



Incident Investigation Report:  
Failure of Ultraviolet Disinfection System at the  
Porirua Wastewater Treatment Plant

# CONTROL SHEET

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**Document Title:** Failure of Ultraviolet Disinfection System at the Porirua Wastewater Treatment Plant

**Prepared by:**



**Reviewed by:**

*withheld under clause 7(2)(a) of the Local Government Official Information & Meetings Act 1987*

**Authorised by:**

## DOCUMENT CONTROL

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Version	Status	Date	Details of Revision
0	Draft	9/2/2021	Draft for review.
1	Final	12/2/2021	Internally reviewed.

# TABLE OF CONTENTS

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<b>CONTROL SHEET</b>	<b>1</b>
<b>DOCUMENT CONTROL</b>	<b>1</b>
<b>TABLE OF CONTENTS</b>	<b>2</b>
<b>INCIDENT DETAILS</b>	<b>3</b>
<b>TIMELINE</b>	<b>4</b>
<b>PHOTOS</b>	<b>5</b>
<b>ABSENT/FAILED DEFENSES</b>	<b>6</b>
<b>INDIVIDUAL - HUMAN FACTORS/TEAM ACTIONS</b>	<b>7</b>
<b>TASK/ENVIRONMENTAL CONDITIONS</b>	<b>8</b>
<b>ORGANISATIONAL FACTORS</b>	<b>9</b>
<b>CORRECTIVE ACTIONS</b>	<b>10</b>
<b>APPENDIX I</b>	<b>11</b>
<b>APPENDIX II</b>	<b>12</b>

# INCIDENT DETAILS

<b>Date</b>	20th January 2021
<b>Location</b>	Porirua Wastewater Treatment Plant (WWTP)
<b>Attending Employee(s)</b>	<div style="background-color: black; color: black;">[REDACTED]</div> <i>withheld under clause 7(2)a of the Local Government Official Information &amp; Meetings Act 1987</i>
<b>Description</b>	The ultraviolet (UV) disinfection system stopped operating for a period between 21:23 on 20th January 2021 and 8:10 on 21st January 2021.
	Final effluent without tertiary treatment was released into the coastal marine area (CMA) around Rukatane Point.
	Notification of this discharge was not provided until 22nd January 2021.
<b>Cause</b>	A power spike in the Porirua region caused the UV system to shut down.
	Miscommunication between Veolia staff resulted in a delay of the notification.
<b>Actions</b>	The UV system at the Porirua WWTP was reset and placed back online.
	Staff were coached about notifications when issues arise.
	Investigation conducted regarding the operation of the UV system, communication between the UV system and the WWTP programmable logic controller (PLC), and the alarms that the UV system generates.
<b>Impacts</b>	Potential contamination of the CMA that could impact human health.

# TIMELINE

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

<b>20th January 2021</b>	
19:44	A line clash caused by high winds resulted in issues with a switch at Moki Street and Pikarere Street. This resulted in power fluctuations in the area.
21:23	The power fluctuations caused the UV system to shut down. The UV system does not alarm when there is a power failure. The Porirua WWTP did not shut down.
23:30	Repairs completed on the transformer to restore power.
<b>21st January 2021</b>	
7:30	Site operator arrived at the Porirua WWTP and during the routine inspection of the site noticed that the UV system was offline.
7:35	Site operator contacted the assets and maintenance manager (who was covering for the northern operations coordinator during this period) and informed them about the UV system being offline. The operator did not know that the UV system had been offline since 20th January 2021 at 21:23.
7:36	The assets and maintenance manager contacted the electrical team lead for assistance. They were still not aware that the UV system was offline since 20th January 2021 at 21:23 so they did not escalate the notifications.
8:00	Electrical team lead contacted the site operator and remotely guided them through the process of resetting the UV system. The electrical team lead instructed one of the electricians to go out to the Porirua WWTP to investigate the cause of the failure and to inspect the system for any other issues.
8:10	The UV system was reset and placed back online.
10:30	The Veolia electrician arrived at the Porirua WWTP and began investigations into the cause of the UV system shutdown. While conducting the investigation, they noted that the UV system tripped on 20th January 2021 at 21:23. There was no alarm to notify the duty operator or manager of the shutdown. The electrician contacted the SCADA engineer regarding this issue. The SCADA engineer stated that an alarm had never been set up historically for the UV system by the original operators.
--	Electrician contacted the electrical team lead regarding the issue. The

	electrical team lead stated that they should escalate the issue to the Wellington management team regarding this situation. Unfortunately it was already late in the day so they waited for the following day to inform Veolia Wellington management team.
<b>22nd January 2021</b>	
8:00	Electrical team lead informed the southern operations coordinator about the UV system shut down. The southern operations coordinator was informed about this issue as they were covering for the northern operations coordinator.
--	The southern operations coordinator was unaware of the UV system issue due to the initial miscommunication between the site operator and the assets and maintenance manager. The southern operations coordinator investigated the issue, asking for assistance from the Veolia process engineer.
--	After completing the investigation the southern operations coordinator informed the Wellington Water wastewater process analyst by phone. They requested that Veolia submit a notification for this incident.
13:40	A notification regarding the shutdown of the UV system at the Porirua WWTP was submitted to Wellington Water by the Veolia process engineer. The wastewater process analyst informed the Porirua stakeholders within Wellington Water and they deemed this discharge a serious incident.
15:53	The wastewater process analyst informed the external stakeholders including Greater Wellington Regional Council and Regional Public Health.
<b>26 January 2021</b>	
6:15	Regular monthly shoreline monitoring was conducted around Titahi Bay as per the discharge resource consent. The sample results have been included in this report.

# ABSENT/FAILED DEFENSES

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When the UV system was installed at the Porirua WWTP, it was considered a “black box” installation. The UV system has a standalone PLC that controls the dosage of UV light. The following parameters are monitored by the UV system:

- Percentage power consumption on each bank;
- Intensity of light on each bank;
- Flow rate through the system; and
- Height of the effluent in the UV channel.

These are the only parameters that are shared between the UV System PLC and the WWTP PLC. The hours of operation for each lamp and any faults experienced by the UV system are only displayed on the local human machine interface (HMI) panel.

When the power fluctuation shut down the UV system, the alarm only displayed on the local panel. There are no signals sent back to the WWTP PLC to notify the operations team that the UV has faulted.

# INDIVIDUAL - HUMAN FACTORS/TEAM ACTIONS

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The main cause for the delay in communicating the shutdown of the UV system was due to miscommunication. The first instance of miscommunication occurred when the site operator contacted the asset and maintenance manager. When the asset and maintenance manager was informed about the fault in the UV system, the duration of the shutdown was unknown. The asset and maintenance manager had assumed that the UV system had recently failed and tried to quickly rectify the issue. Because they believed the UV system only shutdown for a short period of time, notification was not required.

Another communication issue occurred when the electrical team discovered the duration of the UV shutdown. Since the asset and maintenance manager informed the electrical team about the UV fault, they assumed that any necessary notifications to Wellington Water had already been performed. As the electrical team had gone to site to investigate the cause of the fault, when they identified the duration of the shutdown, the electrical team lead therefore wanted to inform Veolia Wellington management team about the issue.

The last instance of miscommunication occurred during the handover between the asset and maintenance manager and the southern operations coordinator. The asset and maintenance manager was going on annual leave, so the southern operations manager would provide oversight of the Porirua WWTP. They did not inform the southern operations coordinator about this UV incident because they believed it was rectified quickly resulting in a short shutdown duration. They therefore did not believe this would have caused an issue.



# TASK/ENVIRONMENTAL CONDITIONS

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## Power Fluctuations

On 20th January 2021, high winds in the area caused power lines to clash resulting in power fluctuations. Although this did not directly impact the Porirua WWTP, the power fluctuations can affect sensitive equipment on the site such as the UV system. That is why the power fluctuations caused the UV system to shut down.

## Shoreline Monitoring

During wet weather events when the Porirua WWTP bypasses, shoreline monitoring is only conducted when the discharge volume exceeds 1,000m<sup>3</sup>. During this incident, it was assumed that duration of shutdown would be short resulting in a minimal amount of untreated effluent discharged from the WWTP (i.e. under 1,000m<sup>3</sup>). Therefore, a sampling program was not initiated. When it was determined that the UV system was shut down from 20th January 2021 at 21:23 to 21st January 2021 at 8:10, the actual volume discharged was 6,737m<sup>3</sup> of effluent. As the Porirua WWTP was discharging approximately 20,000m<sup>3</sup> per day, this volume of effluent discharged without UV disinfection would equate to approximately 30% of the total daily flow.

The discharge effluent without UV disinfection occurred at night. During this period, the flow through the plant is low and there are no people using the beach. Therefore exposure to any potential contaminants is minimised.

When the southern operations coordinator discovered that the failure occurred for over 10 hours, they immediately investigated the situation and informed Wellington Water. Unfortunately, they were unfamiliar with the resource consent for the Porirua WWTP (specifically the sampling requirements for a discharge due to plant malfunctions) since this is not a site they supervise routinely. They did not initiate the shoreline monitoring program. Fortunately, samples were collected on 26th January 2021 as part of the monthly shoreline monitoring as stipulated in the discharge resource consent for the Porirua WWTP. The results have been included in this report.

# ORGANISATIONAL FACTORS

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A communication protocol that reflects the requirements of the regional wastewater treatment plant service contract and resource consent conditions was created but was not properly disseminated to all staff. During this UV incident, the various staff members involved were not aware that the situation required escalating to the Porirua WWTP interested parties until it reached the southern operations coordinator.

A risk communication strategy exists for discharges from the Porirua WWTP. When the document was developed, the malfunctions described focused primarily on sludge carryover rather than other plant malfunctions. Because of this, and the perception that the duration of the UV shutdown was minimal, the Veolia Wellington management team members involved in this incident did not apply the strategy.

# CORRECTIVE ACTIONS

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Several corrective actions have arisen from this UV incident. The following is a summary of these actions:

## Alarms

The lack of an alarm to notify the operations team of a power fault on the UV system will be rectified by 19th February 2021. The SCADA engineer has completed the groundwork required to generate the alarms. They have connected the UV system PLC with the WWTP PLC to allow communication between each other. The SCADA program has been modified to include an alarm when either the comms line between the two PLCs shuts down or the power shuts down. The SCADA engineer will be uploading the program at the Porirua WWTP during the week of February 15th. In the interim, the duty operators have been instructed to attend site whenever a power fluctuation is identified.

When the Porirua WWTP was taken over by Veolia, it was noted that there were several nuisance alarms programmed into the system. These alarms also do not have clear descriptions indicating the cause. Veolia will undergo a risk assessment and review the alarms at the Porirua WWTP. Veolia will then remove any nuisance alarms and add anything that is deemed essential. As this is a long term process it will be completed as soon as practicable.

## Communication

On 2nd February 2021, all Veolia staff in the Wellington region attended a meeting regarding the communication protocols. The contract manager reiterated the importance of communication and notifications to the Veolia Wellington management team immediately about any issues they discover. They also provided an escalation tree in the event that the Veolia Wellington management team cannot be contacted. This will ensure that any incidents are handled appropriately.

An internal meeting has been scheduled for 16th February 2021 where all Veolia Wellington management team will be retrained to ensure acquaintance with the Risk Communication Strategy for the Porirua WWTP. Veolia will also ensure that all staff are familiarised with the document. This will be completed by 1st March 2021.

During the week of March 1st, all site staff will be undergoing “Customer First” training. Over the next few months, Veolia staff will attend six 2-hour workshops that will cover topics such as:

- Understanding your role, where you fit in the business, and the value you bring to Veolia’s continued success;
- What “great” customer service looks like at Veolia;
- How to communicate effectively by asking the right questions, listen and delivering your messages with clarity and impact;
- How to adapt and flex your style to suit the needs of our customers;
- How to deal with difficult customers, and how to deal with them in a constructive way; and
- How to come to work with the right attitude to succeed for yourselves and our customer.

This should assist in resolving a lot of the communication issues experienced during this incident and focus staff on providing timely and accurate information.

# APPENDIX I: Shoreline Monitoring Results

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### Certificate of Analysis

#### Laboratory Reference:210104-011

<b>Attention:</b>	Colin Gerrard	<b>Final Report:</b>	<b>397473-0</b>
<b>Client:</b>	<b>VEOLIA WATER</b>	<b>Report Issue Date:</b>	<b>28-Jan-2021</b>
<b>Address:</b>	<b>127 Stewart Duff Drive, Rongotai, 6022</b>	<b>Received Date:</b>	<b>26-Jan-2021</b>
<b>Client Reference:</b>	<b>Porirua Shoreline Monthly</b>	<b>Quote Reference :</b>	<b>11592</b>
<b>Purchase Order:</b>	<b>7300116623</b>		

#### Sample Details

	WATERS	WATERS	WATERS	WATERS
<b>Lab Sample ID:</b>	<b>210104-011-1</b>	<b>210104-011-2</b>	<b>210104-011-3</b>	<b>210104-011-4</b>
<b>Client Sample ID:</b>				
<b>Sample Date/Time</b>	26/01/2021 06:15	26/01/2021 05:50	26/01/2021 06:23	26/01/2021 06:38
<b>Description:</b>	Porirua Location 1: 200m E of Outfall Grab 1Month	Porirua Location 2: 200m SW of Outfall Grab 1Month	Porirua Location 3: Titahi Bay Beach Point 1 Grab 1Month	Porirua Location 4: Titahi Bay Beach Point 2 Grab 1Month

#### Microbiology

##### Enterococci by Membrane Filtration

Enterococci	cfu/100 mL	78	9.1	1.8	200
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##### Faecal coliforms by Membrane Filtration

Faecal coliforms	cfu/100 mL	170	13	3.6	200
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#### Sample Details

	WATERS	WATERS	WATERS
<b>Lab Sample ID:</b>	<b>210104-011-5</b>	<b>210104-011-6</b>	<b>210104-011-7</b>
<b>Client Sample ID:</b>			
<b>Sample Date/Time</b>	26/01/2021 05:30	26/01/2021 07:10	26/01/2021 07:38
<b>Description:</b>	Porirua Location 5: Te Horohiwa Rocks Grab 1Month	Porirua Location 6: Mount Cooper Coastal Grab 1Month	Porirua Sample Control Site Grab 1 Month

#### Microbiology

##### Enterococci by Membrane Filtration

Enterococci	cfu/100 mL	66	<1.8	1.8
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##### Faecal coliforms by Membrane Filtration

Faecal coliforms	cfu/100 mL	360	<1.8	<1.8
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Results marked with \* are not accredited to International Accreditation New Zealand

Where samples have been supplied by the client, they are tested as received.

The results of analysis contained in this report relate only to the sample(s) tested. A dash indicates no test performed.

#### Reference Methods

The sample(s) referred to in this report were analysed by the following method(s)

Analyte	Method Reference	MDL	Samples	Location
<b>Microbiology</b>				
<b>Enterococci by Membrane Filtration</b>				
Enterococci	APHA (online edition) 9230 C	1 cfu/100 mL	All	Wellington
<b>Faecal coliforms by Membrane Filtration</b>				
Faecal coliforms	APHA (online edition) 9222 D	1 cfu/100 mL	All	Wellington

The method detection limit (MDL) listed is the limit attainable in a relatively clean matrix. If dilutions are required for analysis the detection limit may be higher.  
 For more information please contact the Operations Manager.



Samples, with suitable preservation and stability of analytes, will be held by the laboratory for a period of two weeks after results have been reported, unless otherwise advised by the submitter.

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