

Prepared for To Tatou Vai

**By** Tiu Te Matangi Ltd

June 2023

#### Acronyms

AVG Automatic valveless gravity filter
NES National Environmental Services

OEMP Operational environmental management plan

PACI Poly Aluminium Chloride SOP Standard operating procedure

SS Suspended solids
ST Settling Tank
TTV To Tatou Vai

WTP Water Treatment Plant

<u>Units</u>

μg/L milligrams per liter

Kg Kilograms

E. Coli Escherichia coli (E. coli) bacteria normally live in the intestines of people and animals.

Most *E. coli* are harmless and actually are an important part of a healthy human intestinal tract. However, some *E. coli* are pathogenic, meaning they can cause illness, either diarrhea or illness outside of the intestinal tract. The types of *E. coli* that can cause diarrhea can be transmitted through contaminated water or food, or through contact with animals or persons. (https://www.cdc.gov/ecoli/general/index.html)

## Contents

	Acronyms	1
	Explanation	3
1.	Where is the Matavera Water Treatment Plant?	4
2. er	Matavera Water Treatment Plant – Areas where there are likely significant potential adverse nvironmental impacts.	5
3.	How the WTP work?	6
4.	Management of Environmental Hazards and Risks	7
5.	Summary of Recommendations and Monitoring Programme	9
6.	Appendices1	1
	6.1 Risk Assessment Methodology Used1	1
	6.2 To Tatou Vai (TTV) Water Treatment Plant (WTP) Operator's Daily Check List (Source: TTV Treatment Division)	2
F	igures	
	gure 1 - Location of Rarotonga's Water Treatment Plants with Matavera in red gure 2 - Matavera Water Treatment Plant where there is risk of PACI getting into the environment and	
	here there is potential risk to the Plant from the environment	
Т	ables	
Ta	able 1 Level of risk impact and probability	

#### Explanation

This supplementary plan is informed by the operational environment management plan main report. It provides for the management of environmental hazards and risks outside of the potential hazards and risks caused by the PACI. The plan covers the following:

- 1. Location of the Matavera Water Treatment Plant;
- 2. Areas where there are likely significant potential adverse environmental impacts;
- 3. How the Water Treatment Plant works;
- 4. Management of potential environmental hazards and risks; and
- 5. Summary of Recommendations and Monitoring Programme

## 1. Where is the Matavera Water Treatment Plant?



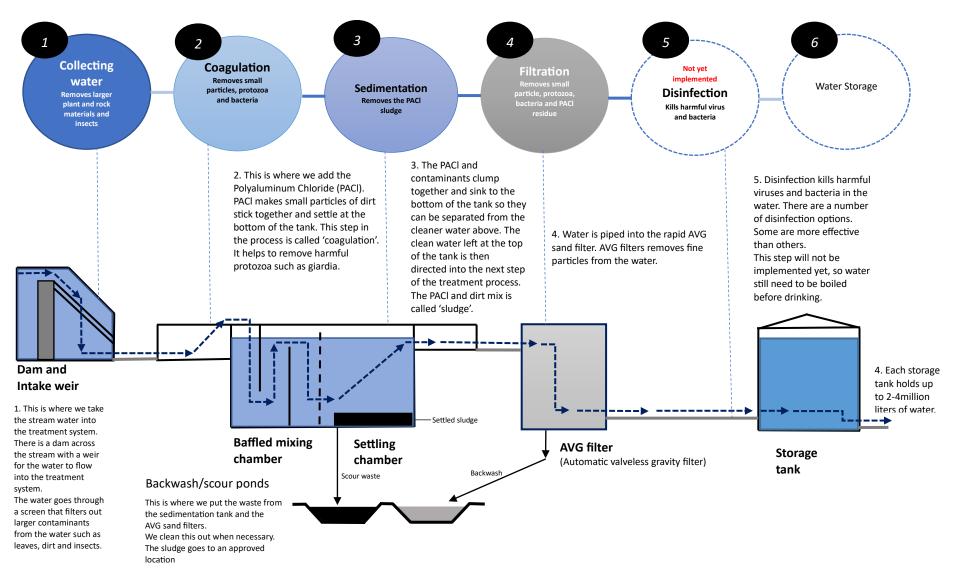
Figure 1 - Location of Rarotonga's Water Treatment Plants with Matavera in red

2. Matavera Water Treatment Plant – Areas where there are likely significant potential adverse environmental impacts. Vater tanl Storage Tank-Detail 3 HW4 -Existing Scour Valve 180 OD PE100 SDR17 -PN10 Pipe HATA-IP5 -7652228 10 422261.30 RL=52.61 180 PE 200 PVC-Connection 7652213.81 U-Bend and Flow Meter New PE pipe connected to existing PVC Watermain typochlorite Shed FFL=63.51 - NAIL-AVG 7652164.62 422228.88 60.10 **AVG Filter** 7652119.265 422197.17 RL=65.16 ding tank Pack Storage Tank FFL=67.38 Risk from PACI PACI Mixing Risk from the Environment IP6A -7652107.78 422207.06 RL=64.78 Note: Areas of risk from PACI is addressed in the main OEMP Report.

Figure 2 - Matavera Water Treatment Plant where there is risk of PACI getting into the environment and where there is potential risk to the Plant from the environment.

#### 3. How the WTP work?

Figure 3 - How the Matavera Water Treatment Plant work (Source: TTV sign boards at each WTP)



# 4. Management of Environmental Hazards and Risks

All hazards and risks are identified and using the risk assessment methodology attached in the Appendices Section as 6.1. The meaning of the color code: Red = Very High Risk, Brown = High Risk, Yellow = Medium Risk, Blue = Low Risk and Green = Very Low Risk.

WTP Location	Hazards and Risks (What they are and level of risk)	Potential Impacts	Mitigation Strategy	Monitoring Parameter	Monitoring Programme	Responsibility	Staff and equipment Requirement	Oversight
Matavera	The result of long-term accumulation of organic material behind the weir during low water flow IC = Minor P = Low	Increased dissolved organic carbon behind the weir at the Intake - can contribution to increased dissolved organic carbon in the water which can influence the solubility level of aluminum in the water.	Short term + keep the area behind immediately behind the weir at the intake free of accumulated organic debris + Check twice weekly	- Accumulation of organic debris behind the weir especially during low water flow.	+ Keep an eye out for accumulation especially during times of low water flow. + Increase rotting smell of vegetation in the water. + Check twice weekly	+ Operator (s)	+ Operator (s) + 4 the more the better.	+ Supervisor
	Increase suspended solids IC = Moderate P = Medium	- Adverse impact on the water quality. - increase sludge in settling pond.	+ Keep vegetation along lower slopes short. + Eliminate invasive species, e.g., pīpī-vai, rau-māniota and kākā. + Regular inspection of inner stream for overgrowth.	- Suspended solid level	+ Continue with water testing programme	+ Operator (s) + TTV laboratory staff	+ Operator (s) + 4 the more the better.	+ Supervisor
	Removal of debris from behind weir. IC = Moderate P = Medium	- Erosion in the catchment area May increase slips in the catchment area Increase sediment entering WTP.	Short term + Develop SOP for controlled release of materials downstream. + Controlled release of material downstream. Long term + Request for NES approval for controlled	- SOP - Debris deposits and volume of deposits When debris level is critical and after major rainfall.	+ Daily check + After major rainfall.	+ Operator (s) + Supervisor	+ Removal by contractor, T&M Heather. Supervisor to be present.	+ Manager + Supervisor

WTP Location	Hazards and Risks (What they are and level of risk)	Potential Impacts	Mitigation Strategy	Monitoring Parameter	Monitoring Programme	Responsibility	Staff and equipment Requirement	Oversight
			release of material downstream. + Investigate and construct silt trap options further inland of the intake and weir to minimize erosion.	- Volume of material released.				
	South side of ST wall, scouring of stream bank. IC = Moderate P = Low	- South side walls of ST threatened, and may crack from instability	Short term + Keep an eye on signs of advance scouring. Long term + Prevent advance scouring to protect ST north wall from potential damage, e.g., Gabion baskets or temporary rock revetments. +See engineering division for advice + Keep an eye on potential advance.	- Signs of advance scouring	+ At the moment no checking, but keep an eye out for signs of advance scouring. + Keep side of stream clear for easy visual observation. + Daily checking <sup>1</sup> , and especially after major flooding event.	+ Supervisor	+ Operator (s) x2 and vehicle assigned, uses daily check list <sup>2</sup> .	+ Manager + Supervisor
	Removal of debris from behind weir. IC = Moderate P = Medium	- Erosion in the catchment area May increase slips in the catchment area Increase sediment entering WTP.	Short term  + Develop SOP for controlled release of materials downstream. + Controlled release of material downstream. Long term + Request for NES approval for controlled release of material downstream.	- SOP - Debris deposits and volume of deposits When debris level is critical and after major rainfall Volume of material released.	+ Daily check + After major rainfall.	+ Operator (s) + Supervisor	Removal from behind the weir by contractor, T&M Heather. Supervisor to be present.	Manager and Supervisor

<sup>&</sup>lt;sup>1</sup> Daily Inspection by two (2) operators, two for the southside and 2 for the northside. There is a swap every week and operator rotation work apply. <sup>2</sup> Checklist reporting attached as evidence.

WTP Location	Hazards and Risks (What they are and level of risk)	Potential Impacts	Mitigation Strategy	Monitoring Parameter	Monitoring Programme	Responsibility	Staff and equipment Requirement	Oversight
			+ Investigate and construct silt trap options further inland of the intake and weir to minimize erosion.					
	Falling trees. IC = Major P = Medium	- Encroachment onto plant increases risk of falling trees onto the Plant. - Increase risk of leaves falling into the ST	Short term + Trim trees + Keep trees low + Remove fallen leaves and branches from the ST Long term + Remove trees that are likely to cause risks to the plant whether it be fallen leaves, broken branches or falling trees.	- Threatening Vegetation. - Invasive species such as pīpī-vai, rau-māniota, albecia, tree hibiscus and creepers like kākā.	+ Daily check + Dedicated monthly check for vegetation overgrowth or vegetation threatening the plant or parts of the plant.	+ Supervisor (s)	+ Contractor option is preferred.	+ Manager + Supervisor

## 5. Summary of Recommendations and Monitoring Programme

The following are recommended actions to improve the operation and effective management of this WTP.

There is one area around the WTP that requires attention but are not priority areas. This regards the protection of the south side of the settling tank as it is close to the stream. Recommendations are provided for them to help deal with it in the long term.

It is important to investigate further ways to reduce the workload involved in the removing of debris from behind the weir. Removing the debris will also help prevent the longer accumulation of organic materials behind the weir.

The risk of falling trees is noted so recommendations are provided to keep this under control.

The following are recommended strategies for each area identified as medium to high risk.

Hazards and	Recommendations	Monitoring Programme			
Risks					
Southside of ST	+ Prevent advance scouring to protect ST north wall from potential damage,	+ keep an eye out for signs of advance scouring.			
wall, scouring	e.g., Gabion baskets or temporary rock revetments.	+ Keep side of stream clear for easy visual observation.			
of stream bank.	+See engineering division for advice	+ Daily checking, and especially after major flooding event.			
	+ Keep an eye on potential advance.				
Removal of	+ Develop SOP for controlled release of materials downstream.	+ Revised SOP			
debris from	+ Request for NES approval for controlled release of material downstream.	+ Measure volume of deposits.			
behind weir.	+ Investigate and construct silt trap options further inland of the intake and	+ Remove debris when debris level is critical and after heavy rain in			
	weir to minimize erosion.	Matavera.			
		+ Measure volume of material released.			
		+ Daily check			
Falling trees.	+ Trim trees	+ Daily check			
	+ Keep trees low	+ Dedicated monthly check for vegetation overgrowth or vegetation			
	+ Remove fallen leaves and branches from the ST	threatening the plant or parts of the plant.			
	+ Remove trees that are likely to cause risks to the plant whether it be fallen				
	leaves, broken branches or falling trees.				

# 6. Appendices

## 6.1 Risk Assessment Methodology Used

The assessment of risks involved for each hazard is provided below in Tables 1 and 2.

Table 1 Level of risk impact and probability

Risk Criteria	Definition of Rating	Score
	A: Extent – The area over which the impact will be experienced	Local = 1; Island = 2; and National = 3
Impact (I)	<b>B:</b> Intensity – The magnitude of the impact, i.e., whether the impact will result in minor, moderate, major or catastrophic environmental, social and economic (including human health) changes	Low = 1; Medium = 2; and High = 3
	<b>C:</b> Duration – The time frame over which the impact will be experienced and its reversibility.	Short Term – 1; Mid Term – 2; and Long Term – 3
In	npact Consequences (Combined Score): Minor 3 – 4; Moderate 5 – 6; Major 7	7 – 8; Massive 9 – 10.
Probability	Improbable - Unlikely to occur during project lifetime	1
(P) -	Possible - May occur during project lifetime 20%-60% chance of occurring	2
Likelihood of the	Probable - Likely to occur during the project lifetime >60-90% chance of occurring	3
impact occurring	Highly probable - Highly likely to occur, or likely to occur more than once during project lifetime	4

Table 2 Matrix showing overall significance of the impact as a combination of the consequences and probability rating

		Probability of Occurrence					
		Improbable	Possible	Probable	Highly Probable		
of	Minor	Very Low	Very Low	Low	Low		
Consequences of Impact	Moderate	Low	Low	Medium	Medium		
lmsequ	Major	Medium	Medium	High	High		
8	Catastrophic	High	High	Very High	Very High		

### 6.2 To Tatou Vai (TTV) Water Treatment Plant (WTP) Operator's Daily Check List (Source: TTV Treatment Division)

Date WTP	Sludge Level (%)	Bulk Tank (%)	Dose Rate (mg/L or g/m³)	Intake (NTU)	ST (NTU)	Post AVG (NTU)	Reservoir (NTU)	Flow Rate (L/Sec)	Reservoir (KPA)	Comments
_										

**Note:** PACI storage tank (how full it is in %), PACI header tank (Float valve and arm), the sludge level in the settling tank (from bottom of tank to mid-way level in %), adjusting the dosing level of PACI (in mg/L), Intake (NTU), Sediment tank (Float valve arm at the NTU), Post AVG (NTU), RES (NTU) Flow rate (L/sec)