



Incident Investigation Report: Porirua Faecal Coliforms Non-Compliance (2,3,4 & 5 July 2024)

CONTROL SHEET

Document Title:	Investigation report_Porirua Faecal Coliforms non-compliance (2,3,4 & 5 July 2024)
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INCIDENT DETAILS

Date	2,3,4 & 5 July 2024
Location	Porirua WWTP
Description	According to Condition 35(A) of the Resource Consent WGN200229 [36816], Porirua WWTP became non-compliant with faecal coliforms count in the final effluent. The faecal coliforms were above 2000 cfu/100mL limit on 2,3,4 & 5th July 2024. The geometric means of daily results were 16125, 9487, 13964 and 5550 cfu/100mL respectively.
Cause	Increased pre-UV faecal coliform counts entering the UV system.
	Use of the TAK UV system as a duty system because of the mechanical issues with the Duron UV system effluent penstock.
Actions	Veolia and WWL are currently working with the contract company (Xylem) to solve the control system issue with Duron UV system
	Review of the scheduled cleaning frequency of TAK system to ensure optimal UV disinfection performance
	Change of the sampling regime with focus on using the Duron UV system.
Impacts	Breach of Resource Consent WGN200229 [36816], Condition 35(A)
	Potential contamination of the CMA that could impact human health.

TIMELINE

The following is a list of events and when they occurred:

5 June 2024
Duron UV system effluent penstock failed. TAK operation initiated during unmanned site hours
21 June 2024
TAK UV system lamps clean performed
1 July 2024
Rain event occurred resulting in high flows entering the plant and most likely in increased pre-UV faecal coliform counts
2 July 2024
Duron UV system lamps clean performed
2 July 2024
Daily results Geometric Mean exceeded limit of 2000 cfu/100 ml (16125 cfu)
3 July 2024
Daily results Geometric Mean exceeded limit of 2000 cfu/100 ml (9487 cfu)
4 July 2024
Daily results Geometric Mean exceeded limit of 2000 cfu/100 ml (13964 cfu)
5 July 2024
Daily results Geometric Mean exceeded limit of 2000 cfu/100 ml (5550 cfu)

ABSENT/FAILED DEFENCES

Duron and TAK UV system operation

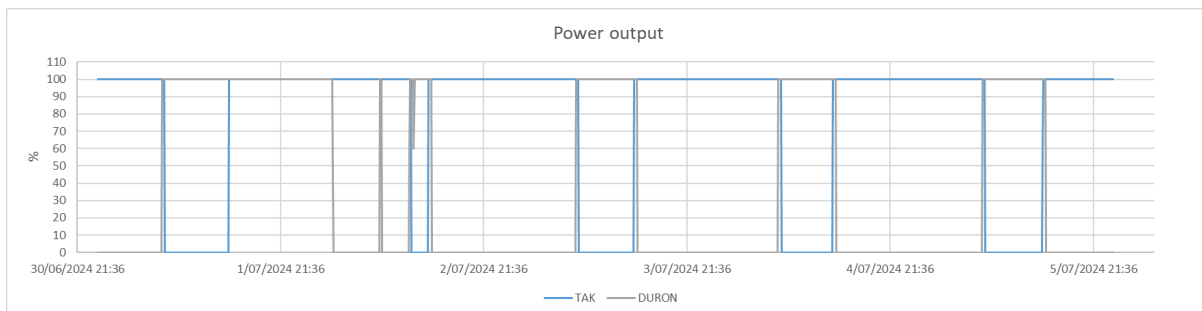
After technical issues with the Duron UV System effluent penstock on 5 June, the penstock i.e. operation of the Duron UV system was deemed unreliable. To minimise the risk of non-disinfected discharge, TAK UV system was put on duty during the times that the plant was unmanned and the Duron UV system has been in operation during the days when the site is manned.

Based on the data for the year 2024, there is a difference in the UV systems removal efficiency. Average log removal values are 3.2 and 2.2 for Duron and TAK UV systems respectively indicating lower disinfection performance of the TAK system.

To maintain consistent conditions during the samples collection, the sample is collected from the duty channel (TAK) and the UV system changeover is performed subsequently.

Both UV systems are operated with 100% output to provide maximum disinfection efficiency possible (see figure 1).

Figure 1 Power outputs for Duron and TAK UV systems



INDIVIDUAL - HUMAN FACTORS/TEAM ACTIONS

The preventive maintenance tasks dedicated to both UV systems have been performed as required.

As part of regular operational duties additional cleaning activities were performed in conjunction with the scheduled PM tasks.

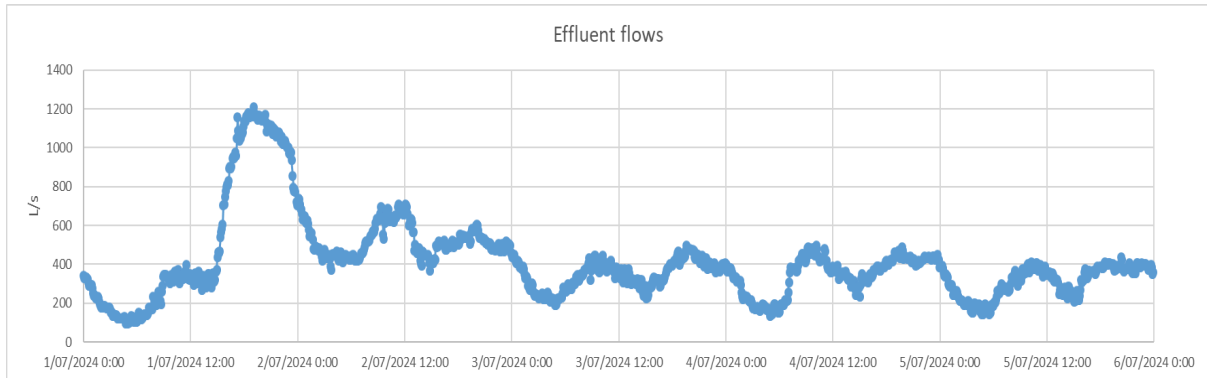
Training of the new operators has been ongoing since December 2023 and confidence in their skills and familiarity with daily tasks have been constantly increasing. No issues have been identified in the team actions.

PROCESS/QUALITY CONTROLS

Factors described below were considered to contribute to the increased faecal coliform counts.

Effluent flows

Figure 2: Faecal coliforms counts



A rain event that starting on 1 July 2024 caused increased flows entering the plant. The flows returned to the average range during the 3 July. During the rain period the average flow was 624 L/s with peak of 1200 L/s.

The UV channels operate in duty/assist systems. Once the flow exceeds 750 L/s, the assist channel is activated to maintain the required retention time/UV dose.

Effluent quality

Table 1: Effluent quality

Date	Total Suspended solids (g/m ³)	Biochemical Oxygen Demand- 5 days (g/m ³)	UVT- lab (%)
2/07/2024	6	8	53
3/07/2024	6	6	65
4/07/2024	6	4	65
5/07/2024	6	13	58

UV removal efficiency is directly dependent on the final effluent quality. Solids present in the wastewater absorb the UV light reducing the pathogens removal efficiency. Final effluent quality results for the period do not show a decrease in the effluent quality.

UV Transmittance

Effluent UVT is a parameter which provides information on the final effluent quality. As the UVT probe used for monitoring is located in the Duron system, it has not provided representative readings due to the channel's changeovers. Consequently, the values cannot be reliably used in this investigation. A separate investigation providing more details on the UVT probe operation is planned / currently underway .

UV disinfection system performance

Figure 3 shows pre-UV faecal coliform counts during the month of July. Orange line represents an average value for the year 2024 (201 269 cfu/100 ml).

Pre-UV faecal coliform counts are analysed twice a week (Tuesdays and Thursdays) and during the investigated period (2- 5 July) the average value was increased significantly which indicates higher demands on the UV disinfection systems.

Figure 3: Pre-UV coliforms

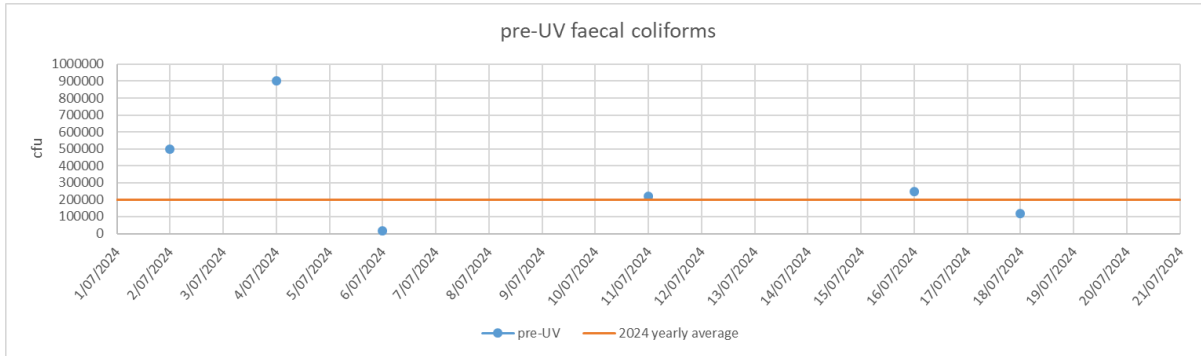


Table 2 provides a summary of results for pre-UV and post-UV faecal coliform counts and log removal calculations.

Table 2: Pre-UV coliforms

Date	pre-UV (cfu/100 ml)	pre-UV (cfu/100 ml)	Log removal
2/07/2024	500000	16125	1.5
3/07/2024		9487	
4/07/2024	900000	13964	1.8
5/07/2024		5550	

ORGANISATIONAL FACTORS

Maintenance

Regular cleaning of the UV lamps is necessary to maintain the required UV system performance.

The TAK UV system is currently an assist system and therefore its cleaning frequency is once a month. Last clean of the TAK system was performed on 21 June 2024 so that the performance of the UV system should not be impaired.

Status of the UV system and lamps in detail is reviewed once a week and recorded into the on-site sheet. Number of faulty lamps is recorded every Monday and this is done for the duty system. For the investigated period the percentage of faulty lamps was as follows:

Date	Duty UV system	Lamps not working (%)
01/07/2024	Duron	0
08/07/2024	TAK	9.7

It is important to note that the percentage of faulty UV lamps is a setpoint which triggers either Minor UV lamps fault or Major UV lamps fault alarm. None of these alarms have been triggered indicating that the number of faulty lamps are in acceptable range.

Training

There are two new operators employed at the Porirua site, who are currently undergoing on-site training. One of the organisational plans involves an ongoing extended training campaign for everyone in the operations and maintenance team. The training will create an ongoing learning process for the team and create a consistent approach to undertaking maintenance tasks which should minimise potential for human error while performing the tasks assigned.

Standard Operating Procedures (SOPs) are also being reviewed. The SOP for the cleaning of the UV has been added to the SOP register that covers the routines and all the necessary steps for the cleaning of the UV.

CORRECTIVE ACTIONS

The corrective actions to address the the Faecal Coliforms non-compliance are:

Corrective Action	Reference of issue on captured system or Defect raised	Responsibility	Measurement
Xylem engaged to return to site, run a full investigation on the cause of the Duron penstock fault and eliminate the cause so the Duron system can operate reliably.	The Duron system has been having technical issues which has been ongoing since the 26th of January 2024. The penstock issues were to be resolved initially by Xylem on the 12th but got delayed until the 15th of February 2024. Xylem fixed the penstock issue on the 15th.	Plant Coordinator	Rivo
TAK system refurbishment. TAK system condition assessment was conducted and quotations for refurbishment have been received. Proposal for WWL is being prepared	Lower removal efficiency compared to the Duron UV system	CAPEX	Project to be approved and completed
TAK System has been added to fortnightly) Preventive Maintenances	The TAK lamps were cleaned once a month since this UV system is not considered to be a duty system. However, because of the increased frequency of its use, the cleaning frequency shall be changed to fortnightly during the period the TAK UV system is used as a Duty system.	Northern Team Leader & Plant coordinator	Rivo documented - SoP record in BMS, and toolboxed to operations staff
Sampling while the Duron UV system is in operation	Results show that the Duron UV system has higher removal efficiency compared to the TAK system.	Northern Team Leader & Plant coordinator	Rivo documented - SoP record in BMS, and toolboxed to operations staff

CONCLUSION

- Due to the mechanical issues with the Duron UV channel effluent penstock, the TAK UV system has been used as a duty system during the hours when the plant is not manned.
- To maintain comparable conditions during the sampling, the sample is collected from the running TAK system and the switchover to Duron is performed subsequently.
- From the effluent parameters analysed, values of Suspended solids or BOD5 did not show any negative effect on the UV performance. However the pre-UV faecal coliform counts show elevated results compared to the average values.
- Additionally, the data analysis (year 2024) shows that the Duron UV system has a higher removal efficiency compared to the TAK UV system.
- Combination of the increased pre-UV faecal coliform counts and use of the UV system with lower removal efficiency were the contributing factors to the elevated counts in the final effluent