Wellington Water

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Me Heke Ki Pōneke

# Western Wastewater Treatment Plant

## Annual Resource Consents Report 2019/2020

Your public water company

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# Control Sheet

**Document Title**: Western Wastewater Treatment Plant Annual Resource Consents Report 2019/2020

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**Reviewed by:** Anna Hector

**Authorised by:** Jeremy McKibbin

## Document Control Register

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| 0 | Draft | 21/07/2020 | Draft for review |
| 1 | Final | 27/07/2020 | Reviewed by Anna Hector. |
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# Executive Summary

This report has been prepared on behalf of the Wellington City Council (WCC) for compliance with the following resource consents:

WGN060283[35255]

This coastal permit allows WCC to continuously discharge disinfected secondary (fully treated) effluent to the Wellington South Coast coastal marine area (Cook Strait in the vicinity of the Karori Stream Mouth) via an existing outfall. The map reference for the discharge location is NZMS 260: R27; 504.836.

WGN060283[25227]

This coastal discharge permit allows WCC to occasionally discharge milli-screened (partially treated) effluent to the Wellington South Coast marine area (cook Strait in the vicinity of the Karori Stream Mouth) via an existing outfall during significant wet weather events. The map reference for the discharge location is NZMS 260: R27; 504.836.

WGN060283[35674]

This discharge permit allows WCC 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 190L/s. The map reference for the discharge location is NZMS 260: R27; 2652332.5987157.

WGN060283[35675]

This discharge permit allows WCC to occasionally discharge milli-screened and settled wastewater from the Western WWTP to Karori stream during events when the stormwater tank is full and the flow to the plant exceeds 390L/s. The map reference for the discharge location is NZMS 260: R27; 2652332.5987157.

WGN060283[25230]

This discharge permit allows WCC to discharge contaminants to air from the operation of the Western WWTP.

The report will cover the period from 1 July 2019 to 30 June 2020.

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# Resource Consent

## WGN060283[35255]

Effluent discharge from the Western WWTP is governed by the resource consent under the Greater Wellington Regional Council consent file number WGN060283 [35255]. In general, the consent allows the continuous discharge disinfected secondary (fully treated) effluent to the Wellington South Coast coastal marine area (Cook Strait in the vicinity of the Karori Stream Mouth) via an existing outfall. The following outlines the conditions of this resource consent required for this report.

## WGN060283[25227]

In addition to the above resource consent, the discharge from the Western WWTP is governed by another resource consent under the Greater Wellington Regional Council consent file number WGN060283 [25227]. In general, the consent allows the occasional discharge of milli-screened (partially treated) effluent to the Wellington South Coast coastal marine area via an existing outfall during significant wet weather events. The following also outlines the conditions of this resource consent required for this report.

## WGN060283[35674]

In addition to the above two (2) resource consents, the discharge from the Western WWTP is governed by another resource consent under the Greater Wellington Regional Council consent file number WGN060283 [35674]. In general, the consent allows the occasional discharge of secondary treated and disinfected wastewater from the Western WWTP to Karori Stream during events when the stormwater tank is full and the flow to the plant exceeds 190L/s. The following also outlines the conditions of this resource consent required for this report.

## WGN060283[35675]

The fourth resource consent that governs the discharge from the Western WWTP is under the Greater Wellington Regional Council consent file number WGN060283 [35675]. In general, the consent allows for the occasional discharge of milli-screened and settled wastewater from the Western WWTP to Karori stream during events when the stormwater tank is full and the flow to the plant exceeds 390L/s. The following also outlines the conditions of this resource consent required for this report.

## WGN060283[25230]

The final resource consent that governs the discharge from the Western WWTP is under the Greater Wellington Regional Council consent file number WGN060283 [25230]. In general, the consent allows the discharge of contaminants to air from the operation of the Western WWTP. The following also outlines the conditions of this resource consent required for this report.

# WGN060283 [35255]

## Condition (2)

| |
|---|
| The rate of discharge shall not exceed 200 litres per second (L/s) or 17, 280 cubic metres per day ($m^3$/day). |

The limits from this condition have been added to WGN060283 [35255] Condition (6). The flow rates from have been reported in cubic meters per hour ($m^3$/hour). Therefore the limit has been converted to 720$m^3$/hour.

# Condition (5)

The permit holder shall establish a community liaison·group (CLG) which shall act as a forum for consultation and liaison with the community and be used as a vehicle to provide information regarding the Western Wastewater Treatment Plant. The permit holder shall invite persons with an interest in participating in the CLG from the following groups:

- representatives of local Tangata Whenua;
- neighbouring and downstream landowners;
- ., residents of South Karori Road;
- a representative from the Makara-Ohariu Community Board;
- a representative of the West Wellington Environmental Protection Society Inc;
- a representative of the permit holder; and
- a representative of the plant operator.

The permit holder may invite any other parties to attend.

A meeting of the CLG shall be held at least once every calendar year. Minutes of any CLG meetings held shall be forwarded to the Manager, Environmental Regulation, Wellington Regional Council and the permit holder shall report in writing to the Manager, Environmental Regulation, Wellington Regional Council, by 31 July each year on any consultation and activities undertaken with regard to the CLG. A copy of this report shall be forwarded to the CLG members.

Note: The permit holder shall not be in breach of this condition if, after taking all reasonable measures, and its best endeavours, it has not been possible to gain the requisite participation.

The Western WWTP community liaison group met on 11th September 2019 which also discussed the Karori Wastewater Network Improvement Programme.

A full set of minutes was circulated to the group.

# Condition (6)

The permit holder shall continuously monitor and record the flow rate and volume of treated wastewater entering the outfall pipeline and the flow rate and volume of the wastewater discharged to the South Coast to the satisfaction of the Wellington Regional Council. A summary of the records listing the daily discharge volumes and the minimum, average and maximum monthly volumes shall be forwarded to the Manager, Environmental Regulation, Wellington Regional Council at quarterly intervals in accordance with condition (19) of this permit.

Although the data requested in Condition (6) is not a requirement for the annual report, please find below a summary of the effluent flow from the treatment plant. The monthly average total daily discharge, average daily flow rate, minimum daily flow, and maximum daily flow.

| Month | Average Daily Flow | Minimum Daily Flow | Maximum Daily Flow | Average Total Daily Volume |
|---|---|---|---|---|
| | $m^3$/hour | $m^3$/hour | $m^3$/hour | $m^3$ |
| July 2019 | 269 | 165 | 240 | 6450 |
| August 2019 | 197 | 142 | 240 | 4720 |
| September 2019 | 156 | 113 | 240 | 3753 |
| October 2019 | 190 | 126 | 240 | 4558 |
| November 2019 | 177 | 116 | 240 | 4244 |
| December 2019 | 173 | 118 | 240 | 4142 |
| January 2020 | 125 | 106 | 240 | 3008 |
| February 2020 | 130 | 105 | 211 | 3116 |
| March 2020 | 167 | 135 | 135 | 4005 |
| April 2020 | 148 | 129 | 339 | 3434 |
| May 2020 | 217 | 143 | 435 | 5216 |
| June 2020 | 299 | 146 | 473 | 7176 |

Table 1: Monthly Treatment Plant Effluent Flow

Please note that the discharge limit specified in WGN060283 [35255], Condition (2) applies to the discharge from the effluent pipeline to the coastal marine area. It is not applicable to the discharge from the WWTP.

For all average daily, peak hourly and total daily flow rates for the WWTP effluent see Appendix i: Treatment Plant Effluent Flow Rate.

Although the data requested in Condition (6) is not a requirement for the annual report, please find below a summary of the effluent pipeline monthly average total daily discharge, average daily flow rate, minimum daily flow, and maximum daily flow.

| Month | Average Daily Flow | Minimum Daily Flow | Maximum Daily Flow | Average Total Daily Volume |
|---|---|---|---|---|
| | $m^3$/hour | $m^3$/hour | $m^3$/hour | $m^3$ |
| July 2019 | 224 | 160 | 142 | 5363 |
| August 2019 | 185 | 144 | 195 | 4436 |
| September 2019 | 180 | 156 | 123 | 4316 |
| October 2019 | 162 | 36 | 143 | 3887 |
| November 2019 | 191 | 108 | 143 | 4568 |
| December 2019 | 185 | 144 | 140 | 4441 |
| January 2020 | 138 | 34 | 468 | 3322 |
| February 2020 | 156 | 138 | 410 | 3751 |
| March 2020 | 167 | 135 | 486 | 4005 |
| April 2020 | 166 | 151 | 285 | 3992 |
| May 2020 | 169 | 67 | 282 | 3784 |
| June 2020 | 222 | 101 | 417 | 4355 |
| **Limit** | | **720** | | **17280** |

**Table 2: Monthly Effluent Pipeline Flow**

Please note that in June 2020, the total flow in the effluent pipeline flowmeter have no readings for several days due to severe weather conditions which did not allow the solar panel to charge the battery and the wind turbine had a loose connection to the battery. Immediate corrective action was not carried out due to health and safety risks.

Comparison between the treatment plant effluent and the effluent pipeline flow rates are difficult due to three reasons:

i) The distance between the two flow meters;
ii) The accuracy of each meter.
iii) The time when the totalizer resets.

Because of these differences, the values are similar but do not match. For all average daily, peak hourly and total daily flow rates for the effluent pipeline see Appendix i: Effluent Pipeline Flow Rate.

# Condition (10)

The wastewater discharged from the Western Wastewater Treatment Plant to the South Coast shall comply with the following effluent quality criteria:

(i) $BOD_5$

The geometric mean of 20 consecutive sampling results taken in any calendar month shall not exceed $20g/m^3$ and no more than two of those 20 sample results shall exceed $50g/m^3$.

(ii) Suspended solids

The geometric mean of 20 consecutive sampling results shall not exceed $30g/m^3$ and no more than two in any 20 consecutive sample results shall exceed $80g/m^3$.

(iii) Faecal Coliforms

The geometric mean of 20 consecutive sampling results taken in any calendar month shall not exceed 200 colony forming units per 100mL and no more than two of those 20 sample results shall exceed 2,000 colony forming units per 100 mL.

Compliance with the effluent quality criteria shall be determined from the results of wastewater monitoring undertaken in accordance with conditions (9) (a) and (9) (b) of this permit.

*Note: When the consent holder takes more than 20 samples during any calendar month, the geometric mean calculated for condition 10 must only be of the first 20 consecutive samples. All samples after the 20$^{th}$ sample in any calendar month shall be disregarded for the geometric mean calculation. All sample results are to be provided to Wellington Regional Council in the quarterly report required by condition 19.*

## Section (i)

Below is a summary of the geometric mean and percent compliance for the Biological Oxygen Demand.

| Date | Biological Oxygen Demand | |
|---|---|---|
| | Geometric Mean | %Compliance |
| | g/m$^3$ | % |
| 31 July 2019 | 3 | 100 |
| 31 August 2019 | 4 | 100 |
| 30 September 2019 | 5 | 100 |
| 31 October 2019 | 4 | 100 |
| 30 November 2019 | 6 | 100 |
| 31 December 2019 | 5 | 100 |
| 31 January 2020 | 5 | 100 |
| 28 February 2020 | 5 | 100 |
| 31 March 2020 | 9 | 100 |
| 30 April 2020 | 11 | 100 |
| 31 May 2020 | 18 | 75 |
| 30 June 2020 | 12 | 95 |
| **Limits** | **20** | **90** |

Table 3: Carbonaceous Biological Oxygen Demand Geometric Mean and % Compliance

For all daily Biological Oxygen Demand results please see Appendix i: Effluent Biological Oxygen Demand Results. The analytical results were in compliance for the 2019/2020 reporting period except for May 2020 wherein the facility had more than two samples greater than 50 g/m$^3$. An investigation report has been forwarded to GWRC regarding the non-compliance.

## Section (ii)

Below is a summary of the geometric mean and percent compliance for the Suspended Solids.

| Date | Suspended Solids | |
|---|---|---|
| | Geometric Mean | %Compliance |
| | g/m$^3$ | % |
| 31 July 2019 | 7 | 100 |
| 31 August 2019 | 7 | 100 |
| 30 September 2019 | 7 | 100 |
| 31 October 2019 | 7 | 100 |
| 30 November 2019 | 9 | 100 |
| 31 December 2019 | 7 | 100 |
| 31 January 2020 | 8 | 100 |
| 28 February 2020 | 7 | 100 |
| 31 March 2020 | 14 | 100 |
| 30 April 2020 | 12 | 100 |
| 31 May 2020 | 33 | 80 |
| 30 June 2020 | 22 | 85 |
| **Limits** | **30** | **90** |

Table 4: Suspended Solids Geometric Mean and %Compliance

For all daily effluent Suspended Solids results please see Appendix i: Suspended Solids Results. The analytical results were in compliance for the 2019/2020 reporting period except for May and June 2020 wherein the facility had more than two samples greater than 80 g/m$^3$ for the reporting period. GWRC had been informed via email last 22$^{nd}$ May and 6th July respectively for these exceedances. Veolia is taking necessary corrective measures to mitigate the noncompliance.

## Section (iii)

Below is a summary of the geometric mean and percent compliance for the Faecal Coliforms.

| Date | Faecal Coliforms | |
|---|---|---|
| | Geometric Mean | % Compliance |
| | g/m$^3$ | % |
| 31 July 2019 | 10 | 100 |
| 31 August 2019 | 18 | 100 |
| 30 September 2019 | 33 | 100 |
| 31 October 2019 | 29 | 100 |
| 30 November 2019 | 34 | 95 |
| 31 December 2019 | 8 | 95 |
| 31 January 2020 | 23 | 100 |
| 28 February 2020 | 41 | 100 |
| 31 March 2020 | 122 | 90 |
| 30 April 2020 | 27 | 100 |
| 31 May 2020 | 6 | 100 |
| 30 June 2020 | 3 | 100 |
| **Limits** | **200** | **90** |

Table 5: Faecal Coliforms Results, Geometric Mean, and % Compliance

For all daily effluent Faecal Coliform results please see Appendix i: Effluent Faecal Coliform Results. All analytical results were in compliance for the 2019/2020 reporting period.

# Condition (16)

The permit holder shall collect representative coastal water samples from knee deep water at the following locations, once each month for five months through November to March inclusive (the bathing season) each year, for the duration of this permit:

a) 1OOm SE of the outfall (map reference NZMS 260: R27; 504.835)
b) 200m SE of the outfall (map reference NZMS 260: R27; 504.834)
c) The Karori Stream, above the tidal influence
d) 1OOm NW of the mouth of the Karori Stream

Sampling shall be undertaken during dry, settled weather where practicable. Each of the water samples shall be analysed for faecal coliform and enterococci bacteria (cfu/100ml). The time of the sample collection, together with the weather and tidal conditions, observations of the sea state, stream colour and location of stream mouth (if at all) shall be recorded and reported with the analytical results.

Water samples taken during the months of January to March inclusive, shall also be analysed for the following parameters:

| | |
|---|---|
| Ammoniacal nitrogen | $g/m^3$ |
| Nitrite nitrogen | $g/m^3$ |
| Nitrate nitrogen | $g/m^3$ |
| Dissolved reactive phosphorus | $g/m^3$ |

The permit holder shall provide the results to the Manager, Environmental Regulation, Regional Council, by 30 April each year (as part of the quarterly report required by condition (19) of this permit), or on request.

Following is a summary of the analytical results for the November to March monthly coastal water samples.

| Date | Karori Stream above Tidal Influence | | | | | | | | | 100m North West of Karori Stream Mouth | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Enterococci | Faecal Coliforms | Ammoniacal Nitrogen | Nitrite Nitrogen | Nitrate Nitrogen | Dissolved Reactive Phosphorus | Colour of Stream | Location of Stream Mouth | Weather | Enterococci | Faecal Coliforms | Ammoniacal Nitrogen | Nitrite Nitrogen | Nitrate Nitrogen | Dissolved Reactive Phosphorus | Sea Conditions | Tide | Weather |
| dd/mm/ yyyy | 100cfu/mL | 100cfu/mL | $g/m^3$ | $g/m^3$ | $g/m^3$ | $g/m^3$ | -- | -- | -- | 100cfu/mL | 100cfu/mL | $g/m^3$ | $g/m^3$ | $g/m^3$ | $g/m^3$ | -- | -- | -- |
| **29/11/2019** | 4 | 50 | N/A | N/A | N/A | N/A | Clear | Alongside Outfall | Clear | 4 | 4 | N/A | N/A | N/A | N/A | Calm | Low | Clear |
| **31/12/2019** | 12 | 64 | N/A | N/A | N/A | N/A | Brown | Alongside Outfall | Clear | 4 | 4 | N/A | N/A | N/A | N/A | Calm | High | Clear |
| **31/01/2020** | 12 | 76 | 0.01 | 0.29 | 0.01 | 0.022 | Brown | Alongside Outfall | Overcast | 12 | 12 | 0.01 | 0.10 | 0.10 | 0.014 | Calm | Half | Overcast |
| **26/02/2020** | 8 | 88 | 0.49 | 0.01 | 0.49 | 0.026 | Clear | Alongside Outfall | Clear | 4 | 4 | 0.16 | 0.10 | 0.16 | 0.022 | Calm | Half | Clear |
| **12/3/2020** | 60 | 96 | 0.01 | 1.00 | 0.10 | 0.018 | Ebb | High | Cool | 4 | 4 | 0.01 | 1.00 | 0.01 | 0.02 | Ebb | High | Cool |

| Date | 100m South East of Western Outfall | | | | | | | | | 200m South East of Western Outfall | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Enterococci | Faecal Coliforms | Ammoniacal Nitrogen | Nitrite Nitrogen | Nitrate Nitrogen | Dissolved Reactive Phosphorus | Sea Conditions | Tide | Weather | Enterococci | Faecal Coliforms | Ammoniacal Nitrogen | Nitrite Nitrogen | Nitrate Nitrogen | Dissolved Reactive Phosphorus | Sea Conditions | Tide | Weather |
| dd/mm/yyyy | 100cfu/mL | 100cfu/mL | g/m³ | g/m³ | g/m³ | g/m³ | -- | -- | -- | 100cfu/mL | 100cfu/mL | g/m³ | g/m³ | g/m³ | g/m³ | -- | -- | -- |
| **29/11/2019** | 4 | 4 | N/A | N/A | N/A | N/A | Calm | Low | Clear | 4 | 4 | N/A | N/A | N/A | N/A | Calm | Low | Clear |
| **31/12/2019** | 4 | 4 | N/A | N/A | N/A | N/A | Calm | High | Clear | 4 | 4 | N/A | N/A | N/A | N/A | Calm | High | Clear |
| **31/01/2020** | 4 | 4 | 0.01 | 0.10 | 0.10 | 0.014 | Calm | Half | Overcast | 8 | 4 | 0.01 | 0.10 | 0.10 | 0.016 | Calm | Half | Overcast |
| **26/02/2020** | 4 | 4 | 0.10 | 0.10 | 0.10 | 0.02 | Calm | Half | Clear | 4 | 4 | 0.10 | 0.10 | 0.10 | 0.018 | Calm | Half | Clear |
| **12/3/2020** | 8 | 4 | 0.01 | 1.00 | 0.10 | 0.015 | Ebb | High | Cool | 8 | 28 | 0.01 | 1.00 | 0.10 | 0.018 | Ebb | High | Cool |

**Table 6: Quarterly Effluent Sample Results**

Please note that bathing beach guidelines were used to generate the colouring for the Enterococci samples. Because there are no bathing beach guidelines for faecal coliforms, fresh water guidelines were applied. The following are the limits for both bacterial species:

| Bacteria Species | Amber Limit | Red Limit |
|---|---|---|
| | cfu/100mL | cfu/100mL |
| Enterococci | 140 | 280 |
| Faecal Coliforms | 260 | 550 |

All data for the 2019/2020 reporting year was compliant.

# Condition (20)

The permit holder shall provide to the Manager, Environmental Regulation, Wellington Regional Council an Annual Assessment and Analysis Report for the period 1 July to 30 June by 31 July each year summarising compliance with the conditions of this permit. This report shall include, but not be limited to the following:

a) A summary of all monitoring undertaken in accordance with the conditions of this permit and a critical analysis of the information in terms of compliance and adverse environmental effects;
b) A comparison of data with previously collected data in order to identify any emerging trends;
c) Comments on compliance with the conditions of this permit;
d) Any reasons for non-compliance or difficulties in achieving compliance with the conditions of this permit;
e) Any measures that have been undertaken to improve the environmental performance of the wastewater treatment and disposal system;
f) Any other issues considered to be important;

## Section (a)

All monitoring performed at the Western WWTP has been provided in the previous sections of this report under the designated resource consent conditions. The following is a summary of the monitoring parameters, the resource consent condition the data is listed under, the monitoring frequency, the limits for each parameter, and compliance with the resource consent:

| Monitoring Parameter | WGN060283[35255] Condition | Monitoring Frequency | Limits | Compliance |
|---|---|---|---|---|
| WWTP Effluent Flow Rate | (6) | Daily | 200L/s<br>17,280$m^3$/day | Compliant |
| Biological Oxygen Demand | (10)(i) | 20 samples/month | Geometric Mean < 20g/$m^3$<br>No more than two samples < 50g/$m^3$ | 11 out of 12 months Compliant |
| Suspended Solids | (10)(ii) | 20 samples/month | Geometric Mean < 30g/$m^3$<br>No more than two samples < 80g/$m^3$ | 10 out of 12 months Compliant |
| Faecal Coliforms | (10)(iii) | 20 samples/month | Geometric Mean < 200cfu/100mL<br>95th Percentile < 2000cfu/100mL | Compliant |
| Enterococci | (16) | Monthly (November – March) | N/A | Compliant |
| Faecal Coliforms | | Monthly (November – March) | N/A | Compliant |
| Ammoniacal nitrogen | | Monthly (January – March) | N/A | Compliant |
| Nitrite nitrogen | | Monthly (January – March) | N/A | Compliant |
| Nitrate nitrogen | | Monthly (January – March) | N/A | Compliant |
| Dissolved reactive phosphorus | | Monthly (January – March) | N/A | Compliant |

**Table 7: Summary of Continuous Discharge Monitoring Undertaken at Western WWTP**

Please see the listed sections for the summary. Note that the geometric mean and percent compliance calculation are performed on the first 20 samples for each month as of the 2nd September 2015.

Statistical analysis was performed on the data from each monitoring parameter. The following is a summary of the analysis performed on the daily effluent flow data:

| Month | WWTP Effluent Flow Rate | | |
|---|---|---|---|
| | Average | Minimum | Maximum |
| | $m^3/hr$ | $m^3/hr$ | $m^3/hr$ |
| July 2019 | 269 | 165 | 240 |
| August 2019 | 197 | 142 | 240 |
| September 2019 | 156 | 113 | 240 |
| October 2019 | 190 | 126 | 240 |
| November 2019 | 177 | 116 | 240 |
| December 2019 | 173 | 118 | 240 |
| January 2020 | 125 | 106 | 240 |
| February 2020 | 130 | 105 | 211 |
| March 2020 | 150 | 110 | 192 |
| April 2020 | 148 | 129 | 339 |
| May 2020 | 217 | 143 | 435 |
| June 2020 | 299 | 146 | 473 |

Table 8: Total Daily Plant Effluent Flow Month Average, Minimum, and Maximum

| Month | Effluent Pipeline Flow Rate | | |
|---|---|---|---|
| | Average | Minimum | Maximum |
| | $m^3/hr$ | $m^3/hr$ | $m^3/hr$ |
| July 2019 | 224 | 160 | 142 |
| August 2019 | 185 | 144 | 195 |
| September 2019 | 180 | 156 | 123 |
| October 2019 | 162 | 36 | 143 |
| November 2019 | 191 | 108 | 143 |
| December 2019 | 185 | 144 | 140 |
| January 2020 | 138 | 34 | 468 |
| February 2020 | 156 | 138 | 410 |
| March 2020 | 167 | 135 | 486 |
| April 2020 | 166 | 151 | 285 |
| May 2020 | 169 | 67 | 282 |
| June 2020 | 222 | 101 | 417 |
| **Limit** | **720** | | |

Table 9: Total Daily Effluent Pipeline Flow Month Average, Minimum, and Maximum

Comparison between the treatment plant effluent and the effluent pipeline flow rates are difficult due to three reasons:

i) The distance between the two flow meters;
ii) The accuracy of each meter; and
iii) The time when the totalizer resets.

Because of these differences, the values do not match. Instead of comparing the numerical values, a comparison of the flow trends should be used to determine if there are any issues.

The following is a summary of the monthly geometric mean and percent compliance for Effluent BOD5, Suspended Solids, and Faecal Coliform results:

| Parameters | Units | Limits | Average | Minimum | Maximum |
|---|---|---|---|---|---|
| **$BOD_5$ Geometric Mean** | **g/ $m^3$** | **20** | 7 | 3 | 18 |
| **SS Geometric Mean** | **g/ $m^3$** | **30** | 12 | 7 | 33 |
| **FC Geometric Mean** | **cfu/100mL** | **200** | 30 | 3 | 122 |

| Parameters | Units | Minimum Requirement | Average | Minimum | Maximum |
|---|---|---|---|---|---|
| **$BOD_5$ %Compliance** | **%** | **90** | 98 | 75 | 100 |
| **SS %Compliance** | **%** | **90** | 97 | 80 | 100 |
| **FC %Compliance** | **%** | **90** | 98 | 90 | 100 |

**Table 10: Analysis of $BOD_5$, Suspended Solids, Faecal Coliform Compliance Results**

As shown in the tables above, the monthly geometric mean values for Effluent BOD and faecal coliform are below the consent limits while the effluent suspended solids have exceeded the limit during FY2019/2020. Percent compliance for effluent BOD5 and suspended solids also failed to be maintained within the minimum requirement of 90% compliance in FY2019/2020. The non-compliances can be attributed to the challenges experienced by the plant in the last quarter of FY2019/2020. Effluent Faecal coliform has maintained the effluent percent compliance requirement this reporting period.

The following is a summary of the results from the coastal monitoring program performed during the months of November to March for FY2019/2020:

| Parameters | Units | Karori Stream above Tidal Influence | | | 100m North West of Karori Stream Mouth | | | 100m South East of Western Outfall | | | 200m South East of Western Outfall | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Average | Minimum | Maximum | Average | Minimum | Maximum | Average | Minimum | Maximum | Average | Minimum | Maximum |
| Enterococci | **cfu/100mL** | 19.2 | 4 | 60 | 6.00 | 4.00 | 12.00 | 4.80 | 4.00 | 8.00 | 5.60 | 4.00 | 8.00 |
| Faecal Coliforms | **cfu/100mL** | 74.8 | 50 | 0.01 | 6.00 | 4.00 | 12.00 | 4.00 | 4.00 | 4.00 | 8.80 | 4.00 | 28.00 |
| Ammoniacal Nitrogen | **g/ $m^3$** | 0.17 | 0.01 | 0.49 | 0.06 | 0.01 | 0.16 | 0.04 | 0.01 | 0.10 | 0.04 | 0.01 | 0.10 |
| Nitrite Nitrogen | **g/ $m^3$** | 0.43 | 0.01 | 1 | 0.40 | 0.10 | 1.00 | 0.40 | 0.10 | 1.00 | 0.40 | 0.10 | 1.00 |
| Nitrate Nitrogen | **g/ $m^3$** | 0.2 | 0.01 | 0.49 | 0.09 | 0.01 | 0.16 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| Dissolved Reactive Phosphorus | **g/ $m^3$** | 0.02 | 0.02 | 0.03 | 0.02 | 0.01 | 0.02 | 0.02 | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 |

Table 11: Coastal Monitoring

From the above tables, the monitoring parameters do not vary throughout the year results are low.

## Section (b)

A comparison of data was made between 2019/2020 reporting period and the previous four (4) years. The following section summarises that comparison.

The following is a comparison of the monthly average total daily effluent flow rate between the previous and current reporting period:

| Month | Final Effluent Total Daily Flow ($m^3$) | | | | |
|---|---|---|---|---|---|
| | 2015/2016 | 2016/2017 | 2017/2018 | 2018/2019 | 2019/2020 |
| July | 5125 | 4185 | 5986 | 6342 | 5363 |
| August | 3917 | 5234 | 5451 | 4941 | 4436 |
| September | 4303 | 5304 | 4848 | 4824 | 4316 |
| October | 2683 | 5267 | 4045 | 3824 | 3887 |
| November | 2750 | 7546 | 3322 | 4768 | 4568 |
| December | 2582 | 4091 | 2894 | 3805 | 4441 |
| January | 3241 | 3530 | 3049 | 3053 | 3322 |
| February | 3396 | 3952 | 3944 | 2991 | 3751 |
| March | 3469 | 3876 | 4798 | 3446 | 4005 |
| April | 3189 | 5655 | 4897 | 5379 | 3992 |
| May | 4265 | 4282 | 5405 | 3968 | 3784 |
| June | 4814 | 4780 | 7273 | 4947 | 4355 |
| **Limit** | **17280** | | | | |

Table 12: Final Effluent Pipeline Monthly Average Total Daily Flow

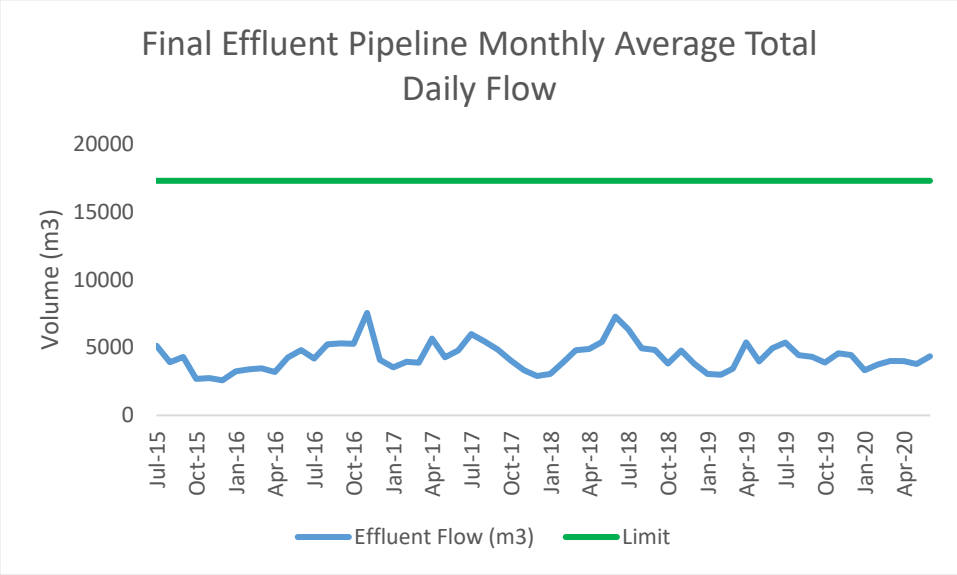


Chart 1: Final Effluent Pipeline Monthly Average Total Daily Flow

The total daily flows are similar over the 5 year period. There is a trend of the total daily effluent flow decreases between the months of November to March. This trend coincides with the summer months which have less rainfall than the winter months.

The following is a comparison of the effluent BOD monthly geometric mean between the previous 4 years and the current reporting period:

| Reporting Period | $cBOD_5$ Geometric Mean ($g/m^3$) | | | | |
|---|---|---|---|---|---|
| | 2015/ 2016 | 2016/ 2017 | 2017/ 2018 | 2018/ 2019 | 2019/ 2020 |
| July | 9 | 8 | 3 | 3 | 3.0 |
| August | 9 | 6 | 6 | 4 | 3.9 |
| September | 9 | 5 | 8 | 6 | 5.0 |
| October | 9 | 4 | 11 | 10 | 4.0 |
| November | 4 | 4 | 9 | 8 | 5.7 |
| December | 5 | 4 | 5 | 9 | 5.4 |
| January | 7 | 5 | 4 | 7 | 5.0 |
| February | 8 | 4 | 10 | 6 | 4.7 |
| March | 8 | 5 | 9 | 5 | 9.0 |
| April | 5 | 4 | 7 | 5 | 11 |
| May | 4 | 6 | 4 | 5 | 18 |
| June | 4 | 6 | 3 | 3 | 12 |
| Limit | 20 | | | | |

Table 13: Final Effluent $BOD_5$ Geometric Mean

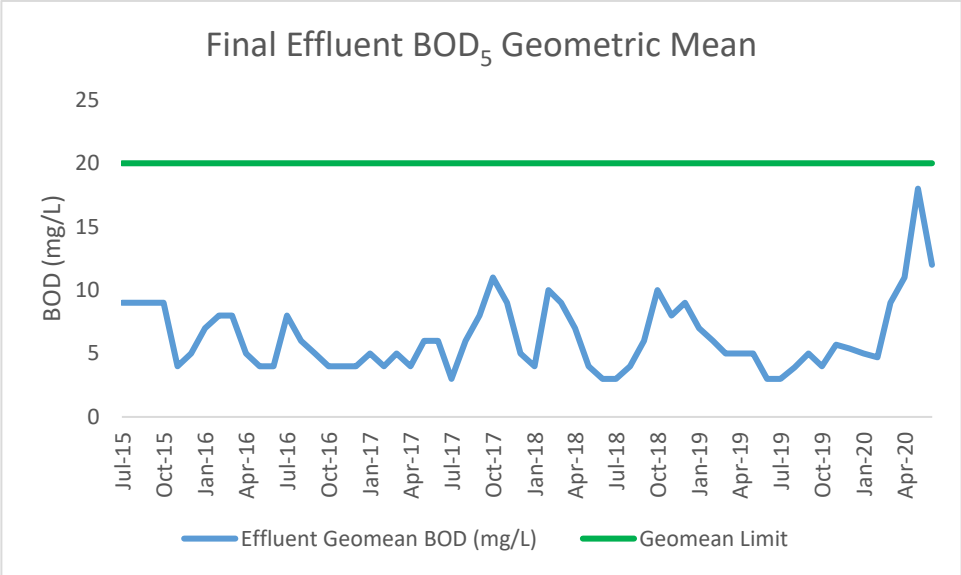


Chart 2: Final Effluent $BOD_5$ Geometric Mean

The $BOD_5$ results are below the 20 $g/m^3$ geometric mean limit for the five year period which signifies the stability of the process. There were some spikes in May 2020 results that made the geometric mean approach the limit. Ninety percent of the monthly geometric mean values in the five year period are below the 9.1 $g/m^3$

The following is a comparison of the effluent suspended solids monthly geometric mean between the previous 4 years and the current reporting period:

| Reporting Period | SS Geometric Mean (g/m$^3$) | | | | |
|---|---|---|---|---|---|
| | 2015/ 2016 | 2016/ 2017 | 2017/ 2018 | 2018/ 2019 | 2019/ 2020 |
| July | 10 | 9 | 6 | 7 | 7.0 |
| August | 11 | 7 | 6 | 6 | 7.0 |
| September | 9 | 7 | 10 | 9 | 6.5 |
| October | 14 | 7 | 9 | 12 | 7 |
| November | 7 | 6 | 14 | 12 | 9 |
| December | 7 | 7 | 11 | 12 | 7.4 |
| January | 11 | 7 | 8 | 16 | 8.0 |
| February | 8 | 7 | 8 | 10 | 6.8 |
| March | 8 | 8 | 17 | 8 | 13.7 |
| April | 7 | 6 | 17 | 8 | 12 |
| May | 7 | 7 | 9 | 8 | 33 |
| June | 8 | 7 | 8 | 7 | 22 |
| Limit | 30 | | | | |

Table 14: Final Effluent Suspended Solids Geometric Mean

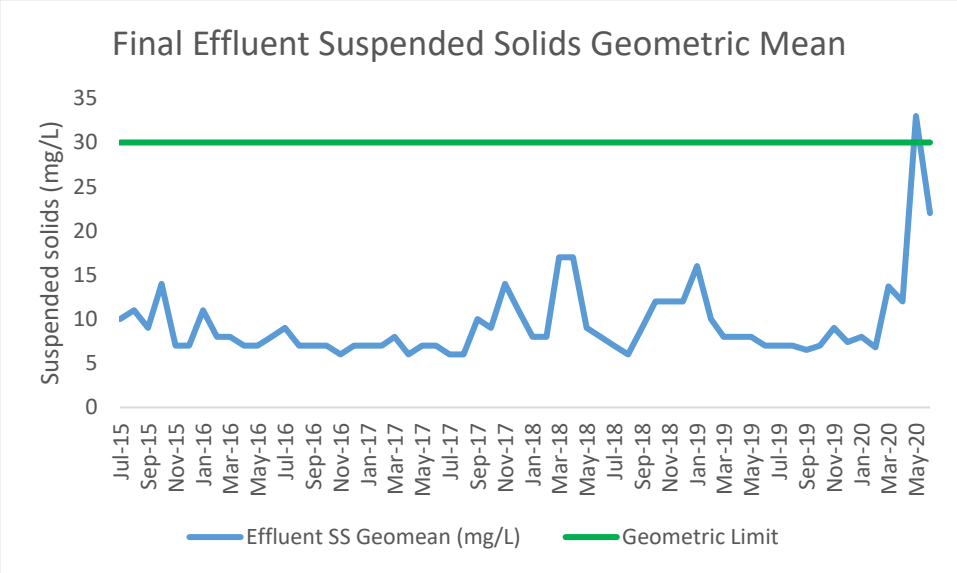


Chart 3: Final Effluent Suspended Solids Geometric Mean

The suspended solids results are below the 30 g/m$^3$ geometric mean limit for the five year period which signifies the stability of the process. There were some spikes in May 2020 results that made the geometric mean go beyond the limit. Ninety percent of the monthly geometric mean values are below 14 g/m$^3$.

The following is a comparison of the effluent faecal coliform monthly geometric mean between the previous 4 years and the current reporting period:

| Reporting Period | FC Geometric Mean ($g/m^3$) | | | | |
|---|---|---|---|---|---|
| | 2015/ 2016 | 2016/ 2017 | 2017/ 2018 | 2018/ 2019 | 2019/ 2020 |
| July | 13 | 17 | 7 | 10 | 10 |
| August | 40 | 10 | 5 | 9 | 18 |
| September | 32 | 9 | 10 | 8 | 33 |
| October | 56 | 8 | 11 | 31 | 29 |
| November | 35 | 8 | 85 | 26 | 34 |
| December | 45 | 9 | 37 | 29 | 8 |
| January | 44 | 7 | 14 | 44 | 23 |
| February | 64 | 11 | 76 | 20 | 41 |
| March | 34 | 11 | 23 | 9 | 122 |
| April | 41 | 21 | 19 | 10 | 27 |
| May | 7 | 14 | 15 | 4 | 6 |
| June | 11 | 13 | 7 | 11 | 3 |
| Limit | 200 | | | | |

Table 15: Final Effluent Faecal Coliforms Geometric Mean

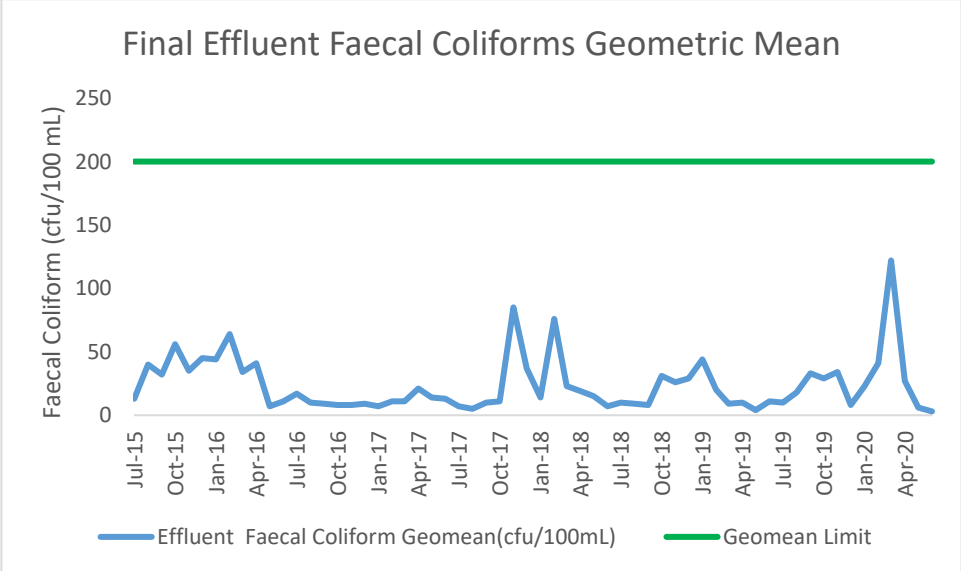


Chart 4: Final Effluent Faecal Coliforms Geometric Mean

The faecal coliform results are below the 2000 $g/m^3$ geometric mean limit for the five year period which signifies the stability of the process. Ninety percent of the monthly geometric mean values are below 44.1 $g/m^3$.

The following is a comparison of the monthly coastal waters samples between the previous and current reporting period:

| Parameter | Units | Karori Stream above Tidal Influence | | | | | 100m North West of Karori Stream Mouth | | | | | 100m South East of Western Outfall | | | | | 200m South East of Western Outfall | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2015/ 2016 | 2016/ 2017 | 2017/ 2018 | 2018/ 2019 | 2019/ 2020 | 2015/ 2016 | 2016/ 2017 | 2017/ 2018 | 2018/ 2019 | 2019/ 2020 | 2015/ 2016 | 2016/ 2017 | 2017/ 2018 | 2018/ 2019 | 2019/ 2020 | 2015/ 2016 | 2016/ 2017 | 2017/ 2018 | 2018/ 2019 | 2019/ 2020 |
| Enterococci | **cfu/100mL** | 22 | 6 | 501 | 48 | 19.2 | 6 | 5 | 23 | 8 | 5.6 | 4 | 6 | 12 | 4 | 4.8 | 4 | 4 | 23 | 40 | 5.6 |
| Faecal Coliforms | **cfu/100mL** | 28 | 15 | 294 | 134 | 74.8 | 4 | 7 | 10 | 10 | 5.6 | 4 | 4 | 7 | 4 | 4 | 4 | 4 | 30 | 13 | 8.8 |
| Ammoniacal Nitrogen | **g/ $m^3$** | 0.010 | 0.690 | 0.010 | 0.015 | 0.17 | 0.013 | 0.760 | 0.010 | 0.010 | 0.06 | 0.027 | 0.890 | 0.020 | 0.017 | 0.04 | 0.030 | 0.790 | 0.020 | 0.020 | 0.04 |
| Nitrite Nitrogen | **g/ $m^3$** | 0.010 | 0.010 | 0.010 | 0.010 | 0.4333 | 0.400 | 0.040 | 0.100 | 0.100 | 0.4 | 0.400 | 0.010 | 0.100 | 0.100 | 0.4 | 0.400 | 0.030 | 0.100 | 0.100 | 0.4 |
| Nitrate Nitrogen | **g/ $m^3$** | 0.2700 | 0.0100 | 0.7200 | 0.4500 | 0.2 | 0.0967 | 0.0800 | 0.1300 | 0.1300 | 0.09 | 0.1000 | 0.0830 | 0.0700 | 0.1000 | 0.1 | 0.0967 | 0.0800 | 0.0900 | 0.1000 | 0.1 |
| Dissolved Reactive Phosphorus | **g/ $m^3$** | 0.0280 | 0.0390 | 0.0300 | 0.0310 | 0.022 | 0.0500 | 0.0320 | 0.0200 | 0.0200 | 0.0187 | 0.0500 | 0.0240 | 0.0200 | 0.0240 | 0.0163 | 0.0500 | 0.0250 | 0.0200 | 0.0320 | 0.0173 |

Table 16: Coastal Monitoring

The results were consistent throughout the 5 year period.

## Section (c)

As noted in WGN060283 [35255], Condition (20) Section (a), Table 6 the facility had received a noncompliance rating for condition 10 due to effluent quality breaches in May and June 2020. Corrective actions is currently progressing to address the issue.

## Section (d)

The non-compliance in condition 10 of the permit in May 2020 and June 2020 can be attributed to the unusual circumstances (i.e. COVID19 pandemic and unusually longer wet weather events) which made the performance management of the facility quite challenging. Wellington Water and Veolia are currently progressing with corrective measures to address this compliance issues.

## Section (e)

Inflow and infiltration issues also affected the performance of the plant during wet weather events. The progress in the inflow and infiltration reduction program can be checked appendix IV. Wellington Water and Veolia currently reviews the operation of the treatment plant to ensure the continuous improvement of its environmental performance.

## Section (f)

Wellington Water clarified with GWRC regarding the interpretation of WGN060283 [35255] condition 10 and 11 last May 2020. The following actions have been agreed upon:

- The assessment of compliance to condition 10 needs to be assessed in accordance to condition wording regardless of the compliance assessment in the past. This would result to omission of the 95$^{th}$ percentile assessment in the effluent quality compliance.
- In condition 11, exceedance of the geometric mean limit will trigger the notification to GWRC.

## Condition (23)

The permit holder shall submit an annual report for the main outfall pipeline, which addresses activities undertaken during the previous year, to the Manager, Environmental Regulation, Wellington Regional Council and members of the CLG, by 31 July each year.

This report shall include, but not be limited to, the following elements:

a) details of the location, extent and duration of any leakage or faults, and the timing, nature and success of remedial action taken to remedy the leaks or faults;
b) details of any other works (including any repairs and replacements) undertaken during the past year; and
c) any work planned in the next 12 months to repair or replace the pipeline.

A report regarding the main outfall pipeline can be found in Appendix iii: Western Treatment Plant: Annual Outfall Pipeline Report_2019 -2020.

## Condition (25)

The permit holder shall collect representative water samples from the Karori Stream at the following locations, once every fortnight for the duration of this permit:

a) Karori Stream at Friend Street (map reference NZMS 260: R27; 554.901)
b) Karori Stream at Campbell Street (map reference NZMS 260: R27; 554.900)
c) Karori Stream at South Karori Road (map reference NZMS 260: R27; 540.880)
d) Karori Stream approximately 100 metres upstream of the Western Treatment Plant (map reference NZMS 260: R27; 523.872)
e) Karori Stream 100 metres approximately downstream of the Western Treatment Plant (map reference NZMS 260: R27; 523.871)

The water samples shall be analysed for faecal coliforms (cfu/100mL). The time of the sample collection, together with the weather conditions shall be recorded and reported with the analytical results.
The permit holder shall provide the results of this monitoring to the Manager, Environmental Regulation, Wellington Regional Council, quarterly, in accordance with the requirements of condition (19) of this permit, or on request.

The Karori Stream monitoring records can be found in Appendix v of this report.

# WGN060283 [25227]

## Condition (2)

| |
|---|
| This permit shall only be exercised when the sewage inflow to the treatment plant exceeds 190 litres per second (L/s), and the 1000 $m^3$ storage tank is full. |

There were eight bypass events that occurred in the 2019/2020 reporting year. These events had an influent flow rate to the Western WWTP greater than 190L/s and the 1000$m^3$ storage tank was full. This resource consent can be applied.

## Condition (5)

The permit holder shall monitor and record the time, flow rate, duration and total volume of the bypass discharges into the coastal marine area, and shall report the results to the Manager, Environmental Regulation, Wellington Regional Council, within 10 working days of the overflow event occurring.

The permit holder shall maintain an incident log containing the details of each bypass discharge and make it available to the public or the Manager, Environmental Regulation, Wellington Regional Council upon request.

The following is a summary of the bypass events from the Western WWTP for the 2019/2020 reporting period:

| Date | Date of Notification | Duration | Average Bypass Flow | Max Bypass Flow Rate | Total Volume of Bypass | Consented | Cause |
|---|---|---|---|---|---|---|---|
| dd mmm yyyy | dd mmm yyyy | hrs/mins | L/s | L/s | $m^3$ | Y/N | -- |
| 04 Jul 2019 | 04 Jul 2019 | 01hr 18m | 23 | 43 | 108 | Y | Storm Event |
| 17 Aug 2019 | 17 Aug 2019 | 00hr 59m | 11 | 20 | 39 | Y | Storm Event |
| 11 Nov 2019 | 11 Nov 2019 | 04hr 5m | 0.5 | 11.5 | 30 | Y | Storm Event |
| 29 Mar 2020 | 29 Mar 2020 | 05hr 48m | 107 | 237 | 2,182 | Y | Storm Event |
| 06 May 2020 | 06 May 2020 | 01hr 57m | 24 | 53 | 172 | Y | Storm Event |
| 05 Jun 2020 | 05 Jun 2020 | 04hr 40m | 34 | 34 | 573 | Y | Storm Event |
| 18 Jun 2020 | 18 Jun 2020 | 32hr 48m | 144 | 238 | 16,988 | Y | Storm Event |
| 20 Jun 2020 | 20 Jun 2020 | 19hr 00m | 13 | 34 | 952 | Y | Storm Event |

Table 17: Coastal Marine Bypass Events from 2019/2020 Reporting Period

# Condition (6)

The permit holder shall submit to the Manager, Environmental Regulation, Wellington Regional Council the amount of rainfall recorded in each hour at Karori Reservoir rain-gauge for each of the 7 days preceding each overflow event in the annual report required by condition (10) of this permit.

The bypass events occurred on several days during the reporting period. The following tables are of the hourly rainfall rate for the seven days prior to the overflow events. All rainfall data is obtained from the GWRC Hilltop system. The original rain gauge used was Karori Stream at Duthie Street. This site was decommissioned in 2019. The current rain gauge used is Karori Sream at Samuel Marsden School.

| Time | Rainfall (mm) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 27/6/2019 | 28/6/2019 | 29/6/2019 | 30/6/2019 | 1/7/2019 | 2/7/2019 | 3/7/2019 |
| 00:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 01:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 02:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 03:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 04:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 05:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 06:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 07:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 08:00 | 0.2 | 0 | 0 | 0 | 0 | 0 | 0 |
| 09:00 | 0 | 0.2 | 0 | 0 | 0 | 0 | 0 |
| 10:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 13:00 | 0 | 0 | 0 | 0 | 0 | 0 | 1.2 |
| 14:00 | 0 | 0 | 0 | 0 | 0 | 0 | 2.1 |
| 15:00 | 0 | 0 | 0 | 0 | 0 | 0 | 2.3 |
| 16:00 | 0 | 0 | 0 | 0 | 0 | 0 | 1.6 |
| 17:00 | 0 | 0 | 0 | 0 | 0 | 0 | 2.5 |
| 18:00 | 0 | 0 | 0 | 0 | 0 | 0 | 6.3 |
| 19:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0.4 |
| 20:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0.8 |
| 21:00 | 0 | 0 | 0 | 0 | 0 | 0 | 2.4 |
| 22:00 | 0 | 0 | 0 | 0 | 0 | 0 | 6.3 |
| 23:00 | 0 | 0 | 0 | 0 | 0 | 0 | 9.9 |

Table 18: Rainfall Data for 7 Days Prior to 04/07/2019 Bypass Event

| Time | Rainfall (mm) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 10/8/2019 | 11/8/2019 | 12/8/2019 | 13/8/2019 | 14/8/2019 | 15/8/2019 | 16/8/2019 |
| 00:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0.6 |
| 01:00 | 0 | 0 | 0 | 0 | 0 | 0 | 1.4 |
| 02:00 | 0 | 0 | 0 | 0 | 0 | 0 | 1.2 |
| 03:00 | 0 | 0 | 0 | 0 | 0.2 | 0 | 2.9 |
| 04:00 | 0 | 0 | 0 | 0 | 0.4 | 0 | 3.7 |
| 05:00 | 0 | 0 | 0 | 0 | 0 | 0 | 5.3 |
| 06:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0.3 |
| 07:00 | 0 | 0 | 1 | 0 | 0 | 0 | 0.2 |
| 08:00 | 0 | 0 | 1.2 | 0 | 2.6 | 0 | 1.6 |
| 09:00 | 0 | 0 | 0 | 0 | 14.2 | 0 | 3.4 |
| 10:00 | 0 | 0 | 0 | 0 | 8.3 | 0 | 1.4 |
| 11:00 | 0 | 0 | 0 | 0 | 2.1 | 0 | 0 |
| 12:00 | 0.8 | 0 | 0 | 0 | 0 | 0 | 0 |
| 13:00 | 0 | 0 | 0 | 0 | 0.2 | 0 | 0 |
| 14:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0.2 |
| 15:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 16:00 | 0 | 0 | 0.6 | 0 | 0 | 0 | 0 |
| 17:00 | 0 | 0 | 1.4 | 0 | 0 | 0 | 0 |
| 18:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 19:00 | 0.657 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20:00 | 0.343 | 0 | 0 | 0 | 0 | 0 | 0 |
| 21:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 22:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 23:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**Table 19: Rainfall Data for 7 Days Prior to 17/08/2019 Bypass Event**

| Time | Rainfall (mm) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 5/11/2019 | 6/11/2019 | 7/11/2019 | 8/11/2019 | 9/11/2019 | 10/11/2019 | 11/11/2019 |
| 00:00 | 0 | 0 | 0 | 0 | 0 | 0.2 | 8.4 |
| 01:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0.2 |
| 02:00 | 0 | 0 | 0 | 0 | 0 | 0 | 1.7 |
| 03:00 | 0 | 0 | 0 | 0 | 0 | 0 | 3.5 |
| 04:00 | 0 | 0 | 0 | 0 | 0 | 0 | 10.2 |
| 05:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0.4 |
| 06:00 | 0 | 0 | 0 | 0 | 0 | 0 | 3.4 |
| 07:00 | 0 | 0 | 0 | 0 | 0 | 0.8 | 1.2 |
| 08:00 | 0 | 0 | 0 | 0 | 0 | 0.8 | 1.9 |
| 09:00 | 0 | 0 | 0 | 0 | 0 | 9.6 | 1.9 |
| 10:00 | 0 | 0 | 0 | 0 | 0 | 0.4 | 4.9 |
| 11:00 | 0 | 0 | 0 | 0 | 5.0 | 4.5 | 3.5 |
| 12:00 | 0 | 0 | 0 | 0 | 0.95 | 1.1 | 1.3 |
| 13:00 | 0 | 0 | 0 | 0 | 0 | 3.3 | 0.6 |
| 14:00 | 0 | 0 | 0 | 0 | 0 | 0.1 | 0 |
| 15:00 | 0 | 0 | 0.2 | 0 | 0 | 0.2 | 0 |
| 16:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 17:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 18:00 | 0 | 0 | 0 | 0 | 0 | 0.6 | 0 |
| 19:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 21:00 | 0 | 0 | 0 | 0 | 0 | 0.2 | 0 |
| 22:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 23:00 | 0 | 0 | 0 | 0 | 0 | 11.2 | 0 |

**Table 20: Rainfall Data for 7 Days Prior to 11/11/2019 Bypass Event**

| Time | Rainfall (mm) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 22/03/2020 | 23/03/2020 | 24/03/2020 | 25/03/2020 | 26/03/2020 | 27/03/2020 | 28/32020 |
| 00:00 | 0 | 0 | 5.9 | 0 | 0 | 0 | 3.4 |
| 01:00 | 0 | 0 | 1.9 | 0 | 0 | 0 | 2.8 |
| 02:00 | 0.2 | 0 | 0 | 0 | 0 | 0 | 1.2 |
| 03:00 | 0.8 | 0 | 0.2 | 0 | 0 | 0 | 1.4 |
| 04:00 | 1.188 | 0 | 1.0 | 0 | 0 | 1.5 | 1.4 |
| 05:00 | 0.412 | 0 | 1.0 | 0 | 0 | 3.3 | 2.9 |
| 06:00 | 0 | 0 | 0.4 | 0 | 0 | 1.8 | 1.9 |
| 07:00 | 0 | 0 | 0 | 0 | 0 | 0.2 | 0.4 |
| 08:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 09:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0.2 |
| 10:00 | 0 | 0 | 0 | 0 | 0 | 0 | 1.0 |
| 11:00 | 0 | 0 | 0 | 0 | 0 | 0 | 2.6 |
| 12:00 | 0 | 0 | 0 | 0 | 0 | 0 | 3.3 |
| 13:00 | 0 | 0 | 0 | 0 | 0 | 0 | 3.2 |
| 14:00 | 0 | 0 | 0 | 0 | 0 | 0 | 1.1 |
| 15:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0.4 |
| 16:00 | 0 | 0 | 0 | 0 | 0 | 0.2 | 0 |
| 17:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 18:00 | 0 | 0 | 0 | 0 | 0 | 2.6 | 0 |
| 19:00 | 0 | 0 | 0 | 0 | 0 | 2.1 | 0 |
| 20:00 | 0 | 0 | 0 | 0 | 0 | 5.8 | 0 |
| 21:00 | 0 | 0.2 | 0 | 0 | 0 | 4.7 | 0.2 |
| 22:00 | 0 | 0 | 0 | 0 | 0 | 2.3 | 0 |
| 23:00 | 0 | 1 | 0 | 0 | 0 | 6.5 | 0.7 |

**Table 21: Rainfall Data for 7 Days Prior to 29/03/2020 Bypass Event**

| Time | Rainfall (mm) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 29/04/2020 | 30/04/2020 | 1/05/2020 | 2/05/2020 | 3/05/2020 | 4/05/2020 | 5/5/2020 |
| 00:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 01:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 02:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 03:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 04:00 | 0 | 0 | 0 | 0 | 0 | 0 | 3.6 |
| 05:00 | 0 | 0 | 0 | 0 | 0.2 | 3.8 | 0.2 |
| 06:00 | 0 | 0 | 0 | 0 | 0.8 | 2.8 | 0.6 |
| 07:00 | 0 | 0 | 0 | 0 | 0.2 | 1.445 | 0.4 |
| 08:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0.6 |
| 09:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0.2 |
| 10:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0.2 |
| 11:00 | 0 | 0 | 0 | 0 | 0 | 0 | 1.2 |
| 12:00 | 0 | 0 | 0 | 0 | 6.0 | 0 | 0 |
| 13:00 | 0 | 0 | 0 | 0 | 0.6 | 0 | 0.4 |
| 14:00 | 0 | 0.2 | 0 | 0 | 0 | 0 | 4.4 |
| 15:00 | 0 | 0 | 0 | 0 | 0.8 | 0 | 8.5 |
| 16:00 | 0 | 0 | 0 | 0 | 4.2 | 0 | 6.9 |
| 17:00 | 0 | 0 | 0 | 0 | 20.5 | 0 | 5.4 |
| 18:00 | 0 | 0 | 0 | 0 | 9.5 | 0.2 | 0.2 |
| 19:00 | 0 | 0 | 0 | 0 | 0.6 | 0 | 0.2 |
| 20:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0.2 |
| 21:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 22:00 | 0 | 0 | 0 | 0 | 0 | 0.2 | 0.2 |
| 23:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0.2 |

**Table 22: Rainfall Data for 7 Days Prior to 06/05/2020 Bypass Event**

| Time | Rainfall (mm) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 29/05/2020 | 30/05/2020 | 31/05/2020 | 1/06/2020 | 2/06/2020 | 3/06/2020 | 4/6/2020 |
| 00:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 01:00 | 0 | 0 | 0 | 0 | 0 | 0 | 2.5 |
| 02:00 | 0 | 0 | 0 | 0 | 0 | 0 | 1.5 |
| 03:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 04:00 | 0 | 0 | 0 | 0 | 0.2 | 0 | 0 |
| 05:00 | 0 | 0 | 0 | 0 | 0.4 | 0 | 0 |
| 06:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0.2 |
| 07:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 08:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 09:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12:00 | 0 | 0 | 0 | 0 | 0.2 | 0 | 1.8 |
| 13:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0.2 |
| 14:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 15:00 | 0 | 0 | 0.2 | 0 | 0 | 0 | 0 |
| 16:00 | 0 | 0 | 0 | 0.6 | 0 | 0 | 2 |
| 17:00 | 0 | 0 | 0 | 1.2 | 0 | 0 | 2.8 |
| 18:00 | 0 | 0 | 0 | 1.3 | 0 | 0 | 2.2 |
| 19:00 | 0.2 | 0 | 0 | 2.1 | 0 | 0 | 1.8 |
| 20:00 | 2.6 | 0 | 0 | 0.2 | 0 | 0 | 3.2 |
| 21:00 | 2.0 | 0 | 0 | 0.2 | 0 | 0.6 | 9.0 |
| 22:00 | 0 | 0 | 0 | 0 | 0 | 0 | 7.0 |
| 23:00 | 0 | 0 | 0 | 0 | 0 | 0 | 2.2 |

**Table 23: Rainfall Data for 7 Days Prior to 05/06/2020 Bypass Event**

| Time | Rainfall (mm) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 11/06/2020 | 12/06/2020 | 13/06/2020 | 14/06/2020 | 15/06/2020 | 16/06/2020 | 17/6/2020 |
| 00:00 | 0 | 0 | 0 | 0 | 0 | 0.2 | 2.2 |
| 01:00 | 0 | 0 | 0 | 0 | 0 | 0.2 | 2.4 |
| 02:00 | 0 | 0 | 0 | 0 | 0 | 0 | 1.4 |
| 03:00 | 0 | 0 | 0 | 0 | 0 | 0.6 | 0.8 |
| 04:00 | 0 | 0 | 0 | 0 | 0 | 0.2 | 1.4 |
| 05:00 | 0 | 0 | 0 | 0 | 0 | 0 | 1.0 |
| 06:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0.4 |
| 07:00 | 0 | 0 | 0 | 0 | 0 | 0.2 | 0.4 |
| 08:00 | 0 | 0 | 0 | 0 | 0 | 2.2 | 0 |
| 09:00 | 0 | 0 | 0 | 0 | 0.6 | 3.0 | 0 |
| 10:00 | 0 | 0 | 0 | 0 | 0.2 | 4.0 | 0 |
| 11:00 | 0 | 0 | 0 | 0 | 0 | 0.8 | 0 |
| 12:00 | 0 | 0.2 | 0 | 0 | 0 | 0 | 0 |
| 13:00 | 0 | 0 | 0 | 0 | 0.2 | 0 | 0 |
| 14:00 | 0 | 0 | 0 | 0 | 0.6 | 0.2 | 0 |
| 15:00 | 0.2 | 0 | 0 | 0 | 0.9 | 0.2 | 0.2 |
| 16:00 | 0 | 0 | 0 | 0 | 0 | 0 | 1.1 |
| 17:00 | 0 | 0 | 0 | 0 | 0 | 0 | 0.9 |
| 18:00 | 0 | 0 | 0 | 0 | 0 | 0 | 2.8 |
| 19:00 | 0 | 0 | 0 | 0 | 0 | 0.2 | 1 |
| 20:00 | 0 | 0 | 0 | 0 | 0 | 0.2 | 1.0 |
| 21:00 | 0 | 0 | 0 | 0 | 0 | 0 | 1.0 |
| 22:00 | 0 | 0 | 0 | 0 | 0 | 0.6 | 1.2 |
| 23:00 | 0 | 0 | 0 | 0 | 0.2 | 0.6 | 1.2 |

**Table 24: Rainfall Data for 7 Days Prior to 18/06/2020 Bypass Event**

| Time | Rainfall (mm) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 13/06/2020 | 14/06/2020 | 15/06/2020 | 16/06/2020 | 17/06/2020 | 18/06/2020 | 19/6/2020 |
| 00:00 | 0 | 0 | 0 | 0.2 | 2.2 | 6.2 | 1.5 |
| 01:00 | 0 | 0 | 0 | 0.2 | 2.4 | 2.2 | 1.8 |
| 02:00 | 0 | 0 | 0 | 0 | 1.4 | 1.6 | 2.0 |
| 03:00 | 0 | 0 | 0 | 0.6 | 0.8 | 2.3 | 5.2 |
| 04:00 | 0 | 0 | 0 | 0.2 | 1.4 | 2.6 | 3.4 |
| 05:00 | 0 | 0 | 0 | 0 | 1.02 | 1.6 | 0.2 |
| 06:00 | 0 | 0 | 0 | 0 | 0.4 | 3.9 | 1.8 |
| 07:00 | 0 | 0 | 0 | 0.2 | 0.4 | 5.2 | 1.6 |
| 08:00 | 0 | 0 | 0 | 2.2 | 0 | 4.1 | 0.4 |
| 09:00 | 0 | 0 | 0.6 | 3.0 | 0 | 3.8 | 0.4 |
| 10:00 | 0 | 0 | 0.2 | 4.0 | 0 | 5.4 | 0.6 |
| 11:00 | 0 | 0 | 0 | 0.8 | 0 | 3.0 | 0.4 |
| 12:00 | 0 | 0 | 0 | 0 | 0 | 3.5 | 0 |
| 13:00 | 0 | 0 | 0.2 | 0 | 0 | 1.1 | 0.4 |
| 14:00 | 0 | 0 | 0.6 | 0.2 | 0 | 1.0 | 0 |
| 15:00 | 0 | 0 | 0.9 | 0.2 | 0.2 | 0.4 | 0 |
| 16:00 | 0 | 0 | 1.9 | 0 | 1.1 | 1.8 | 0.4 |
| 17:00 | 0 | 0 | 0.4 | 0 | 0.9 | 2.8 | 0.2 |
| 18:00 | 0 | 0 | 0 | 0 | 2.8 | 2.4 | 0.2 |
| 19:00 | 0 | 0 | 0 | 0.2 | 1 | 2.3 | 0.2 |
| 20:00 | 0 | 0 | 0 | 0.2 | 1.0 | 2.5 | 0.2 |
| 21:00 | 0 | 0 | 0 | 0 | 1.0 | 4.0 | 0.2 |
| 22:00 | 0 | 0 | 0 | 0.6 | 1.2 | 5.6 | 0.2 |
| 23:00 | 0 | 0 | 0.2 | 0.6 | 1.2 | 4.1 | 0.4 |

**Table 25: Rainfall Data for 7 Days Prior to 20/06/2020 Bypass Event**

# Condition (7)

The permit holder shall take one representative grab sample of the settled, milli-screened effluent prior to its entry into the coastal outfall pipe every time the discharge authorised by this permit has occurred for more than two hours. Each sample shall be analysed for the following parameters:

| | |
|---|---|
| pH | |
| Suspended solids | $g/m^3$ |
| Total 8005 | $g/m^3$ |
| Faecal coliform | cfu/100mL |
| bacteria oils/grease | $g/m^3$ |

The results of the monitoring shall be forwarded to the Manager, Environmental Regulation, Wellington Regional Council within 10 working days of the bypass discharge occurring.

Five bypass events exceeded the two (2) hour limit specified in this condition. Therefore, samples were required. Below is a summary of the results obtained from the sample analysis:

| Date | pH | Suspended Solids | Total BOD5 | Faecal Coliform Bacteria | Oils/Grease |
|---|---|---|---|---|---|
| | -- | $g/m^3$ | $g/m^3$ | cfu/100mL | $g/m^3$ |
| 11/11/2019 | 7.3 | 22 | 15 | 181,000 | 4 |
| 29/03/2020 | 6.7 | 27 | 18 | 590,000 | 9.3 |
| 5/06/2020 | 7 | 22 | 14 | 380,000 | 10 |
| 18/06/2020 | 7 | 160 | 30 | 790,000 | 19 |
| 21/06/2020 | 7 | 104 | 14 | 640,000 | 7 |

Table 26: Bypass Sample Analysis

The analytical data sheets for these samples can be found in the quarterly reports.

# Condition (8)

When a bypass discharge occurs that lasts for longer than 10 hours the permit holder shall collect two sets of representative water samples from knee deep water at the following locations:

a) 100m SE of the outfall (map reference NZMS 260: R27; 504.835)
b) 200m SE of the outfall (map reference NZMS 260: R27; 504.834)
c) The Karori Stream, above the tidal influence
d) 100m NW of the mouth of the Karori Stream

The first set of samples shall be taken within 24 hours of the discharge commencing and the second set of samples shall be taken 12- 48 hours after the discharge has ceased.

These samples shall only be taken provided that safe vehicular access is available and weather conditions allow for safe access to the sample locations.

The water samples shall be analysed for enterococci bacteria (cfu/100ml). The time of the sample collection, together with the weather and tidal conditions shall be recorded and reported with the analytical results.

The results of the monitoring shall be forwarded to the Manager, Environmental Regulation, Wellington Regional Council within 10 working days of the bypass discharge occurring.

2 bypass events exceeded the 10 hour limit stated in this condition. The results from the shoreline monitoring can be found below:

| Date | Enterococci | | | |
|---|---|---|---|---|
| | 100m SE of Outfall | 200m SE of Outfall | The Karori Stream, Above Tidal Influence | 100m NW of the Mouth of Karori Stream |
| dd/mm/yyyy | cfu/100mL | cfu/100mL | cfu/100mL | cfu/100mL |
| 19/06/2020 | 490 | 290 | 2400 | N/A |
| 21/06/2020 | 11 | 3.3 | 96 | N/A |
| 24/06/2020 | 31 | 9.8 | 100 | 1.6 |

Table 27: Shoreline Monitoring

Please note that the sample from 100 NW of the mouth of the Karori Stream could not be sampled due to health and safety concerns on the 19th and 21st of June. The sampler could not cross the stream to collect sample.

# Condition (12)

The permit holder shall provide the Manager, Environmental Regulation, Wellington Regional Council with an annual report detailing what steps have and will be taken to reduce infiltration and stormwater ingress into the Karori sewerage network.

The report shall be submitted to the Manager, Environmental Regulation, Wellington Regional Council by 31 July each year and shall include, but not be limited to, the following information:

a) Details of works that have been undertaken and what these works are expected to achieve;
b) An indication of when any ongoing works will be completed;
c) Details of any investigations undertaken with regard to inflow and infiltration in the Karori catchment; and
d) Details of any works or investigations planned for the next financial year.

Note: One annual inflow and infiltration report may be submitted to the Manager, Environmental Regulation, Wellington Regional Council to meet the requirements in this regard of permits WGN060283 [25226], [25227], [35674] and [25229].

An annual inflow and infiltration report can be found in Appendix iv.

# Condition (13)

The permit holder shall keep a record of any complaints that are received. The record shall contain the following details, where practicable:

a) Name and address of the complainant;
b) Identification of the nature of the complaint;
c) Date and time of the complaint and of the alleged event;
d) Weather conditions at the time of the complaint; and
e) Any measures taken to address the cause of the complaint.

The permit holder shall notify the Manager, Environmental Regulation, Wellington Regional Council of any complaints relating to the exercise of this permit, within twenty-four hours of being received by the permit holder or the next working day.

The permit holder shall forward to the Manager, Environmental Regulation, Wellington Regional Council a copy of any complaints recorded in the annual report required by condition (10) of this permit.

There were no complaints during the 2019/2020 reporting period.

# WGN060283 [35674]

## Condition (2)

| |
|---|
| This permit shall only be exercised when the sewage inflow to the treatment plant exceeds 190 litres per second (L/s), and the 1000 $m^3$ storage tank is full. |

There were seven bypass events that occurred in the 2019/2020 reporting year. These events had an influent flow rate to the Western WWTP greater than 190L/s and the 1000$m^3$ storage tank was full. This resource consent can be applied.

# Condition (6)

The permit holder shall monitor and record the time, flow rate, duration and total volume of the overflow discharges into the Karori Stream, and shall report the results to the Manager, Environmental Regulation, Wellington Regional Council, within 10 working days of the overflow event occurring.

The permit holder shall maintain an incident log containing the details of each overflow discharge and make it available to the public or the Manager, Environmental Regulation, Wellington Regional Council upon request.

The following is a summary of the bypass events from the Western WWTP for the 2019/2020 reporting period:

| Date | Date of Notification | Duration | Average Flow to Stream Rate | Maximum Flow Rate to Stream | Total Volume of Bypass to Stream | Consented | Cause |
|---|---|---|---|---|---|---|---|
| dd mmm yyyy | dd mmm yyyy | hrs/mins | L/s | L/s | $m^3$ | Y/N | -- |
| 4/07/2019 | 4/07/2019 | 01hr 14m | 3 | 5 | 14 | Y | Storm event. |
| 17/08/2019 | 17/08/2019 | 00hr 32m | 1 | 2 | 2 | Y | Storm event. |
| 29/03/2020 | 29/03/2020 | 05hr 02m | 28 | 69 | 557 | Y | Storm event. |
| 6/05/2020 | 6/05/2020 | 01hr 57m | 5 | 10 | 32 | Y | storm event |
| 5/06/2020 | 5/06/2020 | 04hr 20m | 5 | 5 | 92 | Y | storm event |
| 18/06/2020 | 18/06/2020 | 32hr 48m | 37 | 67 | 4,343 | Y | Storm event. |
| 20/06/2020 | 20/06/2020 | 19hr 00m | 2 | 5 | 11,221 | Y | Storm Event |

Table 28: Karori Stream Bypass Events from 2019/2020 Reporting Period

# Condition (7)

| |
|---|
| The permit holder shall submit to the Manager, Environmental Regulation, Wellington Regional Council the amount of rainfall recorded in each hour at Karori Reservoir rain-gauge for each of the 7 days preceding each overflow event in the annual report required by condition (11) of this permit. |

For all rainfall data please refer to WGN080003 [25227] Condition (6).

# Condition (8)

After an overflow discharge has occurred for more than 2 hours, the permit holder shall collect a representative grab sample of the treated effluent, prior to its entry into Karori Stream. All samples shall be analysed for the following parameters:

| | |
|---|---|
| Suspended solids | $g/m^3$ |
| Ammoniacal nitrogen | $g/m^3$ |
| Total $BOD_5$ | $g/m^3$ |
| Faecal coliform | cfu/100mL |

The results of the monitoring shall be forwarded to the Manager, Environmental Regulation, Wellington Regional Council within 10 working days of the bypass discharge occurring.

4 events during the 2019/2020 reporting year exceeded the two (2) hour limit stated in this condition. Therefore, these samples were required. Below is a summary of the analytical results from the samples:

| Date | Suspended Solids | Ammoniacal Nitrogen | $BOD_5$ | Faecal Coliforms |
|---|---|---|---|---|
| | $g/m^3$ | $g/m^3$ | $g/m^3$ | cfu/100mL |
| 29/03/2020 | 16 | 1 | 6 | 13 |
| 5/06/2020 | 26 | 1 | 23 | 100 |
| 18/06/2020 | 3 | 4 | 3 | 4700 |
| 21/06/2020 | 11 | 1 | 10 | 400 |

Table 29: Western WWTP Treated Effluent Sample Results

The analytical data sheet can be found in the quarterly reports.

# Condition (9)

After an overflow discharge has occurred for more than 24 hours, the permit holder shall collect two representative grab samples from the Karori Stream, one from upstream of the discharge point and one no more than 100 metres downstream of the discharge point. This sampling shall be repeated at daily intervals thereafter for the duration of the discharge. A final set of samples shall be taken two hours after the discharge has ceased, or as soon as is practicable thereafter.

All samples shall be analysed for the following parameters:

| | |
|---|---|
| Suspended solids | $g/m^3$ |
| Ammoniacal nitrogen | $g/m^3$ |
| Total $BOD_5$ | $g/m^3$ |
| Faecal coliform | cfu/100mL |

The results of the monitoring shall be forwarded to the Manager, Environmental Regulation, Wellington Regional Council within 10 working days of the bypass discharge occurring.

Note: No monitoring shall be required during the hours of darkness, or when conditions are too dangerous for the safe procurement of samples.

Please note that sample required 100 metres downstream have not been taken due to health and safety concerns.

There have been 1 bypass event that exceeded a 24 hour period. Below is a summary of the analytical results from the samples:

| Date | Suspended Solids | Ammoniacal Nitrogen | $BOD_5$ | Faecal Coliforms |
|---|---|---|---|---|
| | $g/m^3$ | $g/m^3$ | $g/m^3$ | cfu/100mL |
| 18/06/2020 | 210 | 0.019 | 14 | 4500 |
| 21/06/2020 | 10 | 0.0075 | 0.5 | 1100 |

Table 22: Karori Stream Sample Results

# Condition (15)

The permit holder shall provide the Manager, Environmental Regulation, Wellington Regional Council and the members of the Community Liaison Group with an annual report detailing what steps have and will be taken to reduce infiltration and stormwater ingress into the Karori sewerage network.

The report shall be submitted to the Manager, Environmental Regulation, Wellington Regional Council by 31 July each year and shall include, but not be limited to, the following information:

a) Details of works that have been undertaken and what these works are expected to achieve;
b) An indication of when any ongoing works will be complete;
c) Details of any investigations undertaken with regard to inflow and infiltration in the Karori catchment; and
d) Details of any works or investigations planned for the next financial year.

Note: One annual inflow and infiltration report may be submitted to the Manager, Environmental Regulation, Wellington Regional Council to meet the requirements in this regard of permits WGN060283 [25227]-[25229).

An annual inflow and infiltration report can be found in Appendix iv.

# Condition (16)

The permit holder shall keep a record of any complaints that are received. The record shall contain the following details, where practicable:

f) Name and address of the complainant;
g) Identification of the nature of the complaint;
h) Date and time of the complaint and of the alleged event;
i) Weather conditions at the time of the complaint; and
j) Any measures taken to address the cause of the complaint.

The permit holder shall notify the Manager, Environmental Regulation, Wellington Regional Council of any complaints relating to the exercise of this permit, within twenty-four hours of being received by the permit holder or the next working day.

The permit holder shall forward to the Manager, Environmental Regulation, Wellington Regional Council a copy of any complaints recorded in the annual report required by condition (10) of this permit.

There were no complaints during the 2019/2020 reporting period.

# WGN 060283 [35675]

## Condition (2)

This consent shall only be exercised when the sewage inflow to the treatment plant exceeds 390 litres per second (L/s), and the 1000 $m^3$ storage tank is full.

## Condition (5)

The permit holder shall monitor and record the time, flow rate, duration and total volume of the bypass overflow discharges into the Karori Stream, and shall report the results to the Manager, Environmental Regulation, Wellington Regional Council, within 10 working days of the overflow event occurring. The permit holder shall maintain an incident log containing the details of each bypass overflow discharge and make it available to the public or the Manager, Environmental Regulation, Wellington Regional Council, upon request.

There have been one bypass event this FY2019/2020. The details are the following:

| Date | Duration | Average Influent Flow Rate | Maximum Influent Flow Rate | Average Bypass Flowrate | Total Volume of Bypass | Consented | Cause |
|---|---|---|---|---|---|---|---|
| dd/mm/yyyy | hrs/mins | L/s | L/s | L/s | $m^3$ | Y/N | -- |
| 18/06/2020 | N/A | 344 | 450 | N/A | N/A | Y | Wet weather in the catchment area. |

Table 24: Bypass Event Details

# Condition (6)

The permit holder shall submit to the Manager, Environmental Regulation, Wellington Regional Council the amount of rainfall recorded at the Karori Reservoir rain-gauge in each hour for each of the 7 days preceding each bypass overflow event in the annual report required by condition (9) of this permit.

Rainfall data can be found in WGN060283 [25227] Condition 6 of this report.

# Condition (7)

The permit holder shall take one representative grab sample of the settled, milli-screened effluent prior to its entry into the Karori Stream every time the discharge authorised by this permit has occurred for more than one hour. Each sample shall be analysed for the following parameters:
pH
Suspended solids g/m3
Total BOD5 g/m3
Faecal coliform bacteria cfu/100ml
Oils/grease g/m3
The results of the monitoring shall be forwarded to the Manager, Environmental Regulation, Wellington Regional Council within 10 working days of the bypass discharge occurring.

| Date | pH | Suspended Solids | Total BOD5 | Faecal Coliform Bacteria | Oils/Grease |
|---|---|---|---|---|---|
| | -- | $g/m^3$ | $g/m^3$ | cfu/100mL | $g/m^3$ |
| 18/06/2020 | 7 | 160 | 30 | 790,000 | 19 |

Table 32: Partially Treated Effluent Sample Results

# WGN060283 [25230]

## Condition (3)

The permit holder shall monitor air quality in the vicinity of the plant to confirm the absence of faecal coliforms and salmonella originating from the plant. Sampling is to be carried out at least once every six months.

The sampling method and locations are to be agreed with the Wellington Regional Council within three months of the granting of this permit.

Should the presence of faecal coliforms or salmonella be measured at any time, the Wellington Regional Council may direct that the permit holder sample at least once every month for six months before returning to the six monthly sampling regime.

The results shall be provided annually to Wellington Regional Council as part of the annual report required by condition 8 of this permit.

Ambient Microbe Monitoring was performed at the Western WWTP. The following table is a summary of the air quality monitoring in the vicinity of the WWTP:

| Location | Faecal Coliforms | | Total Coliforms | | Salmonella | |
|---|---|---|---|---|---|---|
| | 8/08/2019 | 15/04/2020 | 8/08/2019 | 15/04/2020 | 8/08/2019 | 15/04/2020 |
| Site 1 | Absent | Absent | Absent | Absent | Absent | Absent |
| Site 2 | Absent | Absent | Absent | Absent | Absent | Absent |
| Site 3 | Absent | Absent | Absent | Absent | Absent | Absent |

Table 33:Semi-Annual Air Quality Monitoring

The full reports can be found in the quarterly reports for October – December 2019 and April – June 2020.

# Condition (4)

The permit holder shall undertake a comprehensive assessment of the quality of the biofilter media on an annual basis (or more frequently if appropriate).

The results of this assessment, including a summary of the findings, details of any action(s) to be taken to improve the efficiency of the biofilter, and a timetable for those actions to be undertaken, shall be submitted to the Manager, Environmental Regulation, Wellington Regional Council within one month of the assessment being undertaken.

Actions to be undertaken may include, but are not limited to:

a) Turning, restructuring and dampening of the bed material,
b) the addition of supplementary bed material, or
c) total bed material replacement.

The first assessment shall be undertaken within three months of the granting of this permit. Subsequent assessments shall be undertaken annually thereafter.

The biofilter monitoring report was performed on November 2019. The report can be found in Appendix ii: Biofilter Monitoring Report.

# Condition (5)

The permit holder shall monitor the following parameters at the frequency noted:

a) Weekly visual observations of the state of the biofilter bed, particularly for short circuiting and clogging of the bed;
b) weekly monitoring of pressure drop across the biofilter bed;
c) weekly monitoring of biofilter bed moisture content; and
d) monthly monitoring of biofilter bed pH.

The frequency of (b), (c), and (d) can be altered by agreement in writing by the Manager, Environmental Regulation, Wellington Regional Council.
Monitoring results shall be recorded and be made available to Wellington Regional Council upon request. Information shall be forwarded annually to Wellington Regional Council as part of the annual report required by condition 8 of this permit.

A full summary of the biofilter monitoring can be found in Appendix ii: Biofilter Monitoring

# Condition (10)

The permit holder shall keep a permanent record of any complaints received alleging adverse effects from the permit holder's operations. The complaints record shall contain the following where practicable:

a) the name and address of the complainant, if supplied;

b) identification of the nature of the complaint;

c) date and time of the complaint and alleged event;

d) weather conditions at the time of the alleged event;

e) results of the permit holder's investigations; and

n any mitigation measures adopted.

The permit holder shall notify the Manager, Environmental Regulation, Wellington Regional Council of any complaints relating to the exercise of this permit, within twenty-four hours of being received by the permit holder or the next working day.

The permit holder shall forward to the Manager, Environmental Regulation, Wellington Regional Council a copy of any complaints recorded in the annual report required by condition (8) of this permit.

There were no complaints during the 2019/2020 reporting period.

# Appendix i:

## Effluent Biological Oxygen Demand Results

| Day | $BOD_{5T}$ | | | $BOD_{5T}$ | | | $BOD_{5T}$ | | |
|---|---|---|---|---|---|---|---|---|---|
| | July 2019 | | | Aug 2019 | | | Sept 2019 | | |
| | Results | 20 Day Geometric Mean | 20 Day % Compliance | Results | 20 Day Geometric Mean | 20 Day % Compliance | Results | 20 Day Geometric Mean | 20 Day % Compliance |
| | $g/m^3$ | $g/m^3$ | % | $g/m^3$ | $g/m^3$ | % | $g/m^3$ | $g/m^3$ | % |
| 1 | 3.0 | | | 4.0 | | | 7.0 | | |
| 2 | 4.0 | | | | | | 6.0 | | |
| 3 | 6.0 | | | | | | 6.0 | | |
| 4 | 3.0 | | | 5.0 | | | 5.0 | | |
| 5 | | | | 5.0 | | | 5.0 | | |
| 6 | | | | 4.0 | | | | | |
| 7 | 3.0 | | | 5.0 | | | | | |
| 8 | 3.0 | | | 7.0 | | | 5.0 | | |
| 9 | 3.0 | | | | | | 6.0 | | |
| 10 | 3.0 | | | | | | 4.0 | | |
| 11 | 3.0 | | | 5.0 | | | 5.0 | | |
| 12 | | | | 4.0 | | | 6.0 | | |
| 13 | | | | 3.0 | | | | | |
| 14 | 5.0 | | | 3.0 | | | | | |
| 15 | 3.0 | | | 4.0 | | | 5.0 | | |
| 16 | 3.0 | | | | | | 4.0 | | |
| 17 | 3.0 | | | | | | 5.0 | | |
| 18 | 3.0 | | | 5.0 | | | 4.0 | | |
| 19 | 3.0 | | | 3.0 | | | 5.0 | | |
| 20 | 3.0 | | | 4.0 | | | 3.0 | | |
| 21 | 3.0 | | | 6.0 | | | 3.0 | | |
| 22 | 3.0 | | | 3.0 | | | 5.0 | | |
| 23 | 3.0 | | | 3.0 | | | 5.0 | | |
| 24 | 3.0 | | | 4.0 | | | 5.0 | | |
| 25 | 4.0 | | | 5.0 | | | 5.0 | | |
| 26 | | | | 4.0 | | | 5.0 | | |
| 27 | | | | 4.0 | | | | | |
| 28 | 4.0 | | | 4.0 | | | | | |
| 29 | 4.0 | | | 5.0 | | | 4.0 | | |
| 30 | 3.0 | | | | | | 3.0 | | |
| 31 | 4.0 | 3.0 | 100 | | 3.9 | 100 | | 5.0 | 100 |
| **Limits** | **N/A** | **20** | **90** | **N/A** | **20** | **90** | **N/A** | **20** | **90** |

Please note that analytical results highlighted in amber are above the $20g/m^3$ geometric mean limit. Analytical results highlighted in red are above the $50g/m^3$ percent compliance limit.

| Day | $BOD_{5T}$ | | | $BOD_{5T}$ | | | $BOD_{5T}$ | | |
|---|---|---|---|---|---|---|---|---|---|
| | Oct 2019 | | | Nov 2019 | | | Dec 2019 | | |
| | Results | 20 Day Geometric Mean | 20 Day % Compliance | Results | 20 Day Geometric Mean | 20 Day % Compliance | Results | 20 Day Geometric Mean | 20 Day % Compliance |
| | $g/m^3$ | $g/m^3$ | % | $g/m^3$ | $g/m^3$ | % | $g/m^3$ | $g/m^3$ | % |
| 1 | 3.0 | | | | | | 6.0 | | |
| 2 | 3.0 | | | | | | 5.0 | | |
| 3 | 3.0 | | | 6.0 | | | 5.0 | | |
| 4 | | | | 5.0 | | | 5.0 | | |
| 5 | | | | 4.0 | | | 6.0 | | |
| 6 | 3.0 | | | 4.0 | | | | | |
| 7 | 3.0 | | | 7.0 | | | | | |
| 8 | 4.0 | | | | | | 7.0 | | |
| 9 | 3.0 | | | | | | 5.0 | | |
| 10 | 6.0 | | | 14.0 | | | 5.0 | | |
| 11 | | | | 4.0 | | | 5.0 | | |
| 12 | | | | 7.0 | | | 5.0 | | |
| 13 | 5.0 | | | 13.0 | | | 5.0 | | |
| 14 | 4.0 | | | 16.0 | | | 6.0 | | |
| 15 | 3.0 | | | | | | 6.0 | | |
| 16 | 3.0 | | | | | | 9.0 | | |
| 17 | 4.0 | | | 7.0 | | | 13.0 | | |
| 18 | 6.0 | | | 5.0 | | | 5.0 | | |
| 19 | 3.0 | | | 15.0 | | | 4.0 | | |
| 20 | 3.0 | | | 7.0 | | | | | |
| 21 | 3.0 | | | 5.0 | | | | | |
| 22 | 5.0 | | | 3.0 | | | 10.0 | | |
| 23 | 4.0 | | | 5.0 | | | 6.0 | | |
| 24 | 3.0 | | | 5.0 | | | | | |
| 25 | | | | 4.0 | | | | | |
| 26 | | | | 5.0 | | | 6.0 | | |
| 27 | | | | 5.0 | | | | | |
| 28 | 3.0 | | | 5.0 | | | | | |
| 29 | 3.0 | | | | | | 7.0 | | |
| 30 | 4.0 | | | | | | 5.0 | | |
| 31 | 5.0 | 4.0 | 100 | | 5.7 | 100 | | 5.4 | 100 |
| **Limits** | **N/A** | **20** | **90** | **N/A** | **20** | **90** | **N/A** | **20** | **90** |

Please note that analytical results highlighted in amber are above the $20g/m^3$ geometric mean limit. Analytical results highlighted in red are above the $50g/m^3$ percent compliance limit.

| Day | $BOD_{5T}$ | | | $BOD_{5T}$ | | | $BOD_{5T}$ | | |
|---|---|---|---|---|---|---|---|---|---|
| | Jan 2020 | | | Feb 2020 | | | Mar 2020 | | |
| | Results | 20 Day Geometric Mean | 20 Day % Compliance | Results | 20 Day Geometric Mean | 20 Day % Compliance | Results | 20 Day Geometric Mean | 20 Day % Compliance |
| | $g/m^3$ | $g/m^3$ | % | $g/m^3$ | $g/m^3$ | % | $g/m^3$ | $g/m^3$ | % |
| 1 | | | | | | | 8.0 | | |
| 2 | 4.0 | | | 7.0 | | | 9.0 | | |
| 3 | | | | 6.0 | | | 9.0 | | |
| 4 | | | | 5.0 | | | 7.0 | | |
| 5 | 7.0 | | | | | | 5.0 | | |
| 6 | 6.0 | | | 6.0 | | | 13.0 | | |
| 7 | 6.0 | | | | | | 7.0 | | |
| 8 | 5.0 | | | | | | 8.0 | | |
| 9 | 8.0 | | | 5.0 | | | 7.0 | | |
| 10 | | | | 5.0 | | | 8.0 | | |
| 11 | | | | 5.0 | | | 6.0 | | |
| 12 | 14.0 | | | 5.0 | | | 11.0 | | |
| 13 | 4.0 | | | 5.0 | | | 10.0 | | |
| 14 | 3.0 | | | | | | 10.0 | | |
| 15 | 3.0 | | | | | | 9.0 | | |
| 16 | 4.0 | | | 3.0 | | | 16.0 | | |
| 17 | | | | 6.0 | | | 11.0 | | |
| 18 | | | | 8.0 | | | 10.0 | | |
| 19 | | | | 4.0 | | | 12.0 | | |
| 20 | 4.0 | | | 6.0 | | | 10.0 | | |
| 21 | 3.0 | | | 4.0 | | | 11.0 | | |
| 22 | 4.0 | | | 7.0 | | | 8.1 | | |
| 23 | 5.0 | | | 3.0 | | | 2.6 | | |
| 24 | 4.0 | | | 4.0 | | | 5.5 | | |
| 25 | 6.0 | | | 5.0 | | | 5.9 | | |
| 26 | 7.0 | | | 6.0 | | | 6.4 | | |
| 27 | 4.0 | | | 6.0 | | | 14.0 | | |
| 28 | 4.0 | | | 6.0 | | | 8.5 | | |
| 29 | 5.0 | | | 5.0 | | | 4.5 | | |
| 30 | 6.0 | | | | | | 5.1 | | |
| 31 | | 5.0 | 100 | | 4.7 | 100 | 6.2 | 9.0 | 100 |
| **Limits** | **N/A** | **20** | **90** | **N/A** | **20** | **90** | **N/A** | **20** | **90** |

Please note that analytical results highlighted in amber are above the 20g/$m^3$ geometric mean limit. Analytical results highlighted in red are above the 50g/$m^3$ percent compliance limit.

| Day | $BOD_{5T}$ | | | $BOD_{5T}$ | | | $BOD_{5T}$ | | |
|---|---|---|---|---|---|---|---|---|---|
| | April 2020 | | | May 2020 | | | June 2020 | | |
| | Results | 20 Day Geometric Mean | 20 Day % Compliance | Results | 20 Day Geometric Mean | 20 Day % Compliance | Results | 20 Day Geometric Mean | 20 Day % Compliance |
| | $g/m^3$ | $g/m^3$ | % | $g/m^3$ | $g/m^3$ | % | $g/m^3$ | $g/m^3$ | % |
| 1 | 6 | | | 47 | | | 15 | | |
| 2 | 12 | | | 88 | | | 13 | | |
| 3 | | | | 150 | | | 13 | | |
| 4 | | | | 15 | | | 110 | | |
| 5 | 7 | | | 58 | | | 8 | | |
| 6 | 15 | | | 12 | | | 10 | | |
| 7 | 12 | | | 9.7 | | | 9 | | |
| 8 | 13 | | | 3 | | | 9 | | |
| 9 | 14 | | | 4.2 | | | 8 | | |
| 10 | 14 | | | 8.9 | | | 10 | | |
| 11 | 10 | | | 18 | | | 7 | | |
| 12 | 8 | | | 12 | | | 14 | | |
| 13 | 6 | | | 7.3 | | | 11 | | |
| 14 | 14 | | | 7.3 | | | 11 | | |
| 15 | 12 | | | 16 | | | 11 | | |
| 16 | 14 | | | 22 | | | 10 | | |
| 17 | | | | 16 | | | 6 | | |
| 18 | | | | 71 | | | 48 | | |
| 19 | 11 | | | 60 | | | 6 | | |
| 20 | 12 | | | 15 | | | 23 | | |
| 21 | 16 | | | 15 | | | 7 | | |
| 22 | 10 | | | 19 | | | 11 | | |
| 23 | 13 | | | 18 | | | 8 | | |
| 24 | 6 | | | 17 | | | 8 | | |
| 25 | 14 | | | 18 | | | 7 | | |
| 26 | 13 | | | 17 | | | 11 | | |
| 27 | 110 | | | 19 | | | 11 | | |
| 28 | 120 | | | 23 | | | | | |
| 29 | 14 | | | 23 | | | | | |
| 30 | 14 | | | 19 | | | | | |
| 31 | 6 | 11 | 100 | 21 | 19 | 75 | 15 | 12 | 95 |
| **Limits** | **N/A** | **20** | **90** | **N/A** | **20** | **90** | **N/A** | **20** | **90** |

Please note that analytical results highlighted in amber are above the 20g/$m^3$ geometric mean limit. Analytical results highlighted in red are above the 50g/$m^3$ percent compliance limit.

# Effluent Suspended Solids Results

| Day | Suspended Solids July 2019 | | | Suspended Solids Aug 2019 | | | Suspended Solids Sept 2019 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Results | 20 Day Geometric Mean | 20 Day % Compliance | Results | 20 Day Geometric Mean | 20 Day % Compliance | Results | 20 Day Geometric Mean | 20 Day % Compliance |
| | $g/m^3$ | $g/m^3$ | % | $g/m^3$ | $g/m^3$ | % | $g/m^3$ | $g/m^3$ | % |
| 1 | 6.0 | | | 6.0 | | | 10.0 | | |
| 2 | 6.0 | | | | | | 8.0 | | |
| 3 | 10.0 | | | | | | 9.0 | | |
| 4 | 6.0 | | | 6.0 | | | 7.0 | | |
| 5 | | | | 6.0 | | | 6.0 | | |
| 6 | | | | 6.0 | | | | | |
| 7 | 6.0 | | | 8.0 | | | | | |
| 8 | 6.0 | | | 8.0 | | | 6.0 | | |
| 9 | 6.0 | | | | | | 6.0 | | |
| 10 | 6.0 | | | | | | 8.0 | | |
| 11 | 6.0 | | | 6.0 | | | 6.0 | | |
| 12 | | | | 7.0 | | | 6.0 | | |
| 13 | | | | 8.0 | | | | | |
| 14 | 25.0 | | | 6.0 | | | | | |
| 15 | 6.0 | | | 6.0 | | | 7.0 | | |
| 16 | 6.0 | | | | | | 6.0 | | |
| 17 | 6.0 | | | | | | 6.0 | | |
| 18 | 6.0 | | | 6.0 | | | 6.0 | | |
| 19 | 9.0 | | | 6.0 | | | 6.0 | | |
| 20 | 9.0 | | | 6.0 | | | 14.0 | | |
| 21 | 6.0 | | | 6.0 | | | 15.0 | | |
| 22 | 6.0 | | | 6.0 | | | 6.0 | | |
| 23 | 6.0 | | | 13.0 | | | 6.0 | | |
| 24 | 6.0 | | | 14.0 | | | 6.0 | | |
| 25 | 6.0 | | | 7.0 | | | 6.0 | | |
| 26 | | | | 6.0 | | | 6.0 | | |
| 27 | | | | 6.0 | | | | | |
| 28 | 6.0 | | | 6.0 | | | | | |
| 29 | 6.0 | | | 7.0 | | | 6.0 | | |
| 30 | 6.0 | | | | | | | | |
| 31 | | 7.0 | 100 | | 7.0 | 100 | | 6.5 | 100 |
| **Limits** | **N/A** | **30** | **90** | **N/A** | **30** | **90** | **N/A** | **30** | **90** |

Please note that analytical results highlighted in amber are above the 30g/$m^3$ geometric mean limit. Analytical results highlighted in red are above the 80g/$m^3$ percent compliance limit.

| Day | Suspended Solids | | | Suspended Solids | | | Suspended Solids | | |
|---|---|---|---|---|---|---|---|---|---|
| | Oct 2019 | | | Nov 2019 | | | Dec 2019 | | |
| | Results | 20 Day Geometric Mean | 20 Day % Compliance | Results | 20 Day Geometric Mean | 20 Day % Compliance | Results | 20 Day Geometric Mean | 20 Day % Compliance |
| | g/m³ | g/m³ | % | g/m³ | g/m³ | % | g/m³ | g/m³ | % |
| 1 | 6.0 | | | | | | 7.0 | | |
| 2 | 8.0 | | | | | | 6.0 | | |
| 3 | 6.0 | | | 6.0 | | | 7.0 | | |
| 4 | | | | 7.0 | | | 6.0 | | |
| 5 | | | | 6.0 | | | 7.0 | | |
| 6 | 6.0 | | | 6.0 | | | | | |
| 7 | 6.0 | | | 6.0 | | | | | |
| 8 | 6.0 | | | | | | 14.0 | | |
| 9 | 6.0 | | | | | | 6.0 | | |
| 10 | 8.0 | | | 32.0 | | | 6.0 | | |
| 11 | | | | 7.0 | | | 6.0 | | |
| 12 | | | | 6.0 | | | 6.0 | | |
| 13 | 6.0 | | | 14.0 | | | 12.0 | | |
| 14 | 6.0 | | | 14.0 | | | 11.0 | | |
| 15 | 6.0 | | | | | | 7.0 | | |
| 16 | 6.0 | | | | | | 21.0 | | |
| 17 | 6.0 | | | 8.0 | | | 32.0 | | |
| 18 | 15.0 | | | 6.0 | | | 6.0 | | |
| 19 | 13.0 | | | 17.0 | | | 6.0 | | |
| 20 | 6.0 | | | 10.0 | | | | | |
| 21 | 6.0 | | | 6.0 | | | | | |
| 22 | 6.0 | | | 16.0 | | | 9.0 | | |
| 23 | 6.0 | | | 23.0 | | | 7.0 | | |
| 24 | 6.0 | | | 6.0 | | | | | |
| 25 | | | | 6.0 | | | | | |
| 26 | | | | 6.0 | | | 6.0 | | |
| 27 | | | | 6.0 | | | | | |
| 28 | 6.0 | | | 6.0 | | | | | |
| 29 | 6.0 | | | | | | 6.0 | | |
| 30 | 6.0 | | | | | | 6.0 | | |
| 31 | | 7.0 | 100 | | 9.0 | 100 | | 7.4 | 100 |
| **Limits** | **N/A** | **30** | **90** | **N/A** | **30** | **90** | **N/A** | **30** | **90** |

Please note that analytical results highlighted in amber are above the 30g/m³ geometric mean limit. Analytical results highlighted in red are above the 80g/m³ percent compliance limit.

| Day | Suspended Solids | | | Suspended Solids | | | Suspended Solids | | |
|---|---|---|---|---|---|---|---|---|---|
| | Jan 2020 | | | Feb 2020 | | | March 2020 | | |
| | Results | 20 Day Geometric Mean | 20 Day % Compliance | Results | 20 Day Geometric Mean | 20 Day % Compliance | Results | 20 Day Geometric Mean | 20 Day % Compliance |
| | g/m³ | g/m³ | % | g/m³ | g/m³ | % | g/m³ | g/m³ | % |
| 1 | | | | | | | 10.0 | | |
| 2 | 6.0 | | | 11.0 | | | 15.0 | | |
| 3 | | | | 6.0 | | | 24.0 | | |
| 4 | | | | 7.0 | | | 10.0 | | |
| 5 | 7.0 | | | | | | 10.0 | | |
| 6 | 8.0 | | | 8.0 | | | 28.0 | | |
| 7 | 6.0 | | | | | | 20.0 | | |
| 8 | 6.0 | | | | | | 19.0 | | |
| 9 | 9.0 | | | 6.0 | | | 14.0 | | |
| 10 | | | | 6.0 | | | 9.0 | | |
| 11 | | | | 6.0 | | | 45.0 | | |
| 12 | 31.0 | | | 6.0 | | | 19.0 | | |
| 13 | 6.0 | | | 27.0 | | | 7.0 | | |
| 14 | 6.0 | | | | | | 11.0 | | |
| 15 | 6.0 | | | | | | 12.0 | | |
| 16 | 6.0 | | | 12.0 | | | 12.0 | | |
| 17 | | | | 7.0 | | | 13.0 | | |
| 18 | | | | 8.0 | | | 6.0 | | |
| 19 | | | | 6.0 | | | 11.0 | | |
| 20 | 7.0 | | | 8.0 | | | 13.0 | | |
| 21 | 6.0 | | | 6.0 | | | 14.0 | | |
| 22 | 6.0 | | | 8.0 | | | 14.0 | | |
| 23 | 12.0 | | | 6.0 | | | 16.0 | | |
| 24 | 10.0 | | | 6.0 | | | 11.0 | | |
| 25 | 13.0 | | | 6.0 | | | 13.0 | | |
| 26 | 11.0 | | | 8.0 | | | 14.0 | | |
| 27 | 7.0 | | | 11.0 | | | 13.0 | | |
| 28 | 7.0 | | | 10.0 | | | 8.7 | | |
| 29 | 6.0 | | | 9.0 | | | 6.8 | | |
| 30 | 7.0 | | | | | | 5.6 | | |
| 31 | | 8.0 | 100 | | 6.8 | 100 | 5.2 | 13.7 | 100 |
| **Limits** | **N/A** | **30** | **90** | **N/A** | **30** | **90** | **N/A** | **30** | **90** |

Please note that analytical results highlighted in amber are above the 30g/m$^3$ geometric mean limit. Analytical results highlighted in red are above the 80g/m$^3$ percent compliance limit.

| Day | Suspended Solids | | | Suspended Solids | | | Suspended Solids | | |
|---|---|---|---|---|---|---|---|---|---|
| | April 2020 | | | May 2020 | | | June 2020 | | |
| | Results | 20 Day Geometric Mean | 20 Day % Compliance | Results | 20 Day Geometric Mean | 20 Day % Compliance | Results | 20 Day Geometric Mean | 20 Day % Compliance |
| | g/m³ | g/m³ | % | g/m³ | g/m³ | % | g/m³ | g/m³ | % |
| 1 | 18 | | | 110 | | | 23 | | |
| 2 | 20 | | | 210 | | | 20 | | |
| 3 | | | | 290 | | | 24 | | |
| 4 | | | | 22 | | | 200 | | |
| 5 | 4.4 | | | 53 | | | 9 | | |
| 6 | 23 | | | 16 | | | 13 | | |
| 7 | 14 | | | 8.8 | | | 11 | | |
| 8 | 18 | | | 3.6 | | | 13 | | |
| 9 | 18 | | | 5 | | | 12 | | |
| 10 | 13 | | | 20 | | | 11 | | |
| 11 | 13 | | | 22 | | | 14 | | |
| 12 | 10 | | | 19 | | | 13 | | |
| 13 | 10 | | | 27 | | | 16 | | |
| 14 | 13 | | | 24 | | | 18 | | |
| 15 | 21 | | | 29 | | | 15 | | |
| 16 | 19 | | | 40 | | | 11 | | |
| 17 | | | | 28 | | | 130 | | |
| 18 | | | | 330 | | | 110 | | |
| 19 | 13 | | | 74 | | | 18 | | |
| 20 | 13 | | | 37 | | | 43 | | |
| 21 | 6.5 | | | 24 | | | 13 | | |
| 22 | 8 | | | 36 | | | 42 | | |
| 23 | 9 | | | 38 | | | 12 | | |
| 24 | 5.7 | | | 37 | | | 11 | | |
| 25 | 15 | | | 20 | | | 10 | | |
| 26 | 20 | | | 23 | | | 14 | | |
| 27 | 320 | | | 27 | | | 13 | | |
| 28 | 310 | | | 45 | | | 11 | | |
| 29 | 53 | | | 45 | | | 11 | | |
| 30 | 21 | | | 30 | | | 11 | | |
| 31 | 18 | 12 | 100 | 33 | 33 | 80 | 23 | 22 | 85 |
| **Limits** | **N/A** | **30** | **90** | **N/A** | **30** | **90** | **N/A** | **30** | **90** |

Please note that analytical results highlighted in amber are above the 30g/m$^3$ geometric mean limit. Analytical results highlighted in red are above the 80g/m$^3$ percent compliance limit.

# Effluent Faecal Coliforms Results

| Day | Faecal Coliforms July 2019 | | | Faecal Coliforms Aug 2019 | | | Faecal Coliforms Sept 2019 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Results | 20 Day Geometric Mean | 20 Day % Compliance | Results | 20 Day Geometric Mean | 20 Day % Compliance | Results | 20 Day Geometric Mean | 20 Day % Compliance |
| | g/m³ | g/m³ | % | g/m³ | g/m³ | % | g/m³ | g/m³ | % |
| 1 | 4 | | | 16 | | | | | |
| 2 | 20 | | | 4 | | | 130 | | |
| 3 | 48 | | | | | | 4 | | |
| 4 | 430 | | | | | | 56 | | |
| 5 | 36 | | | 4 | | | 96 | | |
| 6 | | | | 24 | | | 170 | | |
| 7 | | | | 24 | | | | | |
| 8 | 8 | | | 56 | | | | | |
| 9 | 4 | | | 96 | | | 60 | | |
| 10 | 28 | | | | | | 120 | | |
| 11 | 4 | | | | | | 36 | | |
| 12 | 4 | | | 56 | | | 72 | | |
| 13 | | | | 72 | | | 36 | | |
| 14 | | | | 110 | | | | | |
| 15 | 4 | | | 4 | | | | | |
| 16 | 12 | | | 32 | | | 64 | | |
| 17 | 8 | | | | | | 32 | | |
| 18 | 4 | | | | | | 20 | | |
| 19 | 4 | | | 4 | | | 16 | | |
| 20 | 8 | | | 20 | | | 64 | | |
| 21 | 20 | | | 12 | | | 4 | | |
| 22 | 4 | | | 220 | | | 4 | | |
| 23 | 4 | | | 4 | | | 8 | | |
| 24 | 4 | | | 12 | | | 12 | | |
| 25 | 4 | | | 8 | | | 100 | | |
| 26 | 8 | | | 4 | | | 48 | | |
| 27 | | | | 92 | | | 16 | | |
| 28 | | | | 180 | | | | | |
| 29 | 40 | | | 100 | | | | | |
| 30 | 48 | | | 260 | | | 4 | | |
| 31 | 8 | 10 | 100 | | 18 | 100 | | 33 | 100 |
| **Limits** | **N/A** | **200** | **90** | **N/A** | **200** | **90** | **N/A** | **200** | **90** |

Please note that analytical results highlighted in amber are above the 200g/m$^3$ geometric mean limit. Analytical results highlighted in red are above the 2000g/m$^3$ percent compliance limit.

| Day | Faecal Coliforms | | | Faecal Coliforms | | | Faecal Coliforms | | |
|---|---|---|---|---|---|---|---|---|---|
| | Oct 2019 | | | Nov 2019 | | | Dec 2019 | | |
| | Results | 20 Day Geometric Mean | 20 Day % Compliance | Results | 20 Day Geometric Mean | 20 Day % Compliance | Results | 20 Day Geometric Mean | 20 Day % Compliance |
| | g/m³ | g/m³ | % | g/m³ | g/m³ | % | g/m³ | g/m³ | % |
| 1 | 120 | | | 520 | | | | | |
| 2 | 4 | | | | | | 4 | | |
| 3 | 4 | | | | | | 4 | | |
| 4 | 12 | | | 12 | | | 48 | | |
| 5 | | | | 100 | | | 4 | | |
| 6 | | | | 110 | | | 4 | | |
| 7 | 12 | | | 4 | | | | | |
| 8 | 12 | | | 12 | | | | | |
| 9 | 16 | | | 8 | | | 16 | | |
| 10 | 44 | | | | | | 4 | | |
| 11 | 77 | | | 2200 | | | 4 | | |
| 12 | | | | 4 | | | 4 | | |
| 13 | | | | 360 | | | 4 | | |
| 14 | 4 | | | 4 | | | 4 | | |
| 15 | 20 | | | 4 | | | 4 | | |
| 16 | 110 | | | | | | 4 | | |
| 17 | 24 | | | | | | 4 | | |
| 18 | 32 | | | 16 | | | 3600 | | |
| 19 | 350 | | | 52 | | | 28 | | |
| 20 | 92 | | | 84 | | | 4 | | |
| 21 | 24 | | | 320 | | | | | |
| 22 | 24 | | | 48 | | | | | |
| 23 | 280 | | | 4 | | | 4 | | |
| 24 | 20 | | | 24 | | | 4 | | |
| 25 | 32 | | | 24 | | | | | |
| 26 | | | | 12 | | | | | |
| 27 | | | | 8 | | | 64 | | |
| 28 | | | | 4 | | | | | |
| 29 | 460 | | | 36 | | | | | |
| 30 | 80 | | | | | | 4 | | |
| 31 | 190 | 29 | 100 | | 34 | 95 | 9100 | 8 | 95 |
| **Limits** | **N/A** | **200** | **90** | **N/A** | **200** | **90** | **N/A** | **200** | **90** |

Please note that analytical results highlighted in amber are above the 200g/m$^3$ geometric mean limit. Analytical results highlighted in red are above the 2000g/m$^3$ percent compliance limit.

| Day | Faecal Coliforms | | | Faecal Coliforms | | | Faecal Coliforms | | |
|---|---|---|---|---|---|---|---|---|---|
| | Jan 2020 | | | Feb 2020 | | | March 2020 | | |
| | Results | 20 Day Geometric Mean | 20 Day % Compliance | Results | 20 Day Geometric Mean | 20 Day % Compliance | Results | 20 Day Geometric Mean | 20 Day % Compliance |
| | g/m³ | g/m³ | % | g/m³ | g/m³ | % | g/m³ | g/m³ | % |
| 1 | | | | | | | 68 | | |
| 2 | | | | | | | 52 | | |
| 3 | 140 | | | 8 | | | 68 | | |
| 4 | | | | 84 | | | 8180 | | |
| 5 | | | | 210 | | | 24800 | | |
| 6 | 8 | | | | | | 16 | | |
| 7 | 4 | | | 120 | | | 180 | | |
| 8 | 4 | | | | | | 92 | | |
| 9 | 64 | | | | | | 200 | | |
| 10 | 12 | | | 130 | | | 110 | | |
| 11 | | | | 44 | | | 170 | | |
| 12 | | | | 20 | | | 110 | | |
| 13 | 28 | | | 60 | | | 140 | | |
| 14 | 4 | | | 69 | | | 32 | | |
| 15 | 4 | | | | | | 96 | | |
| 16 | 150 | | | | | | 200 | | |
| 17 | 12 | | | 62 | | | 170 | | |
| 18 | | | | 8 | | | 100 | | |
| 19 | | | | 20 | | | 8 | | |
| 20 | | | | 8 | | | 8 | | |
| 21 | 180 | | | 200 | | | 280 | | |
| 22 | 16 | | | 4 | | | 68 | | |
| 23 | 12 | | | 12 | | | 130 | | |
| 24 | 12 | | | 12 | | | 110 | | |
| 25 | 48 | | | 120 | | | 26 | | |
| 26 | 8 | | | 180 | | | 62 | | |
| 27 | 56 | | | 140 | | | 13 | | |
| 28 | 170 | | | 470 | | | 39 | | |
| 29 | 120 | | | 340 | | | 80 | | |
| 30 | 280 | | | | | | 6.6 | | |
| 31 | 32 | 23 | 100 | | 41 | 100 | 1.6 | 122 | 90 |
| **Limits** | **N/A** | **200** | **90** | **N/A** | **200** | **90** | **N/A** | **200** | **90** |

Please note that analytical results highlighted in amber are above the 200g/m$^3$ geometric mean limit. Analytical results highlighted in red are above the 2000g/m$^3$ percent compliance limit.

| Day | Faecal Coliforms | | | Faecal Coliforms | | | Faecal Coliforms | | |
|---|---|---|---|---|---|---|---|---|---|
| | Apr 2020 | | | May 2020 | | | June 2020 | | |
| | Results | 20 Day Geometric Mean | 20 Day % Compliance | Results | 20 Day Geometric Mean | 20 Day % Compliance | Results | 20 Day Geometric Mean | 20 Day % Compliance |
| | g/m³ | g/m³ | % | g/m³ | g/m³ | % | g/m³ | g/m³ | % |
| 1 | 48 | | | 18 | | | 2 | | |
| 2 | 42 | | | 11 | | | 7 | | |
| 3 | | | | 700 | | | 8 | | |
| 4 | | | | 8.2 | | | 23 | | |
| 5 | 39 | | | 1.6 | | | 2 | | |
| 6 | 6.6 | | | 1.6 | | | 2 | | |
| 7 | 120 | | | 1.6 | | | 2 | | |
| 8 | 1.6 | | | 1.6 | | | 2 | | |
| 9 | 1.6 | | | 1.6 | | | 3 | | |
| 10 | 38 | | | 1.6 | | | 2 | | |
| 11 | 9.8 | | | 4.9 | | | 2 | | |
| 12 | 1100 | | | 9.8 | | | 2 | | |
| 13 | 3.3 | | | 9.8 | | | 2 | | |
| 14 | 18 | | | 9.8 | | | 2 | | |
| 15 | 130 | | | 6.6 | | | 2 | | |
| 16 | 120 | | | 9.8 | | | 2 | | |
| 17 | | | | 3.3 | | | 5 | | |
| 18 | | | | 6.6 | | | 5 | | |
| 19 | 15 | | | 3.3 | | | 420 | | |
| 20 | 30 | | | 3.3 | | | 3 | | |
| 21 | 96 | | | 3.3 | | | 3 | | |
| 22 | 31 | | | 1.6 | | | 68 | | |
| 23 | 23 | | | 6.6 | | | 2 | | |
| 24 | 23 | | | 8.2 | | | 2 | | |
| 25 | 40 | | | 680 | | | 2 | | |
| 26 | 110 | | | 34 | | | 2 | | |
| 27 | 76 | | | 30 | | | 2 | | |
| 28 | 82 | | | 11 | | | 2 | | |
| 29 | 44 | | | 18 | | | 7 | | |
| 30 | 8.2 | | | 8.2 | | | 2 | | |
| 31 | 48 | 27 | 100 | 8.2 | 33 | 100 | | 3 | 100 |
| **Limits** | **N/A** | **200** | **90** | **N/A** | **200** | **90** | **N/A** | **200** | **90** |

Please note that analytical results highlighted in amber are above the 200g/m$^3$ geometric mean limit. Analytical results highlighted in red are above the 2000g/m$^3$ percent compliance limit.

# Treatment Plant Effluent Flow Rate

| Day | Treatment Plant July 2019 | | | Treatment Plant Aug 2019 | | | Treatment Plant Sept 2019 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Average Daily Flow | Peak Hourly Flow | Total Daily Flow | Average Daily Flow | Peak Hourly Flow | Total Daily Flow | Average Daily Flow | Peak Hourly Flow | Total Daily Flow |
| | $m^3$/hour | L/s | $m^3$ | $m^3$/hour | L/s | $m^3$ | $m^3$/hour | L/s | $m^3$ |
| 1 | 167 | 240 | 4009 | 201 | 240 | 4815 | 151 | 42 | 3620 |
| 2 | 165 | 229 | 3967 | 176 | 100 | 4229 | 146 | 205 | 3513 |
| 3 | 447 | 217 | 10721 | 203 | 102 | 4871 | 138 | 224 | 3316 |
| 4 | 353 | 239 | 8468 | 214 | 240 | 5142 | 150 | 194 | 3592 |
| 5 | 289 | 148 | 6945 | 175 | 237 | 4202 | 271 | 240 | 6508 |
| 6 | 251 | 127 | 6026 | 187 | 222 | 4486 | 179 | 136 | 4292 |
| 7 | 239 | 240 | 5730 | 182 | 240 | 4362 | 113 | 31 | 2703 |
| 8 | 214 | 184 | 5139 | 176 | 239 | 4215 | 113 | 31 | 2703 |
| 9 | 189 | 240 | 4544 | 154 | 81 | 3702 | 150 | 220 | 3597 |
| 10 | 187 | 238 | 4478 | 227 | 130 | 5459 | 141 | 236 | 3385 |
| 11 | 191 | 240 | 4582 | 243 | 240 | 5834 | 144 | 223 | 3445 |
| 12 | 185 | 87 | 4439 | 331 | 240 | 7933 | 142 | 195 | 3399 |
| 13 | 202 | 109 | 4840 | 209 | 211 | 5019 | 179 | 150 | 4287 |
| 14 | 441 | 228 | 10593 | 179 | 200 | 4298 | 256 | 146 | 6144 |
| 15 | 324 | 240 | 7781 | 163 | 192 | 3904 | 241 | 120 | 5777 |
| 16 | 393 | 240 | 9431 | 142 | 76 | 3414 | 169 | 220 | 4059 |
| 17 | 291 | 240 | 6986 | 399 | 188 | 9570 | 158 | 191 | 3802 |
| 18 | 305 | 240 | 7315 | 281 | 166 | 6735 | 152 | 205 | 3640 |
| 19 | 336 | 163 | 8071 | 196 | 198 | 4706 | 140 | 182 | 3353 |
| 20 | 439 | 167 | 10531 | 186 | 216 | 4464 | 135 | 80 | 3241 |
| 21 | 358 | 141 | 8582 | 214 | 148 | 5133 | 154 | 89 | 3688 |
| 22 | 287 | 240 | 6899 | 204 | 204 | 4905 | 158 | 84 | 3785 |
| 23 | 275 | 240 | 6607 | 170 | 86 | 4084 | 152 | 206 | 3647 |
| 24 | 272 | 240 | 6534 | 176 | 90 | 4229 | 136 | 187 | 3260 |
| 25 | 215 | 240 | 5161 | 194 | 95 | 4652 | 141 | 198 | 3394 |
| 26 | 205 | 91 | 4917 | 158 | 240 | 3780 | 141 | 198 | 3394 |
| 27 | 210 | 97 | 5044 | 158 | 200 | 3800 | 122 | 95 | 2920 |
| 28 | 246 | 109 | 5907 | 153 | 204 | 3670 | 148 | 89 | 3555 |
| 29 | 215 | 240 | 5157 | 142 | 213 | 3399 | 145 | 76 | 3488 |
| 30 | 200 | 239 | 4787 | 154 | 166 | 3684 | 128 | 184 | 3072 |
| 31 | 241 | 240 | 5771 | 151 | 42 | 3620 | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Average** | 268.77 | 199.13 | 6450.39 | 196.71 | 175.68 | 4719.87 | 156.43 | 155.90 | 3752.63 |
| **Minimum** | 165 | 87 | 3967 | 142 | 42 | 3399 | 113 | 31 | 2703 |
| **Maximum** | 447 | 240 | 10721 | 399 | 240 | 9570 | 271 | 240 | 6508 |

| Day | Treatment Plant Oct 2019 | | | Treatment Plant Nov 2019 | | | Treatment Plant Dec 2019 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Average Daily Flow | Peak Hourly Flow | Total Daily Flow | Average Daily Flow | Peak Hourly Flow | Total Daily Flow | Average Daily Flow | Peak Hourly Flow | Total Daily Flow |
| | $m^3$/hour | L/s | $m^3$ | $m^3$/hour | L/s | $m^3$ | $m^3$/hour | L/s | $m^3$ |
| 1 | 159 | 171 | 3816 | 124 | 71 | 2968 | 152 | 71 | 3645 |
| 2 | 159 | 171 | 3816 | 149 | 80 | 3565 | 135 | 199 | 3246 |
| 3 | 133 | 167 | 3197 | 158 | 83 | 3782 | 150 | 168 | 3588 |
| 4 | 126 | 73 | 3031 | 133 | 210 | 3198 | 134 | 185 | 3212 |
| 5 | 273 | 170 | 6547 | 139 | 187 | 3337 | 132 | 186 | 3156 |
| 6 | 206 | 110 | 4931 | 130 | 168 | 3114 | 123 | 84 | 2962 |
| 7 | 181 | 240 | 4337 | 137 | 188 | 3282 | 182 | 143 | 4358 |
| 8 | 164 | 191 | 3945 | 122 | 68 | 2934 | 393 | 240 | 9432 |
| 9 | 171 | 193 | 4103 | 153 | 106 | 3665 | 187 | 233 | 4491 |
| 10 | 255 | 240 | 6123 | 287 | 162 | 6887 | 161 | 239 | 3866 |
| 11 | 156 | 147 | 3751 | 581 | 240 | 13938 | 139 | 190 | 3346 |
| 12 | 172 | 93 | 4133 | 271 | 240 | 6502 | 139 | 192 | 3338 |
| 13 | 165 | 86 | 3966 | 247 | 240 | 5921 | 123 | 73 | 2950 |
| 14 | 145 | 191 | 3485 | 221 | 194 | 5299 | 147 | 197 | 3518 |
| 15 | 142 | 201 | 3418 | 186 | 123 | 4472 | 150 | 188 | 3606 |
| 16 | 172 | 186 | 4133 | 178 | 87 | 4275 | 194 | 210 | 4653 |
| 17 | 147 | 197 | 3532 | 198 | 96 | 4756 | 410 | 238 | 9828 |
| 18 | 430 | 185 | 10315 | 190 | 219 | 4569 | 428 | 239 | 10270 |
| 19 | 319 | 240 | 7665 | 171 | 202 | 4091 | 210 | 230 | 5030 |
| 20 | 237 | 105 | 5684 | 153 | 204 | 3662 | 175 | 116 | 4207 |
| 21 | 200 | 229 | 4806 | 153 | 204 | 3662 | 176 | 99 | 4216 |
| 22 | 230 | 154 | 5509 | 116 | 151 | 2785 | 156 | 161 | 3738 |
| 23 | 279 | 198 | 6701 | 144 | 78 | 3447 | 149 | 157 | 3563 |
| 24 | 184 | 199 | 4411 | 166 | 83 | 3972 | 137 | 66 | 3294 |
| 25 | 164 | 81 | 3925 | 141 | 202 | 3387 | 128 | 68 | 3076 |
| 26 | 159 | 84 | 3820 | 134 | 179 | 3210 | 129 | 155 | 3103 |
| 27 | 156 | 74 | 3735 | 141 | 194 | 3390 | 125 | 240 | 3006 |
| 28 | 169 | 177 | 4060 | 125 | 200 | 2994 | 118 | 62 | 2832 |
| 29 | 151 | 195 | 3620 | 124 | 79 | 2978 | 127 | 56 | 3036 |
| 30 | 142 | 196 | 3399 | 136 | 82 | 3274 | 122 | 174 | 2938 |
| 31 | 141 | 81 | 3379 | | | | 121 | 56 | 2902 |
| **Average** | 189.90 | 162.10 | 4557.84 | 176.93 | 154.00 | 4243.87 | 172.65 | 158.55 | 4142.13 |
| **Minimum** | 126 | 73 | 3031 | 116 | 68 | 2785 | 118 | 56 | 2832 |
| **Maximum** | 430 | 240 | 10315 | 581 | 240 | 13938 | 428 | 240 | 10270 |

| Day | Treatment Plant | | | Treatment Plant | | | Treatment Plant | | |
|---|---|---|---|---|---|---|---|---|---|
| | Jan 2020 | | | Feb 2020 | | | March 2020 | | |
| | Average Daily Flow | Peak Hourly Flow | Total Daily Flow | Average Daily Flow | Peak Hourly Flow | Total Daily Flow | Average Daily Flow | Peak Hourly Flow | Total Daily Flow |
| | $m^3$/hour | L/s | $m^3$ | $m^3$/hour | L/s | $m^3$ | $m^3$/hour | L/s | $m^3$ |
| 1 | 112 | 51 | 2680 | 125 | 72 | 3007 | 129 | 77 | 3108 |
| 2 | 119 | 163 | 2853 | 125 | 72 | 3007 | 119 | 115 | 2844 |
| 3 | 135 | 151 | 3246 | 118 | 159 | 2830 | 110 | 68 | 2643 |
| 4 | 126 | 62 | 3034 | 126 | 165 | 3021 | 133 | 78 | 3200 |
| 5 | 131 | 55 | 3135 | 110 | 58 | 2640 | 120 | 74 | 2889 |
| 6 | 116 | 195 | 2782 | 137 | 196 | 3292 | 111 | 122 | 2672 |
| 7 | 121 | 150 | 2902 | 110 | 63 | 2647 | 129 | 79 | 3106 |
| 8 | 118 | 166 | 2833 | 126 | 65 | 3031 | 126 | 72 | 3025 |
| 9 | 117 | 171 | 2796 | 136 | 74 | 3264 | 129 | 138 | 3100 |
| 10 | 115 | 63 | 2761 | 125 | 188 | 2990 | 121 | 75 | 2905 |
| 11 | 140 | 62 | 3352 | 120 | 75 | 2876 | 112 | 129 | 2700 |
| 12 | 142 | 240 | 3417 | 113 | 183 | 2720 | 120 | 81 | 2868 |
| 13 | 154 | 172 | 3687 | 116 | 171 | 2788 | 117 | 106 | 2808 |
| 14 | 131 | 188 | 3136 | 105 | 70 | 2515 | 125 | 76 | 2998 |
| 15 | 123 | 174 | 2944 | 128 | 73 | 3069 | 126 | 70 | 3015 |
| 16 | 125 | 181 | 2988 | 134 | 70 | 3227 | 120 | 117 | 2889 |
| 17 | 106 | 59 | 2534 | 116 | 185 | 2777 | 112 | 71 | 2683 |
| 18 | 127 | 76 | 3054 | 191 | 211 | 4586 | 124 | 170 | 2973 |
| 19 | 127 | 61 | 3036 | 124 | 166 | 2984 | 119 | 66 | 2863 |
| 20 | 128 | 68 | 3062 | 127 | 208 | 3041 | 120 | 70 | 2890 |
| 21 | 131 | 160 | 3141 | 121 | 67 | 2896 | 121 | 76 | 2912 |
| 22 | 116 | 158 | 2784 | 212 | 128 | 5087 | 146 | 80 | 3515 |
| 23 | 134 | 190 | 3205 | 191 | 146 | 4572 | 116 | 66 | 2783 |
| 24 | 112 | 64 | 2689 | 133 | 204 | 3180 | 160 | 96 | 3848 |
| 25 | 131 | 75 | 3152 | 121 | 187 | 2900 | 125 | 72 | 3012 |
| 26 | 136 | 70 | 3271 | 126 | 186 | 3015 | 128 | 122 | 3061 |
| 27 | 129 | 192 | 3105 | 114 | 178 | 2731 | 196 | 175 | 4698 |
| 28 | 131 | 167 | 3155 | 115 | 65 | 2748 | 389 | 180 | 9333 |
| 29 | 118 | 180 | 2821 | 123 | 70 | 2941 | 403 | 192 | 9664 |
| 30 | 121 | 182 | 2903 | | | | 267 | 155 | 6417 |
| 31 | 117 | 69 | 2802 | | | | 169 | 77 | 4064 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Average** | 125.45 | 129.52 | 3008.39 | 129.93 | 129.48 | 3116.62 | 149.74 | 101.45 | 3596.32 |
| **Minimum** | 106 | 51 | 2534 | 105 | 58 | 2515 | 110 | 66 | 2643 |
| **Maximum** | 154 | 240 | 3687 | 212 | 211 | 5087 | 403 | 192 | 9664 |

| Day | Treatment Plant | | | Treatment Plant | | | Treatment Plant | | |
|---|---|---|---|---|---|---|---|---|---|
| | April 2020 | | | May 2020 | | | June 2020 | | |
| | Average Daily Flow | Peak Hourly Flow | Total Daily Flow | Average Daily Flow | Peak Hourly Flow | Total Daily Flow | Average Daily Flow | Peak Hourly Flow | Total Daily Flow |
| | $m^3$/hour | L/s | $m^3$ | $m^3$/hour | L/s | $m^3$ | $m^3$/hour | L/s | $m^3$ |
| 1 | 152 | 77 | 3649 | 170 | 98 | 4072 | 169 | 95 | 4065 |
| 2 | 133 | 62 | 3202 | 166 | 95 | 3995 | 162 | 78 | 3895 |
| 3 | 132 | 72 | 2031 | 338 | 240 | 8103 | 146 | 79 | 3505 |
| 4 | 164 | 64 | 1326 | 353 | 240 | 8466 | 261 | 191 | 6267 |
| 5 | 152 | 85 | 3806 | 412 | 240 | 9885 | 474 | 204 | 11369 |
| 6 | 135 | 184 | 3101 | 340 | 198 | 8155 | 310 | 159 | 7443 |
| 7 | 135 | 70 | 3252 | 221 | 105 | 5298 | 269 | 143 | 6454 |
| 8 | 144 | 83 | 3446 | 195 | 101 | 4683 | 198 | 97 | 4758 |
| 9 | 144 | 82 | 3461 | 193 | 114 | 4642 | 182 | 94 | 4372 |
| 10 | 142 | 80 | 3410 | 203 | 113 | 4862 | 169 | 81 | 4046 |
| 11 | 146 | 77 | 3515 | 177 | 105 | 4258 | 167 | 86 | 4018 |
| 12 | 147 | 79 | 3528 | 174 | 95 | 4171 | 152 | 89 | 3658 |
| 13 | 181 | 87 | 4333 | 166 | 90 | 3978 | 155 | 89 | 3729 |
| 14 | 138 | 136 | 3304 | 177 | 98 | 4259 | 166 | 90 | 3995 |
| 15 | 129 | 76 | 3097 | 168 | 92 | 4020 | 171 | 88 | 4094 |
| 16 | 137 | 134 | 3294 | 165 | 84 | 3965 | 232 | 146 | 5558 |
| 17 | 139 | 152 | 3345 | 180 | 93 | 4326 | 344 | 137 | 8248 |
| 18 | 159 | 84 | 3824 | 188 | 109 | 4515 | 685 | 234 | 16435 |
| 19 | 161 | 86 | 3861 | 164 | 96 | 3930 | 692 | 224 | 16620 |
| 20 | 146 | 89 | 3507 | 159 | 99 | 3827 | 589 | 211 | 14141 |
| 21 | 146 | 75 | 3504 | 158 | 83 | 3801 | 673 | 202 | 16155 |
| 22 | 140 | 143 | 3362 | 144 | 77 | 3462 | 466 | 163 | 11194 |
| 23 | 146 | 76 | 3502 | 183 | 108 | 4402 | 336 | 144 | 8061 |
| 24 | 152 | 84 | 3644 | 235 | 150 | 5629 | 291 | 120 | 6986 |
| 25 | 148 | 79 | 3548 | 590 | 221 | 14149 | 264 | 113 | 6332 |
| 26 | 139 | 77 | 3340 | 277 | 136 | 6639 | 241 | 103 | 5778 |
| 27 | 165 | 95 | 3962 | 218 | 104 | 5243 | 235 | 109 | 5637 |
| 28 | 165 | 91 | 3962 | 170 | 110 | 4070 | 233 | 107 | 5585 |
| 29 | 166 | 90 | 3996 | 156 | 85 | 3733 | 280 | 151 | 6717 |
| 30 | 163 | 158 | 3906 | 155 | 81 | 3725 | 258 | 115 | 6180 |
| 31 | 152 | 77 | 3649 | 143 | 84 | 3441 | 169 | 95 | 4065 |
| **Average** | 148.32 | 93.68 | 3440.87 | 217.35 | 120.77 | 5216.26 | 294.81 | 130.23 | 7076.13 |
| **Minimum** | 129 | 62 | 1326 | 143 | 77 | 3441 | 146 | 78 | 3505 |
| **Maximum** | 181 | 184 | 4333 | 590 | 240 | 14149 | 692 | 234 | 16620 |

# Effluent Pipeline Flow Rate

| Day | Effluent Pipeline Flow | | | Effluent Pipeline Flow | | | Effluent Pipeline Flow | | |
|---|---|---|---|---|---|---|---|---|---|
| | July 2019 | | | Aug 2019 | | | Sept 2019 | | |
| | Average Daily Flow | Peak Hourly Flow | Total Daily Flow | Average Daily Flow | Peak Hourly Flow | Total Daily Flow | Average Daily Flow | Peak Hourly Flow | Total Daily Flow |
| | $m^3$/hour | L/s | $m^3$ | $m^3$/hour | L/s | $m^3$ | $m^3$/hour | L/s | $m^3$ |
| 1 | 165 | 77 | 3965 | 164 | 79 | 3944 | 172 | 78 | 4132 |
| 2 | 160 | 76 | 3848 | 156 | 76 | 3753 | 169 | 81 | 4053 |
| 3 | 215 | 138 | 5159 | 165 | 75 | 3960 | 157 | 80 | 3756 |
| 4 | 363 | 142 | 8713 | 165 | 76 | 3958 | 163 | 80 | 3891 |
| 5 | 277 | 125 | 6640 | 153 | 74 | 3667 | 210 | 85 | 5052 |
| 6 | 231 | 88 | 5533 | 150 | 74 | 3608 | 246 | 98 | 5916 |
| 7 | 213 | 77 | 5108 | 149 | 74 | 3583 | 202 | 84 | 4838 |
| 8 | 195 | 82 | 4687 | 149 | 75 | 3567 | 187 | 77 | 4481 |
| 9 | 185 | 77 | 4446 | 144 | 71 | 3461 | 181 | 83 | 4354 |
| 10 | 180 | 73 | 4318 | 176 | 100 | 4216 | 168 | 81 | 4021 |
| 11 | 174 | 77 | 4184 | 197 | 114 | 4732 | 170 | 86 | 4088 |
| 12 | 172 | 74 | 4124 | 273 | 193 | 6555 | 161 | 82 | 3854 |
| 13 | 174 | 78 | 4187 | 218 | 92 | 5221 | 165 | 86 | 3962 |
| 14 | 283 | 142 | 6791 | 184 | 92 | 4408 | 255 | 123 | 6126 |
| 15 | 221 | 82 | 5310 | 169 | 80 | 4065 | 252 | 90 | 6041 |
| 16 | 301 | 130 | 7229 | 161 | 78 | 3867 | 202 | 84 | 4855 |
| 17 | 259 | 126 | 6208 | 350 | 195 | 8410 | 182 | 85 | 4363 |
| 18 | 218 | 77 | 5236 | 268 | 100 | 6423 | 180 | 83 | 4313 |
| 19 | 254 | 136 | 6094 | 199 | 89 | 4770 | 170 | 83 | 4088 |
| 20 | 330 | 130 | 7932 | 186 | 83 | 4472 | 167 | 80 | 3979 |
| 21 | 285 | 126 | 6847 | 188 | 80 | 4515 | 177 | 84 | 4238 |
| 22 | 252 | 103 | 6058 | 232 | 135 | 5572 | 177 | 80 | 4259 |
| 23 | 225 | 79 | 5380 | 180 | 81 | 4327 | 163 | 83 | 3910 |
| 24 | 223 | 78 | 5355 | 192 | 82 | 4613 | 171 | 81 | 4108 |
| 25 | 208 | 77 | 4998 | 185 | 81 | 4447 | 165 | 86 | 3970 |
| 26 | 197 | 79 | 4705 | 171 | 79 | 4105 | 158 | 82 | 3784 |
| 27 | 199 | 78 | 4776 | 168 | 91 | 4033 | 162 | 82 | 3890 |
| 28 | 202 | 79 | 4857 | 161 | 79 | 3866 | 157 | 73 | 3772 |
| 29 | 180 | 80 | 4330 | 158 | 77 | 3769 | 160 | 70 | 3670 |
| 30 | 184 | 80 | 4416 | 154 | 76 | 3692 | 156 | 77 | 3724 |
| 31 | 202 | 89 | 4823 | 164 | 76 | 3937 | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Average** | 223.45 | 95.32 | 5363.13 | 184.81 | 91.19 | 4436.00 | 180.17 | 83.57 | 4316.27 |
| **Minimum** | 160 | 73 | 3848 | 144 | 71 | 3461 | 156 | 70 | 3670 |
| **Maximum** | 363 | 142 | 8713 | 350 | 195 | 8410 | 255 | 123 | 6126 |

| Day | Effluent Pipeline Flow | | | Effluent Pipeline Flow | | | Effluent Pipeline Flow | | |
|---|---|---|---|---|---|---|---|---|---|
| | Oct 2019 | | | Nov 2019 | | | Dec 2019 | | |
| | Average Daily Flow | Peak Hourly Flow | Total Daily Flow | Average Daily Flow | Peak Hourly Flow | Total Daily Flow | Average Daily Flow | Peak Hourly Flow | Total Daily Flow |
| | $m^3$/hour | L/s | $m^3$ | $m^3$/hour | L/s | $m^3$ | $m^3$/hour | L/s | $m^3$ |
| 1 | 172 | 87 | 4129 | 108 | 82 | 2595 | 167 | 74 | 4004 |
| 2 | 185 | 91 | 4332 | 173 | 82 | 4148 | 155 | 76 | 3728 |
| 3 | 169 | 78 | 4031 | 167 | 73 | 4016 | 173 | 78 | 4140 |
| 4 | 154 | 69 | 3698 | 165 | 82 | 3963 | 158 | 79 | 3797 |
| 5 | 214 | 134 | 5140 | 159 | 79 | 3823 | 153 | 77 | 3668 |
| 6 | 214 | 88 | 5137 | 155 | 79 | 3730 | 152 | 79 | 3636 |
| 7 | 173 | 79 | 4147 | 161 | 79 | 3874 | 157 | 73 | 3759 |
| 8 | 161 | 76 | 3853 | 148 | 79 | 3563 | 305 | 140 | 7309 |
| 9 | 157 | 71 | 3768 | 173 | 80 | 4162 | 217 | 113 | 5198 |
| 10 | 168 | 82 | 3995 | 231 | 128 | 5545 | 180 | 79 | 4321 |
| 11 | 236 | 103 | 5665 | 451 | 143 | 10722 | 162 | 78 | 3894 |
| 12 | 184 | 87 | 4413 | 272 | 133 | 6528 | 160 | 79 | 3836 |
| 13 | 178 | 79 | 4283 | 245 | 84 | 5884 | 153 | 80 | 3661 |
| 14 | 165 | 79 | 3890 | 249 | 82 | 5971 | 169 | 80 | 4051 |
| 15 | 159 | 81 | 3819 | 201 | 89 | 4814 | 158 | 75 | 3785 |
| 16 | 190 | 87 | 4557 | 187 | 77 | 4500 | 163 | 79 | 3908 |
| 17 | 161 | 85 | 3854 | 201 | 77 | 4820 | 259 | 115 | 6211 |
| 18 | 252 | 117 | 6057 | 188 | 76 | 4521 | 439 | 140 | 10539 |
| 19 | 371 | 143 | 8912 | 193 | 77 | 4622 | 243 | 88 | 5834 |
| 20 | 243 | 86 | 5827 | 215 | 108 | 5153 | 214 | 78 | 5143 |
| 21 | 200 | 82 | 4806 | 172 | 88 | 4121 | 207 | 79 | 4968 |
| 22 | 185 | 85 | 4383 | 152 | 75 | 3637 | 184 | 78 | 4427 |
| 23 | 281 | 138 | 6752 | 176 | 75 | 4220 | 172 | 73 | 4127 |
| 24 | 184 | 84 | 4419 | 186 | 74 | 4457 | 169 | 70 | 4045 |
| 25 | N/A | N/A | N/A | 167 | 77 | 4001 | 159 | 71 | 3827 |
| 26 | N/A | N/A | N/A | 171 | 80 | 4114 | 158 | 71 | 3790 |
| 27 | N/A | N/A | N/A | 160 | 77 | 3848 | 156 | 69 | 3745 |
| 28 | N/A | N/A | N/A | 163 | 78 | 3916 | 153 | 71 | 3668 |
| 29 | N/A | N/A | N/A | 155 | 79 | 3730 | 149 | 64 | 3587 |
| 30 | N/A | N/A | N/A | 168 | 81 | 4037 | 150 | 59 | 3603 |
| 31 | N/A | N/A | N/A | | | | 144 | 62 | 3462 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Average** | 198.17 | 91.29 | 4744.46 | 190.40 | 85.77 | 4567.83 | 185.10 | 81.52 | 4441.00 |
| **Minimum** | 154 | 69 | 3698 | 108 | 73 | 2595 | 144 | 59 | 3462 |
| **Maximum** | 371 | 143 | 8912 | 451 | 143 | 10722 | 439 | 140 | 10539 |

| Day | Effluent Pipeline Flow | | | Effluent Pipeline Flow | | | Effluent Pipeline Flow | | |
|---|---|---|---|---|---|---|---|---|---|
| | Jan 2020 | | | Feb 2020 | | | March 2020 | | |
| | Average Daily Flow | Peak Hourly Flow | Total Daily Flow | Average Daily Flow | Peak Hourly Flow | Total Daily Flow | Average Daily Flow | Peak Hourly Flow | Total Daily Flow |
| | $m^3$/hour | L/s | $m^3$ | $m^3$/hour | L/s | $m^3$ | $m^3$/hour | L/s | $m^3$ |
| 1 | 135 | 54 | 3244 | 154 | 75 | 3688 | 161 | 82 | 3858 |
| 2 | 143 | 65 | 3420 | 155 | 76 | 3727 | 147 | 82 | 3527 |
| 3 | 142 | 65 | 3400 | 142 | 62 | 3409 | 135 | 76 | 3233 |
| 4 | 162 | 79 | 3893 | 152 | 72 | 3649 | 160 | 82 | 3837 |
| 5 | 148 | 58 | 3548 | 145 | 64 | 3474 | 148 | 80 | 3561 |
| 6 | 146 | 80 | 3511 | 156 | 80 | 3738 | 141 | 79 | 3396 |
| 7 | 142 | 55 | 3420 | 144 | 80 | 3458 | 160 | 83 | 3852 |
| 8 | 144 | 55 | 3453 | 152 | 71 | 3647 | 157 | 80 | 3772 |
| 9 | 142 | 60 | 3401 | 160 | 78 | 3850 | 154 | 85 | 3703 |
| 10 | 144 | 68 | 3449 | 149 | 66 | 3586 | 150 | 81 | 3594 |
| 11 | 149 | 71 | 3566 | 142 | 64 | 3411 | 139 | 81 | 3346 |
| 12 | 146 | 55 | 3494 | 144 | 80 | 3451 | 149 | 84 | 3585 |
| 13 | 187 | 130 | 4492 | 146 | 80 | 3508 | 148 | 77 | 3550 |
| 14 | 75 | 54 | 1810 | 138 | 77 | 3302 | 159 | 83 | 3809 |
| 15 | 34 | 18 | 818 | 154 | 77 | 3695 | 158 | 77 | 3780 |
| 16 | 68 | 42 | 1621 | 153 | 70 | 3672 | 150 | 76 | 3608 |
| 17 | 98 | 48 | 2363 | 142 | 77 | 3404 | 141 | 76 | 3393 |
| 18 | 149 | 76 | 3577 | 194 | 112 | 4659 | 154 | 81 | 3695 |
| 19 | 144 | 67 | 3458 | 155 | 80 | 3725 | 151 | 71 | 3613 |
| 20 | 154 | 72 | 3691 | 154 | 81 | 3691 | 154 | 75 | 3690 |
| 21 | 148 | 69 | 3549 | 149 | 75 | 3571 | 155 | 79 | 3709 |
| 22 | 142 | 57 | 3407 | 170 | 80 | 4077 | 164 | 67 | 3927 |
| 23 | 143 | 62 | 3429 | 262 | 114 | 6297 | 137 | 69 | 3282 |
| 24 | 163 | 72 | 3905 | 166 | 85 | 3987 | 191 | 87 | 4580 |
| 25 | 155 | 76 | 3723 | 152 | 82 | 3643 | 158 | 76 | 3792 |
| 26 | 151 | 72 | 3632 | 157 | 81 | 3761 | 158 | 71 | 3792 |
| 27 | 154 | 74 | 3708 | 143 | 80 | 3437 | 204 | 131 | 4898 |
| 28 | 142 | 69 | 3413 | 148 | 75 | 3555 | 160 | 127 | 3836 |
| 29 | 150 | 63 | 3606 | 155 | 76 | 3709 | 340 | 135 | 8150 |
| 30 | 145 | 73 | 3485 | | | | 285 | 131 | 6838 |
| 31 | 146 | 77 | 3497 | | | | 206 | 83 | 4942 |
| **Average** | 138.42 | 65.68 | 3322.03 | 156.31 | 78.28 | 3751.07 | 166.90 | 85.39 | 4004.77 |
| **Minimum** | 34 | 18 | 818 | 138 | 62 | 3302 | 135 | 67 | 3233 |
| **Maximum** | 187 | 130 | 4492 | 262 | 114 | 6297 | 340 | 135 | 8150 |

| Day | Effluent Pipeline Flow | | | Effluent Pipeline Flow | | | Effluent Pipeline Flow | | |
|---|---|---|---|---|---|---|---|---|---|
| | April 2020 | | | May 2020 | | | June 2020 | | |
| | Average Daily Flow | Peak Hourly Flow | Total Daily Flow | Average Daily Flow | Peak Hourly Flow | Total Daily Flow | Average Daily Flow | Peak Hourly Flow | Total Daily Flow |
| | $m^3$/hour | L/s | $m^3$ | $m^3$/hour | L/s | $m^3$ | $m^3$/hour | L/s | $m^3$ |
| 1 | 193 | 84 | 4629 | 157 | 77 | 3769 | 52 | 291 | 4506 |
| 2 | 179 | 74 | 4287 | 154 | 80 | 3700 | 52 | 287 | 4312 |
| 3 | 179 | 82 | 4284 | 241 | 142 | 5785 | 48 | 289 | 4155 |
| 4 | 177 | 84 | 4244 | 246 | 133 | 5895 | 45 | 283 | |
| 5 | 179 | 84 | 4288 | 142 | 79 | 3408 | | | |
| 6 | 166 | 82 | 3981 | 135 | 74 | 3251 | 28 | 290 | |
| 7 | 163 | 75 | 3914 | 83 | 46 | 1987 | 78 | 397 | 4309 |
| 8 | 173 | 80 | 4146 | 73 | 44 | 1757 | 58 | 302 | 5027 |
| 9 | 176 | 86 | 4225 | 75 | 41 | 1789 | 55 | 303 | 4769 |
| 10 | 172 | 84 | 4118 | 78 | 43 | 1882 | 53 | 305 | 4562 |
| 11 | 173 | 83 | 4149 | 67 | 42 | 1619 | 52 | 302 | 4480 |
| 12 | 164 | 80 | 3941 | 135 | 79 | 3239 | 48 | 298 | 4139 |
| 13 | 192 | 86 | 4604 | 167 | 78 | 4008 | 49 | 308 | 4272 |
| 14 | 162 | 74 | 3877 | 164 | 78 | 3945 | 53 | 313 | 4545 |
| 15 | 165 | 80 | 3967 | 165 | 77 | 3951 | 52 | 309 | 4536 |
| 16 | 161 | 83 | 3869 | 160 | 77 | 3839 | 63 | 385 | 5442 |
| 17 | 157 | 71 | 3773 | 175 | 82 | 4189 | 76 | 364 | 4574 |
| 18 | 165 | 78 | 3955 | 189 | 80 | 4545 | | | |
| 19 | 164 | 81 | 3947 | 168 | 81 | 4033 | | | |
| 20 | 156 | 79 | 3743 | 165 | 81 | 3965 | | | |
| 21 | 162 | 74 | 3889 | 154 | 73 | 3694 | | | |
| 22 | 152 | 74 | 3637 | 143 | 60 | 3435 | 101 | 417 | 3601 |
| 23 | 151 | 70 | 3632 | 163 | 80 | 3913 | 77 | 417 | 3985 |
| 24 | 158 | 74 | 3795 | 185 | 86 | 4449 | 71 | 343 | 4963 |
| 25 | 162 | 80 | 3894 | 407 | 135 | 9756 | 72 | 302 | 3413 |
| 26 | 155 | 74 | 3717 | 245 | 110 | 5177 | 71 | 288 | 3156 |
| 27 | 159 | 83 | 3821 | 202 | 80 | 3481 | 75 | 294 | |
| 28 | 164 | 82 | 3939 | 198 | 75 | 4560 | 72 | 294 | |
| 29 | 156 | 78 | 3746 | 224 | 80 | 3349 | 76 | 404 | |
| 30 | 156 | 77 | 3751 | 186 | 58 | 1869 | 68 | 288 | |
| 31 | 193 | 84 | 4629 | 208 | 80 | 3068 | 52 | 291 | 4506 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Average** | 167 | 79 | 4013 | 169 | 78 | 3784 | 61 | 322 | 4363 |
| **Minimum** | 151 | 70 | 3632 | 67 | 41 | 1619 | 28 | 283 | 3156 |
| **Maximum** | 193 | 86 | 4629 | 407 | 142 | 9756 | 101 | 417 | 5442 |

# Appendix ii:
# Biofilter Monitoring Report

# Biofilter Monitoring

| Day | July | | | August | | | September | | |
|---|---|---|---|---|---|---|---|---|---|
| | Back Pressure | Moisture Content | pH | Back Pressure | Moisture Content | pH | Back Pressure | Moisture Content | pH |
| | kPa | % | -- | kPa | % | -- | kPa | % | -- |
| 1 | 669.8 | | | 718.3 | | | 665 | | |
| 2 | 668.7 | | | 699.9 | | | 701.3 | | |
| 3 | 773.9 | 43.47 | 7.99 | 697.6 | | | 685.8 | | |
| 4 | 714.9 | | | 701.6 | | | 714.7 | 44.86 | 7.87 |
| 5 | 694.3 | | | 712.4 | | | 811.4 | | |
| 6 | 680.1 | | | 719.4 | | | 727 | | |
| 7 | 679.3 | | | 722.3 | 44.49 | 7.79 | 733.9 | | |
| 8 | 677.8 | | | 711.6 | | | 733.9 | | |
| 9 | 671.5 | | | 707.4 | | | 721.5 | | |
| 10 | 684.9 | 39.45 | 7.87 | 811.5 | | | 710.9 | | |
| 11 | 679 | | | 796 | | | 700.9 | 39.37 | 7.71 |
| 12 | 714.6 | | | 823.5 | | | 692.3 | | |
| 13 | 713.5 | | | 697.2 | | | 745.4 | | |
| 14 | 768.6 | | | 677.3 | 44.77 | 7.71 | 798.7 | | |
| 15 | 747.3 | | | 656 | | | 766.9 | | |
| 16 | 757.6 | | | 685 | | | 708.4 | | |
| 17 | 746.7 | 36.11 | 7.88 | 921.2 | | | 714.5 | | |
| 18 | 736.4 | | | 795.3 | | | 705.3 | 41.07 | 7.69 |
| 19 | 773.3 | | | 761.9 | | | 704.9 | | |
| 20 | 822.1 | | | 780.7 | | | 704.9 | | |
| 21 | 752.3 | | | 809.3 | 41.28 | 7.84 | 700.3 | | |
| 22 | 705.9 | | | 747.5 | | | 684.2 | | |
| 23 | 716.1 | | | 715.9 | | | 688.3 | | |
| 24 | 735.7 | 46.77 | 7.87 | 724.5 | | | 693.4 | | |
| 25 | 740.7 | | | 697.3 | | | 671.2 | 45.49 | 7.94 |
| 26 | 737.3 | | | 727.9 | | | 671.2 | | |
| 27 | 727.8 | | | 727.4 | | | 674.9 | | |
| 28 | 727.4 | | | 706.4 | 41.68 | 8.07 | 668.4 | | |
| 29 | 713.7 | | | 708.9 | | | 672.3 | | |
| 30 | 718.7 | | | 670.2 | | | 686.1 | | |
| 31 | 738.1 | 38.28 | 7.94 | 665 | | | 665 | | |

| Day | October | | | November | | | December | | |
|---|---|---|---|---|---|---|---|---|---|
| | Back Pressure | Moisture Content | pH | Back Pressure | Moisture Content | pH | Back Pressure | Moisture Content | pH |
| | kPa | % | -- | kPa | % | -- | kPa | % | -- |
| 1 | 746.1 | | | 616.6 | | | 593.5 | | |
| 2 | 746.1 | 46.1 | 7.905 | 612 | | | 600.2 | | |
| 3 | 718.5 | | | 638.3 | | | 651.2 | | |
| 4 | 659.3 | | | 636.8 | | | 623.2 | 54.38 | 7.945 |
| 5 | 765.8 | | | 636.6 | | | 629.5 | | |
| 6 | 698.7 | | | 612 | 53.34 | 7.65 | 616.7 | | |
| 7 | 671.3 | | | 600.3 | | | 717.7 | | |
| 8 | 662.2 | | | 607.4 | | | 812.4 | | |
| 9 | 636.1 | 47.66 | 7.55 | 640.2 | | | 687.4 | | |
| 10 | 686.6 | | | 712 | | | 659 | | |
| 11 | 653.9 | | | 732.6 | | | 628.4 | 39.48 | 7.825 |
| 12 | 608.3 | | | 650.9 | | | 611.9 | | |
| 13 | 581.1 | | | 643.6 | 44.87 | 7.905 | 598.2 | | |
| 14 | 549.1 | | | 655.4 | | | 591.8 | | |
| 15 | 542.9 | | | 621.6 | | | 590.1 | | |
| 16 | 563.1 | 45.78 | 7.93 | 617.9 | | | 695.7 | | |
| 17 | 532.2 | | | 616.5 | | | 829.4 | | |
| 18 | 301.4 | | | 630 | | | 749.9 | 45.44 | 8.085 |
| 19 | 607.3 | | | 606.4 | | | 688.2 | | |
| 20 | 581 | | | 640.5 | 48.76 | 7.975 | 720 | | |
| 21 | 575.7 | | | 640.5 | | | 675.9 | | |
| 22 | 605.9 | | | 614.4 | | | 636.7 | | |
| 23 | 653.1 | 38 | 7.025 | 591.3 | | | 636.6 | | |
| 24 | 640.3 | | | 569.4 | | | 613.3 | | |
| 25 | 634.1 | | | 595.6 | | | 583.9 | | |
| 26 | 625 | | | 612.1 | | | 551.8 | | |
| 27 | 631.7 | | | 594.5 | 41.45 | 7.905 | 507.2 | | |
| 28 | 627.7 | | | 594.4 | | | 485.6 | | |
| 29 | 611.4 | | | 597 | | | 465.4 | | |
| 30 | 614.2 | 47.68 | 8.085 | 582.3 | | | 465.5 | | |
| 31 | 615.6 | | | 616.6 | | | 460.1 | | |

| Day | Jan | | | Feb | | | March | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Biofilter 1 | | Biofilter 2 | |
| | Back Pressure | Moisture Content | pH | Back Pressure | Moisture Content | pH | Back Pressure | Moisture Content | pH | Moisture Content | pH |
| | kPa | % | -- | kPa | % | -- | kPa | % | -- | | -- |
| 1 | 460 | | | 568.9 | | | 569.0 | | | | |
| 2 | 453.7 | | | 568.9 | | | 574.3 | 56 | 7.72 | 67 | 7.79 |
| 3 | 475.6 | | | 580.3 | | | 581.1 | 66 | 7.49 | 60 | 7.83 |
| 4 | 475.9 | | | 584.3 | | | 579.4 | 65 | 7.33 | 58 | 7.62 |
| 5 | 466.9 | | | 586.6 | 48.1 | 7.65 | 587.4 | 57 | 7.66 | 70 | 7.45 |
| 6 | 461.2 | | | 578.6 | | | 579.3 | 56 | 7.75 | 55 | 7.78 |
| 7 | 447.3 | | | 575.9 | | | 578.5 | | | | |
| 8 | 445.1 | 39.11 | 7.9 | 587.2 | | | 580.6 | | | | |
| 9 | 453.3 | | | 581.4 | | | 586.4 | 53 | 7.52 | 69 | 7.27 |
| 10 | 454.8 | | | 581.6 | | | 582.3 | 70 | 7.78 | 48 | 7.97 |
| 11 | 446.2 | | | 588.6 | | | 585.9 | 56 | | 48 | |
| 12 | 402.2 | | | 589.8 | 43.89 | 7.395 | 590.6 | 64 | 7.47 | 59 | 7.78 |
| 13 | | | | 594.2 | | | 591.4 | 57 | 7.51 | 50 | 7.56 |
| 14 | | | | 596.6 | | | 594.2 | 59 | 7.33 | 72 | 5.99 |
| 15 | 350 | 46.99 | 7.675 | 592 | | | 595.7 | 64 | 7.05 | 66 | 7.41 |
| 16 | 448.3 | | | 593.4 | | | 594.6 | 64 | 7.78 | 49 | 8.12 |
| 17 | 387.4 | | | 604.4 | | | 601.8 | 61 | 7.57 | 53 | 7.66 |
| 18 | 521.8 | | | 673.2 | | | 658.6 | 62 | 7.73 | 61 | 7.24 |
| 19 | 550 | | | 643.9 | 43.93 | 7.38 | 643.9 | 68 | 7.46 | 52 | 7.64 |
| 20 | 545.8 | | | 628.8 | | | 634.1 | 58 | 7.60 | 46 | 7.43 |
| 21 | 537.5 | | | 653.9 | | | 639.3 | 45 | 7.24 | 53 | 6.06 |
| 22 | 529.8 | 41.48 | 7.665 | 712.6 | | | 652.5 | 57 | 7.54 | 66 | 6.98 |
| 23 | 527.1 | | | 687.1 | | | 738.6 | 52 | 7.49 | 57 | 7.63 |
| 24 | 542.6 | | | 662.2 | | | 666.7 | 61 | 7.61 | 50 | 7.86 |
| 25 | 545 | | | 659.2 | | | 657.1 | 61 | | 56 | |
| 26 | 559.1 | | | 645.9 | 45 | 7.715 | 656.4 | 62 | | 61 | |
| 27 | 575.5 | | | 639.7 | | | 645.1 | 59 | | 39 | |
| 28 | 568.5 | | | 635.6 | | | 636.0 | 61 | | 58 | |
| 29 | 577 | 52.61 | 7.44 | 645.1 | | | 642.0 | 55 | | 50 | |
| 30 | 569.7 | | | | | | 633.4 | 56 | | 47 | |
| 31 | 564.3 | | | | | | 639.1 | 57 | | 48 | |

| Day | April | | | | | May | | | | | June | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Backpressure | Biofilter 1 | | Biofilter 2 | | Backpressure | Biofilter 1 | | Biofilter 2 | | Backpressure | Biofilter 1 | | Biofilter 2 | |
| | Daily Ave | Moisture Content | pH | Moisture Content | pH | Daily Ave | Moisture Content | pH | Moisture Content | pH | Daily Ave | Moisture Content | pH | Moisture Content | pH |
| | kPa | % | - | % | - | kPa | % | - | % | - | kPa | % | - | % | - |
| 1 | 305.3 | 61 | | 57 | | 598.9 | 43 | 8 | 35 | 8 | 720.2 | 63.1 | 7.6 | 51.6 | 7.9 |
| 2 | 682.9 | 58 | 8 | 48 | 8 | 582.8 | 64 | 8 | 47 | 8 | 736.7 | 51.5 | 7.9 | 58.7 | 8.0 |
| 3 | 695.8 | 72 | 8 | 57 | 8 | 680.9 | 58 | 8 | 55 | 8 | 706.3 | 45.8 | 7.9 | 60.6 | 8.0 |
| 4 | 673.8 | 55 | 8 | 47 | 8 | 718.3 | 65 | 8 | 59 | 7 | 835.8 | 37.2 | 8.0 | 61.4 | 7.9 |
| 5 | 686.5 | 63 | 7 | 59 | 8 | 743.0 | 42 | 8 | 43 | 8 | 805.2 | 74.3 | 7.8 | 82.2 | 7.8 |
| 6 | 576.5 | 51 | 8 | 54 | 8 | 652.8 | 58 | 8 | 62 | 8 | 745.6 | 74.3 | 5.6 | 64.8 | 7.1 |
| 7 | 669.4 | 61 | 8 | 59 | 8 | 633.3 | 64 | 8 | 57 | 8 | 775.1 | 71.3 | 6.1 | 59.5 | 7.2 |
| 8 | 684.3 | 63 | 8 | 54 | 8 | 638.3 | 52 | 8 | 49 | 8 | 718.7 | 50.6 | 7.9 | 54.2 | 8.0 |
| 9 | 670.5 | 37 | 8 | 60 | 9 | 640.2 | 56 | 7 | 63 | 8 | 642.9 | 56.5 | 8.1 | 57.8 | 8.1 |
| 10 | 616.5 | 47 | 7 | 51 | 7 | 644.3 | 65 | 7 | 63 | 7 | 659.6 | 38.1 | 7.8 | 64.9 | 8.1 |
| 11 | 621.9 | 46 | 8 | 51 | 8 | 636.8 | 59 | 8 | 49 | 8 | 669.1 | 56.0 | 7.8 | 60.7 | 7.9 |
| 12 | 581.4 | 65 | 8 | 57 | 8 | 650.0 | 63 | 8 | 56 | 8 | 676.5 | 61.0 | 8.0 | 57.6 | 7.6 |
| 13 | 600.3 | 57 | 7 | 62 | 8 | 675.8 | 53 | 8 | 55 | 8 | 679.5 | | | | |
| 14 | 558.8 | 59 | 8 | 47 | 8 | 672.0 | 48 | 8 | 61 | 8 | 684.0 | | | | |
| 15 | 530.7 | 53 | 8 | 48 | 8 | 675.9 | 63 | 8 | 56 | 8 | 702.8 | 45.3 | 8.0 | 60.6 | 7.3 |
| 16 | 609.2 | 41 | 8 | 72 | 8 | 675.5 | 42 | 8 | 40 | 8 | 762.3 | 59.5 | 8.0 | 56.4 | 7.9 |
| 17 | 651.9 | 68 | 8 | 59 | 8 | 679.9 | 79 | 8 | 84 | 7 | 779.0 | 62.0 | 7.7 | 57.4 | 7.8 |
| 18 | 670.7 | 65 | 8 | 61 | 8 | 679.0 | 47 | 8 | 64 | 7 | 1011.5 | 54.7 | 7.7 | 46.0 | 8.1 |
| 19 | 662.6 | 56 | 7 | 59 | 8 | 654.4 | 57 | 8 | 59 | 8 | 910.5 | 57.3 | 7.7 | 57.4 | 7.8 |
| 20 | 658.0 | 57 | 8 | 53 | 8 | 628.8 | 62 | 8 | 62 | 8 | 848.9 | | | | |
| 21 | 611.5 | 45 | 8 | 39 | 8 | 622.8 | 63 | 8 | 49 | 8 | 831.4 | | | | |
| 22 | 615.3 | 65 | 8 | 58 | 8 | 623.8 | 48 | 8 | 54 | 7 | 726.4 | 68.5 | 8.0 | 46.7 | 8.1 |
| 23 | 586.7 | 59 | 8 | 60 | 8 | 624.7 | 46 | 8 | 60 | 7 | 710.8 | 61.8 | 7.7 | 49.9 | 8.0 |
| 24 | 615.0 | 58 | | 37 | | 642.1 | 48 | 7 | 58 | 7 | 753.2 | 50.9 | 8.0 | 53.4 | 8.0 |
| 25 | 627.7 | 63 | 7 | 61 | 8 | 813.3 | 63 | 8 | 42 | 8 | 769.2 | 55.9 | 7.6 | 55.2 | 7.9 |
| 26 | 632.1 | 61 | 8 | 54 | 8 | 678.7 | 55 | 8 | 55 | 8 | 741.3 | | 7.7 | 48.3 | 7.8 |
| 27 | 646.1 | 66 | 8 | 67 | 8 | 685.3 | 52 | 8 | 58 | 8 | 737.2 | | | | |
| 28 | 657.0 | 55 | 8 | 58 | 8 | 705.6 | 54 | 8 | 47 | 8 | 755.5 | | | | |
| 29 | 563.2 | 56 | 8 | 50 | 8 | | | | | | 828.8 | | | | |
| 30 | 609.9 | 69 | 8 | 66 | 8 | | | | | | 770.2 | | | | |
| 31 | 305.3 | 61 | | 57 | | | | | | | 720.2 | 63.1 | 7.6 | 51.6 | 7.9 |

Veolia Water Australia and New Zealand

# Western Wastewater Treatment Plant

# Annual Biofilter Assessment Report – December 2019

# Control Sheet

**DOCUMENT TITLE**: Western Wastewater Treatment Plant Annual Biofilter Assessment Report – December 2019

**PREPARED BY:** Ticha Mundra

**REVIEWED BY:** Phil Love

**AUTHORISED BY:** Stuart Pearce

## DOCUMENT CONTROL REGISTER

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|---|---|---|---|
| 1 | Final | 19/12/2019 | First issue - Assessment Report |
| | | | |
| | | | |

# Annual Biofilter Assessment Report

# WESTERN WASTEWATER TREATMENT PLANT

## Table of Contents

## 1. Introduction

This report is undertaken to comply with the requirements of Condition 4 of Resource Consent WGN060283 [25230].

To minimise the impact of operation of the Western Treatment Plant (WTP) on its surroundings a biofilter is used to clean the air before discharge to the atmosphere. The biofilter bed consists of moistened Compost, lime and bark mixture which will encourage biological growth and ensure maximum odour is removed.

Odorous areas of the plant are covered to prevent the odour spreading throughout the plant. Two centrifugal fans are used to extract the foul air from the building via fibreglass ducting to the two biofilters approximately 80 metres away.

A water sprinkler system maintains the moisture levels within the filter beds, any excess water flows to the drain water traps and then to the sewer. The sprinkler system is operated from a timer of which the frequency is controlled by the site operator, dependant on the climate conditions.

## 2. Legal Framework

**Condition 4 of Resource Consent WGN060283[25230] states:**

*The permit holder shall undertake a comprehensive assessment of the quality of the biofilter media on an annual basis (or more frequently if appropriate).*

*The results of this assessment, including a summary of the findings, details of any action(s) to be taken to improve the efficiency of the biofilter, and a timetable for those actions to be undertaken, shall be submitted to the Manager, Environmental Regulation, Wellington Regional Council within one month of the assessment being undertaken.*

*Actions to be undertaken may include, but are not limited to:*

*a) Turning, restructuring and dampening of the bed material,*

*b) the addition of supplementary bed material, or*

*c) total bed material replacement.*

*The first assessment shall be undertaken within three months of the granting of this permit. Subsequent assessments shall be undertaken annually thereafter.*

# 3. Media Assessment

## 3.1 General

Ticha Mundra carried out the media assessment on the 12th November 2019.

The weather conditions at the time of the assessment were clear with a light Northerly wind of 1 – 2 knots, and an ambient air temperature of 12 Degrees Celsius.

The process involved the determination of biofilter cell effective media depth, media temperature and the collection of media samples for pH, moisture content and total bacteria count analysis**.**

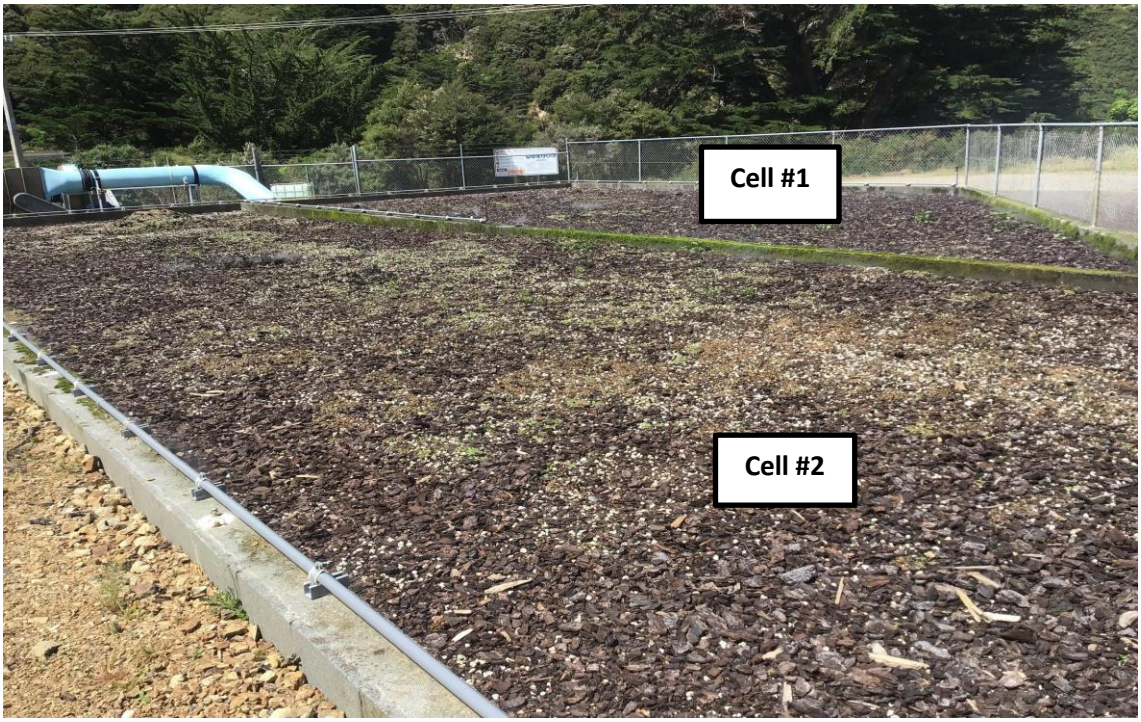


Figure 1 Western Wastewater Treatment Plant Biofilters

## 3.2 Effective Media Depth

The depth of the media is an indicator of how it has slumped over time.

Cell 1:

In 2015 at the time of installation the media consisted of a 75% 25-50mm bark nuggets, 20% compost and 5% Agrilime mix, the compaction ratio was 1.3 and the voids where 35% with a finished level equal with the top of the filter surround. Which give a media treatment depth of 1.3m.

Over time there has been slight settlement of approximately 0.05m.

Cell 2:

The 25mm bark chip media has been in place since 2011. In late 2015 eight cubic metres of 15mm agrilime was mixed into the media to raise the pH, and improve the void percentage. Pre-lime inclusion, the void test indicated 12.9%, and post lime, the newly mixed media indicated 18% voids.

On the day of this inspection the bed media was showing limited slumping from the previous year. There was still a good distribution of lime and no indication of short circuiting.

## 3.3 Media Temperature

The temperature of the biofilter media is measured using analog display thermocouple thermometers, which are inserted approximately 1 metre into the biofilter media bed, at a depth of 300mm to 400mm

On the day of the assessment, Cell #1 and #2 both indicated a temperature of 14 Deg/C.

**Figure 2**: shows the positions of the temperature probes in relationship to the biofilters, the temperature probes give a constant reading, however it is not trended on the SCADA.

Figure 2 Temperature Probe locations

## 3.4 Media Descriptions and Samples

Media condition assessment included an assessment of the media itself and also an examination of the biofilter surface to look for any signs of short circuiting. On the 12th December 2019 a total of two media samples were collected from the centre of the biofilter cells at depths of 100 mm. Samples were delivered to the laboratory for pH, moisture content and total bacteria count on the day of collection.

### 3.4.1 Cell 1 Description

**Figure 3**: Depicts Cell 1 of the biofilter. The cell consisted of 25-50mm bark nuggets with 20% top quality compost and 5% agricultural lime. There a small amount of weed growth over the surface of the biofilter mostly concentrated on the north east corner on the day of the inspection.
Regular testing throughout the year for pH, moisture and aerobic plate count indicated no areas of concern.

Figure 3 Cell 1 Biofilter Media Sample Point

### 3.4.2 Cell 2 Description

**Figure 4**: Depicts Cell 2 of the biofilter. This cell consisted of 25mm bark nuggets partially degraded since 2011 and had been boosted by the inclusion of more lime nuggets in December 2015. The cell was turned completely in 2016 right down to the blinding layer.

On the day of the assessment there was no indication of short circuiting and no rogue odour was detected. The weed growth on top is more substantial than cell 1 and the thicker areas of weed appeared to have less smoke passing through during the test as shown in figure 8 (page 12). This did not appear to have any deleterious effect on treatment.

Figure 4 Cell 2 Biofilter Media Sample Point

### 3.4.3 Media Sample Results

**Table 2** below presents the results of the pH, moisture content and total bacteria count analysis from Cells 1 and 2 at a media depth of 100mm. The analysis was performed by Eurofins ELS Ltd, an IANZ accredited laboratory, using the following methods:

**Table 1: Analytical methods used**

| Test | Methodology | Detection limit |
|---|---|---|
| pH | Soil Suspension /ph Meter. ANZECC GUI 624.131.37 | 0.1 |
| Moisture | APHA online Edition Method 2540 B.A)AC 20th Edition (online version) 950.46B(a) | 0.1% |
| Aerobic Plate Count @ $35^{O}C$ | APHA-Compendium,4thE,Ch6.331, 7&23:2001 | 10 Cfu/g(mL) |

**Table 2: Biofilter Media Analytical results**

| Cell No. and Depth | pH | Moisture Content (% by weight) | Aerobic Plate Count @ $35\ ^{0}C$ (Cfu/g) |
|---|---|---|---|
| Cell 1 100mm | 7.8 | 64.8 | 13000 |
| Cell 2 100mm | 8 | 60.7 | 35000 |

Overall the varying results do not create a problem as the biofilter still successfully treats the foul air from the building and there is no foul air discharge from either Cell.

## 4. Smoke Test

On the day of the assessment a smoke test was performed to verify that negative pressure is maintained throughout the system. **Figures 5, 6, 7** and **Figure 8** illustrate the smoke test process.

Figure 5 Demonstrates the smoke introduced into the building by a smoke machine in the centrifuge room.

Figure 6 Demonstrates the smoke evacuating from the skip bay via the ducting to the biofilter.

Figure 7 Cell 1 smoke test

Figure 8 cell 2 smoke test

Due to the operational maintenance and the innovative air lateral plenum system installed, cell #1 in 2015 and cell #2 2011, the air extraction from the building is noticeably reducing the risk of odour and corrosion to assets. The biofilters #1 and #2 are treating the odourous foul air from the building as required by the consent.

## 5. Complaints

No odour complaints to-date received during 2019.

## 6. Operating regime

At present, both cells are in operation treating the building foul air before discharge to the atmosphere.

## 7. Monitoring regime

In addition to weekly visual checks, Veolia actively monitors the moisture content and pH on a weekly basis and will adjust the watering rate of the biofilter, particularly over the winter months.

## 8. Summary

- Since the assessment in 2018 the aerobic plate counts have remained constant to indicate good treatment performance in both cells.
- The bed media in both cells showed limited / sight slumping from the previous year.
- No indication of short circuiting from either cell.
- The building smoke test performed verifies that negative pressure is maintained throughout the system.
- Overall both cells are treating the foul building odour.
- No Odour complaints were received during the year of 2019.
- Bio filter water spray system refurbished.

## 9. Appendix A – Bio filter analytical report

eurofins | ELS

Eurofins ELS Limited

Veolia Water - Wellington
PO Box 3253
WELLINGTON 6140
Attention: Stuart Pearce

**Analytical Report**

Report Number: 19/66982
Issue: 1
18 December 2019

| Sample | Site | Map Ref. | Date Sampled | Date Received | Order No. |
|---|---|---|---|---|---|
| 19/66982-01 | Western Biofilter | WESSF11A | 12/12/2019 11:00 | 13/12/2019 10:20 | W |

Notes: Side 1

| | Test | Result | Units | Test Date | Signatory |
|---|---|---|---|---|---|
| 0087 | Moisture | 64.8 | % | 17/12/2019 | Marylou Cabral KTP |
| 0780 | pH | 7.8 | | 18/12/2019 | Marylou Cabral KTP |
| M1300A | Anaerobic Plate Count | 13,000 * | cfu/g(mL) | 13/12/2019 | Juana Tamayo KTP |

**Comments:**

* Not an accredited test.

Sampled by customer using ELS approved containers.

**Test Methodology:**

| Test | Methodology | Detection Limit |
|---|---|---|
| Moisture | APHA Online Edition Method 2540 B. AOAC 20th Edition (online version) 950.46 B(a). | 0.1 % |
| pH | Soil Suspension(pH Meter. ANZECC GUI 624.121.27. | 0.1 |
| Anaerobic Plate Count | APHA-Compendium,4thE,Ch8.331,7&23.2001 | 10 cfu/g(mL) |

Unless otherwise stated, all tests are performed in Wellington.
The laboratory is not responsible for the information provided by the customer which can affect the validity of the results.
"<" means that no analyte was found in the sample at the level of detection shown. Detection limits are based on a clean matrix and may vary according to individual sample.
g/m3 is the equivalent to mg/L and ppm.
Samples will be retained for a period of time, in suitable conditions appropriate to the analyses requested.

Report Released By
Rob Deacon

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

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Page 1 of 1
Report Number: 19/66982-1 ELS
18 December 2019 14:22:51

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# Eurofins ELS Limited

## Analytical Report

Veolia Water - Wellington
PO Box 3253
WELLINGTON 6140
Attention: Stuart Pearce

Report Number: 19/66985
Issue: 1
18 December 2019

| Sample | Site | Map Ref. | Date Sampled | Date Received | Order No. |
|---|---|---|---|---|---|
| 19/66985-01 | Western Biofilter | WESSF11A | 12/12/2019 11:00 | 13/12/2019 10:20 | W |

Notes: Side 2

| | Test | Result | Units | Test Date | Signatory |
|---|---|---|---|---|---|
| 0087 | Moisture | 60.7 | % | 17/12/2019 | Marylou Cabral KTP |
| 0780 | pH | 8.0 | | 18/12/2019 | Marylou Cabral KTP |
| M1300A | Anaerobic Plate Count | 35,000 * | cfu/g(mL) | 13/12/2019 | Juana Tamayo KTP |

**Comments:**

* Not an accredited test.

Sampled by customer using ELS approved containers.

**Test Methodology:**

| Test | Methodology | Detection Limit |
|---|---|---|
| Moisture | APHA Online Edition Method 2540 B. AOAC 20th Edition (online version) 950.46 B(a). | 0.1 % |
| pH | Soil Suspension/pH Meter. ANZECC GUI 624.131.37. | 0.1 |
| Anaerobic Plate Count | APHA-Compendium,4thE,Ch8.331,7&23:2001 | 10 cfu/g(mL) |

Unless otherwise stated, all tests are performed in Wellington.
The laboratory is not responsible for the information provided by the customer which can affect the validity of the results.
"<" means that no analyte was found in the sample at the level of detection shown. Detection limits are based on a clean matrix and may vary according to individual sample.
g/m3 is the equivalent to mg/L and ppm.
Samples will be retained for a period of time, in suitable conditions appropriate to the analyses requested.

Report Released By
Rob Deacon

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# Appendix iii:
# Western Treatment Plant: Annual Outfall Pipeline Report

Wellington Water

# Annual Report:
# Western Treatment Plant:

## Outfall pipeline maintenance. 1st August 19 to 31st July 20

**Condition 23 of Consent No. WGN060283 [35255]**

Our water, our future.

## Contents

# 1 Introduction

This report details the maintenance works undertaken on the Western Treatment Plant outfall pipeline as part of condition 23 of the resource consent WGN060283 [35255] and covers the period between 1st August 2019 to 31st July 2020. Figure 1 below is a copy of condition 23 for reference.

The outfall pipeline is 6.25km long, whose alignment generally follows the Karori stream. It is an ageing concrete pipeline, having been built in the 1930's. Over the past year the 381mm inner diameter pipe carried on average between 50-200$m^3$/hour of treated effluent from the treatment plant to discharge into the Cook Strait. A plan detailing its alignment, including reference chainage, is found in Appendix 1.

Because the majority of the pipeline is adjacent and accessed via the stream, there are corresponding Resource Consents to enable pipeline maintenance. These consents have been changed in 2017 year a hearing relating to the removal of the section regarding the renewal of the pipeline by 2023. The original consent WGN160340 [34178] & [34179], and subsequent changes in WGN060283 [35255], permits both land use consent to undertake works in the Karori Stream bed and water use consent to temporarily and permanently divert the flow of water. All maintenance works on the outfall pipeline are done in accordance with the associated Management and Monitoring Plan. Example photos of the various maintenance works are found in Appendix 2.

**Figure 1 Copy of Condition 23**

23. The permit holder shall submit an **annual report** for the main outfall pipeline, which addresses activities undertaken during the previous year, to the Manager, Environmental Regulation, Wellington Regional Council and members of the CLG, by 31 July each year.

    This report shall include, but not be limited to, the following elements:

    a) details of the location, extent and duration of any leakage or faults, and the timing, nature and success of remedial action taken to remedy the leaks or faults;

    b) details of any other works (including any repairs and replacements) undertaken during the past year; and

    c) any work planned in the next 12 months to repair or replace the pipeline.

# 2 General Pipe Repairs between 1st August 2019 to 31st July 2020

## Following Annual Inspection January 2019

On 30th January 2019 the Western Treatment Plant main outfall pipe was inspected as part of scheduled annual maintenance. Table 1 below is the list of items found relative to the pipeline itself. All leaks were minor and occurred either at a join in pipe sections or at a manhole connection.

Only the above ground sections totaling approximately 2370m long, were inspected for condition and leakage. The remaining buried sections, totaling approximately 3880m in long, were not inspected but water samples were taken where feasible where there were indicators for potential leakage.

Table 1.

| No. | Chainage | Comments | Actions | Photos (before) | Photo (after) |
|---|---|---|---|---|---|
| 1 | 1300 | Leaking manhole structure | Seal manhole structure to stop leak |  | No photo provided |

| | | | | | |
|---|---|---|---|---|---|
| 2 | 4175 | Pipe was displaced from manhole structure | Reattach pipe to manhole structure and seal to stop leak |  |  |
| 3 | 6200 | Cavity forming in Manhole Structure, causing pipe to leak | Sealed manhole structure |  |  |

| | | | | | |
|---|---|---|---|---|---|
| 4 | 6150 | Major leaking in pipe, erosion under pipe with plants growing through concrete structure | Reestablish bank and sealed pipe |  |  |
| | | | | | |

## Track Repairs

Maintaining access via the stream crossing is undertaken between the outfall end (ch0) and ch 4000, where vehicle access is possible. This work was carried out from Sept-Dec 2019.

## Stabilization Works

Stabilization works were completed at chainages 6150. Scouring of the bank beneath the manhole structure at 6150 required stabilization of an approximate 2 metre long by 1 metre high section of bank. The scouring issue was addressed by the placement of boulders.

## Vegetation Clearance Works

Vegetation has been cleared where needed to carry out maintenance activities to pipeline during Sept-Dec 2019.

## Summary of Operational Programming

Bulleted below is the timeline summary of works completed leading up to and over this period, and in around other priority works across the wellington region;

- Sept-Dec 2019. Repairs and track works identified during the 2018-19 annual walkover were carried out.
- 24th/25th June 2020. Annual walkover completed
- 25th-30th June 2020. Track works identified during annual walkover begins

# 3 Planned Works for 1st August 2020 to 31st July 2021

The list below summarizes the planned works for the upcoming year, as identified during the annual walkover on 24th/25th June 2020:

- Complete the minor leak repairs as deferred to July/August 2020.
- Inspect the surge chamber at ch100.
- Inspection of tunnels at ch1350-1500 and 4400-4450.
- Complete track repair works
- Complete vegetation clearing
- Clear debris away from pipe bridge supports in stream

Table 2 on the following page offers an overview of each issue/repair that has been identified.

Table 2 Faults identified from the annual inspection for above ground sections of pipe

| **No.** | **Chainage** (m) | **Comments** | **Actions** | **Photo** |
|---|---|---|---|---|
| **1** | **160** | **Surge Tank at Outfall needs to be checked** | **Check surge tank using digger, tracks will need to be cleared to allow digger access. This will be weather permitted.** |   |

| | | | | |
|---|---|---|---|---|
| **2** | **180** | **Possible minor leak from pipe structure, no sample taken as flow insufficient.** | **Further inspection required to determine if this is seepage or sewer leak.** |  |

| | | | | |
|---|---|---|---|---|
| **3** | **200** | **Possible minor leak from pipe structure, no sample taken as flow insufficient.** | **Further inspection required to determine if this is seepage or sewer leak.** |  |

| | | | | |
|---|---|---|---|---|
| **4** | **850** | **Manhole lid is not secure** | **(Optional) Replace existing manhole lidcover at the Outfall flow meter with a hinged lid for easier access** |  |
| **5** | **900** | **Debris has accumulated around pillars, this could cause the stream to change direction. In turn concentrating the flow and could scour out the bank resulting in the pipe structure being undermined within the bank.** | **In the stream, gravel needs to be redistributed to form a larger channel to better distribute flow across the whole stream span back to its normal path.** |  |

| | | | | |
|---|---|---|---|---|
| | | | |  |
| | **1300** | **Vegetation is blocking tunnel exit** | **Remove vegetation and debris around tunnel exit.** |  |

| | | | | |
|---|---|---|---|---|
| **6** | **1500** | **Gravel has accumulated around entrance to tunnel** | **Remove and clear gravel and debris around tunnel entance.** |  |
| **7** | **1580** | **Possible minor leak from pipe structure, no sample taken as flow insufficient. Vegetation needs clearing** | **Further investigation required to determine if this seepage or sewer leak.** |  |

| | | | | |
|---|---|---|---|---|
| **8** | **1650** | **Possible minor leak from pipe structure, no sample taken as flow insufficient** | **Further investigation required to determine if this seepage or sewer leak.** |  |
| **9** | **1860** | **Vegetation growing on manhole, possible leak from manhole structure** | **Clear vegetation from manhole structure. Further investigate whether structure leaking** |  |

| | | | | |
|---|---|---|---|---|
| **10** | **1880** | **Vegetation growing on manhole, possible localised scouring** | **Clear the vegetation around the manhole and fill in localised scouring to restablise bank.** |  |
| **11** | **1900** | **Pipe Undermined for 1.5m** | **Evaluation of the pipe has deemed inconsequential disruption to the integrity of the pipe. structure. This will be monitored .** |  |

| | | | | | |
|---|---|---|---|---|---|
| **12** | **1920** | **Slip on pipe, looks to be historical. With no sign of leaks or disturbance to the integrity of the pipe structure.** | **This is to be monitored.** |  | |
| **13** | **2150** | **Joint mortaring has flaked off on exposed section of pipe. This has no impact on the pipe integrity with the pipe joint still in place.** | **No further action required.** |  | |

| | | | | |
|---|---|---|---|---|
| **14** | **2450** | **Weeping manhole structure, the seepage flow was insufficient to be able to get sample.** | **Further investigation required to determine if this is pipe leaking or natural seepage.** |  |
| | **3050** | **Access track washed away, needs re-establishing** | **Suitably restablish track.** |  |

| | | | | |
|---|---|---|---|---|
| | **3150-3500** | **Vegetation covering length of above ground pipe section** | **This section needs to be cleared to allow access to pipe for inspection** |  |
| **15** | **3590** | **Weeping manhole structure, the seepage flow was too insufficient to get sample.** | **Further investigation to determine if it is natrual seepage or pipe leak.** |  |
| | **3750** | **Large potholes in track** | **The track to be suitably reinstated.** |  |

| | | | | |
|---|---|---|---|---|
| **16** | **4200** | **Debris has built up on bridge pillars** | **Remove debris infron of pillars to prevent future stream scour out.** |  |
| **17** | **4300** | **Manhole structure potentially has a minor localised leak, flow is too insufficient to take sample.** | **Further investigation required to determine if this is natural seepage or pipe leak.** |  |

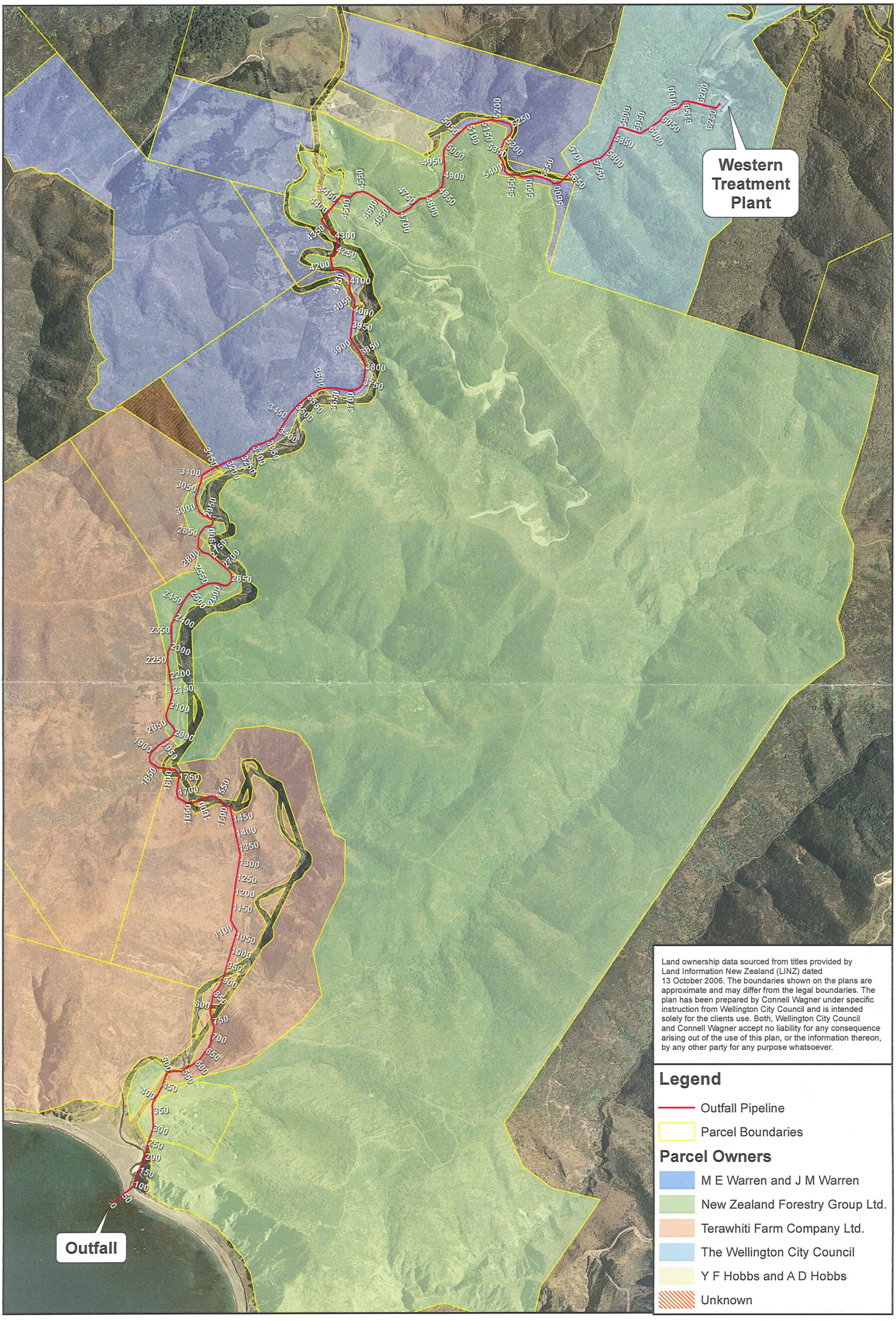
| | | | | |
|---|---|---|---|---|
| **18** | **4325** | **Fallen logs blocking access to pipeline and high rainfall could have potential to cause damage to pipe structure.** | **Remove logs and other vegetation.** |  |
| **19** | **4550** | **Section is being undermine. This slip looks to have stabilised itself over time with rock underneath the historic washout.** | **To monitor for any further movement or washout.** |  |

| | | | | |
|---|---|---|---|---|
| **20** | **6100** | **Manhole structure possibly leaking @ 5l/min. This looks as though the leak is starting to scour out bank.** | **Organise immediate repair and clear debris. Once debris cleared determine methodology to stablise bank.** |  |
| **21** | **6250** | **Vegetation buildup at foot of pillar** | **Clear vegetation around pillar.** |  |

*Those not yet completed have been deferred to 2020-2021.

# Appendix 1

## Western treatment plant outfall pipeline plan




# Western Wastewater Treatment Plant Pipeline & Outfall

Absolutely Positively Wellington
Me Heke ki Pōneke Wellington City Council

Wellington Water

# Appendix 2

## Indicative Photos

| | |
|---|---|
|  |  |
| Placement of boulders to stabilize slip under pipeline ch4730. | Constructed stream crossing at ch4550 to enable boulder delivery to ch4730. |
|  |  |
| Example photo of digger working from gravel beach to expose buried leak. | Example of minor leak found under pipeline after vegetation cleared. |
|  |  |
| Before photo of minor slip debris ontop of encased pipe. | After photo of minor slip debris ontop of encased pipe. |


Photos of patching in manhole, mid works, at ch4220.

Photo of patching in manhole, post works, at ch4220.

Note the lush, green growth benath the manhole at ch5950. This is an indicator of a leak..

Photo of patching inside manholes ch5945 and ch5950s.

Photo of formed stream crossing at ch925.

Photo of typical vegetation clearance around outfall pipeline.

# Appendix iv:
# Western Treatment Plant: Annual Inflow and Infiltration Report FY2019/2020

## Condition (12)

The permit holder shall provide the Manager, Environmental Regulation, Wellington Regional Council with an annual report detailing what steps have and will be taken to reduce infiltration and stormwater ingress into the Karori sewerage network.

The report shall be submitted to the Manager, Environmental Regulation, Wellington Regional Council by 31 July each year and shall include, but not be limited to, the following information:

a) Details of works that have been undertaken and what these works are expected to achieve;
b) An indication of when any ongoing works will be completed;
c) Details of any investigations undertaken with regard to inflow and infiltration in the Karori catchment; and
d) Details of any works or investigations planned for the next financial year.

Note: One annual inflow and infiltration report may be submitted to the Manager, Environmental Regulation, Wellington Regional Council to meet the requirements in this regard of permits WGN060283 [25226], [25227], [35674] and [25229].

# Inflow and Infiltration Report

A variety of mitigation measures have been undertaken to reduce inflow and infiltration (I/I) and to contain wastewater within the reticulated wastewater network. This work aims to reduce the demand on the Western WWTP and to also improve waterway health. Sections a,b,c and d of Condition 12 are addressed below for the various activities or work programs relating to inflow and infiltration.

### Inflow Surveys

Inflow Surveys have been undertaken in 2018-2019 for two Karori Sub-Catchments referred to as 18SK and 400SK. These sub-catchments were identified from an initial Rainfall Derived Inflow and Infiltration (RDII) assessment utilising short term flow monitoring data.

In 2019-2020 faults have been followed up on and are in the process of being finalised with private property owners. The final re-inspections for properties with outstanding faults are being undertaken in August 2020. The public faults identified from the inflow surveys are also being followed up on. These faults included manhole repairs and suspected public faults requiring further investigation to determine if maintenance or repairs are required.

The inflow surveys conducted utilise smoke testing and in some cases dye testing and CCTV which generally identify faults that contribute to inflow. In 2020-2021 there are plans to expand private property fault identification to include lateral testing utilising CCTV and hydrostatic methods for a sample of properties within Karori with the aim to identify faults in laterals which contribute to infiltration.

Previous Inflow and infiltration investigations in the South Karori Road catchment identified stormwater entering the wastewater network through an overflow pipe outside 115 South Karori

Road which occurred in heavy rain events. Reflux valves were installed which assisted in reducing the number of overflows.

## Flow Monitoring and Rain Gauge Monitoring

There are currently two flow monitoring sites in the Karori catchment. Karori Class (WW35469) was installed in March 2019 and Karori Net (WW20420) was installed in January 2019. These flow monitors are expected to remain installed until June 2021 with the results utilised for measuring the effectiveness of inflow and infiltration reduction works.

There are two long term overflow monitoring sites at 62 South Karori Road and 115 South Karori Road. These overflow monitoring sites are part of the long term monitoring contract which will end in June 2021 and therefore reassessment of priority monitoring sites will be carried out to determine whether monitoring these sites will continue beyond June 2021.

There are currently two rain gauges monitoring data in Karori which include Kaiwharawhara Stream at Karori Reservoir and Karori Res RG at Montgomery Avenue.

## Wastewater Modelling

The Karori wastewater model is currently being utilised by modelling consultants to undertake an optioneering exercise and develop a Network Improvement Plan in 2020-2021.

## CCTV Inspections

There has been no planned CCTV works undertaken in the Wellington City Council area (including Karori) in 2019-2020. In 2020-2021 there are plans to reorganise the contract and to proceed with some planned CCTV work. At this stage it has not yet been determined which areas of WCC will be have CCTV carried out and whether the Karori Catchment will be nominated in the scope for 2020-2021.

## Stormwater and Wastewater Capital Projects

Table 1 below provides a summary of capital projects for wastewater (reticulation and trunk network) and stormwater assets that were undertaken in 2019-2020 or planned for 2020-2021. Ongoing operational work such as investigations and reactive maintenance and renewals are also carried out in addition to the planned work listed below.

*Table 1 - Capital Projects for Stormwater and Wastewater in the Western WWTP Catchment (Karori)*

| Activity | 2019/2020 | 2020/2021 |
|---|---|---|
| **Karori Stormwater** | • N/A | • Newcombe Cresent Stormwater |
| **Karori Wastewater** | • Upgrade of existing 1000 $m^3$ Storage Tunnel (expected completion Aug 2020) | • Relining of Wastewater Mains (approx. 1km) and manhole repairs |

# Appendix v:
# Western Treatment Plant: Karori Stream Monitoring

# Karori Stream at Friend Street

| Sample Date | Sample Time | Faecals | E. coli | Wind Direction | Weather |
|---|---|---|---|---|---|
| 5/07/2019 | 11:50 AM | 2200 | 2200 | S | Overcast |
| 25/07/2019 | 11:46 AM | 910 | 910 | Calm | Clear |
| 5/08/2019 | 2:30 PM | 2300 | 2300 | Calm | Clear |
| 20/08/2019 | 10:40 AM | 240 | 230 | N | Clear |
| 3/09/2019 | 11:10 AM | 510 | 510 | S | Clear |
| 19/09/2019 | 10:05 AM | 80 | 64 | N | Clear |
| 1/10/2019 | 12:00 PM | 1800 | 1800 | S | Overcast |
| 22/10/2019 | 12:20 PM | 580 | 570 | NW | Overcast |
| 1/11/2019 | 9:03 AM | 240 | 240 | SE | Clear |
| 15/11/2019 | 12:00 AM | 140 | 140 | NW | Clear |
| 13/12/2019 | 9:45 AM | 380 | 380 | Calm | Clear |
| 6/01/2020 | 11:35 AM | 320 | 320 | Calm | Clear |
| 28/01/2020 | 9:20 AM | 1400 | 1300 | N | Clear |
| 7/02/2020 | 11:10 AM | 210 | 210 | Calm | Clear |
| 27/02/2020 | 10:41 AM | 530 | 510 | N | Clear |
| 12/03/2020 | 9:56 AM | 430 | N/A | N | Overcast |
| 26/03/2020 | 8:05 AM | 2700 | N/A | N | Cloudy |
| 9/04/2020 | 7:40 AM | 8700 | N/A | S | Overcast |
| 23/04/2020 | 7:35 AM | 210 | N/A | N | Rain |
| 7/05/2020 | 7:06 AM | 650 | N/A | N | Clear |
| 21/05/2020 | 7:09 AM | 1100 | N/A | N | Overcast |
| 04/06/2020 | 7:15:00 AM | 4200 | N/A | N | Cloudy |
| 17/06/2020 | 7:16:00 AM | 1100 | N/A | N | Overcast |

# Karori Stream at Campbell Street

| Sample Date | Sample Time | Faecals | E. coli | Wind Direction | Weather |
|---|---|---|---|---|---|
| 5/07/2019 | 11:45 AM | 850 | 840 | S | Overcast |
| 25/07/2019 | 11:38 AM | 680 | 660 | Calm | Clear |
| 5/08/2019 | 2:20 PM | <4 | <4 | Calm | Clear |
| 20/08/2019 | 10:30 AM | 52 | 44 | N | Clear |
| 3/09/2019 | 11:05 AM | 2300 | 2200 | S | Clear |
| 19/09/2019 | 10:00 AM | 3900 | 3800 | N | Clear |
| 1/10/2019 | 11:50 AM | 1300 | 1000 | S | Overcast |
| 22/10/2019 | 12:30 PM | 160 | 160 | NW | Overcast |
| 1/11/2019 | 9:11 AM | 2900 | 2900 | SE | Clear |
| 15/11/2019 | 12:00 AM | 1200 | 1000 | NW | Clear |
| 13/12/2019 | 9:40 AM | 480 | 1300 | Calm | Clear |
| 6/01/2020 | 11:40 AM | 380 | 370 | Calm | Clear |
| 28/01/2020 | 9:13 AM | 670 | 140 | N | Clear |
| 7/02/2020 | 11:00 AM | 2100 | 2100 | Calm | Clear |
| 27/02/2020 | 10:37 AM | 880 | 870 | N | Clear |
| 12/03/2020 | 9:48 AM | 480 | N/A | N | Overcast |
| 26/03/2020 | 7:55 AM | 1400 | N/A | N | Cloudy |
| 9/04/2020 | 7:47 AM | 9700 | N/A | S | Overcast |
| 23/04/2020 | 7:45 AM | 3100 | N/A | N | Rain |
| 7/05/2020 | 7:15 AM | 480 | N/A | N | Clear |
| 21/05/2020 | 7:17 AM | 62 | N/A | N | Overcast |
| 04/06/2020 | 7:23:00 AM | 710 | N/A | N | Cloudy |
| 17/06/2020 | 7:23:00 AM | 1400 | N/A | N | Overcast |

# Karori Stream at South Karori Road

| Sample Date | Sample Time | Faecals | E. coli | Wind Direction | Weather |
|---|---|---|---|---|---|
| 8/07/2019 | 12:45 PM | 2100 | 2100 | S | Clear |
| 25/07/2019 | 10:20 AM | 790 | 790 | | |
| 5/08/2019 | 1:30 PM | 280 | 280 | Calm | Clear |
| 20/08/2019 | 11:00 AM | 420 | 420 | | |
| 3/09/2019 | 10:10 AM | 210 | 160 | S | Clear |
| 19/09/2019 | 8:30 AM | 240 | 190 | | |
| 1/10/2019 | 12:30 PM | 140 | 110 | S | Overcast |
| 22/10/2019 | 12:45 PM | 660 | 660 | | |
| 1/11/2019 | 9:25 AM | 170 | 170 | SE | Clear |
| 15/11/2019 | 12:00 AM | 410 | 410 | | |
| 13/12/2019 | 8:30 AM | 130 | 130 | | |
| 6/01/2020 | 10:50 AM | 4000 | 4000 | Calm | Clear |
| 28/01/2020 | 8:12 AM | 220 | 190 | | |
| 7/02/2020 | 10:20 AM | 240 | 240 | Calm | Clear |
| 27/02/2020 | 9:50 AM | 170 | 170 | | |
| 12/03/2020 | 9:15 AM | 250 | N/A | N | Overcast |
| 26/03/2020 | 8:13 AM | 430 | N/A | N | Cloudy |
| 9/04/2020 | 7:56 AM | 41000 | N/A | S | Overcast |
| 23/04/2020 | 7:51 AM | 200 | N/A | N | Rain |
| 7/05/2020 | 7:24 AM | 390 | N/A | N | Clear |
| 21/05/2020 | 7:29 AM | 110 | N/A | N | Overcast |
| 04/06/2020 | 7:32:00 AM | 700 | N/A | N | Cloudy |
| 17/06/2020 | 7:32:00 AM | 1500 | N/A | N | Overcast |

# Karori Stream at approximately 100 metres upstream of the Western Treatment Plant

| Sample Date | Sample Time | Faecals | E. coli | Wind Direction | Weather |
|---|---|---|---|---|---|
| 8/07/2019 | 12:30 PM | 88 | 65 | S | Clear |
| 25/07/2019 | 11:10 AM | 110 | 110 | Calm | Clear |
| 5/08/2019 | 1:50 PM | 24 | 24 | Calm | Clear |
| 20/08/2019 | 11:10 AM | 130 | 130 | N | Clear |
| 3/09/2019 | 10:25 AM | 12 | 12 | S | Clear |
| 19/09/2019 | 9:10 AM | 100 | 88 | N | Clear |
| 1/10/2019 | 12:20 PM | 100 | 88 | S | Overcast |
| 22/10/2019 | 12:55 PM | 120 | 120 | NW | Overcast |
| 1/11/2019 | 10:14 AM | 42 | 42 | SE | Clear |
| 15/11/2019 | 12:00 AM | 180 | 150 | NW | Clear |
| 13/12/2019 | 8:55 AM | 140 | 140 | Calm | Clear |
| 6/01/2020 | 11:05 AM | 65 | 46 | Calm | Clear |
| 28/01/2020 | 8:26 AM | 81 | 77 | N | Clear |
| 7/02/2020 | 10:45 AM | 120 | 120 | Calm | Clear |
| 27/02/2020 | 10:01 AM | 92 | 92 | N | Clear |
| 12/03/2020 | 9:26 AM | 140 | N/A | N | Overcast |
| 26/03/2020 | 8:28 AM | 110 | N/A | N | Cloudy |
| 9/04/2020 | 8:12 AM | 240 | N/A | S | Overcast |
| 23/04/2020 | 8:07 AM | 120 | N/A | N | Rain |
| 7/05/2020 | 7:36 AM | 300 | N/A | N | Clear |
| 21/05/2020 | 7:39 AM | 48 | N/A | N | Overcast |
| 04/06/2020 | 7:43:00 AM | 510 | N/A | N | Cloudy |
| 17/06/2020 | 7:53:00 AM | 980 | N/A | N | Overcast |

# Karori Stream at approximately 100 metres downstream of the Western Treatment Plant

| Sample Date | Sample Time | Faecals | E. coli | Wind Direction | Weather |
|---|---|---|---|---|---|
| 8/07/2019 | 12:34 PM | 210 | 180 | S | Clear |
| 25/07/2019 | 10:38 AM | 110 | 100 | Calm | Clear |
| 5/08/2019 | 2:05 PM | 32 | 32 | Calm | Clear |
| 20/08/2019 | 11:25 AM | 92 | 92 | N | Clear |
| 3/09/2019 | 10:40 AM | 8 | 8 | S | Clear |
| 19/09/2019 | 8:50 AM | 200 | 170 | N | Clear |
| 1/10/2019 | 12:10 PM | 84 | 64 | S | Overcast |
| 22/10/2019 | 1:10 PM | 58 | 58 | NW | Overcast |
| 1/11/2019 | 9:49 AM | 50 | 50 | SE | Clear |
| 15/11/2019 | 12:00 AM | 120 | 150 | NW | Clear |
| 13/12/2019 | 9:15 AM | 46 | 31 | Calm | Clear |
| 6/01/2020 | 11:20 AM | 62 | 58 | Calm | Clear |
| 28/01/2020 | 8:40 AM | 80 | 60 | N | Clear |
| 7/02/2020 | 10:35 AM | 88 | 72 | Calm | Clear |
| 27/02/2020 | 10:17 AM | 100 | 100 | N | Clear |
| 12/03/2020 | 9:36 AM | 140 | N/A | N | Overcast |
| 26/03/2020 | 8:41 AM | 210 | N/A | N | Cloudy |
| 9/04/2020 | 8:26 AM | 300 | N/A | S | Overcast |
| 23/04/2020 | 8:17 AM | 94 | N/A | N | Rain |
| 7/05/2020 | 7:49 AM | 290 | N/A | N | Clear |
| 21/05/2020 | 7:49 AM | 46 | N/A | N | Overcast |
| 04/06/2020 | 7:51:00 AM | 570 | N/A | N | Cloudy |
| 17/06/2020 | 8:07:00 AM | 950 | N/A | N | Overcast |