
Murupara Public Water Supply – Water Safety Plan

- Report Prepared for:

Whakatane District Council

- Report Prepared by:

Pattle Delamore Partners Ltd

- Final July 2018

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Limitations:

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Executive Summary

Pattle Delamore Partners Ltd (PDP) has been engaged by Whakatane District Council (WDC) to update the existing 'Murupara Water Supply Public Health Risk Management Plan, Final V2' (September 2007) document for the Murupara Public Water Supply Scheme (Murupara Scheme).

This Water Safety Plan (WSP) (formerly known as Public Health Risk Management Plan, PHRMP) was prepared by PDP in collaboration with WDC to identify and manage events that could occur in the Murupara Scheme with potential to cause public health risks to consumers of the scheme.

The following were undertaken in the preparation of this WSP:

- Identifying components and operation of the Murupara Scheme.
- Identifying Contamination and Loss of Supply events that could occur in the scheme that could result in public health risks.
- Preparing Risk Tables to identify potential risks, by identifying existing and additional barriers to contamination and critical points in the scheme. In addition evaluate if the Preventative measures currently in place are able to reduce the risks were also identified.
- Preparing an Improvement Plan by introducing new preventative measures to manage risks that are not sufficiently managed for this non-disinfected water supply.
- Identifying Critical Control Points (CCPs) in the scheme and limits within which the CCPs are operated to prevent contamination. Control actions to be carried out when CCPs operate outside these limits were also identified.
- Preparing Contingency Plans to mitigate events of acute health risk that may occur despite preventative measures being in place for this non-disinfected water supply.

This report was prepared in line with the methodology recommended by the Ministry of Health for preparation of Water Safety Plans. Information used in this report was gathered from documents and reports belonging to the Whakatane District Council, during site visits carried out by PDP to the Murupara water treatment plant, pump station and reservoir sites, and during a consultation workshop with WDC staff. Contributors to this report are listed in Section 11.0.

Table of Contents

SECTION	PAGE
Executive Summary	ii
1.0 Revision and Performance Assessment	1
2.0 Supply Summary	3
3.0 Introduction	4
4.0 Description of Murupara Water Supply	6
4.1 Scheme Details	6
4.2 Changes to the Scheme since last WSP Report	18
5.0 Compliance with Drinking Water Standards	19
6.0 Critical Points and Barriers to Contamination	21
7.0 Risk Assessment Tables	25
8.0 Improvement Plan	26
9.0 Process Control Summaries	36
9.1 Critical Control Point: Non-Disinfected Water Supply	39
10.0 Contingency Plans	39
11.0 Methodology and Consultation	42

Table of Figures

Figure 1: Whakatane District	5
Figure 2: Murupara Water Supply Scheme	7
Figure 3: Schematic of Murupara Water Supply Scheme	8
Figure 4: Pump Station Site with Bores and Suction Tank (Left) and North Bore Head (Right)	9
Figure 5: North Bore Head (Left) and South Bore Head (Right)	10
Figure 6: Suction Tank (Top), Two High-Lift pumps (Bottom Left) and Diesel pump with diesel storage (Bottom Right)	11
Figure 7: Concrete Reservoirs (Left) and Reservoir Roof (Right)	15
Figure 8: View of opened sample box on pipework from bore	18
Figure 9: Barriers to Contamination and Critical Points of the Murupara Scheme	22
Figure 10: Critical Control Points and Corresponding Control Parameters for the Murupara Scheme for Source, Storage and Distribution	38
Figure 11: Methodology	42

Table of Tables

Table 1:	Revision Details	1
Table 2:	Murupara Scheme Summary	3
Table 3:	MoH Grading for Water Supply Schemes	19
Table 4:	Murupara Compliance Criteria (DWSNZ 2008)	19
Table 5:	Barriers to Contamination	23
Table 6:	Critical Points	24
Table 7:	Likelihood Scale as Defined by WDC	25
Table 8:	Consequence Scale as Defined by WDC	26
Table 9:	Risk Matrix	26
Table 10:	Persons Responsible for Improvement Plan Items	27
Table 11:	Improvement Plan – High Priority Items	28
Table 12:	Improvement Plan – Medium Priority Items	32
Table 13:	Improvement Plan – Low Priority Items	34
Table 14:	Process Control Definitions	36
Table 15:	Contingency Plans	40
Table 16:	Source – Catchment and Bores	A-1
Table 17:	Treatment	A-6
Table 18:	Reservoirs	A-9
Table 19:	Distribution	A-12
Table 20:	Limits Process Performance Parameters	A-1
Table 21:	Turbidity - Triggers and Corrective Actions	A-2
Table 22:	Improvement Plan – Completed Items	E-1

Table of Appendices

Appendix A:	Murupara Scheme Risk Tables
Appendix B:	Murupara Scheme Process Control Summaries
Appendix C:	Murupara Scheme Reservoir Inspection Sheet
Appendix D:	Murupara Scheme Log Credit Assignment by DWA
Appendix E:	Improvement Plan – Completed Projects
Appendix F:	Groundwater Capture Zone
Appendix G:	Report on adequacy of a Drinking Water Supply’s Water Safety Plan

1.0 Revision and Performance Assessment

Table 1: Revision Details

Version No.	Revision Details	Author	Date
V1	Public Health Risk Management Plan - submission to DWA	OPUS	23/08/2007
V2	Public Health Risk Management Plan – revised to account for non -conformances	OPUS	19/09/2007
V3	Public Health Risk Management Plan – revised with DWA recommendations	OPUS	15/02/2008
1.00	Prepared by PDP in collaboration with WDC, submitted to WDC for comments	PDP	22/02/2018
1.01	Modified with WDC comments for submission to DWA	WDC/PDP	15/05/2018
1.02	FINAL Version release from PDP to WDC	PDP	30/07/2018
1.03	Updated Improvement Plans and submission to Drinking Water Assessor	WDC	20/12/2018
1.04	Modifications after reviewing DWA ‘Report on adequacy of a Drinking Water Supply’s Water Safety Plan (MUR002_Murupara_WSPadequacy_04012019_v2)	WDC officers: Neal Yeates Michael Van Tilburg	26/04/2019
1.05	Modifications after teleconference with DWA on 10 May 2019 and resubmit to DWA	WDC officers: Neal Yeates Michael Van Tilburg	17/05/2019
2.00	Approval from DWA - change to ‘Report on adequacy of a Drinking Water Supply’s Water Safety Plan (MUR002_Murupara_WSPadequacy_21052019_v1)	DWA approval added by Michael Van Tilburg	27/05/2019

The Health (Drinking Water) Amendment Act 2007 requires drinking-water suppliers providing drinking-water to over 500 people to develop and implement WSPs.

WSPs are required to be revised and re-submitted to the Drinking Water Assessor (DWA) for approval every 5 years as a minimum. Accordingly, this plan was due for revision and approval by the DWA back in 2013! In recent times, Council has increased in-house resources and will keep strict control of adhering to the regulatory requirements. It should be noted that the WSP is a live document and should be updated as required; it is therefore recommended that WDC revise and resubmit this WSP if there are significant changes to the operations or risks to the Murupara Scheme within the 5-year period.

The performance of this WSP is to be assessed annually by reporting on the following items:

- any risk events.

- non-compliances or near misses that have occurred.
- contingency plans that have been used.
- changes made to the scheme operation and components.
- progress made against the Improvement Plan.
- any new risks or improvements that are required to be made and people responsible for carrying them out.

The performance assessment, in the form of a short report, will be submitted by the Manager Three Waters to the Drinking Water Assessor by 31 July each year.

The following staff will be responsible for including any relevant items arising from this report into the Annual Plan, Water Asset Management Plan and Long Term Plans: Manager Three Waters, Team Leader - Three Waters Asset Management and Planning, Manager - Capital Projects, Team Leader - Three Waters Operations.

This WSP is to be linked to the Annual Plan, the Water Asset Management Plan and the Long Term Plan.

This WSP is to be read in conjunction with the 'Catchment Risk Assessment for Murupara Bore Water Supply, Whakatane District Council' report (PDP, October 2017).

2.0 Supply Summary

Table 2: Murupara Scheme Summary	
Supply Details	
Supply Name	Murupara Community Water Supply
WINZ Community Code	MUR002
Supply Owner	Whakatane District Council
General Manager Infrastructure	David Bewley
Manager Three Waters	Tomasz Krawczyk
Team Leader – Water Treatment Plant	Neal Yeates
Water Treatment Plant Operators	Ian Bowen Bryan Vautier Tasman Van der Woude
Capital Projects Manager	Jim Finlay
Team Leader - Three Waters Assets Management and Planning	Michael Van Tilburg
Population Served by Supply ¹	1,915 People
Number of Connections ²	770 Connections
Source Details	
WINZ Source Code	G03032 (Murupara North Bore)
WINZ Source Code	G00437 (Murupara South Bore)
Type of Source	Two deep artesian bores (North bore approximately 88 metres below ground level (bgl), cased to 67 m bgl and an 'open-hole' no screen depth after. No information on South bore available.)
Consent No.	20114
Consent Expiry	01/10/2026
Maximum Consented water take:	4,100 m ³ /d
Map Reference (NZTM2000)	X:1922631.61815, Y:5736760.78125

¹ 2013 Census – Statistics New Zealand. Information based on Whakatāne District data

² WDC Data, December 2018.

Table 2: Murupara Scheme Summary

Treatment Details	
WINZ TP code	TP00719
Treatment Processes	No Treatment
Average Daily Demand (July 2015 – November 2018) ³	1,265 m ³ /day (Pumped to reservoirs)
Peak Daily Demand (July 2015 – November 2018) ³	2,395 m ³ /day
Distribution Details	
WINZ Distribution Zone Code	MUR002MU
Distribution Zone materials	94% Asbestos Cement (AC) and 6% Steel

3.0 Introduction

The Murupara Scheme is owned and operated by WDC and supplies a population of approximately 1,915¹ people. The water is sourced from two deep free flowing artesian bores and is currently not treated for bacteria or protozoa before being circulated to consumers.

Administration of the scheme is carried out at Council head office located at Commerce Street, Whakatāne. The reticulation contractor is stationed in Murupara undertaking day-to-day activities via contacts at the Murupara Service Centre located at Civic Square, Murupara. Treatment plant operators are stationed at Council's main Water Treatment Plant located at Valley Road, Whakatane.

Key WDC personnel responsible for the management and operation of the scheme are as follows:

- Chief Executive (CE) – Steph O’Sullivan
- General Manager Planning and Infrastructure (GM) – David Bewley
- Manager Three Waters (MTW) – Tomasz Krawczyk
- Manager Public Affairs (M-PA) – Ross Boreham
- Team Leader - Water Treatment Plant (TL-WTP) - Neal Yeates
- Water Treatment Plant Operator (WTP-O) – Ian Bowen / Bryan Vautier / Tasman Van der Woude

³ WDC Murupara Water Returns for period July 2015 – November 2018.

- Team Leader - Three Waters Operations (TL-O) – Luke Shipton
- Team Leader - Three Waters Administration (TL-AS) – Helen Toby
- Team Leader - Three Waters Asset Management and Planning (TL-AM) - Michael Van Tilburg
- Asset Engineer - Three Waters (AE) – Sala Ranasinghe & Joe Xie
- Senior Project Planner (SPP) – Nicholas Woodley
- Manager - Capital Projects (PM) – Jim Finlay
- Project Engineer - Three Waters (PE) – Leilani Salanguit
- Murupara Reticulation Contractor (RC) – Adam Anderson

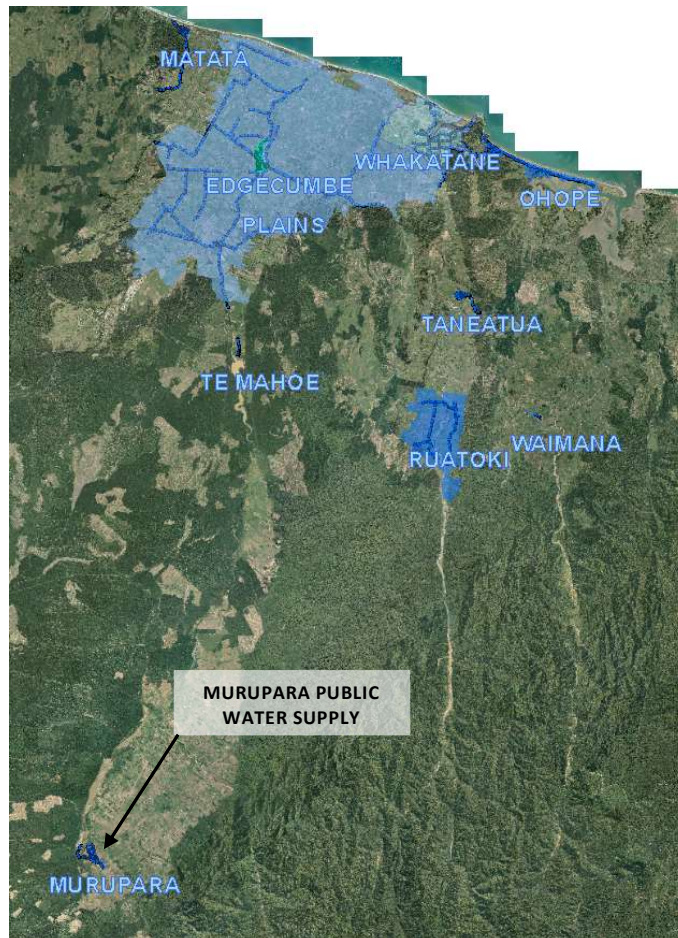


Figure 1: Whakatane District

4.0 Description of Murupara Water Supply

4.1 Scheme Details

The Murupara water supply scheme was established in 1950's and is owned and operated by the WDC. The scheme supplies all residents within the Murupara water supply scheme boundary and has 770 connections serving an estimated population of 1,915 people. The water treatment plant, reservoir and reticulation infrastructure of Murupara are considered sufficient to meet projected demand up to the year 2025.

The supply is predominantly unmetered with just 44 commercial, farm and high-use consumer connections being metered including the following: two schools, two swimming pools, a service station and a small shopping centre consisting of a few cafes and offices. Backflow prevention devices have been installed on some of these connections and Council over the next financial year is installing minimum of dual check manifold backflow devices on all residential properties and reviewing all other connection installing appropriate backflow devices according to potential risk.

The average daily demand and maximum peak demand between July 2015 - November 2018 was 1,265 m³/day and 2,395 m³/day respectively. The water take consent for the scheme is administered by the Bay of Plenty Regional Council (BOPRC) and the maximum consented take for the supply is 4,100 m³/day. The consent (Consent Number 20114) expires in 2026 whereby a new water take resource consent will be required.

Due to its distance from the main service centres in Whakatane town, the Murupara Scheme has its own contact centre in the Murupara Township where administration is carried out. Work on reticulation network and water sampling is undertaken by a local contractor employed by WDC (Adam Anderson) who resides in Murupara. The contractor is responsible for carrying out maintenance and other work in the network, working on both wastewater and water networks. The Whakatane WTP operators have limited involvement in the day to day operation of the Murupara Scheme.

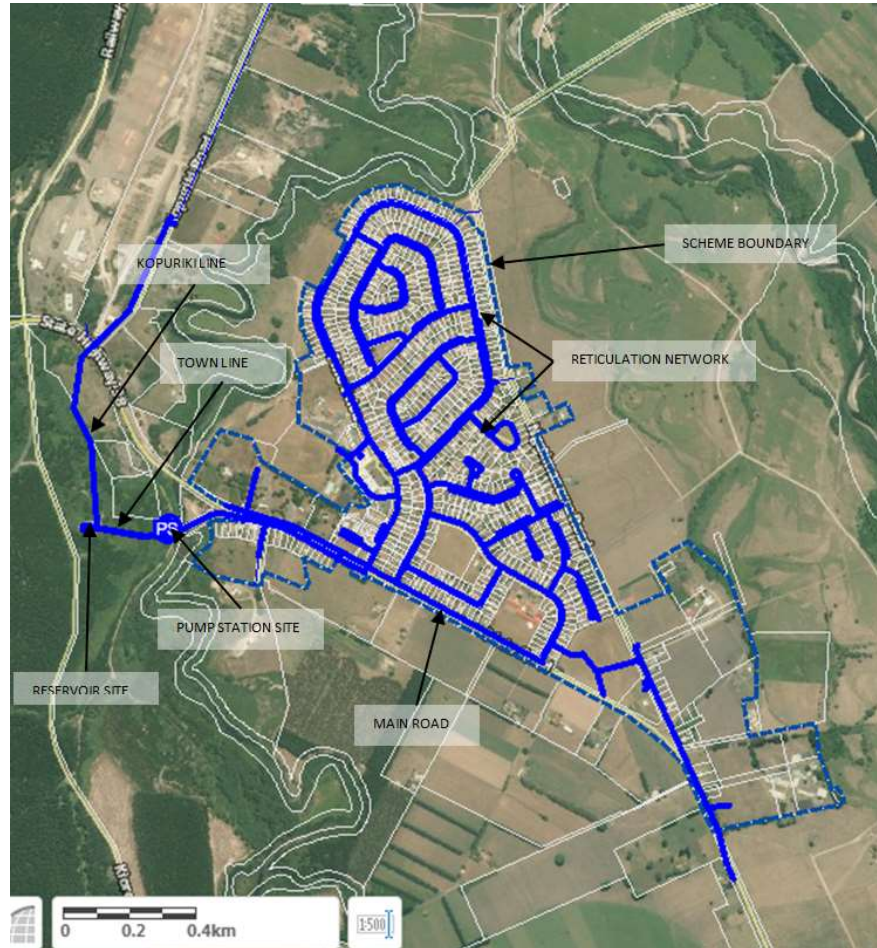


Figure 2: Murupara Water Supply Scheme

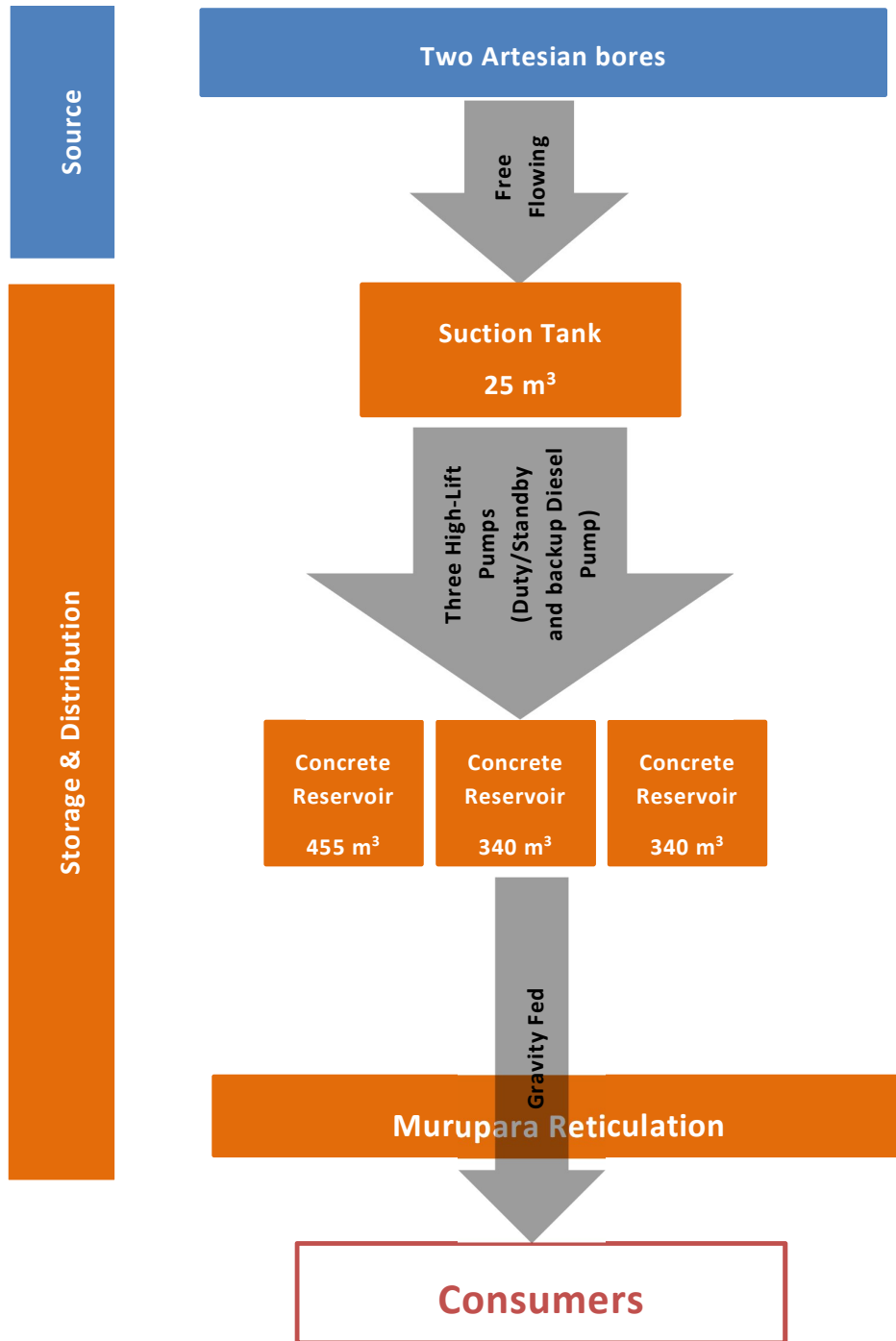


Figure 3: Schematic of Murupara Water Supply Scheme

4.1.1 Water Source and Catchment

Water is abstracted from two free flowing artesian bores (north and south bore) located upstream of the SH38 bridge crossing and were originally installed in 1960's and later deepened in 1984. No bore logs are available, however, a CCTV inspection carried out in August 2017 on the North bore showed that the bore is cased to 67 metres below ground level (m bgl) after which the bore is 'open hole' (no screen). Total depth of the bore was estimated to be approximately 88 m. The South bore was not surveyed and is assumed to have a similar installation design to the North bore.



Figure 4: Pump Station Site with Bores and Suction Tank (Left) and North Bore Head (Right)



Figure 5: North Bore Head (Left) and South Bore Head (Right)

A catchment risk assessment (CRA) carried out in October 2017 (PDP, October 2017) estimates that the two bores are drilled directly into ignimbrite and the source of water is from deeper, confined zone of ignimbrite; this is supported by the high artesian pressure of approximately 20 metres head. Recharge is assumed to be from higher elevations along the Kaingaroa Plateau which is dominated by 'Pine Forest' associated with forestry industry. Groundwater residence testing undertaken by GNS (2013) estimated a groundwater residence time of 44 to 57 years with less than 0.005% young fraction (<1 Year). The assessment considers it likely that the bore supply is hydraulically confined and therefore not likely to be affected by the shallow groundwater system although this cannot be ruled out. Further information can be found in the 'Catchment Risk Assessment for Murupara Bore Water Supply, Whakatane District Council' report (PDP, October 2017).

Although the bores flow at high artesian pressure, contamination through bore head ingress is unlikely but possible if a significant reduction in pressure during summer months was to occur. The security/stock fence is currently less than 5 metres from the centre of the bore heads on two sides as it isn't possible to extend the fence due to the cliff face and tributary on these two sides. Council will seek clarification of the fencing requirement and will provide evidence that all practical measures have been undertaken for this site. The risks of not having a 5 metre exclusion zone is very low due to no stock grazing is undertaken in any of the surrounding areas. Currently there is a single check valve (untestable) installed immediately above the bore casing. Council is reviewing the requirement for installation of double check testable backflow preventer as the two boreheads top discharge into the suction tank with a 100mm airgap present. The likelihood of backflow of water from the reservoirs through the high lift pumps into the suction tank is highly unlikely given this arrangement and the positive bore pressure.

The artesian bores flow into a 25 m³ suction tank; flow is controlled by motorised valves on each bore head which are connected to a level sensor in the suction tank. Raw water is pumped from the suction tank to the reservoirs by two high-lift

pumps which work on a duty/standby basis. A diesel pump is interconnected to operate one during power outages and diesel is stored on-site, locked in the concrete building housing the pumps. There is no immediate danger of prolonged loss of supply due to power outages.

There are no booster pumps in the system. The high-lift pumps are operated based on level sensors in the storage reservoirs.

All air vents on the suction tank and the overflow pipe from the suction tank should be meshed to prevent entry of vermin, birds and feral animals.



Figure 6: Suction Tank (Top), Two High-Lift pumps (Bottom Left) and Diesel pump with diesel storage (Bottom Right)

A reduction in bore yield over time has been experienced and has become more apparent during summer months. The lack of a bore screen indicates the reduction in bore yield over time is likely to be attributed to reducing pressures in the aquifer and not a result of bore screen clogging. Reducing pressures can be driven by a few factors such as long-term changes in rainfall recharge in the source area, or as a cumulative effect of pumping from the municipal bores and/or other bores in the area. Land use can also influence rainfall recharge such as forestry harvesting cycles. Although water produced in peak summer months was adequate to meet demand, measuring of pressure at the bore heads is advised to monitor seasonal variations and reduction in bore pressure over time. Further to this, consideration should be given to new water take applications tapping into the same aquifer that has the potential to reduce yield for the two artesian bores.

The pump station site has no previous history of flooding due to heavy rain events and is situated above the modelled 1% AEP flood level⁴ and is therefore not considered vulnerable to flooding. Historically, surface water ponding has occurred at the site once due to blocking of the adjoining tributary next to the pump station site. This blockage was by a chair being dumped at the culvert and then build-up of vegetation and debris during heavy rain event. Twice a week, visually inspection of the tributary is undertaken when visiting the pumping station site for any signs of blockage. If blockages are present, the passageway is cleared ensuring continuous flow of water and preventing ponding.

4.1.2 Treatment

Artesian water does not undergo any treatment prior to storage and supply to the Murupara reticulation network. The lack of a treatment barrier has heightened the risk of contamination events arising in the Murupara Scheme.

Bacterial Compliance: Treatment plant and distribution zone bacterial compliance is achieved through E coli monitoring according to the Drinking-water Standards New Zealand (DWSNZ 2008)⁵.

No disinfection treatment is carried out. As Murupara water supply is not disinfected in anyway, Council has increased the sampling frequency and any positive E coli transgressions from a sample will trigger appropriate procedures.

Protozoa Compliance: Further to a catchment risk categorisation carried out in October 2017⁶ a protozoa treatment of log credit 3 was assigned to the Murupara Scheme by the DWA (Appendix D). As a result, the Murupara Scheme is non-compliant for protozoa compliance as it has no protozoa treatment in place. The DWA's correspondence states that the 3 log credits can be re-visited once

⁴ Information received from Bay of Plenty Regional Council, August 2017.

⁵ Drinking-water Standards for New Zealand 2005 (Revised 2008).

⁶ Catchment Risk Assessment for Murupara Bore Water Supply Report, PDP September 2017.

groundwater Security Criteria 2⁷ is satisfied by carrying out the recommendations listed in the CRA Report (Section 9.0) and Section 8.0 in this Water Safety Plan. The DWA's correspondence also states that "...the *Report of the Havelock North Drinking Water Inquiry: Stage 2* has made several recommendations regarding the secure classification system and changes in this area may occur in the near future". Therefore, the level of protozoa treatment to be assigned to the Murupara scheme once Security Criteria 2 is satisfied is uncertain. It is anticipated that the Ministry of Health would provide guidance in assigning log credits to the Murupara Scheme once the recommended work is completed.

Chlorination and/or UV treatment of water is recommended as a minimum treatment barrier for this water supply scheme.

Further to Director-General Statement of December 2017 that advises all drinking-water suppliers and drinking-water assessors that:

- Protection of drinking-water sources is of paramount importance and a founding principle of drinking-water safety;
- Every drinking-water supplier must contribute to the protection of drinking-water sources;
- The risk to the public is increased if drinking-water is untreated;
- To provide adequate protection to public health, suppliers providing drinking-water to untreated networked supplies should consider implementing appropriate and effective treatment without delay; and
- They should reconsider their reliance on secure bore water status as a means of providing safe drinking-water.

However, subsequent to public meetings held with the community, the option of any disinfection of the water with chlorination and/or ultraviolet light were discarded by the community and elected Councillors. As per Component 1 of the New Zealand Drinking Water Safety Plan Framework 2018, Council officers with the support of MoH and DWA's engaged the local community who are strongly opposed to any treatment of the water supply and councillors took this on-board.

Council decision, made in February 2018, after considering all advice from Council officers, MoH and DWA was to proceed with secondary mechanical protection of the supply through the implementation of a system-wide installation of backflow prevention devices on all connected properties. The programmed installation of backflow prevention devices using dual check valves on every residential property and testable devices on medium and high risk connections has commenced in April 2019.

The decision to not use any formal disinfection treatment is subject to change if mandated treatment requirements are introduced by Central Government. Council will revisit this item once clear direction has been issued with regards to the matter.

⁷ Drinking-water Standards for New Zealand 2005 (Revised 2008) Section 4.5.2.2.

Currently the only monitoring equipment at the pumping station site is electromagnetic flowmeters. The plant is designed to alarm when there is power loss at site.

Although the water is via positive pressure artesian bore this is a not disinfected water supply so there is a heightened risk of contamination, council acknowledges this so has increase the sampling regime and testing via Heterotrophic Plate Count (HPC) method. Any sudden increases in HPC above levels typically seen within this system may indicate a change in the quality of raw water or, that bacterial regrowth has occurred in the distribution system. When steady increases of HPC are seen over time, this indicates a gradual decline in raw water quality. Council will monitor these results give early warning indication of changes to the water quality.

Additionally, Council is installing online Turbidity meter, conductivity meter and pH to indicate early warning changes in water quality. The installations are to be completed June 2019.

The current control of processes is further discussed in Section 9.0 Process Control Summaries and new process controls will be established once new online equipment has been commissioned and is operational.

4.1.3 Storage and Distribution

The highest perceived risk to the Murupara Scheme storage and distribution system is the absence of residual chlorine in water. In the event of a contamination incident in the storage and distribution system, lack of chlorine could have severe consequences on public health.

Water is pumped to three concrete reservoirs located nearby before being gravity fed to the Murupara reticulation system. The reservoirs consist of two concrete tanks of capacity 340 m³ each and one concrete tank of capacity 455 m³; the reservoirs are connected in series. Another 340 m³ concrete reservoir is also on site; however this has been decommissioned due to rationalisation of number of reservoirs to reduce large volumes of storage water not turning over and the structural integrity of this reservoir. The reservoir has physical pipework removed and is no longer interconnected to the Murupara scheme.

The total storage capacity of 1,135 m³ available is just sufficient to meet average daily demand and fire-fighting flows and provides 24-hour emergency storage. The concrete reservoirs are required to be assessed for structural integrity due to their age and are currently appear to be in average condition. The reservoir site is highly vulnerable to vandalism; the site inspection showed broken glass/bottles, tracks on the site indicating vehicle access and extensive graffiti on at least two reservoir walls. The reservoir vents have been repaired by WDC on a number of occasions due to vandalism. Security fence to be installed at the reservoir site; however, there are ongoing land matter issues dating back to 2010 which Council is

resolving. A forestry gate accessing the site should be locked at all times but again land issues prevent this occurring.

An assessment of the rising main undertaken in 2008 identified the main to be in a vulnerable position due to it crossing the tributary; it could be damaged during high flows in the tributary. The rising and falling mains are also reported to be in poor condition. A decision was made to install a second rising main but this was later discounted due to the costs. As an alternative and for security of supply additional valving and pipework was installed, allowing direct pumping into the reticulation system by-passing the rising main and reservoirs. This by-pass arrangement can be used in an emergency in case of failure of either the rising main or reservoirs.

The reservoirs feed two main lines; the Kopuriki Line which supplies water to several forest blocks and the Town Line which supplies water to the Murupara Township.



Figure 7: Concrete Reservoirs (Left) and Reservoir Roof (Right)

The reticulation network comprises of approximately 13.1 km of watermains which consists of approximately 94% Asbestos Cement (AC) and 6% Steel (ST) pipes. There are 6.9 km of rider mains of which 87% are of 50mmØ AC material. There are some Galvanised Iron (GI), Medium Density Polyethylene (MDPE) and Polyvinyl Chloride (PVC) pipes within the system.

Like the majority of Councils water supply systems the Murupara reticulated water scheme is in the vicinity of Murupara sewerage network. The Murupara sewerage network experiences high levels of inflow and infiltration into the wastewater pipes during wet weather events and due to these high volumes, the likely source is from illegally connected stormwater pipes on properties but this needs further investigation. There is no known exfiltration from the wastewater pipe network and therefore the level of contamination of soil is unknown. Unlike Council's other wastewater systems the Murupara system is entirely a gravity based system with

no wastewater pumping stations to assist in delivering sewage to the treatment plant, due to this gravity system the pipe network is generally deeper than the pressurised water reticulation network and the risk of contamination dramatically reduced. Council has undertaken CCTV of sections of Murupara in 2006 and 2009/10 with details of repaired works to be investigated. Council is also developing a district wide inflow/infiltration strategy in 2020 financial year which will include the Murupara wastewater network. From the Inflow/Infiltration strategy council will be able to identify the true risk and what degree of risk, if any, to the Murupara water supply and develop an approach in dealing with the risk.

An in-house water balance carried out for part of the year 2017/18 according to the International Water Association (IWA) guidelines showed that the percentage of real water losses in the system was 56% and the Infrastructure Leakage Index (ILI) was 14.13. The high leakage rates in the system poses risks of contamination in the water distribution network through backflow and through potentially contaminated soil. The amount of leaks in private pipes especially within the private property boundary in the Murupara scheme is consistently high. Risk heightened due to lack of residual chlorine in the water.

The reticulation network is operated at approximately 500 kPa pressure and there are currently no plans to carry out pressure management in the Murupara Scheme.

Although minor routine maintenance is carried out, a majority of the day-to-day operational work consists of reactive maintenance. Attention is required to develop appropriate routine maintenance schedules, procedures and protocols to ensure the system is maintained to optimise the lifecycle of the assets.

As this is a non-disinfected water supply any backflow event from residential properties is heightened and Council's decision is to install backflow prevention devices on all connections which will assist with reducing possibility of a secondary contamination event from a domestic premises. Council has programmed that all domestic connections have a manifold with dual check valve installed. Testable backflow prevention devices have been installed on many farm and commercial connections and the backflow prevention programme will address, by installing, any Murupara water supply connection that does not have a device installed.

Currently, no routine testing of existing backflow prevention devices are carried out. A dedicated Council reticulation operator has recently obtained a certificate for backflow testing and is able to undertake in-house testing once a backflow prevention policy has been adopted by the Council. Additional council officers are scheduled to undertake the backflow testing certificate.

There are some procedures currently in place for third party contractors/developers working on Councils reticulation network. However, procedures need to be further developed, documented and strictly enforced in order to minimise risks arising from these works. Risk arising from this event is heightened due to lack of residual chlorine in the water.

The isolated nature of the scheme has the potential for illegal connections to be made to the reticulated network, therefore, implementation of a policy for identifying and dealing with illegal connections is required.

4.1.4 Monitoring & Control of Scheme

A combined telemetry and SCADA (Supervisory Control and Data Acquisition) system is used to transmit data from the remote sites of the Murupara Scheme (Murupara pump station and reservoir site) to the WDC main control room at Valley Road, Whakatane, where it is monitored and controlled by WDC staff.

Events causing signal failure from equipment such as power outages and malfunctioning of equipment trigger alarms via the SCADA/Telemetry system. Alarms can be seen on the control room monitors and are also delivered to operator mobile phones via text message.

Telemetry shows the high lift pump status, flow rate to the reservoirs and reservoir levels.

Reservoir levels are monitored with the use of level sensors. The two bore pumps operate on a duty standby basis according to pre-set minimum and maximum reservoir levels in order to fill the reservoirs.

Currently, the monitoring of water quality in the Murupara reticulation system is undertaken through routine E coli, total coliform and HPC sampling.

Samples are manually taken two times a week; at the pump station, on either the pumping main or the falling main and within the distribution zone (2 out of 4 sampling sites) and the samples are sent to an approved BoPRC laboratory. Additionally, at the same time pH, turbidity and temperature are undertaken and details recorded.

Council water sample sites for this system are under Council control via locked 'blue box' and sampling is undertaken by trained operators.



Figure 8: View of opened sample box on pipework from bore

Water quality in the reticulation is managed through routine maintenance such as mains flushing, through leak detection programmes and the use of backflow prevention devices.

Council maintains a customer driven Request for Services (RFS) and this is directly linked to Council's Asset Management System. The RFS can come from any person and can be in relation to any of Council's business activities. Generally these originate as a telephone call, this is then entered into the system and depending on the nature of the request different processes are followed. As Murupara is a non-disinfected water supply any water related RFS, i.e. complaints about dirty water, drop in water pressure, water leaks, odour of water, interruption of water services, etc. should be treated as higher priority due to the potential increased risk. Council will include actions in the WSP improvement plan to identify Murupara RFS and how these can be captured, monitored and reported upon to optimise Council response.

Monitoring and control of the system is further discussed in Section 9.0.

4.2 Changes to the Scheme since last WSP Report

No significant changes have been carried out to the Murupara scheme since the previous WSP document apart from routine replacements carried out for valves, hydrants, mains and connections according to the asset renewals programme.

5.0 Compliance with Drinking Water Standards

The Murupara Scheme received a MoH Grading of Dc in 2012. MoH recommends a grading of at least Cc for a drinking water supply of this size. An explanation of the grading given can be found in Table 3.

Table 3: MoH Grading for Water Supply Schemes	
Source and Treatment Grading: Assessment based on source and treatment factors:	
A1:	Completely satisfactory, negligible level of risk, demonstrably high quality.
A:	Completely satisfactory, extremely low level of risk.
B:	Satisfactory, very low level of risk when the water leaves the treatment plant.
C:	Marginally satisfactory, low level of microbiological risk when the water leaves the treatment plant, but may not be satisfactory chemically.
D:	Unsatisfactory level of risk.
E:	Unacceptable level of risk.
Distribution Zone Grading: Assessment based on reticulation condition, management, and actual water quality:	
a1:	Completely satisfactory, negligible level of risk, demonstrably high quality; meets Aesthetic Guidelines and has ISO 9001:2000 accreditation.
a:	Completely satisfactory, extremely low level of risk.
b:	Satisfactory, very low level of risk.
c:	Marginally satisfactory, moderate level of risk.
d:	Unsatisfactory level of risk.
e:	Unacceptable level of risk.

Bacterial, protozoal, chemical, radiological and cyanotoxin compliance requirements and compliance achieved for the year 2017/18 can be found in Table 4.

Table 4: Murupara Compliance Criteria (DWSNZ 2008)						
Compliance Type/Location	Section of DWSNZ 2008	Monitoring Parameters	Sampling Frequency	Samples per year	Compliance Criteria	Compliance 2017/18
Bacterial Compliance						
Treatment Plant	Compliance Criterion 1 (Section 4.3.1)	E Coli	Twice a week ¹	104	<1 E coli per 100 mL sample according to table A1.4	Compliant
Distribution Zone	Compliance Criterion 6A (Section 4.4.1, 4.4.3, 4.4.4)	E Coli	13 samples per quarter ²	Required: 52 Taken: 78	<1 E coli per 100 mL sample	Compliant

Table 4: Murupara Compliance Criteria (DWSNZ 2008)					
Protozoal Compliance					
Treatment Plant	Log Credit 3 required, however, no protozoa treatment installed; therefore non-compliant.				Non-Compliant
P2D Compliance					
Treatment Plant	No priority 2 Determinands assigned to this scheme.				
Distribution Zone	No priority 2 Determinands assigned to this scheme.				
Radiological Compliance					
Treatment Plant	Section 9.4	Alpha and beta emitting radionuclides and radon-222	Once every 10 years	Last undertaken October 2016	Compliant
Cyanotoxin Compliance					
Not applicable to bore water.					
<i>Notes:</i> 1. Table 4.2a for E coli monitoring only and population band of 501 – 10,000 with 5 maximum days between samples and 6 minimum days of the week used. 2. Table 4.3a and 4.3b for the population band of 501 – 5,000 with 11 maximum days between samples and 5 minimum days of the week used. Sampling sites and sampling frequencies are as per Sections 4.4.3 and 4.4.4.1 of the DWSNZ respectively.					

6.0 Critical Points and Barriers to Contamination

By considering both the existing Barriers to Contamination and Critical Points of the scheme it is possible to highlight areas in the scheme that require improvements.

Barriers to Contamination that are present in the Murupara Scheme that eliminate, minimize or isolate contamination were identified and is presented in Table 5. A multi-barrier approach would provide the most robust system ensuring processes are in place to reduce contamination at each stage of the scheme.

As defined by the water safety plan guidelines, barriers should be present to achieve the following:

- To stop contamination of raw water;
- To remove particles from water;
- To kill germs; and
- To prevent recontamination of treated water.

Critical Points are areas in the scheme where there is potential for contamination or loss of supply of water. These were identified and presented in Table 6 and graphically in Figure 9.

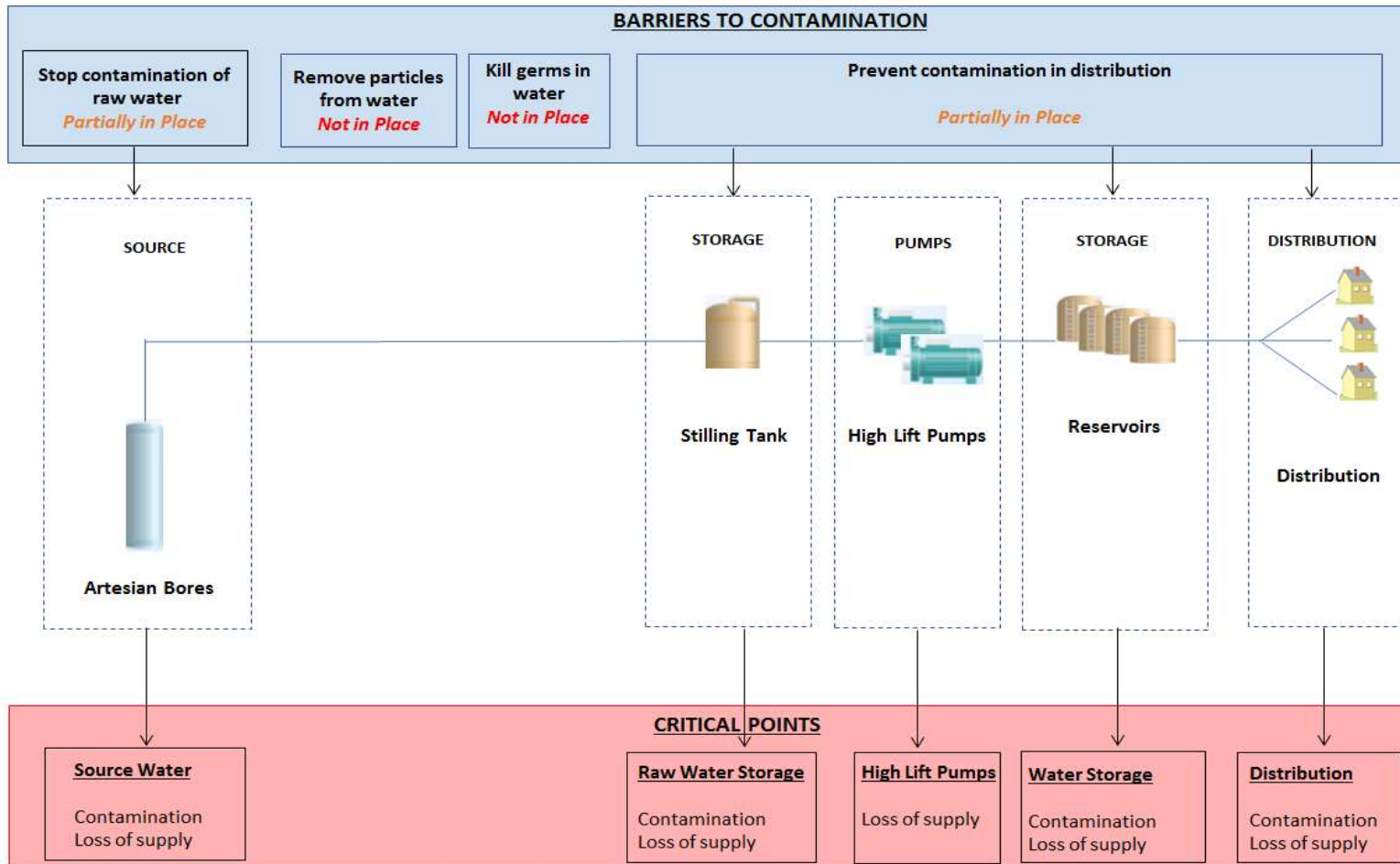


Figure 9: Barriers to Contamination and Critical Points of the Murupara Scheme

Table 5: Barriers to Contamination	
Barriers to:	Actions/Supply elements contributing to the barrier
Stop contamination of raw water (At Source) <i>Partially In Place</i>	<ul style="list-style-type: none"> • Security of groundwater source: <i>Partially in Place.</i> Groundwater Security Criteria 2 not met. • Abstraction point positioned and constructed to avoid contamination: <i>Partially in place.</i> Bore heads have 1 metre concrete apron; stock fence requires upgrades to achieve the 5 metre exclusion zone or a letter to the DWA stating why this cannot be achieved and current risk to the site as a result. CCTV of south bore to ascertain casing condition and bore depth. • Source protected from contamination: <i>Partially in place.</i> CRA carried out to identify activities in the catchment; ongoing monitoring of activities required.
Remove particles from the water (Treatment) <i>Not In Place - No Treatment for Murupara Water Supply</i>	<ul style="list-style-type: none"> • Coagulation/Flocculation/Clarification: <i>Possible Requirement, Not in place.</i> Possible requirement to achieve log credit of 3. • Dissolved air filtration: <i>Possible Requirement, Not in place.</i> Possible requirement to achieve log credit 3. • Filtration: <i>Possible Requirement, Not in place.</i> Possible requirement to achieve log credit of 3.
Kill germs in water (Treatment) <i>Not In Place - No Treatment for Murupara Water Supply</i>	<ul style="list-style-type: none"> • Disinfection: <i>Not In Place.</i> No treatment currently in place.
Prevent recontamination in Storage & Distribution <i>Partially In Place</i>	<ul style="list-style-type: none"> • Measures to stop contamination of storage tanks: <i>Partially in place.</i> Some measure in place, rationalise number of reservoirs and reservoirs operating in series so as not to have large volumes of water not turning over. • Actions taken to avoid contamination during distribution: <i>Partially in place.</i> Some routine asset maintenance and asset replacements in place; all valves exercised and replaced where required. Pipe replacements require further development for this system. • Installation of backflow preventers: <i>Partially in place.</i> Farm and commercial connections: Backflow Prevention Devices installed or will be installed. Residential connections are not metered but current programme to have manifold with dual check valves installed.

Table 6: Critical Points	
Critical Point	Description
Groundwater bores: Contamination of source supply	<ul style="list-style-type: none"> • Uncertainty of bore depth and condition: No bore logs available, depth and condition of bore casing of South bore not known. • Possible contamination of bore water due to non-conformance of bore head to DWSNZ 2008 standards: 5 metre stock exclusion not achieved on one side of the South bore but no stock or large animals within vicinity.
Groundwater bores: Loss of source supply	<ul style="list-style-type: none"> • Failure of high-lift pumps leading to loss of supply. • Seasonal variations in bore water resulting in insufficient supply to service customers.
Water storage	<ul style="list-style-type: none"> • Possible contamination of water storage in the concrete reservoirs due to access by vermin and birds via gaps in the roof and/or overflow pipe. Risk heightened due to no treatment. • Loss of structural integrity of reservoir leading to loss of supply.
Distribution system	<ul style="list-style-type: none"> • Insufficient routine maintenance such as flushing resulting in build-up of contaminants in the system. Risk heightened due to no treatment. • Inadequate backflow prevention provided resulting in contamination of water. Farm and commercial connections: Backflow Prevention Devices installed. All residential connections are not metered but current programme to have manifold with dual check valves installed. No testing of existing devices is carried out at present. Risk heightened due to no treatment. • Failure of distribution system components such as pipes, valves and hydrants due to lack of routine asset renewals, resulting in contamination of water and loss of supply. • Inadequate maintenance procedures and policies in place to maintain the distribution system (including hygiene/disinfection procedures, procedures for contractors) resulting in contamination of distribution system. • High leakage rates in the distribution system leading to possible contamination of water through back flow. Other risks are loss of supply during seasonal variations. Risk heightened due to no treatment. • Possible illegal connections leading to contamination of network. Risk heightened due to no treatment.

7.0 Risk Assessment Tables

Based on the Barriers to Contamination and Critical Points identified in Section 6.0 it is possible to identify ‘Risk Events’ that could occur in the Murupara Scheme that has the potential to compromise public health by either contamination of water supply and/or loss of water supply.

These Risk Events are tabulated in the form of Risk Tables and grouped by Source, Treatment, Reservoirs and Distribution, and are found in Appendix A.

The ‘*Current Scenario*’ section of the Risk Tables contain ‘Preventative Measures’ currently in place to prevent the Risk Event from occurring, and assesses the ‘Current Risk’ of the Risk Event occurring.

The ‘*To be Implemented*’ section of the Risk Tables contain Preventative Measures that are to be implemented to reduce the Current Risk, and assesses the ‘Residual Risk’ of the Risk Event occurring once the new measures are implemented. The person/s responsible for the preventative measure/s to be implemented is also identified.

The Current Risk and Residual Risk were assessed according to the qualitative risk assessment methodology consistent with AS/NZS 4360:1999 Risk Management standard. A Likelihood scale (Table 7) and Consequence scale (Table 8) were defined and set by WDC staff according to how they perceived risks and the corresponding Risk Matrix (Table 9) was used to assign the level of Current Risk and Residual Risk as ‘Low’, ‘Medium’, ‘High’ or ‘Extreme’.

Table 7: Likelihood Scale as Defined by WDC	
Almost Certain	Is expected to occur in most circumstances
Likely	Will probably occur (once in 1-2 Years)
Possible	Might occur (once in 5-10 Years)
Unlikely	Might occur (once in 10-20 Years)
Rare	Could occur (once in 50-100 Years)

Table 8: Consequence Scale as Defined by WDC

	Loss of Supply	Boil Water Notice	Illness	Operation Disruption
Insignificant	Insignificant to none	None	No reported illness	Little disruption
Minor	Less than 1 hour	None. Aesthetic water quality event.	No reported illness	Manageable disruption
Moderate	Less than 4 hours	Up to 3 days. Water quality event that requires flushing.	No reported illness	Significant modification to normal operation
Major	Greater than 4 hours	Prolonged	Probable illness	Abnormal or cease of operation
Catastrophic	For 1 or more days	Prolonged	Severe illness and probable death	Complete failure of system

Table 9: Risk Matrix

		Consequence				
		Insignificant	Minor	Moderate	Major	Catastrophic
Likelihood	Almost Certain	High	High	Extreme	Extreme	Extreme
	Likely	Medium	High	High	Extreme	Extreme
	Possible	Low	Medium	High	Extreme	Extreme
	Unlikely	Low	Low	Medium	High	Extreme
	Rare	Low	Low	Medium	High	High

8.0 Improvement Plan

The Improvement Plan lists improvements to the Murupara Scheme identified during the preparation of this WSP. Each item has been allocated to a person/department that will be responsible for its implementation (Table 10) and the date by which WDC intends to carry it out.

Improvements are listed in order of Priority as follows: High Priority (Table 11), Medium Priority (Table 12) and Low Priority (Table 13).

Items were assigned by WDC based on the timeline achievability, cost of implementation, the ease of implementation and the current risk to the Murupara Scheme if the improvements are not carried out.

Table 10: Persons Responsible for Improvement Plan Items

Person Responsible	Code
General Manager Planning and Infrastructure	GM
Manager Three Waters	MTW
Team Leader - Water Treatment Plant	TL-WTP
Water Treatment Plant Operator	WTP-O
Team Leader - Three Waters Operations	TL-O
Team Leader - Three Waters Administration	TL - AS
Team Leader - Three Waters Asset Management and Planning	TL-AM
Asset Engineer - Three Waters	AE
Manager - Capital Projects	PM
Project Engineer - Three Waters	PE
Manager Public Affairs	M-PA
Senior Project Planner	SPP
Reticulation Contractor	RC

Table 11: Improvement Plan – High Priority Items						
Item	Risk Table No.	Area of Work	Work To be Implemented	Responsibility	Estimated Cost/Time	Due by Date
1	S3.1 (PM1)	Managing activities in the catchment	WDC to liaise with pesticide application companies and make them aware of locations of water sources, and to be informed of pesticide drops in vicinity of water source.	SPP / TL-AM	80 hours	August 2019
2	T1.1 (PM3) T1.2 (PM3)	Insufficient bacterial and/or protozoal treatment installed	Install online Turbidity meter and conductivity meter to indicate early warning changes in water quality	TL-WTP	\$20,000	August 2019
3	T1.4 (PM1)	Other - Insufficient pH treatment	Install online pH monitoring at water pumping station site	TL-WTP	\$5,000	August 2019
4	R4.2 (PM1)	Inadequate operating Procedures	Review 'Incident Response Plan – Three Waters Assets (Water, Wastewater and Stormwater (A1376861)' section WATER SUPPLY RESPONSE PROCEDURE to including further actions, if required for this non disinfected water supply.	MTW / TL-WTP / TL-O / RC	16 hours	September 2019
5	D5.2 (PM1G)	Inadequate operating Procedures	Review 'Incident Response Plan – Three Waters Assets (Water, Wastewater and Stormwater (A1376861)' document. Modify, where required to clearly define steps for each process, items to be recorded and objectives of the process, with reference to other documents.	TL-O/TL-WTP/WTP-O / RC	40 hours	September 2019
6	T1.1 (PM8) T1.2 (PM8)	Insufficient bacterial treatment installed Inadequate operating Procedures	Review 'Incident Response Plan – Three Waters Assets (Water, Wastewater and Stormwater (A1376861)' section WATER SUPPLY RESPONSE PROCEDURE with regards to: a. communication plan for emergency temporary treatment for this non-disinfected water supply b. Total Coliform-Positive (TC+) response procedures to be undertaken	MTW / TL-O / TL-WTP / M-PA	40 hours	September 2019
7	D5.2 (PM2G) D7.1 (PM2G)	Inadequate operating Procedures	Develop and implement a Council SOP (Hygiene code of practice for working on water supply systems). The document to reflect industry best practice and have inclusion of special reference to working on 'untreated water supply' and how Council will manage preventing cross contamination in the unlikely event that staff alternate on wastewater and water reticulation work. The Hygiene	TL-WTP/TL-O/TL-AS / RC	4 hours	November 2019

Table 11: Improvement Plan – High Priority Items						
Item	Risk Table No.	Area of Work	Work To be Implemented	Responsibility	Estimated Cost/Time	Due by Date
			Code of Practice to include sickness statement and medical clearance requirements.			
8	T1.1 (PM4) T1.2 (PM4) T1.4 (PM4)	Insufficient bacterial and/or protozoal treatment installed	After installation of Turbidity meter, Conductivity meter, and pH monitoring modify WSP with inclusion of Critical Control Points for these early warning changes in water quality	TL-WTP / TL-O / RC	40 hours	November 2019
9	D1.1 (PM2) D4.1 (PM5)	Contamination from backflow	Install backflow prevention devices on all connections as a result of WDC decision in February 2018 to install backflow preventers on all connections to support decision by WDC/Community not to provide treatment to water. Dual check manifold valve to be installed on residential connections. – Project has commenced April 2019	TL-O / PM / PE / TL-AM	\$325,000	November 2019
10	D5.1 (PM1G)	Poor planning of scheduled work by WDC staff and their contractors	Where possible utilise WDC Asset Management System to maintain an up-to-date database of critical users such as dialysis patients/hospitals/businesses. Develop robust process for critical customer rating and updating data to maintain active list.	TL-AM	20 hours	November 2019
11	S2.1 (PM1) S3.1 T1.3 (PM1)	Managing activities in the catchment	Monitor changes in activities in the catchment and modify catchment risk assessment where required with review of details Annually	AE / TL-AM	80 hours	December 2019
12	D1.1 (PM1G)	Contamination from backflow	Develop and implement a backflow prevention policy to match device to risk level of activity, including testing requirements of the devices.	GM / MTW / M-PA / TL-AM	100 hours	December 2019
13	S2.1 (PM5) S3.1 (PM3)	Managing activities in the catchment	WDC to monitor activities within groundwater capture zone – see Appendix E. To liaise with any business owners and especially the forestry industry which forms the greatest portion of groundwater capture zone as these have potential to discharge contaminants and ensuring industry best practices are followed; Tradewaste consents and building consents to act as triggers.	AE/TL-AM	240 hours	December 2019
14	S2.2 (PM3)	Bore head Security	Carry out checks to determine adequacy of cable gland seals and bore head seals including replacing any deteriorating gaskets with water tight gaskets.	AE / PM	8 hours	December 2019

Table 11: Improvement Plan – High Priority Items						
Item	Risk Table No.	Area of Work	Work To be Implemented	Responsibility	Estimated Cost/Time	Due by Date
15	S2.2 (PM1)	Bore head Security	WDC is to request DWA to remove 5 metre stock fence requirement by proving all practical measures have been undertaken for fencing the site and that the risks of not having a 5 metre exclusion zone is low due to no stock grazing carried out in the surrounding area.	AE / PM	8 hours	December 2019
16	S2.2 (PM2)	Bore head Security	Re-inspect the 100 mm air gap at the suction tank and investigate the risk of backflow and if required programme and budget for the installation of backflow device (double check) on both bore heads.	AE / PM	8 hours	December 2019
17	T1.1 (PM6) T1.2 (PM6)	Insufficient bacterial and/or protozoal treatment installed	Develop base data from HPC testing and review sample results, identify if any past HPC testing data exists and after each sample routinely check for changes. From this data establish Critical points and include Controls in dealing with the changes.	TL-WTP / TL-O / RC	40 hours	August 2020
18	D2.1 (PM2G) D2.2 (PM1G) S1.3 (PM1) S1.4 (PM1) S2.2 (PM5G) R2.1 (PM2) R4.1 (PM1) R4.3 (PM1) T2.1 (PM1G)	Poor circulation in network Bore Pump failure Bore-head Security	Utilise Asset Management System to <ul style="list-style-type: none"> • schedule routine maintenance plan for flushing of mains and hydrants with priority given to flushing dead ends and areas of poor circulation. • schedule and/or monitor preventative maintenance. • verification and calibration of flow meter equipment. • schedule and implement a site maintenance programme as required to prevent breeding of vermin/animals • schedule and implement a CCTV inspection of reservoirs and vacuum cleaning programmes as required. 	TL-AS / TL-O / AE / RC	20 hours	September 2020
19	T1.1 (PM2) T1.2 (PM2)	Insufficient bacterial and/or protozoal treatment installed	Confirm groundwater age estimate from GNS.	TL-WTP	\$2,000	October 2020
20	D1.1 (PM8) D4.1 (PM6) D6.1 (PM3)	Contamination from backflow, customer complaint: odour, service disruption,	Review the way Council customer driven RFS for this water supply are captured, monitored and acted upon to optimise Council response to reduce the risk of contamination. Investigate and where possible develop, promote and implement additional 2-way communications paths via social media platforms and/or other	MTW/ M-PA/ TL-O / TL- WTP / RC / TL-AM	120 hours	October 2020

Table 11: Improvement Plan – High Priority Items						
Item	Risk Table No.	Area of Work	Work To be Implemented	Responsibility	Estimated Cost/Time	Due by Date
		contamination, low pressure	technologies to accommodate this higher risk non-disinfected water supply.			
21	D5.3 (PM1G)	Inadequate training and registers	Staff certificates are maintain on training register. Develop a training and competency system for working on reticulated network, including local contractor Adam Anderson.	TL-O / TL-AS / TL-WTP / RC	20 hours + \$500	December 2020
22	T1.1 (PM7) T1.2 (PM7)	Insufficient bacterial and/or protozoal treatment installed	Investigate the installation requirements and costing of temporary chlorination treatment disinfection systems to be ‘mobilised’ in emergency situation for this non-disinfected water supply.	MTW / M-PĀ / TL-WTP/ AE / PM	160 hours	March 2021
23	S2.1 (PM1) S3.1 T1.3 (PM2)	Managing activities in the catchment	Catchment Risk Assessment undertaken September 2017. Programme activities to submit a catchment risk assessment to the DWA before 5 year period, for approval.	AE / TL-AM	240 hours	July 2022
24	R2.2 (PM1)	Vandalism to reservoir structure	Padlocked security fence to be installed at the reservoir site to restrict vehicle access and large animals. (Land matter issues at this site)	PM / TL-O / TL-AM / RC	\$65,000	December 2022
25	S1.9 (PM1)	Resource consent limitations	Apply for new water take consent in accordance with requirements (at least six months prior to expiry)	SPP/AE/TL-AM	\$100,000	December 2025
26	T1.1 (PM1) T1.2 (PM1)	Insufficient bacterial and/or protozoal treatment installed	Install chlorination or UV treatment as a minimum treatment requirement of source water.	N/A	N/A	To be re-visited depending on possible future mandatory requirements

Table 12: Improvement Plan – Medium Priority Items						
Items	Risk Table No.	Area of Work	Work To be Implemented	Responsibility	Estimated Cost/Time	Due by Date
1	WSPs	WSP Review	Once water safety plan is approved carry out an internal review of the WSP annually	MTW / TL-WTP / TL-AM	40 hours	(annually)
2	D4.1 (PM2G)	Pressure fluctuations in the system	Carry out a periodic water balance to identify levels of leakage in system.	AE	8 hours	August (annually)
3	S1.1 (PM1) S2.2 (PM4) S1.8 (PM1) R3.1 (PM1)	Bore head Security/Insufficient source water due to seasonal variations/ Clogged Bore	Fix isolating valve on the south bore and carry out CCTV inspection to check condition of casing, depth of bore and possible blockages.	TL-O / AE / PM	\$30,000	August 2019
4	WSPs	WSP Review	Update population for Murupara Scheme on the Drinking Water Register NZ via application to the Drinking Water Assessor.	AE / TL-AM	20 hours	September 2019
5	D5.2 (PM3G)	Inadequate operating Procedures	Review existing operating procedures and develop procedures that clearly define steps for each process, items to be recorded and objectives of the process, with reference to other documents.	MTW / TL-WTP/WTP-O / RC	40 hours	September 2019
6	R4.4 (PM1)	Entry of contaminants due to reservoir design	Investigate location of overflow and install appropriate marker post. Install appropriate flap/non return valve device on overflow line	TL-O / TL-WTP / RC	8 hours	October 2019
7	D1.1 (PM4G)	Contamination from backflow	Review policy for withdrawing water from hydrants; specify the use of standpipes fitted with approved backflow preventers.	MTW / M-PA / AE / TL-O / TL-AM	4 hours	October 2019
8	D1.1 (PM6G)	Contamination from backflow	Develop and implement a district wide policy to disconnect connections not in use – For this system and as part of backflow installation project (D1.1 (PM2)), any vacant, derelict, burnt out properties will be capped off and recorded in asset management system.	MTW / M-PA / AE / TL-O / TL-AM	8 hours	November 2019
9	D1.1 (PM7G)	Contamination from backflow	Develop and implement a policy for identifying and dealing with illegal connections.	MTW / M-PA / AE / TL-O / TL-AM	4 hours	November 2019

Table 12: Improvement Plan – Medium Priority Items						
Items	Risk Table No.	Area of Work	Work To be Implemented	Responsibility	Estimated Cost/Time	Due by Date
10	R4.4 (PM2)	Entry of contaminants due to reservoir design	Investigate the 'as-built' for this reservoir site to see what operational parameters the reservoirs can operate under (in series / parallel). Investigate valving arrangements of individual reservoirs for isolated for cleaning and/or resilience.	AE	16 hours	December 2019
11	S1.6 (PM1) S1.7 (PM1)	Natural disasters - Flooding and extreme storm events	Develop a disaster management plan for the water supply which could be included as part of a wider disaster management plan for the district.	MTW / TL-O / TL-WTP	120 hours	December 2019
12	D1.1 (PM3G)	Contamination from backflow	Circulate educational material to customers, especially those considered high risk, about risks of backflow prevention and ways of minimising the risk.	AE / M-PA	4 hours	December 2019
13	R4.1 (PM2) R4.2 (PM2)	Vandalism and sabotage, staff access reservoirs	Weekly reservoir site inspection details to be captured within the Asset Management System.	TL-AS / RC	24 hours	February 2020
14	T1.4 (PM2)	Other - Insufficient pH treatment	Investigate options to install pH correction and cost benefit of installation of pH correction. If feasible budget and programme for works to occur	PM / TL-AM	60 hours	February 2020
15	D4.1 (PM8)	Pressure fluctuations in the system	Carry out periodic hydrant testing exercises to test effects on pressure in the system.	AE	\$1,000	July 2020
16	D5.3 (PM2)	Inadequate training and registers	As this is a non-disinfected water supply review requirements of local reticulation contractor Adam Anderson and Council to support in obtaining necessary specific training required	MTW / TL-O / TL-AS / TL-WTP / RC	24 hours + \$1000	December 2020
17	WSP	WSP Review	Carry out a review of the WSP every 5 years and submit to DWA for approval.	MTW / AE / TL-AM / TL-WTP / TL-O	240 hours	May 2023

Table 13: Improvement Plan – Low Priority Items						
Item	Risk Table No.	Area of Work	Work To be Implemented	Responsibility	Estimated Cost/Time	Due by Date
1	T1.4 (PM3G)	Other - Insufficient pH treatment	Plumb solvency - Inform wider community and consumers about the use of copper pipes and fittings (including lead jointing) for internal plumbing by circulating information flyer and notification on Council Website	M-PA / AE	40 hours + \$1,000	October 2019
2	S1.1 (PM2)	Insufficient source water	Install permanent online pressure logger at each bore head pipework to monitor artesian head.	TL-O / AE / PM	\$2,000	October 2019
3	D4.1 (PM4G) D5.1 (PM2G)	Pressure fluctuations in the system	Develop and adopt internal procedure for maintaining an up-to-date Asset Management System and GIS system.	AE / TL-AM	40 hours	December 2019
4	R2.1 (PM1)	Loss of structural integrity of reservoirs	Carry out condition assessment of all concrete reservoirs by 2019 and formulate a condition assessment programme thereafter.	AE / PE / RC	\$5,000	December 2019
5	D5.1 (PM3G)	Poor planning of scheduled work by WDC staff and their contractors	Maintain a systematic workflow procedure with control checks for the update of capital works arising from projects, subdivision work and daily replacements and renewals so that all paperwork is sent to the asset engineer for recording on Asset Management System and GIS.	AE / TL-AM	20 hours	June 2020
6	D6.1 (PM2G)	Third party contractor damage to reticulation	Review the information that Council sends out in response to 'beforeUdig' requests to contractors working on other services and align the response with current incident notification protocol and responsibilities.	TL-O / AE / TL-AM	40 hours	August 2020
7	R1.1 (PM1)	Insufficient storage capacity to store treated water for daily demand	Investigate the state of the decommissioned reservoir and consider refurbishing and reconnecting in future if more capacity required.	TL-AM / PE / RC	\$5,000	November 2020
8	D4.1 (PM1)	Pressure fluctuations in the system	Identify problem pressure areas by carrying out hydraulic computer modelling and network analysis coupled with customer complaint records.	AE / TL-AM	\$10,000	December 2020
9	D4.1 (PM3)	Pressure fluctuations in the system	Undertake leak detection programme once hydraulic water models complete and programme for leaks to be fixed as matter of urgency.	AE / TL-O	20 hours + M & R costs	December 2020

Table 13: Improvement Plan – Low Priority Items						
Item	Risk Table No.	Area of Work	Work To be Implemented	Responsibility	Estimated Cost/Time	Due by Date
10	D7.1 (PM1)	Inadequate operating Procedures.	Input into Council’s district wide inflow /infiltration strategy giving higher importance to the Murupara scheme as it is in the vicinity of the non-disinfected water supply scheme.	MTW / AE / TL-AM	80 hours +\$5,000	May 2021
11	D3.1 (PM2G)	Pipe, valve and hydrant failure due to age, condition and material of pipe	Update water asset management plan as required and republish every 3 years.	TL-AM / AE	\$4,000 per system	June 2021
12	D3.1 (PM1G)	Pipe, valve and hydrant failure due to age, condition and material of pipe	Develop asset renewals programme based on condition, analysis of asset age, material, frequency of breakages and increase in maintenance costs, prioritize critical assets such as rising mains/falling mains, pipes supplying a critical consumers or large consumer base, critical valves and hydrants.	AE / TL-AM	240 hours	June 2022
13	D4.1 (PM7)	Pressure fluctuations in the system	Once hydraulic models are completed utilise the hydraulic model to investigate, develop and implement a pressure optimization programme where possible for this water supply.	AE / TL-O	20 hours + \$15,000	March 2023
14	S2.1 (PM6G) S3.1 (PM5G)	Managing activities in the catchment	Team Leader - Three Waters Asset Management and Planning to provide input into next version district plan (WDC) and regional plan (BOPRC) concerning protection of catchment; input into activities such as sediment control from earthworks and riparian strip management.	SPP / TL-AM	240 hours	December 2026

9.0 Process Control Summaries

Several parameters within the water supply scheme known as ‘Control Parameters’ are routinely monitored by the operators to ensure the system is operating within the prescribed ‘Target Range’. When any of these Control Parameters exceed the Target Range and reach ‘Action Limits’ or ‘Critical Limits’, the operator/s are required to undertake ‘Corrective Actions’ to restore the system back to the prescribed Target Range.

Effective process control occurs when operators are aware of the Target Range, the Corrective Actions required to be taken and who is responsible for carrying them out. Therefore it is recommended ‘Process Control Summaries’ are used as a guide by WDC treatment plant operators in day to day operations.

Table 14: Process Control Definitions	
Critical Control Points (CCP)	Points and processes in the Murupara Scheme that can be controlled to prevent contamination of water.
Control Parameters (CP)	Parameters that can be measured and monitored in order to determine if a process is performing as required.
Target Range	Desired range within which each CP is required to operate in the normal day-to-day operation of the system.
Action Limits and Critical Limits	When CPs reach these limits Corrective Actions are required to be carried out by persons responsible to bring CPs back within the Target Range.
Corrective Actions	Actions to be carried out when CPs reach Action Limits and Critical Limits.
Process Control Summaries (PCS)	Target Range, Action Limits and Critical Limits for CPs and a list of corrective actions to be taken when CPs reach Action Limits and Critical Limits, along with person/s responsible for carrying them out.

Figure 10 shows the Critical Control Points (CCPs) of the Murupara Scheme and the Control Parameters that are to be monitored and measured at each CCP.

Currently the only monitoring equipment at the pumping station site is electromagnetic flowmeters. The pumping station is designed to alarm when there is power loss at site.

Although the water supply is via positive pressure artesian bore council this is a non-disinfected water supply so there is a heightened risk of contamination. Council acknowledges this and has increase the sampling regime and has started HPC testing methodology, from this Council will establish base data from HPC results and will monitor results after each sample run to check for changes in results. Over time and from this data, Council will establish Critical Points and appropriate Control actions to dealing with any changes.

Council is installing online Turbidity meter, conductivity meter and pH to indicate early warning changes in water quality with installations to be completed August 2019. New process controls will be established once new online equipment has been commissioned and is operational and this section of the Water Safety Plan will be modified appropriately.

Council is reviewing the way customer driven RFS for this water supply are captured, monitored and acted upon to optimise Council response to reduce the risk of contamination.

Council has an 'Incident Response Plan – Three Waters Assets (Water, Wastewater and Stormwater (A1376861)' document. This comprehensive document details operational response procedures undertaken and what actions are required to bring the water supply back to normal operation. The document was reviewed in September 2018 but as Murupara is a non-disinfected water supply some of the procedures may need modification to reduce this heightened risk, so where required need improvement to add clearly define steps for each process. This has been included as action in the improvement plans actions

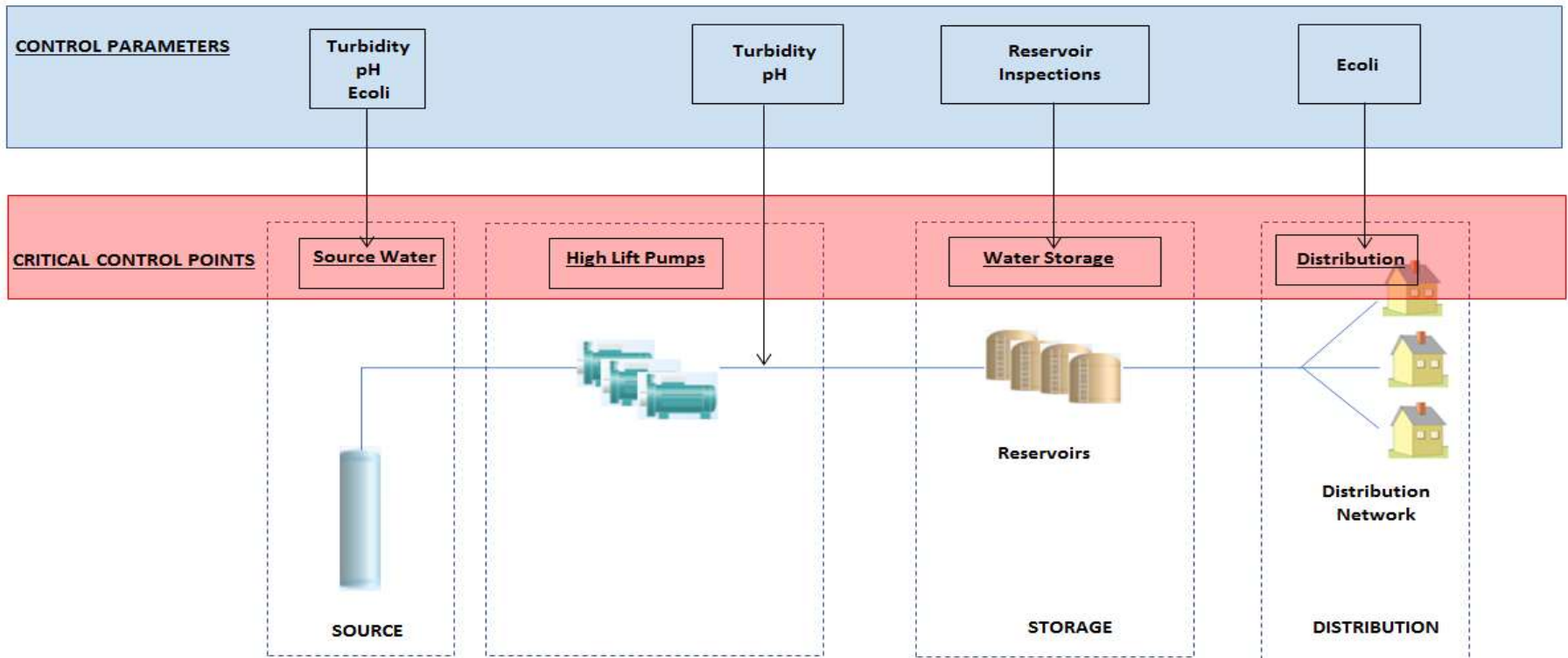


Figure 10: Critical Control Points and Corresponding Control Parameters for the Murupara Scheme for Source, Storage and Distribution

9.1 Critical Control Point: Non-Disinfected Water Supply

Process Objectives:

- CCP early warning of water quality change at source or within distribution system.

Parameters and manual monitoring:

- Turbidity (NTU units) – Manual monitoring twice a week
- Temperature – Manual monitoring twice a week
- Conductivity – Manual monitoring twice a week
- pH (pH units) – Manual monitoring twice a week

Parameter Monitoring Points:

- All parameters are manually monitored at sample point located on individual bore head pipework for raw water sampling.

Process Records:

- Manual: manual sampling sheets from reticulation operator then sent to Water Treatment Plant/s on duty officer.

Process Controller:

- Reticulation Contractor operator and Water Treatment Plant/s on duty.

Supporting Programmes:

- Checks prior to sample and weekly calibration of monitoring instruments.
- Training of operators for obtaining samples for turbidity, pH, temperature and conductivity.
- IANZ lab checks for *E. coli* occurs on each sample with transgression reporting to Operator as per drinking water standards.

10.0 Contingency Plans

Contingency Plans have been prepared to provide guidance in the event that control measures fail to prevent the occurrence of a risk event that may present acute risk to public health. WDC is responsible for implementation of the Contingency Plans when monitoring has identified the occurrence of a risk event.

If an event occurs despite preventive and corrective actions being in place, WDC is to consult with the Medical Officer of Health to assess the seriousness of the event.

Table 15: Contingency Plans		
Event	Actions	Responsibility
Microbiological and/or Chemical contamination of source as a result of, but not limited, to the following: <ul style="list-style-type: none"> High rainfall events Change of activity in the catchment Accidental spills 	Isolate source - Isolate source at pumping station through manual valve isolation.	Reticulation Contractor / Operations
	Carry out manual dosing – refer to ‘Incident Response Plan – Three Waters Assets (Water, Wastewater and Stormwater (A1376861)’ section WATER SUPPLY RESPONSE PROCEDURE <i>Note: this includes all aspects of water reticulation responses including items such as flushing, main breaks, boil water notices etc.</i>	Reticulation Contractor / Operations
	Undertake Incident Response Plan – Three Waters Assets (Water, Wastewater and Stormwater (A1376861) – ‘Communication in the Event of a Boil Water Notice’ and when directed by MTW or DWA notify customers using M-PA department. High risk customers to be notified as a priority.	Public Affairs/ Operations
	Carry out increased monitoring according to DWSNZ 2008.	Operations
	Notify the DWA of event.	Operations
	Carry out following depending on nature of event: <ul style="list-style-type: none"> Investigate changes to activities in the catchment. If accidental spill contain the spill. 	Operations
	Carry out flushing of reservoirs and distribution system that may be affected.	Reticulation Contractor / Operations
	Malfunctioning equipment/sensors	Pumping station alarms during power failure.
Inspect, initiate back up pumping arrangement and carry out maintenance on pumping station plant equipment		Reticulation Contractor / Operations
Following in distribution system: E coli, as a result of, but not limited to, the following: <ul style="list-style-type: none"> Backflow into system Leaks in system Inadequate maintenance of distribution system leading to slime build up, leaching and poor circulation. 	Carry out manual dosing actions when E Coli is detected in the storage and distribution systems – refer to ‘Incident Response Plan – Three Waters Assets (Water, Wastewater and Stormwater (A1376861)’ section WATER SUPPLY RESPONSE PROCEDURE	Reticulation Contractor / Operations
	Isolate sections of the distribution network and reservoirs through manual valve isolation as part of the manual dosing / flushing requirements	Reticulation Contractor / Operations
	Undertake Incident Response Plan – Three Waters Assets (Water, Wastewater and Stormwater (A1376861) – ‘Communication in the Event of a Boil Water Notice’ and when directed by MTW or DWA notify customers using M-PA department. High risk customers to be notified as a priority.	Public Affairs/ Operations
	Carry out increased monitoring according to DWSNZ 2008.	Operations
	Notify the DWA of event.	Operations
	Undertake the following depending on nature of event: <ul style="list-style-type: none"> Identify and fix leaks in the system and instruct customers to carry out the same on private property reticulation. 	Operations

Table 15: Contingency Plans		
Event	Actions	Responsibility
	<ul style="list-style-type: none"> Fix backflow preventers on offending connections and carry out routine backflow preventer testing. 	
Loss of Supply of Source Water: <ul style="list-style-type: none"> Prolonged loss of supply due to leaks, insufficient storage, loss of reservoir structural integrity, unplanned maintenance, pump breakdown 	Procedure for sourcing water from emergency supply: alternative groundwater/surface water supply or providing tankered water.	Operations
	Procedure for sourcing water from emergency supply: alternative groundwater/surface water supply or providing tankered water.	Operations
	Undertake Incident Response Plan – Three Waters Assets (Water, Wastewater and Stormwater (A1376861) – ‘Communication in the Event of a Boil Water Notice’ and when directed by MTW or DWA notify customers using M-PA department. High risk customers to be notified as a priority.	Public Affairs/ Operations
	Notify the DWA for loss of supply over 8 hours.	Operations
	Monitor reservoir levels.	Operations
	Provide extra temporary storage if possible.	Operations
Loss of Supply and Contamination of water due to natural disasters and high rainfall events	Undertake contingency plan as per civil defence emergency appropriate to the scenario.	Operations
	Procedure for sourcing water from emergency supply: alternative groundwater/surface water supply or providing tankered water.	Operations
	Increased monitoring according to DWSNZ 2008.	Operations
	Notify DWA of the event.	Operations
	Carry out inspections of the components of the intake/pumps, treatment plant, reservoirs and distribution system for structural integrity.	Operations

11.0 Methodology and Consultation

This WSP has been prepared consistent with the approaches recommended by the Ministry of Health.

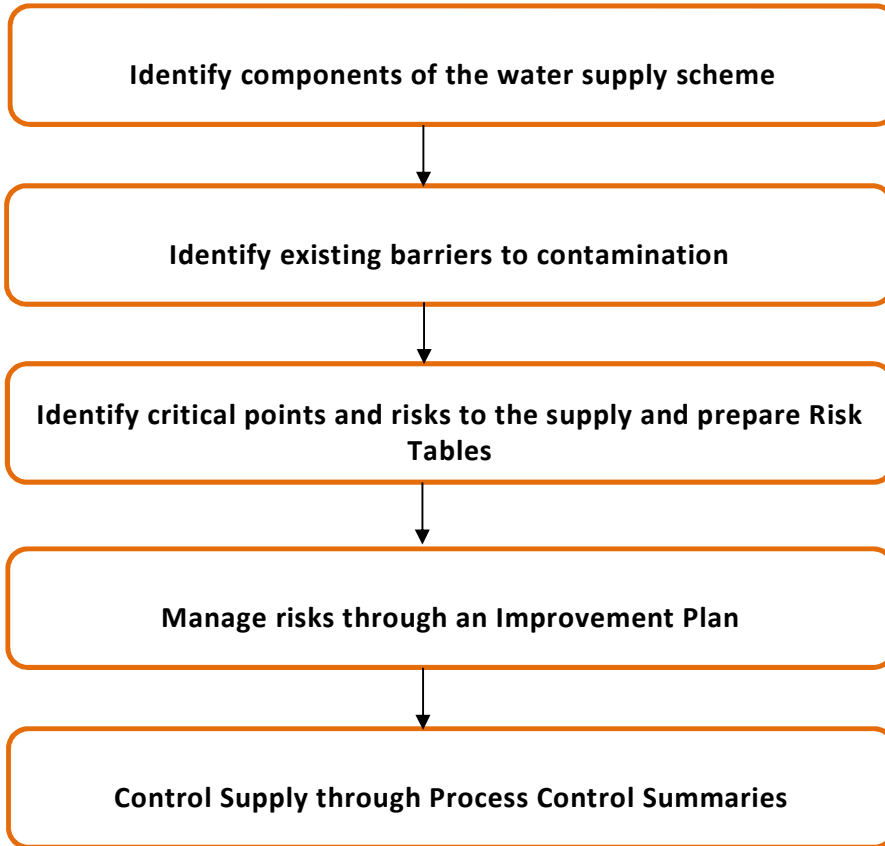


Figure 11: Methodology

The following supporting documents published by the Ministry of Health have been used in the preparation of this report:

- The series of “Water Safety Plan Guides for Drinking Water Supplies (2014)”.
- The document “A Framework on How to Prepare and Develop Water Safety Plans for Drinking-water Supplies (2014)”.

Information used in this report has been gathered as follows:

- Documents and reports:
 - Water Asset Management Plans (WDC).

- Asset condition assessments for reservoirs and pipes (WDC).
 - Various Council Policies and Procedures (WDC).
 - Maintenance checklists and schedules (WDC).
 - Council Annual Plan and Long Term Plan (WDC).
 - Drinking Water Assessor Compliance Reports and PHRMP verification reports (DWA, Ministry of Health).
 - Reservoir cleaning and structural assessments (WDC).
 - Catchment Risk Assessment for Murupara bore Water Supply Report (September 2017, PDP).
 - Report on adequacy of a Drinking Water Supply's Water Safety Plan (MUR002_Murupara_WSPadequacy_04012019_v2) (DWA, Ministry of Health).
- Site Visits carried out by PDP to the following locations on the 17th July 2017: Murupara treatment plant and pump station site, Murupara reservoir site (Appendix D: Murupara Scheme Reservoir Inspection Sheet).
 - Consultation workshop carried out by PDP with participation of WDC, 1st of September 2017.

The consultation workshop was facilitated by Sala Ranasinghe (Senior Environmental Engineer) from PDP with the participation of key WDC personnel.

The following key WDC personnel participated in the workshop and contributed to the information provided in this report:

Michael Van Tilburg – Team Leader Three Waters Asset Management and Planning; Gareth Phillips – Manager Three Waters Operations (position held up till May 2018), Leilani Salanguit – Project Engineer; Inka Krawczyk – Project Engineer; Neal Yeates – Team Leader Water Treatment Plant; Luke Shipton – Team Leader Operations; Joe Xie – Asset Engineer Three Waters .

The aim of the workshop was to identify risks to the Murupara Scheme as experienced by the operators of the scheme based on historical events and their knowledge of the scheme, and putting in place improvement measures to manage risks that are not currently managed.

The qualitative risk assessment was carried out using the AS/NZS 4360:1999 Risk Management Standard approach. A Likelihood scale and Consequence scale was defined and set by WDC staff according to how they perceived risks, and the corresponding risk matrix was used to assign risks to events.

The Improvement Plan was ranked by WDC in order of priority, taking into account current risks to the Murupara Scheme if not implemented along with the cost of implementation.

Appendix A: Murupara Scheme Risk Tables

Table 16: Source – Catchment and Bores								
No	Cause	Indicators	Current Scenario			To Be Implemented		
			Preventative measures in place	Risk Managed?	Current Risk	Preventative measures to be put in place (‘G’ reference after PM number refers to Generic item across all Whakatāne Water Safety Plans)	Residual Risk	Responsibility
S1: EVENT: LOSS OF BORE WATER SUPPLY								
S1.1	Insufficient source water due to seasonal variations/drought (low levels in the river or water tables).	<ul style="list-style-type: none"> Reduced or no flows. Drop in system pressure. 	<ul style="list-style-type: none"> Pressure in artesian bores lower during summer months, however, sufficient water available for town supply. Storage available in reservoirs. <p>PM1: CCTV inspection carried out on the North bore to check for blockages. PM2: Demand Management Plan: Water conservation notices issued during high summer.</p>	Partially	Medium (Possible x Minor)	<p>PM1: Fix isolating valve on the south bore and carry out CCTV inspection to check condition of casing, depth of bore and possible blockages. PM2: Install permanent online pressure logger at each bore head pipework to monitor artesian head.</p>	Low (Unlikely x Minor)	<p>PM1: TL-WTP / PM PM2: TL-O / AE</p>
S1.2	Power failure	<ul style="list-style-type: none"> Power failure alarms. Reduced or no flows. 	<p>PM1: One diesel pump available on site for backup and tested monthly. PM2: Generator can be hired from local contractor and taken to site if required. PM3: SCADA alarms when there is loss of power to site.</p>	Yes	Low (Possible x Insignificant)	N/A	Low (Possible x Insignificant)	N/A
S1.3	Pump failure	<ul style="list-style-type: none"> Pump failure alarms. Reduced or no flows. 	<p>PM1: Two high-lift pumps operated on a duty/standby basis and a backup diesel high-pump available with fuel stored on site. PM2: Suction tank connected to the town supply by passing high lift pumps and reservoirs.</p>	Yes	Low (Possible x Insignificant)	<p>PM1: Utilise Asset Management System to schedule and monitor preventative maintenance.</p>	Low (Possible x Insignificant)	PM1: TL-AS
S1.4	Damage to bore headworks and pumping equipment/wiring due to vandalism and/or vermin and animals.	<ul style="list-style-type: none"> Visual damage to intake/pump equipment/electrical cables. Reduced or no flows from bore. No signal or no readings received from equipment and/or equipment failure. 	<ul style="list-style-type: none"> Bore headworks exposed, however no history of vandalism. Perimeter locked security fence. Site visited weekly for sampling and inspection. <p>PM1: Pumps and other equipment inside locked concrete housing.</p>	Yes	Medium (Unlikely x Moderate)	<p>PM1: Utilise Asset Management System to schedule replacement of vermin/rodent poison stations via routine maintenance of pumping station</p>	Low (Unlikely x Minor)	PM1: TL-AS / TL-O
S1.5	Restricted access to bore site due to absence of right of access.	<ul style="list-style-type: none"> Restricted access to site during normal operating conditions. 	<ul style="list-style-type: none"> Bore site situated on road reserve and WDC has 24/7 access 	Yes	Low (Unlikely x Minor)	N/A	N/A	N/A

Table 16: Source – Catchment and Bores								
No	Cause	Indicators	Current Scenario			To Be Implemented		
			Preventative measures in place	Risk Managed?	Current Risk	Preventative measures to be put in place ('G' reference after PM number refers to Generic item across all Whakatāne Water Safety Plans)	Residual Risk	Responsibility
S1.6	Natural disasters – Flooding and extreme storm events.	<ul style="list-style-type: none"> Restricted access to site. Inability to operate and maintain equipment. 	<ul style="list-style-type: none"> Site situated above 1% AEP flood level. However, some surface flooding has occurred once previously due to blockage of culvert in the adjoining tributary from dumped household chair. Road leading to site not known to flood, and local reticulation service person lives in Murupara. 	Yes	Low (Unlikely x Minor)	PM1: Develop a disaster management plan for the water supply which could be included as part of a wider disaster management plan for the district.	Low (Unlikely x Minor)	PM1: MTW / TL-O / TL-WTP
S1.7	Natural disasters – slips and earthquakes.	<ul style="list-style-type: none"> Restricted access to site. Inability to operate and maintain equipment. 	<ul style="list-style-type: none"> Possible road closures at Matahina and Kopuriki, however, local reticulation service person lives in Murupara. 	Yes	Low (Unlikely x Minor)	PM1: Develop a disaster management plan for the water supply which could be included as part of a wider disaster management plan for the district.	Low (Unlikely x Minor)	PM1: MTW / TL-O / TL-WTP
S1.8	Clogged bore screen/s	<ul style="list-style-type: none"> Reduced or no flows. 	PM1: CCTV inspection carried out on the North bore and no blockages were found as bore is open hole (no screen).	Partially	High (Rare x Major)	PM1: Fix isolating valve on the south bore and carry out CCTV inspection to check condition of casing, depth of bore and possible blockages.	Low (Unlikely x Minor)	PM1: TL-WTP / PM
S1.9	Resource consent limitations	<ul style="list-style-type: none"> Loss of right to abstract water. Increase in take compared to extraction limit granted. 	<ul style="list-style-type: none"> Consent for water take is current Number of consents expiring in 2026 throughout the country and due for renewal through BOPRC, therefore some risk in delay in having new consent issued. Consented take well below peak demand. <p>PM1: Consent management System currently in place to alert when consents are nearing expiration (CS/VU system).</p>	Yes	Medium (Unlikely x Moderate)	PM1: Apply for new water take consent in accordance with requirements (at least six months prior to expiry)	Low (Rare x Minor)	PM1: SPP/AE/TL-AM
S2: EVENT: MICROBIAL CONTAMINATION OF BORE WATER								
S2.1	Discharge/leachate/runoff from the following activities in the catchment: Agriculture: Manure from grazing livestock, Manure fertiliser Forestry: Sewage from sludge application. Industry: Wastewater discharges from industrial processes, biological washwater.	<p>Murupara non-disinfected system:</p> <ul style="list-style-type: none"> E coli transgression from any sample point that has positive reading Concentrations of health significant determinands, agrichemicals and 	<ul style="list-style-type: none"> Activities in catchment predominantly forestry, therefore primary risk from forestry activities. Catchment Risk Assessment indicated that no neighbouring bores are within the groundwater capture zone. Council is unaware of any unused bores within the catchment area of this artesian aquifer. Source deep aquifer considered to be confined with high artesian pressure, therefore minimal effects from shallow groundwater. 	Partially	Extreme (Possible x Major)	<p>PM1: Monitor changes in activities in the catchment and modify catchment risk assessment annually.</p> <p>PM2: Submit a catchment risk assessment to the DWA every 5 years for approval.</p> <ul style="list-style-type: none"> WDC to monitor activities within groundwater capture zone – see Appendix E <p>PM5: To liaise with any business owners and especially the forestry industry which forms the greatest portion of groundwater capture zone as these have</p>	Medium (Unlikely x Moderate)	<p>PM1: AE/TL-AM</p> <p>PM2: AE/TL-AM</p> <p>PM5: AE/TL-AM</p>

Table 16: Source – Catchment and Bores

No	Cause	Indicators	Current Scenario			To Be Implemented		
			Preventative measures in place	Risk Managed?	Current Risk	Preventative measures to be put in place ('G' reference after PM number refers to Generic item across all Whakatāne Water Safety Plans)	Residual Risk	Responsibility
	<p>Human activities: Wastewater discharge from human activities to land or water i.e. on-site disposal and septic tank.</p> <p>Feral animals: faecal matter.</p> <p>Other: Stormwater runoff, construction sites, abandoned/unused bores</p>	<p>other contaminants more than 50% of their MAV in the source water.</p> <ul style="list-style-type: none"> Unsatisfactory practices being used in farming and forestry activities, especially related to fertiliser application and sediment control. 	<ul style="list-style-type: none"> Council increase sampling regime and undertakes sampling twice a week from each bore head pipe work. Recent inclusion of HPC sampling method indicating changes to water. Any positive E-coli transgressions, Council enacts operations procedures in dealing with this. <p>PM1 & PM2: Catchment risk assessment carried out in 2017. Through the assessment WDC has developed an understanding of the extent of the recharge zone and nature of activities in it.</p> <p>PM3: Business as usual - BOPRC informs WDC of new discharge consents to the recharge zone (2 Km groundwater capture zone) and WDC to provide comments on these consents.</p> <p>PM4: WDC to send BOPRC submissions opposing new applications for septic tanks within 2 km groundwater capture zone.</p>			<p>potential to discharge contaminants and ensuring industry best practices are followed; Tradewaste consents and building consents to act as triggers.</p> <p>PM6G: Team Leader - Three Waters Asset Management and Planning to provide input into next version district plan (WDC) and regional plan (BOPRC) with regards to protection of catchment; input into activities such as sediment control from earthworks and riparian strip management.</p>		PM6: SPP/TL-AM
S2.2	<p>Contamination of bore/well from surface ingress due to:</p> <ul style="list-style-type: none"> Inappropriate bore/well head design, not complying with the standards set by DWSNZ 2008 and the DWA. Bore headworks and pipework damaged. Poor joints, cracks or corrosion, in the bore casing. 	<ul style="list-style-type: none"> Inspection of bore/well head shows non-compliance with DWSNZ 2008. E coli transgressions. Single check backflow prevention device located at bore head No damage to bore headworks or pipework could be assessed visually. Inappropriate casing material selected, or old casing. 	<ul style="list-style-type: none"> Artesian Bore with positive pressure Bore/well site fully fenced and no stock grazing or large wild animals within area but has been identified the fence exclusion zone is non-compliant features against the DWSNZ 2008 and DWA requirements. CCTV carried out on North bore and condition of casing found to be good. CCTV to be carried out on South bore. 	Partially	High (Possible x Moderate)	<p>Refurbish boreheads to comply with DWSNZ 2008 and DWA requirements as follows:</p> <p>PM1: WDC is to request DWA to remove 5 metre stock fence requirement by proving all practical measures have been undertaken for fencing the site and that the risks of not having a 5 metre exclusion zone is low due to no stock grazing carried out in the surrounding area.</p> <p>PM2: Re-inspect the 100 mm air gap at the suction tank and investigate the risk of backflow and if required programme and budget for the installation of backflow device (double check) on both bore heads.</p> <p>PM3: Carry out checks to determine adequacy of cable gland seals and borehead seals including replacing any deteriorating gaskets in bore headworks with water tight gaskets.</p>	Medium (Rare x Moderate)	<p>PM1: AE/PM</p> <p>PM2: AE/PM</p> <p>PM3: AE/PM</p> <p>PM4: TL-WTP/PM</p>

Table 16: Source – Catchment and Bores

No	Cause	Indicators	Current Scenario			To Be Implemented		
			Preventative measures in place	Risk Managed?	Current Risk	Preventative measures to be put in place ('G' reference after PM number refers to Generic item across all Whakatāne Water Safety Plans)	Residual Risk	Responsibility
						<p>PM4: Fix isolating valve on the south bore and carry out CCTV inspection to check condition of casing, depth of bore and possible blockages.</p> <p>PM5G: Programme for re-CCTV inspection of bore casing utilising Asset Management System to schedule and monitor preventative maintenance</p>		PM5G: TL-AS / TL-O
S3.1	<p>Discharge/leachate/runoff from the following activities in the catchment:</p> <p>Agriculture: Pesticides (including stock dip), chemical fertiliser, dairy shed washwater, stock effluent, effluent spray irrigation, effluent ponds, increase in turbidity from soil and silt due to cultivation (tilling).</p> <p>Forestry & Pesticides: poison from feral animal control, 1080, cyanide, brodifacoum, fuel contamination from vehicles and fuel storage.</p> <p>Industry and HAIL sites: Chemical discharges depending on industry; underground fuel storage contamination, cyanide and metal contamination from ore extraction/mining, turbidity from open cast mining and quarrying.</p> <p>Roading: Asphalt, contamination due to fuel/oil leaks and accidental spillages.</p> <p>Other: Contaminated/landfill sites, Stormwater</p>		<ul style="list-style-type: none"> Primary chemical contamination risk from forestry activities carried out in the catchment. Source deep aquifer considered to be confined with high artesian pressure, therefore minimal effects from shallow groundwater. Currently no chemical treatment carried out on source water, therefore high risk in the event of chemical contamination. <p>PM2G: Pesticide suite testing on raw water was undertaken in September 2013 and again in July 2018, a comparison of results is being undertaken and report to Toi Te Ora will be prepared in July 2019</p>	No	High (Unlikely x Major)	<p>Also refer to S2.1 Monitor changes in activities in the catchment and modify catchment risk assessment annually. Submit a catchment risk assessment to the DWA every 5 years for approval.</p> <p>PM1: Council to liaise with pesticide application companies and make them aware of locations of water sources, and to be informed of pesticide drops in vicinity of water source.</p> <p>PM3: WDC to monitor activities within groundwater capture zone – see Appendix E. To liaise with any business owners and especially the forestry industry which forms the greatest portion of groundwater capture zone as these have potential to discharge contaminants and ensuring industry best practices are followed; Tradewaste consents and building consents to act as triggers.</p> <p>PM4: Obtain groundwater monitoring results from consent holders in the vicinity if available, as a way of early warning of source contamination.</p> <p>PM5G: Team Leader - Three Waters Asset Management and Planning to provide input into next version district plan (WDC) and regional plan (BOPRC) with regards to protection of catchment; input into activities such as sediment control from earthworks and riparian strip management.</p>	Medium (Unlikely x Moderate)	<p>PM1: SPP/TL-AM</p> <p>PM3: AE/TL-AM</p> <p>PM4: AE / TL-AM</p> <p>PM5G: SPP / TL-AM</p>

Table 16: Source – Catchment and Bores								
No	Cause	Indicators	Current Scenario			To Be Implemented		
			Preventative measures in place	Risk Managed?	Current Risk	Preventative measures to be put in place (‘G’ reference after PM number refers to Generic item across all Whakatāne Water Safety Plans)	Residual Risk	Responsibility
	runoff, increased turbidity from construction sites, abandoned/unused bores							

Table 17: Treatment								
No	Cause	Indicators	Current Scenario			To Be Implemented		
			Preventative measures in place	Risk Managed?	Current Risk	Preventative measures to be put in place ('G' reference after PM number refers to Generic item across all Whakatāne Water Safety Plans)	Residual Risk	Responsibility
T1: EVENT: INADEQUATE TREATMENT INSTALLED								
T1.1	Insufficient bacterial treatment installed	<ul style="list-style-type: none"> High turbidity and E coli levels present 	<ul style="list-style-type: none"> Turbidity samples manually taken twice a week from bore head pipework Bacterial treatment complies with current DWSNZ 2008 requirements of criterion 1 Using HPC testing to indicate early warning changes in water quality Total coliform sampling undertaken <p>PM5 Increase E Coli sampling from each bore water and within zone for early detection, using HPC testing to indicate early warning changes in water quality.</p>	Partially	High (Unlikely x Major)	<p>PM1: Install treatment disinfection systems. Chlorination and/or UV treatment as a minimum treatment requirement of source water.</p> <p>PM2: Confirm groundwater age estimate from GNS.</p> <p>PM3: Install online Turbidity meter and conductivity meter to indicate early warning changes in water quality</p> <p>PM4: After installation of Turbidity and Conductivity meters modify WSP with inclusion of Critical Control Points for these early warning changes in water quality</p> <p>PM6: Develop base data from HPC testing and review sample results, identify if any past HPC testing data exists and after each sample routinely check for changes. From this data establish Critical points and include Controls in dealing with the changes.</p> <p>PM7: Investigate the installation requirements and costing of temporary chlorination treatment disinfection systems to be 'mobilised' in emergency situation for this non-disinfected water supply.</p> <p>PM8: Review and modify 'Incident Response Plan – Three Waters Assets (Water, Wastewater and Stormwater (A1376861)' section WATER SUPPLY RESPONSE PROCEDURE with regards to:</p> <ol style="list-style-type: none"> communication plan for emergency temporary treatment for this non-disinfected water supply Total Coliform-Positive (TC+) response procedures to be undertaken 	Medium (Unlikely x Moderate)	<p>PM1: This item ruled out by Council and will be re-visited depending on possible future mandatory requirements</p> <p>PM2: TL-WTP</p> <p>PM3: TL-WTP</p> <p>PM4: TL-WTP/ WTP-O / RC</p> <p>PM6: TL-WTP/ WTP-O</p> <p>PM7: MTW / M-PA / TL-WTP/ AE / PM</p> <p>PM8: MTW / M-PA / TL-WTP/ TL-O</p>
T1.2	Insufficient protozoal treatment installed	<ul style="list-style-type: none"> High turbidity and E coli levels present 	<ul style="list-style-type: none"> Turbidity samples manually taken twice a week from bore head pipework Protozoa log credit 3 required, current does not qualify for any log credits due to lack of treatment. DWA log credit assignment (January 2018) states the 	No	High (Unlikely x Major)	<p>PM1: Install treatment disinfection systems. Chlorination and/or UV treatment as a minimum treatment requirement of source water.</p> <p>PM2: Confirm groundwater age estimate from GNS.</p> <p>PM3: Install online Turbidity meter and conductivity meter to indicate early warning changes in water quality</p>	Medium (Unlikely x Moderate)	<p>PM1: This item ruled out by Council and will be re-visited depending on possible future mandatory requirements</p> <p>PM2: TL-WTP</p> <p>PM3: TL-WTP</p> <p>PM4: TL-WTP/ WTP-O / RC</p>

Table 17: Treatment								
No	Cause	Indicators	Current Scenario			To Be Implemented		
			Preventative measures in place	Risk Managed?	Current Risk	Preventative measures to be put in place ('G' reference after PM number refers to Generic item across all Whakatāne Water Safety Plans)	Residual Risk	Responsibility
			<p>possibility of bores achieving secure bore status once borehead security requirements are achieved. However, it also states that there could be future changes to secure bore status as a result of the Havelock North Inquiry.</p> <p>PM5 Increase E Coli sampling from each bore heads pipework and within zone for early detection, using HPC testing to indicate early warning changes in water quality.</p>			<p>PM4: After installation of Turbidity and Conductivity meters modify WSP with inclusion of Critical Control Points for these early warning changes in water quality</p> <p>PM6: Develop base data from HPC testing and review sample results, identify if any past HPC testing data exists and after each sample routinely check for changes. From this data establish Critical points and include Controls in dealing with the changes.</p> <p>PM7: Investigate the installation requirements and costing of temporary chlorination treatment disinfection systems to be 'mobilised' in emergency situation for this non-disinfected water supply.</p> <p>PM8: Review 'Incident Response Plan – Three Waters Assets (Water, Wastewater and Stormwater (A1376861)' section WATER SUPPLY RESPONSE PROCEDURE with regards to:</p> <ul style="list-style-type: none"> a. communication plan for emergency temporary treatment for this non-disinfected water supply b. Total Coliform-Positive (TC+) response procedures to be undertaken 		<p>PM6: TL-WTP/ WTP-O</p> <p>PM7: MTW / M-PA / TL-WTP/ AE / PM</p> <p>PM8: MTW / M-PA / TL-WTP/ TL-O</p>
T1.3	Insufficient chemical treatment installed	<ul style="list-style-type: none"> • Chemicals exceed set MAVs 	<ul style="list-style-type: none"> • No priority 2 determinands assigned. PM1: Activities in the catchment giving rise to chemical contamination identified by carrying out a catchment risk assessment every 5 years. 	Partially	High (Unlikely x Major)	<p>PM1: Monitor changes in activities in the catchment and modify catchment risk assessment annually.</p> <p>PM2: Submit a catchment risk assessment to the DWA every 5 years for approval.</p>	Medium (Rare x Moderate)	<p>PM1: AE/TL-AM</p> <p>PM2: AE/TL-AM</p>
T1.4	Other – Insufficient pH treatment	<ul style="list-style-type: none"> • pH below 7 or pH above 8.5 	<ul style="list-style-type: none"> • pH monitoring on-site at pumping station 2 times a week • No pH correction installed. PM3G: Plumb solvency notice circulated among customers every 6 months. 	Partially	High (Possible x Moderate)	<p>PM1: Install online pH monitoring at pumping station site to monitor changes in pH.</p> <p>PM2: Investigate options to install pH correction and cost benefit of installation of pH correction. If feasible budget and programme for works to occur</p> <p>PM3G: Plumb solvency - Inform wider community and consumers about the use of copper pipes and fittings (including lead jointing) for internal plumbing by circulating information flyer and notification on Council Website</p>	Low (Unlikely x Minor)	<p>PM1: TL-WTP</p> <p>PM2: PM/TL-AM</p> <p>PM3G: M-PA / AE</p>

Table 17: Treatment								
No	Cause	Indicators	Current Scenario			To Be Implemented		
			Preventative measures in place	Risk Managed?	Current Risk	Preventative measures to be put in place ('G' reference after PM number refers to Generic item across all Whakatāne Water Safety Plans)	Residual Risk	Responsibility
						PM4: After installation of online pH monitoring modify WSP with inclusion of Critical Control Points for these early warning changes in water quality		PM4: TL-WTP/ WTP-O / RC
T2: EVENT: INADEQUATE CALIBRATION/VERIFICATION, MAINTENANCE, PROCEDURES, SAMPLING, TRAINING								
T2.1	Inadequate calibration, verification of flow meter and maintenance of equipment.		PM1: Only flow monitoring equipment on site i.e.-magnetic flow meter not required for instrument control	Yes	Low (Unlikely x Minor)	PM1G: Utilise Asset Management System to schedule the maintenance, verification and calibration of flow meter.	Low (Unlikely x Insignificant)	PM1G: TL-AS / TL-O
T2.2	Inadequate/incorrect sampling		PM1: Review internal procedures and develop robust schedule sampling regime. PM2: WDC treatment plant operators trained and aware of correct sampling procedures. PM3: MoH approved accredited labs carry out testing of samples.	Partially	Medium (Unlikely x Moderate)	PM2G: Water Operator Authorisation. Authorisation assessments by DWA undertaken with WDC operators in September 2018. The next assessments will be carried out in 2021.	Low (Unlikely x Minor)	PM2G: TL-WTP/ WTP-O / RC

Table 18: Reservoirs								
No	Cause	Indicators	Current Scenario			To Be Implemented		
			Preventative measures in place	Risk Managed?	Current Risk	Preventative measures to be put in place ('G' reference after PM number refers to Generic item across all Whakatāne Water Safety Plans)	Residual Risk	Responsibility
R1: EVENT: LOSS OF SUPPLY DUE TO INSUFFICIENT STORAGE								
R1.1	Insufficient storage capacity to store water for daily demand.	Water storage levels low. Reservoir telemetry indicates loss in levels. Decreased or no flow, loss of pressure in the system.	PM1: Just under 24 hr storage currently available (1x455 m ³ and 2x340 m ³ concrete tanks=1,135 m ³ total storage available for average daily demand 1,265 m ³ /day).	Yes	Low (Unlikely x Minor)	PM1: Investigate the state of the decommissioned reservoir and consider refurbishing and reconnecting in future if more capacity required.	Low (Unlikely x Minor)	PM1: TL-AM / PE / RC
R2: EVENT: LOSS OF SUPPLY DUE TO STRUCTURAL FAILURE								
R2.1	Poor condition of reservoirs leading to leakages, collapse or loss of structural integrity.	Drop in reservoir levels do not match demand. Increased pump starts. Loss of supply. Insufficient pressure/flow for firefighting purposes.	PM1: Visual site inspection of reservoirs showed concrete reservoirs in poor condition with visible seepage. <ul style="list-style-type: none"> Visits to reservoir site occur on a weekly basis by RC with any anomalies reported. The presence of site visits has deterred unruly behaviour around reservoir site Suction tank has controlled interconnection to allow town supply bypassing high lift pumps and reservoirs arrangement. 	Partially	Medium (Unlikely x Moderate)	PM1: Carry out condition assessment of all concrete reservoirs by 2019 and formulate a condition assessment programme thereafter. PM2G: Utilise Asset Management System to schedule and implement a preventative maintenance programme for reservoirs.	Low (Unlikely x Minor)	PM1: AE / PE PM2G: TL-AS / RC
R2.2	Vandalism to reservoir structure	Loss of supply. Insufficient pressure/flow for firefighting purposes.	No gate at the immediate reservoir site. Site can be accessed by foot/ vehicle. Vehicle tracks and signs of vandalism: broken glass, two reservoirs had been vandalised by graffiti. Site considered high risk for vandalism. PM1: No ladder access available on site. Suction tank interconnected to the town supply thus can bypass high lift pumps and reservoirs.	No	High (Likely x Moderate)	PM1: Padlocked security fence to be installed at the reservoir site to restrict vehicle access. Land Matter issues at this site have started.	Low (Unlikely x Minor)	PM1: PM / TL-O / TL-AM / RC
R3: EVENT: LOSS OF SUPPLY DUE TO INSUFFICIENT SOURCE WATER								
R3.1	Insufficient storage capacity to store additional	Water storage levels unacceptably low. Insufficient	Seasonal variation in bore pressure, however, supply has been adequate to supply the Scheme.	Partially	High (Unlikely x Major)	PM1: Fix isolating valve on the south bore and carry out CCTV inspection to check condition of casing, depth of bore and possible blockages.	Medium (Unlikely x Moderate)	PM1: TL-O / AE / PM

Table 18: Reservoirs								
No	Cause	Indicators	Current Scenario			To Be Implemented		
			Preventative measures in place	Risk Managed?	Current Risk	Preventative measures to be put in place ('G' reference after PM number refers to Generic item across all Whakatāne Water Safety Plans)	Residual Risk	Responsibility
	water due to seasonal variations in source.	pressure/flow for firefighting purposes. Reservoir telemetry indicates loss in levels.						
R4: EVENT: MICROBIAL AND/OR CHEMICAL CONTAMINATION OF STORED WATER								
R4.1	Access by animals/birds.	Visual evidence of animal and bird access i.e. feral animal droppings, birds' nests. Unexplained deterioration/change in water quality.	<ul style="list-style-type: none"> WDC staff have confirmed there is no daylight visible inside the reservoirs therefore no gaps between roof and reservoir body expected. Clear well tank grills have been replaced to prevent entry by vermin. PM2: Visit to reservoir site occurs on a weekly basis by RC with any anomalies reported. The presence of site visits has deterred unruly behaviour around reservoir site	Partially	High (Possible x Moderate)	PM1: Utilise Asset Management System to schedule and implement a site inspection and maintenance programme as required to prevent breeding of vermin/animals. PM2: Weekly reservoir site inspection details to be captured within the Asset Management System.	Low (Unlikely x Minor)	PM1: TL-AS / TL-O / AE / RC PM2: TL-AS / RC
R4.2	Vandalism and sabotage, staff access	Visual evidence of vandalism to reservoir structure, evidence of unauthorized human access (broken glass, bottles, rubbish). Unexplained deterioration/change in water quality.	See R2.2 PM1: Disinfection procedures undertaken after failed sampling. PM2: Visit to reservoir site occurs on a weekly basis by RC with any anomalies reported. The presence of site visits has deterred unruly behaviour around reservoir site	Partially	High (Possible x Moderate)	No Treatment facility for Murupara system PM1: Review 'Incident Response Plan – Three Waters Assets (Water, Wastewater and Stormwater (A1376861)' section WATER SUPPLY RESPONSE PROCEDURE to including further actions, if required for this non-disinfected water supply. PM2: Weekly reservoir site inspection details to be captured within the Asset Management System.	Low (Unlikely x Minor)	PM1: TL-O / TL-WTP / MTW / RC PM2: TL-AS / RC
R4.3	Sediment/slime accumulation and resuspension of accumulated sediment.	Visible slime/sediment and customer complaints.	PM1: Internal reservoir inspections carried out in 2008 and 2015. PM2: Procedure for reservoir cleaning to include disinfection of equipment, appropriate isolation from network, minimising sediment stir up, etc.	Partially	Medium (Unlikely x Moderate)	PM1: Utilise Asset Management System to schedule and implement a CCTV inspection of reservoirs and vacuum cleaning programmes as required.	Low (Unlikely x Minor)	PM1: TL-AS
R4.4	Entry of contaminants due to reservoir design	Deterioration of water quality following new installation.	Unable to check reservoir roof hatches during site inspection due to necessity of need ladder.	Partially	Medium (Unlikely x Moderate)	PM1: Investigate location of overflow and install appropriate marker post. Install appropriate flap/non return valve device on overflow line	Low (Unlikely x Minor)	PM1: TL-O / TL-WTP / RC PM2: AE / TL-O / TL-WTP

Table 18: Reservoirs								
No	Cause	Indicators	Current Scenario			To Be Implemented		
			Preventative measures in place	Risk Managed?	Current Risk	Preventative measures to be put in place ('G' reference after PM number refers to Generic item across all Whakatāne Water Safety Plans)	Residual Risk	Responsibility
		Change in water quality after rain events, increased turbidity.	PM1: Suction tank roof hatch designed to prevent rainwater ingress and padlocked.			PM2: Investigate the 'as-built' for this reservoir site to see what operational parameters the reservoirs can operate under (in series / parallel).		

Table 19: Distribution								
No	Cause	Indicators	Current Scenario			To Be Implemented		
			Preventative measures in place	Risk Managed?	Current Risk	Preventative measures to be put in place ('G' reference after PM number refers to Generic item across all Whakatāne Water Safety Plans)	Residual Risk	Responsibility
D1: EVENT: MICROBIAL AND CHEMICAL CONTAMINATION DUE TO BACKFLOW INTO DISTRIBUTION NETWORK								
D1.1	Backflow from individual properties into the distribution system due to a pressure drop in the reticulated system/elevated pressure in individual premises, where the property has no/malfunctioning backflow prevention device	<ul style="list-style-type: none"> E. coli or coliforms detected in 100 mL water sample. Unexplained fluctuations in chemical and microbiological water quality. Customer complaints of: Odour from tap water; gross contamination of tap water. Customer complaints about low pressure 	<ul style="list-style-type: none"> Backflow prevention policy is currently being developed by WDC Testing of existing backflow preventers not currently carried out. All new commercial and farm connections installed with backflow preventers adhering to NZ Building Code standards; triggered during building/ land use/ tradewaste consents or 'new connection' applications. <p>Specific hydrants assigned for water withdrawal by contractors for ease of policing. Applications are made to the operations depot and water to be withdrawn using standpipes with fitted BFP device and water meter.</p> <p>PM5G: Discussion between 3 Waters and Building compliance has occurred. Building compliance utilities Building Code G12-Water supplies whereby if backflow prevention is required this is a condition of a building warrant of fitness (WOF) and follows the WOF process.</p>	Partially	High (Possible x Moderate)	<p>PM1G: Develop and implement a backflow prevention policy to match device to risk level of activity, including testing requirements of the devices.</p> <p>PM2: Install backflow prevention devices on all connections as a result of WDC decision in February 2018 to install backflow preventers on all connections to support decision by WDC/Community not to provide treatment to water. Dual check manifold valve to be installed on residential connections. – Project has commenced April 2019</p> <p>PM3G: Circulate educational material to customers, especially those considered high risk, about risks of backflow prevention and ways of minimising the risk.</p> <p>PM4G: Review policy for withdrawing water from hydrants; specify the use of standpipes fitted with approved backflow preventers</p> <p>PM6G: Develop and implement a district wide policy to disconnect connections not in use – For this system and as part of backflow installation project (PM2, above) any vacant, derelict, burnt out properties will be capped off and recorded in asset management system.</p> <p>PM7G: Develop and implement a policy for identifying and dealing with illegal connections.</p> <p>PM8: Review the way Council customer driven RFS for this water supply are captured, monitored and acted upon to optimise Council response to reduce the risk of contamination. Investigate and where possible promote and implement additional 2 way communications paths via social media platforms and/or other technologies to accommodate this higher risk non-disinfected water supply.</p>	Low (Unlikely x Minor)	<p>PM1G: MTW / M-PA / AE / TL-O / TL-AM</p> <p>PM2: TL-O / PM / PE / TL-AM</p> <p>PM3G: AE / M-PA</p> <p>PM4G: MTW / M-PA / AE / TL-O / TL-AM</p> <p>PM6G: MTW / M-PA / AE / TL-O / TL-AM</p> <p>PM7G: MTW / M-PA / AE / TL-O / TL-AM</p> <p>PM8: MTW / M-PA/ TL-O / TL- WTP / RC / TL-AM</p>

Table 19: Distribution								
No	Cause	Indicators	Current Scenario			To Be Implemented		
			Preventative measures in place	Risk Managed?	Current Risk	Preventative measures to be put in place ('G' reference after PM number refers to Generic item across all Whakatāne Water Safety Plans)	Residual Risk	Responsibility
D2: EVENT: CHEMICAL AND MICROBIOLOGICAL CONTAMINATION DUE TO LACK OF ROUTINE MAINTENANCE								
D2.1	Poor circulation due to lack of hydrant and mains flushing programme.	<ul style="list-style-type: none"> Accumulation of sediments in the system. 	<ul style="list-style-type: none"> The current routine maintenance schedule is being reviewed by WDC. PM1: Flushing of dead ends in the network was undertaken as part of 2018 valve replacement programme 	Partially	Low (Unlikely x Minor)	PM1G: Utilise Asset Management System to schedule routine maintenance plan for flushing of mains and hydrants with priority given to flushing dead ends and areas of poor circulation.	Low (Rare x Minor)	PM1G: TL-AS / TL-O / RC
D2.2	Inability to isolate or shut down the system due to missing or failed valves.		<ul style="list-style-type: none"> PM1: Critical valves have been identified through a study carried out by OPUS in 2016. PM2: All valves exercised and valve replacement programme of failed valve completed December 2018 PM3: A programme of marking valve boxes for ease of location has been undertaken December 2018. 	Partially	Low (Unlikely x Minor)	PM1G: Utilise Asset Management System to schedule routine maintenance plan for valve exercising with priority given to critical valves i.e.-those supplying a large or critical customer base, valves on rising and falling mains and those used for bore and reservoir isolation	Low (Rare x Minor)	PM1G: TL-AS / TL-O / RC
D3: EVENT: LOSS OF SUPPLY AND CONTAMINATION OF SUPPLY DUE TO LACK OF ROUTINE ASSET REPLACEMENT								
D3.1	Pipe, valve and hydrant failure due to age, condition and material of pipe.	<ul style="list-style-type: none"> Increased failure frequency in assets. 	<ul style="list-style-type: none"> Currently reactive maintenance being carried out. AMP has been prepared to identify condition of existing components of the scheme. Pipe sampling has been carried out in certain areas. PM3G: New Asset Management System implemented, recording maintenance carried out and cost of maintenance per asset. 	Partially	High (Possible x Moderate)	<ul style="list-style-type: none"> PM1G: Undertake an asset renewals programme based on condition sampling and assessments, analysis of asset age, material, frequency of breakages and increase in maintenance costs. Asset renewals to prioritize critical assets including the rising main supplying water from pump station to reservoirs. Other critical assets include falling mains, pipes supplying a critical consumers or large consumer base, critical valves and hydrants. PM2G: Update water asset management plan as required and republish every 3 years. 	Low (Unlikely x Minor)	<ul style="list-style-type: none"> PM1G: AE / TL-AM PM2G: TL-AM / AE
D4: EVENT: CONTAMINATION DUE TO PRESSURE FLUCTUATIONS IN THE SYSTEM								
D4.1	Pressure fluctuations in the system due to: pipe failure, accidental penetration by contractors and leaks in the system, major fire events, Low pressure areas (hills/extremities).	<ul style="list-style-type: none"> Increased customer pressure complaints Notification by contractors 	<ul style="list-style-type: none"> GIS system for WDC reticulation network can be accessed online by public or contractors. PM6G: Procedures for third party contractors/developers that require them to obtain a Permit to Work before any work is carried out as part of resource consent. Only Council approved contractors to work on council reticulation 	Partially	High (Possible x Moderate)	<ul style="list-style-type: none"> PM1: Identify problem pressure areas by carrying out hydraulic model network analysis coupled with customer complaint records. PM2G: Carry out a periodic water balance to identify levels of leakage in system PM3: Once hydraulic models are completed and in-line with annual water balance calculations develop and implement leak detection programme. 	Low (Unlikely x Minor)	<ul style="list-style-type: none"> PM1: AE / RC PM2G: AE PM3: AE PM4G: TL-AM/AE

Table 19: Distribution								
No	Cause	Indicators	Current Scenario			To Be Implemented		
			Preventative measures in place	Risk Managed?	Current Risk	Preventative measures to be put in place ('G' reference after PM number refers to Generic item across all Whakatāne Water Safety Plans)	Residual Risk	Responsibility
						<p>PM4G: Develop and adopt internal procedure for maintaining an up-to-date Asset Management System and GIS system</p> <p>PM5: Install backflow prevention devices on all connections as a result of WDC decision in February 2018 to install backflow preventers on all connections to support decision by WDC/Community not to provide treatment to water. Dual check manifold valve to be installed on residential connections. – Project has commenced April 2019</p> <p>PM6: Review the way Council customer driven RFS for this water supply are captured, monitored and acted upon to optimise Council response to reduce the risk of contamination. Investigate and where possible develop, promote and implement additional 2-way communications paths via social media platforms and/or other technologies to accommodate this higher risk non-disinfected water supply.</p> <p>PM7: Once hydraulic models are completed utilise the hydraulic model to investigate, develop and implement a pressure optimization programme where possible for this water supply.</p> <p>PM8: Carry out periodic hydrant testing exercises to test effects on pressure in the system.</p>		<p>PM5: TL-AM</p> <p>PM6: MTW / TL-O / TL- WTP / RC / TL-AM</p> <p>PM7: TL-AM/AE</p> <p>PM8: AE</p>
D5: EVENT: CONTAMINATION AND LOSS OF SUPPLY DUE TO POOR PLANNING, INADEQUATE PROCEDURES AND INADEQUATE TRAINING								
D5.1	Poor planning of scheduled work carried out by WDC staff and their contractors.		<ul style="list-style-type: none"> Customer services department notified of work being carried out resulting in service disruption. Works are carried out outside peak hours to ensure minimum disruption. Public announcements made on radio/ newspaper for major work. 24 hour letter drop notice given to smaller projects. Critical users (dialysis patients/hospitals) notified as a priority. 	Partially	Medium (Possible x Minor)	<p>PM1G: Where possible utilise WDC Asset Management System to maintain an up-to-date database of critical users such as dialysis patients/hospitals/businesses. Develop robust process for critical customer rating and updating data to maintain active list.</p> <p>PM2G: Develop and adopt internal procedure for maintaining an up-to-date Asset Management System and GIS system.</p> <p>PM3G: Maintain a systematic workflow procedure with control checks for the update of capital works arising from projects, subdivision work and daily replacements and renewals so that all paperwork is</p>	Low (Unlikely x Minor)	<p>PM1G: TL-AM</p> <p>PM2G: AE/TL-AM</p> <p>PM3G: AE/TL-AM</p>

Table 19: Distribution								
No	Cause	Indicators	Current Scenario			To Be Implemented		
			Preventative measures in place	Risk Managed?	Current Risk	Preventative measures to be put in place ('G' reference after PM number refers to Generic item across all Whakatāne Water Safety Plans)	Residual Risk	Responsibility
						sent to the asset engineer for recording on Asset Management System and GIS.		
D5.2	Inadequate operating Procedures.		<ul style="list-style-type: none"> Murupara wastewater system is entirely a gravity based system with no wastewater pumping stations to assist in delivering sewage to the treatment plant. Due to this gravity system there is reduced interaction with wastewater system with the operation attending to reactive works and thus risk of contamination from this event is dramatically reduced. <p>PM1G: Existing operations procedure 'Incident Response Plan – Three Waters Assets (Water, Wastewater and Stormwater)' last updated 2018.</p> <p>PM2G: As part of operators training well aware of Hygiene issues associated within the 3 Waters industry. Some common sense prevails.</p>	Partially	Medium (Possible x Minor)	<p>PM1G: Review 'Incident Response Plan – Three Waters Assets (Water, Wastewater and Stormwater)' document. Modify, where required to clearly define steps for each process, items to be recorded and objectives of the process, with reference to other documents.</p> <p>PM2G: Develop and implement a Council SOP (Hygiene code of practice for working on water supply systems). The document to reflect industry best practice and have inclusion of special reference to working on 'untreated water supply' and how Council will manage preventing cross contamination in the unlikely event that staff alternate on wastewater and water reticulation work. The Hygiene Code of Practice to include sickness statement and medical clearance requirements.</p> <p>PM3G: Review existing operating procedures and develop procedures that clearly define steps for each process, items to be recorded and objectives of the process, with reference to other documents.</p>	Low (Unlikely x Minor)	<p>PM1G: MTW / TL-WTP / WTP-O / RC</p> <p>PM2G: TL-WTP /WTP-O / TL-AS / RC</p> <p>PM3G: MTW / TL-WTP / WTPO</p>
D5.3	Inadequate training of operations staff.		<ul style="list-style-type: none"> Staff provided with relevant training. All staff hold appropriate certificate in water reticulation. Prior to employment within 3 Waters Operation Section, staff are vaccinated against Hepatitis A/B and Tetanus to immunised against these known water borne diseases Tool box meetings carried out weekly. 	Partially	Medium (Possible x Minor)	<p>PM1G: Staff certificates are maintain on training register. Develop a training and competency system for working on reticulated network, including local contractor Adam Anderson.</p> <p>PM2: As this is a non-disinfected water supply review requirements of local reticulation contractor Adam Anderson and Council to support in obtaining necessary specific training required</p>	Low (Unlikely x Minor)	<p>PM1G: TL-O / TL-AS / TL-WTP / RC</p> <p>PM2: MTW / TL-O / TL-AS / TL-WTP / RC</p>
D6: EVENT: CONTAMINATION AND LOSS OF SUPPLY DUE TO THIRD PARTY CONTRACTORS								
D6.1	Third party contractor/developer work on WDC reticulation (not directly engaged by WDC).	Calls from public about disruptions	PM1G: implement procedures for third party contractors/developers that require them to obtain a Permit to Work before any work is carried out.	Partially	High (Possible x Moderate)	PM2G: Review the information that Council sends out in response to 'beforeUdig' requests to contractors working on other services and align the response with current incident notification protocol and responsibilities.	Medium (Unlikely x Moderate)	PM2G: TL-O/AE/TL-AM

Table 19: Distribution								
No	Cause	Indicators	Current Scenario			To Be Implemented		
			Preventative measures in place	Risk Managed?	Current Risk	Preventative measures to be put in place ('G' reference after PM number refers to Generic item across all Whakatāne Water Safety Plans)	Residual Risk	Responsibility
			<ul style="list-style-type: none"> Contractors to submit disinfection procedures, Health and Safety plans, detailed design of work to be carried out WDC to supervise subdivision work at critical stages such as pressure testing, disinfection, connection to the water main and backfilling, in the presence of the Engineer to the developer. Part of resource consent <p>PM2G: Third party contractors working in district are required to obtain a 'beforeUdig' certificate which indicates underground service locations.</p>			<p>PM3: Review the way Council customer driven RFS for this water supply are captured, monitored and acted upon to optimise Council response to reduce the risk of contamination. Investigate and where possible develop, promote and implement additional 2-way communications paths via social media platforms and/or other technologies to accommodate this higher risk non-disinfected water supply.</p>		<p>PM3: MTW / TL-O / TL- WTP / RC / TL-AM</p>
D7: EVENT: CONTAMINATION DUE TO INFLOW / INFILTRATION CROSS CONTAMINATION OF WASTEWATER SYSTEM								
D7.1	Inadequate operating Procedures.		<ul style="list-style-type: none"> Council has undertaken CCTV of sections of Murupara in 2006 and 2009/10 Murupara wastewater system is entirely a gravity based system with no wastewater pumping stations to assist in delivering sewage to the treatment plant. Due to this gravity system there is reduced interaction with wastewater system with the operation attending to reactive works and thus risk of contamination from this event is dramatically reduced. <p>PM1: Council is developing a district wide inflow/infiltration strategy in 2020 financial year which will include the Murupara wastewater network.</p> <p>PM2G: As part of operators training well aware of Hygiene issues associated within the 3 Waters industry. Some common sense prevails.</p>	Partially	Medium (Possible x Minor)	<p>PM1: Input into Council's district wide inflow /infiltration strategy giving higher importance to the Murupara scheme as it is in the vicinity of the non-disinfected water supply scheme.</p> <p>PM2G: Develop and implement a Council SOP (Hygiene code of practice for working on water supply systems). The document to reflect industry best practice and have inclusion of special reference to working on 'untreated water supply' and how Council will manage preventing cross contamination in the unlikely event that staff alternate on wastewater and water reticulation work. The Hygiene Code of Practice to include sickness statement and medical clearance requirements.</p>	Low (Unlikely x Minor)	<p>PM1: MTW / TL-AM / AE</p> <p>PM2G: TL-WTP /WTP-O / TL-AS / RC</p>

Appendix B: Murupara Scheme Process Control Summaries

Non-Disinfected Water Supply

No alarms are currently set up as no online monitoring for this system and manual samples are taken twice a week at source water and within the distribution system at controlled sample points.

The below Target Range is for current normal operation for this non-disinfected Water Supply system and the Critical level are where action is undertaken. Action is undertaken via ‘Incident Response Plan – Three Waters Assets (Water, Wastewater and Stormwater (A1376861)’ section WATER SUPPLY RESPONSE PROCEDURE.

Council is installing online Turbidity meter, conductivity meter and pH. The installations are to be completed August 2019. Once new online equipment has been commissioned and is operational, Process Control sections of this WSP will be modified appropriately.





Table 20: Limits Process Performance Parameters			
Limits		Performance Parameters	
		pH (pH units)	Turbidity (NTU)
DWSNZ 2008 Monitoring Parameters		Guideline: Between 7.0 and 8.0	<1.0 NTU for >5% of 1 day
			<2.0 NTU for 3 minutes of 1 day
Target Range	Range limit	7.2	0.2
Critical Limits	Low level	5.0	
	High level	8.0	1.00
<p><i>When ‘Critical levels’ are detected from a sample Council’s Incident Response Plan is undertaken. Note: Ranges and Limits will be reviewed and modified to reflect this system once online monitoring commences (August 2019).</i></p>			

Turbidity– Triggers and Corrective Actions for this non-disinfected water supply

Corrective actions to be taken when trigger limits are reached:

Table 21: Turbidity - Triggers and Corrective Actions		
Limits	Triggers	Corrective Actions
Target Range	During day to day monitoring or inspection.	<ul style="list-style-type: none"> Nil.
Critical Limits	High Turbidity reading	<ul style="list-style-type: none"> If at source water Reticulation Contractor turns off the pumps (supply of water to the reservoirs) and contacts Water Treatment Plant operator. Water Treatment Plant operator to notify Water Treatment Plant Team Leader and Water Treatment Plant Team Leader to notify Three Waters Manager. Carry out a site inspection to investigate reason for turbidity and/or pH outside action limits: <ul style="list-style-type: none"> Carry out additional manual tests to obtain turbidity and pH readings to verify against out of limit reading / pH meter readings to check equipment is operating correctly. Obtain sample for E. coli and Total Coliform test. Carry out a visual check of borehead equipment and surrounding site for signs of vandalism. Check around borehead area and vicinity for any visible signs of contamination. Increase manual monitoring frequency. Carry out the ‘Incident Response Plan – Three Waters Assets (Water, Wastewater and Stormwater (A1376861)’ section WATER SUPPLY RESPONSE PROCEDURE. If there is a requirement for the plant to supply water to the scheme whilst performance parameters are in the critical limit range carry out the following: <ul style="list-style-type: none"> Obtain approval from TL-WTP, MTW and DWA before supplying water to the scheme that may not satisfy DWSNZ 2008 limits. Confirm conditions of continued operation with the DWA and carry them out (i.e. boil water notice etc.). WTP-O to complete an incident report for the event, and the TL-WTP to develop a full transgression report.

Appendix C: Murupara Scheme Reservoir Inspection Sheet

Reservoir Inspection				
General Information				
Project:	Murupara Water Safety Plan			
Survey Carried out by:	Sala Ranasinghe			
Date of Site Visit:	17th July 2017			
Location of Reservoirs:	Murupara			
Number of Reservoirs on site:	3 Reservoirs. 1 Reservoir out of commission			
Client Details:	Whakatane District Council			
Assessment				
Access to reservoir:	Dirt road			
Security to reservoir site:	Forestry gate to access road from main road, no gate at reservoir site.			
Security fence or stock fence?	No security/stock fence on site.			
Reservoir construction material (Concrete/Timber/Steel/Plastic/Other):	Material:	In service: Concrete (455 m3)	No:	1
	Material:	In service: Concrete (340 m3)	No:	2
	Material:	Not in service: Concrete (455 m3)	No:	1
	Material:		No:	
Condition of Reservoirs (Good/Average/Bad) please comment:	Reservoir 1: All reservoirs - Visual inspection showed average/poor condition. Few damp patches on the reservoirs although no ponding seen. Two reservoirs with extensive graffiti marked on structure.			
Evidence of human or animal access on site?	Evidence of human access: vehicle tracks on site and broken bottles/glass.			
Evidence of vandalism?	Broken bottles/glass on site and reservoirs vandalised by graffiti.			
Any points of possible entry of animals into reservoir?	Visual inspection of reservoir showed possible points of entry of animals into reservoir between roof and tank body. To be further inspected by WTP operators. Overflow required to be meshed.			
Any signs of leaks?	Wet patches on reservoir structure, but no ponding.			
Check reservoir roof	As above.			
Any reservoirs not being used?	1 concrete reservoir not in use and disconnected from reticulation (455 m3)			
Is ladder access restricted?	No ladder on site.			
Are roof hatches designed to prevent rainwater ingress?	Wasn't able to confirm during site visit.			
Are roof hatches padlocked?	As above.			
Photos				
Reservoir Structure				
				
Reservoir Roof/overflow				
				

Appendix D: Murupara Scheme Log Credit Assignment by DWA



Toi Te Ora Public Health
PO Box 2120
TAURANGA 3140

04 January 2018

Tomasz Krawczyk
General Manager Infrastructure
Tomasz.Krawczyk@whakatane.govt.nz

Dear Tomasz

Murupara (TP00719): Protozoal log credit requirement assignment

Whakatane District Council has provided the following documentation for assessment:

1. Pattle Delamore Partners Catchment Risk Assessment for Murupara Water Supply, Whakatane District Council, Oct 2017(A1212112)

Whakatane District Council have nominated to use a catchment risk category approach as per section 5.2.1.1 of the Drinking-water Standards for New Zealand 2005 (Revised 2008) (DWSNZ). Survey method and information presented in the catchment risk assessment (CRA) is acceptable for determining the protozoal log credit requirements and to inform the water safety plan.

The CRA stipulates a log credit of 0, however it also states that groundwater security criteria 2 is not met. In order to achieve a log credit of less than 3, groundwater security criteria 2 must be satisfied. The CRA states that further testing is required in order to confirm compliance with groundwater security criteria 2. In particular only the North bore was assessed using a down hole CCTV survey. No survey was undertaken on the South bore. The CRA also identified that the fenced exclusion zone only extended 2.5 m from the bore head. Leniency can be granted around the distance of fences as long sufficient evidence is provided that stock animals do not have access to the site.

It is my understanding that further information can be provided around stock exclusion and surveying the South bore is planned. Until these outstanding requirements are addressed the assigned log credit requirement is 3.

The CRA identifies a number of recommendations that are expected to be addressed in the pending Murupara WSP.

Please note that the *Report of the Havelock North Drinking Water Inquiry: Stage 2* has made several recommendations regarding the secure classification system and changes in this area may occur in the near future.

Phone us on 0800 221 555 • enquiries@toiteora.govt.nz • www.toiteora.govt.nz

The Institute of Environmental Science and Research will be informed of any changes to the security designation and or log credit requirement assignation for a source so that the national drinking-water database can be updated.

If you do not agree with the log credit assignation an appeal, as per section 1.9 of the DWSNZ, must be lodged with the Technical Manager, Central North Island Drinking Water Assessment Unit, PO Box 11036, Palmerston North 4440, within 2 months of receipt of this letter. The Technical Manager will arrange for a review to be undertaken using the Ministry of Health appeals procedure. Any log credit assignation appeal must be supported by data obtained by monitoring *Cryptosporidium* as per section 5.2.1.2 of the DWSNZ.

If you have any questions about this assessment please contact me 07 577 3788.

Yours sincerely,
Grant King



Drinking Water Assessor

Central North Island Drinking-water Assessment Unit – Tauranga Branch

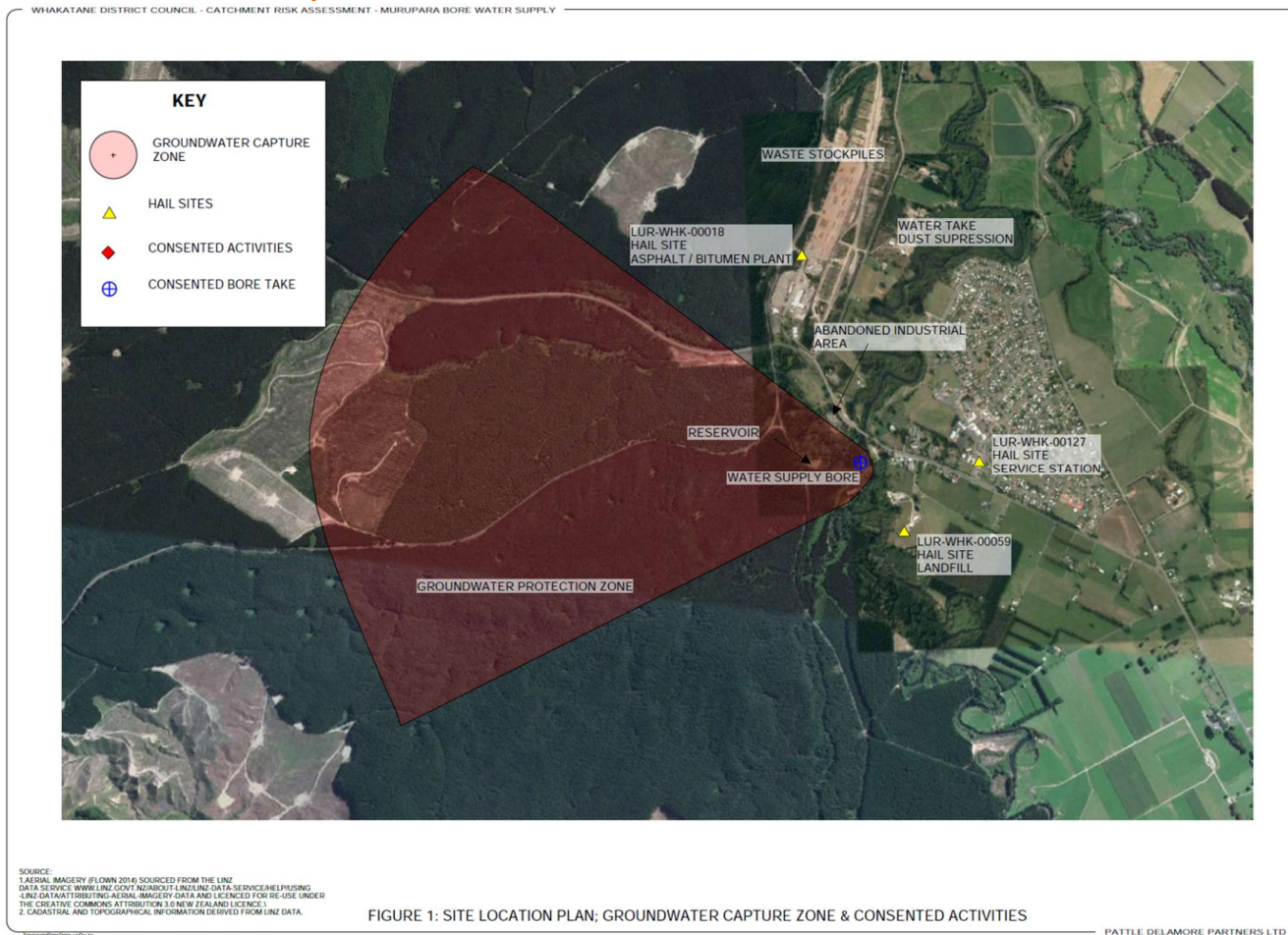
cc: Leilani.Salanguit@whakatane.govt.nz
Michael.VanTilburg@whakatane.govt.nz
Gareth.Phillips@whakatane.govt.nz
Neal.Yeates@whakatane.govt.nz

Appendix E: Improvement Plan – Completed Projects

Table 22: Improvement Plan – Completed Items						
Priority	Risk Table No.	Area of Work	Work To be Implemented	Responsibility	Comment	Date
Low	D4.1 (PM6G) D6.1 (PM1G)	Third party contractor/developer work on WDC reticulation (not directly engaged by WDC)	Included in engagement of contractors. Contractors submit disinfection procedures, Health and Safety plans, detail design of work to be carried out for Council approval.	Contractors and AE / PE	BAU Implemented	March 2018
High	S3.1 (PM2G)	Managing activities in the catchment	Pesticide suite testing on raw water was undertaken in September 2013 and again in July 2018, a comparison of results is being undertaken and report to Toi Te Ora will be prepared as part of business as usual	TL-WTP	Completed	July 2018
Low	D1.1 (PM5G)	Contamination from backflow	Operations department to discuss with building control department to include backflow prevention devices as part of the building control checklist when carrying out building inspections.	AE / TL-AM	Discussions held - Part of building inspection process for consented works	July 2018
Medium	T2.2 (PM2G)	Water Operator Authorisation assessment	Water Operator Authorisation. Authorisation assessments by DWA were undertaken with WDC operators in September 2018. The next assessments to be carried out in 2021.	TL-WTP / WTP-O / RC	undertaken	September 2018
High	D2.2 (PM2)	Inability to isolate or shut down the system	Undertake a programme of marking valve boxes for ease of location and to indicate whether they are open or closed.	PE / TL-O	completed	December 2018

Table 22: Improvement Plan – Completed Items						
Priority	Risk Table No.	Area of Work	Work To be Implemented	Responsibility	Comment	Date
High	D2.2 (PM1)	Inability to isolate or shut down the system	Carry out a routine maintenance plan for valve exercising with priority given to critical valves i.e.-those supplying a large or critical customer base, valves on rising and falling mains and those used for bore and reservoir isolation.	PE / TL-O	completed	December 2018
High	T1.1 (PM5) T1.2 (PM5)	Insufficient bacterial and/or protozoal treatment installed	Increase E Coli sampling from each bore water and within zone for early detection, using HPC testing to indicate early warning changes in water quality. - Increased frequency started 2018, HPC testing commenced after teleconference with DWA 7 February 2019	TL-WTP / WTP-O / RC	completed	February 2019

Appendix F: Groundwater Capture Zone



Appendix G: Report on adequacy of a Drinking Water Supply's Water Safety Plan



Report on adequacy of a Drinking Water Supply's Water Safety Plan

Drinking Water Supply Murupara (MUR002)

Central North Island Drinking Water Assessment Unit – Toi Te Ora
PO Box 2120
Tauranga 3110

Report Identifier
MUR002_Murupara_WSPadequacy_21052019_v1

Executive Summary

Water Safety planning is internationally recognised as the most effective means of consistently ensuring the safety of a drinking-water supply. Six principles underpin the foundation of effective water safety planning:

1. A high standard of care must be embraced
2. Protection of source water is of paramount importance
3. Maintain multiple barriers against contamination
4. Change precedes contamination
5. Suppliers must own the safety of drinking water
6. Apply a preventive risk management approach

Under the Health Act, this supply falls into the category of a minor drinking-water supply. Section 69Z of the Act requires that the supply have an approved and implemented water safety plan (WSP).

Non-conformances: These are areas of the WSP that must be corrected or amended before the plan can be approved. These relate directly to, or give practical effect to the requirements of the Health Act.

Strong Recommendations: An aspect of the plan where deficiencies are identified and these are of a nature where amendment is desirable, but the plan is still meeting the statutory minimum requirement e.g: International Best Practice in relation to identification and management of CCPs

Recommendations – These are areas of the WSP where suggestions for improvement have been made that are not mandatory requirements. They do not affect approval of the plan.

The Murupara Public Water Supply - Water Safety Plan sets out details of the water supply including descriptions and control points, risk identification and assessment information, planned improvements, and contingency plans. Whakatane District Council's (WDC) adoption of a more comprehensive approach to water safety planning is commendable and acknowledged by the Bay of Plenty and Lakes District Health Boards.

The Murupara WSP version 1.05 was submitted in May 2019 after three versions that could not be approved. All non-conformances have been resolved therefore the WSP for the Murupara public water supply has been approved with one strong recommendation, and 6 recommendations being made. It is noted that a number of the requirements that enable the WSP to be approved are included as planned improvements. Due to the significant lapse in time since the expiry of the previous WSP and concerns about the lack of critical control points or residual disinfection, the Drinking Water Assessor and the Designated Officer expect that all planned improvements will be implemented in full and within the relevant timeframes. The cooperation and professionalism of the WDC staff responsible for the water supply is acknowledged and appreciated by the Central North Island Drinking Water Assessment Unit.

Description of drinking water supply

The WSP describes a WDC owned and operated public water supply consisting of a groundwater source (two artesian bores greater than 30 m deep) with a groundwater capture zone that includes primarily forestry. No treatment is installed within the supply. Storage consists of a 25 m³ sucker tank and three concrete reservoirs (455 m³, 340 m³ and 340 m³). The population supplied is listed at 2,060. Most known commercial and high risk connections have a backflow prevention device. Murupara properties are connected to a reticulated wastewater system. The supply has historically been non-compliant for Drinking-water Standards for New Zealand 2005 (revised 2008 (DWSNZ) protozoal compliance. Secure ground water has been a planned improvement, and is again included in this version. The WSP documents that the community has been consulted and have rejected the installation of disinfection treatment barriers.

Adequacy of risk assessment methodology

Risk assessment methodology is based on a mixture of Ministry of Health Guides and the AS/NZS 4360:1999 standard. The methodology, scope and description of the water supply, including identification and description of critical points are considered adequate.

Adequacy of risk identification and analysis

The risk identification and analysis is considered adequate. Public health risks for all common supply elements and their possible causes have been adequately identified. The qualitative risk assessment is adequate.

Adequacy of control measures (including Critical Points and Critical Control Points)

Preventative or control measures have been identified for most public health risks/events and are considered to be largely adequate. Critical Points have been clearly identified. However, the following points relating to the adequacy of the management of risks were identified during the assessment of the WSP.

No Critical Control Points (CCPs) have been included in the WSP for this supply that has no treatment processes because there are no critical points that can be controlled. The WSP describes that the community predominantly do not want any treatment systems, in particular chlorination.

Strong recommendation 1: International best practice has determined that all water safety plans should identify and manage CCPs. The Murupara drinking-water supply, as an untreated drinking-water supply, meets the risk criteria set out in the Director General Statement from December 2017 issued in response to the Government Inquiry into the Havelock North outbreak. WDC are reminded that, to provide adequate protection to public health, water suppliers providing drinking-water to untreated network supplies should consider implementing appropriate and effective treatment without delay. This and other points relating to the protection of drinking-water supplies is set out in the attached in the Director General Statement.

It is noted that this latest WSP includes details of the December 2017 of Director General Statement within the WSP. The statement is included again in this report.

A number of issues related to preventative measures were raised as non-conformances in assessment reports of previous versions that have been adequately addressed in this latest WSP version 1.05, including descriptions and planned improvements of communication and management of customer complaints, descriptions of dedicated sampling points, descriptions of risks and preventative measures relating to the reticulated wastewater system, descriptions and planned improvements relating to operator hygiene controls, description and planned improvements related to recording reservoir inspections, descriptions and planned improvements of investigations and remedial actions in response to the presence of total coliforms, and descriptions and planned improvements related to corrective actions.

Best practice is for the same maintenance personnel to not work on both water and sewer systems and that vehicles and equipment are to be dedicated to water operations and kept totally separate from those used for sewage work. A high standard of cleanliness is required for vehicle interiors. It is expected that the planned improvement to develop and implement disinfection procedures will adequately cover this significant risk for this supply that has no residual disinfection.

Recommendation 1: Ensure planned development of disinfection procedures adequately covers risks from working on both water and sewer systems.

The following points relating to the adequacy of the monitoring of risks were identified during the assessment.

A lack of adequate procedures is acknowledged in the WSP and Improvements have been included covering a number of deficiencies relating operational and hygiene procedures. The scope and content of planned procedures, including how WDC is assured that they are being followed will be a focus of future WSP implementation assessments.

Best practice is to have an annual inspection and testing of backflow prevention devices and that personnel undertaking the testing are adequately trained, and competency and quality of work is appropriately verified on an ongoing basis.

Recommendation 2: Testable BFP devices are inspected annually. Personnel undertaking the testing are adequately trained, and competency and quality of work is appropriately verified on an ongoing basis.

When developing the backflow policy and / or disinfection procedures consider what appropriate backflow prevention practices should be incorporated into operational procedures to prevent or mitigate the risk of a pressure drop in the reticulated system such as controls placed on open fire hydrants during mains repairs or hydrant or pressure checking, opening and closing valves and hydrants slowly, running hydrants at the lowest necessary flow, returning mains to service (disinfection), disinfecting local mains which have drained as a consequence of work on other mains, implementing soft start and stop for pumps, maintaining PRVs, maintaining pressures during maintenance, and security measures for devices at high risk premises.

To manage risks related to mains breakages, consider, where possible, six-monthly physical inspection of mains for deterioration, and always inspect after extraordinary events (floods, slips, etc.).

To manage risks related to entrained contaminated air or water, consider checking and/or modifying air valves to minimise entrainment caused by very low or negative pressures.

Recommendation 3: Backflow policy and / or disinfection procedures to include best practice preventative measures for backflow and back syphonage, and physical inspections of water mains and management of air valves to be included in operational procedures.

Preventative measures around checks and maintenance (including scope, schedule and recording) of bore heads and reservoirs is referred to in the WSP but it is not adequately detailed. WDC have advised verbally that these items are either largely in place or in development as part of the improvement schedule item for operational procedures. The checking and verification of supply processes after significant events or changes such as, near misses, weather events, or the return to business as usual after planned works or significant reactive maintenance should also be considered in the development of operational procedures.

Recommendation 4: Ensure procedures, that are under development, adequately cover (including scope, schedule and recording) the bore head and reservoir checks and maintenance that are referred to in the water safety plan.

Adequacy of improvement schedule

An improvement schedule is included and appears to be aimed at addressing preventative measures, monitoring or corrective actions that are currently absent or ineffective. Many improvement schedule items cover multiple council-owned water supplies. The scope and detail of the improvement item is considered adequate.

With regards to planned improvements aimed at achieving secure ground water, please note that In order for the bore water to be considered secure all the relevant criteria of DWSNZ section 4.4 must be met.

Adequacy of Contingency plans

Contingency plans are included for typical major adverse events and are considered largely adequate.

Table 15. Similar to recent previous WDC WSPs. Consider including supply-specific flushing plans for use during a contamination event by considering supply hydrology, and pipe and valve configurations.

Recommendation 5: Supply flushing plans developed in response to emergency events, prior to events.

Decision

WSP for Murupara has been approved.

It is expected that the water supplier begin to implement this WSP within one month.

The Health Act sets out the maximum expiry of a WSP however due to the transition to the new WSP framework it is expected that plans approved prior to 01 July 2019 will have a maximum expiry of two years. Therefore the approval of this WSP is subject to the DWA requiring its alteration (to meet the new WSP framework) within a specified period of time. This requirement is subject to further direction from the Ministry of Health.

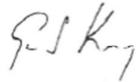
Please be aware that if significant changes are made to either the processes used to treat water or to the raw water source, the WSP must be revised and re-submitted for approval by a drinking water assessor.

Information in this report will be provided to the Ministry of Health (in accordance with requirements of Section 69ZZZB of the Health Act).

Attachments:

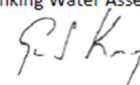
Director General Statement from December 2017.

Completed 27 May 2019



Grant King
Drinking Water Assessor
Central North Island Drinking Water Assessment Service – Toi Te Ora

Assessment Report Information

Report identifier	MUR002_Murupara_WSPadequacy_21052019_v1
Drinking Water Assessment Unit (Inspection Body)	Central North Island Drinking Water Assessment Unit – Toi Te Ora PO Box 2120 Tauranga 3110 07 5773788
District Health Board	Bay of Plenty District Health Board
Drinking Water Assessor	Grant King
Assessment Date	21/05/2019
Description of assessment work	Assessment of adequacy of Water Safety Plan for: Supply: MUR002 Murupara Zone: MUR002MU Murupara Plant: TP00719 Murupara Source: G03032 Murupara North Bore Source: G00437 Murupara South Bore
Equipment Used	Drinking Water Online Database.
Water Supply Owner / Person Responsible	Whakatane District Council Tomasz Krawczyk, Manager Three Waters.
Assessment method	Standard assessment as per Scope Procedure 3 Standard specified in Health Act 1956
Documents and Information	<ul style="list-style-type: none"> • Drinking Water Standards for New Zealand 2005 (revised 2008) • Murupara Public Water Supply – Water Safety Plan. Draft Version 1.03, December 2018 T01616400R013 WSP Murupara_DRAFT_15.05.2018V3- 2 WDC OBJECTIVE FILE A1257596. • Pattle Delamore Partners Catchment Risk Assessment for Murupara Water Supply, Whakatane District Council, Oct 2017(A1212112) • Murupara Public Water Supply – Water Safety Plan. Draft Version 1.04 April 2019 • 20190501_Incident Response Plan Three Waters Assets (Water, Wastewater & Stormwater) - A1376861 • Murupara Public Water Supply – Water Safety Plan. Draft Version 1.05 May 2019
Site of Assessment	Toi Te Ora, 510 Cameron road, Tauranga
Omissions from proposed assessment	Nil.
Sub-contracted work	Nil.
Document checked by:	Braden Leonard IANZ Accredited Drinking Water Assessor Date: 27/05/2019
Release of report authorised by:	Grant King IANZ Accredited Drinking Water Assessor Signature:  Date: 27/05/2019

If you do not agree with the findings of this report a written appeal must be lodged with the Technical Manager, Peter Wood, PO Box 11036, Palmerston North 4440, within 2 months of receipt of this report. The Technical Manager will arrange for a review to be undertaken using the Ministry of Health appeals procedure.



DIRECTOR-GENERAL STATEMENT

HEALTH ACT 1956 s 69ZZZC

I, Chai Chuah, Director-General of Health, for the purposes of protecting public health and informing the public, issue the following statement.

In August 2016 an outbreak of campylobacteriosis arising from contamination of the Havelock North drinking-water supply affected around 5,500 people.

The Government Inquiry into the contamination event is now complete and the Stage Two report has provided important recommendations for the safe management of drinking-water supplies in New Zealand.

The Inquiry identified that the outbreak was caused by contamination of ground water that was provided to consumers as untreated drinking-water. The Inquiry identified that several parties with responsibility for the water supply system failed to adhere to the high levels of care and diligence necessary to avoid this occurring and to protect public health. Improvements to the drinking-water framework have been identified and need to be actioned.

I advise all drinking-water suppliers and drinking-water assessors that:

- Protection of drinking-water sources is of paramount importance and a founding principle of drinking-water safety;
- Every drinking-water supplier must contribute to the protection of drinking-water sources;
- The risk to the public is increased if drinking-water is untreated;
- To provide adequate protection to public health, suppliers providing drinking-water to untreated networked supplies should consider implementing appropriate and effective treatment without delay; and
- They should reconsider their reliance on secure bore water status as a means of providing safe drinking-water.

A handwritten signature in blue ink, consisting of several overlapping loops and a long horizontal stroke extending to the left.

Chai Chuah
Director-General of Health

in Wellington this 20th day of December 2017.