

New Plymouth District Council

Mangapouri Cemetery

Monitoring Programme

Annual Report

2022-2023

Technical Report 2023-66



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Taranaki Regional Council
Private Bag 713
Stratford

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Executive summary

New Plymouth District Council (NPDC) operates the Mangapouri Cemetery (the Cemetery) located on Junction Road (SH3) between New Plymouth and Egmont Village, in the Waiwhakaiho catchment. The Cemetery site is gated and includes an access road, landscaped greens, storage buildings and washroom facilities. This report covers the reporting period July 2022 to June 2023 and describes the monitoring programme implemented by the Taranaki Regional Council (the Council) to assess NPDC's environmental performance during the period under review. This report details the results of the monitoring undertaken in relation to the site, and any potential environmental impacts.

During the monitoring period, NPDC demonstrated a good level of environmental performance and a high level of administrative performance.

NPDC held one resource consent that allows for the discharge of contaminants into land where it may enter water. The consent included a total of eight conditions setting out the requirements that they must satisfy.

The Cemetery opened to the public in May 2019 and the compliance monitoring programme commenced following the first interment in July 2019. The monitoring programme for the period under review included an annual site inspection, water quality sampling of the receiving waters (groundwater and surface water) and continuous groundwater level monitoring. The monitoring programme also included a significant data review component, with all data submitted by NPDC assessed for compliance upon receipt.

The monitoring showed that the activities were generally being carried out in compliance with the conditions of the resource consent. The results of surface and groundwater quality monitoring undertaken show no adverse effects of the activity on local fresh water resources. Site visits undertaken found the site to be tidy and well managed.

During this monitor year, following higher than average rainfall the minimum separation distance between burial sites and the water table was not met in some areas of the Cemetery. NPDC is currently working on a dewatering project involving deforesting around the northern boundary of the cemetery and installing subsoil drainage reticulation to intercept underground runoff of rainwater at the site to prevent any further breaches of the consent occurring. This project is scheduled to be undertaken and completed in the 2023-2024 monitoring period.

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.

This report includes recommendations to be implemented during the 2023–2024 monitoring period.

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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) describing the results of the monitoring programme associated with the resource consent held by New Plymouth District Council (NPDC) for discharges related the Mangapouri Cemetery (the Cemetery).

The Cemetery is located on Junction Road (SH3) between New Plymouth and Egmont Village. The consent includes a number of special conditions which set out specific requirements that NPDC must satisfy.

This report covers the results and findings of the monitoring programme implemented by the Council in respect of the consent held by NPDC. The report also discusses the planned activities and any associated potential environmental impacts. This is the fourth report prepared by the Council in relation to the consent held by NPDC for the Mangapouri Cemetery and the third to cover the discharges to land and their effects since the Cemetery opened to the public.

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 *Resource Management Act 1991* (RMA) and the Council's obligations;
- the Council's approach to monitoring sites through annual programmes;
- the resource consent held by NPDC in the Waiwhakaiho Catchment;
- the nature of the monitoring programme in place for the period under review; and
- a description of the activities and operations conducted by NPDC at the Cemetery site.

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 2023-2024 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 Mangapouri Cemetery (the Cemetery) is one of three main cemeteries that NPDC operate. The other two are the Awanui and Te Henui cemeteries, located in central New Plymouth. The availability of plots within the Awanui Cemetery is now limited and the Te Henui Cemetery has no more new plots available for purchase. The Cemetery opened to the public in May 2019 and the first interment was undertaken in July 2019.

The Cemetery accepts conventional single plots, natural burials and ashes. Each grave will be centered on an area of 10 m², which will result in 1,000 graves per hectare (ha). The first two areas available to the public are Area-A which is 0.8 ha in the north of the development, and Area-B which is 0.65 ha in the south and west of the development (Figure 1).

To avoid contamination of local surface and groundwater resources, burials are required to occur at a minimum of 0.8 m above the high water table. Interments will be spread out in time and space to reduce any risks associated with point source loading.

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

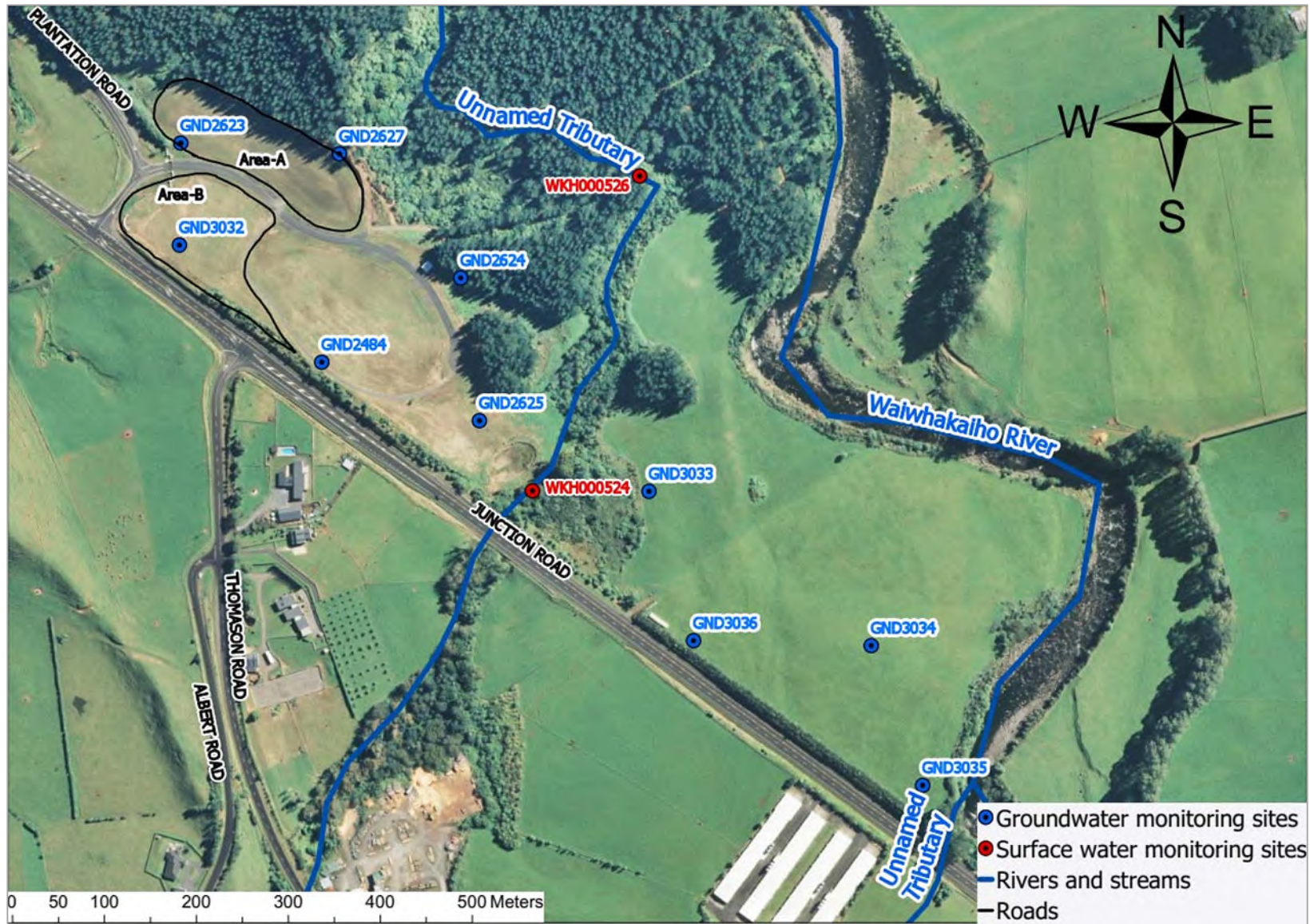


Figure 1 Mangapouri Cemetery location map

1.3 Resource consents

NPDC holds one discharge consent in relation to the Cemetery. The details of which are summarised in the table below (Table 1). A summary of the conditions attached to the 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 is a copy of the permit held by NPDC that authorises their discharge to land.

Table 1 Summary of resource consents held by NPDC at the Mangapouri Cemetery

Consent number	Purpose	Granted	Review	Expires
<i>Discharges of waste to land</i>				
7882-1.1	To discharge contaminants into land at a cemetery in circumstances where they may enter water	09 Nov 2011	June 2026	01 Jun 2046

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 main environmental impacts associated with the interment of human remains is related to the degradation of human corpses. Degradation normally takes 10-12 years and it is estimated that more than half the pollutant load leaches within the first year, with loadings reducing by 50% each year thereafter (SEPA, 2015).

The main point source contamination issues related to cemeteries are the following (SEPA, 2015):

- Ammoniacal nitrogen resulting from the breakdown of organic products;
- Pathogens and organisms harmful to human health can be released into the environment if present;
- Formaldehyde, used in embalming fluids and coffin resins and glues is a biocide with toxic and carcinogenic properties;
- Mercury, present in amalgam in dental fillings, is a hazardous substance;
- Phosphates and metal concentrations in ground and surface water resources, present in cremated remains, can increase; and
- Phosphate from the decomposition of skeletal remains.

The monitoring programme included the collection and analysis of a comprehensive suite of general water quality parameters and those contaminants specifically related to the degradation of human remains.

The monitoring programme in relation to the Cemetery is outlined below. The collection of field data was undertaken by Geosearch Ltd, on behalf of NPDC.

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

1.4.3 Review of NPDC's monitoring data

The monitoring data was provided quarterly to the Council for review to determine compliance with consent conditions. A Burial Report, which included a detailed Burial Plan, was submitted and reviewed by the Council prior to the first interment at the cemetery. Updated plans showing interments to date are submitted annually.

1.4.4 Site inspections

Inspections are undertaken annually in relation to NPDC's discharge consent. The main points of interest during an inspection are to check for signs of water ponding or sediment runoff into local waterways and to survey the area for any potential environmental effects.

1.4.5 Surface water quality monitoring

Surface water quality samples were collected in an unnamed tributary of the Waiwhakaiho River, at one site upstream and one site downstream of the Cemetery. The samples were obtained during low flow and high flow conditions. The samples were submitted to Hill laboratories (Hills) for analysis.

In addition to the routine sampling, baseline samples were collected prior to the commencement of the activity to allow for an in depth comparison of any variations in surface water composition should the need arise.

The location of surface water monitoring sites are displayed on Figure 1. A description of each site is provided in Table 2.

Table 2 Surface water monitoring site details

Site	Eastings	Northings	Description	Location
WKH000524	1697720	5667352	Unnamed tributary of the Waiwhakaiho River	On the cemetery side of Junction Road, downstream of the SH3 culvert
WKH000526	1697837	5667687	Unnamed tributary of the Waiwhakaiho River	320 m downstream of SH3 culvert

1.4.6 Groundwater quality monitoring

Ten groundwater monitoring sites were installed by NPDC at the Cemetery site to enable the collection of comprehensive groundwater quality and level data. Monitoring was undertaken at six of the ten sites. The six sites monitored GND2623, GND2624, GND2625, GND2627, GND2484 and GND3032 are located on the western side of the unnamed tributary that intersects the Cemetery site (Figure 1). The western side of the site includes Area-A and Area-B, the first two sections of the Cemetery available to the public for burials. The groundwater sampling was undertaken quarterly and samples were submitted to Hills for analysis.

In addition to the routine sampling, baseline samples have been collected from all monitored sites to allow for a more in depth assessment of variations in groundwater composition should the need arise in the future.

1.4.7 Groundwater level monitoring

Groundwater level data was collected using in-situ level loggers from six sites GND2623, GND2624, GND2625, GND2627 GND2484 and GND3032. Loggers recorded water level measurements at 15 minute intervals. Data was downloaded quarterly and submitted to the Council for review.

The location of all groundwater monitoring sites are displayed on Figure 1 and the details of each site included in the monitoring programme are summarised below in Table 3.

Table 3 Groundwater monitoring site details

Site code	id.	Eastings	Northings	bore depth (m)	Screen depth (m)
GND2623	MW1	1697453	5667700	8.0	1.2-8
GND2624	MW2	1697688	5667583	6.0	1.2-6
GND2625	MW3	1697703	5667463	5.6	1.6-5.6
GND2484*	MW4	1697570	5667514	8.0	1.2-8
GND2627	MW5	1697587	5667689	12.0	0-12
GND3032	MW6	1697454	5667601	8.0	4-8

**Note GND2484 is referred to as GND2626 in the burial report referenced in the following sections*

2 Results

2.1 Inspections

An annual inspection was undertaken by a Council Officer, in conjunction with the Council's shallow groundwater monitoring programme during 26 July 2022, and the site appeared to be in good condition and being well managed.

No issues were identified during the annual inspection or any of the additional three site visits undertaken as part of the Council's quarterly regional shallow groundwater monitoring programme.

2.2 Provision of consent holder data

Groundwater levels and ground and surface water quality results were provided quarterly for review.

NPDC's Burial report outlined how they would meet compliance with condition 3 of Consent 7882-1.1, which requires NPDC to adopt the best practicable option, to avoid or minimise any adverse effects on the environment.

The report included the Burial Plan for the first five years of interments. The Burial Plan was designed to enable the spreading of burials, in both time and location, in order to reduce point source loading of contaminants (Figure 2). The Report provided a map showing which areas were suitable for which type of burial to ensure that all burials will occur no deeper than 0.8 m above the seasonally high water table.

The Burial Plan established that for the first five years of operation only Area-A and Area-B would be utilised. The type of interment recommended for each area was also determined using available groundwater level data and a 1 in 100 year high groundwater elevation scenario.

2.3 Results of receiving environment monitoring

The monitoring programme is designed to capture any seasonal changes in groundwater and surface water composition, and fluctuations in groundwater levels. The following sections display and discuss the results.

2.3.1 Surface water quality monitoring

Surface water samples were collected and analysed for an extensive suite of parameters during summer and winter/spring flow conditions. Both sites, one upstream and one downstream, are located in the unnamed tributary of the Waiwhakaiho River that flows through the Cemetery site. The results of the baseline analysis in comparison to the more recent sampling carried out are set out below in Table 4 and Table 5. All historic results have been included as Appendix III.

Dissolved reactive phosphorus and total organic carbon show slightly higher concentrations downstream of the site during the summer months when flows are at their lowest both pre and post commencement of the activity.

There are also some minor differences in some parameters seen between seasons. The summer samples exhibit higher total dissolved solids, carbonates and major cation and anions at both sites, when compared to the winter/spring samples. The increases in these analytes are likely related to samples being made up of predominantly groundwater sourced baseflow during the drier summer months. In comparison during the winter and spring when increases in nitrogen species can be seen, a major component of flow will be rainfall runoff received from the predominantly rural surroundings.

No significant changes in surface water quality can be seen between the upstream and downstream sites since monitoring commenced.

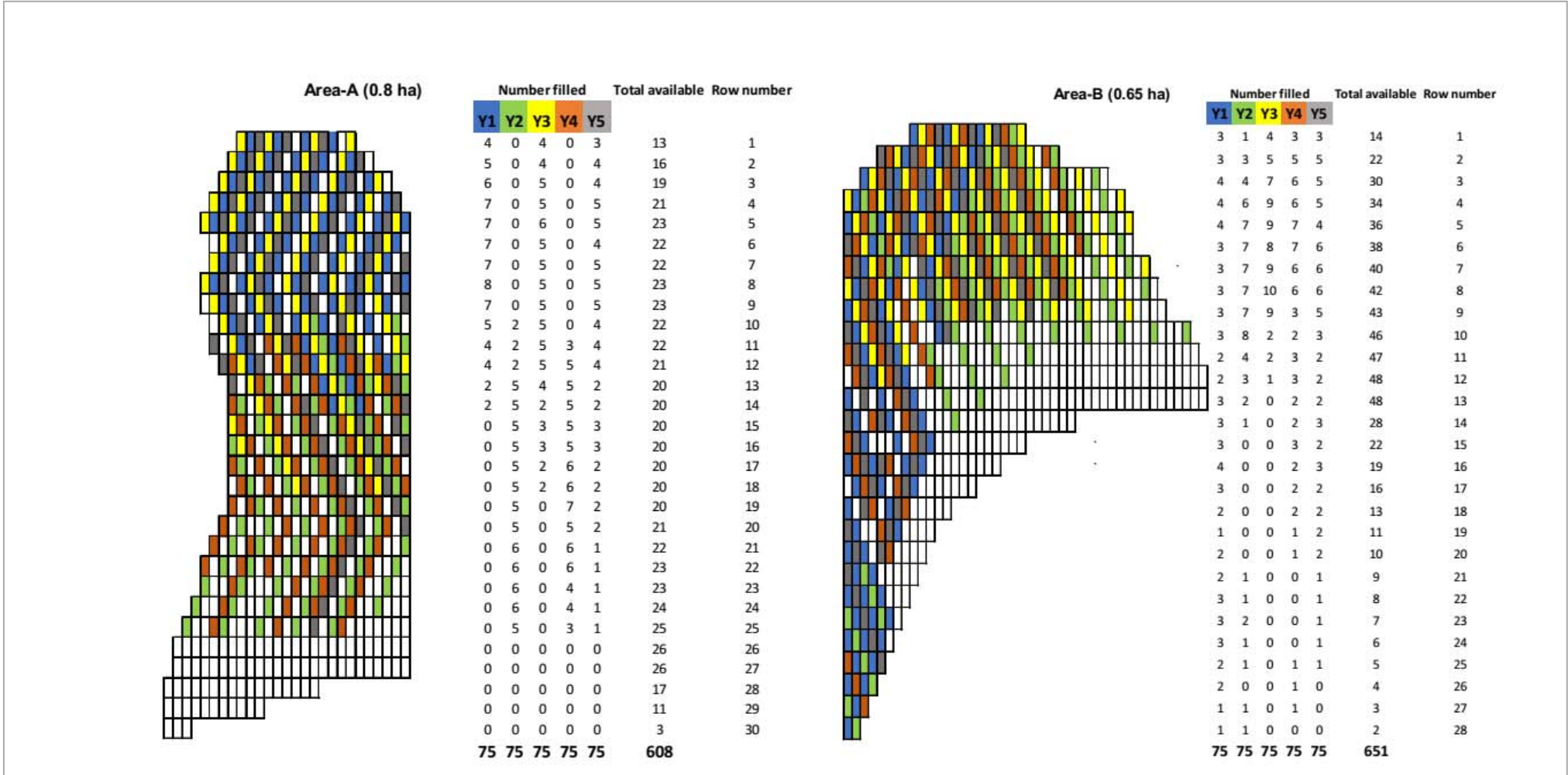


Figure 2 Burial Plan for first five years of operation

Table 4 Surface water quality results-upstream

Parameter	Bore id	WKH000524 upstream					
		Baseline (2017-2018)		Current year (2022-2023)		All years (2017-2023)	
Duration (year)	-	High flow	Low flow	High flow	Low flow	Minimum	Maximum
Sample type	Unit	High flow	Low flow	High flow	Low flow	Minimum	Maximum
pH	pH	7.2	7.5	7.2	7.4	6.9	7.7
Total alkalinity	g/m ³ CaCO ₃	36	76	29	53	29	76
Carbonate	g/m ³ CO ₃	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bicarbonate	g/m ³ HCO ₃	44	92	35	64	35	92
Total hardness	g/m ³ CaCO ₃	43	74	33	52	33	74
Electrical conductivity	µS/cm	140	215	113	17.2	113	215
Total suspended solids	g/m ³	< 3	< 3	19	< 3	< 3	19
Total dissolved solids	g/m ³	95	146	86	108	86	146
Dissolved calcium	g/m ³	10.2	16.0	8.2	11.9	8.2	16
Dissolved magnesium	g/m ³	4.3	8.2	3	5.4	3	8.2
Dissolved potassium	g/m ³	2.9	3.5	3.2	2.9	2.6	3.5
Dissolved sodium	g/m ³	8.9	13.5	6.9	10.3	6.9	13.5
Chloride	g/m ³	12.7	14.5	9.8	11.6	9.8	14.6
Total nitrogen	g/m ³	1.58	0.79	1.99	1.24	0.79	1.88
Ammoniacal nitrogen	g/m ³	0.057	0.040	0.117	0.057	0.03	0.117
Nitrite nitrogen	g/m ³ N	0.007	0.004	0.009	0.004	0.003	0.009
Nitrate nitrogen	g/m ³ N	1.33	0.63	1.23	1.08	0.63	1.61
Nitrate & nitrite nitrogen	g/m ³ N	1.34	0.63	1.24	1.09	0.63	1.61
Total kjeldahl nitrogen	g/m ³	0.24	0.17	0.64	0.15	< 0.10	0.64
Dissolved reactive phosphorus	g/m ³	< 0.004	0.005	0.012	< 0.004	< 0.004	0.012
Total phosphorus	g/m ³	0.016	0.029	0.103	0.018	0.014	0.103
Sulphate	g/m ³	5.9	7.2	4.6	5	4.6	7.2
Biological oxygen demand	g O ₂ /m ³	< 2	< 2	< 2	< 2	< 2	< 2
Chemical oxygen demand	g O ₂ /m ³	< 6	< 6	15	< 6	< 6	15
Total organic carbon	g/m ³	0.7	1.3	6.4	1.6	<0.5	6.4
Escherichia coli	MPN / 100 mL	> 200	579	411	313	110	2,420

Table 5 Surface water quality results-downstream

Parameter	Bore id	WKH000526 downstream					
		Baseline (2017-2018)		Current year (2022-2023)		All years (2017-2023)	
Duration (year)	-	High flow	Low flow	High flow	Low flow	Min	Max
Sample type	Unit	High flow	Low flow	High flow	Low flow	Min	Max
pH	pH	7.1	7.7	7.3	7.6	6.9	7.8
Total alkalinity	g/m ³ CaCO ₃	36	73	28	53	28	73
Carbonate	g/m ³ CO ₃	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bicarbonate	g/m ³ HCO ₃	43	89	34	64	34	89
Total hardness	g/m ³ CaCO ₃	43	73	31	55	31	73
Electrical conductivity	µS/cm	140	211	11.1	16.5	111	211
Total suspended solids	g/m ³	< 3	< 3	12	< 3	< 3	12
Total dissolved solids	g/m ³	108	153	97	118	75	153
Dissolved calcium	g/m ³	10.2	15.5	7.6	12.7	7.6	15.5
Dissolved magnesium	g/m ³	4.4	8.3	2.8	5.7	2.8	8.3
Dissolved potassium	g/m ³	2.9	3.7	3.1	2.9	2.6	3.7
Dissolved sodium	g/m ³	8.8	13.7	6.9	10.5	6.9	13.7
Chloride	g/m ³	12.7	14.6	9.6	12.2	9.6	14.6
Total nitrogen	g/m ³	1.47	0.75	1.88	1.16	0.75	1.88
Ammoniacal nitrogen	g/m ³	0.037	< 0.010	0.194	0.017	< 0.01	0.194
Nitrite nitrogen	g/m ³ N	0.007	< 0.002	0.009	0.004	< 0.002	0.009
Nitrate nitrogen	g/m ³ N	1.27	0.61	1.16	1.06	0.61	1.58
Nitrate & nitrite nitrogen	g/m ³ N	1.28	0.61	1.17	1.06	0.61	1.58
Total kjeldahl nitrogen	g/m ³	0.19	0.14	0.7	< 0.10	< 0.10	0.7
Dissolved reactive phosphorus	g/m ³	< 0.004	0.011	0.013	0.008	< 0.004	0.013
Total phosphorus	g/m ³	0.013	0.022	0.094	0.016	0.01	0.094
Sulphate	g/m ³	6.0	6.8	4.5	5.3	4.5	6.8
Biological oxygen demand	g O ₂ /m ³	< 2	< 2	< 2	< 2	< 2	< 2
Chemical oxygen demand	g O ₂ /m ³	< 6	< 6	13	< 6	< 6	13
Total organic carbon	g/m ³	0.8	< 0.5	7.2	2.2	<0.5	7.2
Escherichia coli	MPN / 100 mL	> 200	140	2,420	225	75	2,420

*Note results reported as >200 due to the lab method for clean water which has a top range of 20

2.3.2 Groundwater quality monitoring

Groundwater sampling was undertaken at quarterly intervals during the monitoring year at six sites (GND2623, GND2624, GND2625, GND2484, GND2627 and GND3032). Results are displayed in Table 6 to Table 11. Results are compared to the range of results since monitoring commenced. All historic results have been included as Appendix III.

Some minor variations in groundwater quality can be observed between bores. GND2624 and GND2625, the two shallowest bores, exhibit slightly higher electrical conductivity and ion concentrations than the other bores. The higher mineral concentrations indicate that the groundwater intercepted by these two bores may be older and more evolved. Results also point to a highly reducing environment at these two sites, which has led to a decrease in nitrates and an increase in iron and manganese concentrations.

GND3032 was added to the programme in January 2019 to monitor groundwater quality in Area-B of the Cemetery. Groundwater quality in the bore fluctuates but is generally similar to that reported in Area-A.

The majority of bores indicate occasional increases in COD and suspended solids. GND2624 recorded an anomalously high nitrate result in April 2021. It decreased slightly, but the peak value tested in October 2022 was still obviously higher than other bores.

Occasional increases in some parameters are not uncommon in shallow groundwater with some analytes being easily re-mobilised following rainfall events. The application of fertiliser at the site also has the potential to temporarily increase some parameters. Occasional elevated total suspended solid concentrations have also been reported and may be a result of bore holes being disturbed prior to sampling resulting in the movement of sediment through the slotted screen into the bore casing.

The majority of slight variations in analytic concentrations seen in each bore during the year are a result of seasonal fluctuations and sampling variability.

**Note GND2484 is referred to as GND2626 in the following sections.*

Table 6 Groundwater quality results GND2627-north

Parameter	Bore id.	MW5 (GND2627)					
		26/07/2022	18/10/2022	31/01/2023	28/04/2023	Minimum 2017-2022	Maximum 2017-2023
Sample date	Unit						
pH	pH	6.1	6.4	6.2	6.2	6.1	6.4
Total alkalinity	g/m ³ CaCO ₃	25	24	26	23	22	38
Carbonate	g/m ³ CO ₃	< 1.0	< 1.0	< 1.0	< 1.0	<1.0	<1.0
Bicarbonate	g/m ³ HCO ₃	30	30	32	28	27	46
Total hardness	g/m ³ CaCO ₃	43	42	39	29	25	43
Electrical conductivity	mS/m	17.3	17.4	15.4	12.3	10.7	17.4
Total suspended solids	g/m ³	< 3	< 3	< 3	< 3	< 1	9
Total dissolved solids	g/m ³	101	115	88	84	73	135
Dissolved aluminium	g/m ³	-	-	< 0.003	-	< 0.003	0.042
Dissolved arsenic	g/m ³	-	-	< 0.0010	-	< 0.0010	< 0.0010
Dissolved barium	g/m ³	-	-	0.009	-	0.007	0.0092
Dissolved boron	g/m ³	-	-	0.008	-	0.008	0.011
Dissolved cadmium	g/m ³	-	-	< 0.00005	-	< 0.00005	< 0.00005
Dissolved calcium	g/m ³	7.3	6.8	6.5	5.5	4.6	7.3
Dissolved chromium	g/m ³	-	-	0.0007	-	0.0006	0.001
Dissolved copper	g/m ³	-	-	< 0.0005	-	< 0.0005	0.0012
Dissolved iron	g/m ³	-	-	< 0.02	-	< 0.02	0.04
Dissolved lead	g/m ³	-	-	< 0.00010	-	< 0.00010	0.00044
Dissolved magnesium	g/m ³	6	6	5.5	3.7	2.4	6
Dissolved manganese	g/m ³	-	-	0.0008	-	0.0008	0.006
Dissolved mercury	g/m ³	-	-	< 0.00008	-	< 0.00008	< 0.00008
Dissolved Nickel	g/m ³	-	-	< 0.0005	-	< 0.0005	< 0.0005
Dissolved potassium	g/m ³	0.65	0.69	0.72	0.53	0.53	1.07
Dissolved sodium	g/m ³	14.2	13.6	14.2	12.3	7.7	15.1
Dissolved zinc	g/m ³	-	-	0.002	-	0.0012	0.0074
Chloride	g/m ³	30	31	23	15.6	8	31
Fluoride	g/m ³	-	-	< 0.05	-	< 0.05	< 0.05
Total nitrogen	g/m ³	0.37	0.37	0.74	1.5	0.12	1.92
Ammoniacal nitrogen	g/m ³	<0.010	<0.010	< 0.010	< 0.010	< 0.010	< 0.010
Nitrite nitrogen	g/m ³ N	<0.002	<0.002	< 0.002	< 0.002	< 0.002	< 0.002
Nitrate nitrogen	g/m ³ N	0.35	0.34	0.7	1.48	0.11	1.92

Parameter	Bore id.	MW5 (GND2627)					
Sample date	Unit	26/07/2022	18/10/2022	31/01/2023	28/04/2023	Minimum 2017-2022	Maximum 2017-2023
Nitrate & nitrite nitrogen	g/m ³ N	0.35	0.34	0.7	1.48	0.11	1.92
Total kjeldahl nitrogen	g/m ³	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dissolved reactive phosphorus	g/m ³	< 0.004	< 0.004	0.005	< 0.004	< 0.004	0.008
Dissolved reactive silica	g/m ³ SiO ₂	-	-	24	-	20	30
Total phosphorus	g/m ³	< 0.004	0.003*	0.004	0.004	<0.004	0.017
Sulphate	g/m ³	5.3	5.3	4.7	5.1	4.9	7.4
Biological oxygen demand	g O ₂ /m ³	< 2	< 2	< 2	< 2	< 2	< 2
Chemical oxygen demand	g O ₂ /m ³	< 6	< 6	< 6	< 6	< 6	< 6
Total organic carbon	g/m ³	< 0.5	0.5	2.4	0.9	< 0.5	1.2
Escherichia coli	MPN/100 mL	< 1	< 1	< 1	< 1	< 1	< 1
Formaldehyde	g/m ³	-	-	< 0.02	-	< 0.02	< 0.02

Table 7 Groundwater quality results GND2624-north

Parameter	Bore id.	MW2 (GND2624)					
Sample date	Unit	26/07/2022	18/10/2022	31/01/2023	28/04/2023	Minimum 2017-2023	Maximum 2017-2023
pH	pH	6.3	6.5	6.3	6	6	6.5
Total alkalinity	g/m ³ CaCO ₃	170	158	171	72	72	180
Carbonate	g/m ³ CO ₃	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bicarbonate	g/m ³ HCO ₃	210	193	210	88	88	220
Total hardness	g/m ³ CaCO ₃	131	119	125	67	67	210
Electrical conductivity	mS/m	42.7	44	41.7	20.2	20.2	49.5
Total suspended solids	g/m ³	< 3	< 3	8	4	< 3	90
Total dissolved solids	g/m ³	230	270	220	131	131	320
Dissolved aluminium	g/m ³	-	-	< 0.003	-	< 0.003	0.004
Dissolved arsenic	g/m ³	-	-	< 0.0010	-	< 0.0010	< 0.0010
Dissolved barium	g/m ³	-	-	0.23	-	0.072	0.23
Dissolved boron	g/m ³	-	-	0.006	-	0.006	0.011
Dissolved cadmium	g/m ³	-	-	0.00012	-	0.0001	0.00016
Dissolved calcium	g/m ³	29	20	22	13.7	13.7	69
Dissolved chromium	g/m ³	-	-	< 0.0005	-	< 0.0005	< 0.0005
Dissolved copper	g/m ³	-	-	0.0023	-	0.0011	0.0053

Parameter	Bore id.	MW2 (GND2624)					
		26/07/2022	18/10/2022	31/01/2023	28/04/2023	Minimum 2017-2023	Maximum 2017-2023
Sample date	Unit						
Dissolved iron	g/m ³	-	-	19.3	-	0.07	19.3
Dissolved lead	g/m ³	-	-	< 0.00010	-	< 0.00010	0.00066
Dissolved magnesium	g/m ³	14.3	16.5	17.2	8	7.9	17.2
Dissolved manganese	g/m ³	-	-	29	-	6.8	29
Dissolved mercury	g/m ³	-	-	< 0.00008	-	< 0.00008	< 0.00008
Dissolved Nickel	g/m ³	-	-	0.0007	-	< 0.0005	0.0007
Dissolved potassium	g/m ³	5.7	5.3	5.3	2.7	3.3	5.7
Dissolved sodium	g/m ³	16.8	16.5	16.6	11.9	11.1	17.9
Dissolved zinc	g/m ³	-	-	0.0173	-	0.0061	0.022
Chloride	g/m ³	16.7	15.9	16.3	8.5	13.4	22
Fluoride	g/m ³	-	-	< 0.05	-	< 0.05	< 0.05
Total nitrogen	g/m ³	4.6	10.7	2.2	2.2	0.5	13.5
Ammoniacal nitrogen	g/m ³	3.2	2	2.1	0.123	0.123	3.2
Nitrite nitrogen	g/m ³ N	0.006	0.032	< 0.02	< 0.002	< 0.002	0.108
Nitrate nitrogen	g/m ³ N	0.55	7.7	< 0.02	1.93	< 0.002	12.9
Nitrate & nitrite nitrogen	g/m ³ N	0.56	7.7	< 0.02	1.93	< 0.002	13
Total kjeldahl nitrogen	g/m ³	4.1	3	2.2	0.29	0.33	4.1
Dissolved reactive phosphorus	g/m ³	<0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004
Dissolved reactive silica	g/m ³ SiO ₂	-	-	14.1	-	15.5	21
Total phosphorus	g/m ³	0.004	0.004	0.004	0.002	0.002	0.09
Sulphate	g/m ³	18.2	14	9.1	7	7	70
Biological oxygen demand	g O ₂ /m ³	< 2	< 2	< 2	< 2	< 2	< 2
Chemical oxygen demand	g O ₂ /m ³	6	10	< 6	9	< 6	14
Total organic carbon	g/m ³	8.2	1	4.6	2.5	< 0.5	8.2
Escherichia coli	MPN/100 mL	< 1	< 1	< 1	< 1	< 1	1
Formaldehyde	g/m ³	-	-	< 0.02	-	< 0.02	< 0.02

Table 8 Groundwater quality results GND2625-east

Parameter	Bore id.	MW3 (GND2625)						
		Sample date	Unit	26/07/2022	18/10/2022	31/01/2023	28/04/2023	Minimum 2017-2023
pH	pH		6.5	6.8	6.5	6.3	6	6.8
Total alkalinity	g/m ³ CaCO ₃		153	128	138	132	23	152
Carbonate	g/m ³ CO ₃		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bicarbonate	g/m ³ HCO ₃		187	156	168	161	28	187
Total hardness	g/m ³ CaCO ₃		84	70	75	83	31	95
Electrical conductivity	mS/m		35.7	28.2	33.1	31.1	12.8	36.8
Total suspended solids	g/m ³		19	16	33	15	< 3	40
Total dissolved solids	g/m ³		177	150	156	166	88	230
Dissolved aluminium	g/m ³		-	-	< 0.003	-	< 0.003	< 0.003
Dissolved arsenic	g/m ³		-	-	< 0.0010	-	< 0.0010	< 0.0010
Dissolved barium	g/m ³		-	-	0.189	-	0.058	0.198
Dissolved boron	g/m ³		-	-	0.009	-	0.007	0.016
Dissolved cadmium	g/m ³		-	-	< 0.00005	-	< 0.00005	0.00013
Dissolved calcium	g/m ³		19	15.9	18.9	17.9	5.3	21
Dissolved chromium	g/m ³		-	-	< 0.0005	-	< 0.0005	< 0.0005
Dissolved copper	g/m ³		-	-	0.001	-	< 0.0005	0.001
Dissolved iron	g/m ³		-	-	27	-	0.25	27
Dissolved lead	g/m ³		-	-	< 0.00010	-	< 0.00010	< 0.00010
Dissolved magnesium	g/m ³		8.8	7.5	8.2	9.3	4.3	10.1
Dissolved manganese	g/m ³		-	-	18.2	-	1.92	22
Dissolved mercury	g/m ³		-	-	< 0.00008	-	< 0.00008	< 0.00008
Dissolved Nickel	g/m ³		-	-	0.0007	-	< 0.0005	0.0007
Dissolved potassium	g/m ³		6.1	5.3	5.1	6.3	0.6	6.7
Dissolved sodium	g/m ³		9	7.7	16.6	9.9	8.3	16.6
Dissolved zinc	g/m ³		-	-	0.0173	-	0.0045	0.036
Chloride	g/m ³		11.2	9.9	9.8	11.1	9.9	29
Fluoride	g/m ³		-	-	< 0.05	-	< 0.05	< 0.05
Total nitrogen	g/m ³		2.8	2.4	2.1	2.1	0.4	2.8
Ammoniacal nitrogen	g/m ³		2.5	1.99	2.1	1.78	0.28	2.5
Nitrite nitrogen	g/m ³ N		<0.02	<0.02	< 0.02 #1	< 0.02	< 0.002	0.017
Nitrate nitrogen	g/m ³ N		<0.02	<0.02	< 0.02	< 0.02	< 0.002	1.15

Parameter	Bore id.	MW3 (GND2625)					
Sample date	Unit	26/07/2022	18/10/2022	31/01/2023	28/04/2023	Minimum 2017-2023	Maximum 2017-2023
Nitrate & nitrite nitrogen	g/m ³ N	< 0.02	< 0.02	< 0.02 #1	< 0.02	< 0.002	1.15
Total kjeldahl nitrogen	g/m ³	2.8	2.4	2.1	2.1	< 0.10	2.8
Dissolved reactive phosphorus	g/m ³	< 0.004	0.01	< 0.04	< 0.004	< 0.004	0.01
Dissolved reactive silica	g/m ³ SiO ₂	-	-	13.5	-	15.9	22
Total phosphorus	g/m ³	0.006	0.007	0.005	0.007	0.002	0.055
Sulphate	g/m ³	14	10.8	10.3	14.5	6.3	15.5
Biological oxygen demand	g O ₂ /m ³	3	<2	< 2	< 2	< 2	5
Chemical oxygen demand	g O ₂ /m ³	9	9	< 6	< 6	< 6	12
Total organic carbon	g/m ³	3.5	0.9	3.8	4.4	< 0.5	7.8
Escherichia coli	MPN/100 mL	< 1	< 1	< 1	7	< 1	35
Formaldehyde	g/m ³	-	-	< 0.02	-	< 0.02	< 0.02

Table 9 Groundwater quality results GND3032-south

Parameter	Bore id.	MW6 (GND3032)					
Sample date	Unit	26/07/2022	18/10/2022	31/01/2023	28/04/2023	Minimum 2019-2023	Maximum 2019-2023
pH	pH	6.2	6.4	6.1	6.2	6.1	6.7
Total alkalinity	g/m ³ CaCO ₃	52	52	50	51	50	110
Carbonate	g/m ³ CO ₃	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bicarbonate	g/m ³ HCO ₃	64	63	61	62	61	134
Total hardness	g/m ³ CaCO ₃	51	51	55	51	51	108
Electrical conductivity	mS/m	17.4	16.3	16.3	16.3	16.3	31.3
Total suspended solids	g/m ³	157	< 3	< 3	< 3	< 3	680
Total dissolved solids	g/m ³	109	125	112	117	109	220
Dissolved aluminium	g/m ³	-	-	< 0.003	-	< 0.003	0.006
Dissolved arsenic	g/m ³	-	-	< 0.0010	-	< 0.0010	< 0.0010
Dissolved barium	g/m ³	-	-	0.021	-	0.021	0.057
Dissolved boron	g/m ³	-	-	0.013	-	0.011	0.014
Dissolved cadmium	g/m ³	-	-	< 0.00005	-	< 0.00005	< 0.00005
Dissolved calcium	g/m ³	12.5	12.2	12.6	12.3	12.2	31
Dissolved chromium	g/m ³	-	-	0.0006	-	0.0005	0.0022
Dissolved copper	g/m ³	-	-	0.0014	-	0.0007	0.0022

Parameter	Bore id.	MW6 (GND3032)					
Sample date	Unit	26/07/2022	18/10/2022	31/01/2023	28/04/2023	Minimum 2019-2023	Maximum 2019-2023
Dissolved iron	g/m ³	-	-	< 0.02	-	< 0.02	< 0.02
Dissolved lead	g/m ³	-	-	< 0.00010	-	< 0.00010	< 0.00010
Dissolved magnesium	g/m ³	4.7	5	5.7	4.8	4.7	8.1
Dissolved manganese	g/m ³	-	-	0.0058	-	0.0024	0.085
Dissolved mercury	g/m ³	-	-	< 0.00008	-	< 0.00008	< 0.00008
Dissolved Nickel	g/m ³	-	-	< 0.0005	-	< 0.0005	0.0014
Dissolved potassium	g/m ³	1.4	1.47	1.52	1.41	1.4	1.83
Dissolved sodium	g/m ³	13.2	11.4	12.2	14.5	11.4	21
Dissolved zinc	g/m ³	-	-	0.0018	-	0.0018	0.0079
Chloride	g/m ³	11.1	10.6	10.2	9.5	10.2	19.4
Fluoride	g/m ³	-	-	< 0.05	-	< 0.05	< 0.05
Total nitrogen	g/m ³	1.61	1.75	1.82	1.22	1.22	6
Ammoniacal nitrogen	g/m ³	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	0.016
Nitrite nitrogen	g/m ³ N	< 0.002	<0.002	< 0.002	< 0.002	< 0.002	< 0.002
Nitrate nitrogen	g/m ³ N	1.49	1.72	1.81	1.18	1.49	6
Nitrate & nitrite nitrogen	g/m ³ N	1.49	1.72	1.81	1.18	1.49	6
Total kjeldahl nitrogen	g/m ³	0.12	<0.10	< 0.10	<0.10	<0.10	0.7
Dissolved reactive phosphorus	g/m ³	< 0.004	0.006	0.007	0.006	<0.004	0.005
Dissolved reactive silica	g/m ³ SiO ₂	-	-	28	-	27	34
Total phosphorus	g/m ³	0.137	0.008	0.007	0.01	<0.004	0.81
Sulphate	g/m ³	7.8	5	3.5	9	3.5	12.2
Biological oxygen demand	g O ₂ /m ³	< 2	< 2	< 2	< 2	< 2	< 2
Chemical oxygen demand	g O ₂ /m ³	< 6	< 6	< 6	< 6	< 6	23
Total organic carbon	g/m ³	1.7	0.5	0.7	< 0.5	< 0.5	22
Escherichia coli	MPN/100 mL	< 1	< 1	< 1	< 1	< 1	< 1
Formaldehyde	g/m ³	-	-	< 0.02	-	< 0.02	< 0.02

Table 10 Groundwater quality results GND2484-south

Parameter	Bore id.	MW4 (GND2484)					
		26/07/2022	18/10/2022	31/01/2023	28/04/2023	Minimum 2017-2023	Maximum 2017-2023
pH	pH	6.2	6.5	6.3	6.1	5.9	6.5
Total alkalinity	g/m ³ CaCO ₃	29	32	32	29	24	98
Carbonate	g/m ³ CO ₃	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bicarbonate	g/m ³ HCO ₃	36	40	39	36	29	120
Total hardness	g/m ³ CaCO ₃	26	26	28	26	20	79
Electrical conductivity	mS/m	9.8	9.9	10.4	9.1	8.1	21.9
Total suspended solids	g/m ³	< 3	< 3	< 3	< 3	< 3	27
Total dissolved solids	g/m ³	72	57	77	72	50	139
Dissolved aluminium	g/m ³	-	-	< 0.003	-	< 0.003	0.013
Dissolved arsenic	g/m ³	-	-	< 0.0010	-	< 0.0010	< 0.0010
Dissolved barium	g/m ³	-	-	0.011	-	0.0061	0.012
Dissolved boron	g/m ³	-	-	0.009	-	0.008	0.009
Dissolved cadmium	g/m ³	-	-	< 0.00005	-	< 0.00005	< 0.00005
Dissolved calcium	g/m ³	6	5.9	6.1	5.9	4.7	20
Dissolved chromium	g/m ³	-	-	0.0005	-	< 0.0005	0.0008
Dissolved copper	g/m ³	-	-	0.0005	-	< 0.0005	0.0058
Dissolved iron	g/m ³	-	-	< 0.02	-	< 0.02	< 0.02
Dissolved lead	g/m ³	-	-	< 0.00010	-	< 0.00010	< 0.00010
Dissolved magnesium	g/m ³	2.6	2.7	3.1	2.6	2	6.9
Dissolved manganese	g/m ³	-	-	0.0039	-	0.0012	0.0098
Dissolved mercury	g/m ³	-	-	< 0.00008	-	< 0.00008	< 0.00008
Dissolved Nickel	g/m ³	-	-	< 0.0005	-	< 0.0005	< 0.0005
Dissolved potassium	g/m ³	1.14	1.08	1.16	1.16	1.02	4.4
Dissolved sodium	g/m ³	8.6	8.3	9.4	9	6.9	10.3
Dissolved zinc	g/m ³	-	-	0.0025	-	0.001	0.0033
Chloride	g/m ³	7.6	7.1	7	6.9	6.3	9.8
Fluoride	g/m ³	-	-	< 0.05	-	< 0.05	< 0.05
Total nitrogen	g/m ³	<0.11	0.12	< 0.11	0.11	< 0.11	1.06
Ammoniacal nitrogen	g/m ³	<0.010	<0.010	< 0.010	< 0.010	< 0.010	0.59
Nitrite nitrogen	g/m ³ N	<0.002	<0.002	< 0.002	< 0.002	< 0.002	< 0.002
Nitrate nitrogen	g/m ³ N	0.092	0.098	0.087	0.089	0.076	0.34

Parameter	Bore id.	MW4 (GND2484)					
Sample date	Unit	26/07/2022	18/10/2022	31/01/2023	28/04/2023	Minimum 2017-2023	Maximum 2017-2023
Nitrate & nitrite nitrogen	g/m ³ N	0.092	0.098	0.087	0.089	0.076	0.34
Total kjeldahl nitrogen	g/m ³	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.94
Dissolved reactive phosphorus	g/m ³	0.008	0.013	0.014	0.008	< 0.004	0.018
Dissolved reactive silica	g/m ³ SiO ₂	-	-	24	-	24	31
Total phosphorus	g/m ³	0.011	0.015	0.016	0.011	0.008	0.029
Sulphate	g/m ³	4.9	4.8	4.6	3.8	3.8	9.1
Biological oxygen demand	g O ₂ /m ³	< 2	< 2	< 2	< 2	< 2	< 2
Chemical oxygen demand	g O ₂ /m ³	< 6	< 6	< 6	< 6	< 6	< 6
Total organic carbon	g/m ³	< 0.5	< 0.5	0.8	< 0.5	< 0.5	5.1
Escherichia coli	MPN/100 mL	< 1	< 1	< 1	< 1	< 1	2
Formaldehyde	g/m ³	-	-	< 0.02	-	< 0.02	< 0.02

Table 11 Groundwater quality results GND2623-west

Parameter	Bore id.	MW1 (GND2623)					
Sample date	Unit	26/07/2022	18/10/2022	31/01/2023	28/04/2023	Minimum 2017-2023	Maximum 2017-2023
pH	pH	6.1	6.5	6.1	6.1	5.9	6.5
Total alkalinity	g/m ³ CaCO ₃	41	48	52	45	39	68
Carbonate	g/m ³ CO ₃	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bicarbonate	g/m ³ HCO ₃	50	58	63	54	47	82
Total hardness	g/m ³ CaCO ₃	38	37	41	43	32	56
Electrical conductivity	mS/m	12.3	13.7	15.3	12.9	12.1	18.3
Total suspended solids	g/m ³	< 3	< 3	< 3	< 3	< 3	3200
Total dissolved solids	g/m ³	76	86	91	86	76	151
Dissolved aluminium	g/m ³	-	-	< 0.003	-	< 0.003	0.005
Dissolved arsenic	g/m ³	-	-	< 0.0010	-	< 0.0010	< 0.0010
Dissolved barium	g/m ³	-	-	0.009	-	0.0068	0.01
Dissolved boron	g/m ³	-	-	0.012	-	0.01	0.012
Dissolved cadmium	g/m ³	-	-	< 0.00005	-	< 0.00005	< 0.00005
Dissolved calcium	g/m ³	10.3	9.2	9.6	11.3	7.7	13.6
Dissolved chromium	g/m ³	-	-	< 0.0005	-	< 0.0005	0.0005
Dissolved copper	g/m ³	-	-	< 0.0005	-	< 0.0005	0.0005

Parameter	Bore id.	MW1 (GND2623)					
Sample date	Unit	26/07/2022	18/10/2022	31/01/2023	28/04/2023	Minimum 2017-2023	Maximum 2017-2023
Dissolved iron	g/m ³	-	-	< 0.02	-	< 0.02	< 0.02
Dissolved lead	g/m ³	-	-	< 0.00010	-	< 0.00010	0.00015
Dissolved magnesium	g/m ³	3	3.3	4.2	3.5	3.1	5.4
Dissolved manganese	g/m ³	-	-	0.0034	-	0.001	0.0014
Dissolved mercury	g/m ³	-	-	< 0.00008	-	< 0.00008	< 0.00008
Dissolved Nickel	g/m ³	-	-	< 0.0005	-	< 0.0005	< 0.0005
Dissolved potassium	g/m ³	1.52	1.52	1.54	1.66	1.34	1.78
Dissolved sodium	g/m ³	8.4	11.8	14.1	10	10.3	15.3
Dissolved zinc	g/m ³	-	-	0.0021	-	0.0011	0.0026
Chloride	g/m ³	7.3	7.6	7.6	6.9	6.9	11
Fluoride	g/m ³	-	-	< 0.05	-	< 0.05	< 0.05
Total nitrogen	g/m ³	0.64	0.81	1	1.02	0.64	1.89
Ammoniacal nitrogen	g/m ³	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	0.012
Nitrite nitrogen	g/m ³ N	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Nitrate nitrogen	g/m ³ N	0.59	0.71	0.98	0.96	0.59	1.62
Nitrate & nitrite nitrogen	g/m ³ N	0.59	0.71	0.98	0.96	0.59	1.62
Total kjeldahl nitrogen	g/m ³	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.51
Dissolved reactive phosphorus	g/m ³	< 0.004	0.006	0.012	0.006	<0.004	0.014
Dissolved reactive silica	g/m ³ SiO ₂	-	-	26	-	22	32
Total phosphorus	g/m ³	0.004	0.007	0.015	0.007	<0.004	2.2
Sulphate	g/m ³	4.7	5.1	4.1	3.8	3.8	5.5
Biological oxygen demand	g O ₂ /m ³	< 2	< 2	< 2	< 2	< 2	< 2
Chemical oxygen demand	g O ₂ /m ³	< 6	< 6	< 6	< 6	< 6	15
Total organic carbon	g/m ³	< 0.5	< 0.5	1.1	< 0.5	< 0.5	2.7
Escherichia coli	MPN/100 mL	< 1	< 1	< 1	< 1	< 1	< 1
Formaldehyde	g/m ³	-	-	< 0.02	-	< 0.02	0.02

2.3.3 Groundwater level monitoring

Groundwater level data was collected electronically at 15 minute intervals using in-situ level loggers. Data was downloaded quarterly.

A comparison with rainfall data collected in the nearby Waiwhakaiho at Egmont Village rainfall site is included as Figure 3. An assessment of the data confirms all groundwater levels respond to sustained periods of rainfall recharge.

A summary of the range of groundwater levels at the site and the minimum required depth to water for each type of interment are included in Table 12 below. The Table indicates that some areas are not suitable for some types of burials.

Table 12 Groundwater level range and burial type

Site code	Area	Shallow double burial Minimum depth of 1.8 m BGL	Conventional single burial Minimum depth of burial is 1.2 m BGL	Natural grave Minimum depth of burial is 1.0 m BGL	Water level range (m BGL)		Range (m)	High Water Level Commenced
		Minimum required depth to high water table (m BGL)			High	Low		
GND2627	north	2.6	2.0	1.8	0*	5.10	5.28	4 Mar 2017
GND2624	north				0*	5.40	5.52	4 Mar 2017
GND2625	east				0*	4.39	4.56	14 May 2018
GND3032	south				1.86	5.94	4.08	19 Aug 2022
GND2484	south				1.83	5.22	3.39	19 Aug 2022
GND2623	west				0.91	5.64	4.72	19 Aug 2022

Note *Water levels in these bores rose to ground level in 19 August 2022 following a sustained period of heavy rainfall (189.5mm/day).

Groundwater level data is illustrated for all six monitored sites in Figure 4 and Figure 5. The minimum depth to water required for shallow double plot burials (red line), conventional single burials (green line) and natural burials (purple line) have been added for reference.

An assessment of the data indicates that groundwater levels are high and fluctuate significantly in GND2624 and GND2627, ranging from <0 m BGL during the wetter months to >5 m BGL in the drier months (Figure 4). The flat-lined data seen in March 2019 and March-April 2020 in GND2624 is anomalous. The data is likely an artefact of groundwater levels exceeding the level loggers design range. GND2625 also exhibits high groundwater levels, fluctuating between <0m BGL and >4 m BGL (Figure 4). Groundwater levels in GND2623, GND2484 and GND3032 are slightly more subdued and fluctuate to a lesser degree this monitoring year (Figure 4 and Figure 5). The high water level of each bore is still slightly beyond previous values. The greater fluctuations seen to the north and east may be a result of enhanced recharge, due to the close proximity of the forested hills to the north of the Cemetery.

Groundwater level data indicates that Area-A and Area-B are not suitable for conventional double plot or shallow double plot stacked burials which require interment to a minimum depth of 1.2 m BGL and 1.8 m BGL respectively. Groundwater levels also indicate that the majority of Area-A is not suitable for conventional single plot burials (1.2 m BGL) or in the north and east natural graves (1 m BGL). To ensure the long-term viability of Area-A for burials passive dewatering drainage pipes will be installed to ensure that

the water levels beneath the site remain below consented thresholds. It is preparing presently and scheduled to commence from the mid of November 2023 depending on the site and weather conditions. To date the number of interments undertaken at the Cemetery has been significantly less than provided for in the burial report submitted prior to the cemetery opening. These numbers are expected to increase significantly once New Plymouth's other cemeteries close.

During the 2022-2023 monitoring period several significant rainfall events occurred. Heavy rainfalls over a short period can cause the ground to become saturated and consequentially the water table to rise. Following a sustained period of heavy rainfall groundwater levels in Area-B rose significantly resulting in a breach of condition 3 of consent 7882-1.1, which requires graves to be located no closer than 0.8 m above the water table, occurring between 17 and 22 August 2022 (Figure 5).

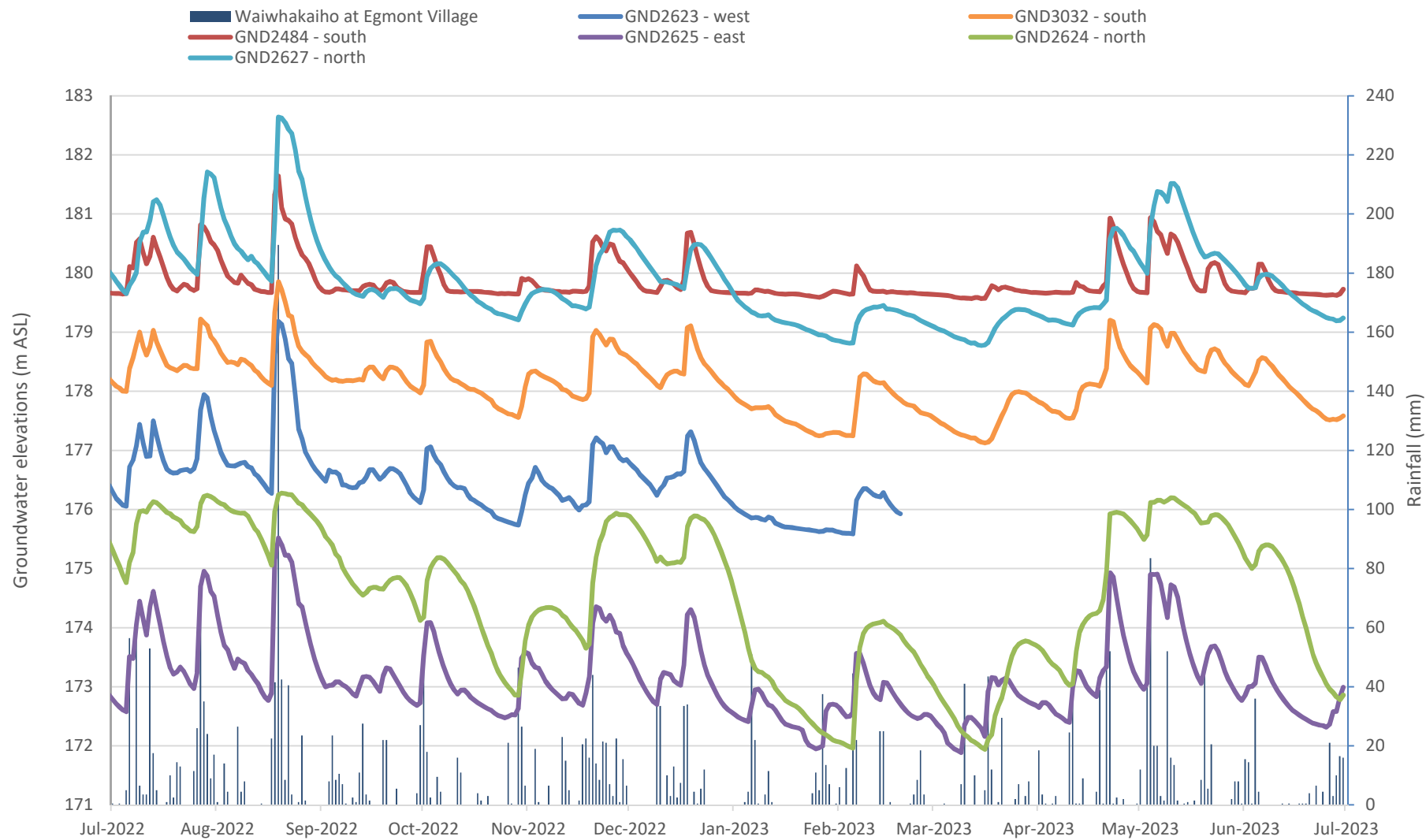


Figure 3 Groundwater elevations and rainfall at Egmont Village in 2022-2023

*Note: GND2623 didn't collect data from 10/02/2022-30/06/2023 due to a sensor malfunction

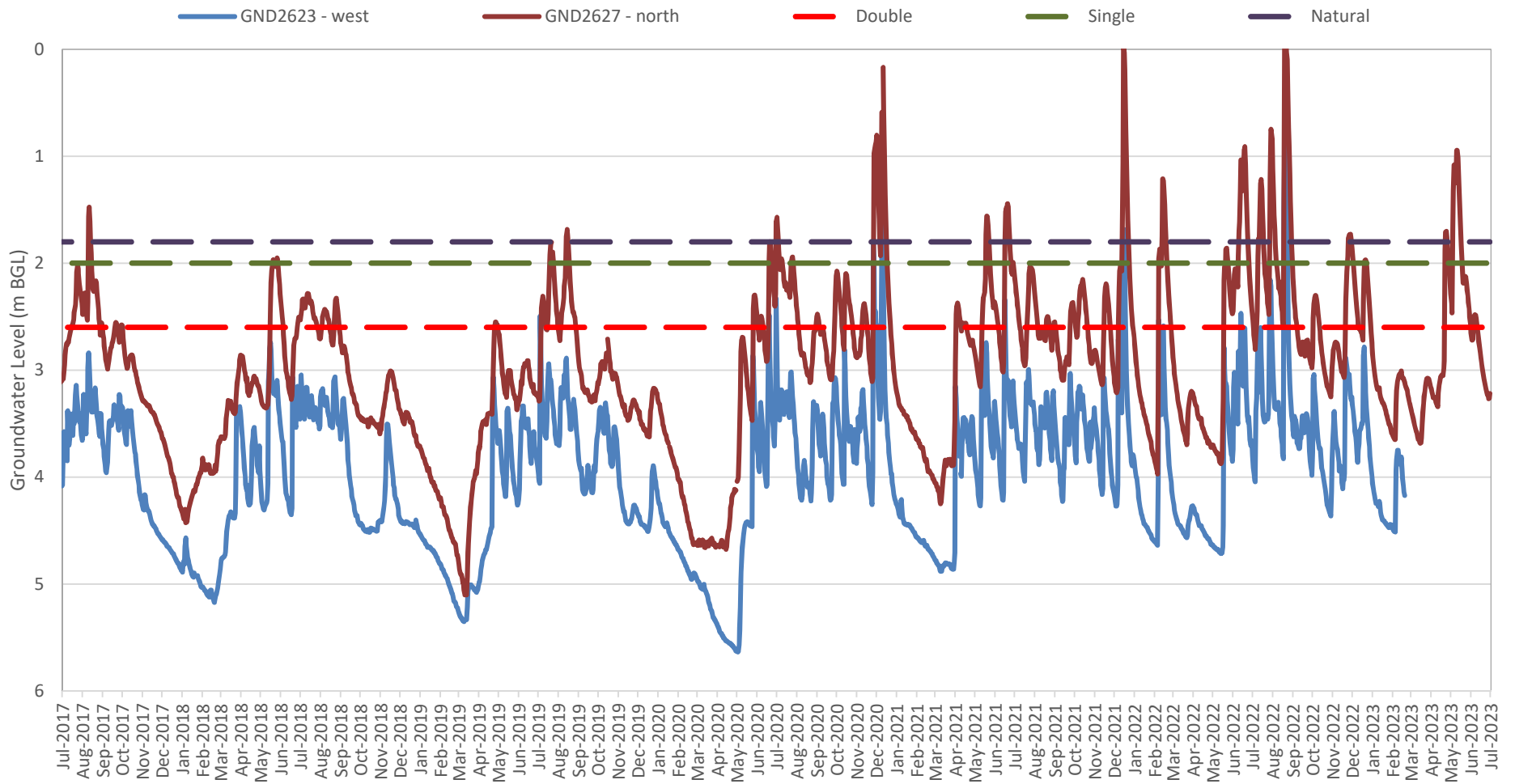


Figure 4 Groundwater levels Area A (GND2623 and GND2627) compared to minimum required water table depths by burial type

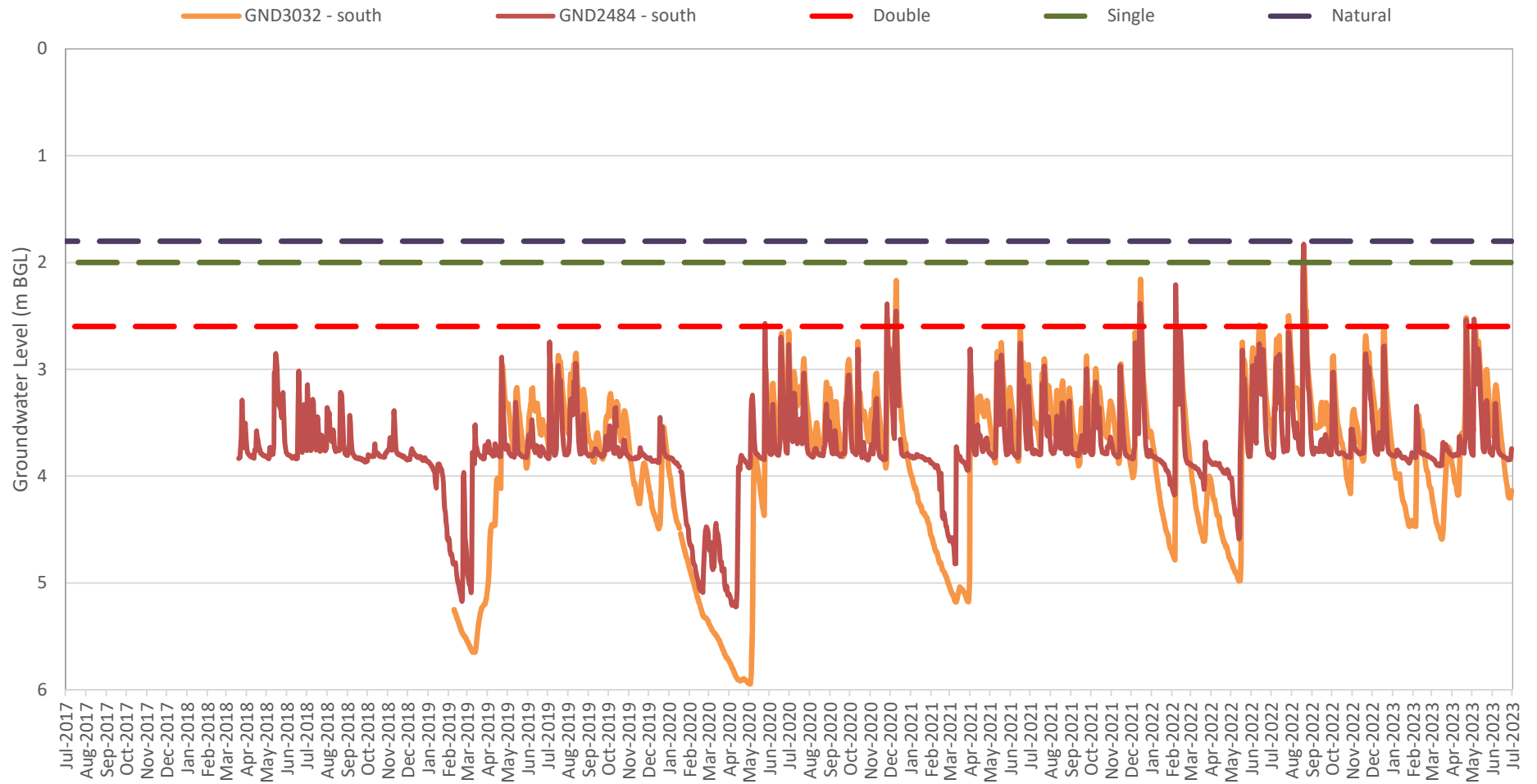


Figure 5 Groundwater levels Area-B (GND2484 and GND3032) compared to minimum required water table depths by burial type

2.4 Investigations, interventions and incidents

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 and or their representatives. 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 proactive approach that in the first instance avoids issues occurring is favoured.

The Council operates and maintains a register of all complaints or reported and discovered excursions from acceptable limits and practices, including non-compliance with consents, which may damage the environment. The incident register includes events where NPDC was concerned, and has notified Council themselves. The register contains details of any investigation and corrective action taken.

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 company is indeed the source of the incident (or that the allegation cannot be proven).

Table 13 below sets out details of any incidents recorded, additional investigations, or interventions required by the Council in relation to NPDC's activities during the 2022-2023 period. This table presents details of all events that required further investigation or intervention regardless of whether these were found to be compliant or not.

Several non-compliances occurred during the 2022-2023 monitoring period. The non-compliances were due to high water levels recorded at the site resulting in the likelihood that there was less than 0.8 m separation between the water table and several double plot and single depth graves. Non-compliances occur following heavy rainfall events with levels increasing in all bores above the limit for double depth burials and in some areas above the limit for single and natural burials.

Following discovery of the non-compliance NPDC were contacted and discussions began. An abatement notice was issued on 28 March 2022 and NPDC engaged a consultant to design an underground drainage network to ensure the water table remains below the level required to prevent any further breaches occurring. The works were planned to commence during the 2022-2023 monitoring year, however, the schedule has been postponed to the following monitoring year due to unforeseen reasons.

Table 13 Incidents, investigations, and interventions summary table

Date	Details	Compliant (Y/N)	Enforcement Action Taken?	Outcome
19 September 2022	Due to high rainfall events water levels in Area-A and Area-B exceeded those required to meet the conditions of the consent	N	NPDC was informed when the breach was discovered and a meeting was held to discuss mitigation options to avoid future breaches.	Works to improve drainage at the site are due to commence during the 2023-2024 year.

3 Discussion

3.1 Discussion of site performance

The Cemetery opened to the public in May 2019 and the compliance monitoring programme commenced following the first interment in July 2019.

Inspections of the site during the monitoring period found it to be in good condition and being well managed. The monitoring programme was undertaken as required and data was provided to the Council for review in a timely manner.

Groundwater levels indicated that Area-A and Area-B, are both unsuitable for conventional plots (1.2 m depth) and, during wetter months shallow double stacked plots (1.8 m depth). In addition, due to high groundwater levels parts of Area-A are also unsuitable for conventional single depth or natural burials.

Groundwater levels for the monitoring period show that during periods of heavy, sustained rainfall the water table can rise above the consented threshold resulting in a breach of consent conditions.

Figure 6 shows the areas allocated to each type of interment.

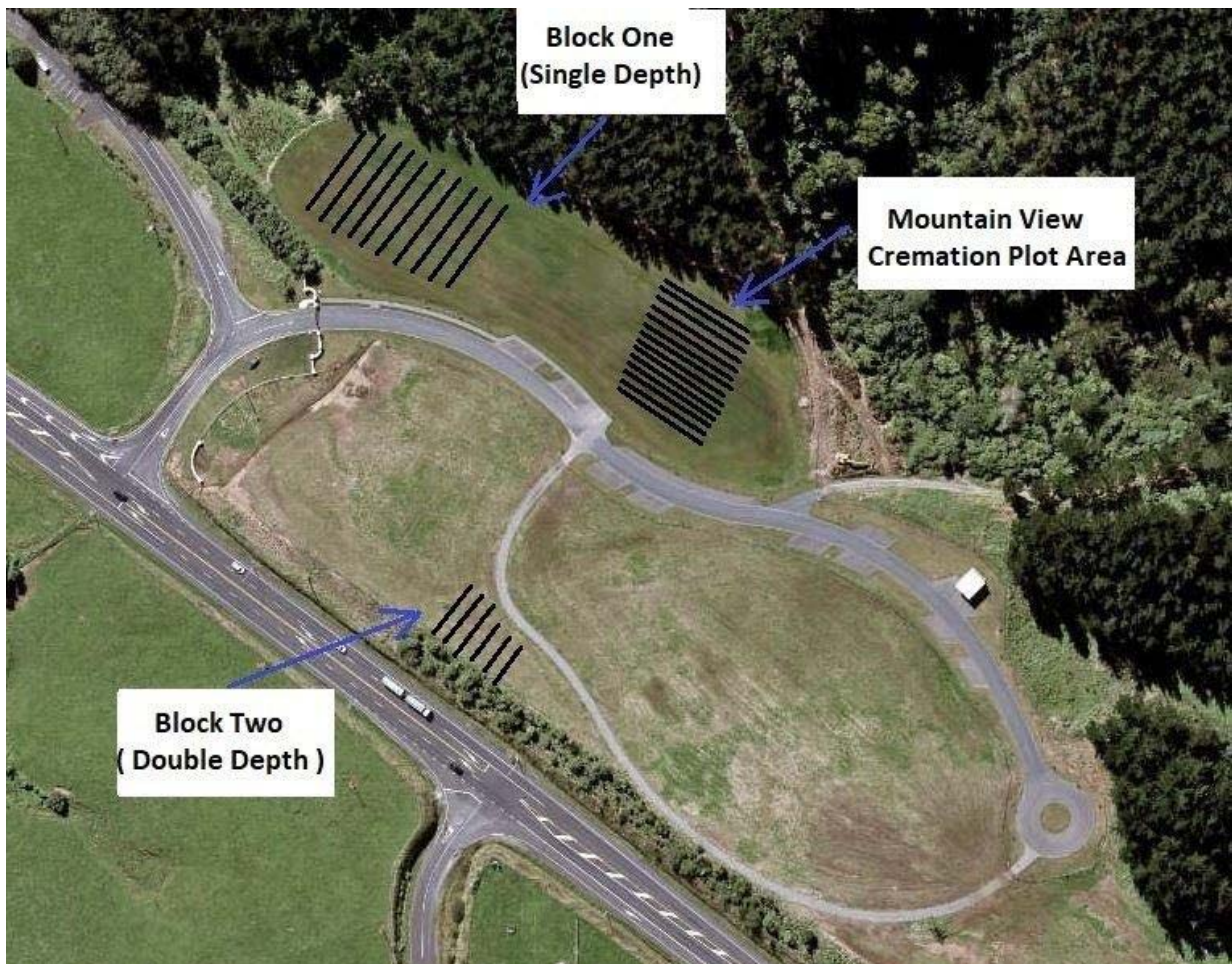


Figure 6 Type of interment planned for Area-A (Block One and Mountain View) and Area-B (Block Two)

The burial plan (Figure 2) contained a provision for up to 150 interments comprising of 75 in Area-A and 75 in Area-B during each year of the first five years of operation. The number of interments undertaken at the Cemetery have been significantly lower than shown in the burial plan over the last three years. The low interment numbers have been a result of the ongoing availability of the Awanui and Te Henui cemeteries which are located in Central New Plymouth. The availability of plots within the Awanui Cemetery is limited

and the Te Henui Cemetery no longer has plots available for purchase and the number of interments at the new Cemetery is expected to rise significantly once the other two cemeteries close.

3.2 Environmental effects of exercise of consents

The groundwater and surface water monitoring components of this programme continued during the period under review, with 24 groundwater samples and 4 surface water samples collected from monitoring sites in the vicinity of the Cemetery. The results of the monitoring carried out show that the groundwater and surface water composition has remained relatively stable since monitoring commenced.

Groundwater and surface water monitoring included the sampling and analysis of a comprehensive suite of general water quality parameters and any contaminants related to the degradation of human remains. The monitoring programme also included the collection of groundwater level data from six bores. The data collected will allow for an in depth assessment of any variations in groundwater and surface water composition should the need arise in the future.

Surface water chemistry exhibited a distinct seasonal change. Groundwater composition in each bore remained relatively stable with only slight changes resulting from natural seasonal fluctuation and sampling variability. Groundwater composition differed slightly between bores due to depth and redox conditions.

An assessment of the groundwater level data concluded that groundwater levels fluctuate in response to rainfall and are slightly higher in the northern and eastern areas of the site close to the forested hills. The range of levels differs between bores with the greatest range (>5 m) seen in GND2624.

There is no evidence to suggest that any activity undertaken at the Cemetery during the review period has had any adverse effect on local groundwater or surface water quality.

No complaints were received from the public with regard to the discharge consent during the period under review.

A breach of consent conditions did occur at the site following a period of long sustained rainfall, which caused groundwater levels to rise to within the 0.8 m limit of several interments. It may expedite the wash-down and transport of contaminants from the grave yard into receiving waters. This is an ongoing issue which is being addressed by using appropriate burial types/depths, and by installing a new drainage network in the 2023-2024 monitoring period to prevent further non-compliances by improving drainage and reducing groundwater level fluctuations.

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 14. A summary of the consent holder's compliance record from 2018 is set out in Table 15.

Table 14 Summary of performance for consent 7882-1.1

Purpose: To discharge contaminants into land at a cemetery in circumstances where they may enter water		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Burials to occur within designated areas	Review burial plan	Yes
2. Burials must occur more than 50 m from a surface water body	Review of burial plan	Yes

Purpose: <i>To discharge contaminants into land at a cemetery in circumstances where they may enter water</i>		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
3. Best practicable option condition. Ensure graves remain > 0.8 m above water table and spread burials in time and remain location	Updates to burial plan and review of water level data	No – some exceedances occurred
4. Reporting provision	Receipt of report	Yes
5. Provision of a report detailing how compliance with Condition 3 will be achieved	Receipt of report	Yes
6. Notification requirement	Receipt of notification	Yes
7. Lapse condition	Commencement of activity prior to lapse date	N/A
8. Optional review provision re environmental effects	Option not available. Next review date June 2026	N/A
Overall assessment of environmental performance in respect of this consent		Good
Overall assessment of administrative performance in respect of this consent		High

During the year, NPDC demonstrated a good level of environmental performance and a high level of administrative performance with the resource consents as defined in Appendix II.

Table 15 Evaluation of environmental performance since 2018

Year	Consent no	High	Good	Improvement required	Poor
2022-2023	7882-1.1	-	1		-
2021-2022	7882-1.1	-	-	1	-
2020-2021	7882-1.1	-	1	-	-
2019-2020	7882-1.1	1	-	-	-
2018-2019	7882-1.1	1	-	-	-
Totals	-	2	2	1	-

3.4 Recommendations from the 2021-2022 Annual Report

1. THAT in the first instance, monitoring of consented activities in the 2022-2023 year continue at the same level as in 2021-2022.
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.

Recommendation one was implemented during the period under review and recommendation two was not required.

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:

1. THAT in the first instance, monitoring of consented activities in the 2023-2024 year continue at the same level as in 2022-2023.
2. THAT should there be any ongoing issues with environmental or administrative performance in 2023-2024, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.

It should be noted that the proposed programme represents a reasonable and risk-based level of monitoring for the site(s) 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.

4 Recommendations

1. THAT in the first instance, monitoring of consented activities in the 2023-2024 year continue at the same level as in 2022-2023.
2. THAT should there be any ongoing issues with environmental or administrative performance in 2023-2024, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.

Glossary of common terms and abbreviations

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

Al*	Aluminium.
As*	Arsenic.
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.
CBOD	Carbonaceous biochemical oxygen demand. A measure of the presence of degradable organic matter, excluding the biological conversion of ammonia to nitrate.
COD	Chemical oxygen demand. A measure of the oxygen required to oxidise all matter in a sample by chemical reaction.
Conductivity	Conductivity, an indication of the level of dissolved salts in a sample, usually measured at 25°C and expressed in $\mu\text{S}/\text{cm}$.
DO	Dissolved oxygen.
DRP	Dissolved reactive phosphorus.
E.coli	Escherichia coli, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre 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.
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.
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.
L/s	Litres per second.
m^3	Cubic Metres.
m BGL	Metres below ground level
mS/m	Millisiemens per metre.
$\mu\text{S}/\text{cm}$	Microsiemens per centimetre
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).
NNN	Nitrate and nitrite combined, expressed in terms of the mass of nitrogen (N).
NO ₃	Nitrate, normally expressed in terms of the mass of nitrogen (N).
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.
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).
Redox	Short for reduction-oxidation. A redox reaction is a chemical reaction that involves a transfer of electrons between two species. Groundwater can be reduced (low in oxygen) or oxidised (high in oxygen).
RMA	<i>Resource Management Act 1991</i> and including all subsequent amendments.
SS	Suspended solids.
Temp	Temperature, measured in °C (degrees Celsius).
Turb	Turbidity, expressed in NTU.
UI	Unauthorised Incident.
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 an Environment Quality Manager.

Bibliography and references

- Environment Agency 2004. Assessing the groundwater pollution potential of cemetery developments.
- Geosearch Limited 2018. Mangapouri Cemetery, pre-burial groundwater level and water quality assessment. 26 April 2018.
- Ministry of Health 2008. Drinking-Water Standards for New Zealand 2005 (Revised 2008) Wellington: Ministry of Health.
- Scottish Environment Protection Agency (SEPA) 2015. Land Use Planning System SEPA Guidance Note, Guidance on assessing the impacts of Cemeteries on Groundwater - Version 3.
- Taranaki Regional Council (2021). 2021-84 New Plymouth District Council Mangapouri Cemetery monitoring programme annual report 2020-2021. Frodo id 2916218.
- Taranaki Regional Council (2020). 2020-86 New Plymouth District Council Mangapouri Cemetery monitoring programme annual report 2019-2020. Frodo id 2497237.
- Taranaki Regional Council (2018). 2019-67 New Plymouth District Council Mangapouri Cemetery monitoring programme annual report 2018-2019. Frodo id 2245542.
- World Health Organisation 1998. The impacts of cemeteries on the environment and public health – An introductory briefing.

Appendix I

Resource consent held by New Plymouth District Council

(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.

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 28 May 2018
(Change):

Commencement Date 28 May 2018 (Granted Date: 9 November 2011)
(Change):

Conditions of Consent

Consent Granted: To discharge contaminants into land at a cemetery in
circumstances where they may enter water

Expiry Date: 1 June 2046

Review Date(s): June 2020, June 2026, June 2032, June 2038

Site Location: 279 Junction Road, New Plymouth

Grid Reference (NZTM) 1697558E-5667612N

Catchment: Waiwhakaiho

*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. This consent authorises the discharge of contaminants to land associated with the burial of deceased persons at a cemetery. Subject to the other conditions of this consent, burials shall occur only in the areas identified as 'potential burial areas' on the plan titled 'Location of burial areas' attached to this document.
2. No burial shall occur within 50 metres of any surface water body.
3. 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. The best practicable option includes, but is not limited to:
 - a) ensuring graves are no deeper than 0.8 metres above the seasonally high watertable; and
 - b) spreading the burials, in both time and location, to reduce point source loading of contaminants.
4. At least three months before the first burial, and at five-yearly intervals thereafter, the consent holder shall provide the Chief Executive, Taranaki Regional Council with a plan showing the specific areas where burials will occur.
5. The consent holder shall prepare a report that details how compliance with condition 3 will be achieved. The report shall be submitted for the approval of the Chief Executive, Taranaki Regional Council, acting in a certification capacity, at least three months before the first burial, and at five-yearly intervals thereafter.
6. The consent holder shall notify the Chief Executive, Taranaki Regional Council, in writing of the date that the cemetery will become operative, at least 1 month before. Notification shall include the consent number and a brief description of the activity consented and shall be emailed to worknotification@trc.govt.nz.
7. This consent shall lapse on 31 December 2021, 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(1)(b) of the Resource Management Act 1991.

Consent 7882-1.1

8. 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 2014 and/or June 2020 and/or 2026 and/or June 2032 and/or June 2038 and 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 28 May 2018

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

Groundwater and surface water quality results

WKH000526 downstream									
5-Oct-17	31-Jan-18	22-Jul-19	17-Jan-20	20-Jul-20	14-Jan-21	6-Jul-21	27-Jan-22	26-Jul-22	31-Jan-23
7.1	7.7	7.3	7.8	7.1	7.2	6.9	7.7	7.3	7.6
36	73	32	59	36	45	37	60	28	53
<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
43	89	40	72	44	55	45	73	34	64
43	73	40	62	43	49	44	62	31	55
14	21.1	13.3	18	13.8	15.4	13.8	18	11.1	16.5
<3	<3	<3	5	<3	<3	<3	<3	12	<3
108	153	93	123	90	89	75	133	97	118
<0.05	<0.05	-	-	-	-	-	-		
0.006	0.005	-	-	-	-	-	-		
<0.0010	<0.0010	-	-	-	-	-	-		
0.027	0.021	-	-	-	-	-	-		
0.012	0.01	-	-	-	-	-	-		
<0.00005	<0.00005	-	-	-	-	-	-		
10.2	15.5	9.7	13.8	10.3	11.3	10.4	13.6	7.6	12.7
0.0005	<0.0005	-	-	-	-	-	-		
<0.0005	0.0008	-	-	-	-	-	-		
0.36	0.34	-	-	-	-	-	-		
<0.00010	<0.00010	-	-	-	-	-	-		
4.4	8.3	3.9	6.8	4.2	4.9	4.4	6.7	2.8	5.7
0.096	0.048	-	-	-	-	-	-		
<0.00008	<0.00008	-	-	-	-	-	-		
<0.0005	<0.0005	-	-	-	-	-	-		
2.9	3.7	2.7	3.6	2.7	3	2.6	2.8	3.1	2.9
8.8	13.7	8.4	11.7	9.2	9.8	9.1	11.5	6.9	10.5
0.0015	<0.0010	-	-	-	-	-	-		
12.7	14.6	12.4	14.4	12.6	11.7	12.5	13.5	9.6	12.2
1.47	0.75	1.64	1.14	1.64	1.22	1.61	1.17	1.88	1.16
0.037	<0.010	0.041	<0.010	0.03	0.019	0.031	<0.010	0.194	0.017
0.007	<0.002	0.004	0.003	0.004	0.004	0.004	0.002	0.009	0.004
1.27	0.61	1.54	0.98	1.58	1.15	1.53	1.03	1.16	1.06
1.28	0.61	1.54	0.99	1.58	1.15	1.54	1.04	1.17	1.06
0.19	0.14	<0.10	0.15	<0.10	<0.10	<0.10	0.14	0.7	<0.10
<0.004	0.011	<0.004	0.01	0.005	0.01	0.005	0.01	0.013	0.008
0.013	0.022	0.018	0.041	0.012	0.019	0.01	0.018	0.094	0.016
22	33	-	-	-	-	-	-		
6	6.8	5.5	6.2	6.5	5.4	6.3	6.4	4.5	5.3
<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
<6	<6	<6	6	8	6	<6	<6	13	<6
0.8	<0.5	1.5	2.3	0.7	1.7	1.3	1.8	7.2	2.2
> 200	140	261	82	225	222	75	411	2420	225
<0.02	-	-	-	<0.02	-	-	-	-	-

Parameter	Sample date	Dissolved cadmium	Dissolved calcium	Dissolved chromium	Dissolved copper	Dissolved iron	Dissolved lead	Dissolved magnesium	Dissolved manganese	Dissolved mercury
		g/m ³	g/m ³	g/m ³	g/m ³	g/m ³	g/m ³	g/m ³	g/m ³	g/m ³
Bore id	Unit									
MW1 (GND2623)	27-Feb-17	<0.00005	8.0	<0.0005	<0.0005	<0.02	<0.00010	3.2	0.001	<0.00008
MW1 (GND2623)	26-May-17	<0.00005	7.7	<0.0005	<0.0005	<0.02	<0.00010	3.1	0.0012	<0.00008
MW1 (GND2623)	28-Aug-17	<0.00005	8.4	0.0005	0.001	<0.02	<0.00010	3.3	0.0014	<0.00008
MW1 (GND2623)	16-Nov-17	<0.00005	9.6	0.0005	0.0017	<0.02	<0.00010	3.7	0.0013	<0.00008
MW1 (GND2623)	22-Jul-19	-	10.5	-	-	-	-	3.6	-	-
MW1 (GND2623)	14-Oct-19	-	10.2	-	-	-	-	3.4	-	-
MW1 (GND2623)	17-Jan-20	<0.00005	10.7	<0.0005	0.0023	<0.02	0.00012	4.7	0.0011	<0.00008
MW1 (GND2623)	30-Apr-20	-	13.6	-	-	-	-	5.4	-	-
MW1 (GND2623)	20-Jul-20	-	9.7	-	-	-	-	3.2	-	-
MW1 (GND2623)	15-Oct-20	-	10.3	-	-	-	-	3.4	-	-
MW1 (GND2623)	14-Jan-21	<0.00005	10.4	<0.0005	0.0049	<0.02	<0.00010	3.8	0.0013	<0.00008
MW1 (GND2623)	8-Apr-21	-	9.6	-	-	-	-	3.4	-	-
MW1 (GND2623)	6-Jul-21	-	11.4	-	-	-	-	4.0	-	-
MW1 (GND2623)	28-Sep-21	-	9.9	-	-	-	-	3.1	-	-
MW1 (GND2623)	27-Jan-22	<0.00005	10.5	0.0005	0.0005	<0.02	0.00015	4.2	0.0014	<0.00008
MW1 (GND2623)	28-Apr-22	-	12.1	-	-	-	-	5.2	-	-
MW1 (GND2623)	26-Jul-22		10.3					3		
MW1 (GND2623)	18-Oct-22	-	9.2	-	-	-	-	3.3	-	-
MW1 (GND2623)	31/01/2023	<0.00005	9.6	<0.0005	<0.0005	<0.02	<0.00010	4.2	0.0034	<0.00008
MW1 (GND2623)	28-Apr-23	-	11.3	-	-	-	-	3.5	-	-
MW2 (GND2624)	27-Feb-17	0.00011	17.8	<0.0005	0.0011	0.1	<0.00010	8.2	6.8	<0.00008
MW2 (GND2624)	26-May-17	0.0001	17.5	<0.0005	0.0015	2.8	<0.00010	7.9	9.4	<0.00008
MW2 (GND2624)	28-Aug-17	0.00012	17.5	<0.0005	0.002	1.69	<0.00010	8.6	10.6	<0.00008
MW2 (GND2624)	16-Nov-17	0.0001	16.9	<0.0005	0.0014	0.07	<0.00010	8.1	9.8	<0.00008
MW2 (GND2624)	22-Jul-19	-	69.0	-	-	-	-	9.8	-	-
MW2 (GND2624)	14-Oct-19	-	35.0	-	-	-	-	11.2	-	-
MW2 (GND2624)	17-Jan-20	0.00016	22.0	<0.0005	0.0033	3	<0.00010	13.0	23	<0.00008
MW2 (GND2624)	30-Apr-20	-	23.0	-	-	-	-	13.1	-	-
MW2 (GND2624)	20-Jul-20	-	62.0	-	-	-	-	10.7	-	-
MW2 (GND2624)	15-Oct-20	-	35.0	-	-	-	-	12.0	-	-
MW2 (GND2624)	14-Jan-21	0.00012	25.0	<0.0005	0.0053	11.9	<0.00010	14.1	25	<0.00008
MW2 (GND2624)	8-Apr-21	-	21.0	-	-	-	-	13.9	-	-
MW2 (GND2624)	6-Jul-21	-	61.0	-	-	-	-	9.2	-	-
MW2 (GND2624)	28-Sep-21		25.0					12.6		
MW2 (GND2624)	27-Jan-22	0.00012	24.0	<0.0005	0.0033	16.8	0.00066	13.8	24	<0.00008

Parameter	Sample date	Dissolved	Dissolved	Dissolved	Dissolved zinc	Chloride	Fluoride	Total	Ammoniacal nitrogen
		Nickel	potassium	sodium					
Bore id	Unit	g/m ³	g/m ³	g/m ³	g/m ³	g/m ³	g/m ³	g/m ³	g/m ³
MW1 (GND2623)	27-Feb-17	<0.0005	1.34	12.7	0.0024	9.2	<0.05	1.39	<0.010
MW1 (GND2623)	26-May-17	<0.0005	1.53	14.9	<0.0010	8.7	<0.05	1.48	<0.010
MW1 (GND2623)	28-Aug-17	<0.0005	1.53	12.8	<0.0010	8.9	<0.05	0.94	<0.010
MW1 (GND2623)	16-Nov-17	<0.0005	1.63	13.3	0.0018	8.6	<0.05	1.68	0.012
MW1 (GND2623)	22-Jul-19	-	1.73	11.6	-	9.6	-	1.21	<0.010
MW1 (GND2623)	14-Oct-19	-	1.63	11.0	-	9.9	-	1.06	<0.010
MW1 (GND2623)	17-Jan-20	<0.0005	1.61	14.9	0.0011	8.2	<0.05	1.27	<0.010
MW1 (GND2623)	30-Apr-20	-	1.6	14.3	-	11	-	1.89	<0.010
MW1 (GND2623)	20-Jul-20	-	1.71	10.3	-	8.8	-	1.1	<0.010
MW1 (GND2623)	15-Oct-20	-	1.61	11.4	-	9.3	-	1.34	<0.010
MW1 (GND2623)	14-Jan-21	<0.0005	1.58	13.9	0.0022	8.1	<0.05	1.06	<0.010
MW1 (GND2623)	8-Apr-21	-	1.65	12.9	-	8.8	-	0.99	<0.010
MW1 (GND2623)	6-Jul-21	-	1.72	11.9	-	9	-	1.09	<0.010
MW1 (GND2623)	28-Sep-21	-	1.54	9.1	-	8.9	-	0.81	<0.010
MW1 (GND2623)	27-Jan-22	<0.0005	1.61	13.9	0.0026	9	<0.05	1.3	<0.010
MW1 (GND2623)	28-Apr-22	-	1.78	15.3	-	9.5	-	1.51	<0.010
MW1 (GND2623)	26-Jul-22	-	1.52	8.4	-	7.3	-	0.64	<0.010
MW1 (GND2623)	18-Oct-22	-	1.52	11.8	-	7.6	-	0.81	<0.010
MW1 (GND2623)	31/01/2023	<0.0005	1.54	14.1	0.0021	7.6	<0.05	1	<0.010
MW1 (GND2623)	28-Apr-23	-	1.66	10	-	6.9	-	1.02	<0.010
MW2 (GND2624)	27-Feb-17	<0.0005	3.4	14.9	0.007	19.9	<0.05	0.46	0.34
MW2 (GND2624)	26-May-17	<0.0005	4.1	15.4	0.0098	16.9	<0.05	0.58	0.4
MW2 (GND2624)	28-Aug-17	<0.0005	4.9	14.2	0.0073	21	<0.05	0.9	0.77
MW2 (GND2624)	16-Nov-17	0.0006	3.8	13.7	0.0061	22	<0.05	1.18	0.52
MW2 (GND2624)	22-Jul-19	-	3.4	11.1	-	13.4	-	1.07	0.4
MW2 (GND2624)	14-Oct-19	-	3.7	14.3	-	15.4	-	4.8	0.128
MW2 (GND2624)	17-Jan-20	0.0007	4	16.7	0.0146	18	<0.05	3.6	0.87
MW2 (GND2624)	30-Apr-20	-	3.5	17.1	-	18.2	-	1.18	0.39
MW2 (GND2624)	20-Jul-20	-	4.4	15.2	-	19.2	-	1.91	1.77
MW2 (GND2624)	15-Oct-20	-	4.1	16.8	-	16.6	-	3.6	0.41
MW2 (GND2624)	14-Jan-21	0.0007	5.7	17.9	0.022	22	<0.05	1.81	1.73
MW2 (GND2624)	8-Apr-21	-	4.5	16.3	-	18.3	-	13.5	0.187
MW2 (GND2624)	6-Jul-21	-	3.3	15.8	-	18.8	-	1.9	0.86
MW2 (GND2624)	28-Sep-21	-	4.1	15.1	-	15.4	-	9.7	0.73
MW2 (GND2624)	27-Jan-22	0.0005	4.9	16.3	0.021	19.7	<0.05	2	1.19

Parameter	Sample date	Nitrite nitrogen	Nitrate nitrogen	Nitrate & nitrite nitrogen	Total kjeldahl nitrogen	Dissolved reactive phosphorus	Dissolved reactive silica	Total phosphorus
Bore id	Unit	g/m ³ N	g/m ³ N	g/m ³ N	g/m ³	g/m ³	g/m ³ SiO ₂	g/m ³
MW1 (GND2623)	27-Feb-17	<0.002	1.32	1.32	<0.10	0.012	25	0.016
MW1 (GND2623)	26-May-17	<0.002	1.45	1.45	<0.10	0.01	23	0.019
MW1 (GND2623)	28-Aug-17	<0.002	0.91	0.91	<0.10	0.008	22	0.011
MW1 (GND2623)	16-Nov-17	<0.002	1.62	1.62	<0.10	0.011	27	0.026
MW1 (GND2623)	22-Jul-19	<0.002	1.17	1.17	<0.10	<0.004	-	0.006
MW1 (GND2623)	14-Oct-19	<0.002	1.02	1.02	<0.10	0.007	-	0.004
MW1 (GND2623)	17-Jan-20	<0.002	1.26	1.26	<0.10	0.014	32	0.025
MW1 (GND2623)	30-Apr-20	<0.002	1.38	1.38	0.51	0.004	-	2.2
MW1 (GND2623)	20-Jul-20	<0.002	1.01	1.01	<0.10	0.005	-	0.02
MW1 (GND2623)	15-Oct-20	<0.002	1.29	1.29	<0.10	<0.004	-	<0.004
MW1 (GND2623)	14-Jan-21	<0.002	1.03	1.03	<0.10	0.014	26	0.012 #1
MW1 (GND2623)	8-Apr-21	<0.002	0.94	0.94	<0.10	0.006	-	0.004
MW1 (GND2623)	6-Jul-21	<0.002	1.06	1.06	<0.10	0.007	-	0.004 #1
MW1 (GND2623)	28-Sep-21	<0.002	0.79	0.79	<0.10	<0.004	-	0.006
MW1 (GND2623)	27-Jan-22	<0.002	1.27	1.27	<0.10	0.012	26	0.012
MW1 (GND2623)	28-Apr-22	<0.002	1.5	1.5	<0.10	0.012	-	0.015
MW1 (GND2623)	26-Jul-22	< 0.002	0.59	0.59	< 0.10	< 0.004	-	0.004
MW1 (GND2623)	18-Oct-22	< 0.002	0.71	0.71	< 0.10	0.006	-	0.007
MW1 (GND2623)	31/01/2023	< 0.002	0.98	0.98	< 0.10	0.012	26	0.015
MW1 (GND2623)	28-Apr-23	< 0.002	0.96	0.96	< 0.10	0.006	-	0.007
MW2 (GND2624)	27-Feb-17	<0.002	0.007	0.008	0.45	<0.004	19	0.005
MW2 (GND2624)	26-May-17	<0.002	0.019	0.019	0.57	<0.004	18.3	0.008
MW2 (GND2624)	28-Aug-17	<0.002	<0.002	<0.002	0.9	<0.004	19.7	0.004
MW2 (GND2624)	16-Nov-17	0.018	0.6	0.62	0.57	<0.004	21	0.005
MW2 (GND2624)	22-Jul-19	0.003	0.48	0.51	0.56	<0.004	-	0.01
MW2 (GND2624)	14-Oct-19	0.055	4.4	4.4	0.33	<0.004	-	<0.004
MW2 (GND2624)	17-Jan-20	0.03	2.7	2.8	0.86	<0.004	21	<0.004
MW2 (GND2624)	30-Apr-20	0.026	0.7	0.73	0.45	<0.004	-	<0.004
MW2 (GND2624)	20-Jul-20	<0.002	<0.002	<0.002	1.91	<0.004	-	0.09
MW2 (GND2624)	15-Oct-20	0.003	3	3	0.59	<0.004	-	0.004
MW2 (GND2624)	14-Jan-21	0.003	<0.002	0.004	1.81	<0.004	16.4	0.005
MW2 (GND2624)	8-Apr-21	0.108	12.9	13	0.54	<0.004	-	0.002
MW2 (GND2624)	6-Jul-21	0.004	0.86	0.86	1.04	<0.004	-	0.004
MW2 (GND2624)	28-Sep-21	0.004	8.9	8.9	0.79	<0.004	-	0.005
MW2 (GND2624)	27-Jan-22	<0.002	0.007	0.008	2	<0.004	15.5	0.004

Parameter	Sample date		Biological oxygen demand	Chemical oxygen demand	Total organic carbon	Escherichia coli	Formaldehyde
		Sulphate	g O ₂ /m ³	g O ₂ /m ³	g/m ³	MPN / 100mL	g/m ³
Bore id	Unit	g/m ³	g O ₂ /m ³	g O ₂ /m ³	g/m ³	MPN / 100mL	g/m ³
MW1 (GND2623)	27-Feb-17	5	<2	<6	0.9	<1	<0.02
MW1 (GND2623)	26-May-17	4.6	<2	<6	<0.5	<1	<0.02
MW1 (GND2623)	28-Aug-17	4.8	<2	<6	<0.5	<1	<0.02
MW1 (GND2623)	16-Nov-17	5.5	<2	<6	<1	<1	<0.02
MW1 (GND2623)	22-Jul-19	3.8	<2	<6	1.5	<1	-
MW1 (GND2623)	14-Oct-19	4.2	<2	<6	<0.5	<1	-
MW1 (GND2623)	17-Jan-20	3.9	<2	<6	<0.5	<1	<0.02
MW1 (GND2623)	30-Apr-20	4.8	<2	13	2.7	<1	-
MW1 (GND2623)	20-Jul-20	4.8	<2	12	2.7	<1	-
MW1 (GND2623)	15-Oct-20	4.2	<2	<6	1.3	<1	-
MW1 (GND2623)	14-Jan-21	4.3	<2	<6	0.5	<1	<0.02
MW1 (GND2623)	8-Apr-21	4.5	<2	<6	0.8	<1	-
MW1 (GND2623)	6-Jul-21	4.7	<2	15	<0.5	<1	-
MW1 (GND2623)	28-Sep-21	4.8	<2	<6	<0.5	<1	-
MW1 (GND2623)	27-Jan-22	4.3	<2	<6	3.7	<1	<0.02
MW1 (GND2623)	28-Apr-22	4	<2	<6	<0.5	<1	-
MW1 (GND2623)	26-Jul-22	4.7	<2	<6	<0.5	<1	-
MW1 (GND2623)	18-Oct-22	5.1	<2	<6	<0.5	<1	-
MW1 (GND2623)	31/01/2023	4.1	<2	<6	1.1	<1	<0.02
MW1 (GND2623)	28-Apr-23	3.8	<2	<6	<0.5	<1	-
MW2 (GND2624)	27-Feb-17	10.4	<2	<6	<0.5	<1	<0.02
MW2 (GND2624)	26-May-17	12.7	<2	<6	0.9	<1	<0.02
MW2 (GND2624)	28-Aug-17	15.7	<2	10	1.5	<1	<0.02
MW2 (GND2624)	16-Nov-17	9.3	<2	<6	<1	<1	<0.02
MW2 (GND2624)	22-Jul-19	70	<2	<6	<0.5	<1	-
MW2 (GND2624)	14-Oct-19	42	<2	<6	1.9	<1	-
MW2 (GND2624)	17-Jan-20	14.1	<2	<6	<0.5	<1	<0.02
MW2 (GND2624)	30-Apr-20	13	<2	<6	1.5	<1	-
MW2 (GND2624)	20-Jul-20	63	<2	12	1.1	<1	-
MW2 (GND2624)	15-Oct-20	37	<2	<6	1.5	<1	-
MW2 (GND2624)	14-Jan-21	21	<2	14	3.8	<1	<0.02
MW2 (GND2624)	8-Apr-21	13.2	<2	<6	4.2	1	-
MW2 (GND2624)	6-Jul-21	30	<2	7	<0.5	<1	-
MW2 (GND2624)	28-Sep-21	18.7	<2	<6	4	<1	-
MW2 (GND2624)	27-Jan-22	18.4	<2	<6	6.6	<1	<0.02

Parameter	Sample date	Dissolved	Dissolved	Dissolved	Dissolved	Dissolved	Dissolved	Dissolved	Dissolved	Dissolved
		cadmium	calcium	chromium	copper	iron	lead	magnesium	manganese	mercury
MW2 (GND2624)	28-Apr-22	-	24.0	-	-	-	-	14.7	-	-
MW2 (GND2624)	26-Jul-22	-	29	-	-	-	-	14.3	-	-
MW2 (GND2624)	18-Oct-22	-	20	-	-	-	-	16.5	-	-
MW2 (GND2624)	31-Jan-23	0.00012	22	<0.0005	0.0023	19.3	<0.00010	17.2	29	<0.00008
MW2 (GND2624)	28-Apr-23	-	13.7	-	-	-	-	8	-	-
MW3 (GND2625)	27-Feb-17	0.00013	13.5	<0.0005	<0.0005	0.25	<0.00010	5.3	1.92	<0.00008
MW3 (GND2625)	26-May-17	<0.00005	14.9	<0.0005	<0.0005	0.79	<0.00010	5.7	2.4	<0.00008
MW3 (GND2625)	28-Aug-17	<0.00005	17.7	<0.0005	<0.0005	1.66	<0.00010	7.3	2.6	<0.00008
MW3 (GND2625)	16-Nov-17	<0.00005	15.8	<0.0005	<0.0005	1.56	<0.00010	6.8	4.1	<0.00008
MW3 (GND2625)	22-Jul-19	-	19.1	-	-	-	-	6.5	-	-
MW3 (GND2625)	14-Oct-19	-	19.6	-	-	-	-	9.4	-	-
MW3 (GND2625)	17-Jan-20	0.00012	19.0	<0.0005	0.0008	6	<0.00010	9.7	18.9	<0.00008
MW3 (GND2625)	30-Apr-20	-	19.4	-	-	-	-	10.0	-	-
MW3 (GND2625)	20-Jul-20	-	21.0	-	-	-	-	10.1	-	-
MW3 (GND2625)	15-Oct-20	-	19.8	-	-	-	-	9.3	-	-
MW3 (GND2625)	14-Jan-21	<0.00005	18.9	<0.0005	0.00009	14.6	<0.00010	9.9	22	<0.00008
MW3 (GND2625)	8-Apr-21	-	17.9	-	-	-	-	9.3	-	-
MW3 (GND2625)	6-Jul-21	-	19.8	-	-	-	-	9.0	-	-
MW3 (GND2625)	28-Sep-21		5.3					4.3		
MW3 (GND2625)	27-Jan-22	<0.00005	-	<0.0005	<0.0005	18	<0.00010	-	18.7	<0.00008
MW3 (GND2625)	28-Apr-22	-	20.0	-	-	-	-	10.5	-	-
MW3 (GND2625)	26-Jul-22	-	19	-	-	-	-	8.8	-	-
MW3 (GND2625)	18-Oct-22	-	15.9	-	-	-	-	7.5	-	-
MW3 (GND2625)	31-Jan-23	<0.00005	18.9	<0.0005	0.001	27	<0.00010	8.2	18.2	<0.00008
MW3 (GND2625)	28-Apr-23	-	17.9	-	-	-	-	9.3	-	-
MW4 (GND2626)	27-Feb-17	<0.00005	6.3	0.0005	<0.0005	<0.02	<0.00010	2.7	0.0012	<0.00008
MW4 (GND2626)	26-May-17	<0.00005	6.3	<0.0005	<0.0005	<0.02	<0.00010	2.7	0.0015	<0.00008
MW4 (GND2626)	28-Aug-17	<0.00005	6.3	0.0006	<0.0005	<0.02	<0.00010	2.8	0.0022	<0.00008
MW4 (GND2626)	16-Nov-17	<0.00005	6.7	0.0005	<0.0005	<0.02	<0.00010	2.8	0.0021	<0.00008
MW4 (GND2626)	22-Jul-19	-	5.5	-	-	-	-	2.4	-	-
MW4 (GND2626)	14-Oct-19	-	5.8	-	-	-	-	2.5	-	-
MW4 (GND2626)	17-Jan-20	<0.00005	7.0	<0.0005	0.0058	<0.02	<0.00010	3.4	0.0071	<0.00008
MW4 (GND2626)	30-Apr-20	-	7.5	-	-	-	-	3.7	-	-
MW4 (GND2626)	20-Jul-20	-	6.1	-	-	-	-	2.7	-	-
MW4 (GND2626)	15-Oct-20	-	4.7	-	-	-	-	2.0	-	-
MW4 (GND2626)	14-Jan-21	<0.00005	6.5	0.0007	0.0015	<0.02	<0.00010	2.8	0.0051	<0.00008

Parameter	Sample date	Dissolved	Dissolved	Dissolved	Dissolved zinc	Chloride	Fluoride	Total	Ammoniacal
		Nickel	potassium	sodium					
MW2 (GND2624)	28-Apr-22	-	4.9	17.3	-	16.9	-	4.3	1.14
MW2 (GND2624)	26-Jul-22	-	5.7	16.8	-	16.7	-	4.6	3.2
MW2 (GND2624)	18-Oct-22	-	5.3	16.5	-	15.9	-	10.7	2
MW2 (GND2624)	31-Jan-23	0.0007	5.3	16.6	0.0173	16.3	<0.05	2.2	2.1
MW2 (GND2624)	28-Apr-23	-	2.7	11.9	-	8.5	-	2.2	0.123
MW3 (GND2625)	27-Feb-17	<0.0005	4.1	11.0	0.007	13.4	<0.05	0.5	0.42
MW3 (GND2625)	26-May-17	<0.0005	4.6	11.7	0.0074	11.7	<0.05	0.77	0.55
MW3 (GND2625)	28-Aug-17	<0.0005	4.4	10.4	0.0045	9.9	<0.05	0.7	0.3
MW3 (GND2625)	16-Nov-17	0.0006	4.2	10.3	0.0056	12.6	<0.05	0.35	0.28
MW3 (GND2625)	22-Jul-19	-	3.7	8.3	-	29	-	0.56	0.33
MW3 (GND2625)	14-Oct-19	-	4.7	10.4	-	12.1	-	0.78	0.7
MW3 (GND2625)	17-Jan-20	0.0007	4.6	11.2	0.0173	12.3	<0.05	0.52	0.59
MW3 (GND2625)	30-Apr-20	-	5.1	11.9	-	12.8	-	0.56	0.45
MW3 (GND2625)	20-Jul-20	-	5.7	10.9	-	13.6	-	1.29	1.19
MW3 (GND2625)	15-Oct-20	-	5.5	10.7	-	12.5	-	1.5	1.28
MW3 (GND2625)	14-Jan-21	<0.0005	6.1	10.4	0.036	12.8	<0.05	2	1.61
MW3 (GND2625)	8-Apr-21	-	6.3	9.9	-	11.1	-	2.1	1.78
MW3 (GND2625)	6-Jul-21	-	5.7	9.0	-	10.1	-	1.8	1.32
MW3 (GND2625)	28-Sep-21		0.55	11.2		17.4		1.15	<0.010
MW3 (GND2625)	27-Jan-22	0.0006	-	-	0.0179	-	-	-	-
MW3 (GND2625)	28-Apr-22	-	6.7	10.7	-	12.1	-	2.1	1.79
MW3 (GND2625)	26-Jul-22	-	6.1	9	-	11.2	-	2.8	2.5
MW3 (GND2625)	18-Oct-22	-	5.3	7.7	-	9.9	-	2.4	1.99
MW3 (GND2625)	31-Jan-23	0.0007	5.1	16.6	0.0173	9.8	<0.05	2.1	2.1
MW3 (GND2625)	28-Apr-23	-	6.3	9.9	-	11.1	-	2.1	1.78
MW4 (GND2626)	27-Feb-17	<0.0005	1.13	9.2	0.0033	8.1	<0.05	0.37	<0.010
MW4 (GND2626)	26-May-17	<0.0005	1.25	9.3	0.0013	7.1	<0.05	0.34	<0.010
MW4 (GND2626)	28-Aug-17	<0.0005	1.18	8.9	<0.0010	7.6	<0.05	0.31	<0.010
MW4 (GND2626)	16-Nov-17	<0.0005	1.22	8.7	0.0016	7.5	<0.05	0.33	<0.010
MW4 (GND2626)	22-Jul-19	-	1.18	7.9	-	7.1	-	0.17	<0.010
MW4 (GND2626)	14-Oct-19	-	1.07	8.0	-	6.8	-	0.19	<0.010
MW4 (GND2626)	17-Jan-20	<0.0005	1.19	9.9	0.001	6.8	<0.05	0.26	<0.010
MW4 (GND2626)	30-Apr-20	-	1.29	10.3	-	7.4	-	0.25	<0.010
MW4 (GND2626)	20-Jul-20	-	1.18	8.7	-	7	-	0.13	<0.010
MW4 (GND2626)	15-Oct-20	-	1.02	6.9	-	7	-	<0.11	<0.010
MW4 (GND2626)	14-Jan-21	<0.0005	1.16	8.7	0.0015	6.3	<0.05	0.27	<0.010

Parameter	Sample date	Nitrite nitrogen	Nitrate nitrogen	Nitrate & nitrite nitrogen	Total kjeldahl nitrogen	Dissolved reactive phosphorus	Dissolved reactive silica	Total phosphorus
MW2 (GND2624)	28-Apr-22	0.034	2.8	2.8	1.44	<0.004	-	0.006
MW2 (GND2624)	26-Jul-22	0.006	0.55	0.56	4.1	<0.004	-	0.004
MW2 (GND2624)	18-Oct-22	0.032	7.7	7.7	3	< 0.004	-	0.004
MW2 (GND2624)	31-Jan-23	< 0.02	< 0.02	< 0.02	2.2	< 0.004	14.1	0.004
MW2 (GND2624)	28-Apr-23	<0.002	1.93	1.93	0.29	<0.004	-	0.002*
MW3 (GND2625)	27-Feb-17	<0.002	<0.002	<0.002	0.5	<0.004	21	0.006
MW3 (GND2625)	26-May-17	<0.002	<0.002	<0.002	0.77	<0.004	22	0.018
MW3 (GND2625)	28-Aug-17	<0.002	<0.002	<0.002	0.7	<0.004	22	0.055
MW3 (GND2625)	16-Nov-17	<0.002	<0.002	<0.002	0.35	<0.004	22	0.005
MW3 (GND2625)	22-Jul-19	<0.02	<0.02	<0.02	0.55	<0.004	-	0.007
MW3 (GND2625)	14-Oct-19	<0.002	<0.002	<0.002	0.78	<0.004	-	0.014
MW3 (GND2625)	17-Jan-20	0.017	<0.002	0.017	0.5	<0.004	19.9	0.008
MW3 (GND2625)	30-Apr-20	0.009	0.009	0.018	0.54	<0.004	-	0.004
MW3 (GND2625)	20-Jul-20	<0.002	<0.002	<0.002	1.29	<0.004	-	0.004
MW3 (GND2625)	15-Oct-20	<0.02	<0.02	<0.02	1.5	<0.004	-	0.011
MW3 (GND2625)	14-Jan-21	<0.02	<0.02	<0.02	2	<0.004	15.9	0.002
MW3 (GND2625)	8-Apr-21	<0.02	<0.02	<0.02	2.1	<0.004	-	0.007
MW3 (GND2625)	6-Jul-21	0.004	<0.002	0.003	1.79	<0.004	-	0.014
MW3 (GND2625)	28-Sep-21	<0.002	1.15	1.15	<0.10	<0.004	-	0.004
MW3 (GND2625)	27-Jan-22	-	-	-	1.9	-	-	-
MW3 (GND2625)	28-Apr-22	<0.02	<0.02	<0.02	2	0.009	-	0.006
MW3 (GND2625)	26-Jul-22	<0.02	<0.02	<0.02	2.8	<0.004	-	0.006
MW3 (GND2625)	18-Oct-22	<0.02	<0.02	<0.02	2.4	0.01	-	0.007
MW3 (GND2625)	31-Jan-23	< 0.02	< 0.02	< 0.02	2.1	< 0.04	13.5	0.005
MW3 (GND2625)	28-Apr-23	<0.02	<0.02	<0.02	2.1	<0.004	-	0.007
MW4 (GND2626)	27-Feb-17	<0.002	0.34	0.34	<0.10	0.012	25	0.019
MW4 (GND2626)	26-May-17	<0.002	0.29	0.29	<0.10	0.011	24	0.029
MW4 (GND2626)	28-Aug-17	<0.002	0.29	0.29	<0.10	0.01	25	0.012
MW4 (GND2626)	16-Nov-17	<0.002	0.28	0.28	<0.10	0.013	26	0.013
MW4 (GND2626)	22-Jul-19	<0.002	0.153	0.153	<0.10	0.005	-	0.009
MW4 (GND2626)	14-Oct-19	<0.002	0.169	0.169	<0.10	0.009	-	0.009
MW4 (GND2626)	17-Jan-20	<0.002	0.23	0.23	<0.10	0.016	31	0.021
MW4 (GND2626)	30-Apr-20	<0.002	0.22	0.22	<0.10	0.015	-	0.016
MW4 (GND2626)	20-Jul-20	<0.002	0.126	0.126	<0.10	0.008	-	0.009
MW4 (GND2626)	15-Oct-20	<0.002	0.076	0.076	<0.10	0.005	-	0.011
MW4 (GND2626)	14-Jan-21	<0.002	0.178	0.178	<0.10	0.014	26	0.012 #1

Parameter	Sample date		Biological oxygen demand	Chemical oxygen demand	Total organic carbon	Escherichia coli	Formaldehyde
		Sulphate					
MW2 (GND2624)	28-Apr-22	11.9	<2	10	3.8	<1	-
MW2 (GND2624)	26-Jul-22	18.2	<2	6	8.2	<1	-
MW2 (GND2624)	18-Oct-22	14	<2	10	1	<1	-
MW2 (GND2624)	31-Jan-23	9.1	<2	< 6	4.6	< 1	<0.02
MW2 (GND2624)	28-Apr-23	7	<2	9	2.5	<1	-
MW3 (GND2625)	27-Feb-17	9.8	<2	<6	<0.5	<1	<0.02
MW3 (GND2625)	26-May-17	9.6	<2	<6	<0.5	<1	<0.02
MW3 (GND2625)	28-Aug-17	6.3	5	10	1.2	<1	<0.02
MW3 (GND2625)	16-Nov-17	12.1	<2	<6	<1	<1	<0.02
MW3 (GND2625)	22-Jul-19	9.4	<2	<6	3.8	1	-
MW3 (GND2625)	14-Oct-19	13.3	<2	6	3.1	7	-
MW3 (GND2625)	17-Jan-20	12.4	<2	<6	<0.5	<1	<0.02
MW3 (GND2625)	30-Apr-20	13.4	<2	<6	1.3	<1	-
MW3 (GND2625)	20-Jul-20	15.5	<2	10	4.4	<1	-
MW3 (GND2625)	15-Oct-20	15.1	<2	6	7.1	3	-
MW3 (GND2625)	14-Jan-21	14	<2	8	3.4	35	<0.02
MW3 (GND2625)	8-Apr-21	14.5	<2	<6	4.4	7	-
MW3 (GND2625)	6-Jul-21	11.7	<2	8	7.8	1	-
MW3 (GND2625)	28-Sep-21	6.8	<2	<6	<0.5	<1	
MW3 (GND2625)	27-Jan-22	-	<2	<6	4.8	<1	<0.02
MW3 (GND2625)	28-Apr-22	12.6	3	12	2.8	2	-
MW3 (GND2625)	26-Jul-22	14	3	9	3.5	<1	-
MW3 (GND2625)	18-Oct-22	10.8	<2	9	0.9	<1	-
MW3 (GND2625)	31-Jan-23	10.3	<2	<6	3.8	<1	<0.02
MW3 (GND2625)	28-Apr-23	14.5	<2	<6	4.4	7	-
MW4 (GND2626)	27-Feb-17	6.3	<2	<6	<0.5	<1	<0.02
MW4 (GND2626)	26-May-17	6	<2	<6	0.8	<1	<0.02
MW4 (GND2626)	28-Aug-17	5.7	<2	<6	<0.5	<1	<0.02
MW4 (GND2626)	16-Nov-17	6.1	<2	<6	<1	<1	<0.02
MW4 (GND2626)	22-Jul-19	3.8	<2	<6	1	<1	-
MW4 (GND2626)	14-Oct-19	4.8	<2	<6	<0.5	<1	-
MW4 (GND2626)	17-Jan-20	5	<2	<6	<0.5	<1	<0.02
MW4 (GND2626)	30-Apr-20	6	<2	<6	<0.5	<1	-
MW4 (GND2626)	20-Jul-20	4.9	<2	<6	<0.5	<1	-
MW4 (GND2626)	15-Oct-20	4	<2	<6	<0.5	2	-
MW4 (GND2626)	14-Jan-21	4.7	<2	<6	<0.5	<1	<0.02

Parameter	Sample date	Dissolved	Dissolved	Dissolved	Dissolved	Dissolved	Dissolved	Dissolved	Dissolved	Dissolved
		cadmium	calcium	chromium	copper	iron	lead	magnesium	manganese	mercury
MW4 (GND2626)	8-Apr-21	-	6.5	-	-	-	-	3.1	-	-
MW4 (GND2626)	6-Jul-21	-	6.3	-	-	-	-	2.8	-	-
MW4 (GND2626)	28-Sep-21		20.0					6.9		
MW4 (GND2626)	27-Jan-22	<0.00005	6.6	0.0008	<0.0005	<0.02	<0.00010	3.0	0.0098	<0.00008
MW4 (GND2626)	28-Apr-22	-	7.3	-	-	-	-	3.4	-	-
MW4 (GND2626)	26-Jul-22	-	6	-	-	-	-	2.6	-	-
MW4 (GND2626)	18-Oct-22	-	5.9	-	-	-	-	2.7	-	-
MW4 (GND2626)	31-Jan-23	<0.00005	6.1	0.0005	0.0005	<0.02	<0.00010	3.1	0.0039	<0.00008
MW4 (GND2626)	28-Apr-23	-	5.9	-	-	-	-	2.6	-	-
MW5 (GND2627)	27-Feb-17	<0.00005	6.6	0.0006	<0.0005	<0.02	<0.00010	5.0	0.0015	<0.00008
MW5 (GND2627)	26-May-17	<0.00005	5.5	<0.0005	0.0012	<0.02	0.00044	4.3	0.0019	<0.00008
MW5 (GND2627)	28-Aug-17	<0.00005	5.7	0.0008	0.0005	0.04	<0.00010	4.9	0.0035	<0.00008
MW5 (GND2627)	16-Nov-17	<0.00005	6.3	0.0007	<0.0005	<0.02	<0.00010	4.9	0.001	<0.00008
MW5 (GND2627)	22-Jul-19	-	4.9	-	-	-	-	3.2	-	-
MW5 (GND2627)	14-Oct-19	-	5.1	-	-	-	-	4.1	-	-
MW5 (GND2627)	17-Jan-20	<0.00005	5.9	0.0007	0.0007	<0.02	<0.00010	4.7	0.006	<0.00008
MW5 (GND2627)	30-Apr-20	-	6.7	-	-	-	-	5.1	-	-
MW5 (GND2627)	20-Jul-20	-	4.6	-	-	-	-	3.6	-	-
MW5 (GND2627)	15-Oct-20	-	4.6	-	-	-	-	3.4	-	-
MW5 (GND2627)	14-Jan-21	<0.00005	5.3	0.0006	0.0012	<0.02	<0.00010	4.0	0.0008	<0.00008
MW5 (GND2627)	8-Apr-21	-	5.4	-	-	-	-	4.6	-	-
MW5 (GND2627)	6-Jul-21	-	6.2	-	-	-	-	5.1	-	-
MW5 (GND2627)	28-Sep-21		5.6					2.4		
MW5 (GND2627)	27-Jan-22	<0.00005	5.6	0.001	0.0007	<0.02	<0.00010	4.2	0.0026	<0.00008
MW5 (GND2627)	28-Apr-22	-	5.8	-	-	-	-	4.7	-	-
MW5 (GND2627)	26-Jul-22	-	7.3	-	-	-	-	6	-	-
MW5 (GND2627)	18-Oct-22	-	6.8	-	-	-	-	6	-	-
MW5 (GND2627)	31-Jan-23	<0.00005	6.5	0.0007	<0.0005	<0.02	<0.00010	5.5	0.0008	<0.00008
MW5 (GND2627)	28-Apr-23	-	5.5	-	-	-	-	3.7	-	-
MW6 (GND3032)	31-Jan-19	<0.00005	31.0	0.0022	0.0007	<0.02	<0.00010	7.7	0.085	<0.00008
MW6 (GND3032)	22-Jul-19	-	28.0	-	-	-	-	7.9	-	-
MW6 (GND3032)	14-Oct-19	-	22.0	-	-	-	-	6.6	-	-
MW6 (GND3032)	17-Jan-20	<0.00005	16.7	0.0009	0.0014	<0.02	<0.00010	6.1	0.0024	<0.00008
MW6 (GND3032)	30-Apr-20	-	25.0	-	-	-	-	8.1	-	-
MW6 (GND3032)	20-Jul-20	-	19.3	-	-	-	-	6.7	-	-
MW6 (GND3032)	15-Oct-20	-	18.6	-	-	-	-	6.4	-	-

Parameter	Sample date	Dissolved	Dissolved	Dissolved	Dissolved zinc	Chloride	Fluoride	Total	Ammoniacal nitrogen
		Nickel	potassium	sodium					
MW4 (GND2626)	8-Apr-21	-	1.28	9.6	-	7.1	-	0.15	<0.010
MW4 (GND2626)	6-Jul-21	-	1.18	9.0	-	7.3	-	0.12	<0.010
MW4 (GND2626)	28-Sep-21		4.4	7.1		9.8		1.06	0.59
MW4 (GND2626)	27-Jan-22	<0.0005	1.17	9.2	<0.0010	7.1	<0.05	0.17	<0.010
MW4 (GND2626)	28-Apr-22	-	1.29	10.2	-	7.6	-	0.14	<0.010
MW4 (GND2626)	26-Jul-22	-	1.14	8.6	-	7.6	-	<0.11	<0.010
MW4 (GND2626)	18-Oct-22	-	1.08	8.3	-	7.1	-	0.12	<0.010
MW4 (GND2626)	31-Jan-23	<0.0005	1.16	9.4	0.0025	7	<0.05	< 0.11	< 0.010
MW4 (GND2626)	28-Apr-23	-	1.16	9	-	6.9	-	0.11	<0.010
MW5 (GND2627)	27-Feb-17	<0.0005	0.76	14.2	0.0074	16.6	<0.05	1.34	<0.010
MW5 (GND2627)	26-May-17	<0.0005	0.67	12.9	0.0012	12.7	<0.05	1.24	<0.010
MW5 (GND2627)	28-Aug-17	<0.0005	0.66	12.7	0.003	16	<0.05	0.88	<0.010
MW5 (GND2627)	16-Nov-17	<0.0005	0.84	13.4	0.0025	15	<0.05	1.37	<0.010
MW5 (GND2627)	22-Jul-19	-	0.61	10.8	-	9.6	-	1.56	<0.010
MW5 (GND2627)	14-Oct-19	-	0.59	11.2	-	12.6	-	1.25	<0.010
MW5 (GND2627)	17-Jan-20	<0.0005	0.72	13.4	0.0016	15.5	<0.05	1.24	<0.010
MW5 (GND2627)	30-Apr-20	-	0.83	15.1		17.4		1.13	<0.010
MW5 (GND2627)	20-Jul-20	-	0.49	10.8	-	9.7	-	1.92	<0.010
MW5 (GND2627)	15-Oct-20	-	0.54	11.4	-	11.2	-	1.2	<0.010
MW5 (GND2627)	14-Jan-21	<0.0005	0.63	11.4	0.0025	14.1	<0.05	1.07	<0.010
MW5 (GND2627)	8-Apr-21	-	0.62	12.2	-	16.6	-	1.21	<0.010
MW5 (GND2627)	6-Jul-21	-	0.61	13.0	-	23	-	0.52	<0.010
MW5 (GND2627)	28-Sep-21		1.07	7.7		8		0.12	<0.010
MW5 (GND2627)	27-Jan-22	<0.0005	0.67	12.6	0.0017	16.9	<0.05	0.9	<0.010
MW5 (GND2627)	28-Apr-22	-	0.7	13.8	-	16.5	-	0.91	<0.010
MW5 (GND2627)	26-Jul-22	-	0.65	14.2	-	30	-	0.37	<0.010
MW5 (GND2627)	18-Oct-22	-	0.69	13.6	-	31	-	0.37	<0.010
MW5 (GND2627)	31-Jan-23	<0.0005	0.72	14.2	0.002	23	<0.05	0.74	< 0.010
MW5 (GND2627)	28-Apr-23	-	0.53	12.3	-	15.6	-	1.5	<0.010
MW6 (GND3032)	31-Jan-19	0.0014	1.83	21.0	0.0079	14.5	<0.05	5.4	0.016
MW6 (GND3032)	22-Jul-19	-	1.66	15.4	-	19.4	-	5.8	<0.010
MW6 (GND3032)	14-Oct-19	-	1.61	13.2	-	15	-	6	<0.010
MW6 (GND3032)	17-Jan-20	0.0006	1.6	13.2	0.0027	13.4	<0.05	5	<0.010
MW6 (GND3032)	30-Apr-20	-	1.52	15.1	-	13	-	4.9	<0.010
MW6 (GND3032)	20-Jul-20	-	1.51	14.0	-	16.7	-	4.3	<0.010
MW6 (GND3032)	15-Oct-20	-	1.48	15.7	-	15.3	-	4.2	<0.010

Parameter	Sample date	Nitrite nitrogen	Nitrate nitrogen	Nitrate & nitrite nitrogen	Total kjeldahl nitrogen	Dissolved reactive phosphorus	Dissolved reactive silica	Total phosphorus
MW4 (GND2626)	8-Apr-21	<0.002	0.134	0.134	<0.10	0.008	-	0.009
MW4 (GND2626)	6-Jul-21	<0.002	0.124	0.125	<0.10	0.012	-	0.010 #1
MW4 (GND2626)	28-Sep-21	<0.002	0.112	0.113	0.94	<0.004		0.008
MW4 (GND2626)	27-Jan-22	<0.002	0.169	0.169	<0.10	0.015	26	0.016
MW4 (GND2626)	28-Apr-22	<0.002	0.142	0.142	<0.10	0.018	-	0.018
MW4 (GND2626)	26-Jul-22	<0.002	0.092	0.092	<0.10	0.008	-	0.011
MW4 (GND2626)	18-Oct-22	<0.002	0.098	0.098	<0.10	0.013	-	0.015
MW4 (GND2626)	31-Jan-23	< 0.002	0.087	0.087	< 0.10	0.014	24	0.016
MW4 (GND2626)	28-Apr-23	<0.002	0.089	0.089	<0.10	0.008	-	0.011
MW5 (GND2627)	27-Feb-17	<0.002	1.3	1.3	<0.10	0.005	25	0.007
MW5 (GND2627)	26-May-17	<0.002	1.22	1.22	<0.10	<0.004	20	0.017
MW5 (GND2627)	28-Aug-17	<0.002	0.79	0.79	<0.10	0.005	23	<0.004
MW5 (GND2627)	16-Nov-17	<0.002	1.3	1.3	<0.10	0.005	26	0.009
MW5 (GND2627)	22-Jul-19	<0.002	1.55	1.55	<0.10	<0.004	-	0.007
MW5 (GND2627)	14-Oct-19	<0.002	1.22	1.22	<0.10	<0.004	-	<0.004
MW5 (GND2627)	17-Jan-20	<0.002	1.23	1.23	<0.10	0.008	30	0.007
MW5 (GND2627)	30-Apr-20	<0.002	1.08	1.08	<0.10	0.005	-	0.01
MW5 (GND2627)	20-Jul-20	<0.002	1.92	1.92	<0.10	<0.004	-	<0.004
MW5 (GND2627)	15-Oct-20	<0.002	1.15	1.15	<0.10	<0.004	-	0.005
MW5 (GND2627)	14-Jan-21	<0.002	1.04	1.04	<0.10	0.004	24	0.003 #1
MW5 (GND2627)	8-Apr-21	<0.002	1.19	1.19	<0.10	<0.004	-	<0.002
MW5 (GND2627)	6-Jul-21	<0.002	0.48	0.48	<0.10	<0.004	-	<0.002
MW5 (GND2627)	28-Sep-21	<0.002	0.114	0.114	<0.10	0.007		0.01
MW5 (GND2627)	27-Jan-22	<0.002	0.9	0.9	<0.10	<0.004	24	0.004
MW5 (GND2627)	28-Apr-22	<0.002	0.89	0.89	<0.10	0.004	-	0.005
MW5 (GND2627)	26-Jul-22	<0.002	0.35	0.35	<0.10	<0.004	-	<0.004
MW5 (GND2627)	18-Oct-22	<0.002	0.34	0.34	<0.10	<0.004	-	0.003
MW5 (GND2627)	31-Jan-23	< 0.002	0.7	0.7	< 0.10	0.005	24	0.004
MW5 (GND2627)	28-Apr-23	<0.002	1.48	1.48	<0.10	<0.004	-	0.004
MW6 (GND3032)	31-Jan-19	<0.002	5.1	5.1	0.33	<0.004	32	0.81
MW6 (GND3032)	22-Jul-19	<0.002	5.7	5.7	<0.10	<0.004	-	0.046
MW6 (GND3032)	14-Oct-19	<0.002	6	6	<0.10	<0.004	-	<0.004
MW6 (GND3032)	17-Jan-20	<0.002	5	5	<0.1	<0.004	34	0.007
MW6 (GND3032)	30-Apr-20	<0.002	4.2	4.2	0.7	0.004	-	0.133
MW6 (GND3032)	20-Jul-20	<0.002	4.3	4.3	<0.10	0.004	-	0.108
MW6 (GND3032)	15-Oct-20	<0.002	4	4	0.27	<0.004	-	0.163

Parameter	Sample date		Biological oxygen	Chemical oxygen	Total organic	Escherichia coli	Formaldehyde
		Sulphate	demand	demand	carbon		
MW4 (GND2626)	8-Apr-21	4.9	<2	<6	0.7	<1	-
MW4 (GND2626)	6-Jul-21	4.9	<2	<6	<0.5	<1	-
MW4 (GND2626)	28-Sep-21	9.1	<2	<6	5.1	<1	
MW4 (GND2626)	27-Jan-22	5	<2	<6	1.8	<1	<0.02
MW4 (GND2626)	28-Apr-22	5	<2	<6	<0.5	<1	-
MW4 (GND2626)	26-Jul-22	4.9	<2	<6	<0.5	<1	-
MW4 (GND2626)	18-Oct-22	4.8	<2	<6	<0.5	<1	-
MW4 (GND2626)	31-Jan-23	4.6	< 2	< 6	0.8	< 1	<0.02
MW4 (GND2626)	28-Apr-23	3.8	<2	<6	<0.5	<1	-
MW5 (GND2627)	27-Feb-17	4.9	<2	<6	<0.5	<1	<0.02
MW5 (GND2627)	26-May-17	7.2	<2	<6	0.8	<1	<0.02
MW5 (GND2627)	28-Aug-17	6.9	<2	<6	<0.5	<1	<0.02
MW5 (GND2627)	16-Nov-17	5.9	<2	<6	<1	<1	<0.02
MW5 (GND2627)	22-Jul-19	6.3	<2	<6	1.2	<1	-
MW5 (GND2627)	14-Oct-19	7.4	<2	<6	0.6	<1	-
MW5 (GND2627)	17-Jan-20	5	<2	<6	<0.5	<1	<0.02
MW5 (GND2627)	30-Apr-20	4.9	<2	<6	<0.5	<1	
MW5 (GND2627)	20-Jul-20	7.3	<2	<6	<0.5	<1	-
MW5 (GND2627)	15-Oct-20	6.6	<2	<6	0.5	<1	-
MW5 (GND2627)	14-Jan-21	5.8	<2	<6	<0.5	<1	<0.02
MW5 (GND2627)	8-Apr-21	6.7	<2	<6	<0.5	<1	-
MW5 (GND2627)	6-Jul-21	6.6	<2	<6	<0.5	<1	-
MW5 (GND2627)	28-Sep-21	4.9	<2	<6	<0.5	<1	
MW5 (GND2627)	27-Jan-22	5.6	<2	<6	<0.5	<1	<0.02
MW5 (GND2627)	28-Apr-22	5.3	<2	<6	<0.5	<1	-
MW5 (GND2627)	26-Jul-22	5.3	<2	<6	<0.5	<1	-
MW5 (GND2627)	18-Oct-22	5.3	<2	<6	0.5	<1	-
MW5 (GND2627)	31-Jan-23	4.7	< 2	< 6	2.4	< 1	<0.02
MW5 (GND2627)	28-Apr-23	5.1	<2	<6	0.9	<1	-
MW6 (GND3032)	31-Jan-19	6.3	<2	<6	22	<1	<0.02
MW6 (GND3032)	22-Jul-19	8.2	<2	<6	1.7	<1	-
MW6 (GND3032)	14-Oct-19	5.6	<2	<6	1.1	<1	-
MW6 (GND3032)	17-Jan-20	3.8	<2	<6	<0.5	<1	<0.02
MW6 (GND3032)	30-Apr-20	5.3	<2	23	<5	<1	-
MW6 (GND3032)	20-Jul-20	7.8	<2	<6	<0.5	<1	-
MW6 (GND3032)	15-Oct-20	12.2	<2	<6	2.3	<1	-

Parameter	Sample date	Dissolved cadmium	Dissolved calcium	Dissolved chromium	Dissolved copper	Dissolved iron	Dissolved lead	Dissolved magnesium	Dissolved manganese	Dissolved mercury
MW6 (GND3032)	14-Jan-21	<0.00005	15.2	0.0005	0.0022	<0.02	<0.00010	5.6	0.0148	<0.00008
MW6 (GND3032)	6-Jul-21	-	14.9	-	-	-	-	5.5	-	-
MW6 (GND3032)	6-Jul-21	-	14.9	-	-	-	-	5.5	-	-
MW6 (GND3032)	28-Sep-21		14.6					5.5		
MW6 (GND3032)	27-Jan-22	<0.00005	12.9	0.0008	0.0018	<0.02	<0.00010	5.0	0.0102	<0.00008
MW6 (GND3032)	28-Apr-22	-	13.9	-	-	-	-	5.6	-	-
MW6 (GND3032)	26-Jul-22	-	12.5	-	-	-	-	4.7	-	-
MW6 (GND3032)	18-Oct-22	-	12.2	-	-	-	-	5	-	-
MW6 (GND3032)	31-Jan-23	<0.00005	12.6	0.0006	0.0014	<0.02	<0.00010	5.7	0.0058	<0.00008
MW6 (GND3032)	28-Apr-23	-	12.3	-	-	-	-	4.8	-	-

Parameter	Sample date	Dissolved Nickel	Dissolved potassium	Dissolved sodium	Dissolved zinc	Chloride	Fluoride	Total nitrogen	Ammoniacal nitrogen
MW6 (GND3032)	14-Jan-21	<0.0005	1.57	12.2	0.0024	11.7	<0.05	4.2	<0.010
MW6 (GND3032)	6-Jul-21	-	1.55	13.0	-	12.8	-	2.9	<0.010
MW6 (GND3032)	6-Jul-21	-	1.55	13.0	-	12.8	-	2.9	<0.010
MW6 (GND3032)	28-Sep-21		1.46	13.3		13.3		2.8	<0.010
MW6 (GND3032)	27-Jan-22	<0.0005	1.59	11.8	0.0022	11.4	<0.05	3	<0.010
MW6 (GND3032)	28-Apr-22	-	1.75	12.5	-	11.7	-	2.4	<0.010
MW6 (GND3032)	26-Jul-22	-	1.4	13.2	-	11.1	-	1.61	<0.010
MW6 (GND3032)	18-Oct-22	-	1.47	11.4	-	10.6	-	1.75	<0.010
MW6 (GND3032)	31-Jan-23	<0.0005	1.52	12.2	0.0018	10.2	<0.05	1.82	< 0.010
MW6 (GND3032)	28-Apr-23	-	1.41	14.5	-	9.5	-	1.22	<0.010

Parameter	Sample date	Nitrite nitrogen	Nitrate nitrogen	Nitrate & nitrite nitrogen	Total kjeldahl nitrogen	Dissolved reactive phosphorus	Dissolved reactive silica	Total phosphorus
MW6 (GND3032)	14-Jan-21	<0.002	4.1	4.1	<0.10	<0.004	30	0.025
MW6 (GND3032)	6-Jul-21	<0.002	2.9	2.9	<0.10	<0.004	-	0.018
MW6 (GND3032)	6-Jul-21	<0.002	2.9	2.9	<0.10	<0.004	-	0.018
MW6 (GND3032)	28-Sep-21	<0.002	2.7	2.7	<0.10	<0.004		0.042
MW6 (GND3032)	27-Jan-22	<0.002	2.9	2.9	0.11	<0.004	27	0.063
MW6 (GND3032)	28-Apr-22	<0.002	2.4	2.4	<0.10	0.005	-	0.03
MW6 (GND3032)	26-Jul-22	<0.002	1.49	1.49	0.12	<0.004	-	0.137
MW6 (GND3032)	18-Oct-22	<0.002	1.72	1.72	<0.10	0.006	-	0.008
MW6 (GND3032)	31-Jan-23	< 0.002	1.81	1.81	< 0.10	0.007	28	0.007
MW6 (GND3032)	28-Apr-23	<0.002	1.18	1.18	<0.10	0.006	-	0.01

Parameter	Sample date		Biological oxygen demand	Chemical oxygen demand	Total organic carbon	Escherichia coli	Formaldehyde
MW6 (GND3032)	14-Jan-21	Sulphate 4	<2	6	0.6	<1	<0.02
MW6 (GND3032)	6-Jul-21	5.7	<2	<6	1.1	<1	-
MW6 (GND3032)	6-Jul-21	5.7	<2	<6	1.1	<1	-
MW6 (GND3032)	28-Sep-21	9.3	<2	<6	2.3	<1	
MW6 (GND3032)	27-Jan-22	4.5	<2	<6	1.9	<1	<0.02
MW6 (GND3032)	28-Apr-22	4.1	<2	<6	<0.5	<1	-
MW6 (GND3032)	26-Jul-22	7.8	<2	<6	1.7	<1	-
MW6 (GND3032)	18-Oct-22	5	<2	<6	0.5	<1	-
MW6 (GND3032)	31-Jan-23	3.5	< 2	< 6	0.7	< 1	<0.02
MW6 (GND3032)	28-Apr-23	9	<2	<6	<0.5	<1	-