Investigation report - Porirua UV Bypass Event - 2 December 2024

CONTROL SHEET

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INCIDENT DETAILS

Date	2 December 2024
Location	Porirua Waste Water Treatment Plant (PWWTP)
Background	On 5, 16 and 17 June 2024 three discharges of undisinfected wastewater from PWWTP occurred. The latter two events were due to a disruption to power and having no back-up power supply to the UV systems. Consequently, on 7 October Greater Wellington Regional Council (GWRC) issued formal warnings for breaching section 15(1)(a) of the Resource Management Act 1991 and Resource Consent WGN200229 [36816] for the discharges on 16 June 2024 and 17 June 2024. The Advisory Notice was issued to Veolia, Wellington Water and Porirua City Council and set out five required actions and timeframes for compliance with these actions. Action item 4 was to Install and make operational a backup power supply to the UV treatment systems by 31 January 2025. A Waste Water Shutdown Plan (the Plan) was developed to support the necessary work and manage associated risks (WWTP Shutdown Plan - Wellington Water). In brief, the Plan (appended) noted that *'to install the three sensing fuses on the UV plant main switchboard, the power supply to the UV plant must be isolated*.' The Plan identified a number of risks which included a risk of partially treated but undisinfected discharges to the coastal marine area and land. Either discharge would be unconsented. The impact of all risks along with contingencies and mitigations for each risk were noted in the Plan.
Description	The Plan was finalised on 29 November 2024. Work to install a back-up power service was undertaken on 2 December. The aeration basin outlets were isolated and the three clarifiers were drained as far as possible. The original plan involved lowering the clarifier levels by 500mm but this was not possible. After the flow to the pre-UV channel ceased, the UV system was isolated and the power was shut down. This process took 45 min. Electrical works were completed by the subcontractor. While the Plan assumed storage (i.e. buffer) capacity of the aeration basin was 76 minutes, the inflows on the day saw the maximum safe level (as determined in the Plan) being reached within 60 minutes at approximately 06:10. The required electrical work was completed and Veolia instructed the subcontractors to restore power to the transformer supplying the UV system. As this work was being undertaken, Veolia recommenced flow to the clarifiers in a controlled manner. Water was also gradually supplied to the pre-UV channel from Clarifier #2 to start the UV systems. When power was restored to the UV systems at approximately 06:20, the TAK UV came online first since it could achieve the minimum required UV chamber water level before the Duron System would be operative. Its inlet penstock started to open allowing flow to enter the UV chamber.

	The Duron UV failed to start since the minimum UV chamber level could not be reached while its inlet penstock remained closed as per the control philosophy. When clarifier #1 started to provide flow to the UV system, this exceeded the available TAK UV capacity and increased the pre-UV channel level. This high inlet channel level triggered the bypass penstock opening at 06.47 to 9% of maximum for four minutes (i.e. until 06.51). During this time there was a bypass discharge to the coastal marine area via the outfall. It should be noted that this is the designed failsafe to prevent overflow that would result in a discharge to land. The discharge terminated when flows to clarifiers #1 and #2 were stopped. Once the discharge stopped, flows to clarifiers #1 and #2 recommenced in a controlled manner by increasing the splitter box penstocks incrementally to 20%. The Duron UV was brought online and took over duty from the TAK UV system as per Resource Consent condition 12B. Flows to the UV systems were gradually increased, but exceeded maximum capacity in the pre UV channel which activated the penstock opening at 07:09 to 14% of maximum for five minutes (i.e. until 07:14) and there was a second discharge to the coastal marine area via the outfall. During this time the Duron (system) was open at 100%. In response, flows to clarifiers #1 and #2 were, again, stopped and the bypass discharge ceased. After the bypass discharge terminated, flows to clarifiers #1 and #2 were recommenced at a slower rate. Flows to clarifier #3 was reinstated by removing four of the eight stopboards. Normal UV operation resumed thereafter.
Cause	The Plan's estimated timeframes for stopping and then controlling flows to the UV channels were found to be optimistic and these weren't able to be tested before the work commenced. The Plan assumed that draining of the clarifiers would allow a window / buffer of 76 minutes to stop flows to the UV channel, but on the day the penstock had to be opened after 60 minutes. Due to higher than normal aeration basin levels, the rate-of-opening of the splitter penstock that the operators are used to (usually in increments of 10%), resulted in unpredictable flow rates to the UV channel. Flows from the clarifiers to the pre UV channel exceeded the channel's capacity.

Actions	Prerequisites - no rain for the past 24 hours. - upstream pumping stations must shutdown at least 30mins prior to flow ceasing at the plant.
02:00	Pumping stations began draining down.
03.30	Plant operators on site. Toolbox and permit signatures, standby for pumping station isolation of pumps.
04:00	Pumping stations isolated pumps and ceased flow to Porirua WWTP
04.30	Operators gradually closed clarifiers #1 and #2 inlet Rotorks to 0%. All 8 inlet stopboards inserted for clarifier #3. TAK UV system placed in manual to prevent coming on duty. Duron and TAK outlet weir placed in manual to prevent modulation flows from the clarifiers. This ensured water stays in the UV channel for start-up later on. RAS pumps continued running as per usual. Flows to clarifiers were modulated such that levels are maintained around 200mm below weir level to stimulate normal hydraulics within the aeration basin and clarifiers. When the incoming flow to the pre-UV channel ceased, inlet penstock for Duron was closed. After the Duron UV inlet penstock was fully closed and flows to the effluent chamber stops, Duron UV was powered off.
05.15	Operations gave the go ahead, Northpower isolated the MCC breaker. Stewart Electrical proceeded to test isolations, install new cables onto breaker.
06:00	Operations noted that the levels in the aeration basin was approaching the high mark (dividing wall). Stewart Electrical was informed that work had to cease soon. They reported that the crucial works were almost done and the UV system can be put online soon.
06:00 - 06:25	Operations manually opened the inlet penstocks to clarifiers #1 and #2 to reduce the volumetric load in the aeration basin. This increases the buffer time until the UV systems could come online.
06:25	Northpower removed the electrical isolations.
06:30	Duron UV system could not turn on due to low levels in the channel. TAK UV system came online as per design philosophy when the Duron system failed.
06:40	TAK UV system intensity matured, Operations proceed to get clarifier 2 overflowing to supply effluent to the UV system. When clarifier #2 started overflowing, inlet penstock to TAK UV system was initiated to open. Subsequently, clarifier #1 also started overflowing effluent to the UV system.
06:47	Bypass discharge commences. Operations immediately closed the inlet penstocks to clarifiers 1 and 2 to stop flows.

06:51	Bypass discharge stops
06:52 - 07:08	Duron inlet penstock was manually opened to pre-fill the UV channel. That removed the low level fault on the system, allowing the Duron UV system to come online and take over duty from TAK UV system. During that time, inlet penstocks to clarifier 1 and 2 were opened back to 10%. After the Duron UV system normalised, operations opened inlet penstocks to clarifier 1 and 2 from 10% to 20% as part of normalising procedures.
07:09	Second bypass discharge commences. Operations immediately closed the inlet penstocks to clarifier 1 and 2 to stop flows.
07:14	Second bypass discharge stops.
07.15	Operations gradually opened the inlet penstocks to clarifiers #1 and #2 in 5% increments.
07.45	Stopboards to clarifier 3 were gradually removed 1 at time to normalise the clarifier operations.
09:00	Normal operations restored.
Impacts	Two short-duration discharges of partially treated but undisinfected wastewater to the coastal marine area. Breach of Resource Consent WGN200229 [36816], Conditions 12B and 12E

PROCESS/QUALITY CONTROL

This section provides an overview of the parameters monitored in the final effluent.

Data in table 2 provide results for BOD_5 and TSS concentrations in the final effluent. Periods prior to the undisinfected by-pass event are included to enable a comparison of the final effluent. Table 3 provides information on the pre and post UV Faecal coliforms concentration and shows no significant increase in the pre-UV stream before or after the by-pass event. UV transmissivity trends (Figure 1) show a decrease when the UV system was offline due to the power shutdown (2 December). Decrease below the 45% compliance limit was observed on 26 November and 1 December, however these decreases are explained in separate reports. Data show that at the day of the by-pass event, quality of the final effluent was good and the plant performed well.

Discharge volume

Normally, the flow and volume discharged through the by-pass are calculated using inlet flows and flows through the UV channels. Calculation is required because there is no flowmeter installed in the by-pass channel. This calculation is valid for situations where there is a continuous flow through the treatment plant. During the 2 December event, the inlet flow was retained and accumulated in the aeration basin and then gradually released through the UV channels. Because of the retention, the inlet/UV effluent calculation can't be used.

There is an old flowmeter in the effluent pipeline, which can not be accessed due to the surrounding terrain modifications. This flowmeter was deemed inaccurate and readings from the UV flowmeters are used for the compliance reporting instead. However for the purpose of this discharge, readings from this effluent meter were used.

The difference between the readings from the final effluent flowmeter (total) and readings provided by the UV flowmeters (disinfected) has been used to provide information on the flow through the by-pass.

Table 1 - Event Flow Data

Date d/m/y	Duration hrs:mins	Type of Discharge	Average Flow L/s	Peak Flow L/s	Total Volume of Discharge m^3	Consented Y/N	Cause	Monitoring Results
02/12/2024	00:04	by-pass	232	391.4	70	N	New generator connection project	Shoreline sampling done
02/12/2024	00:05	by-pass	185	348.8	67	N		

Final effluent compliance - Biochemical Oxygen Demand$_5$, Total Suspended Solids

Table 2 - Laboratory results and calculations of the final effluent BOD5 and TSS

Date	BOD_5			TSS		
	Daily results	90 days Geometric mean (30 mg/L)	90 days Percentile (90 mg/L)	Daily results	90 days Geometric mean (30 mg/L)	90 days Percentile (90 mg/L)
25/11/2024	20	14.9	28	19	9.7	16
26/11/2024	18	15.0	28	8	9.6	16
27/11/2024	15	15.2	28	15	9.6	16
28/11/2024	13	15.4	28	14	9.7	16
29/11/2024	15	15.4	28	8	9.5	16
30/11/2024	35	15.6	28	6	9.4	16
1/12/2024	21	15.8	28	6	9.4	16
2/12/2024	18	16.0	28	5	9.2	15.2

Pre-UV, post-UV Faecal coliforms and Enterococci

Table 3- Laboratory results for the pre-UV FC, post-UV FC and Enterococci

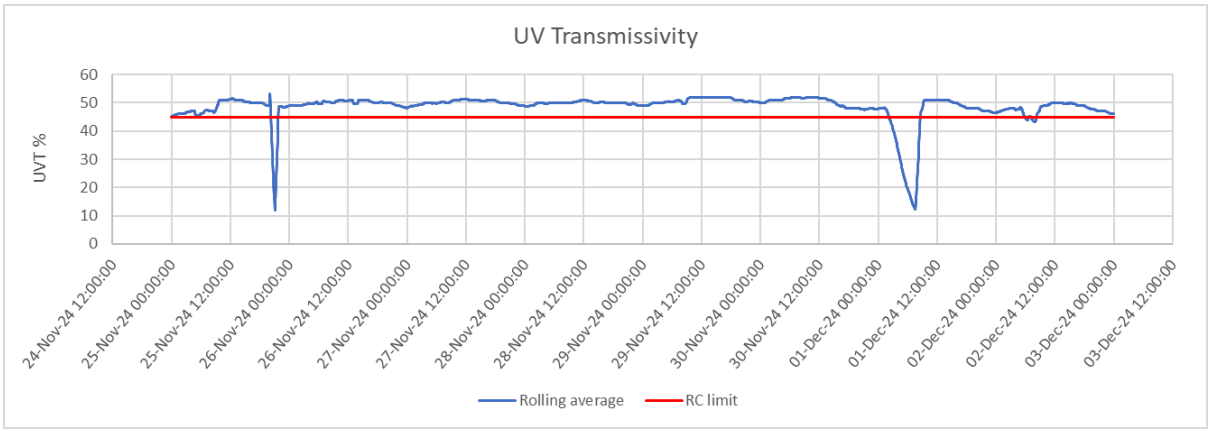
Date	pre-UV Faecal coliforms (cfu/100 mL)	post-UV Faecal coliforms (cfu/100 mL)	Enterococci (cfu/100 mL)
26/11/2024	220000	883	60
27/11/2024		525	30
28/11/2024	400000	469	10
29/11/2024		182	10
30/11/2024	400000	35	10
1/12/2024		32	10
2/12/2024		490	10
3/12/2024	400000	10	10

UV-transmissivity

Table 4- Laboratory results for final effluent transmissivity

Date	UV-transmissivity (%)
25/11/2024	64
26/11/2024	63
27/11/2024	62
28/11/2024	63
29/11/2024	62
30/11/2024	62
1/12/2024	59
2/12/2024	59

Figure 1- Final effluent UVT readings (online)



Shoreline monitoring

Information below provides a summary of shoreline sampling undertaken as a response to the undisinfected by-pass event.

Table 5: Shoreline Monitoring 200m generally southwestwards of the outfall

Date	Time	Enterococci	pH	Salinity	Dissolved Oxygen	Temp.	Wind Direction	Wind Strength	Tide	Sea Conditions
dd/mm/yyyy	hh:mm	cfu/100mL	-	g/m3	g/m3	C	--	--	--	--
02/12/2024	08:48	10	8.12	33	10.59	17	NW	Moderate	Mid	Flood
03/12/2024	08:25	20	8.09	34	10.26	17.7	SW	Strong	Mid	Flood
04/12/2024	09:40	<10	8.12	35	10.54	17.6	SW	Strong	High	Flood

Table 6: Shoreline Monitoring

Date	Time	Total Ammonia Nitrogen	Nitrate Nitrogen	Nitrite Nitrogen	Dissolved Reactive Phosphorus	Total Nitrogen	Total Phosphorus
dd/mm/yyyy	hh:mm	g/m3	g/m3	g/m3	g/m3	g/m3	g/m3
02/12/2024	08:48	0.36	<0.1	<0.1	0.017	0.214	0.038
03/12/2024	08:25	0.37	<0.1	<0.1	0.019	0.303	0.070
04/12/2024	09:40	0.61	<0.1	<0.1	0.022	0.59	0.065

Table 7: Shoreline Monitoring 140m generally eastwards of the outfall

Date	Time	Enterococci	pH	Salinity	Dissolved Oxygen	Temp.	Wind Direction	Wind Strength	Tide	Sea Conditions
dd/mm/yyyy	hh:mm	cfu/100mL	-	g/m3	g/m3	C	--	--	--	--
02/12/2024	08:27	100	8.19	33	10.64	17.3	NW	Moderate	Mid	Flood
03/12/2024	09:22	10	8.14	33	10.41	17.1	SW	Strong	High	Flood
04/12/2024	10:00	<10	8.14	35	10.66	17.6	SW	Strong	High	Flood

Table 8: Shoreline Monitoring

Date	Time	Total Ammonia Nitrogen	Nitrate Nitrogen	Nitrite Nitrogen	Dissolved Reactive Phosphorus	Total Nitrogen	Total Phosphorus
dd/mm/yyyy	hh:mm	g/m3	g/m3	g/m3	g/m3	g/m3	g/m3
02/12/2024	08:27	1.04	<0.1	<0.1	0.079	1.43	0.181
03/12/2024	09:22	1.35	<0.1	<0.1	0.061	1.28	0.038
04/12/2024	10:00	0.33	<0.1	<0.1	0.007	0.193	0.03

Table 9: Shoreline Monitoring Titahi Bay Beach At Toms Road - Surf Club

Date	Time	Enterococci	pH	Salinity	Dissolved Oxygen	Temp.	Wind Direction	Wind Strength	Tide	Sea Conditions
dd/mm/yyyy	hh:mm	cfu/100mL	-	g/m3	g/m3	C	--	--	--	--
02/12/2024	09:13	90	8.09	33	10.37	17.4	NW	Moderate	Mid	Flood
03/12/2024	09:33	60	8.12	34	10.71	17.3	SW	Strong	High	Flood
04/12/2024	10:16	20	8.07	35	10.59	17.4	SW	Strong	High	Flood

Table 10: Shoreline Monitoring Control

Date	Time	Enterococci	pH	Salinity	Dissolved Oxygen	Temp.	Wind Direction	Wind Strength	Tide	Sea Conditions
dd/mm/yyyy	hh:mm	cfu/100mL	-	g/m3	g/m3	C	--	--	--	--
02/12/2024	09:30	10	8.04	33	11.62	18	NW	Moderate	Mid	Flood
03/12/2024	09:46	<10	8.08	34	11.22	17.9	SW	Strong	High	Flood
04/12/2024	10:32	<10	8.19	35	11.04	17.9	SW	Strong	High	Flood

Table 11: Shoreline Monitoring

Date	Time	Total Ammonia Nitrogen	Nitrate Nitrogen	Nitrite Nitrogen	Dissolved Reactive Phosphorus	Total Nitrogen	Total Phosphorus
dd/mm/yyyy	hh:mm	g/m3	g/m3	g/m3	g/m3	g/m3	g/m3
02/12/2024	09:30	0.35	<0.1	<0.1	0.013	0.173	0.027
03/12/2024	09:46	0.37	<0.1	<0.1	0.016	0.161	0.032
04/12/2024	10:32	0.33	<0.1	<0.1	0.006	0.276	0.031

Please note that the enterococci for the shoreline monitoring samples were analysed by the contract laboratory and that bathing beach guidelines were used to generate the colouring for the Enterococci samples. The following are the limits for both bacterial species:

Table 12: Shoreline Monitoring Guidelines

Bacterial Species	Amber Limit	Red Limit
	cfu/100mL	cfu/100mL
Enterococci	140	280

Image 1
Taken at 06:49 - most of the effluent is being discharged from the TAK UV channel, some discharge is evident from the overflow bypass. There is no discolouration in the bypass discharge.

Image 2
Taken at 06:51 - effluent is being discharged from the Duron UV and the TAK UV channels. Some discharge is evident from the overflow bypass. There is no discolouration in the bypass discharge.

ORGANISATIONAL and INDIVIDUAL - HUMAN FACTORS / TEAM ACTIONS

The work was undertaken in accordance with a Plan developed by Connect Water with assistance from Stewart Electrical, Northpower, Porirua City Council, Wellington Water and Veolia.

Risks were identified as per the Plan (appended). The agreed procedures were followed.

The Plan was effective in enabling the work to be undertaken.

CORRECTIVE ACTIONS

Issue or Defect Identified	Notes / Corrective Actions	Responsibility	Measurement
Estimation of timing for shut-down of flow to pre UV channel.	The entire process took 45 minutes, for flows to cease going to the pre UV channel. The aeration basin dividing wall was almost reached by 60 minutes after shutdown. Action = Create a draindown pre-UV channel SOP, with the relevant information from the recent project,	Plant Coordinator	Rivo
Starting Up - Managing flows from clarifiers to UV systems.	Due to high levels in the aeration basin, there is high hydraulic pressure for the clarifiers. Action = include in the SOP referred above: Ensure that UV is powered on and have the inlet penstock fully opened before gradually overflowing 1 clarifier to introduce flows through the UV system.	Plant Coordinator	Rivo

CONCLUSION

- The Plan's estimated timeframes for stopping and then controlling flows to the UV channels weren't able to be tested before the work commenced.
- The Plan's calculations for draining of the clarifiers estimated a window / buffer of 76 minutes to stop flows to the UV channel, but in practice the penstock had to be opened after 60 minutes.
- Due to higher than normal aeration basin levels, the rate-of-opening of the splitter penstock that the operators are used to (usually in increments of 10%), resulted in unpredictable flow rates to the UV channel. Flows from the clarifiers to the pre UV channel exceeded the channel's capacity.

APPENDIX - Shutdown Plan

Sensitivity: General

Wellington Water

WWTP Shutdown Plan

Project Name	Porirua WWTP Standby Generator Upgrade
Project Number	OPC101883
Contract Number (if applicable)	774.00075
Shutdown Date & Time	4am – 7am, Monday 2 December
Pump Station to be Shutdown	Tangare Drive Pump Station, Rukutane Point Pump Station and City Centre Pump Station
Contractor	Stewart Electrical Ltd, Tim Stewart, 021 507 245 *(Contractor Organisation Name, Contact Person, Mobile Number)*
Wellington Electricity (Northpower)	Northpower, Hone Walker, 0212408920
Engineer	Connect Water [redacted](Engineer's Representative), [redacted] *Engineer Organisation Name, Contact Person, Mobile Number)*
WWTP Operations	Veolia, [redacted]
Wellington Water Customer Planning Engineer	[redacted]
Wellington Water Customer Hub	04 912 4400 *(Contact Number)*
Council	Porirua City Council (PCC)*(WCC/PCC/HCC/UHCC/SWDC/GWRC)*
Council Call Centre	04-237 5089

Scope of Shutdown

Describe the reasons for the wastewater pump station shutdown, provide an indication of the number of customers affected, and expected duration of the shutdown.

A new standby generator is being installed for the Porirua WWTP UV plant. This will enable the UV plant to automatically continue running in the event of a power outage. In order to install the three sensing fuses on the UV plant main switchboard, the power supply to the UV plant must be isolated. This requires temporarily turning off the UV. To prevent discharge of undisinfected wastewater into the harbour, incoming flows into the plant are to be stopped temporarily, and the outlet of the oxidation ditch is to be isolated. The pump stations discharging to Porirua WWTP are to be temporarily shutdown to enable this. When the pump station wet wells fill up, the pumps are to be turned back on, and the freeboard in the oxidation ditch at the WWTP is to be used for additional wastewater storage.

To carry out the works on the MSB, the contractor has advised that 2 hours is required.

The pump station draindown and WWTP isolation, and reinstatement is expected to take 2 hours in total.

Allowing for a 2 hour contingency, the total duration of the works is expected to be 6 hours.

The pumpstations are planned to be shutdown from 3 am, and put back online by 7am.

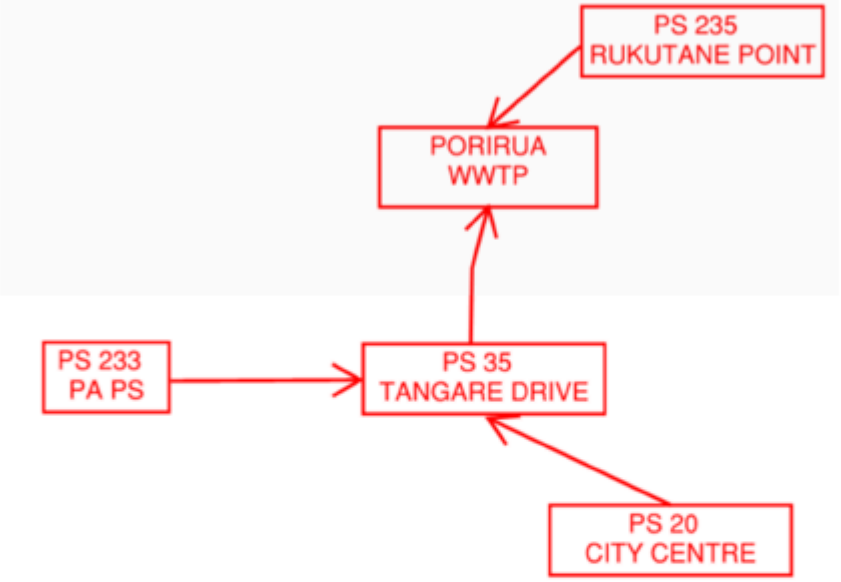
Number of residential customers affected: None directly affected

List commercial customers affected: None directly affected

Planning

List the steps leading to obtaining approval from Chief Advisor to proceed with the shutdown. Consider if the shutdown can be avoided, and assess what resources will be required and any effects the shutdown may have. Add or edit steps where applicable.

The following schematic shows a simplified overview of the pump stations feeding Porirua WWTP.



Based on an assessment of the flows to the WWTP and to the pump stations, the project team is proposing to carry out the shutdown from 3 am – 7am. Refer graphs below showing data for a typical weekday.

Wellington Water

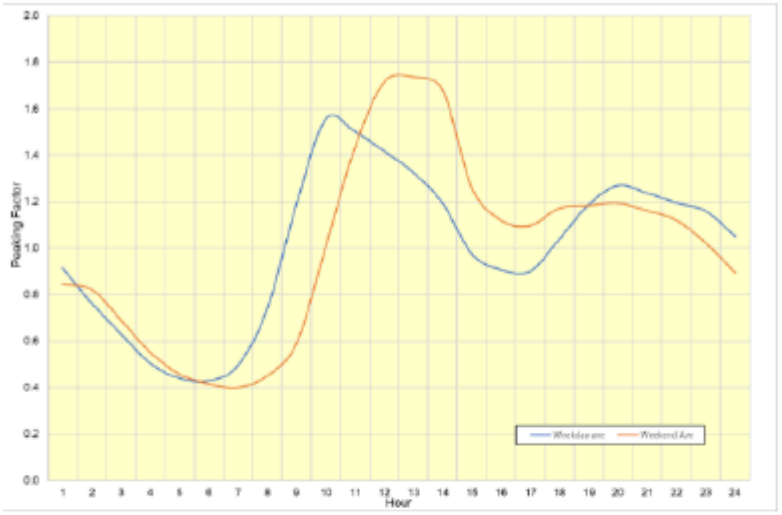


Figure 2 Averaged Flow Peaking Factors for Weekdays and Weekends

Figure 1 Dirunal flow pattern entering the WWTP

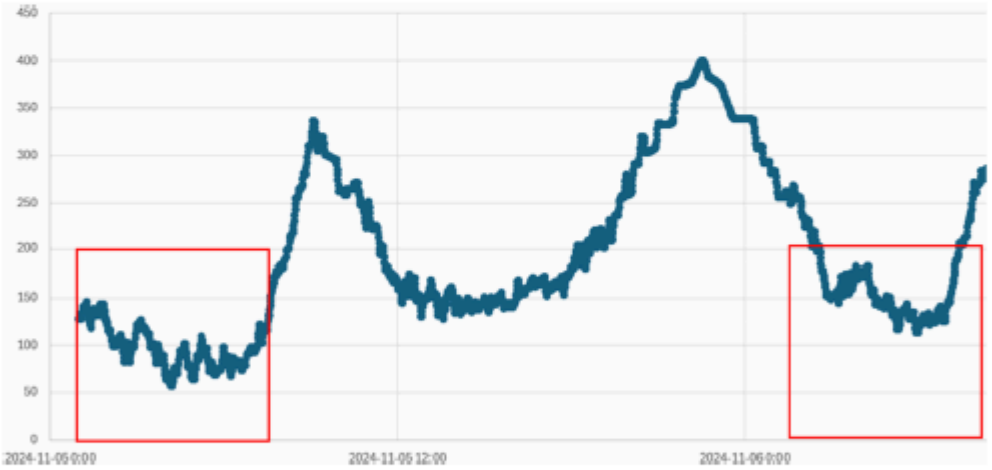


Figure 2 Diurnal flow profile from City Centre Pump Station in L/s (shutdown hours indicated)

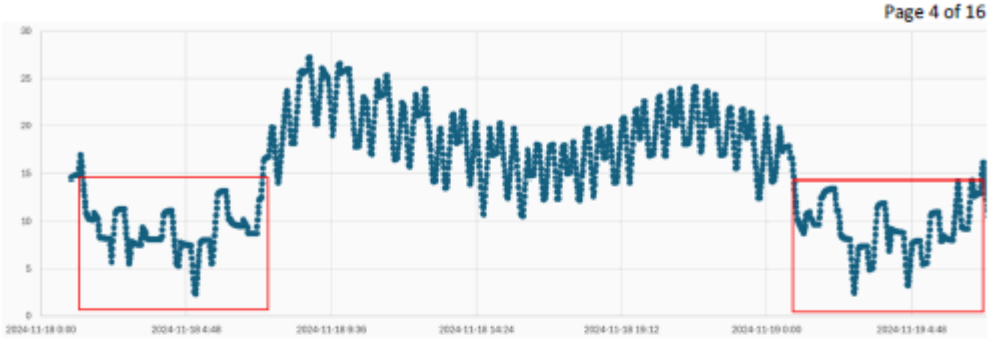


Figure 3 Dirunal flow profile from Rukutane Pump Station in L/s (shutdown hours indicated)

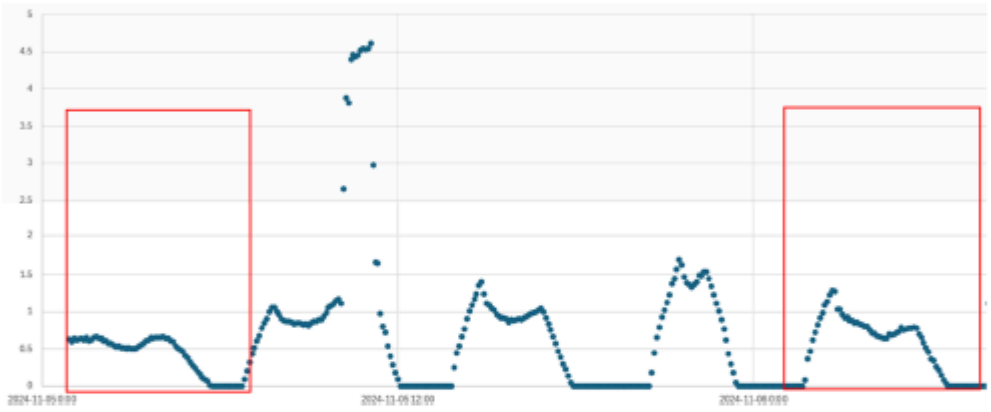


Figure 4 Diurnal flow profile from Takapuwahia Pump Station in L/s (shutdown hours indicated)

	Average incoming flow during shutdown hours	Peak incoming flow during shutdown hours	Nominal wet well storage volume	Minimum storage time (assuming peak flows)
City Centre (PS20)	150 L/s	180 L/s	60 m^3	5.6 minutes*
Takapuwahia (PS233)	0.8 L/s	1.5 L/s	18 m^3	200 minutes
Rukutane Point (PS235)	7 L/s	15 L/s	28 m^3	31 minutes
Tangare Drive (PS35)	150.8 L/s	181.5 L/s	80 m^3	7.3 minutes
Porirua WWTP aeration basin	157.8 L/s	196.5 L/s	900m^3	76 minutes

			(Assuming 200mm freeboard)	

* Pump stations upstream of city centre can be drained down prior to shutdown as well, providing additional storage time. On the days that the flow data was assessed, there was a total of 9.8mm of rainfall which would have elevated the flows exiting the pump station.

Before the shutdown, the wet wells of the pump stations stated above are to be drained down. If possible, the pump stations further upstream in the network are to be drained down too.

After confirmation of the draindown, City Centre, Tangare Drive, and Pa pump stations are to be shutdown, and the wet wells are to be used for storage of incoming wastewater. Wellington Water Customer Operations Group are to initiate the drain down, and monitor the wet well levels over the duration of the shut down. It is understood that this can be done remotely via SCADA. The WWL COG representative will need to communicate when levels have risen to 75%, so notice can be given to the project team at the plant that incoming flows will resume again.

Rukutane Point PS will not be able to be shutdown due to its relatively small wet well volume and higher incoming flows, so it will remain online, pumping to the Porirua WWTP, where the aeration basin will be used for storage the entire time. The aeration basin has a relatively large capacity, assuming a conservative 200mm freeboard is used for capacity (there is 230mm of freeboard between the divider wall separating the aeration and anoxic zone), 900m^3 of storage is available, which is plenty for Rukutane Point flows, and any additional buffering from the pump stations.

At the plant, the incoming flows from the wastewater tunnel are to be monitored, and when they have visibly come down, the clarifier will be drained down by Veolia operations. Stoplogs will be installed on the outlet of the aeration basin after this. The actuated penstocks on the UV inlet channel, VLV0601, VLV0602 (normally closed) and VLV0603 are then to be closed by Veolia operations. Rukutane Point flows will still be entering the plant, but compared to Tangare Drive, are a relatively small flow.

After confirmation that there is no more flow exiting the UV channel over the penstocks VLV0604 and VLV0605, the UV lamps are to be turned off by Veolia operations. Wellington Electricity/Northpower will isolate the 400V transformer supplying the UV plant.

The rest of the plant will continue to receive power, as it is supplied from the 10kV side. The plant will continue to run as normal, including the RAS pumps which should remain running.

Stewart Electrical will then carry out the works on the transformer.

The 400V transformer will be reconnected, and the UV plant will start up again. After the lamps have reached operating temperature (~15 minutes), Veolia operations will open the penstocks VLV0602 and VLV0603 to restore flow to the UV channel.

City Centre, Tangare Drive, and Pa pump stations will be put back online (if they weren't already online).

Process Step	Activity	Who (Name & Sign)	Date/Time
1	Consider alternate options to avoid the shutdown. Conduct investigations into options to minimise the length of the shutdown.	Connect Water	Discussed at workshop held 22

Wellington Water

Process Step	Activity	Who (Name & Sign)	Date/Time
	This is considered the only option to carry out the work without discharging disinfected effluent into the environment. Temporary chlorine dosing to achieve disinfection could be considered, but carries significant chemical handling risks due to the quantity required. In addition, the chlorination of wastewater containing organic matter can result in the formation of disinfection byproducts such as trihalomethanes and haloacetic acids which are toxic to aquatic ecosystems. Shutdown duration is minimum. Establish shutdown duration. 2 hours is allowed for to carry out the electrical work. Stewart Electrical have advised that 1 hours should be sufficient, but 2 hours is allowed for in case any issues arise.		Nov (12pm – 1pm)
2	Consider the potential effects the shutdown will directly have on the customers in the network. Seek advice from stakeholders (Council, Iwi, affected customers). No direct impact on customers in the network. This work will be carried out at night to minimise risk of interruption.	Connect Water	Discussed at workshop held 22 Nov (12pm – 1pm), and second workshop with COG 26 Nov (2:30pm – 3pm)
3	Determine what Communications will need to be made to affected customers (e.g. letter drop, signage). Seek advice from WWL communications team if required. Not considered to be required.	Connect Water	Discussed at workshop held 22 Nov (12pm – 1pm)
4	Consider risk of shutdown and worst-case scenarios for the network and environment. Discuss practicality of shutdown and requirements with COG team. The worst case scenario would involve a discharge of undisinfected effluent to the outfall. Measures have been taken to minimise this risk (i.e. carrying out the work at night, draining down wet wells prior to work, minimising duration of the shutdown)	Connect Water	Discussed at workshop held 22 Nov (12pm – 1pm)
5	Consider if the shutdown creates the risk of surcharging upstream manholes or properties. Seek advice from WWL hydraulic modelling team if required. Not likely to create a risk, as wastewater will gravitate into wet wells of pump stations.	Connect Water/ Wellington Water	Discussed at workshop held 22 Nov (12pm – 1pm), and second workshop with

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Process Step	Activity	Who (Name & Sign)	Date/Time
			COG 26 Nov (2:30pm – 3pm)
6	Consider shutdown duration, and the expected storage capacity of the wet well based on the time of the shutdown and catchment. Also consider risk of solids settlement, and the effect this will have on pump station start-up. Investigate if pump priming will be an issue, and what arrangements need to be made. Shut down duration expected to be around 4 hours. It has been demonstrated that the city centre pump can be turned off for this long based on experience at Tangare Dr PS in 2019, conducted by Connect Water. Flows have not likely increased significantly since then.	Connect Water	Discussed at workshop held 22 Nov (12pm – 1pm), and second workshop with COG 26 Nov (2:30pm – 3pm)
7	Establish resources required to complete the shutdown successfully. Include consideration for Contractor, COG and Consultant staff required. WWL COG, Veolia operations, main contractor (Stewart Electrical) and CW required.	All	Discussed at workshop held 22 Nov (12pm – 1pm), and second workshop with COG 26 Nov (2:30pm – 3pm)
8	Consider if over pumping is required. If required, ensure suitably sized pumps with contingencies are included as part of the shutdown procedure. Not required.		Discussed at workshop held 22 Nov (12pm – 1pm), and second workshop with COG 26 Nov (2:30pm – 3pm)
9	Discuss final shutdown plan with COG. Seek approval from Chief Advisor if shutdown work is considered a major or high-risk activity.	Wellington Water	
10	Meet Wellington Electricity's Contractor onsite	Connect Water	1pm Wednesday 27 Nov.

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Prior to Shutdown

If approval is received, list the steps leading up to the shutdown.

Process Step	Activity	Who (Name & Sign)	Date/Time
1	Ensure all necessary communications with Customers have been made. Notify Wellington Water customer hub, and Council call centre of the shutdown.	[redacted] (Wellington Water)	Actioned at 1:30pm Friday 29 Nov meeting.
2	Hold pre-shutdown meeting with key personnel (COG, Engineer, Contractor) involved in shutdown to run through the shutdown plan. Ideally held prior to the day of the shutdown, or at least several hours before.	Connect Water	Held Friday 29 Nov at 1:30pm.
3	Confirm dry weather for the past 24 hours, all resources are ready to carry out works, plant is ready for temporary shut.	Connect Water	Kevin to confirm via email / text Sunday 1 Dec 3pm.
4	Engineer to confirm with COG the maximum level of the wet well (e.g. overflow levels), and agree on a 'high level' which will provide adequate storage capacity, while also ensuring there is sufficient time to reinstate pumping.	[redacted] Connect Water)	Proposed notification 'high level' is 200mm below high level alarm.
5	Contractor to confirm with Engineer availability of required resources, equipment and sub-contractors (e.g. vacuum trucks, pumps).	COG	Stewart Electrical (from 3am) and Northpower (5am) to be on site Monday 2 Dec.
6	COG to carry out any necessary work at the pump station for the shutdown to proceed. Contractor to provide assistance where required.	COG	
7	If possible, WWL COG to drain down levels of pump stations in the network upstream of the pump station to be shut down to provide additional storage capacity.	COG	Start draining pump stations upstream of city centre PS from 12am – 2am Monday 2 Dec.
8	Immediately prior to shutdown, hold toolbox safety meeting to discuss risks involved with the shutdown, and the control measures in place. Run through shutdown plan a final time. All personnel involved with shutdown to be present.	All	To be held 3am, Monday 2 Dec.

Process Step	Activity	Who (Name & Sign)	Date/Time
9	Test communications between personnel involved in shutdown, including alternate contacts. Ensure back-up communication methods are available for remote personnel.	Connect Water	Google group to be created to facilitate comms. RTs will be used on site. Vito Lim to be contact at plant with reliable reception.
10	All personnel involved with shutdown to assemble at designated locations. Assign personnel to monitor key locations identified to be at risk of surcharging (e.g. manholes).	COG	COG may be able to remotely monitor and control PS from SCADA.
11	Engineer to notify COG to commence pump station shutdown, once all resources are confirmed to be ready.	[redacted]	Monday 2 Dec 4am – 5am (depending on pump station draindown time)

Shutdown Process:

The detailed sequence of tasks to be carried out for the shutdown to occur are tabulated below. Seek advice from COG where required.

Step	Action	Responsibility	Expected Time
1	**Preparation**		
1.1	Complete Documentation LOTO etc	[redacted]	4am Monday 2 Dec
1.2	WWL COG Personnel to check up on the following pump stations on the SCADA screen: - Rukutane PS (PS235) - City Centre PS (PS20) - Tangare Drive PS (PS34) - Pa PS (PS233)	WWL Customer Operations Group	3:30am Monday 2 Dec
1.3	Test communications between all personnel involved in shutdown i.e. between each of the pump stations and the Porirua WWTP operator, including alternate contacts. Ensure back-up communication methods are available for remote personnel.	ALL	3:30am Monday 2 Dec
2	**Shutdown Activities**		
2.1	Arrange for COG to drain down wet well levels of the following pump stations before plant shutdown. This	WWL Customer Operations Group	3:30am Monday 2 Dec

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Step	Action	Responsibility	Expected Time
	will provide some wastewater storage capacity when the pumps are isolated. - Rukutane PS (PS235) - City Centre PS (PS20) - Tangare Drive PS (PS34) - Pa PS (PS233)		
2.2	COG to stop all pumps on the following pump stations. Pumps will continue to run on auto. - City Centre PS (PS20) - Tangare Drive PS (PS34) - Pa PS (PS233)	WWL Customer Operations Group	4am Monday 2 Dec.
2.3	HOLD POINT: Porirua WWTP operations has received verbal confirmation from COG that all 3 pump stations have been pumped down to low level, and stopped. Notify Connect Water when complete.	[redacted]	4am Monday 2 Dec.
2.4	Porirua WWTP operations to visually observe flow at screens inlet to confirm incoming pump station flows have ceased. Note there will be a 'lag' from turning PS34 pumps off and seeing a reduction in flow. Notify CW when flows have reduced.	[redacted]	4:30am Monday 2 Dec.
2.5	Porirua WWTP operations to drain down clarifier.	[redacted]	4:30am Monday 2 Dec onwards.
2.6	Porirua WWTP operations to install stoplogs on outlet of aeration ditch and close the inlet penstocks to the UV channel (VLV0601, VLV0602 (should be normally closed), VLV0603) entering the UV channels.	[redacted]	5am Monday 2 Dec onwards.
2.7	After there is no significant flow exiting the visual inspection chamber, Porirua WWTP operations to shutdown the UV plant and advise Northpower/Wellington Electricity	[redacted]	5am Monday 2 Dec onwards.
2.8	Northpower/Wellington Electricity to isolate the LV power supply to the UV main switchboard and confirm to T Stewart	TBC	4:30am Monday 2 Dec onwards.
2.9	COG monitor their pump station level at 15-minute intervals and update Connect Water at WWTP on the level rise.	WWL Customer Operations Group	4am – 7am Monday 2 Dec
2.10	If notification 'high level' is reached (~200mm below high level alarm) in pump stations, notify Connect Water at WWTP. COG to notify Veolia operations and Connect Water engineer so notice can be given that the PS20, PS35 and PS233 pumps will be switched back on soon.	WWL Customer Operations Group	4am – 7am Monday 2 Dec

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Step	Action	Responsibility	Expected Time
2.11	When pump stations are back online. Veolia operations to monitor aeration basin level closely going forward, and notify the project team when levels have risen 100mm (i.e. 130mm of the freeboard overflow level). Consider removing stoplogs on outlet of aeration basin when this level is reached so the clarifier can be used for storage. Level of triggering abort of transformer works is to be 180mm (i.e. 50mm of the freeboard overflow level on the divider wall separating aeration and anoxic zones).	[redacted]	4am – 7am Monday 2 Dec
Total time:			3.5 hours (incl shutdown activities)

Wellington Water

Risk Contingency plan:

Below is a table summarising the risks, their impact and contingencies or mitigations in place.

Risk	Impact	Contingency/Mitigation
Working around wastewater	Infections and disease	• Discuss hygiene issues related to wastewater at pre-start briefing • Workers exposed to wastewater to have all necessary immunisations as outlined in Section 6 of the Wellington water regional specification – Hepatitis A, Hepatitis B, Polio, Typhoid & Tetanus. • Use of appropriate PPE • Site washing facilities
UV systems fail to come online after the power is returned or inflow increases the UV inlet channel level.	Spill to land of partial treated effluent.	• Lower clarifier levels • Monitor aeration basin levels closely • Open bypass UV penstock (as a last resort)
	Discharge to sea of partial treated effluent.	• Only open UV inlet penstocks when UV lamps have reached operating temperature.
Insufficient network storage resulting in undisinfected wastewater discharges to the ocean	Adverse impact to the environment Reputational risk to WWL	• Pumps stations to confirm when they are 30, 20, 15, 10 mins from full. • Ensure that wastewater levels at the pump stations always remain well below wet well emergency overflow levels. Clear communication between T Stewart and Isolation Supervisors at all times. • Any issues at the pump station or on site to be communicated both directions. • The freeboard in the aeration basin could be used for buffer storage if required in an emergency, as it is a significant volume. • Bung to be installed in the stormwater sump in the carpark of the WWTP for containment of any possible overflows. • In the event of a undisinfected discharge at the WWTP, notify the Porirua WWTP operator in the first instance. The operator will then inform the Connect Water Project Manager, Connect Water Eng Rep, and WWL Ops.
Loss of communication with pump station	No indication on pump station status and wet well level. Inability to make clear decisions.	• Verify contact details of operations staff. Have radio communication available as back-up. • Stewart Electrical personnel will be at three pumps stations and on site at the WWTP to provide clear communication between all 4 locations and to prevent any mis-communication.

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Risk	Impact	Contingency/Mitigation
		• Pumps are not to be turned back on until Stewart Electrical coordinator confirms it is safe to do so.
Drowning in aeration basin	Drowning due to lack of flotation in aeration basin	• Follow the Veolia procedures for working above the aeration basin

Permission to proceed from Engineer

[redacted]		29/11/24
Name	Sign	Date

Approval to proceed from COG (Customer Planning Engineer &/or Utilities Engineer)

[redacted]		
Name	Sign	Date

Approval to proceed from Network Controller (Critical Assets and/or customers only)

[redacted]		
Name	Sign	Date

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Shutdown Activity List

List all activities to be undertaken while the pump station is shutdown. These are construction/investigative tasks which necessitated the pump station shutdown.

Process Step	Activity	Who (Name & Sign)	Date/Time
1	Once Site Ops team are happy, will shut down each UV system one at a time. Isolate the UV systems Breakers.	[redacted]	5am Monday 2 Dec.
2	Isolate MCC Breaker	Northpower	5am Monday 2 Dec.
3	11KV Transformer 400V Switch can now be isolated and locked out	Northpower	5am Monday 2 Dec.
4	Test for isolation at UV MCC	Stewart Electrical	5:15am Monday 2 Dec.
5	Remove input cables from MCC breaker and install cables and fuses for the voltage sensing of the ATS controller.	Stewart Electrical	5:15am Monday 2 Dec.
6	Connect input cables back on breaker	Stewart Electrical	5:30am Monday 2 Dec.
7	Modify the MCC and Generator Breakers in UV MCC with the motorized control parts required for the automatic switching.	Stewart Electrical	5:30am Monday 2 Dec.
8	Re-instate covers, Test and power back up from Transformer to UV MCC then bring on equipment in a staged approach.	Stewart Electrical	5:30am Monday 2 Dec.

Restoration of Supply Process:

For safe return to normal operation the following sequence of steps are to be conducted:

Process Step	Activity	Who (Name & Sign)	Date/Time
1	Northpower/Wellington Electricity to restore transformer LV power	Northpower	6-7am Monday 2 Dec
2	Ensure there is a high water level in the UV channel	[redacted]	6-7am Monday 2 Dec
3	Porirua WWTP operations to restore power to UV plant and initiate start up of UV lamps.	[redacted]	6-7am Monday 2 Dec
4	Operations to open up penstocks VLV0601 and VLV0603 to UV channel.	[redacted]	6-7am Monday 2 Dec

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5	Porirua WWTP operations to notify COG to put all pump stations back online (if they: - Rukutane PS (PS235) - City Centre PS (PS20) - Tangare Drive PS (PS34) - Pa PS (PS233) Only one pump is put back online at each pump station to minimise sending a high volume slug of wastewater the to the plant. The estimated flow to the WWTP when the pumps are back online is 527 L/s.	WWL COG	6-7am Monday 2 Dec
6	Confirm flow to the UV plant is normal	[redacted]	6-7am Monday 2 Dec
7	Confirm operation of the UV plant is normal	[redacted]	6-7am Monday 2 Dec

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Debrief & Reporting

Engineer to discuss shutdown with Contractor & COG and record learnings here, then file the completed shutdown plan in the project file (Woogle).

Shutdown complete confirmed by Contractor

Name	Sign	Date

Shutdown complete confirmed by Engineer

Name	Sign	Date

Shutdown complete confirmed by COG (Customer Planning Engineer &/or Utilities Engineer)