Veolia Water Services (ANZ) Pty Ltd Wellington

WESTERN TREATMENT PLANT BIOFILTER ASSESSMENT, NOVEMBER 2023

Issue

January 2024

Veolia Water Services (ANZ) Pty Ltd Wellington

WESTERN TREATMENT PLANT BIOFILTER ASSESSMENT, NOVEMBER 2023

Issue

January 2024

Source Testing New Zealand Ltd
PO Box 32 017
Maungaraki
Lower Hutt 5010
Tel: 0275 533 210
Fax: 04 569 4446

Document history and status

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Final Draft	7 January 2024	M. Newby	S. van Soest – Quality Consultant	8 January 2024	Minor amendments
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Approved by

Name	Title	Signature
Matthew Newby, CAQP	Senior Air Quality Scientist	

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Contents

1. Executive Summary

Source Testing New Zealand Limited (STNZ) was commissioned by Veolia Water Services (ANZ) Pty Ltd (Veolia) to carry out an assessment of the biofilter located at the Western Treatment Plant (WTP), South Karori Rd, Wellington. In late 2021 the media in Cell 1 was replaced, with additional media added in late 2022. The objective of the current assessment was to determine the operational status of the biofilter including flow/ventilation rates and the condition of the biofilter media.

The results of the WTP biofilter flow rate assessment conducted on 8 November 2023 showed the total flow to the biofilter to be 14,664 m^3/hr, which was similar to June 2022. The media ventilation rates were 71.0 and 71.4 m^3/m^3/hr for Cells 1 and 2 respectively with a retention time of 108 seconds for both cells 2, exceeding the recommended 90 seconds.

Smoke testing showed the discharge to be relatively well distributed for Cell 1 with slightly elevated emissions observed at the interface between the different media types. Hence, *it is recommended that more media be added to provide a level and consistent surface.*

For Cell 2, the smoke testing showed minimal smoke emission over the bed, except for a small area at the northern end of the cell and minor short circuiting around the edge of the cell indicating the bulk of the foul air was treated by a very small portion of the media, with light sewage odour present.

The media in Cell 1 had been topped up with material from the SDP refurbishment carried out in 2022. Unfortunately, this mix was found to be unsuitable, hence *it is recommended that bark chip only be used to fill the remainder of the biofilter and that the bark be mixed in with the current media to increase the voids.* The media used for the WTP 2021 refurbishment consisted of bark nuggets, and limited amounts of compost and lime chip. In November 2023, the media was still in reasonable condition with a suitable amount of well distributed lime chip. Deeper in the bed, the levels of fine material increased but there were still reasonable voids present.

The media in Cell 2 was generally consistent with the 2021 media in Cell 1 except for the small area identified by the smoke testing. The material in this area was extremely dry with excessive degradation and high levels of fines, which increased with depth. There was also a light sewage odour present.

The smoke testing showed this area to be discharging the bulk of the flow and has severely degraded the media. For such localised high flow, there must be an issue with the under lying flow distribution crates and *it is recommended that this area be excavated to identify and remediate the problem.*

The results of the biofilter media analysis showed that excluding the dry zone, the pH was in the recommended range and while the moisture content was marginally elevated, this would be unlikely to adversely affect the odour removal efficiency. The bacteria counts were in the order of 10^6 cfu/g and consistent with samples collected when the biofilter has been working well.

The results for the dry zone differ significantly from the rest of the media with the pH declining to below optimal and a very low moisture content, with correspondingly low levels of bacteria available for treatment, resulting in localised detectable odours. Hence, *it is recommended that the media in this area be replaced.*

2. Introduction

Source Testing New Zealand Limited (STNZ) was commissioned by Veolia Water Services (ANZ) Pty Ltd (Veolia) to carry out an assessment of the biofilter located at the Western Treatment Plant (WTP), South Karori Rd, Wellington. The WTP biofilter consist of a two-cell system with a bark/compost/lime media and is used to treat the air extracted from the plants process areas. In late 2021 the media in Cell 1 was replaced with additional media added in 2023. The objective of the current assessment was to determine the operational status of the biofilter including flow/ventilation rates and the condition of the biofilter media.

Matthew Newby, Senior Air Quality Scientist with STNZ conducted the WTP biofilter assessment on 8 November 2023. Matthew has 25 year's air quality monitoring and consulting experience and is designated as a Key Technical Person under STNZ's IANZ accreditation. Matthew is also a Certified Air Quality Professional (CAQP) under the Clean Air Society of Australia and New Zealand (CASANZ) certification programme.

The following report provides a background on the design of the biofilter, flow rate measurements and biofilter media description. Recommendations for the biofilter are then presented.

3. Biofilter Description

The WTP odour control system consists of extraction ducting from process areas of the plant, with the aim of minimising the release of potentially odorous emissions. The foul air from the plant is fed to a biofilter which consists of two independent cells containing a mixed bark/compost media with lime added as a buffer. While the media was replaced in 2021 and topped up in early 2023, there was still an area approximately 25 m2 which required another 300 mm of media. In addition to the media being replaced in 2021, the original lateral PVC piping was replaced with a plastic crate system to better distribute the flow over the base of the bed. The crates are held in place with a layer of <40 mm aggregate, which in turn is covered with a thin layer of course bark chips (<50 mm) with the remainder of the bed consisting of a fine bark chip (<20 mm), compost and medium lime chip (2-10 mm) matrix. This composition generally complies with the original design specifications (Drawing Reference 05-018 Soil Filter-Piping Aggt/Details Dated 11/09/97).

The surface area of Cells 1 and 2 are 144 m^2 and 150 m^2 respectively and with an estimated depth of 700 mm, the volumes for Cells 1 and 2 are 101 m^3 and 105 m^3 respectively. The biofilter has two ID fans working in a duty stand-by configuration with a single duct splitting to each cell. The flow to each cell can be adjusted and on 8 November 2023 both valves were set to 100%.

4. Biofilter Assessment

4.1 Introduction

On 8 November 2023, Matthew Newby Senior Air Quality Scientist with STNZ conducted the assessed of the WTP biofilter by initially measuring the flow rate to each cell to determine the ventilation rates and retention time. In addition to the inlet flow measurements, a smoke machine was used to visually assess the flow distribution. The biofilter media was then reviewed including the collection of media samples at 100 mm and 500 mm from one location in each cell. The media samples were then analysed for pH, moisture content and total bacteria count.

The following sections outline the results of the November 2023 WTP biofilter assessment.

4.2 Flow Rate Assessment

The volumetric flows and temperature of the gas flow to each of the biofilter cells was determined using a TSI VelociCalc 9545 Hot Wire Anemometer while the back pressure was measured using the Colmark digital manometer. On the day of the assessment, the flow was distributed evenly to each cell. The results of the biofilter flow rate assessment conducted on 8 November 2023 are presented in Table 1.

- **Table 1 Biofilter Flow Rates, 8 November 2023**

	Velocity (m/s)	Gas Temp. (°C)	Back Pressure (mmH_2O)	Volumetric Flow Rate (m^3/hr)
Cell 1	12.85	16.7	51	7,170
Cell 2	13.43	16.4	28	7,494

The results of the WTP biofilter flow rate assessment showed the total flow to the biofilter was 14,664 m^3/hr, which was similar to the flow observed in June 2022.

As noted in Section 2, the empty cell volumes for Cells 1 and 2 are 101 m^3 and 105 m^3 respectively and accounting for the volumetric flow rates, the ventilation rates in terms of m^3 of media per m^3 of foul air per hour can be calculated along with the effective retention time of the foul air within the biofilter media. Table 2 presents these results for the data collected on 8 November 2023.

- **Table 2 Biofilter Ventilation Rates, 8 November 2023**

Cell	Volumetric Flow Rate (m^3/hr)	Ventilation Rate ($m^3/m^3/hr$)	Retention time (s)
1	7,170	71.0	108
2	7,494	71.4	108

The resource consent for the Veolia Sludge Dewatering Plant located at Wellington Southern Landfill (SDP) recommends a ventilation rate of less than 40 $m^3/m^3/hr$ and a minimum retention time of 90 seconds under normal operating conditions. While these consent conditions relate specifically to the SDP biofilter, they do provide a good guide for biofilters in general, although the ventilation rate is generally dependent on the odour loading of the specific biofilter.

As can be seen in Table 2, under the current operating conditions the ventilation rate was almost twice that recommended for the SDP biofilter which reflects the relative levels of odour generated at the different plants. Given the significantly lower odour loading of the WTP biofilter compared to the SDP, the higher ventilation rate is unlikely to adversely affect odour removal. The retention times are more critical as this determines the treatment period, and currently both cells exceeded the 90 second guideline.

4.3 Biofilter Media Assessment

The assessment of the biofilter media initially involved reviewing the surface of the biofilter looking for any signs of short circuiting or degradation of the surface of the media. The biofilter was subsequent smoke tested to assess the flow distribution and finally, media samples for pH, moisture content and total bacterial count analysis were collected at depths of 100 mm and 500 mm from a single location on each cell.

4.3.1 Biofilter Smoke Testing

On 8 November 2023, the plant grit room was filled with smoke using an industrial pipe testing machine allowing the flow distribution of the biofilter to be visually assessed. For Cell 1, the smoke was relatively well distributed over the bed, as depicted in Figure 1. However, the additional media used to top up the cell was denser than the original mix, resulting in more smoke being emitted at the interface between the two medias (see Figure 3). Hence, *it is recommended that more media be added to provide a level and consistent surface.*

The inlet flow monitoring showed Cell 2 to be operating at a slightly higher flow, however, minimal emissions were visible except for an area of approximately 1 m^2 at the northern end of the cell (see Figure 3). There was also visible short circuiting around the edge of the cell as depicted in Figure 4. This would indicate that the bulk of the flow is being discharged via a very small portion of the media which will adversely affect the odour treatment process. The high flow area is described in more detail in the following section.

Figure 1: Cell 1 Smoke Test, 8 November 2023

Figure 2: Cell 1 Smoke Test, 8 November 2023 Short Circuiting, 8 November 2023

Figure 3: Cell 8 Smoke Test, 8 November 2023

Figure 4: Cell 2 Smoke Test Short Circuiting, 8 November 2023

4.3.2 Biofilter Media

The media in Cell 1 was topped up with material from the 2022 refurbishment of the SDP biofilter, however, this media contained a 50:50 mix of bark chip and composite and was found to have insufficient voids, compacted rapidly, and had elevated levels of fines resulting in excess back pressure (see Figure 5). There was also a significant amount of white wood and stringy material which act to bind the material (see Figure 6). As a result, the media was completely replaced in early 2023. It is therefore *recommended that bark chip only be used to fill the remainder of the biofilter and that the bark be mixed in with the current media to increase the voids.*

The media used for the WTP 2021 refurbishment represents the bulk of the material, consists of bark nuggets, and limited amounts of compost and lime chip. The media was in a reasonable condition with a suitable amount of well distributed lime chip. Deeper in the bed, the level of fines had increased (see Figure 7), but there were still reasonable voids present.

The media in Cell 2 was generally consistent with the 2021 media in Cell 1 (see figure 8), with the exception for the high discharge area identified by the smoke testing. Figure 9 shows this area was clearly identifiable by the dried-out media with a boarder of moist material. This media was extremely dry and exhibited excessive degradation with a significant level of fines. Deeper in the bed, the media was more degraded with even more fines. There was also a light to moderate sewage odour present at the location.

The smoke testing showed this dry area to be discharging the bulk of the flow which has severely degraded the media. The flow remains high despite the high levels of fines, due to the extremely low moisture content. For such localised high flow, there must be an issue with the under lying flow distribution crates and *it is recommended that this area be excavated to identify and remediate the problem.*

Figure 5: Cell 1 Media, 8 November 2023

Figure 6: Cell 2 Media, 8 November 2023

Figure 7: Cell 1 Media Fines, 8 November 2023

Figure 8: Cell 2 Media, 8 November 2023

Figure 9: Cell 2 Dry Zone, 8 November 2023

Figure 10: Cell 2 Dry Zone, 8 November 2023

4.3.3 Biofilter Media Analytical Results

The results of the biofilter media samples collected on 8 November 2023 are presented in Table 3 with Appendix A containing the raw analytical report.

- **Table 3 Biofilter Media Analytical Results, 8 November 2023**

Sample Description	pH	Moisture Content (% by weight)	Aerobic Plate Count @ 35 ºC (cfu/g)
Cell 1 100 mm	7.6	65	2,100,000
Cell 1 500 mm	7.5	61	1,980,000
Cell 2 100 mm	7.3	61	2,200,000
Cell 2 500 mm	7.4	62	1,520,000
Cell 2 Dry Zone 100 mm	5.0	10	270,000
Cell 2 Dry Zone 500 mm	4.8	6	270,000

For the effective operation of biofilters is recommended the pH of the media to be in the range 5.5 to 8 with a moisture content between 40 and 60 % by weight allowing for optimal bacterial growth. Excluding the dry zone, the pH of the media in both cells was in the recommended range with no indication of excess acidification. While the moisture content was marginally above 60 %, this would be unlikely to adversely affect the odour removal process.

The recommended bacteriological count for effective treatment is dependent on the loading with fewer bacteria required to treat lower levels of odour, however, concentrations in the order of 10^7 to 10^9 cfu/g are suggested. The current bacteria counts are in the order of 10^6 cfu/g which is consistent with samples collected when the biofilter has been working well.

The results for the dry zone differ significantly from the rest of the media with the pH declining to below optimal and a very low moisture content, with correspondingly low levels of bacteria available for treatment resulting in detectable odour emissions. Hence, *it is recommended that the media in this area be replaced.*

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5. Summary and Recommendations

The results of the WTP biofilter assessment conducted on 8 November 2023 showed the total biofilter flow to be 14,664 m^3/hr, which was similar to June 2022. The measured ventilation rates were 71.0 and 71.4 m^3/m^3/hr, for Cells 1 and 2 respectively with a retention time of 108 seconds for both cells. While the ventilation rates reflect the odour loading, the retention times were greater than the recommended 90 seconds allowing for suitable treatment.

The assessments smoke testing showed that for Cell 1 the discharge was generally evenly distributed over the bed with slightly elevated emissions observed at the interface between the different media types. Hence, *it is recommended that more media be added to provide a level and consistent surface.*

The inlet flow monitoring showed Cell 2 to be operating at a slightly higher flow, however, the smoke testing showed minimal smoke emissions except for a small area at the northern end of the cell with minor short circuiting around the edge of the cell also observed. This would indicate that the bulk of the flow is being discharged via a very small portion of the media, adversely affecting the odour treatment process.

The media in Cell 1 had been topped up with material from the 2022 SDP refurbishment, however, this mix was found to be unsuitable due to the resulting high back pressure and was completely replaced. It is therefore *recommended that bark chip only be used to fill the remainder of the biofilter and that the bark be mixed in with the current media to increase the voids.*

The media used for the WTP 2021 refurbishment consisted of bark nuggets, and limited amounts of compost and lime chip. The media was in reasonable condition with a suitable amount of well distributed lime chip. Deeper in the bed, the levels of fine material were increasing but there were still reasonable voids present.

The media in Cell 2 was generally consistent with the 2021 media in Cell 1 except for the high discharge area identified by the smoke testing. This area was clearly identifiable by the dried-out media and a boarder of moist material. This media was extremely dry with excessive degradation and high levels of fines which increased with depth. There was also a light to moderate sewage odour present at the location.

The smoke testing showed this area to be discharging the bulk of the flow which has severely degraded the media. For such localised high flow, there must be an issue with the under lying flow distribution crates and *it is recommended that this area be excavated to identify and remediate the problem.*

The results of the biofilter media analysis showed that excluding the dry zone, the pH was in the recommended range and while the moisture content was marginally elevated, this would be unlikely to adversely affect the removal efficiency. The bacteria counts were in the order of 10^6 cfu/g and consistent with samples collected when the biofilter has been working well.

The results for the dry zone differ significantly from the rest of the media with the pH declining to below optimal and a very low moisture content, with correspondingly low levels of bacteria available for treatment, resulting in localised detectable odours. Hence, *it is recommended that the media in this area be replaced.*

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Appendix A Laboratory Reports

This Appendix contains 4 pages including cover.

PO Box 32-017
Maungaraki
Lower Hutt 5010
New Zealand
Tel: +64 4 569 4446
www.sourcetesting.co.nz

Veolia Water Services (ANZ) Pty Ltd
PO Box 3253
Wellington
Attn: Julian Villada

Test results indicated as not accredited are outside the scope of the laboratory's accreditation

9 November 2023 *ST1165 WTP Biolfilter pH Results 9-11-23*

Veolia Water Services (ANZ0 Pty Ltd, Western Wastewater Treatment Plant Biofilter pH Results, November 2023

Sample ID	Sample Description	Sampling Date	pH	Comments
ST1165/07	Cell 1 100 mm	8/11/2023	7.6	
ST1165/08	Cell 1 500 mm	8/11/2023	7.6	
ST1165/09	Cell 2 100 mm	8/11/2023	7.3	
ST1165/10	Cell 2 500 mm	8/11/2023	7.4	
ST1165/11	Cell 2 Dry Zone 100 mm	8/11/2023	5.0	Very Dry
ST1165/12	Cell 2 Dry Zone 500 mm	8/11/2023	4.8	Very Dry

Sampling Methodology

Contaminant	STNZ Standard Test Methods	Detection Limit
Biofilter Media pH	Biofilter Media pH Procedure	0.1 pH units

Analyst's Comments

This test is beyond the scope of STNZ's IANZ accreditation.

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

Key Technical Person

Matthew Newby, CAQP
Senior Air Quality Scientist
Phone: 0275 533 210
E-mail: m.newby@sourcetesting.co.nz

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

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

Certificate of Analysis

Client:	Source Testing NZ Limited	**Lab No:**	3403614 SPv1
Contact:	Matthew Newby	**Date Received:**	10-Nov-2023
	PO Box 32017	**Date Reported:**	27-Nov-2023
	Maungaraki	**Quote No:**	126509
	Lower Hutt 5050	**Order No:**	STPO296
		Client Reference:	WTP
		Submitted By:	Matthew Newby

Sample Type: Compost

	Sample Name:	ST1165/01 WTP Biofilter Cell 1-100 mm 08-Nov-2023	ST1165/02 WTP Biofilter Cell 1-500 mm 08-Nov-2023	ST1165/03 WTP Biofilter Cell 2-100 mm 08-Nov-2023	ST1165/04 WTP Biofilter Cell 2-500 mm 08-Nov-2023	ST1165/05 WTP Biofilter Dry Zone - 100 mm 08-Nov-2023
	Lab Number:	3403614.1	3403614.2	3403614.3	3403614.4	3403614.5
Moisture	g/100g as rcvd	55	59	59	58	-
Aerobic Plate Count 35°C	cfu / g	2,100,000	1,980,000	2,200,000	1,520,000	270,000

	Sample Name:	ST1165/06 WTP Biofilter Dry Zone - 500 mm 08-Nov-2023
	Lab Number:	3403614.6
Aerobic Plate Count 35°C	cfu / g	270,000

Summary of Methods

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

Sample Type: Compost

Test	Method Description	Default Detection Limit	Sample No
Moisture	Drying for 16 hours at 103°C, gravimetry. In-house based on AOAC 945.15.	0.10 g/100g as rcvd	1-4
Aerobic Plate Count 35°C	Pour Plate Count on Plate count agar, Incubated at 35°C for 48 hours. APHA 8.72 5th Ed.	10 cfu / g	1-6

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

Testing was completed between 15-Nov-2023 and 24-Nov-2023. For completion dates of individual analyses please contact the laboratory.

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

Mark Bryant NZCS (Chemistry)
Senior Technologist - Food & Bioanalytical

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

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

Certificate of Analysis

Client:	Source Testing NZ Limited	**Lab No:**	3405279	SPv1
Contact:	Matthew Newby	**Date Received:**	13-Nov-2023	
	PO Box 32017	**Date Reported:**	15-Nov-2023	
	Maungaraki	**Quote No:**	126509	
	Lower Hutt 5050	**Order No:**	STPO296	
		Client Reference:	WTP	
		Submitted By:	Matthew Newby	

Sample Type: Miscellaneous

		Sample Name:	ST1165/05 WTP Biofilter Dry Zone - 100 mm 08-Nov-2023	ST1165/06 WTP Biofilter Dry Zone - 500 mm 08-Nov-2023
		Lab Number:	3405279.1	3405279.2
Dry Matter	g/100g as rcvd		90	94

Summary of Methods

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

Sample Type: Miscellaneous

Test	Method Description	Default Detection Limit	Sample No
Dry Matter	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	1-2

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

Testing was completed on 14-Nov-2023. For completion dates of individual analyses please contact the laboratory.

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

Ara Heron BSc (Tech)
Client Services Manager - Environmental

Western WWTP 2023-2024

Assessment of Environmental Effects of ongoing non-compliance under consents WGN060283 [37892], [25227], [35674], and [35675]

Stantec

Prepared for:
WWL

31 July 2024

Prepared by:
Stantec

Project/File:
310003194/100.5002

Stantec New Zealand

Revision	Description	Author	Date	Quality Check	Date	Independent Review	Date
0	Internal Draft	RR	29/7/24	DC	30/7/24		
1	Draft for Review	RR	30/7/24	DC	31/7/24		

The conclusions in the Report titled Western WWTP 2023-2024 AEE for wastewater non-compliance are Stantec's professional opinion, as of the time of the Report, and concerning the scope described in the Report. The opinions in the document are based on conditions and information existing at the time the scope of work was conducted and do not take into account any subsequent changes. The Report relates solely to the specific project for which Stantec was retained and the stated purpose for which the Report was prepared. The Report is not to be used or relied on for any variation or extension of the project, or for any other project or purpose, and any unauthorized use or reliance is at the recipient's own risk.

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Prepared by 

Signature

Rombout Ruiterkamp

Printed Name

Reviewed by 

Signature

David Cameron

Printed Name

Approved by 

Signature

Ilze Rautenbach

Printed Name

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1 Introduction and Scope

The Western Wastewater Treatment Plant (WWTP) has not consistently achieved its consent requirements during the 1 July 2023 – 31 June 2024 reporting period. The purpose of this report is to provide a high-level assessment of the potential effects of non-compliant discharges under resource consents WGN060283 [37892], [25227], [35674] and [35675]

2 Relevant consents and conditions

The WWTP operates under four discharge consents. The full consents, and conditions relevant to this report are available in Appendix A

Table 2-1 Relevant consents and conditions

Consent	Consent purpose	Conditions
37892[1]	To continuously discharge disinfected secondary (fully treated) effluent to the Wellington South Coast coastal marine area (Cook Straight in the vicinity of the Karori Stream Mouth) via an existing outfall	1, 2, 3, 6, 9, 10, 13, 14, 15, 16, 25
25227	To occasionally discharge milli-screened (partially treated) effluent to the Wellington South Coast coastal marine area (Cook Straight in the vicinity of the Karori Stream Mouth) via an existing outfall during significant wet weather events	1, 2, 3, 5, 7, 8
35674	To occasionally discharge secondary treated and disinfected wastewater from the Western Wastewater Treatment plant to Karori Stream during events when the stormwater tank is full, and the flow to the plant exceeds 190 L/s.	2, 3, 6, 8, 9
35675	To occasionally discharge milli-screened and settled wastewater from the Western Wastewater Treatment Plant to Karori Stream during events when the stormwater tank is full and the flow to the plant exceeds 390 L/s	2, 3, 5, 7, 8

[1] Replaced [35255] on 1st April 2022

3 Main outfall pipe break

The main outfall pipeline (MOP) failed in February 2022, followed by a major land slip in August 2022, which removed the pipeline repair, and resulted in all wastewater being discharged to Karori Stream near 41°18'45.01"S / 174°41'11.72"E instead into the coastal marine area as required by conditions of consent [37892] and [25227]. A significant monitoring programme has been implemented in relation to the pipe breakage and is reported separately.

4 Compliance assessment for coastal permit [37892]

Significant non-compliance was noted for 37892 in the reporting period.

Table 4-1 Summary of compliance with relevant conditions of 37892

Condition	Compliance
1. Location and nature of discharge	Non-compliant due to MOP break
2. Discharge rate	Partially compliant
3. Location of discharge	Non-compliant due to MOP break
6. Flow monitoring	Non-compliant due to MOP break
9. Sampling of BOD, TSS and FC	Compliant
10. Discharge quality standard	Non-compliant for BOD, but otherwise compliant
13. Minimum standards after reasonable mixing	Compliant (but not relevant because of MOP break)
14. Minimum standards after reasonable mixing	Compliant (but not relevant due to pipe break)
15. Visual/olfactory monitoring	Compliant
16 Coastal water quality monitoring	Compliant
25. Karori Stream monitoring	Compliant

4.1 Discharge location (Conditions 1 and 3)

Due to the breakage in the MOP, the discharge point for consent [37892] has been located within Karori Stream for most of the 2023-2024 year instead of the consented location at "the existing outfall, at or about NZMS 260: R27; 504.836". This is a significant non-compliance.

4.2 Discharge rate (Condition 2 and 6)

Condition 2 requires that "The rate of discharge shall not exceed 200 L/s or 17,280 m^3/day". The discharge limit as specified in [37892] condition 2 applies to the discharge from the MOP to the Coastal Marine Area (CMA). Flow rates for this location are not available. Flow entering the MOP at the WWTP has been used as a proxy.

Figure 4-1 illustrates that effluent flow rates from the WWTP into the MOP are mostly compliant except for 4 instances where peak flows have exceeded 200 L/s.

Figure 4-2 illustrates that daily discharge volumes have consistently been less than 17,280 m^3/day.

Condition 6 requires continuous monitoring of the flow rate and volume of treated wastewater entering the MOP, and the flow rate and volume of treated wastewater discharged to the CMA. As above, this is non-compliant, as the flow of wastewater discharge to the CMA has not been recorded due to the MOP breakage.

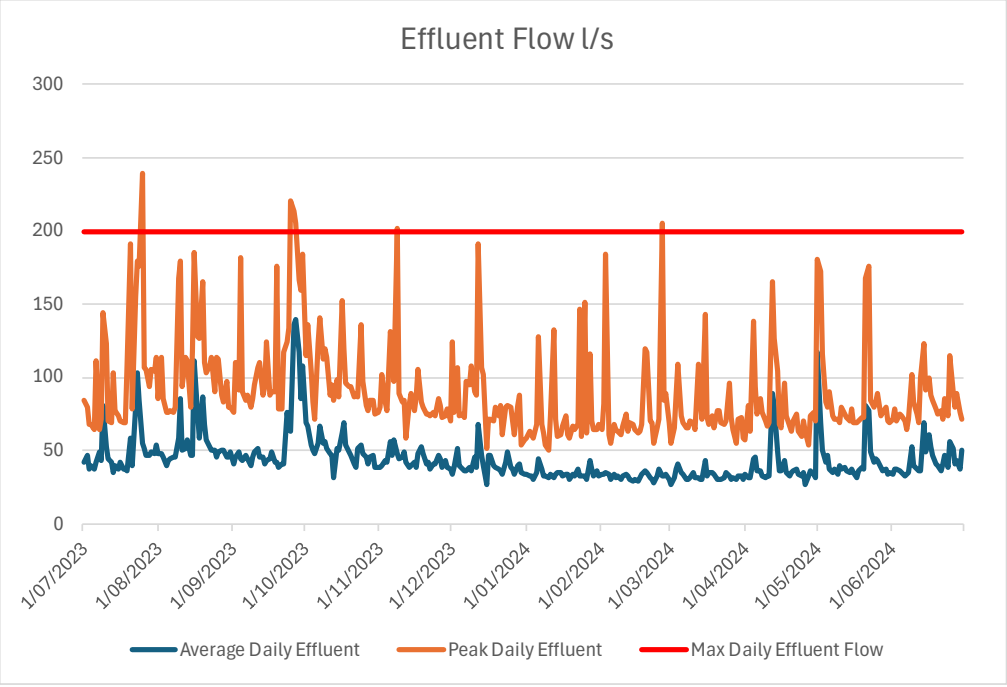

Figure 4-1 Effluent flow (l/s) from the WWTP

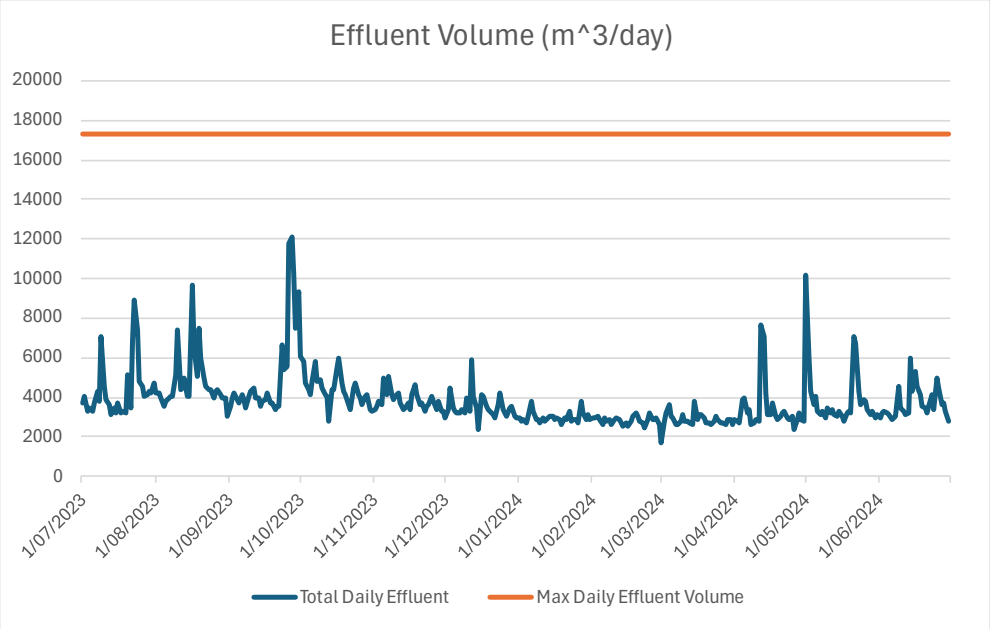

Figure 4-2 Effluent volume (m^3/day) from the WWTP.

4.3 Effluent quality (Conditions 9 and 10)

Condition 9 requires daily sampling of 5-Day Biochemical Oxygen Demand (BOD), Total Suspended Solids (TSS) and Faecal Coliforms. This has been undertaken and is compliant.

Condition 10 provides effluent quality criteria, including 90-day geomean limits, 90-day 80th percentile limits, and that no 15 consecutive samples, or 18 samples within a 90 day period may exceed the 80th percentile limit (Appendix B).

Of the effluent parameters, BOD repeatedly exceeded the limits throughout the year and is non-compliant. TSS exceeded the 90-day 18 sample limit and is non-compliant. Faecal coliforms remained compliant throughout the reporting period.

4.3.1 BOD5

BOD (g/m^3) (Figure 4-3) has continually exceeded the consented maximum for 90-day geometric mean (20 g/m^3) since October 2023. BOD was also non-compliant with the 80th percentile limit (50 g/m^3) from November 23 to January 24.

(Note, the requirement that no more than 18 of 90 daily samples must not exceed 50 g/m^3 is effectively the same as requiring the 90-day 80th percentile value to not exceed 50 g/m^3).

4.3.2 Total Suspended Solids

4.3.3 TSS (g/m^3) (Figure 4-4) remained compliant throughout the year for the geometric mean and 90-day 80th percentile resultsFaecal Coliforms

Faecal Coliforms (cfu/100ml) (Figure 4-5) remained well below the geometric mean, and the 90 day 80th percentile results.

Western WWTP 2034-2024 AEE for wastewater non-compliance
4 Compliance assessment for coastal permit [37892]

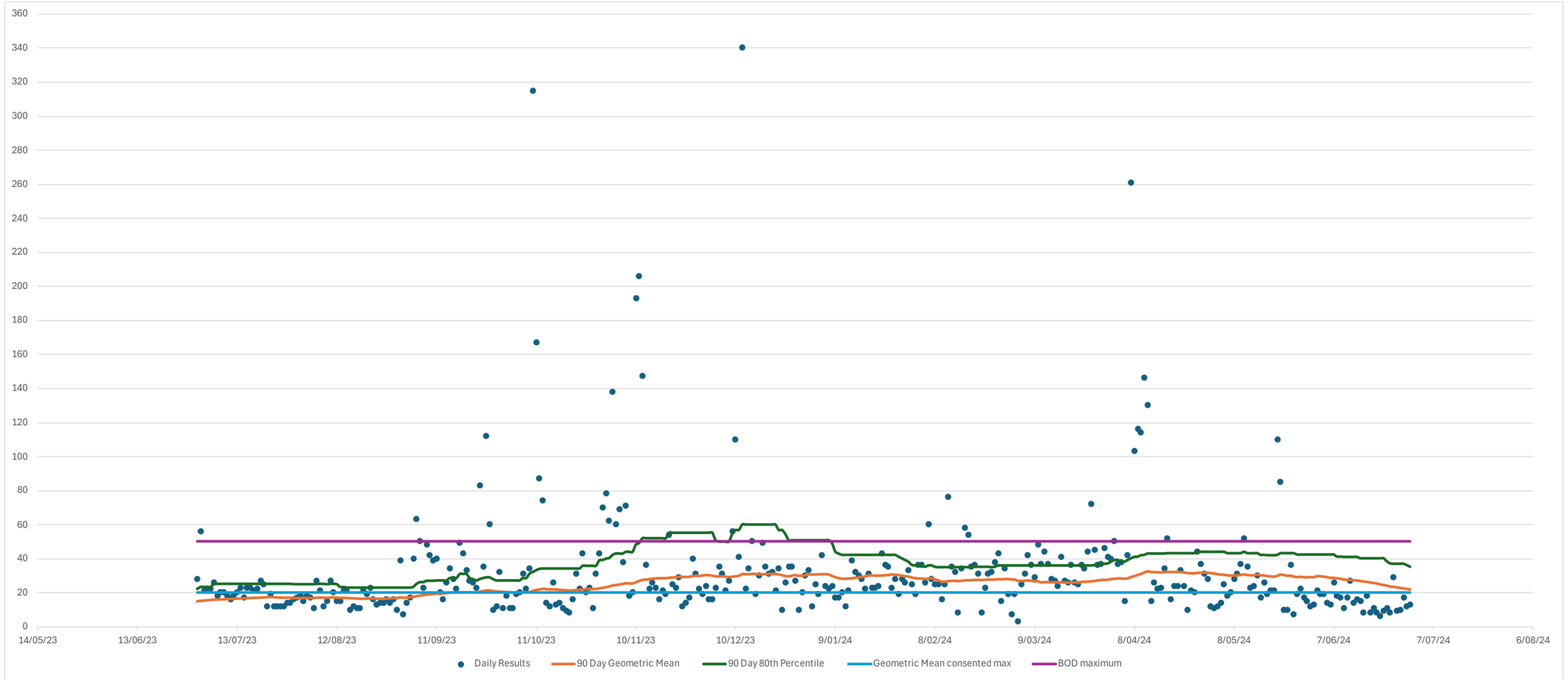

Figure 4-3 BOD daily results, geometric mean, and 80th percentile results, and comparison to consent limits

Western WWTP 2034-2024 AEE for wastewater non-compliance
4 Compliance assessment for coastal permit [37892]

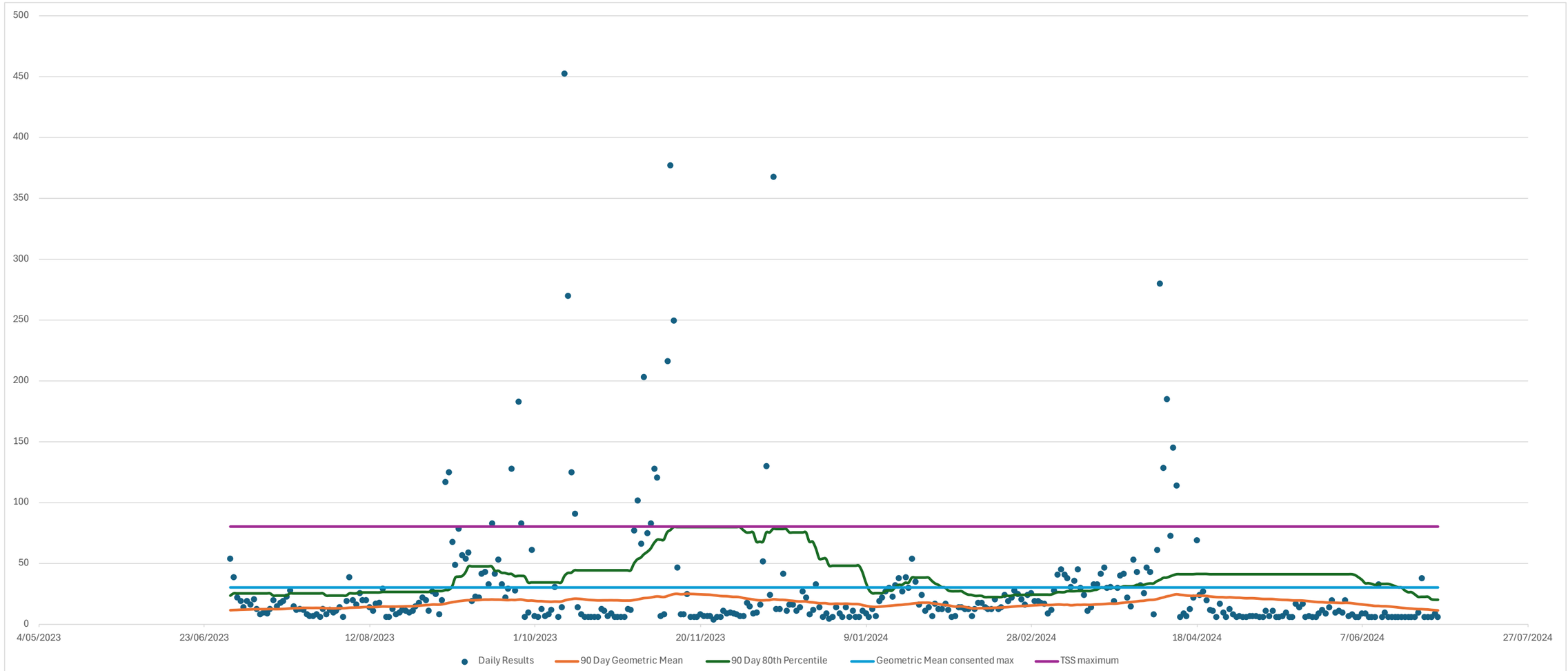

Figure 4-4 Total Suspended Solids daily results, geometric mean, 80th percentile results, and comparison to consent limit

Western WWTP 2034-2024 AEE for wastewater non-compliance
4 Compliance assessment for coastal permit [37892]

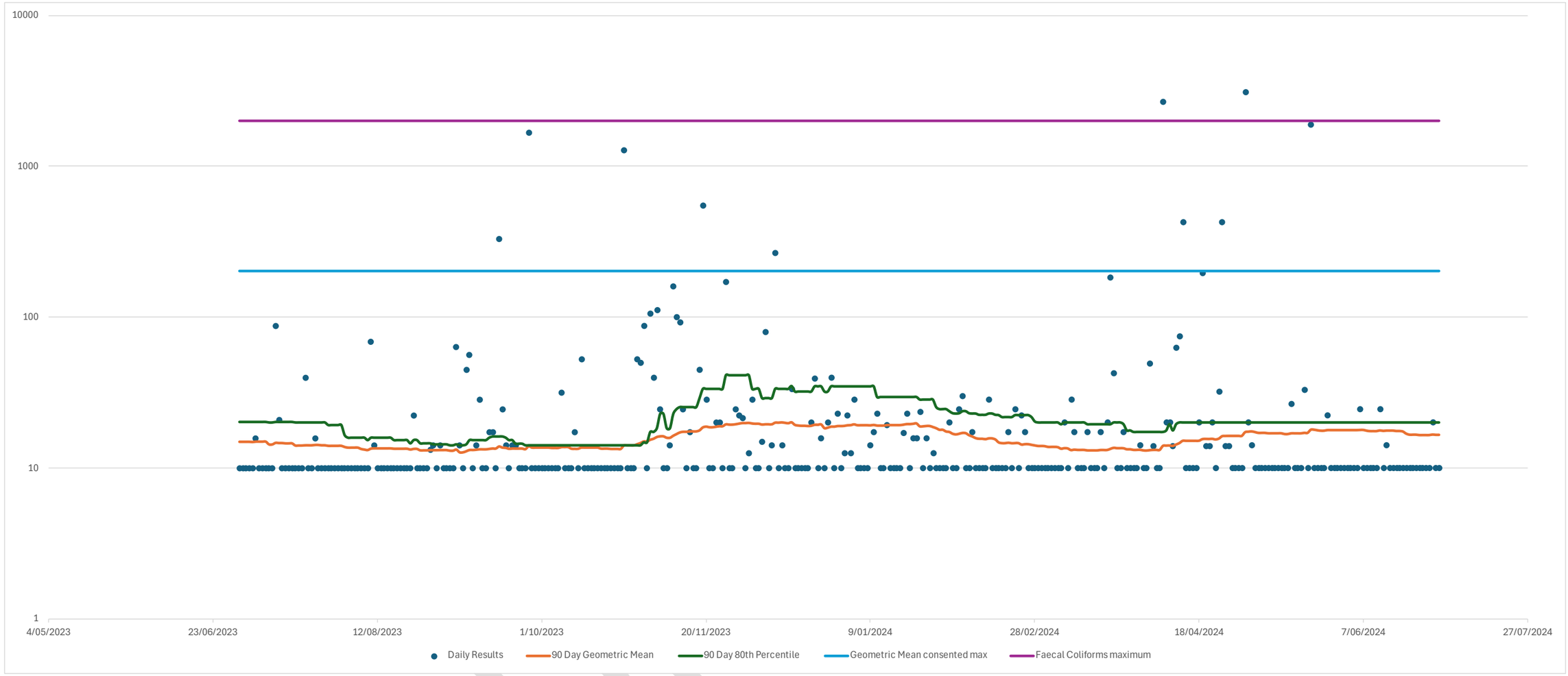

Figure 4-5 Faecal Coliform daily results, geometric mean, 80th percentile results, and comparison to consent limit (Log scale)

4.4 Mixing Zone (Conditions 13 and 14)

Condition 13 requires that the discharge does not cause the following within a 50m radius of the discharge point.

- Production of conspicuous oil or grease films, scums, or foams suspended material
- Conspicuous change in colour or visual clarity,
- Emission of objectional odour,
- Or significant adverse effects on aquatic life

Condition 14 requires that the discharge does not result in any of the following effects beyond a 100m radius of the discharge point

- Rendering of seafood inedible through virtue of concentration of toxic substances, or
- By concentration of microorganisms

Neither condition is applicable to the 2023-2024 year because of the MOP break.. Monitoring was continued at the consented discharge location and did not identify any of the above impacts. It is noted that the effects listed in condition 13 were observed at the unconsented discharge point in Karori Stream.

4.5 Receiving Water Monitoring (Conditions 15 and 16)

Condition 15 requires visual and olfactory assessment of the receiving waters beyond the mixing zone at least once per month to assess compliance with condition 13. This has been undertaken at the consented discharge point and is compliant.

Condition 16 requires representative coastal water samples at four locations, for each month from November to March (inclusive) each year. This sampling was undertaken and is compliant.

4.6 Karori Stream Monitoring (Condition 25)

Condition 25 requires fortnightly water samples within Karori Stream at 5 locations for the duration of the permit to be analysed for Faecal Coliforms (cfu/100ml). This sampling was undertaken and is complaint with the condition.

5 Compliance assessment for coastal permit [25227]

The only non-compliance in relation to 25227, is condition 1 as it related to the discharge location

Table 5-1 Summary of compliance with relevant conditions of 25227

Condition	Compliance
1. Discharge location	Non-compliant due to MOP break
2. Discharge of partially treated wastewater	Compliant
3. Influent flow monitoring	Compliant
5. Bypass discharge monitoring	Partially compliant due to MOP break
7. Bypass discharge monitoring	Compliant
8. Coastal monitoring	N/A

5.1 Discharge location (Condition 1)

Condition 1 requires that the location and nature of the discharge will be in accordance with the consent application. This condition is non-compliant, as the discharge(s) under this permit have been discharged into the Karori Stream at the MOP breakage throughout the reporting period, instead of the consented discharge point in the CMA

5.2 Permit Use (Condition 2)

Condition 2 requires that the permit shall only be exercised when the sewage inflow to the treatment plant exceeds 190 l/s and the 1000m^3 storage tank is full. The discharge record in Table 5-2 indicates that three wet weather events that occurred during the reporting year which resulted in the discharge of partially treated wastewater to the coast, and that all three were compliant with Condition.

A fourth discharge of partially treated wastewater to the coast was caused by a power outage and was not compliant with Condition 2

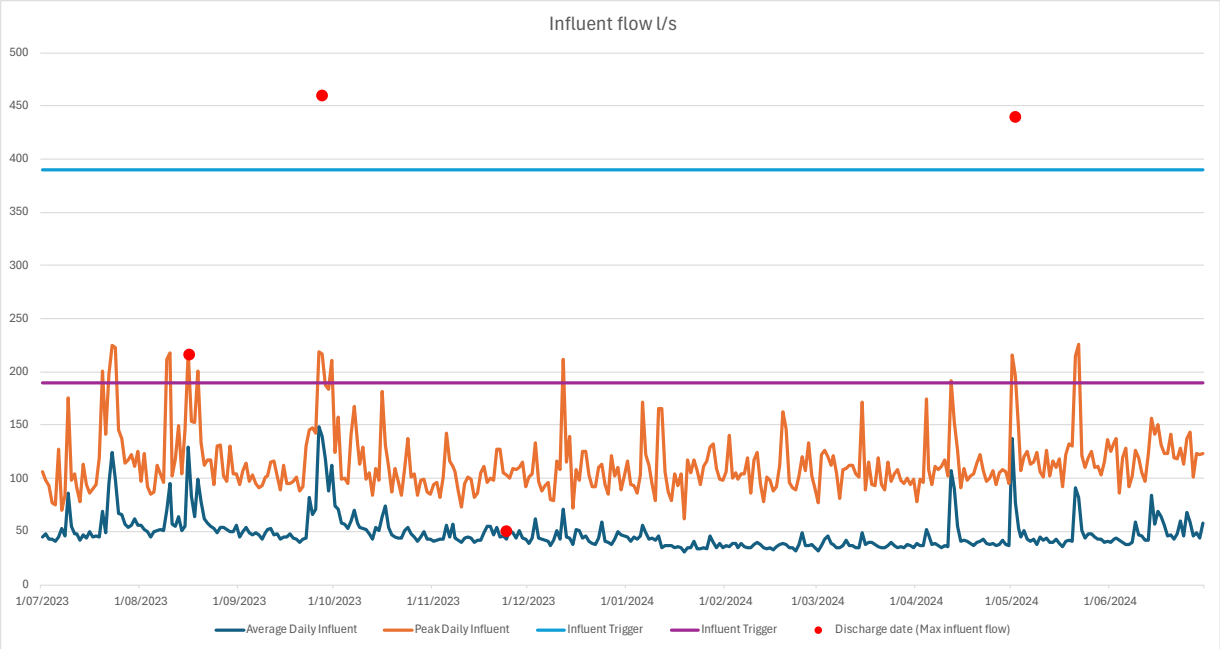

Figure 5-1 Influent flow (l/s) to the WWTP. The blue influent trigger is for 25227 and 35674. The purple influent trigger is for 35674

.

Table 5-2 Discharge events between 1 July 2023 and 31 June 2024

Consented	Date	Duration	Cause	Average discharge to Stream (l/s)	Max discharge to stream (l/s)	Average flow to WWTP (l/s)	Max flow to WWTP (l/s)	Discharge volume to stream (m^3)	Discharge volume to CMA (m^3)	Total treated volume (m^3)	Max storm tank level (%)
Yes	16/08/2023	02hr 04m	Wet weather	6	14	198	216	44	330	2,017	100%
Yes	27/09/2023	07hr 20m	Wet weather	18	70	259	460	388	1,645	7,228	100%
No	24/11/2023	01hr 31m	Power outage – UV treatment offline	50	53	45	50	277	n/a	277	0%
Yes	2/05/2024	06hr 46m	Wet weather	28	68	305	444	677	n/a	4,218	100%

5.3 Influent Flow (Condition 3)

Condition 3 requires continuous monitoring of influent flow to the WWTP. This is compliant (Noting the limitations identified in Section 5.2.)

5.4 Bypass discharge monitoring (Condition 5)

Condition 5 requires monitoring of the time, flow rate, duration and total volume(s) of bypass flows to the CMA. Monitoring of the above parameters was completed for flows entering the MOP (Table 5-2), however due to the MOP breakage flow rates at the consented discharge point were not recorded. This is partially complaint.

5.5 Effluent sampling (Condition 7)

Condition 7 requires sampling of effluent prior to its entry into the MOP each time a discharge under the consent has occurred for more than two hours. This condition is compliant.

5.6 Water Sampling (Condition 8)

Condition 8 requires 2 sets of representative water samples at four locations, provided that a discharge has occurred for more than 10 hours. This condition is not applicable, as no discharge event exceeded 10 hours.

6 Compliance assessment for stream permit [35674]

No non-compliance for 35674 was noted in the reporting period

Table 6-1 Summary of compliance with relevant conditions of 35674

Condition	Compliance
2. Discharge to Karori Stream	Compliant
3. Influent flow monitoring	Compliant
6. Bypass discharge monitoring	Compliant
8. Discharge quality monitoring	Compliant
9. Stream water monitoring	N/A

6.1 Permit use (Condition 2)

Condition 2 requires that the consent will only be exercised when the sewage inflow to the treatment plant exceeds 190 l/s and the 1000m^3 storage tank is full. This is compliant (Table 5-2).

6.2 Influent flow (Condition 3)

Condition 3 requires continuous monitoring of influent flow to the WWTP. This is compliant. (Noting the limitations identified in Section 5.2.)

6.3 Bypass discharge monitoring (Condition 6)

Condition 6 requires monitoring of the time, flow rate, duration and total volume(s) of bypass flows to the Karori Stream. This is compliant (Table 5-2)

6.4 Effluent Sampling (Condition 8)

Condition 7 requires sampling of effluent prior to its entry into the Karori Stream each time a discharge under the consent has occurred for more than two hours. This condition is compliant.

6.5 Water Sampling (Condition 9)

Condition 9 requires two representative samples from the Karori Stream, one upstream, and one downstream of the discharge after each overflow has occurred for more than 24 hours. This condition is not applicable as no discharge occurred for more than 24 hours.

7 Compliance assessment for stream permit [35675]

No non-compliance for 35675 was noted in the reporting period.

Table 7-1 Summary of compliance with relevant conditions of 35675

Condition	Compliance
2. Discharge of partially treated wastewater to Karori Stream	Compliant
3. Influent flow monitoring	Compliant
5. Discharge monitoring	Compliant
7. Discharge monitoring	Compliant
8. Stream monitoring	Compliant

7.1 Permit use (Condition 2)

Condition 2 requires that the consent will only be exercised when the sewage inflow to the treatment plant exceeds 390 l/s and the 1000m^3 storage tank is full. This is compliant (Table 5-2).

7.2 Influent flow (Condition 3)

Condition 3 requires continuous monitoring of influent flow to the WWTP. This is compliant (Noting the limitations identified in Section 5.2.).

7.3 Bypass discharge monitoring (Condition 5)

Condition 6 requires monitoring of the time, flow rate, duration and total volume(s) of bypass flows to the Karori Stream. This is compliant (Table 5-2).

7.4 Effluent Sampling (Condition 7)

Condition 7 requires sampling of effluent prior to its entry into the Karori Stream each time a discharge under the consent has occurred for more than two hours. This condition is compliant.

7.5 Water Sampling (Condition 8)

Condition 8 requires a stream sample in the Karori Stream, upstream of the discharge point after any bypass discharge under this consent has occurred for over one hour. This condition is compliant.

8 Assessment of Effects of Non-Compliance

Discharges that occurred to Karori Stream under consents 35674 and 35675 were fully compliant with the relevant conditions, and as such are not assessed for the effects of non-compliance.

8.1 Unconsented discharges to Karori Stream

An un-consented discharge to Karori Stream occurred on the 24th of November 2023 due to a power outage at the WWTP resulting in a biologically treated, but undisinfected discharge. Occurring over 1 hour and 31 minutes, the discharge had a total volume of 277m^3 and is unlikely to have caused any additional ecological impacts, however may have temporarily increased the risk to public health (Noting that both the Karori Stream, and the consented discharge location are not frequently used for recreation).

The MOP breakages in February and August 2022 has resulted in a sustained unconsented discharge of secondary Treated and UV disinfected wastewater to Karori Stream, which was complicated by a dispute over access to private land but repair works eventually resumed in May 2024. This event is covered by a comprehensive monitoring programme and the impacts will be addressed separately in an AEE report. In summary, the ongoing discharge caused a significant decline in a range of water quality parameters and marked changes in the macroinvertebrate community composition.

Non-compliance of BOD at the WWTP has only caused marginal increases in BOD downstream of the MOP breakpoint and any impacts are tied directly to the MOP breakage.

Appendix

Appendix A Consents

Appendix B 37892 Condition 10 – 90 day daily result exceedances

Date	BOD		TSS		Faecal Coliforms	
	Maximum	Number of samples in 90 days exceeding maximum	Maximum	Number of samples in 90 days exceeding maximum	Maximum	Number of samples in 90 days exceeding maximum
1/07/2023	50	5	80	6	2000	0
2/07/2023	50	5	80	6	2000	0
3/07/2023	50	4	80	6	2000	0
4/07/2023	50	4	80	6	2000	0
5/07/2023	50	4	80	6	2000	0
6/07/2023	50	4	80	6	2000	0
7/07/2023	50	4	80	6	2000	0
8/07/2023	50	4	80	6	2000	0
9/07/2023	50	4	80	6	2000	0
10/07/2023	50	4	80	6	2000	0
11/07/2023	50	4	80	6	2000	0
12/07/2023	50	4	80	6	2000	0
13/07/2023	50	5	80	7	2000	0
14/07/2023	50	6	80	8	2000	0

Date	BOD		TSS		Faecal Coliforms	
	Maximum	Number of samples in 90 days exceeding maximum	Maximum	Number of samples in 90 days exceeding maximum	Maximum	Number of samples in 90 days exceeding maximum
15/07/2023	50	7	80	9	2000	0
16/07/2023	50	8	80	10	2000	0
17/07/2023	50	8	80	10	2000	0
18/07/2023	50	8	80	10	2000	0
19/07/2023	50	8	80	10	2000	0
20/07/2023	50	8	80	10	2000	0
21/07/2023	50	8	80	10	2000	0
22/07/2023	50	8	80	10	2000	0
23/07/2023	50	8	80	10	2000	0
24/07/2023	50	8	80	10	2000	0
25/07/2023	50	8	80	10	2000	0
26/07/2023	50	8	80	10	2000	0
27/07/2023	50	8	80	10	2000	0
28/07/2023	50	8	80	10	2000	0
29/07/2023	50	8	80	10	2000	0
30/07/2023	50	8	80	10	2000	0

Date	BOD		TSS		Faecal Coliforms	
	Maximum	Number of samples in 90 days exceeding maximum	Maximum	Number of samples in 90 days exceeding maximum	Maximum	Number of samples in 90 days exceeding maximum
31/07/2023	50	8	80	10	2000	0
1/08/2023	50	8	80	10	2000	0
2/08/2023	50	8	80	10	2000	0
3/08/2023	50	9	80	10	2000	0
4/08/2023	50	10	80	11	2000	0
5/08/2023	50	11	80	11	2000	0
6/08/2023	50	12	80	12	2000	0
7/08/2023	50	13	80	12	2000	0
8/08/2023	50	14	80	13	2000	0
9/08/2023	50	14	80	14	2000	0
10/08/2023	50	15	80	15	2000	0
11/08/2023	50	15	80	15	2000	0
12/08/2023	50	15	80	15	2000	0
13/08/2023	50	16	80	16	2000	0
14/08/2023	50	17	80	17	2000	0
15/08/2023	50	18	80	18	2000	0

Date	BOD		TSS		Faecal Coliforms	
	Maximum	Number of samples in 90 days exceeding maximum	Maximum	Number of samples in 90 days exceeding maximum	Maximum	Number of samples in 90 days exceeding maximum
16/08/2023	50	18	80	18	2000	0
17/08/2023	50	18	80	18	2000	0
18/08/2023	50	18	80	18	2000	0
19/08/2023	50	18	80	18	2000	0
20/08/2023	50	18	80	18	2000	0
21/08/2023	50	18	80	18	2000	0
22/08/2023	50	18	80	18	2000	0
23/08/2023	50	19	80	18	2000	0
24/08/2023	50	19	80	18	2000	0
25/08/2023	50	19	80	18	2000	0
26/08/2023	50	19	80	18	2000	0
27/08/2023	50	19	80	18	2000	0
28/08/2023	50	19	80	18	2000	0
29/08/2023	50	19	80	18	2000	0
30/08/2023	50	19	80	18	2000	0
31/08/2023	50	19	80	18	2000	0

Date	BOD		TSS		Faecal Coliforms	
	Maximum	Number of samples in 90 days exceeding maximum	Maximum	Number of samples in 90 days exceeding maximum	Maximum	Number of samples in 90 days exceeding maximum
1/09/2023	50	19	80	18	2000	0
2/09/2023	50	19	80	18	2000	0
3/09/2023	50	19	80	18	2000	0
4/09/2023	50	19	80	18	2000	0
5/09/2023	50	19	80	17	2000	0
6/09/2023	50	18	80	16	2000	0
7/09/2023	50	18	80	16	2000	0
8/09/2023	50	18	80	16	2000	0
9/09/2023	50	18	80	16	2000	0
10/09/2023	50	18	80	16	2000	0
11/09/2023	50	19	80	16	2000	0
12/09/2023	50	20	80	17	2000	0
13/09/2023	50	20	80	17	2000	0
14/09/2023	50	21	80	18	2000	0
15/09/2023	50	21	80	18	2000	0
16/09/2023	50	21	80	18	2000	0

Date	BOD		TSS		Faecal Coliforms	
	Maximum	Number of samples in 90 days exceeding maximum	Maximum	Number of samples in 90 days exceeding maximum	Maximum	Number of samples in 90 days exceeding maximum
17/09/2023	50	21	80	18	2000	0
18/09/2023	50	21	80	18	2000	0
19/09/2023	50	21	80	17	2000	0
20/09/2023	50	21	80	17	2000	0
21/09/2023	50	21	80	17	2000	0
22/09/2023	50	21	80	17	2000	0
23/09/2023	50	21	80	17	2000	0
24/09/2023	50	21	80	17	2000	0
25/09/2023	50	20	80	16	2000	0
26/09/2023	50	20	80	16	2000	0
27/09/2023	50	19	80	15	2000	0
28/09/2023	50	18	80	14	2000	0
29/09/2023	50	18	80	14	2000	0
30/09/2023	50	18	80	14	2000	0
1/10/2023	50	18	80	14	2000	0
2/10/2023	50	18	80	14	2000	0

Date	BOD		TSS		Faecal Coliforms	
	Maximum	Number of samples in 90 days exceeding maximum	Maximum	Number of samples in 90 days exceeding maximum	Maximum	Number of samples in 90 days exceeding maximum
3/10/2023	50	18	80	14	2000	0
4/10/2023	50	18	80	14	2000	0
5/10/2023	50	18	80	14	2000	0
6/10/2023	50	18	80	14	2000	0
7/10/2023	50	18	80	14	2000	0
8/10/2023	50	18	80	14	2000	0
9/10/2023	50	18	80	14	2000	0
10/10/2023	50	18	80	14	2000	0
11/10/2023	50	17	80	13	2000	0
12/10/2023	50	16	80	12	2000	0
13/10/2023	50	15	80	11	2000	0
14/10/2023	50	14	80	10	2000	0
15/10/2023	50	14	80	10	2000	0
16/10/2023	50	14	80	10	2000	0
17/10/2023	50	14	80	10	2000	0
18/10/2023	50	14	80	10	2000	0

Date	BOD		TSS		Faecal Coliforms	
	Maximum	Number of samples in 90 days exceeding maximum	Maximum	Number of samples in 90 days exceeding maximum	Maximum	Number of samples in 90 days exceeding maximum
19/10/2023	50	14	80	10	2000	0
20/10/2023	50	14	80	10	2000	0
21/10/2023	50	14	80	10	2000	0
22/10/2023	50	14	80	10	2000	0
23/10/2023	50	14	80	10	2000	0
24/10/2023	50	14	80	10	2000	0
25/10/2023	50	14	80	10	2000	0
26/10/2023	50	14	80	10	2000	0
27/10/2023	50	14	80	10	2000	0
28/10/2023	50	14	80	10	2000	0
29/10/2023	50	14	80	10	2000	0
30/10/2023	50	14	80	10	2000	0
31/10/2023	50	14	80	10	2000	0
1/11/2023	50	13	80	10	2000	0
2/11/2023	50	12	80	9	2000	0
3/11/2023	50	11	80	9	2000	0

Date	BOD		TSS		Faecal Coliforms	
	Maximum	Number of samples in 90 days exceeding maximum	Maximum	Number of samples in 90 days exceeding maximum	Maximum	Number of samples in 90 days exceeding maximum
4/11/2023	50	10	80	8	2000	0
5/11/2023	50	9	80	8	2000	0
6/11/2023	50	8	80	7	2000	0
7/11/2023	50	8	80	6	2000	0
8/11/2023	50	7	80	5	2000	0
9/11/2023	50	8	80	5	2000	0
10/11/2023	50	8	80	5	2000	0
11/11/2023	50	7	80	4	2000	0
12/11/2023	50	6	80	3	2000	0
13/11/2023	50	5	80	2	2000	0
14/11/2023	50	5	80	2	2000	0
15/11/2023	50	6	80	2	2000	0
16/11/2023	50	6	80	2	2000	0
17/11/2023	50	6	80	2	2000	0
18/11/2023	50	6	80	2	2000	0
19/11/2023	50	6	80	2	2000	0

Date	BOD		TSS		Faecal Coliforms	
	Maximum	Number of samples in 90 days exceeding maximum	Maximum	Number of samples in 90 days exceeding maximum	Maximum	Number of samples in 90 days exceeding maximum
20/11/2023	50	7	80	2	2000	0
21/11/2023	50	7	80	2	2000	0
22/11/2023	50	7	80	2	2000	0
23/11/2023	50	7	80	2	2000	0
24/11/2023	50	7	80	2	2000	0
25/11/2023	50	7	80	2	2000	0
26/11/2023	50	7	80	2	2000	0
27/11/2023	50	7	80	2	2000	0
28/11/2023	50	7	80	2	2000	0
29/11/2023	50	7	80	2	2000	0
30/11/2023	50	7	80	2	2000	0
1/12/2023	50	7	80	2	2000	0
2/12/2023	50	7	80	2	2000	0
3/12/2023	50	7	80	2	2000	0
4/12/2023	50	7	80	2	2000	0
5/12/2023	50	7	80	2	2000	0

Date	BOD		TSS		Faecal Coliforms	
	Maximum	Number of samples in 90 days exceeding maximum	Maximum	Number of samples in 90 days exceeding maximum	Maximum	Number of samples in 90 days exceeding maximum
6/12/2023	50	7	80	2	2000	0
7/12/2023	50	7	80	2	2000	0
8/12/2023	50	7	80	2	2000	0
9/12/2023	50	7	80	2	2000	0
10/12/2023	50	6	80	2	2000	0
11/12/2023	50	5	80	1	2000	0
12/12/2023	50	5	80	1	2000	0
13/12/2023	50	4	80	0	2000	0
14/12/2023	50	4	80	0	2000	0
15/12/2023	50	4	80	0	2000	0
16/12/2023	50	4	80	0	2000	0
17/12/2023	50	4	80	0	2000	0
18/12/2023	50	4	80	0	2000	0
19/12/2023	50	4	80	0	2000	0
20/12/2023	50	4	80	0	2000	0
21/12/2023	50	4	80	0	2000	0

Date	BOD		TSS		Faecal Coliforms	
	Maximum	Number of samples in 90 days exceeding maximum	Maximum	Number of samples in 90 days exceeding maximum	Maximum	Number of samples in 90 days exceeding maximum
22/12/2023	50	4	80	0	2000	0
23/12/2023	50	4	80	0	2000	0
24/12/2023	50	4	80	0	2000	0
25/12/2023	50	4	80	0	2000	0
26/12/2023	50	4	80	0	2000	0
27/12/2023	50	4	80	0	2000	0
28/12/2023	50	5	80	0	2000	0
29/12/2023	50	5	80	0	2000	0
30/12/2023	50	5	80	0	2000	0
31/12/2023	50	5	80	0	2000	0
1/01/2024	50	5	80	0	2000	0
2/01/2024	50	5	80	0	2000	0
3/01/2024	50	5	80	0	2000	0
4/01/2024	50	5	80	0	2000	0
5/01/2024	50	5	80	0	2000	0
6/01/2024	50	5	80	0	2000	0

Date	BOD		TSS		Faecal Coliforms	
	Maximum	Number of samples in 90 days exceeding maximum	Maximum	Number of samples in 90 days exceeding maximum	Maximum	Number of samples in 90 days exceeding maximum
7/01/2024	50	5	80	0	2000	0
8/01/2024	50	5	80	0	2000	0
9/01/2024	50	6	80	1	2000	1
10/01/2024	50	7	80	2	2000	1
11/01/2024	50	8	80	3	2000	1
12/01/2024	50	9	80	3	2000	1
13/01/2024	50	10	80	4	2000	1
14/01/2024	50	11	80	5	2000	1
15/01/2024	50	11	80	5	2000	1
16/01/2024	50	11	80	5	2000	1
17/01/2024	50	11	80	5	2000	1
18/01/2024	50	11	80	5	2000	1
19/01/2024	50	11	80	5	2000	1
20/01/2024	50	12	80	5	2000	1
21/01/2024	50	12	80	5	2000	1
22/01/2024	50	12	80	5	2000	1

Date	BOD		TSS		Faecal Coliforms	
	Maximum	Number of samples in 90 days exceeding maximum	Maximum	Number of samples in 90 days exceeding maximum	Maximum	Number of samples in 90 days exceeding maximum
23/01/2024	50	12	80	5	2000	1
24/01/2024	50	12	80	5	2000	1
25/01/2024	50	12	80	5	2000	1
26/01/2024	50	12	80	5	2000	1
27/01/2024	50	12	80	5	2000	1
28/01/2024	50	12	80	5	2000	1
29/01/2024	50	12	80	5	2000	1
30/01/2024	50	12	80	5	2000	1
31/01/2024	50	12	80	5	2000	1
1/02/2024	50	12	80	5	2000	1
2/02/2024	50	12	80	5	2000	1
3/02/2024	50	12	80	5	2000	2
4/02/2024	50	12	80	5	2000	2
5/02/2024	50	12	80	5	2000	2
6/02/2024	50	12	80	5	2000	2
7/02/2024	50	11	80	5	2000	2

Date	BOD		TSS		Faecal Coliforms	
	Maximum	Number of samples in 90 days exceeding maximum	Maximum	Number of samples in 90 days exceeding maximum	Maximum	Number of samples in 90 days exceeding maximum
8/02/2024	50	11	80	5	2000	2
9/02/2024	50	11	80	5	2000	2
10/02/2024	50	11	80	5	2000	2
11/02/2024	50	11	80	5	2000	2
12/02/2024	50	12	80	5	2000	2
13/02/2024	50	11	80	5	2000	2
14/02/2024	50	11	80	5	2000	2
15/02/2024	50	11	80	5	2000	2
16/02/2024	50	11	80	5	2000	2
17/02/2024	50	11	80	5	2000	2
18/02/2024	50	10	80	5	2000	2
19/02/2024	50	9	80	5	2000	2
20/02/2024	50	9	80	5	2000	2
21/02/2024	50	9	80	5	2000	2
22/02/2024	50	10	80	5	2000	2
23/02/2024	50	11	80	5	2000	2

Date	BOD		TSS		Faecal Coliforms	
	Maximum	Number of samples in 90 days exceeding maximum	Maximum	Number of samples in 90 days exceeding maximum	Maximum	Number of samples in 90 days exceeding maximum
24/02/2024	50	11	80	5	2000	2
25/02/2024	50	11	80	5	2000	2
26/02/2024	50	11	80	5	2000	2
27/02/2024	50	11	80	5	2000	2
28/02/2024	50	11	80	5	2000	2
29/02/2024	50	11	80	5	2000	2
1/03/2024	50	11	80	5	2000	2
2/03/2024	50	11	80	5	2000	2
3/03/2024	50	11	80	5	2000	2
4/03/2024	50	11	80	5	2000	2
5/03/2024	50	11	80	5	2000	2
6/03/2024	50	11	80	5	2000	2
7/03/2024	50	11	80	5	2000	2
8/03/2024	50	11	80	5	2000	2
9/03/2024	50	11	80	5	2000	2
10/03/2024	50	11	80	5	2000	2

Date	BOD		TSS		Faecal Coliforms	
	Maximum	Number of samples in 90 days exceeding maximum	Maximum	Number of samples in 90 days exceeding maximum	Maximum	Number of samples in 90 days exceeding maximum
11/03/2024	50	11	80	5	2000	2
12/03/2024	50	11	80	5	2000	2
13/03/2024	50	11	80	5	2000	2
14/03/2024	50	11	80	5	2000	2
15/03/2024	50	11	80	5	2000	2
16/03/2024	50	11	80	5	2000	2
17/03/2024	50	11	80	5	2000	2
18/03/2024	50	11	80	5	2000	2
19/03/2024	50	11	80	5	2000	2
20/03/2024	50	11	80	5	2000	2
21/03/2024	50	11	80	5	2000	2
22/03/2024	50	11	80	5	2000	2
23/03/2024	50	11	80	5	2000	2
24/03/2024	50	11	80	5	2000	2
25/03/2024	50	11	80	5	2000	2
26/03/2024	50	11	80	5	2000	2

Date	BOD		TSS		Faecal Coliforms	
	Maximum	Number of samples in 90 days exceeding maximum	Maximum	Number of samples in 90 days exceeding maximum	Maximum	Number of samples in 90 days exceeding maximum
27/03/2024	50	10	80	5	2000	2
28/03/2024	50	10	80	5	2000	2
29/03/2024	50	10	80	5	2000	2
30/03/2024	50	10	80	5	2000	2
31/03/2024	50	10	80	5	2000	2
1/04/2024	50	10	80	5	2000	2
2/04/2024	50	10	80	5	2000	2
3/04/2024	50	10	80	5	2000	2
4/04/2024	50	10	80	5	2000	2
5/04/2024	50	10	80	5	2000	2
6/04/2024	50	10	80	5	2000	2
7/04/2024	50	10	80	5	2000	2
8/04/2024	50	9	80	4	2000	1
9/04/2024	50	8	80	3	2000	1
10/04/2024	50	7	80	2	2000	1
11/04/2024	50	6	80	2	2000	1

Date	BOD		TSS		Faecal Coliforms	
	Maximum	Number of samples in 90 days exceeding maximum	Maximum	Number of samples in 90 days exceeding maximum	Maximum	Number of samples in 90 days exceeding maximum
12/04/2024	50	5	80	1	2000	1
13/04/2024	50	4	80	0	2000	1
14/04/2024	50	4	80	0	2000	1
15/04/2024	50	4	80	0	2000	1
16/04/2024	50	4	80	0	2000	1
17/04/2024	50	4	80	0	2000	1
18/04/2024	50	4	80	0	2000	1
19/04/2024	50	3	80	0	2000	1
20/04/2024	50	3	80	0	2000	1
21/04/2024	50	3	80	0	2000	1
22/04/2024	50	3	80	0	2000	1
23/04/2024	50	3	80	0	2000	1
24/04/2024	50	3	80	0	2000	1
25/04/2024	50	3	80	0	2000	1
26/04/2024	50	3	80	0	2000	1
27/04/2024	50	3	80	0	2000	1

Date	BOD		TSS		Faecal Coliforms	
	Maximum	Number of samples in 90 days exceeding maximum	Maximum	Number of samples in 90 days exceeding maximum	Maximum	Number of samples in 90 days exceeding maximum
28/04/2024	50	3	80	0	2000	1
29/04/2024	50	3	80	0	2000	1
30/04/2024	50	3	80	0	2000	1
1/05/2024	50	3	80	0	2000	1
2/05/2024	50	3	80	0	2000	1
3/05/2024	50	3	80	0	2000	0
4/05/2024	50	3	80	0	2000	0
5/05/2024	50	3	80	0	2000	0
6/05/2024	50	3	80	0	2000	0
7/05/2024	50	3	80	0	2000	0
8/05/2024	50	3	80	0	2000	0
9/05/2024	50	3	80	0	2000	0
10/05/2024	50	3	80	0	2000	0
11/05/2024	50	3	80	0	2000	0
12/05/2024	50	2	80	0	2000	0
13/05/2024	50	2	80	0	2000	0

Date	BOD		TSS		Faecal Coliforms	
	Maximum	Number of samples in 90 days exceeding maximum	Maximum	Number of samples in 90 days exceeding maximum	Maximum	Number of samples in 90 days exceeding maximum
14/05/2024	50	2	80	0	2000	0
15/05/2024	50	2	80	0	2000	0
16/05/2024	50	2	80	0	2000	0
17/05/2024	50	2	80	0	2000	0
18/05/2024	50	2	80	0	2000	0
19/05/2024	50	2	80	0	2000	0
20/05/2024	50	2	80	0	2000	0
21/05/2024	50	2	80	0	2000	0
22/05/2024	50	1	80	0	2000	0
23/05/2024	50	0	80	0	2000	0
24/05/2024	50	0	80	0	2000	0
25/05/2024	50	0	80	0	2000	0
26/05/2024	50	0	80	0	2000	0
27/05/2024	50	0	80	0	2000	0
28/05/2024	50	0	80	0	2000	0
29/05/2024	50	0	80	0	2000	0

Date	BOD		TSS		Faecal Coliforms	
	Maximum	Number of samples in 90 days exceeding maximum	Maximum	Number of samples in 90 days exceeding maximum	Maximum	Number of samples in 90 days exceeding maximum
30/05/2024	50	0	80	0	2000	0
31/05/2024	50	0	80	0	2000	0
1/06/2024	50	0	80	0	2000	0
2/06/2024	50	0	80	0	2000	0
3/06/2024	50	0	80	0	2000	0
4/06/2024	50	0	80	0	2000	0
5/06/2024	50	0	80	0	2000	0
6/06/2024	50	0	80	0	2000	0
7/06/2024	50	0	80	0	2000	0
8/06/2024	50	0	80	0	2000	0
9/06/2024	50	0	80	0	2000	0
10/06/2024	50	0	80	0	2000	0
11/06/2024	50	0	80	0	2000	0
12/06/2024	50	0	80	0	2000	0
13/06/2024	50	0	80	0	2000	0
14/06/2024	50	0	80	0	2000	0

Date	BOD		TSS		Faecal Coliforms	
	Maximum	Number of samples in 90 days exceeding maximum	Maximum	Number of samples in 90 days exceeding maximum	Maximum	Number of samples in 90 days exceeding maximum
15/06/2024	50	0	80	0	2000	0
16/06/2024	50	0	80	0	2000	0
17/06/2024	50	0	80	0	2000	0
18/06/2024	50	0	80	0	2000	0
19/06/2024	50	0	80	0	2000	0
20/06/2024	50	0	80	0	2000	0
21/06/2024	50	0	80	0	2000	0
22/06/2024	50	0	80	0	2000	0
23/06/2024	50	0	80	0	2000	0
24/06/2024	50	0	80	0	2000	0
25/06/2024	50	0	80	0	2000	0
26/06/2024	50	0	80	0	2000	0
27/06/2024	50	0	80	0	2000	0
28/06/2024	50	0	80	0	2000	0
29/06/2024	50	0	80	0	2000	0
30/06/2024	50	0	80	0	2000	0

Stantec

Stantec is a global leader in sustainable architecture, engineering, and environmental consulting. The diverse perspectives of our partners and interested parties drive us to think beyond what's previously been done on critical issues like climate change, digital transformation, and future-proofing our cities and infrastructure. We innovate at the intersection of community, creativity, and client relationships to advance communities everywhere, so that together we can redefine what's possible.