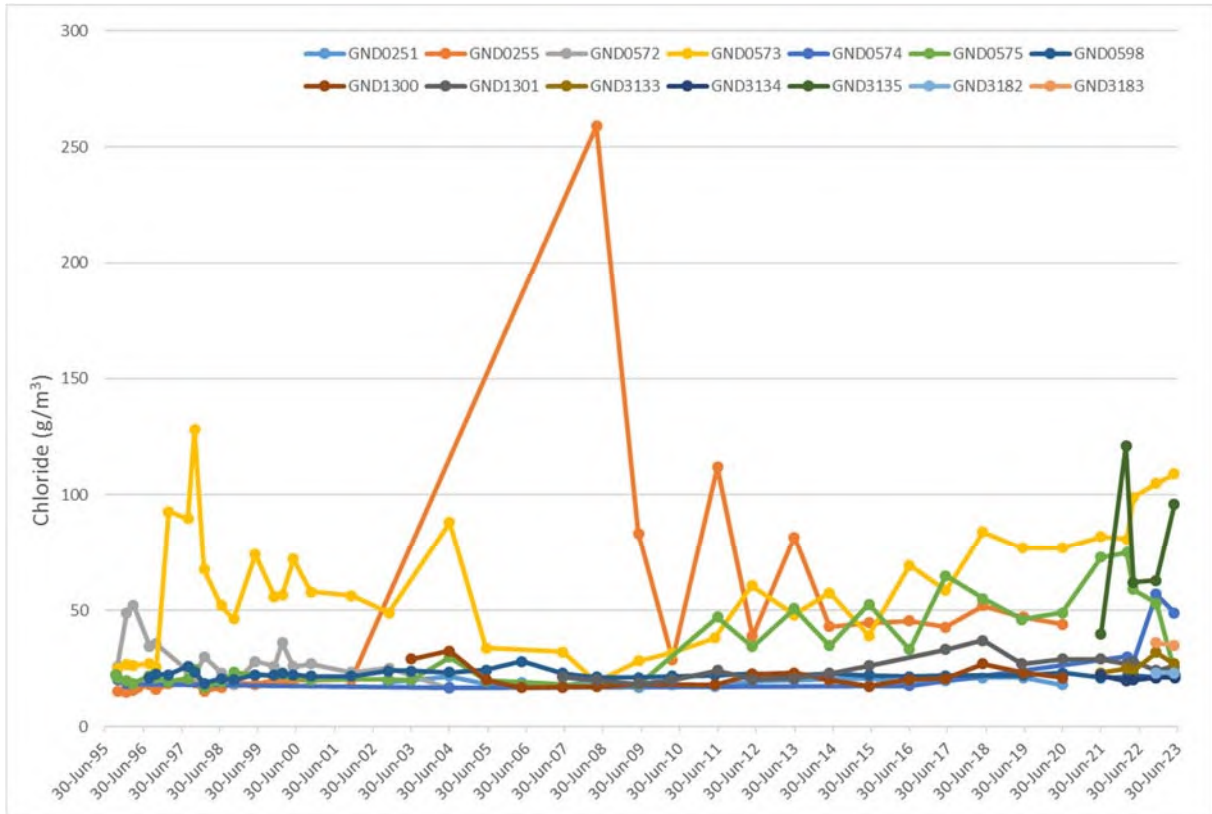


Figure 20 Chloride concentrations in the Colson Road groundwater bores

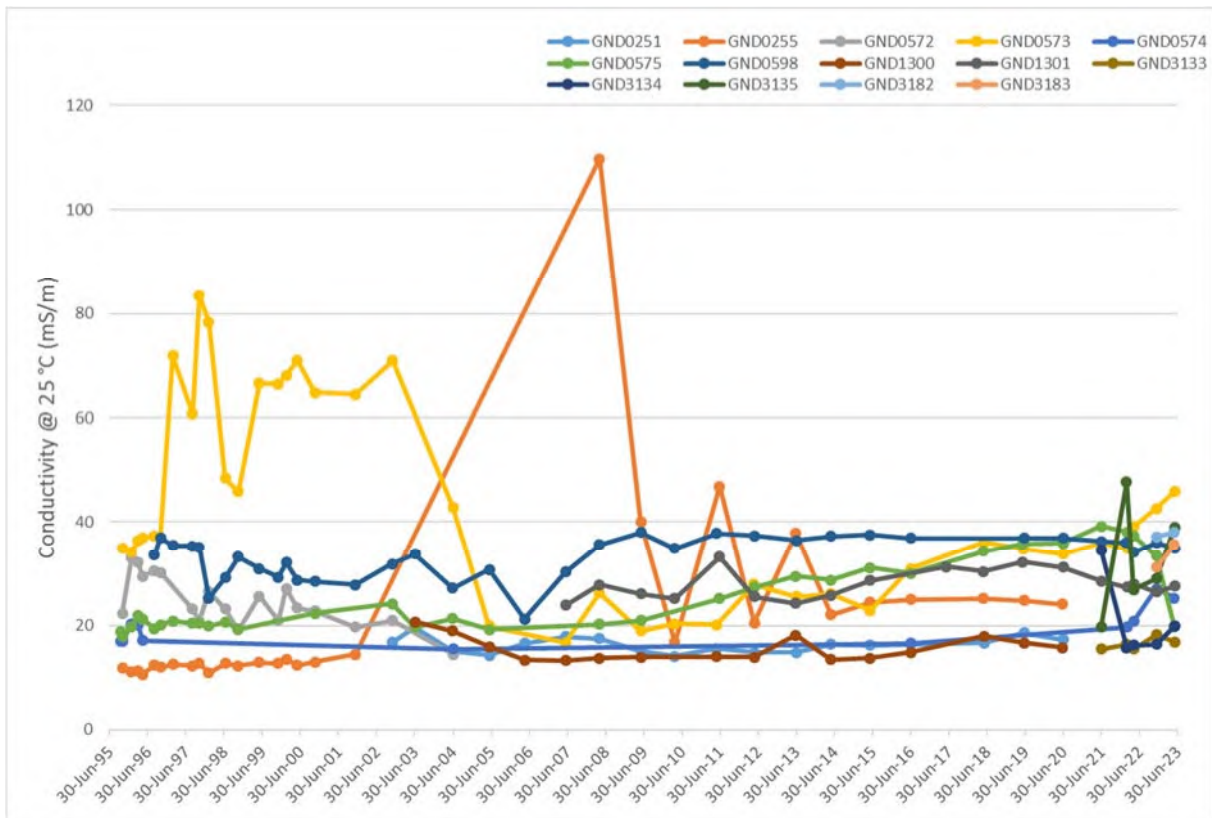


Figure 21 Conductivity in the Colson Road groundwater bores

Figure 22 shows that there may also be an emerging trend of increasing nitrate/nitrite nitrogen concentrations in GND0575 (north of Stage 3). This finding is consistent with the elevated ammoniacal

nitrogen in the under liner groundwater drainage results provided by NPDC (2.3.1.2, Figure 12). Nitrate/nitrite nitrogen had not previously been determined in the routine under liner groundwater drainage monitoring undertaken by NPDC, however it was included in the additional parameters determined in the more comprehensive, monitoring that was undertaken in 2021-2022 (Appendix III). The concentrations of nitrate/nitrite nitrogen found in these samples were 0.69 and 1.36 g/m³. The nitrate/nitrite nitrogen concentration obtained at GND1301 (further east of the landfill than GND0575) during the year under review was again elevated above the historical median of 0.91 g/m³ for this monitoring location and above that found in the under liner groundwater drainage in the 2021-2022 year. The nitrate/nitrite nitrogen concentrations of the samples collected from GND3133 were above the historical median of the bore that this site replaced (GND1300), indicating that there is also potentially a trend of increasing nitrate/nitrite nitrogen concentration in the groundwater in the vicinity of these bores.

From the data gathered during the year under review, it appears that there may be a seasonal variation in some of the parameters in some of the bores. The extent of these variations will be evaluated in the on-going high and low groundwater level monitoring surveys over the next few years.

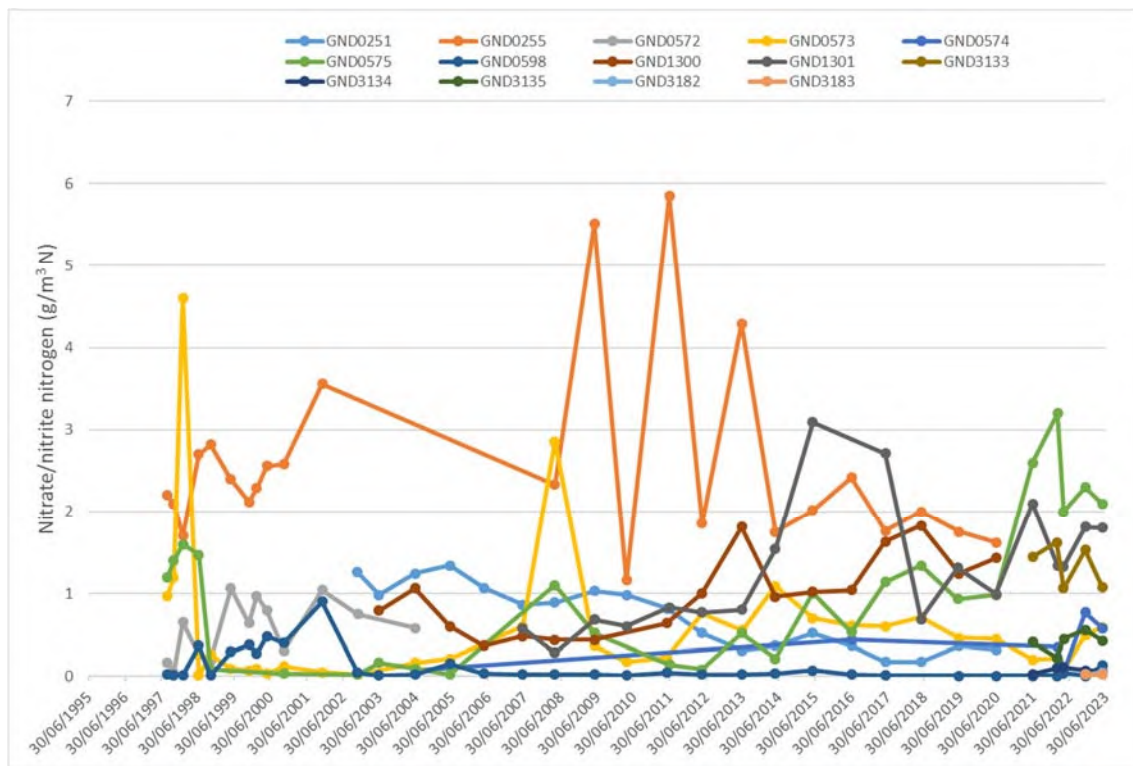


Figure 22 Nitrate/nitrite nitrogen concentrations in the Colson Road groundwater bores, June 2006 to date

In general terms, the groundwater quality in the vicinity of the landfill is good, and all parameters are comparable with typical Taranaki groundwater. The data gathered in this, and other monitoring periods, indicates that the effect that the Colson Road landfill is having on groundwater quality at this time is minor.

2.5 Air

2.5.1 Data review – landfill gas flare

The Resource Management (National Environmental Standards for Air Quality) Regulations 2004 as at 1 July 2017 (NES) requires the control of greenhouse gas emissions at landfills (Regulations 25 to 27). Regulation 25 discusses the applicability of the two following regulations. In the case of Stage 3 of the Colson Road

landfill, Regulations 26 and 27 do not apply as this stage of the landfill has a total capacity of less than 1 million tonnes (the threshold for Regulations 26 and 27 to apply).

As discussed in Section 1.2, NPDC chose to install a flare at the landfill to mitigate odour issues that were resulting in a significant number of complaints in the 2014 to 2016 years. Although the NES does not apply at the site, this was used to provide guidance in the development of the conditions attached to the varied consent and on the “best practicable option” requirement contained in the pre-existing consent.

Landfill gas (LFG) is generated by the decomposition of organic waste materials by bacteria within a landfill. LFG consists mainly of methane and carbon dioxide with trace amounts (typically 1% or less) of odorous reduced sulphur compounds (including hydrogen sulphide) and other volatile organic compounds (VOCs). LFG can be distinctly odorous depending on concentration of odorous components and dilution. It also presents an explosion/flammability hazard at certain concentrations and can present potential health risks due to low levels of various organic hazardous air pollutants. LFG monitoring of leachate pipework at Colson Road landfill in February 2016 showed the composition of LFG to be 63% methane, 33% carbon dioxide, 1% oxygen, 2% nitrogen and remaining trace constituents 1%, which is a typical composition for landfill gas.

Typically, LFG contains a small amount (0.4%) of non-methane organic compounds (NMOC), which can contain organic hazardous air pollutants. Most of the NMOC emissions result from the volatilisation of organic compounds in the landfilled waste. Small amounts may be created by biological processes and chemical reactions within the landfill.

The conditions included in the varied consent were to ensure that the potential adverse effects from the flare, as a point source of emissions, are controlled and are consistent with the assessment of environmental effects provided with the application.

Conditions on the varied Consent 4779-1.1 require that:

1. Within three months of the first operation of any landfill gas flare, the consent holder shall provide the Chief Executive, Taranaki Regional Council with a measurement of the temperature of the flare together with a measurement of the concentrations of methane and of hydrogen sulphide in the flare feedstock. Thereafter the consent holder shall annually provide updated information on flare temperature and feedstock composition.
- 3 The first revision of the landfill management plan, described in condition 9(c) following installation of any landfill gas flare shall describe, variously, methods of, schedules for, and/or the recording of: observations and inspections of the flare, its operation, and its effects, including downwind odour and smoke plume details; a calibration schedule; records of maintenance; and any complaints. Information gathered under these provisions shall be made available to the Chief Executive, Taranaki Regional Council upon request.

Condition 1

Commissioning of the flare was completed on 28 March 2018, with testing undertaken by an independent consultant on the same day. The information required to satisfy special condition 1 was received within the three months stipulated by consent conditions, on 16 April 2018 and has been presented in the 2017-2018 Annual Report.

Condition 1 also requires that NPDC provide updated annual information on the feed gas and temperature.

The assessment of environmental effects stated that the enclosed flare for the site would have an operating temperature between 750 and 1200°C, with a residence time greater than 0.3 seconds. This was to ensure a destruction efficiency of at least 0.9 (90 %) for both methane and NMOC.

The full year's data was provided in the form of daily average temperature, gas flow, and methane concentration in the feed gas collected by the monitoring system that is integrated into the flare system (Figure 23 and Figure 25).

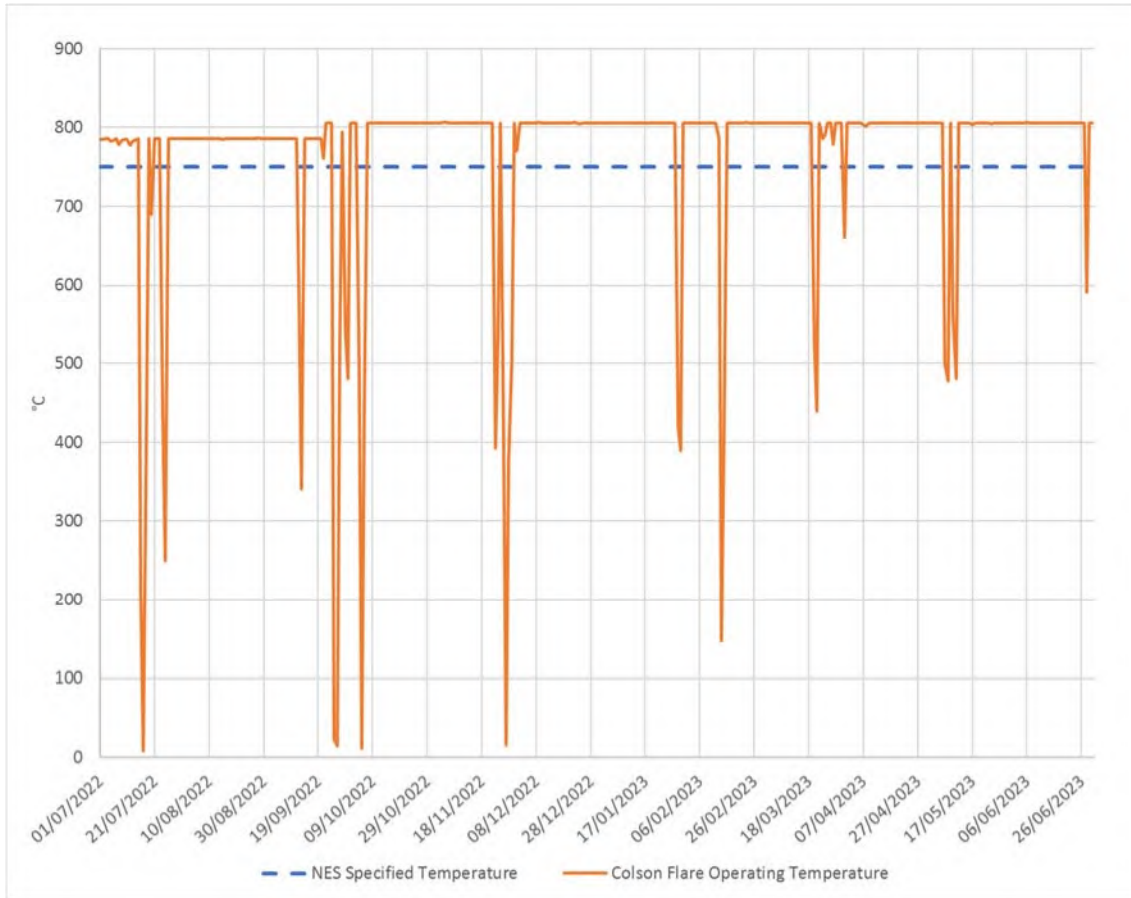


Figure 23 Colson Road landfill flare temperature for the year under review

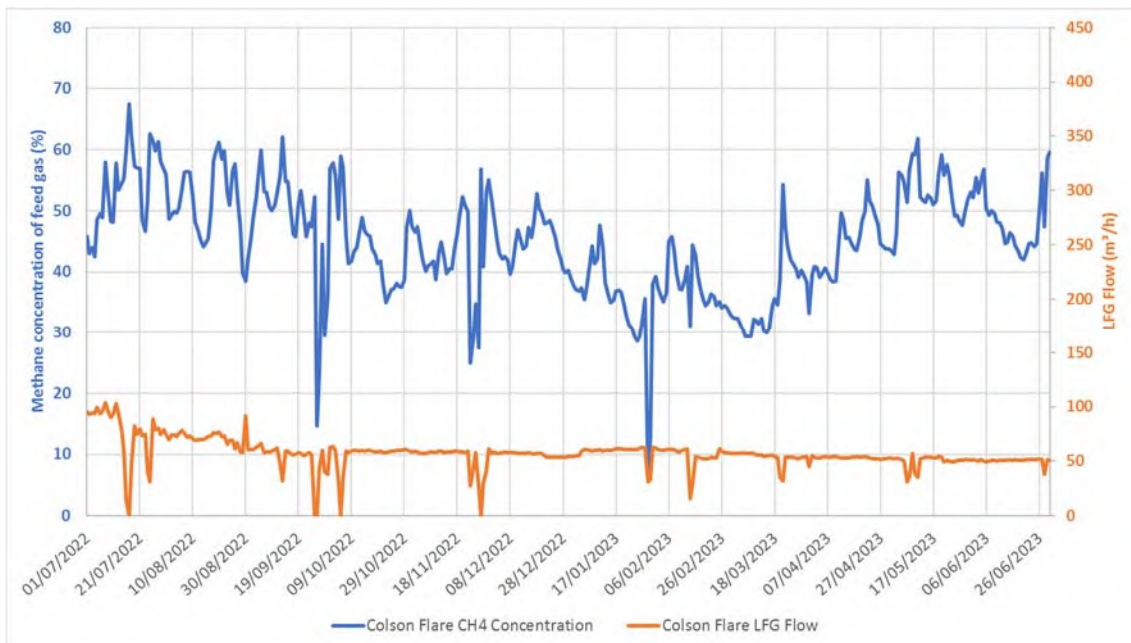


Figure 24 Flare feed gas flow rate and methane concentration during the year under review

In previous years, due to the number of occasions that the flare temperature was recorded to be less than is optimal for complete combustion of the landfill gas components, to check that the flare was being operated in accordance with the best practicable option (condition 4 of Consent 4779-1.1) based on the guidance provided by the NES, NPDC has previously confirmed that:

- The system incorporates automatic isolation valves and a flame arrestor so that there are no emissions of unburnt gas from the flare during periods when the flare is not operational;
- While the flare is not operating the landfill gas is not extracted. It accumulates in the landfill and vents passively as is the case with all smaller landfills that are not required to have an engineered extraction and flaring system;
- There is a process for manually restarting the flare given that for safety reasons, the flare does not have an auto-ignition system. Council was informed that a text alarm is sent to NPDC staff, who will respond during work hours and attempt to restart the flare, resulting in varying response times.

During the year under review, additional mitigation measures were implemented, including the addition of a logic control to shut the flare down if the temperature drops below 750°C for 10 minutes, due to the decrease in the methane concentration of the feed gas that occurred during the 2021-2022 year. This ensured that, during the year under review, the flare temperature was maintained at or above 750°C when the flare was operating.

In terms of the changes in the landfill gas quality, whilst it is expected that the landfill gas generation will decrease in time, this may not occur for several years. The reduction in methane concentration that occurred at Colson Road coincided with a significant increase in the landfill gas flow to the flare (Figure 25).

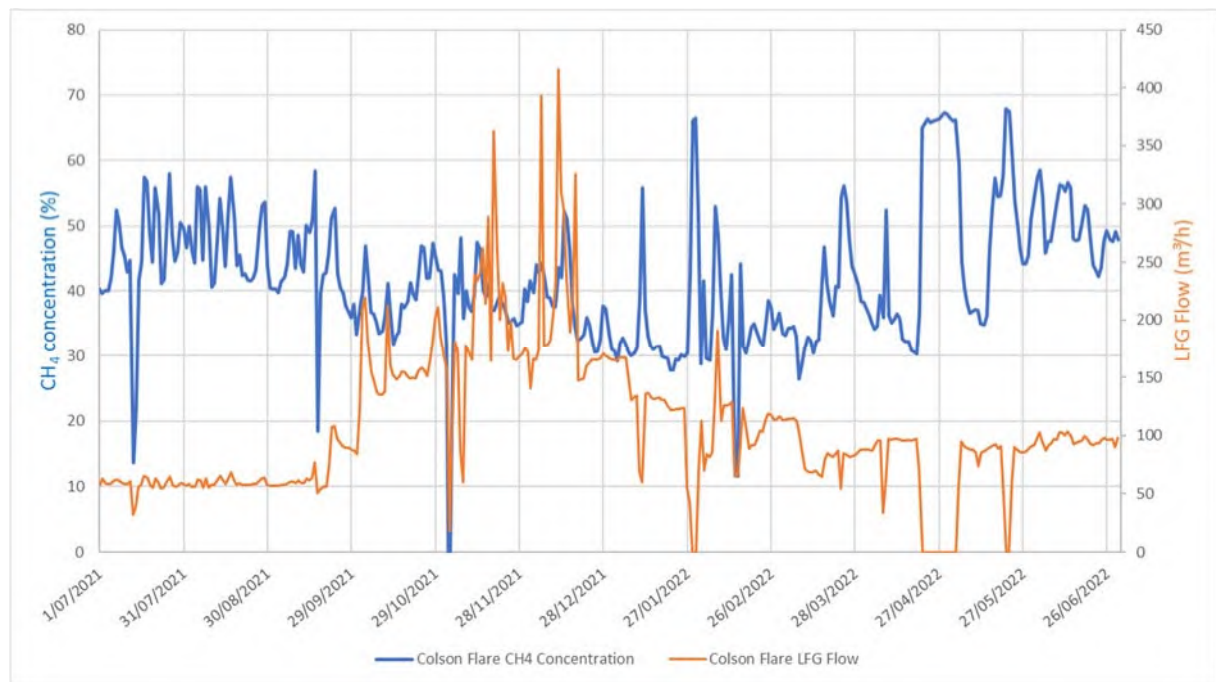


Figure 25 Flare feed gas flow rate and methane concentration during the 2021-2022 year

A better measure for monitoring landfill gas generation and the continuing need for the flare is to track the landfill gas volumes and methane gas volumes directed through the flare. These are presented in (Figure 26, Figure 27 and Table 15).

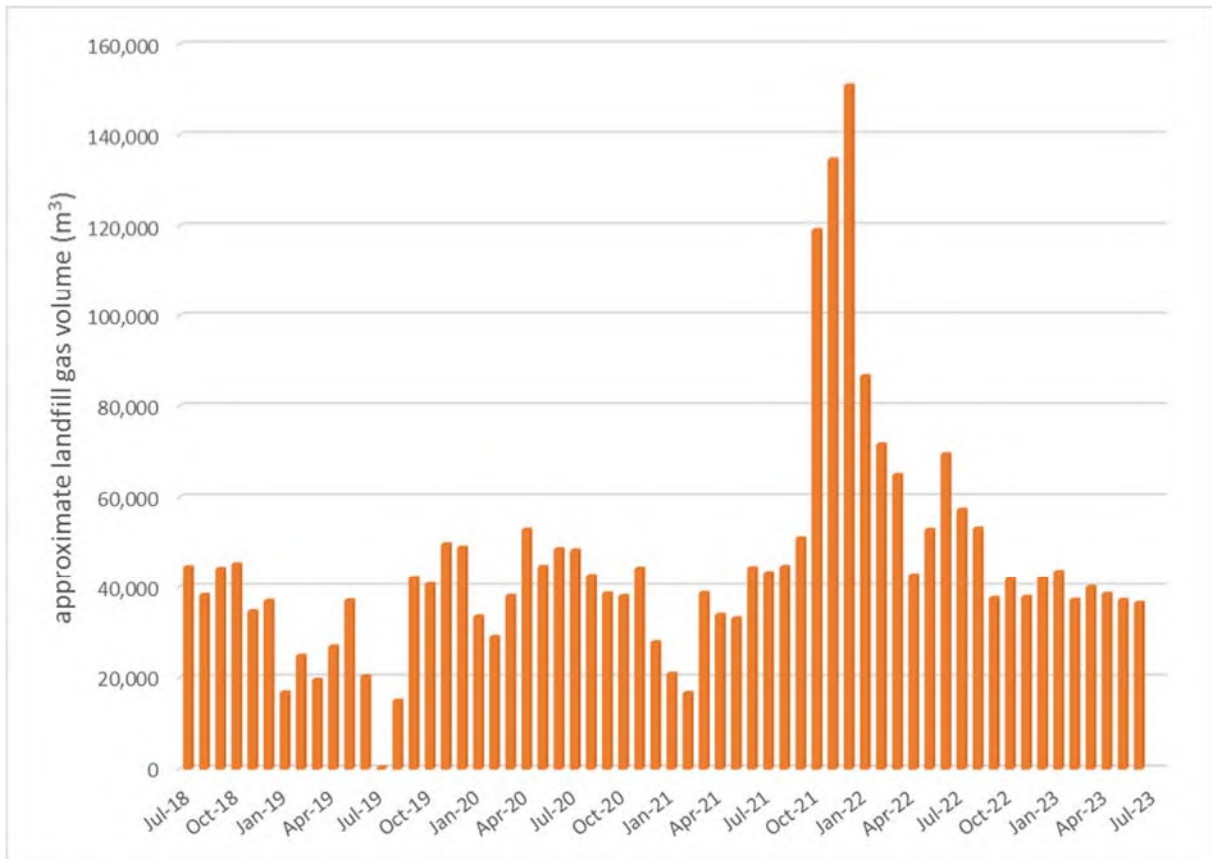


Figure 26 Monthly landfill gas flow volumes flared, July 2018 to date

Table 15 Annual landfill gas quantities treated by the flare

Monitoring year	Annual landfill gas volume (m ³)	Approximate annual methane volume (m ³)
2018-2019	386,959	-
2019-2020	440,758	-
2020-2021	424,684	190,244
2021-2022	929,606	372,646
2022-2023	499,931	226,846

This holistic view of the flare monitoring data confirms that whilst the methane concentration of the feedstock gas was significantly lower in the 2021-2022 year, due to the increased gas flow rate to the flare, a greater volume of methane was extracted and treated by the flare during that year. This indicates that it was likely that, during the 2021-2022 year, there was an ingress of air into the system that was diluting the landfill gas. During the year under review, there was a reduction in both the landfill gas volume and the methane volume when compared to the previous year. The annual volumes were however higher than in the 2020-2021 year, indicating that the ingress of air into the system was avoided during the year under review. Although there has been no significant decrease in landfill gas generation since site closure, peak production may have occurred in the 2021-2022 year.

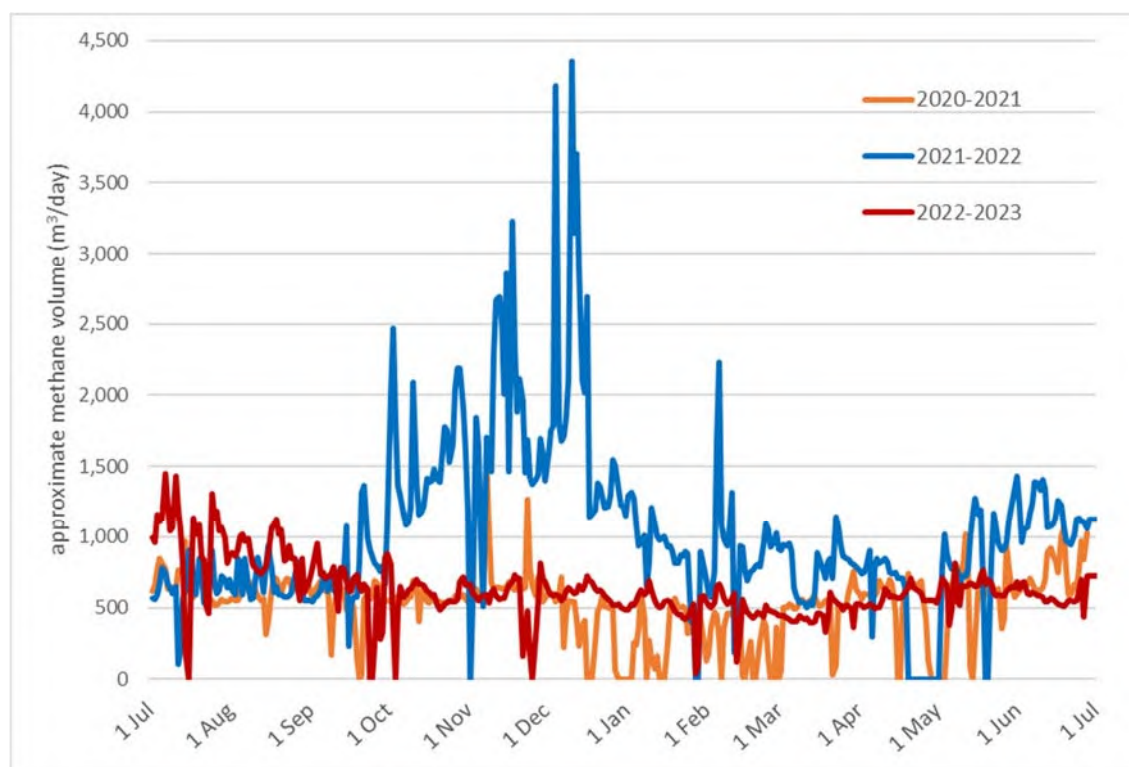


Figure 27 Approximate daily methane volumes flared in the 2020-2021 to 2022-2023 years

The hydrogen sulphide concentration of the feedstock gas was measured on four occasions during the year under review with the results given in Table 16, along with previous year's results for comparison.

Table 16 Feedstock gas hydrogen sulphide concentration test results

Date	Hydrogen sulphide concentration (ppm)
31 October 2019	25.0
12 December 2019	11.0
21 January 2020	2.0
10 August 2020	10
8 September 2020	10
30 June 2021	0
21 July 2021	0
11 November 2021	0
1 February 2022	0
5 April 2022	0
30 September 2022	13.0
1 December 2022	6.0
16 February 2023	5.0
17 May 2023	5.0
31 May 2023	10.0
29 June 2023	5.0

Condition 3

When the CRLMP was updated in June 2018 it included a general description of the flare, and outlined that the flare's performance is continually monitored by means of real time electronic data. The plan also clarified that NPDC, with the support of external contractors, have responsibility for the maintenance, inspections and calibration of the flare. The CRLMP referenced a separate specific NPDC procedure for the management and operation of the flare that must be adhered to, which has also been received by Council. It has previously been confirmed that the CRLMP covers the required procedures, schedules and records keeping information. The latest iteration of the CRLMP retains this information.

A flare fault log was provided for the year under review. This showed that there was a total of 18 non-operational days in the 2022-2023 year (15 shutdowns in total). This is 4.9% of the year (compared to 7.4% in the 2021-2022 year). The length of the outages varied and were affected by the response being possible only during normal working hours. The shortest outage was just under 5 hours and was to provide for the annual service of the flare system. The longest outage was 2 days and 10 hours days. A summary of the monthly non-operational hours is given in Table 17 and Figure 28.

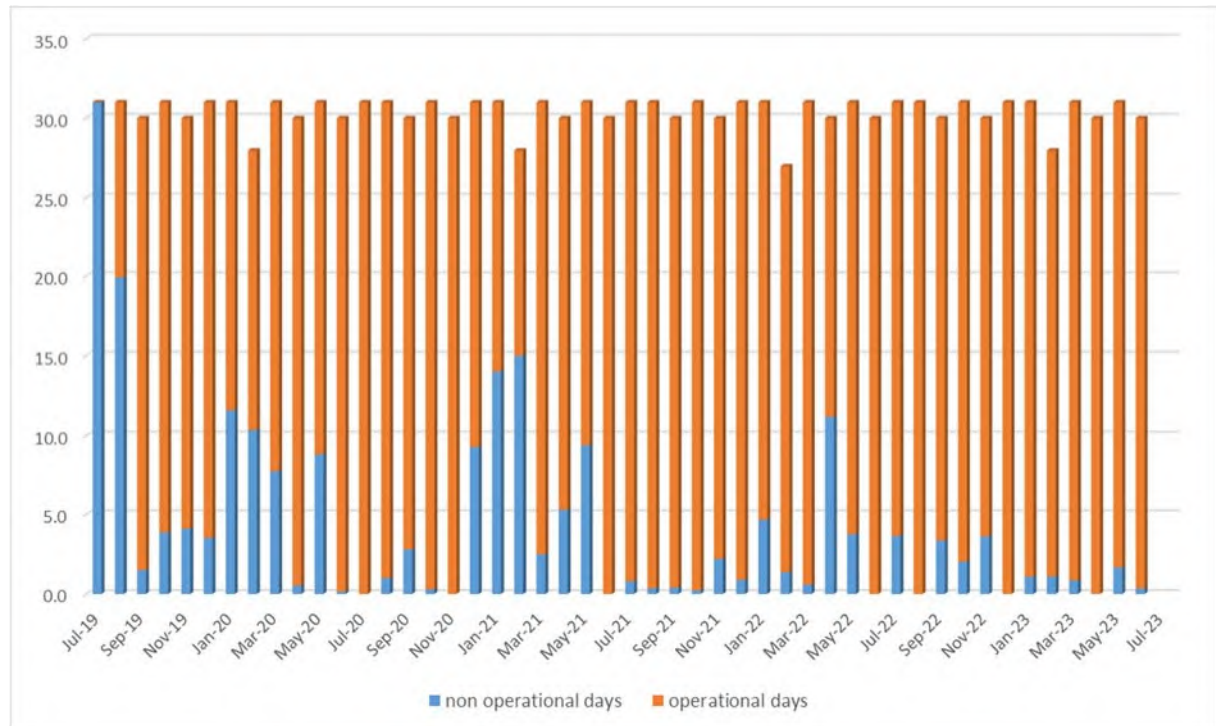


Figure 28 Monthly operational/non-operational days for the Colson Road landfill gas flare for the 2019 to date

Table 17 Statistical summary of the Colson Road landfill gas flare non-operational hours for the year under review

Month	No. shutdowns	Monthly total non- operational time
Jul-22	3	3.7 days
Aug-22	0	-
Sep-22	2	3.4 days
Oct-22	1	2 days
Nov-22	3	3.6 days
Dec-22	0	-

Month	No. shutdowns	Monthly total non- operational time
Jan-23	1	1.1 days
Feb-23	1	1.1 days
Mar-23	1	20.8 hours
Apr-23	0	-
May-23	2	1.7 days
Jun-23	1	8.25 hours
Totals	15	17.7 days

2.5.2 Results of receiving environment monitoring

2.5.2.1 Deposition gauging

Many industries emit dust from various sources during operational periods. In order to assess the effects of the emitted dust, industries have been monitored using deposition gauges.

Deposition gauges are basically buckets elevated on a stand to about 1.6 m. The buckets have a solution in them to ensure that any dust that settles out of the air is not re-suspended by wind.

Gauges are placed around the site and within the surrounding community. The gauges were left in place for a period of two weeks to a month, on two separate occasions.

The rate of dust fall is calculated by dividing the weight of insoluble material collected (g) by the cross-sectional area of the gauge (m²) and the number of days over which the sample was collected. The units of measurement are g/m²/day.

Guideline values used by the Council for dust deposition are 4 g/m²/30 days or 0.13 g/m²/day deposited matter. Consideration is given to the location of the industry and the sensitivity of the surrounding community, when assessing results against these values.

Material from the gauges was analysed for solid particulates, the results of which are presented in Table 18.

Table 18 Air deposition monitoring results for January and February 2023

Site code	Site description	Particulate g/m ² /day	
		21 days up to 27 January 2023	21 days up to 17 February 2023
AIR001603	At entrance to landfill	0.03	0.04
AIR001604	Adjacent to Manganaha Stream, behind rose nursery	0.07	0.06
AIR001608	124 Egmont Road, paddock boundary, west of house	0.01	0.03
AIR001613	Grass lawn, behind work shed	0.05	0.04
AIR001622	At rear of RSPCA building	0.08	b
AIR001623	Behind 194 Egmont Road	0.17^a	0.02

Key: a sample comments indicate organic contamination – gauge contents were green
b result discarded dead bird in deposition gauge

All results of both surveys were below guideline deposition values of 0.13 g/m²/day, with the exception of AIR001623 at the time of the January survey. It is noted that this gauge contained organic contamination following this survey, so the exceedance of the guideline value is unlikely to be as a result of dust deposition from site activities.

2.5.2.2 Ambient suspended particulate and landfill gas component monitoring

Ambient monitoring of suspended particulates (dust) and/or landfill gas components were scheduled to be undertaken under dry weather conditions on three occasions during the year under review at seven monitoring locations on, and in the neighbourhood of, the landfill. The particulate (dust) monitoring was scheduled to be undertaken using a DustTrak, and the methane and H₂S monitoring was scheduled to be undertaken using a MultiRae. These surveys were not completed during the year under review due to equipment failure. It is noted that there were no air quality issues found at the time of the inspections and there were no complaints received by Council.

2.6 Incidents, investigations, and interventions

The monitoring programme for the year was based on what was considered to be an appropriate level of monitoring, review of data, and liaison with NPDC. During the year matters may arise which require additional activity by the Council, for example provision of advice and information, or investigation of potential or actual causes of non-compliance or failure to maintain good practices. A pro-active approach, that in the first instance avoids issues occurring, is favoured.

For all significant compliance issues, as well as complaints from the public, the Council maintains a database record. The record includes events where the individual/organisation concerned has itself notified the Council. Details of any investigation and corrective action taken are recorded for non-compliant events.

Complaints may be alleged to be associated with a particular site. If there is potentially an issue of legal liability, the Council must be able to prove by investigation that the identified individual/organisation is indeed the source of the incident (or that the allegation cannot be proven).

Table 19 and Table 23 give outlines of any incidents recorded, additional investigations, or interventions required by the Council in relation to NPDC's activities during the 2022-2023 period. The tables present a summary of all events that required further investigation or intervention regardless of whether these were found to be compliant or not. Table 19 summarises the matters first recorded in the 2022-2023 monitoring year, and Table 23 summarises any on-going matters from previous years. Where additional investigations were undertaken, they are reported in more detail following the tables.

Table 19 Summary table for incidents, investigations, and interventions commencing in the year under review

Date	Details	Compliant (Y/N)	Enforcement Action Taken?	Outcome
20 Aug 2022	Self-notification was received from New Plymouth District Council that the leachate pond from the closed Colson Road Landfill had overflowed and was discharging, due a severe rainfall event	Y	N	Investigation found that the leachate pond has breached and discharged into the Puremu Stream. A resource consent is held which allows overflow from the ponds to the stream during such events. NPDC continued to monitor the overflow and undertake receiving environment sampling to confirm consent compliance. The results of this sampling are presented below

20 August 2022

Self-notification was received concerning an overflow from the Leachate Pond at Colson Road Landfill in New Plymouth. The overflow occurred from 20 August to 30 August 2022. It was considered that this event complied with the conditions of the consent and no enforcement action was necessary.

NPDC are planning to consider longer term mitigation measures, and the effects associated with overflows, as part of the consent replacement process. Investigations to increase the leachate pond storage capacity are being considered to minimise the frequency and duration of such discharges in the future. NPDC have undertaken to keep the Council informed of proposals to increase the pond capacity once solutions and designs have been considered.

- f. During the overflow event NPDC followed the IRP for the site, including sampling and additional short term mitigation measures. NPDC provided a report that outlined that:
- NPDC had been closely monitoring the levels of the leachate pond since the day before the overflow;
 - the valve that controls the release of leachate from Stage 3 to the leachate pond and pump station was closed. This was closed prior to the overflow occurring as part of the mitigation measures to reduce the flow into the leachate pond and the impact of any potential overflows over the weekend;
 - the Stage 3 valve being closed reduces the contaminant concentration levels by only having the older stages of the leachate entering the pond while the discharge was occurring. This is because the Stage 3 leachate is known to contain higher concentrations of contaminants than the Stage 1 & 2 leachate;
 - while the Stage 3 leachate valve is closed there is increasing risk that a large volume of water becomes stored within the landfill itself. This can potentially increase the risk of instability. Short periods of leachate storage can occur, however longer term storage of increasing volumes would need to be managed. Therefore NPDC continued to monitor the pond levels in order to minimise the pond overflow whilst ensuring the stability of Stage 3;
 - NPDC reviewed the weather and pond levels again each day with the aim to open the Stage 3 valve under stringent daily controls;
 - while the leachate pond continued to discharge NPDC completed sampling every second day as per the contingency plan;
 - the use of sucker trucks to reduce the pond volume was considered and discounted, as the rate at which the truck could remove liquid from the pond would have had little impact on the amount of leachate discharged.

Results for the sampling carried out by NPDC are presented in Table 20, Table 21 and Table 22.

Table 20 Results of samples collected by NPDC during leachate overflow, 20 and 22 August 2022

Analysis	Units	20 August 2022		22 August 2022		Consent limits 2370-3	Consent limits 4619-1
		Leachate overflow	Puremu Stream u/s SPCA culvert	Leachate overflow	Puremu Stream u/s SPCA culvert		
pH	pH units	6.8	7.0	6.8	7.0	6.5 – 8.5	6.5 – 8.5
Alkalinity	g/m ³	360	28	221	67	-	-
Ammoniacal nitrogen	g/m ³	40	0.73	23	0.88	2.5	2
Suspended solids	g/m ³	91	11	-	17	-	-

Analysis	Units	20 August 2022		22 August 2022		Consent limits 2370-3	Consent limits 4619-1
		Leachate overflow	Puremu Stream u/s SPCA culvert	Leachate overflow	Puremu Stream u/s SPCA culvert		
CBOD5	gO ₂ /m ³ CBOD ⁵	-	-	<3	<3	-	-
Conductivity	mS/m	93	17.0	64.1	17.2	-	-
Chloride	g/m ³	56	24	53	25	-	-
Nitrite as 'N'	g/m ³	<0.20	<0.20	<0.20	<0.20	5	0.06
Nitrate as 'N'	g/m ³	0.32	0.97	0.31	0.91	100	10
Sulphate	g/m ³	12	9.69	9.82	8.54	500	-
Cadmium	ppm soluble	<0.005	<0.005	<0.005	<0.005	0.01 total	0.05 total
Chromium	ppm soluble	<0.005	<0.005	<0.005	<0.005	0.1 total	1.0 total
Copper	ppm soluble	<0.005	<0.005	<0.005	<0.005	0.2 total	0.5 total
Iron	ppm soluble	43	1.89	20.8	2.75	5.0 total	10 total
Lead	ppm soluble	<0.05	<0.05	<0.05	<0.05	0.1 total	0.1 total
Manganese	ppm soluble	4.3	0.38	3.2	0.3	1.0 total	5.0 total
Nickel	ppm soluble	<0.005	<0.005	<0.005	<0.005	-	-
Zinc	ppm soluble	<0.05	<0.05	<0.05	<0.05	2.0 total	2.4 total

Table 21 Results of samples collected by NPDC during leachate overflow, 24 and 26 August 2022

Analysis	Units	24 August 2022		26 August 2022			Consent limits 2370-3	Consent limits 4619-1
		Leachate overflow	Puremu Stream u/s SPCA culvert	Puremu U/S leachate overflow	Leachate overflow	PMU000110		
pH	pH units	6.6	6.8	6.8	7	7	6.5 – 8.5	6.5 – 8.5
Alkalinity	g/m ³	368	34	30	343	39	-	-
Ammoniacal nitrogen	g/m ³	37	1.3	0.9	35	1.8	2.5	2
Suspended solids	g/m ³	13	<5	<5	21	<5	-	-
CBOD5	gO ₂ /m ³ CBOD ⁵	<3	<3	<3	<3	<3	-	-
Conductivity	mS/m	90	9.8	18	88.9	20.9	-	-
Chloride	g/m ³	61	29	28	63	25	-	-
Nitrite as 'N'	g/m ³	<0.02	<0.02	<0.02	<0.02	<0.02	5	0.06
Nitrate as 'N'	g/m ³	0.28	1.09	1.0	33	0.94	100	10
Sulphate	g/m ³	8.84	9.42	8.61	7.68	8.6	500	-

Analysis	Units	24 August 2022		26 August 2022			Consent limits 2370-3	Consent limits 4619-1
		Leachate overflow	Puremu Stream u/s SPCA culvert	Puremu U/S leachate overflow	Leachate overflow	PMU000110		
Cadmium	ppm soluble	<0.005	<0.005	<0.005	<0.005	<0.005	0.01 total	0.05 total
Chromium	ppm soluble	<0.005	<0.005	<0.005	<0.005	<0.005	0.1 total	1.0 total
Copper	ppm soluble	<0.005	<0.005	<0.005	<0.005	<0.005	0.2 total	0.5 total
Iron	ppm soluble	31.8	1.34	1.29	27.6	1.54	5.0 total	10 total
Lead	ppm soluble	<0.05	<0.05	<0.05	<0.05	<0.05	0.1 total	0.1 total
Manganese	ppm soluble	4.85	0.27	0.19	5.00	0.32	1.0 total	5.0 total
Nickel	ppm soluble	<0.005	<0.005	<0.005	<0.005	<0.005	-	-
Zinc	ppm soluble	<0.05	<0.05	<0.05	<0.05	<0.05	2.0 total	2.4 total

Table 22 Results of samples collected by NPDC during leachate overflow, 29 August 2022

Analysis	Units	29 August 2022		Consent limits 2370-3	Consent limits 4619-1
		Leachate overflow	Puremu Stream u/s SPCA culvert		
pH	pH units	6.6	7.1	6.5 – 8.5	6.5 – 8.5
Alkalinity	g/m ³	318	40	-	-
Ammoniacal nitrogen	g/m ³	29	1.8	2.5	2
Suspended solids	g/m ³	11	<5	-	-
CBOD5	gO ₂ /m ³ CBOD ⁵	<3	<3	-	-
Conductivity	mS/m	78	22	-	-
Chloride	g/m ³	64	32	-	-
Nitrite as 'N'	g/m ³	<0.02	<0.02	5	0.06
Nitrate as 'N'	g/m ³	0.28	1.05	100	10
Sulphate	g/m ³	6.72	9.06	500	-
Cadmium	ppm soluble	<0.005	<0.005	0.01 total	0.05 total
Chromium	ppm soluble	<0.005	<0.005	0.1 total	1.0 total
Copper	ppm soluble	<0.005	<0.005	0.2 total	0.5 total
Iron	ppm soluble	32	1.6	5.0 total	10 total
Lead	ppm soluble	<0.05	<0.05	0.1 total	0.1 total

Analysis	Units	29 August 2022		Consent limits 2370-3	Consent limits 4619-1
		Leachate overflow	Puremu Stream u/s SPCA culvert		
Manganese	ppm soluble	5.07	0.37	1.0 total	5.0 total
Nickel	ppm soluble	<0.005	<0.005	-	-
Zinc	ppm soluble	<0.05	<0.05	2.0 total	2.4 total

Table 23 Summary table for on-going incidents, investigations, and interventions

Date	Details	Compliant (Y/N)	Enforcement Action Taken?	Outcome
23-May-2018	During routine monitoring it was found that capping, compaction and vegetative cover in the Stage 2 area was insufficient to comply with resource consent conditions	N	Abatement notice issued	Cap depth investigations by NPDC during the year under review found that the cap depth was insufficient in some areas. A remediation plan was developed and presented to the Council. Abatement Notice, EAC-22506, was issued requiring that works be undertaken to ensure compliance by 15 March 2020. Extension of due date to 14 March 2021 approved to allow prioritisation of Stage 3 capping. Further extension to 14 March 2022 approved in 2020-2021 year. Further extension to 1 May 2023 granted due to delays caused by the wet weather in December and February and the impacts of COVID on the contracts staff availability, combined with the additional 0.76 ha outside the landfill footprint that was found to be in need of remedial works. The abatement notice was found to have been complied with at inspection on 28 April 2023
21-Jul-2020	During analysis of data it was found that three groundwater monitoring bores were compromised and also that there were some changes in parameters in the groundwater in the under liner drain that likely exceeded the maximum natural background variation. It was also found that the "trigger values" that should have been included in the sites monitoring plan had not been identified and documented	N	Abatement notices issued	NPDC have undertaken further investigation and have confirmed that non-compliant discharges are occurring. Compromised groundwater bores were replaced. Change to consent granted with respect to the bores that are required to be maintained. Abatement Notice EAC-23543 was complied with. Investigations continued during the year under review. CRLMP updated in August 2021. Draft CRLMP yet to be finalised. Early consent replacement to be sought to ensure compliance with Abatement Notice EAC-23544 initially by 30 April 2021. The date on the abatement notice was extended to 31 January 2024

30 May 2018

During the 2021-2022 year, the earthworks consent was granted and required silt controls installed so that progress could be made on the mitigation works on the Stage 2 cap. During the preparatory work in this area it was found that refuse had previously been disposed of outside the known footprint of Stage 2, under

the access road. This was added to the area for planned mitigation works which is identified as Access Road area C in Figure 29. This resulted in a further extension to the timeframe on the abatement notice. During the 2021-2022 year, Stage 2: Area A was completed. The remaining area was completed during the year under review and the abatement notice was found to have been complied with at inspection on 28 April 2023.

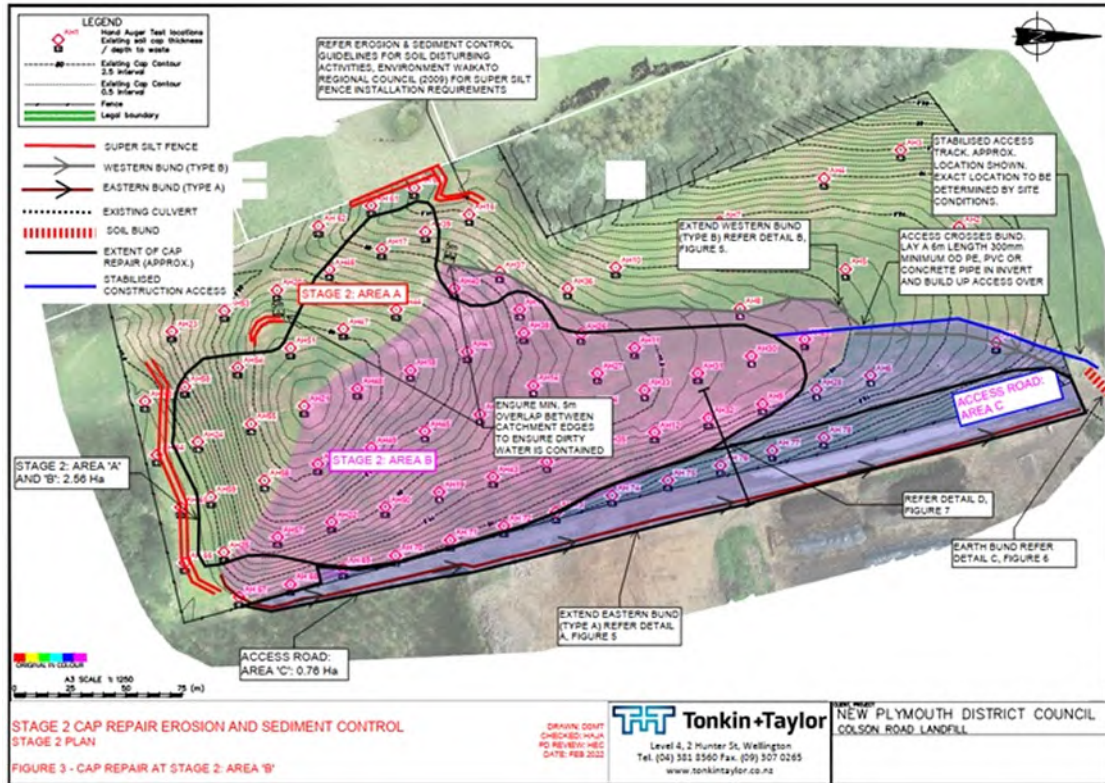


Figure 29 Phasing of Stage 2 cap repair

21 July 2020

During the 2019-2020 year NPDC commissioned a consultant to conduct a two part desk top study to:

- assess the Stage 3 under liner drainage, and if contamination is confirmed, identify possible sources of that groundwater contamination; and
- consider the effect of any contamination and options to address it.

The consultant's report covering the first part of this investigation was provided to Council following a meeting on 21 July 2020. This report identified that there were a significant number of parameters that either exceeded the calculated natural maximum values and/or showed increasing trends over time, suggesting that contamination of the groundwater collected by the under liner drain had occurred between 2008 and 2019. It was identified that the contamination appeared to originate from the landfill and that this was most likely to be as a result of leakage of leachate to the under liner drain. Further investigation was recommended to determine:

- The direction of groundwater flow by carrying out a hydrogeological assessment to determine if groundwater may be flowing offsite or whether it is being captured in the under liner drain;
- Whether the contamination noted in the groundwater discharged through the under liner drainage system or potentially migrating offsite in groundwater may be affecting the downstream/down gradient groundwater and surface water quality (including trend analysis on groundwater and surface water quality data); and

- Options to address groundwater and surface water quality impacts if necessary.

Special conditions 5 and 6 of Consent 4621-1 states

3. *THAT should groundwater quality be significantly affected by activities or processes associated with the landfill or composting, then the consent holder shall implement such measures as are necessary to remedy or mitigate and if practicable to prevent the continuation of any effect upon quality of the groundwater. 'Significantly affected' for the purposes of this condition is defined as a change greater than the maximum natural variation in any parameter for water in any piezometer, bore, or spring, and the criteria for this shall be set out in the monitoring programme under condition 6.*
4. *THAT the consent holder shall provide, maintain and comply with a monitoring programme, to the satisfaction of the Chief Executive, Taranaki Regional Council, setting out details of monitoring to be carried out and containing guidelines for the determination of whether contamination is occurring, the initial plan to be provided at least three months prior to the exercise of this consent.*

It was found that the maximum natural variations had not been provided to Council. It was also noted that a similar requirement to set out guidelines for the determination of whether contamination is occurring in the surface waters that is contained in condition 5 of Consent 4619-1 had also not been complied with.

A letter of explanation was requested and received in the 2021-2022 year.

The response was accompanied by a preliminary summary of the Part 2 investigation. The preliminary summary indicated that there may be some limited impact on groundwater quality beyond the underliner drain, however while some parameters have demonstrated increasing trends, these are only small increases and the contaminant levels remain below relevant water quality standards. The preliminary summary also indicated that where surface water samples have exceeded the water quality guidelines these were not considered to be the result of contaminants in the discharge from the underliner drain. Maximum limits for calculated natural variation had also been determined. NPDC proposed that, considering the change in landfill activity following closure in October 2020, it is logical to review monitoring requirements and align groundwater bore locations with proposed monitoring to ensure the programme is fit for purpose. As NPDC is committed to ensuring compliance with resource consent requirements, the following timeline was proposed to the identified matters and any further recommendations from Part 2 and 3 of the investigation:

Table 24 Proposed timeline for resolution of consent non compliances and progress to date

Action	Timeframe	Comment/Update
Complete Part 2 investigation	18 September 2020	Completed
Complete Part 3 investigation	20 November 2020	Completed
Confirm new bore locations with Council	December 2020	Completed
Apply for variation to Consent 4621-1 in relation to the specified bores that are listed as needing to be maintained in condition 1	February 2021	Completed
Install new bores (subject to supplier availability and weather)	By 30 April 2021	Bores installed and two sets of samples collected. Abatement notice compliance achieved

Action	Timeframe	Comment/Update
Lodge renewal applications for the landfill consents that are due to expire in June 2025	2022	Revised schedule was provided to ensure that there is sufficient information available to inform the assessment of environmental effects and to allow pre-application consultation. An abatement notice (EAC-23544) has been issued with the works now required to be undertaken by 31 January 2024

Following receipt of the Part 2 report two abatement notices were issued, one of which was complied with in the 2020-2021 year.

Initially, Abatement Notice EAC-23544 that was issued following the provision of the Part 2 investigation required that works be undertaken to comply with conditions 5 and 6 of Consent 4621-1 and condition 5 of Consent 4619-1 by 30 April 2021.

In summary, the Part 2 investigation found that groundwater and surface water analytical results indicated a likely release of contaminants associated with the landfill beneath the Stage 3 liner, and although the under liner drain provides a preferential pathway, some groundwater may bypass the drain and travel north-northwest with the natural flow of groundwater. Analysis of the groundwater data suggested that the impact on groundwater quality down gradient of Stage 3 is relatively minor and unlikely to present a human health risk. Parameters that do exhibit an increasing trend are generally at low levels and do not indicate imminent or near-future exceedances of the drinking water standards. It was concluded that discharges from Stage 3 were not significantly degrading water quality in either down gradient groundwater or the downstream Puremu Stream. On this basis, immediate remedial action was not considered necessary. The consultant recommended ongoing monitoring and assessment to determine any future need for remedial action.

The Part 3 investigation focused on developing a site-wide monitoring programme that considers the site conditions characterised in Part 1 and is protective of the receptors identified in Part 2. Additionally, NPDC requested an assessment of suitable locations for monitoring wells to replace the three damaged wells. The scope of work was as follows:

Developing a recommended site-wide monitoring programme comprising:

- appropriate monitoring locations for surface water and groundwater that provide suitable coverage;
- a targeted list of analytes based on historical concentrations and typical leachate constituents;
- appropriate response procedures in the event of an exceedance of a trigger value and/or consent limit;
- a stepped reduction in monitoring frequency, in accordance with Ministry for the Environment (MfE) guidance.
- identifying appropriate consent limits for surface water and groundwater, that are protective of likely receptors and based on published guidelines, and suitable "point of compliance" monitoring locations;
- developing trigger values (TV) for surface water and groundwater to provide advance warning of contamination that may lead to a consent limit being exceeded in the future at the point of compliance;
- recommending suitable locations for replacement monitoring wells (installed in the 2020-2021 year).

It was determined that compliance with the abatement notice could not be achieved until there was a change to condition 5, as this condition contains a specific definition of "significantly affected" as being a change greater than the maximum natural variation. It is noted that this differs from the definition of a "significant effect" in the RMA. So, whilst this condition was deemed appropriate and agreed to by both NPDC and the submitters at the time the discharge application was processed, this may not be appropriate for the re-issued consents. This would be determined during the processing of the application for the replacement consents.

During the review of the Part 3 report by Council officers, there were a number of discussions focusing on ensuring that any monitoring programme addressed the necessary matters to ensure sufficient information was available to support an assessment of environmental effects to support a consent application, as previously outlined in Section 1.4.1.

Council agreed that the timing of the early application to replace the landfill consents could be revised to ensure that there is sufficient information available to inform the assessment of environmental effects and to allow pre-application consultation. A schedule was provided by NPDC that outlined the timeframes for the various activities that would need to be undertaken during the preparation to lodge the consent replacement application. Based on this schedule a request was made to extend the deadline on the abatement notice to 30 April 2023. This was approved by Council. Whilst NPDC continued to progress the work outlined in the schedule, a further request to extend the deadline on the abatement notice to 31 January 2024 had been approved at the time of writing this report.

3 Discussion

3.1 Discussion of site performance

At inspection the site was found to be well managed. Minor matters were noted at times in relation to ensuring that localised silt and sediment controls were maintained. The site was adequately stabilised at the end of the construction season.

During the year under review progress was made on:

- the capping of Stage 2 in order to comply with the abatement notice issued in February 2019. This abatement notice was found to have been complied with at inspection on 28 April 2023;
- the capping on Stage 3; and
- the works required in order to comply with the abatement notice issued in September 2020, that is, working towards an early application for replacement of the consents for the site.

There were no new substantiated non compliances found in the 2022-2023 year. Additional investigations were undertaken following notification that there was a discharge of leachate to the Puremu Stream from 20 August to 30 August 2022. However, the IRP was followed and it was determined that the event was provided for by the consents held for the site.

The diversion of the pipework under Stage 1B that allowed the discharge of leachate, contaminated stormwater and groundwater to the small silt ponds, resulted in a marked improvement in the quality of the stormwater discharged from these ponds (STW001006). During the year under review samples collected from this monitoring location contained had ammoniacal nitrogen concentrations that were similar to those found in samples from the uppermost receiving water site (PMU000100). The concentrations of ammoniacal nitrogen and manganese were well below their respective historical medians at the time of the 2022-2023 surveys. There did however, continue to be elevated levels of manganese that were above their respective historical medians of 6.8 and 2.6 g/m³ in the large silt pond discharge, and the downstream receiving waters of the Puremu Stream, as discussed in Section 3.2.

The operation of the flare was well managed during the year under review. There were few non-operational periods and consent conditions were complied with. This included ensuring that the operating temperature of 750°C was maintained to ensure a destruction efficiency of at least 0.9 (90%).

3.2 Environmental effects of exercise of consents

In the 2020-2021 year, an evaluation of NPDC's monitoring of the water quality of the groundwater captured by the under liner drain confirmed that there were a significant number of parameters that either exceeded the calculated natural maximum values and/or showed increasing trends over time. It was concluded that the findings suggested that:

- contamination of the groundwater collected by the under liner drain had occurred between 2008 and 2019; and
- it was likely to be as a result of damage caused to the liner by the slumping of the refuse within the landfill in July 2005.

The results to the end of the 2019-2020 year showed that the groundwater beneath the landfill has been "significantly affected" as defined by the conditions of the consent, with the trends of increasing contaminant concentrations continuing during the year in question.

The data for the under liner drain analysis performed by NPDC in the 2019-2023 years indicated that:

- whilst the trend of increasing conductivity and potentially chloride have continued (from annual averages of 44.3 mS/m and 56.6 g/m³ in the 2019-2020 year to annual averages of 49.2 mS/m and 63.5 g/m³ respectively in the 2022-2023 year);
- total alkalinity and ammoniacal nitrogen concentrations may have stabilised or reduced in recent years (from annual averages of 126 g/m³ CaCO₃ and 3.1 g/m³ in the 2019-2020 year to annual averages of 120 g/m³ CaCO₃ and 2.7 g/m³ respectively in the 2022-2023 year).

The under liner drainage results, and the monitoring of the wider groundwater and surface water in the vicinity of the landfill indicate that, although some of the indicator parameters have increased in some of the bores, this would not currently be considered a significant adverse effect as defined in the RMA. In the short term, it is considered that the groundwater and surface water monitoring related to this site should be continued in this expanded form to ensure that a clear conceptual model of the site, and the potential effects of discharges from the site, can be better understood.

Council's chemical sampling and biological monitoring found that there was no evidence of contaminants entering the Manganaha Stream from the landfill, and that there were no significant adverse effects occurring in the Puremu Stream during the period under review. There were also no direct discharges found to the Manganaha Stream during the year under review.

The faecal coliform concentrations exceeded the limit on Consent 4619-1 at the time of the rain event monitoring survey and one of the dry weather surveys, the counts were also elevated upstream of the site, and therefore these were not considered to be substantiated non-compliances.

In the 2015 to 2021 years, the total manganese concentration at the compliance point for Consent 2370-3 was exceeded in five out of 12 samples. In contrast, no exceedances occurred during the year under review. The historical results for the more bioavailable dissolved manganese are shown in Figure 30.

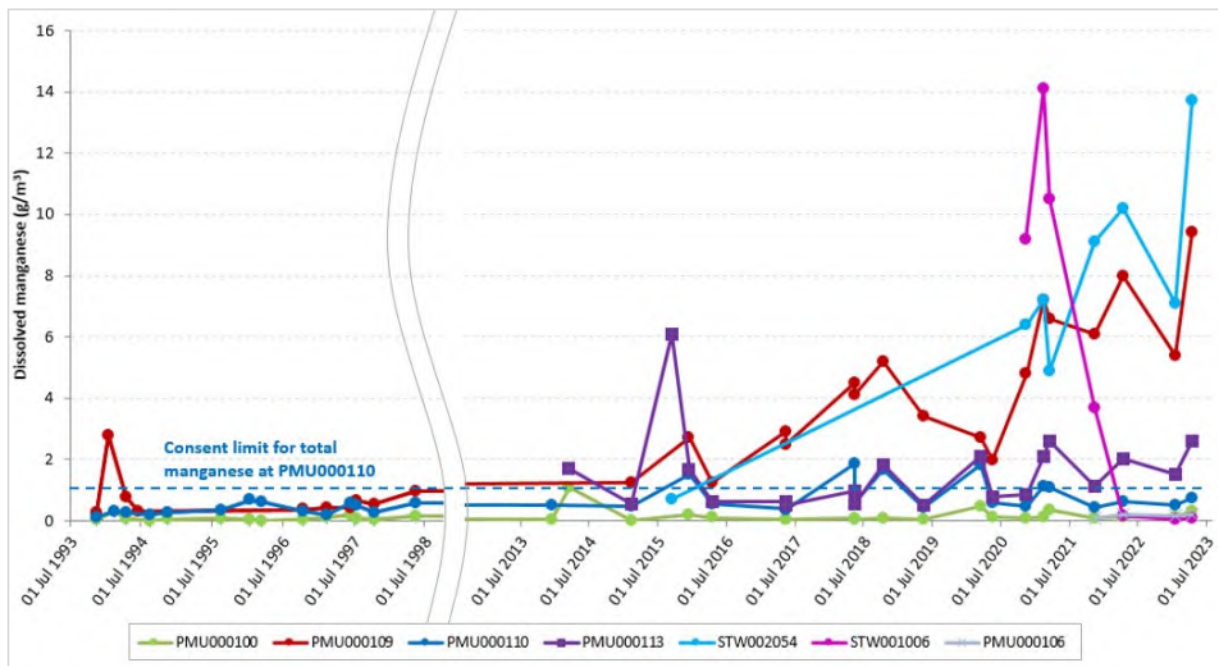


Figure 30 Dissolved manganese concentrations in the wetland polishing area and Puremu Stream

In order to assist data interpretation monitoring of the manganese concentration in the discharges from the stormwater ponds commenced in the 2020-2021 year. The marked reduction in manganese concentration in the discharge from the western silt ponds following the diversion of contaminated groundwater/leachate from down gradient of Stage 1B is clearly evident (from a maximum of 14.1 g/m³ in February 2021 to less than 0.1 g/m³ in the samples collected during the 2022-2023 year). The trend of increasing manganese

concentration at sites PMU000109 is continuing, with a new maximum concentration of 9.4 g/m³ found in the sample from this monitoring location on 18 April; 2023. This monitoring site is inside the mixing zone and therefore not a compliance issue. However, this suggest that NPDC may want to investigate this further to ensure continued consent compliance at site PMU000113.

There was one leachate overflow to the Puremu Stream during the year under review. The consent held by NPDC provides for minor amounts of leachate to be discharged to the stream, with a contingency plan (the IRP) in place for such events. The IRP was followed and sample results provided by NPDC showed that the consent parameter limits on the receiving water were complied with during the overflow event. Therefore, although this was investigated, it was not considered to be an unauthorised discharge. NPDC is investigation options to reduce the potential for overflows to occur.

Groundwater sampling found that the groundwater in the vicinity of the site was such that no remedial actions, as contained in special condition 5 of Consent 4621-1, were required at this time. Overall, there is no evidence of significant adverse environmental effects from contamination either in the groundwater or in the under liner drainage system. However there are increasing trends in conductivity, chloride and/or nitrate/nitrite nitrogen observed in some of the bores, and in conductivity and chloride in the under liner drainage (groundwater and springs from under the landfill). Monitoring will continue to ensure that remedial actions will be undertaken, if required, as per the conditions of Consent 4621-1.

The ambient deposited particulate levels obtained during the year under review were below the Council guideline level for dust deposition in residential areas (0.13 g/m²/day), with the exception of one of the gauges during one of the surveys. It was noted that the gauge contained organic contamination, so the exceedance is unlikely to be attributable to site activities.

The flare was initially installed as a mitigation measure due to the number of odour complaints that were being received by Council in relation to discharges to air from the site. The flare was operational for just under 95% of the time during the year under review. There were no odour complaints received during the 2022-2023 monitoring year. Based on the analysis of the approximate volume of methane directed to the flare in the three years from 2019-2020 to 2022-2023, although there has been no significant reduction in the annual volume of landfill gas produced since site closure, it is possible that this peaked in the 2021-2022 year.

3.3 Evaluation of performance

A tabular summary of the consent holder's compliance record for the year under review is set out in Table 25 to Table 34.

Table 25 Summary of performance for diversion Consent 0226-1

Purpose: To divert the Puremu Stream in the Waiwhakaiho catchment by culverting stream to provide road access to refuse tip		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Comply with Water Right 226	Site inspections	Yes
2. Pipe laid in accordance with manufacturer's specifications	Site inspection	Yes
Overall assessment of environmental performance and compliance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

Table 26 Summary of performance for contaminated stormwater and leachate Consent 2370-3

Purpose: To discharge up to 1,000 m³/day [5 L/s] of leachate and contaminated stormwater from the closed section, Area A, of Colson Road municipal landfill to groundwater in the vicinity of and into the Puremu Stream a tributary of the Mangaone Stream in the Waiwhakaiho catchment		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Best practice to be adopted	Site inspection	No. Compliance with the abatement notice relating to the cap depth and contouring was only achieved in May 2023
2. Consent undertaken in accordance with information supplied in the application	Site inspection and review of documentation on file	No. As per condition 1
3. Discharge not alter colour, clarity or pH of Puremu Stream	Site inspection and water sampling	Yes
4. No significant adverse effects on aquatic life	Site inspection, sampling and biomonitoring	Yes
5. Monitor surface water on/near the site	Undertaken by the Council via site specific monitoring programme, inspections and water sampling	Yes
6. Satisfy all requirements of the District Plan of the New Plymouth District Council	N/A	N/A
7. Management and site contingency plan	Site inspection and review of documentation on file	No. As per condition 1
8. Maintain a landfill capping barrier and vegetative cover	Site inspection (Stages 1 & 2)	No. As per condition 1
9. Area is closed and managed in accordance with the management plan	Site inspection and review of documentation on file	No. As per condition 1
10. Maintain drains, ponds and contours on site to minimise unwanted water movement and ponding on site	Site inspections	No. As per condition 1
11. No cleaning or hosing out of refuse vehicles on site	Site inspections	Yes
12. The mixing zone extends downstream from the culvert outlet to 2 m above the confluence between the Puremu Stream and its tributary	N/A	N/A

Purpose: To discharge up to 1,000 m³/day [5 L/s] of leachate and contaminated stormwater from the closed section, Area A, of Colson Road municipal landfill to groundwater in the vicinity of and into the Puremu Stream a tributary of the Mangaone Stream in the Waiwhakaiho catchment		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
13. Discharge shall not alter the Puremu Stream in the way of films, foams or suspended materials, change colour or visibility, objectionable odour, harm aquatic or farm animals, or increase temperature by more than 2.0°C	Site inspection and water sampling	Yes
14. Discharge shall not alter the water quality of the Puremu Stream below the given criteria	Site inspection and water sampling	Yes
15. Discharge shall not reduce the concentration of dissolved oxygen below 5 mg/litre	Site inspection and water sampling	Yes
16. Discharge shall not render the Puremu Stream unfit for stock consumption	Site inspection and water sampling	Yes
17. Satisfactorily maintain and manage the leachate collection and treatment systems	Site inspection	Yes
18. Optional review provision re environmental effects	No further opportunities to review prior to expiry	N/A
Overall assessment of environmental performance and compliance in respect of this consent Overall assessment of administrative performance in respect of this consent		Improvement required Improvement required

N/A = not applicable

Table 27 Summary of performance for Consent 4619-1 treated stormwater and leachate discharge

Purpose: To discharge up to 675 L/s of treated stormwater and minor amounts of leachate from areas B1, B2, C1 and C2 of the Colson Road landfill to groundwater in the vicinity of and into the Puremu Stream a tributary of the Mangaone Stream in the Waiwhakaiho catchment		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Water quality in the Manganaha Stream shall not be changed	Site inspection and water sampling	Yes

Purpose: To discharge up to 675 L/s of treated stormwater and minor amounts of leachate from areas B1, B2, C1 and C2 of the Colson Road landfill to groundwater in the vicinity of and into the Puremu Stream a tributary of the Mangaone Stream in the Waiwhakaiho catchment		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
2. Water quality of the Puremu Stream shall not exceed the given criteria	Site inspection and water sampling	Yes
3. Discharge shall not alter the Puremu Stream in the way of films, foams or suspended materials, change colour or visibility, objectionable odour, harm aquatic or farm animals, or increase temperature by more than 2.0°C	Site inspection and water sampling	Yes
4. Operate according to the 'New Plymouth District Council Colson Road Landfill: Landfill Management Plan July 1994', or subsequent versions with no less environmental protection. Plan to be updated at not greater than yearly intervals	Site inspection and review of documentation on file. Draft plan on file dated August 2021	No. Further update to plan required following work to identify criteria (see condition 5). Draft plan still to be finalised
5. Maintain and comply with a monitoring programme. Programme to include guidelines for determining if contamination is occurring	Site inspection and review of documentation on file. Monitoring programme included in the Colson Road Landfill Management Plan. Draft plan on file dated August 2021	No. Further update to plan required following work to identify criteria (see condition 5). Draft plan still to be finalised
6. Consent will lapse after six years if not exercised	Consent exercised	N/A
7. Optional review provision re environmental effects	No further opportunity for review prior to consent expiry	N/A
Overall assessment of environmental performance and compliance in respect of this consent		Good
Overall assessment of administrative performance in respect of this consent		Improvement required

N/A = not applicable

Table 28 Summary of performance for uncontaminated stormwater Consent 4620-1

Purpose: To discharge up to 675 L/s of uncontaminated stormwater from areas B1, B2, C1 and C2 of the Colson Road landfill into the Puremu Stream a tributary of the Mangaone Stream in the Waiwhakaiho catchment		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Water quality in the Manganaha Stream shall not be altered	Inspections and water sampling	Yes
2. Discharge to have pH 6.5-8.5, maximum suspended solids 100 g/m ³ , and maximum ammoniacal nitrogen 0.5 g/m ³ as nitrogen	Inspections and water sampling	Not able to assess as discharge is mixed with that of Consent 4619
3. No leachate discharge	Sampling and inspection	Yes
4. Channels shall minimise erosion	Site inspections	Yes
5. Channels shall minimise instability of the surrounding land	Site inspections	Yes
6. Repair land eroded/made unstable due to construction/maintenance	Site inspections	Yes
7. Notification of any proposal which may affect areas contributing runoff	Site inspections and liaison with consent holder	Yes
8. Discharge shall not alter the Puremu Stream in the way of films, foams or suspended materials, change colour or visibility, objectionable odour, harm aquatic or farm animals, or increase temperature by more than 2.0°C	Site inspections and water sampling	Not able to assess as discharge is mixed with that of Consent 4619
9. No excavation or landfilling if any runoff to Manganaha Stream will contain suspended solids or any other contaminant	Site inspection and water sampling	Yes
10. Operate according to the 'New Plymouth District Council Colson Road Landfill: Landfill Management Plan July 1994', or subsequent versions with no less environmental protection. Plan to be updated at not greater than yearly intervals	Site inspection and review of documentation on file. Draft CRLMP on file dated August 2021	No. Draft plan still to be finalised

Purpose: To discharge up to 675 L/s of uncontaminated stormwater from areas B1, B2, C1 and C2 of the Colson Road landfill into the Puremu Stream a tributary of the Mangaone Stream in the Waiwhakaiho catchment		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
11. Maintain and comply with a monitoring programme that contains guidelines for determining if contamination is occurring	Site inspection and review of documentation on file. Monitoring programme included in the Colson Road Landfill Management Plan. Draft CRLMP on file dated August 2021	No. Further update to plan required following work to identify criteria. Draft plan still to be finalised
12. Consent will lapse after six years if not exercised	N/A, consent has been exercised	N/A
13. Optional review provision re environmental effects	No further opportunity for review prior to consent expiry	N/A
Overall assessment of environmental performance and compliance in respect of this consent		Good
Overall assessment of administrative performance in respect of this consent		Improvement required

N/A = not applicable

Table 29 Summary of performance for discharge to land Consent 4621-1.1

Purpose: To discharge up to 500 tonnes/day of contaminants onto and into land in areas B1, C1 and C2 at the Colson Road landfill		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Install and maintain network of groundwater monitoring bores to determine changes in groundwater quality. New bores to be installed to NZS 4411:2001 at locations and depths approved by Council	Sampling and liaison with consent holder	Yes
2. Prevent surface runoff into the Manganaha Stream from any area used or previously used for the deposition of refuse	Site inspection and water sampling	Yes
3. All drainage channels, bunds and contouring is complete prior to use	N/A	N/A
4. Civil works relating to construction of Stage 3 be certified by a registered engineer prior to use	N/A	N/A

Purpose: To discharge up to 500 tonnes/day of contaminants onto and into land in areas B1, C1 and C2 at the Colson Road landfill		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
5. Mitigate if spring and/or groundwater "significantly affected". Defined as increase above natural variation. Criteria to be set out in plan produced under condition 6	Changes observed in spring water that are above natural variation. Monitoring and investigations continuing. Although under liner groundwater drainage is "significantly affected". No significant environmental effects found, so no mitigation required at this stage.	No ⁴ . Early consent replacement to be sought to ensure compliance with Abatement Notice EAC-23544 by 31 January 2024
6. Maintain and comply with a monitoring programme	Review of documentation on file. Monitoring programme is provided in CRLMP	No. Guidelines for determining if contamination is occurring were not identified. Work has commenced to rectify this. To be provided in next plan update. Draft plan still to be finalised
7. Operate according to the 'New Plymouth District Council Colson Road Landfill: Landfill Management Plan July 1994', or subsequent versions with no less environmental protection. Plan to be updated at not greater than yearly intervals	Site inspection and review of documentation on file. Draft CRLMP on file dated August 2021	No. Further update to plan required following work to identify criteria (see conditions 5 and 6). To be provided in next plan update. Draft plan still to be finalised
8. Disposal of waste shall comply with the 'criteria for calculating landfill potentials' and the 'Draft Health and Environment Guidelines for selected Timber Treatment Chemicals'	Not assessed during period under review	N/A
9. Consent will lapse after six years if not exercised	N/A, consent exercised	N/A

⁴ Although this consent condition has not been complied with, Council will not undertake any further enforcement action whilst the Abatement Notice is in effect, so long as steps are being undertaken to comply with the notice and the scale of the environmental effects do not increase significantly. Extensions to the deadline on the Abatement Notice may be approved by Council if there are sufficient extenuating circumstances.

Purpose: To discharge up to 500 tonnes/day of contaminants onto and into land in areas B1, C1 and C2 at the Colson Road landfill		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
10. Optional review provision re environmental effects	No further opportunity for review prior to consent expiry	N/A
Overall assessment of environmental performance and compliance in respect of this consent		Good
Overall assessment of administrative performance in respect of this consent		Improvement required

N/A = not applicable

Table 30 Summary of performance for composting air Consent 4622-1

Purpose: To discharge emissions into the air from composting and ancillary activities at the Colson Road landfill		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Minimise adverse effects on the environment	Site inspection. No compost on site therefore consent not exercised during the year under review	N/A
2. No offensive odours		N/A
3. No adverse ecological effects on any ecosystem		N/A
4. Materials accepted for composting comply with the 'Assessment of Discharges to Air' July 1994 and the New Plymouth District Council Colson Road Landfill Management Plan July 1994		N/A
5. All composting to occur at least 300 m from any dwelling existing as of 21 March 1999		N/A
6. Composting piles must consist of no less than 95% plant-derived material		N/A
7. Composting to occur on a trial basis until the consent is approved or reviewed on receipt of a full report		N/A
8. Consent will lapse after six years if not exercised	N/A, consent has previously been exercised	N/A
9. Optional review provision re environmental effects	No further opportunity for review prior to consent expiry	N/A

Purpose: To discharge emissions into the air from composting and ancillary activities at the Colson Road landfill		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
Overall assessment of environmental performance and compliance in respect of this consent		N/A
Overall assessment of administrative performance in respect of this consent		N/A

N/A = not applicable

Table 31 Summary of performance for air discharge Consent 4779-1.1

Purpose: To discharge contaminants into the air associated with operation of the municipal landfill at Colson Road, New Plymouth		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Provision of temperature and feedstock composition data within three months of landfill gas flare operation commencing and annually thereafter	Data provided	Yes
2. Provision of as built plans and suppliers operating instructions within three months of operation of the flare	Data provided	Yes
3. First revision of the landfill management plan following the installation of the flare is to include specified aspects of the flares operation, monitoring, maintenance and record keeping	CRLMP revised, and is supported by a separate flare specific document (SW-G-20)	Yes
4. Best practicable option (BPO) to prevent or minimise adverse effects on the environment	Site inspection, air surveys, complaint response	Yes
5. No offensive odours or dust or noxious concentrations	Site inspection, air surveys, complaint response	Yes
6. No burning on site with the exception of the flare	Site inspection, complaint response	Yes
7. No adverse ecological effects on any ecosystem	Inspections of site and neighbouring areas	Yes
8. No venting untreated landfill gases within 200 m of any boundary	Site inspection	Yes

Purpose: To discharge contaminants into the air associated with operation of the municipal landfill at Colson Road, New Plymouth		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
9. Comply with 'Air Discharge Consent Application Supporting Documentation' and according to the 'New Plymouth District Council Colson Road Landfill: Landfill Management Plan July 1994, or subsequent versions with no less environmental protection. Plan to be updated at not greater than yearly intervals	Site inspection and review of documentation on file. Draft CRLMP on file dated August 2021	Yes
10. Council approval to be sought in the event of alterations at the site or to site operations	Site inspections and liaison with consent holder and site operator	Yes
11. Meet once a year to discuss any matter relating to the consent	Landfill liaison committee meetings	Yes
12. Provide a report within a year on the collection, extraction, venting and combustion of landfill gas	Review of documentation on file. Compliance previously achieved, as report had been received	Yes
13. Optional review provision re environmental effects	No further opportunity for review prior to consent expiry	N/A
14. Optional review provision re landfill gas combustion	No further opportunity for review prior to consent expiry	N/A
Overall assessment of environmental performance and compliance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

N/A = Not applicable

Table 32 Summary of performance for earthworks stormwater Consent 6177-2.0

Purpose: To discharge stormwater and sediment from earthworks associated with the capping of Stage 3 of the Colson Road landfill onto land and into an unnamed tributary of the Puremu Stream		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Adopt best practice	Site inspection and liaison with content holder	Yes
2. Site to be managed in accordance with a certified Soil Erosion and Sediment Control Plan (ESCP)	Site inspection	Yes

Purpose: To discharge stormwater and sediment from earthworks associated with the capping of Stage 3 of the Colson Road landfill onto land and into an unnamed tributary of the Puremu Stream		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
3. Principal to be appointed and contact details to be provided to Council	Check of Council records	Yes
4. Pre-construction site meeting to be held	Site inspections	Yes
5. Up to date copy of certified ESCP to be kept available on site	Site inspection. The current ESCP is dated July 2022, however, it was resubmitted in November 2022 with minor amendments	Yes
6. As built certification statements to be provided before commencement of bulk earthworks	Site inspection and check of Council records	Yes
7. Discharge of untreated stormwater from unstabilised areas prohibited	Site inspection	Yes
8. Suspended solids concentration in combined discharge from the SRP (pond 1) not to exceed 100 gm ⁻³	Visual assessment at site inspection, sampling by Council and NPDC	Yes
9. As far as practicable, all clean water run-off from stabilised surfaces including catchment areas above the site must be separated from the exposed areas via a stabilised system to prevent erosion	Review and certification of ESCP, as built certification statements and site inspection	Yes
10. Progressive stabilisation to a specified standard to be completed as soon as practically possible and within a period not exceeding five days after completion of any phase authorised by this resource consent	Site inspection and liaison with consent holder	Yes
11. Further to condition 10, any area that is not to be worked within a 21 day period is to be stabilised	Site inspection and liaison with consent holder	No. Insufficient stabilisation at July and August 2022 inspections
12. Stabilisation must be undertaken by providing adequate measures to achieve immediate stabilisation. Requirement to maintain this until vegetation is sufficiently established to prevent erosion and prevent sediment from entering any water body	Site inspection	Yes
13. Kaitiaki Forum to be established to enable Ngāti Tawhirikura Hapū and Te Kotahitanga o Te Atiawa Trust to provide advice to the consent holder on specified matters. A copy of the forum collaboration	Liaison with the consent holder and review of Council records.	Yes

Purpose: To discharge stormwater and sediment from earthworks associated with the capping of Stage 3 of the Colson Road landfill onto land and into an unnamed tributary of the Puremu Stream		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
agreement shall be provided to the Council		
14. Except as provided for in condition 15 no earthworks shall occur, and all exposed areas shall be stabilised between 1 May and 1 October	Site inspection and liaison with consent holder	No. Insufficient stabilisation at July and August 2022 inspections
15. Maintenance work may be undertaken between 1 May and 1 October, in accordance with the ESCP required by condition 2, or an activity specific ESCP that has been certified by the Council	Site inspection, review of ESCP and liaison with consent holder	Yes
16. Provision for review	Review at June 2022 opportunity not required. No further opportunities prior to June 2025 expiry	N/A
17. Additional opportunity for review within 3 months of any ESCP update if it is determined that the 100 gm ⁻³ suspended solids limit does not adequately avoid or mitigate adverse effects	Review of ESCP and monitoring information. Reviews not required following updates to the plan.	N/A
Overall assessment of environmental performance and compliance in respect of this consent		Good
Overall assessment of administrative performance in respect of this consent		Good

Table 33 Summary of performance for earthworks stormwater Consent 10804-1.0

Purpose: To discharge stormwater and sediment arising from earthworks into an unnamed tributary of the Puremu Stream		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Consent to be exercised in accordance with application	Site inspection	Yes
2. Adopt best practice	Site inspection	Yes
3. Notification of commencement required	Review of Council records	Yes
4. Site and stormwater to be managed as per NPDC Soil Erosion and Sediment Control Plan	Site inspection	Yes

Purpose: To discharge stormwater and sediment arising from earthworks into an unnamed tributary of the Puremu Stream		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
5. Requirements of Condition 4 and control measures cease only after suitable stabilisation has been established	Site inspection. Control measures still in place	Yes
6. On site meeting required prior to exercise of consent	Previously complied with	N/A
7. Sediment control measures to be installed prior to works other than construction of sediment control pond	Site inspection	Yes
8. Stabilisation required as soon as is practicable, but no longer than 6 month post completion of earthworks	No areas needing final stabilisation as earthworks not completed	N/A
9. Suspended solids limit of 100 g/m ³ from "large silt pond"	Visual assessment at inspection and sampling	Yes
10. Provision for review	Next opportunity to review June 2022	N/A
Overall assessment of environmental performance and compliance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

N/A = Not applicable

Table 34 Summary of performance for earthworks stormwater Consent 10912-1.0

Purpose: To discharge stormwater and sediment from earthworks associated with the capping of Stage 2 of the Colson Road landfill onto land and into an unnamed tributary of the Puremu Stream		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Area of soil disturbance limited to 2.6 ha	Site inspection and liaison with content holder	Yes
2. Adopt best practice	Site inspection and liaison with content holder	Yes
3. Site to be managed in accordance with a certified Soil Erosion and Sediment Control Plan (ESCP)	Site inspection	Yes
4. Principal to be appointed and contact details to be provided to Council	Check of Council records	Yes
5. Pre-construction site meeting to be held	Site inspections	Yes
6. Up to date copy of certified ESCP to be kept available on site	Site inspection	Yes

Purpose: To discharge stormwater and sediment from earthworks associated with the capping of Stage 2 of the Colson Road landfill onto land and into an unnamed tributary of the Puremu Stream		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
7. As built certification statements to be provided before commencement of bulk earthworks	Site inspection and check of Council records	Yes
8. Discharge of untreated stormwater from unstabilised areas prohibited	Site inspection	Yes
9. Suspended solids concentration in combined discharges from the site not to exceed 100 gm ⁻³ . Assessed at point of discharge to neighbouring properties or at discharge point from SRP (pond 1)	Visual assessment at site inspection, sampling by Council and NPDC	Yes
10. As far as practicable, all clean water run-off from stabilised surfaces including catchment areas above the site must be separated from the exposed areas via a stabilised system to prevent erosion	Review and certification of ESCP, as built certification statements and site inspection	Yes
11. The outlet valve on the "borrow area" SRP must be kept closed, and may only be opened once there is only dead storage remaining in SRP (Pond 1)	Site inspection	Yes
12. Progressive stabilisation to a specified standard to be completed as soon as practically possible and within a period not exceeding five days after completion of any phase authorised by this resource consent	Site inspection and liaison with consent holder	Yes
13. Further to condition 12, any area that is not to be worked within a 21 day period is to be stabilised	Site inspection and liaison with consent holder	Yes
14. Stabilisation must be undertaken by providing adequate measures to achieve immediate stabilisation. Requirement to maintain this until vegetation is sufficiently established to prevent erosion and prevent sediment from entering any water body	Site inspection	Yes
15. Kaitiaki Forum to be established to enable Ngāti Tawhirikura Hapū and Te Kotahitanga o Te Atiawa Trust to provide advice to the consent holder on specified matters. A copy of the forum collaboration agreement shall be provided to the Council	Liaison with the consent holder and review of Council records.	Yes

Purpose: To discharge stormwater and sediment from earthworks associated with the capping of Stage 2 of the Colson Road landfill onto land and into an unnamed tributary of the Puremu Stream		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
16. Except as provided for in condition 15 no earthworks shall occur, and all exposed areas shall be stabilised between 1 May and 1 October	Site inspection and liaison with consent holder	Yes
17. Provision for review	Review at June 2022 opportunity not required. No further opportunities prior to June 2025 expiry	N/A
18. Additional opportunity for review within 3 months of any ESCP update if it is determined that the 100 gm ⁻³ suspended solids limit does not adequately avoid or mitigate adverse effects	Review of ESCP and monitoring information. Reviews not required following updates to the plan.	N/A
Overall assessment of environmental performance and compliance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

Overall, NPDC demonstrated a good level of environmental performance, however an improvement is required in their administrative performance and compliance with the resource consents as defined in Appendix II. In relation to the on-going non-compliance of the cap on Stage 2, the abatement notice in place requiring the works to be undertaken by 1 May 2023 was complied with. The abatement notice issued during the 2020-2021 year in relation to water quality changes in the groundwater in the under liner drain, and monitoring plan requirements are still in effect with works required to be undertaken by 31 January 2024. There appear to be some legacy issues that are affecting the water quality in the receiving environment. These have resulted in some consent non-compliances, however, they have not resulted in any non-compliant results in the surface waters or had significant adverse effects on the receiving waters during the year under review. Monitoring requirements have been revised and evaluation is on-going. Additional investigations are also being undertaken by NPDC, when required, to ensure that any appropriate interventions are implemented where improvements are required.

Table 35 Evaluation of environmental performance over time

Year	Consent no	High	Good	Improvement required	Poor	N/A
2012-13	0226-1, 2370-3, 4622-1, 4779-1	4	-	-	-	
	6177-1	-	1	-	-	
	4619-1, 4620-1, 4621-1	-	-	3	-	
2013-14	0226-1, 4779-1, 4620-1, 4619-1, 2370-3, 4622-1, 4621-1, 6177-1	8	-	-	-	
2014-15	0226-1, 2370-3, 4619-1, 4622-1	4	-	-	-	
	4620-1, 4621-1, 6177-1	-	3	-	-	
	4779-1	-	-	1	-	

Year	Consent no	High	Good	Improvement required	Poor	N/A
2015-16	0226-1, 4622-1, 6177-1	3	-	-	-	
	2370-3	-	1	-	-	
	4619-1, 4620-1, 4621-1	-	-	3	-	
	4779-1	-	-	-	1	
2016-17	0226-1, 4620-1, 4621-1, 4622-1, 6177-1	5	-	-	-	
	2370-3, 4619-1, 4779-1 (4779-1.1)	-	3	-	-	
2017-18	0226-1, 4622-1, 4779-1, 6177-1	4	-	-	-	
	4619-1, 4620-1, 4621-1	-	3	-	-	
	2370-3	-	-	1	-	
2018-19	0226-1, 4620-1, 4622-1, 4779-1.1, 6177-1, 10804-1.0	6	-	-	-	
	4619-1, 4621-1	-	2	-	-	
	2370-3	-	-	1	-	
2019-20	0226-1, 4622-1, 4779-1.1, 6177-1, 10804-1.0	5	-	-	-	
	4619-1, 4621-1	-	2	-	-	
	2370-3	-	-	1	-	
	4620-1	-	-	-	-	1
2020-21	0226-1, 4622-1, 4779-1.1, 6177-1, 10804-1.0	6	-	-	-	-
	4620-1, 4621-1	-	2	-	-	-
	2370-3, 4619-1	-	-	2	-	-
2021-22	0226-1, 4622-1, 4779-1.1, 10912-1.0	4	-	-	-	-
	4619-1, 4620-1, 4621-1, 6177, 10804-1.0	-	5	-	-	-
	2370-3	-	-	1	-	-
2022-23	0226-1, 4779-1.1, 6177-2, 10804-1.0, 10912-1.0	5	-	-	-	-
	4619-1, 4620-1, 4621-1	-	3	-	-	-
	2370-3	-	-	1	-	-
	4622-1	-	-	-	-	1
Totals		54	25	14	1	2

3.4 Recommendations from the 2021-2022 Annual Report

In the 2021-2022 Annual Report, it was recommended:

1. THAT in the first instance, monitoring of consented activities at the Colson Road regional landfill in the 2022-2023 year be amended from that of 2021-2022 by the replacement of biomonitoring site PMU000104 with site PMU000106.
2. THAT should there be issues with environmental or administrative performance in 2022-2023, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.
3. THAT the NPDC continue with the review of the Colson Road Management Plan to ensure that the criteria for determining whether any contamination is occurring that is greater than the natural variation be included along with measure to be taken remedy, mitigate or if practicable prevent continuation of any effect on the groundwater quality as per conditions 5, 6 and 7 of Consent 4621-1, and guidelines for determining contamination is occurring as per condition 5 of Consent 4619-1, are included in the plan.
4. THAT NPDC replace bore GND0572.
5. THAT NPDC establish and confirm clear dimensional conceptual model for the entire site, in terms of potential sources of contaminants from leachate, flow paths and receptors, in order to inform the consent renewal applications.

Recommendation one was implemented by Council. Implementation of recommendation two was not required. Recommendation four was implemented by Council. NPDC is continuing towards implementation of recommendations three and five.

3.5 Alterations to monitoring programmes for 2023-2024

In designing and implementing the monitoring programmes for air/water discharges in the region, the Council has taken into account:

- the extent of information already made available through monitoring or other means to date;
- its relevance under the RMA;
- the Council's obligations to monitor consented activities and their effects under the RMA;
- the record of administrative and environmental performances of the consent holder; and
- reporting to the regional community.

The Council also takes into account the scope of assessments required at the time of renewal of permits, and the need to maintain a sound understanding of industrial processes within Taranaki exercising resource consents.

It is proposed that for 2023-2024, the programme remains unchanged.

It should be noted that the proposed programme represents a reasonable and risk-based level of monitoring for the site in question. The Council reserves the right to subsequently adjust the programme from that initially prepared, should the need arise if potential or actual non-compliance is determined at any time during 2023-2024.

3.6 Exercise of optional review of consent

Resource Consent 10804-1.0 provides for an optional review of the consent in June 2024. Condition 10 allows the Council to review the consent for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which

were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Based on the results of monitoring in the year under review, and in previous years as set out in earlier annual compliance monitoring reports, it is considered that there are no grounds that require a review to be pursued.

4 Recommendations

1. THAT in the first instance, monitoring of consented activities at the Colson Road regional landfill in the 2023-2024 year continue at the same level as in 2022-2023.
2. THAT should there be issues with environmental or administrative performance in 2023-2024, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.
3. THAT the option for a review of Resource Consent 10804-1.0 in June 2024, as set out in condition 10 of the consent, not be exercised, on the grounds that the conditions of the consent are adequate to deal with the potential effects of this activity.
4. THAT NPDC establish and confirm a clear dimensional conceptual model for the entire site, in terms of potential sources of contaminants from leachate, flow paths and receptors, in order to inform the applications for the replacement consents.
5. THAT NPDC continue with the more comprehensive characterisation of contaminants present in the Stage 1 & 2 leachate, the Stage 3 leachate and the under liner drain on two of the regular sampling occasions per year.
6. THAT the NPDC continue with the review of the CRLMP to ensure that the criteria for determining whether any contamination is occurring that is greater than the natural variation be included along with measure to be taken remedy, mitigate or if practicable prevent continuation of any effect on the groundwater quality as per conditions 5, 6 and 7 of Consent 4621-1, and guidelines for determining contamination is occurring as per condition 5 of Consent 4619-1, are included in the plan.

Glossary of common terms and abbreviations

The following abbreviations and terms may be used within this report:

Al*	Aluminium.
As*	Arsenic.
Biomonitoring	Assessing the health of the environment using aquatic organisms.
BOD	Biochemical oxygen demand. A measure of the presence of degradable organic matter, taking into account the biological conversion of ammonia to nitrate.
BODF	Biochemical oxygen demand of a filtered sample.
Bund	A wall around a tank to contain its contents in the case of a leak.
CBOD	Carbonaceous biochemical oxygen demand. A measure of the presence of degradable organic matter, excluding the biological conversion of ammonia to nitrate.
cfu	Colony forming units. A measure of the concentration of bacteria usually expressed as per 100 millilitre sample.
COD	Chemical oxygen demand. A measure of the oxygen required to oxidise all matter in a sample by chemical reaction.
Condy	Conductivity, an indication of the level of dissolved salts in a sample, usually measured at 25°C and expressed in mS/m.
Cu*	Copper.
DO	Dissolved oxygen.
DRP	Dissolved reactive phosphorus.
<i>E.coli</i>	<i>Escherichia coli</i> , an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre sample.
Ent	Enterococci, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre of sample.
F	Fluoride.
FC	Faecal coliforms, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre sample.
fresh	Elevated flow in a stream, such as after heavy rainfall.
g/m ³	Grams per cubic metre, and equivalent to milligrams per litre (mg/L). In water, this is also equivalent to parts per million (ppm), but the same does not apply to gaseous mixtures.
HDPE	High density polyethylene.
L/s	Litres per second.
Incident	An event that is alleged or is found to have occurred that may have actual or potential environmental consequences or may involve non-compliance with a consent or rule in

	a regional plan. Registration of an incident by the Council does not automatically mean such an outcome had actually occurred.
Intervention	Action/s taken by Council to instruct or direct actions be taken to avoid or reduce the likelihood of an incident occurring.
Investigation	Action taken by Council to establish what were the circumstances/events surrounding an incident including any allegations of an incident.
Incident register	The incident register contains a list of events recorded by the Council on the basis that they may have the potential or actual environmental consequences that may represent a breach of a consent or provision in a Regional Plan.
LFG	Landfill gas, a complex mixture of gaseous components produced as the refuse decomposes.
MCI	Macroinvertebrate community index; a numerical indication of the state of biological life in a stream that takes into account the sensitivity of the taxa present to organic pollution in stony habitats.
mS/m	Millisiemens per metre.
Mixing zone	The zone below a discharge point where the discharge is not fully mixed with the receiving environment. For a stream, conventionally taken as a length equivalent to 7 times the width of the stream at the discharge point.
Moxie	A large earthmoving truck.
NH ₄	Ammonium, normally expressed in terms of the mass of nitrogen (N).
NH ₃	Unionised ammonia, normally expressed in terms of the mass of nitrogen (N).
NLG	Neighbourhood liaison group.
NO ₃	Nitrate, normally expressed in terms of the mass of nitrogen (N).
NTU	Nephelometric Turbidity Unit, a measure of the turbidity of water.
O&G	Oil and grease, defined as anything that will dissolve into a particular organic solvent (e.g. hexane). May include both animal material (fats) and mineral matter (hydrocarbons).
Pb*	Lead.
pH	A numerical system for measuring acidity in solutions, with 7 as neutral. Numbers lower than 7 are increasingly acidic and higher than 7 are increasingly alkaline. The scale is logarithmic i.e. a change of 1 represents a ten-fold change in strength. For example, a pH of 4 is ten times more acidic than a pH of 5.
Physicochemical	Measurement of both physical properties (e.g. temperature, clarity, density) and chemical determinants (e.g. metals and nutrients) to characterise the state of an environment.
PM ₁₀	Relatively fine airborne particles (less than 10 micrometre diameter).
ppm	Parts per million on a volume/volume basis.
Resource consent	Refer Section 87 of the RMA. Resource consents include land use consents (refer Sections 9 and 13 of the RMA), coastal permits (Sections 12, 14 and 15), water permits (Section 14) and discharge permits (Section 15).

RMA	<i>Resource Management Act 1991</i> and subsequent amendments.
SS	Suspended solids.
SVOC	Semi-volatile organic compounds
Temp	Temperature, measured in °C (degrees Celsius).
Turb	Turbidity, expressed in NTU.
Zn*	Zinc.

*an abbreviation for a metal or other analyte may be followed by the letters 'As', to denote the amount of metal recoverable in acidic conditions. This is taken as indicating the total amount of metal that might be solubilised under extreme environmental conditions. The abbreviation may alternatively be followed by the letter 'D', denoting the amount of the metal present in dissolved form rather than in particulate or solid form.

For further information on analytical methods, contact a Manager within the Environmental Quality department.

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Appendix I

Resource consents held by NPDC

(For a copy of the signed resource consent
please contact the TRC Consents department)

Water abstraction permits

Section 14 of the RMA stipulates that no person may take, use, dam or divert any water, unless the activity is expressly allowed for by a resource consent or a rule in a regional plan, or it falls within some particular categories set out in Section 14. Permits authorising the abstraction of water are issued by the Council under Section 87(d) of the RMA.

Water discharge permits

Section 15(1)(a) of the RMA stipulates that no person may discharge any contaminant into water, unless the activity is expressly allowed for by a resource consent or a rule in a regional plan, or by national regulations. Permits authorising discharges to water are issued by the Council under Section 87(e) of the RMA.

Air discharge permits

Section 15(1)(c) of the RMA stipulates that no person may discharge any contaminant from any industrial or trade premises into air, unless the activity is expressly allowed for by a resource consent, a rule in a regional plan, or by national regulations. Permits authorising discharges to air are issued by the Council under Section 87(e) of the RMA.

Discharges of wastes to land

Sections 15(1)(b) and (d) of the RMA stipulate that no person may discharge any contaminant onto land if it may then enter water, or from any industrial or trade premises onto land under any circumstances, unless the activity is expressly allowed for by a resource consent, a rule in a regional plan, or by national regulations. Permits authorising the discharge of wastes to land are issued by the Council under Section 87(e) of the RMA.

Land use permits

Section 13(1)(a) of the RMA stipulates that no person may in relation to the bed of any lake or river use, erect, reconstruct, place, alter, extend, remove, or demolish any structure or part of any structure in, on, under, or over the bed, unless the activity is expressly allowed for by a resource consent, a rule in a regional plan, or by national regulations. Land use permits are issued by the Council under Section 87(a) of the RMA.

Coastal permits

Section 12(1)(b) of the RMA stipulates that no person may erect, reconstruct, place, alter, extend, remove, or demolish any structure that is fixed in, on, under, or over any foreshore or seabed, unless the activity is expressly allowed for by a resource consent, a rule in a regional plan, or by national regulations. Coastal permits are issued by the Council under Section 87(c) of the RMA.

TRK750226

WATER PERMIT

**Pursuant to the RESOURCE MANAGEMENT ACT 1991
a resource consent is hereby granted by the
Taranaki Regional Council**

Name of: NEW PLYMOUTH DISTRICT COUNCIL
Consent Holder: PRIVATE BAG 2025 NEW PLYMOUTH

Change to
Conditions Date: 8 October 1986

CONDITIONS OF CONSENT

Consent Granted: TO DIVERT THE PUREMU STREAM A TRIBUTARY OF THE MANGAONE STREAM IN THE WAIWHAKAIHO CATCHMENT BY CULVERTING THE STREAM TO PROVIDE ROAD ACCESS TO THE REFUSE TIP AT OR ABOUT GR: P19:070-380

Expiry Date: 1 October 2026 [as per section 386(2) of the Resource Management Act 1991]
[originally granted 2 April 1975 under the Water and Soil Conservation Act 1967 'at the pleasure of the Commission']

Site Location: COLSON ROAD NEW PLYMOUTH

Legal Description: SEC 223 HUA DIST BK VI PARITUTU SD

Catchment: WAIWHAKAIHO 392.000

Tributary: MANGAONE 392.010
PUREMU 392.012

For General, Standard and Special Conditions pertaining to this consent please see reverse side of this document.

TRK750226

Conditions of right

- (a) The Commission may prescribe the method of management of this right, including the limitation of periods during which the right may be fully exercised, if a water shortage or other abnormal circumstances occur in the locality.
- (b) This right may be operated only by the person holding the right or his agent and only for the purpose stated in the right.
- (c) The right may, with the consent of the Commission in writing, be transferred to a new owner or occupier of the property to which the right relates, but only on the same conditions as contained in this right.
- (d) The conditions relating to this right cannot be varied without the prior consent in writing of the Commission.
- (e) This right is not a guarantee that the quantity and quality of water specified will be available.
- (f) Unless specifically authorised by this right the discharge of water or waste containing pollutants into natural water is not permitted.
- (g) This right is not an authority to obtain access to a source of water or a point of discharge.
- (h) The grantee of the right shall keep such records as may reasonably be required by the Commission and shall if so requested supply this information to the Commission.
- (i) This right may be cancelled by the Commission, or Commission may take such other action as the Act provides, if the right is not exercised within 12 months of its granting or such longer time as the Commission may approve.
- (j) This right may be cancelled by the Commission if in the opinion of the Commission it is not diligently and beneficially exercised.
- (k) This right is granted subject to the Commission or its servants or agents being permitted access at all reasonable times for the purpose of carrying out inspections and measurements.
- (l) The design and maintenance of any works relating to the right must be to a standard adequate to meet the conditions of the right so that neither the works nor the exercise of the right is likely to cause damage to any property or injury to any person.
- (m) Should the grantee in the opinion of the Commission commit any breach of the right or its conditions the Commission may cancel the right.
- (n) This right is granted, subject to the Commission retaining the right to review the terms and conditions attached hereto including the period of the right at intervals of not less than five [5] years.
- (o) This right will expire upon the date shown overleaf or upon 14 days notice, whichever comes sooner.
- (p) The cost of supervision of this right, including water sampling deemed necessary by the Commission shall be carried by the grantee.
- (q) The final drawings of the culvert are to be submitted to the Commission for approval before work is commenced.

TRK750226

VARIATION OF 14 MAY 1986:

Additional General Conditions

- (a)The grantee shall provide to the Manager, Taranaki Catchment Commission, on request plans, specifications and maintenance programmes of works associated with the exercise of this right, showing that the conditions of this right are able to be met.
- (b)The standards, techniques and frequency of monitoring of this right shall be to the specific approval of the Manager, Taranaki Catchment Commission.
- (c)The actual and reasonable cost of administration supervision and monitoring of this right, deemed necessary by the Manager, Taranaki Catchment Commission, shall be met by the grantee.
- (d)This right may be cancelled in writing to the grantee by the Commission if the right is not exercised within twelve months of the date of grant of such longer time as the Manager, Taranaki Catchment Commission, may approve.
- (e)This right may be terminated by the Commission upon not less than six months notice in writing to the grantee if, in the opinion of the Commission, the public interest so requires, but without prejudice to the grantee to apply for a further right in respect of the same matter.

Additional Special Conditions

- 1)The terms and conditions pertaining to Water Right 226 shall apply.
- 2)[**Note: Condition 2 was subsequently deleted as per variation of 8 October 1986.**]
- 3)The new 900 mm pipe shall be laid in accordance with the manufacturers specifications.

VARIATION OF 8 OCTOBER 1986:

Deletion of special condition 2.

Signed at Stratford on 8 October 1986

For and on behalf of
TARANAKI REGIONAL COUNCIL

OPERATIONS MANAGER

Discharge Permit
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of
Consent Holder: New Plymouth District Council
Private Bag 2025
NEW PLYMOUTH

Consent Granted
Date: 19 March 2003

Conditions of Consent

Consent Granted: To discharge up to 1000 cubic metres/day [5 litres/second]
of leachate and contaminated stormwater from the closed
section, Area A, of Colson Road municipal landfill to
groundwater in the vicinity of and into the Puremu Stream
a tributary of the Mangaone Stream in the Waiwhakaiho
catchment at or about GR: P19:074-372

Expiry Date: 1 June 2026

Review Date(s): June 2004, June 2006, June 2008, June 2014, June 2020

Site Location: Colson Road Landfill, Colson Road, New Plymouth

Legal Description: Sec 223 Hua Dist Blk VI Paritutu SD

Catchment: Waiwhakaiho

Tributary: Mangaone
Puremu

Consent 2370-3

General conditions

- a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council (hereinafter the Chief Executive), the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
 - i) the administration, monitoring and supervision of this consent; and
 - ii) charges authorised by regulations.

Special conditions

1. That any discharge shall not alter to a conspicuous extent the natural colour, clarity or pH of the receiving water, nor shall it contain visible oil or grease, nor shall it emit objectionable odours, nor shall it increase the temperature of the Puremu Stream by more than 2.0°C.
2. That there shall be no significant adverse impact upon natural aquatic life downstream of the landfill as a result of the exercise of this permit.
3. Monitoring of surface waters and groundwater on or in the vicinity of the site shall be undertaken to the satisfaction of the Chief Executive, Taranaki Regional Council.
4. That the Grantee shall satisfy all relevant requirements, obligations and duties of the District Plan of the New Plymouth District Council.
5. That the consent holder shall maintain and comply with a current management and contingency plan as per condition 9 for Area A and associated activities on the site, to the approval of the Chief Executive, Taranaki Regional Council.
6. The consent holder shall at all times adopt the best practicable option, as defined in the Resource Management Act 1991, to prevent or minimise any or likely adverse effects on the environment associated with the discharges of leachate and/or stormwater from the site, including but not limited to the collection, containment and removal from the site of any discharge of leachate and/or contaminated stormwater.
7. The consent holder shall maintain an adequate landfill capping barrier and vegetative cover on the site to the satisfaction of the Chief Executive, Taranaki Regional Council.
8. The consent holder shall ensure that the area to which this consent is attributed to is closed and subsequently managed in accordance with the amended Management Plan provided November 2001 or as subsequently amended provided that subsequent amendments do not reduce the level of environmental protection set out in the amendment of November 2001.

Consent 2370-3

9. The consent holder shall maintain stormwater drains, the sediment detention pond, and/or ground contours at the site, in order to minimise stormwater movement across, or ponding on the site.
10. The consent holder shall ensure that any discharge from the cleaning and hosing out of refuse containing vehicles shall not occur on site.
11. The mixing zone in each condition of this consent shall extend for a distance downstream of the point of the culvert outlet of the Puremu Stream to 2 metres above the confluence of the unnamed tributary of the Puremu Stream and the Puremu Stream at the sites legal boundary.
12. After allowing for reasonable mixing the consent holder shall ensure that the discharge shall not give rise to any of the following effects in the receiving waters of the Puremu Stream:
 - a) The production of any conspicuous oil or grease films, scums or foams, or floatable or suspended material;
 - b) any conspicuous change in colour or visual clarity;
 - c) any emission of objectionable odour;
 - d) the rendering of fresh water unsuitable for consumption by farm animals;
 - e) any significant adverse effects on aquatic life.
 - f) an increase in the temperature of the Puremu Stream by more than 2.0° Celsius
13. The discharge shall not be shown to reduce the quality of the Puremu Stream at or beyond the mixing zone below the following criteria:

Constituent	Max. Concentration or level
Aluminium	5.0 mg/l
Arsenic	0.1 mg/l
Beryllium	0.1 mg/l
Boron	0.5 mg/l
Cadmium	0.01 mg/l
Chromium	0.1 mg/l
Cobalt	0.05 mg/l
Copper	0.2 mg/l
Fluoride	1.0 mg/l
Iron	5.0 mg/l
Lead	0.1 mg/l
Manganese	1.0 mg/l
Nitrate + Nitrite (NO ₃ -N + NO ₂ -N)	100 mg/l
Nitrite -N	5.0 mg/l
Selenium	0.02 mg/l
Vanadium	0.1 mg/l
Zinc	2.0 mg/l
Ammoniacal nitrogen	2.5 mg/l
pH	6.5 - 8.5
Sulphate	500 mg/l

Note: Levels of trace metals expressed as total recoverable metals

14. The discharge shall not be shown to reduce the concentration of dissolved oxygen in the Puremu Stream below 5 mg/litre, beyond the mixing zone specified in special condition 12 above.
15. The discharge shall not, in the opinion of the Chief Executive, Taranaki Regional Council, contain substances or constituents other than those listed in Condition 15, nor pathogenic organisms, which would render the water of the Puremu Stream, beyond the mixing zone specified in special condition 12 above, unpalatable or unfit for stock consumption purposes.

Consent 2370-3

16. The maintenance, management and operation of the leachate and collection and treatment systems shall be to the satisfaction of the Chief Executive, Taranaki Regional Council, to ensure that the conditions attached to this permit can be met.

17. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2004 and/or June 2006 and/or June 2008 and/or June 2014 and/or June 2020, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 19 March 2003

For and on behalf of
Taranaki Regional Council

Chief Executive

TRK994619

DISCHARGE PERMIT

**Pursuant to the RESOURCE MANAGEMENT ACT 1991
a resource consent is hereby granted by the
Taranaki Regional Council**

Name of
Consent Holder: NEW PLYMOUTH DISTRICT COUNCIL
PRIVATE BAG 2025 NEW PLYMOUTH

Consent
Granted Date: 21 March 1999

CONDITIONS OF CONSENT

Consent Granted: TO DISCHARGE UP TO A MAXIMUM OF 675 LITRES/SECOND OF TREATED STORMWATER AND MINOR AMOUNTS OF LEACHATE FROM AREAS B1, B2, C1 AND C2 OF THE COLSON ROAD LANDFILL TO GROUNDWATER IN THE VICINITY OF AND INTO THE PUREMU STREAM A TRIBUTARY OF THE MANGAONE STREAM IN THE WAIWHAKAIHO CATCHMENT AT OR ABOUT GR: P19:074-372

Expiry Date: 1 June 2025

Review Date[s]: June 2006, June 2012, June 2018 and/or within six months of the first exercise of this consent

Site Location: COLSON ROAD LANDFILL, COLSON ROAD, NEW PLYMOUTH

Legal Description: SEC 223 HUA DIST BLK VI PARITUTU SD

Catchment: WAIWHAKAIHO 392.000

Tributary: MANGAONE 392.010
PUREMU 392.012

For General, Standard and Special Conditions pertaining to this consent please see reverse side of this document.

TRK994619

General conditions

- a) That on receipt of a requirement from the General Manager, Taranaki Regional Council (hereinafter the General Manager), the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
 - i) the administration, monitoring and supervision of this consent; and
 - ii) charges authorised by regulations.

Special conditions

1. THAT the water quality in the Manganaha Stream above its confluence with the Mangaone Stream shall not be changed as a result of this discharge.
2. THAT the exercise of this consent shall not cause the water quality of the Puremu Stream at the northern boundary of the site to exceed the following criteria:

Component	Criteria
pH	range within 6.5-8.5
Dissolved oxygen	maximum reduction of 1.0 gm^{-3} in the upstream dissolved oxygen concentration
Ammoniacal nitrogen	2.0 gm^{-3} for pH below 7.75 1.3 gm^{-3} for pH between 7.75-8.00 1.0 gm^{-3} for pH between 8.00-8.50
Nitrate	10 gm^{-3} as nitrogen
Nitrite	0.06 gm^{-3} as nitrogen
Faecal coliforms	1000/100 mL
Sulphate	1000 gm^{-3}
Oil and grease	10 gm^{-3}
Suspended solids maximum permitted increase in instream concentration	
[dry weather conditions]	10 gm^{-3}
[wet weather conditions]	10%
of upstream concentration	

	Maximum instream concentration Total Recoverable Metals gm⁻³	Maximum permitted increase in concentration Filtered Metals gm⁻³
Aluminium	5.0	0.1
Arsenic	0.2	0.05
Beryllium	0.1	n/a
Boron	5.0	n/a
Cadmium	0.05	0.001
Chromium	1.0	0.02
Cobalt	1.0	n/a
Copper	0.5	0.002
Iron	10.0	0.3
Lead	0.1	0.002
Manganese	5.0	n/a
Selenium	0.05	0.001
Vanadium	0.1	n/a
Zinc	2.4	0.03

3. THAT the discharge authorised by this consent, in conjunction with the exercise of any other consent associated with the landfill property, shall not give rise to any of the following effects in the Puremu Stream at the northern boundary of the site:
 - a) the production of conspicuous oil or grease films, scums or foams, or floatable or suspended materials [other than storm debris and suspended solids as permitted under condition 2 above];
 - b) any conspicuous change in the colour or visual clarity;
 - c) any emission of objectionable odour;
 - d) the rendering of fresh water unsuitable for consumption by farm animals;
 - e) any significant adverse effects on aquatic life.

4. THAT this consent shall be exercised in a manner conforming with the relevant requirements of the 'New Plymouth District Council Colson Road Landfill: Landfill Management Plan 1994', or any subsequent version of that document which does not lessen environmental protection standards. The Management Plan shall be updated at not greater than yearly intervals, to the satisfaction of the General Manager, Taranaki Regional Council.

5. THAT the consent holder shall provide, maintain and comply with a monitoring programme, to the satisfaction of the General Manager, Taranaki Regional Council, setting out details of monitoring to be carried out and containing guidelines for the determination of whether contamination is occurring, the initial plan to be provided at least three months prior to the exercise of this consent.

6. THAT this consent shall lapse on the expiry of six years after the date of commencement of this consent, unless the consent is given effect to before the end of that period or the Taranaki Regional

TRK994619

Council fixes a longer period pursuant to section 125(b) of the Resource Management Act 1991.

7. THAT pursuant to section 128(1)(a) of the Resource Management Act 1991, the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during June 2006, June 2012, June 2018 and/or within six months of the first exercise of this consent, to deal with any significant adverse ecological effects on any ecosystems, including but not limited to, habitats, plants, animals, microflora and microfauna, arising from discharges licensed by this consent.

Signed at Stratford on 21 March 1999

For and on behalf of
TARANAKI REGIONAL COUNCIL

GENERAL MANAGER

Discharge Permit
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of
Consent Holder: New Plymouth District Council
Private Bag 2025
New Plymouth 4342

Decision Date 4 May 2021
(Change):

Commencement Date 4 May 2021 (Granted Date: 21 March 1999)
(Change):

Conditions of Consent

Consent Granted: To discharge up to 500 tonnes/day of contaminants onto
and into land in areas B1, C1 and C2 at the Colson Road
landfill

Expiry Date: 1 June 2025

Site Location: Colson Road Landfill, Colson Road, New Plymouth

Grid Reference (NZTM) 1697310E-5675450N

Catchment: Waiwhakaiho

Tributary: Puremu

*For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document*

General condition

- a. The consent holder shall pay to the Taranaki Regional Council all the administration, monitoring and supervision costs of this consent, fixed in accordance with section 36 of the Resource Management Act 1991.

Special conditions

1. The consent holder shall install and maintain a network of groundwater monitoring sites in consultation with The Chief Executive, Taranaki Regional Council at locations, and to depths, that enable monitoring to determine any change in groundwater quality resulting from the exercise of this consent. Any new bores shall be installed in accordance with NZS 4411:2001 at locations and depths approved by The Chief Executive, Taranaki Regional Council.
2. That the consent holder shall prevent surface runoff of water or contaminants to the Manganaha Stream from any surface area being used or previously used for the deposition of refuse, or for extraction of soil, clay, or other cover material, or prepared for the deposition of refuse, unless such surface area has been covered and rehabilitated to the satisfaction of the Chief Executive, Taranaki Regional Council.
3. That prior to commencing any use of any part of Area B, C1 or C2 for the deposition of refuse or for composting activities, the consent holder shall demonstrate to the satisfaction of the Chief Executive, Taranaki Regional Council, that drainage channels, bunds, surface contouring, or other engineering and landscaping works associated with an Area or part of an Area have been undertaken and completed to the extent that compliance with condition 2 above will be achieved.
4. That the construction, installation, placement, integrity and performance of groundwater drainage systems, landfill lining systems, and leachate interception, collection, holding, recirculation, and discharge systems in any part of Areas B1, B2, C1 and C2 of the Colson Road Landfill as described in the 'Colson Road Landfill Assessment of Effects on the Environment' July 1994 and the 'New Plymouth District Council Colson Road Landfill Management Plan' July 1994 be certified by a registered engineer prior to any discharge of solid wastes in such part of those areas.
5. That should groundwater quality be significantly affected by activities or processes associated with the landfill or composting, then the consent holder shall implement such measures as are necessary to remedy or mitigate and if practicable to prevent the continuation of any effect upon quality of the groundwater. 'Significantly affected' for the purposes of this condition is defined as a change greater than the maximum natural variation in any parameter for water in any piezometer, bore, or spring, and the criteria for this shall be set out in the monitoring programme under condition 6.
6. That the consent holder shall provide, maintain and comply with a monitoring programme, to the satisfaction of the Chief Executive, Taranaki Regional Council, setting out details of monitoring to be carried out and containing guidelines for the determination of whether contamination is occurring, the initial plan to be provided at least three months prior to the exercise of this consent.

Consent 4621-1.1

7. That the disposal of wastes shall be carried out in a manner conforming with the relevant requirements of the 'New Plymouth District Council Colson Road Landfill: Landfill Management Plan July 1994', or any subsequent version of that document which does not lessen environmental protection standards. The Management Plan shall be updated at not greater than yearly intervals, to the satisfaction of the Chief Executive, Taranaki Regional Council.
8. That the acceptance and disposal of waste types at the landfill for disposal shall conform to Section 2.5, Section 5.6 and Appendix E [or their equivalent] of the Landfill Management Plan referred to in condition 7 above, and in particular shall conform to the following:

Table 11.2 'Criteria for calculating landfill potentials' Hazardous Waste Management Handbook, Ministry for the Environment, 1994;

and

Chapter 5 of the 'Draft Health and Environmental Guidelines for Selected Timber Treatment Chemicals', Ministry for the Environment/Ministry of Health, September 1993, in compliance with the requirement for a Class 2 landfill.

9. That this consent shall lapse on the expiry of six years after the date of commencement of this consent, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(b) of the Resource Management Act 1991.
10. That pursuant to section 128(1) of the Resource Management Act 1991, the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during June 2006, June 2102, June 2018 and/or within six months of the first exercise of this consent, to deal with any significant adverse ecological effects on any ecosystems, including but not limited to, habitats, plants, animals, microflora and microfauna, arising from discharges licensed by this consent.

Signed at Stratford on 4 May 2021

For and on behalf of
Taranaki Regional Council

A D McLay
Director - Resource Management

Discharge Permit
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of
Consent Holder: New Plymouth District Council
Private Bag 2025
New Plymouth 4342

Decision Date 24 January 2017
(Change):

Commencement Date 24 January 2017 (Granted Date: 21 March 1999)
(Change):

Conditions of Consent

Consent Granted: To discharge contaminants into the air associated with
operation of the municipal landfill at Colson Road, New
Plymouth

Expiry Date: 1 June 2025

Review Date(s): June 2018 and in accordance with special condition 14

Site Location: Colson Road, New Plymouth

Grid Reference (NZTM) 1697239E-5676071N (approx. centre of landfill)
1697127E-5676249N (approx. location of flare)

*For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document*

General condition

- a. The consent holder shall pay to the Taranaki Regional Council all the administration, monitoring and supervision costs of this consent, fixed in accordance with section 36 of the Resource Management Act 1991.

Special conditions

1. Within 3 months of the first operation of any landfill gas flare, the consent holder shall provide the Chief Executive, Taranaki Regional Council with a measurement of the temperature of the flare together with a measurement of the concentrations of methane and of hydrogen sulphide in the flare feedstock. Thereafter the consent holder shall annually provide updated information on flare temperature and feedstock composition.
2. Within 3 months of the first operation of any landfill gas flare, the consent holder shall provide the Chief Executive, Taranaki Regional Council with a copy of 'as built' drawings for the flare, including a figure to scale showing the location of the flare relative to the boundaries of the landfill property, and a copy of the supplier's or manufacturer's operating instructions.
3. The first revision of the landfill plan, described in condition 9(c) following installation of any landfill gas flare shall describe, variously, methods of, schedules for, and/or the recording of: observations and inspections of the flare, its operation, and its effects, including downwind odour and smoke plume details; a calibration schedule; records of maintenance; and any complaints. Information gathered under these provisions shall be made available to the Chief Executive, Taranaki Regional Council upon request.
4. That the consent holder shall at all times adopt the best practicable option to prevent or minimise any actual or likely adverse effect on the environment arising from emissions from the landfill operation. 'Best practicable option' [as defined in section 2 of the Act] shall be determined by the Taranaki Regional Council, following review of the conditions of this consent as set out under conditions 13 and 14 of this consent and having regard to the requirements of condition 9 of this consent.
5. That the discharge of contaminants into the air from the landfill operation shall not result in any of the following – offensive or objectionable odours; offensive or objectionable dust; or dangerous or noxious ambient concentrations of any airborne contaminant -- as determined by at least one enforcement officer of the Taranaki Regional Council, at or beyond the boundary of the site.
6. That no material is to be burnt at the landfill site with the exception of landfill gas in a flare.
7. That the discharges authorised by this consent shall not give rise to any significant adverse ecological effects on any ecosystem, including but not limited to, habitats, plants, animals, microflora and microfauna.

Consent 4779-1.1

8. That no extraction venting of untreated landfill gases be located closer than 200 metres to any boundary of the landfill property site.
9. That the operation of the landfill shall give effect to:
 - (a) the 'Air Discharge Consent Application Supporting Documentation' July 1995, prepared for the New Plymouth District Council by Woodward Clyde;
 - (b) *Variation to Air Discharge Consent – Colson Road Landfill*, prepared by Tonkin & Taylor Ltd and dated December 2016; and
 - (c) the New Plymouth District Council Colson Road Landfill Management Plan July 1994 or any subsequent version of that document which does not lessen the standard of environmental protection afforded by that document. The management plan shall be updated at not greater than yearly intervals, to the satisfaction of the Chief Executive, Taranaki Regional Council.
10. That prior to undertaking any alteration to the site or site operations other than as specified and discussed in the application and supporting documentation lodged with the Taranaki Regional Council for this consent, and any subsequent application to change the conditions of this consent, which may significantly alter the nature or quantities of contaminants discharged from the site into the air, the consent holder shall consult with the Chief Executive, Taranaki Regional Council, and shall obtain any necessary approvals under the Resource Management Act 1991.
11. That the consent holder and staff of the Taranaki Regional Council shall meet as appropriate, and at least once per year, with the submitters to the consent, and any other interested party at the discretion of the Chief Executive, Taranaki Regional Council, to discuss any matter relating to the exercise of this consent, and in order to facilitate ongoing consultation.
12. That the consent holder shall, within one year of the commencement of this consent, provide a report on the feasibility of collecting, extracting, venting, or combusting of landfill gas at the Colson Road landfill, to the satisfaction of the Chief Executive, Taranaki Regional Council.
13. That pursuant to section 128(1)(a) of the Resource Management Act 1991, the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during June 2006, June 2012, June 2018 and/or within six months of the first exercise of this consent, for the purpose of reviewing the best practicable option or options available to reduce or remove any adverse effects on the environment, or to deal with any significant adverse ecological effects on any ecosystems, including but not limited to, habitats, plants, animals, microflora and microfauna, arising from discharges licensed by this consent.

Consent 4779-1.1

14. That in addition to the review provisions of condition 13 above, pursuant to section 128(1)(a) of the Resource Management Act 1991 the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review:

- (a) within six months of receipt of the report required by condition 12; and/or
- (b) during June 2001, June 2003, June 2006, June 2012 and/or June 2018; and/or
- (c) within the 6 months following the installation of any landfill gas collection and treatment at the site;

for the purposes of:

- (i) considering the options of collecting, extracting, venting or combusting landfill gas; and/or
- (ii) monitoring landfill gas combustion and its effects.

Signed at Stratford on 24 January 2017

For and on behalf of
Taranaki Regional Council

A D McLay
Director - Resource Management

Discharge Permit
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of
Consent Holder: New Plymouth District Council
Private Bag 2025
NEW PLYMOUTH

Consent Granted
Date: 11 June 2003

Conditions of Consent

Consent Granted: To discharge stormwater [due to earthworks in providing
an area for Stage 3 of the municipal landfill] onto land and
into the Puremu Stream a tributary of the Mangaone
Stream in the Waiwhakaiho catchment at or about GR:
P19:074-372

Expiry Date: 1 June 2020

Review Date(s): June 2004, June 2006, June 2008, June 2014

Site Location: Colson Road Landfill, Colson Road, New Plymouth

Legal Description: Sec 223 Hua Dist Blk VI Paritutu SD

Catchment: Waiwhakaiho

Tributary: Mangaone
Puremu

Consent 6177-1

General conditions

- a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council (hereinafter the Chief Executive), the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
 - i) the administration, monitoring and supervision of this consent; and
 - ii) charges authorised by regulations.

Special conditions

1. The water quality of uncontaminated stormwater discharge to the Puremu Stream shall meet the following criteria:

pH	6.5-8.5
suspended solids	maximum concentration of 100gm ⁻³
ammoniacal nitrogen	maximum concentration of 0.5 gm ⁻³ as nitrogen
2. No leachate discharge shall be permitted by the exercise of this consent.
3. All stormwater diversion and channels shall be designed, constructed and maintained so as to prevent or minimise erosion of the channel in all circumstances.
4. Any discharge shall not alter to a conspicuous extent the natural colour or clarity of the receiving water in the Puremu Stream.
5. There shall be no significant adverse impact upon natural aquatic life downstream of the landfill as a result of the exercise of this permit.
6. Monitoring of surface waters on or in the vicinity of the site shall be undertaken to the satisfaction of the Chief Executive, Taranaki Regional Council.
7. The consent holder shall prepare and maintain a management plan and site contingency plan for the site and associated activities on the site, to the satisfaction of the Chief Executive, Taranaki Regional Council.
8. The consent holder shall prepare and maintain a site erosion and sediment control management plan for the site and associated activities on the site, to the satisfaction of the Chief Executive, Taranaki Regional Council.
9. The consent holder shall at all times adopt the best practicable option, as defined in the Resource Management Act 1991, to prevent or minimise any or likely adverse effects on the environment associated with the discharges of stormwater from the site, including but not limited to the collection, containment and removal from the site of any discharge of contaminated stormwater.
10. The consent holder shall repair and rehabilitate any land made unstable and any erosion occurring due to the construction or maintenance of the diversion channels.

Consent 6177-1

11. The consent holder shall maintain stormwater drains, sediment detention ponds, and ground contours at the site, in order to minimise stormwater movement across, or ponding on the site, to the satisfaction of the Chief Executive, Taranaki Regional Council.
12. After allowing for reasonable mixing the consent holder shall ensure that the discharge shall not give rise to any of the following effects in the receiving waters of the Puremu Stream:
 - a) The production of any conspicuous oil or grease films, scums or foams, or floatable or suspended material;
 - b) any conspicuous change in colour or visual clarity;
 - c) any emission of objectionable odour;
 - d) the rendering of fresh water unsuitable for consumption by farm animals;
 - e) any significant adverse effects on aquatic life.
 - f) an increase in the temperature of the Puremu Stream by more than 2.0 degrees Celsius.
13. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2004 and/or June 2006 and/or June 2008 and/or June 2014, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 11 June 2003

For and on behalf of
Taranaki Regional Council

Chief Executive

Discharge Permit
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of
Consent Holder: New Plymouth District Council

Decision Date: 13 October 2021

Commencement Date: 13 October 2021

Conditions of Consent

Consent Granted: To discharge stormwater and sediment from earthworks associated with the capping of Stage 3 of the Colson Road landfill onto land and into an unnamed tributary of the Puremu Stream

Expiry Date: 1 June 2025

Review Date(s): June 2022 and in accordance with special condition 17

Site Location: Colson Road Landfill, 76 Colson Road, New Plymouth

Grid Reference (NZTM) 1697110E-5676383N (discharge point)
1697265E-5676055N (approximate centre of earthworks)

Catchment: Waiwhakaiho

Tributary: Puremu

*For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document*

General condition

- a. The consent holder shall pay to the Taranaki Regional Council all the administration, monitoring and supervision costs of this consent, fixed in accordance with section 36 of the Resource Management Act 1991.

Special conditions

1. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any actual or likely adverse effect on the environment associated with the discharge of contaminants from the site.
2. The site shall be managed and any stormwater treated in accordance with a Soil Erosion and Sediment Control Plan (ESCP) that has been approved by the Taranaki Regional Council acting in a technical certification capacity. This plan is to be prepared and maintained in accordance with the "*Erosion and sediment control plan preparation guideline*" (Waikato Regional Council, 2019), taking account of the principles and practices given in "*Erosion & Sediment Control Guidelines for Soil Disturbing Activities*" (Waikato Regional Council, 2009), and any subsequent amendments. The plan shall include, but not be limited to:
 - a) the way in which the work will be phased, and
 - b) stormwater drainage plans, and
 - c) estimates of sediment loss from each area, and
 - d) the erosion and sediments controls, and
 - e) how these will be developed prior to the start of each phase, and
 - f) the location capacity and design of each structure, and
 - g) monitoring and maintenance, record keeping and reporting, and
 - h) preparation and responses in relation to heavy rainfall, and
 - i) contingency measures, including for matters that may arise such as ponding, rilling, vehicle tracking, erosion.
3. Prior to this consent being exercised the consent holder must appoint a principal contact for matters relating to this consent. The representative's name and how they can be contacted shall be provided to the Taranaki Regional Council.
4. The consent holder must arrange and conduct a pre-construction site meeting and invite, with a minimum of five working days' notice, the Taranaki Regional Council, the site representative(s) nominated under condition 3 of this consent, the contractor, and any other party representing the consent holder prior to any work authorised by this consent commencing on site.

Advice note: In the case that any of the invited parties, other than the site representative does not attend this meeting, the Consent Holder will have complied with this condition, provided the invitation requirement is met.

Consent 6177-2.0

5. The consent holder must ensure that a copy of the certified ESCP required by condition 2, including any certified amendments, is kept onsite in a place where it is available to officers of Taranaki Regional Council, and this copy is updated within five working days of any amendments being certified.
6. The consent holder shall, prior to bulk earthworks commencing in any phase, submit to the Taranaki Regional Council "As Built Certification Statements" signed by an appropriately qualified and experienced professional certifying that the erosion and sediment controls have been constructed in accordance with the certified ESCP. Information contained in the certification statement shall include at least the following:
 - a) confirmation of contributing catchment areas;
 - b) the location, capacity and design of each structure;
 - c) position of inlets and outlets; and
 - d) any other relevant matter.
7. There shall be no discharge of untreated stormwater from any unstabilised areas to the Puremu Stream or its tributaries.
8. Any discharge authorised by this consent from the SRP (Pond 1) (NZTM: 1697110E-5676383N) to the unnamed tributary of the Puremu Stream, in combination with the other discharges at the same location, shall have a suspended solids concentration no greater than 100 gm⁻³.
9. As far as practicable, all clean water run-off from stabilised surfaces including catchment areas above the site must be separated from the exposed areas via a stabilised system to prevent erosion.
10. The consent holder must progressively stabilise, re-contour and re-vegetate any disturbed areas, to minimise sediment runoff and erosion until the site has been stabilised in accordance with the measures detailed in the document Waikato Regional Council document titled "Erosion and Sediment Control – Guidelines for Soil Disturbing Activities", as soon as practically possible and within a period not exceeding five days after completion of any phase authorised by this resource consent.
11. Further to condition 10, any area that is not to be worked within a 21 day period is to be stabilised.
12. Stabilisation must be undertaken by providing adequate measures (vegetative and/or structural) that will immediately stabilise disturbed areas, and will minimise sediment runoff and erosion. The consent holder must monitor and maintain the site until vegetation is established to such an extent that it prevents erosion and prevents sediment from entering any water body.

Consent 6177-2.0

13. Before exercising this consent, the consent holder shall establish a 'Kaitiaki Forum'. The purpose of the Kaitiaki Forum shall be to provide advice to the consent holder, regarding but not limited to the following:
- a) avoiding, remedying and mitigating adverse effects on the cultural, traditional, historical and spiritual values of the Puremu Stream associated with exercising this consent; and
 - b) recognising and providing for the relationship of Ngāti Tawhirikura and their culture and traditions with their ancestral lands, waters, sites, taonga and wāhi tapu associated with exercising this consent; and
 - c) the exercise of kaitiakitanga by Ngāti Tawhirikura Hapū associated with exercising this consent.

The make-up of the Kaitiaki Forum, its operations and procedures are to be determined by the consent holder, Ngāti Tawhirikura Hapū and Te Kotahitanga o Te Atiawa Trust and detailed in a forum collaboration agreement. A copy of the forum collaboration agreement shall be provided to the Chief Executive, Taranaki Regional Council.

14. Except as provided for in condition 15 no earthworks shall occur, and all exposed areas shall be stabilised between 1 May and 1 October.
15. Maintenance work may be undertaken between 1 May and 1 October, in accordance with the ESCP required by condition 2, or an activity specific ESCP that has been approved by the Taranaki Regional Council acting in a technical certification capacity.
16. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2022, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.
17. In addition to the review provision of condition 16 above, in accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may review condition 8 of this consent by giving notice within 3 months of receiving the ESCP required by condition 2 or subsequent amendments, if it is determined that the 100 gm⁻³ suspended solids limit does not adequately avoid or mitigate adverse effects.

Signed at Stratford on 13 October 2021

For and on behalf of
Taranaki Regional Council



A D McLay
Director - Resource Management

Appendix II

Categories used to evaluate environmental and administrative performance

Categories used to evaluate environmental and administrative performance

Environmental performance is concerned with actual or likely effects on the receiving environment from the activities during the monitoring year. Administrative performance is concerned with the Company's approach to demonstrating consent compliance in site operations and management including the timely provision of information to Council (such as contingency plans and water take data) in accordance with consent conditions.

Events that were beyond the control of the consent holder and unforeseeable (that is a defence under the provisions of the RMA can be established) may be excluded with regard to the performance rating applied. For example loss of data due to a flood destroying deployed field equipment.

The categories used by the Council for this monitoring period, and their interpretation, are as follows:

Environmental Performance

High: No or inconsequential (short-term duration, less than minor in severity) breaches of consent or regional plan parameters resulting from the activity; no adverse effects of significance noted or likely in the receiving environment. The Council did not record any verified unauthorised incidents involving environmental impacts and was not obliged to issue any abatement notices or infringement notices in relation to such impacts.

Good: Likely or actual adverse effects of activities on the receiving environment were negligible or minor at most. There were some such issues noted during monitoring, from self-reports, or during investigations of incidents reported to the Council by a third party but these items were not critical, and follow-up inspections showed they have been dealt with. These minor issues were resolved positively, co-operatively, and quickly. The Council was not obliged to issue any abatement notices or infringement notices in relation to the minor non-compliant effects; however abatement notices may have been issued to mitigate an identified potential for an environmental effect to occur.

For example:

- High suspended solid values recorded in discharge samples, however the discharge was to land or to receiving waters that were in high flow at the time;
- Strong odour beyond boundary but no residential properties or other recipient nearby.

Improvement required: Likely or actual adverse effects of activities on the receiving environment were more than minor, but not substantial. There were some issues noted during monitoring, from self-reports, or during investigations of incidents reported to the Council by a third party. Cumulative adverse effects of a persistent minor non-compliant activity could elevate a minor issue to this level. Abatement notices and infringement notices may have been issued in respect of effects.

Poor: Likely or actual adverse effects of activities on the receiving environment were significant. There were some items noted during monitoring, from self-reports, or during investigations of incidents reported to the Council by a third party. Cumulative adverse effects of a persistent moderate non-compliant activity could elevate an 'improvement required' issue to this level. Typically there were grounds for either a prosecution or an infringement notice in respect of effects.

Administrative performance

High: The administrative requirements of the resource consents were met, or any failure to do this had trivial consequences and were addressed promptly and co-operatively.

Good: Perhaps some administrative requirements of the resource consents were not met at a particular time, however this was addressed without repeated interventions from the Council staff. Alternatively adequate reason was provided for matters such as the no or late provision of information, interpretation of 'best practical option' for avoiding potential effects, etc.

Improvement required: Repeated interventions to meet the administrative requirements of the resource consents were made by Council staff. These matters took some time to resolve, or remained unresolved at the end of the period under review. The Council may have issued an abatement notice to attain compliance.

Poor: Material failings to meet the administrative requirements of the resource consents. Significant intervention by the Council was required. Typically there were grounds for an infringement notice.

Appendix III

Comprehensive leachate and under liner drainage
monitoring 2021-2022

Table 36 Sample results for characterisation of Stage 1 & 2 and Stage 3 leachate

Parameter	Units	Stage 1 & 2 Leachate		Stage 3 Leachate	
		27-Oct-2021	15-Jun-2022	27-Oct-2021	15-Jun-2022
Sum of Anions	meq/L	25	17.9	105	66
Sum of Cations	meq/L	24	15.5	112	56
Turbidity	NTU	167	300	14.9	38
pH	pH Units	6.9	6.8	7.6	7.2
Total Alkalinity	g/m ³ CaCO ₃	1,060	790	4,200	2,700
Bicarbonate	g/m ³ at 25°C	1,290 ^a	960 ^a	5,100 ^a	3,300 ^a
Total Hardness	g/m ³ CaCO ₃	330	270	320	290
Electrical Conductivity (EC)	mS/m@25°C	237	148.7	1,016	551
Total Suspended Solids	g/m ³	41	57	50	8
Total Dissolved Solids (TDS)	g/m ³	870 ^a	530 ^a	3,800 ^a	1,980 ^a
Sample Temperature	°C	19	20	24	20
Dissolved Aluminium	g/m ³	< 0.003	< 0.003	0.143	0.048
Total Aluminium	g/m ³	0.036	0.03	0.64	0.125
Dissolved Boron	g/m ³	0.60	0.37	3.3	2.1 ^b
Total Boron	g/m ³	0.60	0.38	3.3	2.0 ^b
Dissolved Calcium	g/m ³	89	70	72	66
Dissolved Cobalt	g/m ³	0.0021	0.0018	0.025 ^b	0.0147
Total Cobalt	g/m ³	0.0021	0.002	0.024 ^b	0.0156
Dissolved Iron	g/m ³	0.16	0.02	4.7	9.6
Total Iron	g/m ³	15.7	27	6.4	16.3
Dissolved Magnesium	g/m ³	27	24	34	30
Dissolved Manganese	g/m ³	1.47	3.9 ^b	1.12	3.2
Total Manganese	g/m ³	1.64	3.8 ^b	1.21	3.8
Dissolved Mercury	g/m ³	< 0.00008	< 0.00008	< 0.00015	< 0.00008
Dissolved Potassium	g/m ³	93	53	390	210
Dissolved Sodium	g/m ³	101	67	770	380
Dissolved Arsenic	g/m ³	0.002	< 0.0010	0.069	0.028
Total Arsenic	g/m ³	0.0039	0.0029	0.073	0.034
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	0.00006	< 0.00005
Total Cadmium	g/m ³	< 0.000053	< 0.000053	< 0.000053	< 0.000053

Parameter	Units	Stage 1 & 2 Leachate		Stage 3 Leachate	
		27-Oct-2021	15-Jun-2022	27-Oct-2021	15-Jun-2022
Dissolved Chromium	g/m ³	0.0016	0.0009	0.162	0.062
Total Chromium	g/m ³	0.00197	0.00123	0.164	0.077
Dissolved Copper	g/m ³	< 0.0005	< 0.0005	0.0021	0.0015
Total Copper	g/m ³	0.00074	0.00056	0.0053	0.002
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	0.00051	0.00021
Total Lead	g/m ³	< 0.00011	0.00012	0.00084	0.00034
Dissolved Nickel	g/m ³	0.0033	0.0019	0.050	0.021
Total Nickel	g/m ³	0.0034	0.00192	0.050	0.023
Dissolved Zinc	g/m ³	0.0039	0.0025	0.0108	0.0058
Total Zinc	g/m ³	0.0073	0.0062	0.0187	0.0084
Chloride	g/m ³	119	71	720	390
Fluoride	g/m ³	0.14	0.12	0.43	0.27
Total Ammoniacal-N	g/m ³	150	79 ^d	870	400
Free Ammonia	g/m ³	0.52	0.26	22	3.3
Nitrite-N	g/m ³	< 0.002	0.002	0.081	0.03
Nitrate-N	g/m ³	0.022	0.025	0.018	0.09
Nitrate-N + Nitrite-N	g/m ³	0.024	0.027	0.098	0.12
Total Kjeldahl Nitrogen (TKN)	g/m ³	150	77 ^d	880	460
Dissolved Reactive Phosphorus	g/m ³	< 0.004	< 0.004	3.5	0.46
Total Phosphorus	g/m ³	0.059	0.043	5.2	1.86
Reactive Silica	g/m ³ as SiO ₂	22	21	37	31
Sulphate	g/m ³	1.8	5.5	17.2	36
Dissolved C-Biochemical Oxygen Demand (CBOD5)	gO ₂ /m ³	< 2	3	86	32
Carbonaceous Biochemical Oxygen Demand (cBOD5)	gO ₂ /m ³	3	4 ^c	100 ^c	35
Total Biochemical Oxygen Demand (TBOD5)	gO ₂ /m ³	4	3 ^c	90 ^c	37
Chemical Oxygen Demand (COD)	gO ₂ /m ³	107	70	1,190	580
Total Organic Carbon (TOC)	g/m ³	58	29	550	200
Faecal Coliforms MPN	/100 ml	< 180	< 18	< 180	< 18
Escherichia coli MPN	/100 ml	< 180	< 18	< 180	< 18
Organonitro & phosphorus pesticides					
Diuron	g/m ³	0.0005	< 0.0004	< 0.0004	0.0005

Parameter	Units	Stage 1 & 2 Leachate		Stage 3 Leachate	
		27-Oct-2021	15-Jun-2022	27-Oct-2021	15-Jun-2022
Hexazinone	g/m ³	0.0014	0.0006	< 0.0002	0.0004
Propiconazole	g/m ³	< 0.0003	< 0.0003	0.0048	0.0044
Tebuconazole	g/m ³	< 0.0004	< 0.0004	0.009	0.0078
Semi volatile organic compounds (SVOC)		ND	ND	ND	ND
Volatile organic compounds (VOC)					
Chlorobenzene (monochlorobenzene)	g/m ³	0.004	0.003	< 0.003	< 0.003
Isopropylbenzene (Cumene)	g/m ³	< 0.003	0.003	< 0.003	0.004
1,2,4-Trimethylbenzene	g/m ³	< 0.005	< 0.003	0.005	0.008

Key:

- a results indicative only due to high total dissolved solids content of the sample
- b the result for the dissolved fraction was greater than that for the total fraction, but within analytical variation of the methods
- c the result for Carbonaceous Biochemical Oxygen Demand (CBOD₅), was greater than that for Total Biochemical Oxygen Demand (TBOD₅), but within the analytical variation of these methods
- d the result for Total Ammoniacal-N was greater than that for Total Kjeldahl Nitrogen, but within the analytical variation of these methods

As expected, the Stage 3 leachate contains higher concentrations of contaminants than the Stage 1 & 2 leachate. However, the Stage 1 & 2 leachate continues to contain high concentrations of some contaminants as indicated by the cation and anion balances.

The contaminant concentrations in the leachates were generally higher in the October samples than in the June samples.

Whilst there were timber treatment chemicals arsenic, boron, copper, chrome, propiconazole and tebuconazole detected in the leachate samples, only boron and total copper were detected in either of the under liner groundwater drainage samples. The concentrations of these contaminants were considerably lower in the under liner groundwater drainage samples.

Table 37 Sample results for the characterisation of the under liner groundwater drainage

Parameter	Units	Under liner groundwater drainage	
		27-Oct-2021	15-Jun-2022
Sum of Anions	meq/L	3.7	4.3
Sum of Cations	meq/L	3.7	4.4
Turbidity	NTU	43	45
pH	pH Units	6.5	6.5
Total Alkalinity	g/m ³ CaCO ₃	104	112
Bicarbonate	g/m ³ at 25°C	127	136
Total Hardness	g/m ³ CaCO ₃	85	101

Parameter	Units	Under liner groundwater drainage	
		27-Oct-2021	15-Jun-2022
Electrical Conductivity (EC)	mS/m@25°C	39.8	43.9
Total Suspended Solids	g/m ³	15	17
Total Dissolved Solids (TDS)	g/m ³	230	240
Sample Temperature	°C	23	20
Dissolved Aluminium	g/m ³	< 0.003	< 0.003
Total Aluminium	g/m ³	0.023	0.165
Dissolved Boron	g/m ³	0.03	0.036
Total Boron	g/m ³	0.03	0.041
Dissolved Calcium	g/m ³	16.5	18.6
Dissolved Cobalt	g/m ³	0.0021 ^a	0.0036
Total Cobalt	g/m ³	0.0020 ^a	0.0037
Dissolved Iron	g/m ³	1.67	1.79
Total Iron	g/m ³	5.1	5.9
Dissolved Magnesium	g/m ³	10.6	13.2
Dissolved Manganese	g/m ³	1.59	2.3
Total Manganese	g/m ³	1.64	2.4
Dissolved Mercury	g/m ³	< 0.00008	< 0.00008
Dissolved Potassium	g/m ³	4.4	4.8
Dissolved Sodium	g/m ³	37	45
Dissolved Arsenic	g/m ³	< 0.0010	< 0.0010
Total Arsenic	g/m ³	< 0.0011	< 0.0011
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005
Total Cadmium	g/m ³	< 0.000053	< 0.000053
Dissolved Chromium	g/m ³	< 0.0005	< 0.0005
Total Chromium	g/m ³	< 0.00053	< 0.00053
Dissolved Copper	g/m ³	< 0.0005	< 0.0005
Total Copper	g/m ³	< 0.00053	0.00075
Dissolved Lead	g/m ³	< 0.00010	< 0.00010
Total Lead	g/m ³	< 0.00011	< 0.00011
Dissolved Nickel	g/m ³	< 0.0005	< 0.0005
Total Nickel	g/m ³	< 0.00053	< 0.00053

Parameter	Units	Under liner groundwater drainage	
		27-Oct-2021	15-Jun-2022
Dissolved Zinc	g/m ³	0.0028	0.0029
Total Zinc	g/m ³	0.0032	0.0032
Chloride	g/m ³	51	61
Fluoride	g/m ³	0.06	0.06
Total Ammoniacal-N	g/m ³	2.3	1.77
Free Ammonia	g/m ³	0.0043	0.0025
Nitrite-N	g/m ³	0.011	0.059
Nitrate-N	g/m ³	0.69	1.3
Nitrate-N + Nitrite-N	g/m ³	0.7	1.36
Total Kjeldahl Nitrogen (TKN)	g/m ³	2.4	1.9
Dissolved Reactive Phosphorus	g/m ³	< 0.004	< 0.004
Total Phosphorus	g/m ³	0.042	0.051
Reactive Silica	g/m ³ as SiO ₂	47	44
Sulphate	g/m ³	6.8	9.9
Dissolved C-Biochemical Oxygen Demand (CBOD5)	gO ₂ /m ³	< 2	< 2
Carbonaceous Biochemical Oxygen Demand (cBOD5)	gO ₂ /m ³	< 2	< 2
Total Biochemical Oxygen Demand (TBOD5)	gO ₂ /m ³	< 2	< 2
Chemical Oxygen Demand (COD)	gO ₂ /m ³	8	< 6
Total Organic Carbon (TOC)	g/m ³	6	5.1
Faecal Coliforms MPN	/100 ml	< 18	< 18
Escherichia coli MPN	/100 ml	< 18	< 18
Organonitro & phosphorus pesticides		ND	ND
Semi volatile organic compounds (SVOC)		ND	ND
Volatile organic compounds (SVOC)		ND	ND

Key: a the result for the dissolved fraction was greater than that for the total fraction, but within analytical variation of the methods.

There were no organonitro or phosphorus pesticides, SVOC's or VOC's detected in the under liner groundwater drainage. However, it is noted that the detection limit for the analytical methods used was approximately 10 times higher than the detection limits for the analyses of the stormwater and groundwater samples collected by Council.