

## **Martinborough Water Incidents – Lessons Learned**

**Date: 29 August 2019**

**Version: 1.0 FINAL**

### **Purpose of this document**

The purpose of this document is to capture the lessons learned from the Martinborough boil water incidents in February and April this year. This document is intended as a valuable tool to help avoid water contamination incidents and improve the response of Council officers to any kind of similar event in the future. The document includes not only what went wrong but also what went well; for this reason, there is not always a corrective action.

### **Lessons learned approach**

The Lessons Learned are drawn from a range of different inputs including the Havelock North Inquiry, Lutra Technical Report, Regional Public Health Compliance Report and feedback from Martinborough residents, business community and council staff.

Feedback from Martinborough businesses was gathered from a meeting held with the Martinborough Business Association on 11 March and from the community at a meeting held on 8 April.

A chronological approach has been taken to document the lessons as they arose in the lead up and during the boil water incidents, although for the purposes of this report, the two incidents have been reviewed together.

The lessons learned from the Lutra Technical Report are based on the six principles of safe drinking water (Government Inquiry into the Havelock North Drinking Water, 2017). See Appendix 1 for more information.

### **Background – what happened in brief**

Further background information is available at [www.swdc.govt.nz/Martinborough-town-water-situation](http://www.swdc.govt.nz/Martinborough-town-water-situation)

#### ***January 2019***

- Late afternoon on 30 January, routine testing carried out at various sites around the water system showed a positive result for low levels of E. coli at Martinborough School, all other samples were clear.
- Within half an hour, Regional Public Health was contacted to discuss the course of action.
- In consultation with Regional Public Health, the school was advised to use an alternative water source as a precaution.
- Further samples were taken from around the system and sent for testing, and follow-up results received on 10am 31 January showed all the results were clear. This was communicated to the school and in a Facebook response.

**February-April 2019**

- Continued testing showed a second low, positive result at a different site that required further testing.
- In conjunction with Regional Public Health, a Boil Water Notice was issued at approximately 3pm 1 Feb, the day before the Martinborough Fair.
- Investigations into the probable cause identified a malfunction in the UV disinfection system following a power cut as the likely cause.
- The UV disinfection system was fixed so it was working as per the manufacturer's specifications.
- Working with advice from Wellington Water, the town water supply network was systematically checked for potential sources of contamination, and any identified risk points were addressed.
- Flushing of the water supply using water compliant with drinking water standards was completed on 17 February. Subsequent testing of the water for three days following the flush received clear results for E. coli and the boil water notice was lifted on 21 February.
- Throughout the incident, there was ongoing monitoring of illness reporting (particularly gastro-intestinal complaints) in the community and any reports of potential clusters of illness. Regional Public Health and Wairarapa DHB reported no increase in illness levels above the usual levels for the time of year.
- After the boil water notice was lifted, Council increased water sampling and testing, both in terms of the number and frequency of sites, in addition to the online monitoring of the data from the UV disinfection system.
- On 11 March, a meeting for Martinborough businesses was held in collaboration with the Martinborough Business Association for the Council to listen to and understand their specific challenges during the incident and how we can work together to be more prepared for any similar event in the future.
- On 8 April a public meeting was held in the Martinborough Town Hall to answer questions from the public and listen to feedback. A panel with representatives from SWDC, Regional Public Health, Lutra, Wellington Water answered questions from the floor. Approximately 80 people attended including Councillors and the Mayor.

**April 2019**

- On 9 April, preliminary positive results were received for the indicator organism E. coli for two routine water samples taken the day before, one from the reservoir area and the other from Shooting Butts Rd; all other samples taken around the system came back clear of E. coli.
- In consultation with Regional Public Health, a boil water notice was issued at approximately 6pm on 9 April.
- The boil water notice was communicated by letter drop, loud speaker announcements, electronic and corflute message signs, print and radio media, ratepayer email list, the Martinborough Business Association, Lions and sports clubs.
- Wharekaka Rest Home, Martinborough School, kindergartens, day cares and medical centre also received direct communication.
- The water network near the sites where the positive samples were taken was chlorinated on the night of 9 April.
- On 10 April, emergency water bladders were installed to provide alternative, safe water sources at Wharekaka Rest Home, the Square, Rugby Club, Waihinga Centre, Martinborough School and Martinborough Golf Club.
- On 10 April, Council, Lutra, Wellington Water and Regional Public Health started daily incident management meetings via teleconference. Where necessary these meetings were held over weekends as well as on week days.

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- On 11 April, the UV disinfection system was ruled out as the cause of contamination in this incident. A systematic risk assessment of the whole network continued, with investigations focusing at the reservoir and on backflow mechanisms to private properties.
- Midday 11 April, results for the second water samples taken before chlorination on the evening of 9 April confirmed the presence of E. coli in the reservoir area, but all other samples taken around the town were clear.
- On 24 April, Councillors approved temporary chlorination of the town’s water supply to take place on 13 May, pending further investigation and collaboration with vineyard and brewery owners
- From 24 April to 13 May, Council worked with vineyard and brewery owners to ensure they could make the necessary arrangements so their products would not be adversely affected by the upcoming chlorination.
- From 6 May to 11 May, the town’s water network was scoured and flushed, a different zone each day, to remove any built up manganese in the biofilm and sediment in the pipes in preparation for chlorination. Letter drops and advertising in local newspapers and on Council website and facebook page alerted residents to the day their area would be flushed and the times they were likely to be without running water while the flushing was completed.
- On 17 May, after three days of clear water testing, and with approval from Regional Public Health, the Boil Water Notice was lifted.
- Throughout the incident, there was ongoing monitoring of illness reporting (particularly gastro-intestinal complaints) in the community and any reports of potential clusters of illness. Regional Public Health and Wairarapa DHB reported no increase in illness levels above the usual levels for the time of year.

### Lessons and corrective actions

#### 1. Lessons learned in the overall management/set-up of the water supply network

ID#	Lesson	Source	Recommended corrective action(s)	Status of corrective action
1.1	There needs to be a review of the importance of drinking water supply within the Council and our contractor organisations	Lutra technical report, Corrective action 1.1	<ul style="list-style-type: none"> <li>a) Review the findings of the Havelock North Stage 1 and Stage 2 Reports.</li> <li>b) Ensure all staff and contractors involved with the supply of drinking water understand their personal responsibility for the health of the public.</li> <li>c) Ensure that the contracts with suppliers and contractors are set up for 24/7 support.</li> <li>d) Ensure that all staff are adequately trained to</li> </ul>	<ul style="list-style-type: none"> <li>a) Operators are now aware of the summary and it is part of on-going operator training.</li> <li>b) See above</li> <li>c) Operators have that authority, and it will be part of on-going operator training. A standard operating procedure for an emergency has also been developed.</li> <li>d) Operators are aware of this and it will be part of on-going operator training.</li> </ul>

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ID#	Lesson	Source	Recommended corrective action(s)	Status of corrective action
			perform their duties including calibrations.	
1.2	There needs to be a multi-barrier treatment process and protection against contamination of the reticulation system.	Lutra technical report, Corrective action 3.1	Chlorination	<ul style="list-style-type: none"> <li>• The water supply from the bore with the lowest manganese levels is being chlorinated (since 13 May). This is a temporary arrangement as the bore is unlikely to supply enough water to the town over the summer period.</li> <li>• Plans are underway to install a manganese removal plant to enable water from all bores to be chlorinated. (Chlorination of water with manganese content can result in discoloured/brown water).</li> <li>• Community engagement on this is also underway.</li> </ul>
1.3	A systematic assessment of risks throughout the drinking water system needs to be carried out	Lutra technical report, Corrective action 6.1	<p>The risk assessment needs to:</p> <ul style="list-style-type: none"> <li>• Identify source risks, treatment risks and reticulation risks.</li> <li>• Identify mitigation measures for each risk.</li> <li>• Monitor the performance of each barrier.</li> </ul>	<ul style="list-style-type: none"> <li>• The Water Safety Plan has been updated, including a risk assessment to address these points (see Appendix 2)</li> <li>• Monitoring will form part of the permanent chlorination solution.</li> </ul>
1.4	Plant documentation needs to be current and relevant	Lutra technical report, Corrective action 1.2	<ul style="list-style-type: none"> <li>a) Ensure the process schematics (P&amp;IDs) are available and current.</li> <li>b) Ensure the functional description describing plant operation is available and current.</li> <li>c) Provide a detailed operations manual that details the plant functionality, troubleshooting and standard operating procedures for the operators.</li> <li>d) Provide a schedule of maintenance checks, verifications and calibrations for the whole plant.</li> </ul>	<ul style="list-style-type: none"> <li>a) There is a Process and instrumentation diagram (P&amp;ID), this is being updated as part of the permanent solution for Martinborough water supply.</li> <li>b) This is being updated as part of the permanent solution for Martinborough water supply.</li> <li>c) There is a current Operation and Maintenance (O&amp;M) manual. This was kept at the Waiohine Water Treatment Plant, a copy has now been provided for the MBA site.</li> <li>d) This schedule has been developed as part of the Infrastructure Data software system .</li> </ul>

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ID#	Lesson	Source	Recommended corrective action(s)	Status of corrective action
1.5	Compliance data must be analysed correctly (by a system that has been through adequate quality assurance) and presented in a way that is easily understood	Lutra technical report, Corrective action 1.3	Use an independent compliance reporting system to report compliance.	A software programme “Infrastructure Data” was purchased in April 2019 and is now being used to monitor compliance.
1.6	Operators, supervisors, and managers need to be sufficiently trained to understand the importance of change on a treatment plant	Lutra technical report, Corrective action 4.1	There needs to be training on: <ul style="list-style-type: none"> <li>• What constitutes a change</li> <li>• What action to take in the event of a change.</li> <li>• Authority of operators to respond to a change.</li> <li>• Understanding the change cannot compromise drinking water safety.</li> </ul>	Standard Operating Procedures are being updated to define ‘what constitutes a change’ <ul style="list-style-type: none"> <li>• Operators are now aware of this and it is part of on-going operator training.</li> <li>• See above</li> <li>• Operators have that authority, and it will be part of on-going operator training.</li> <li>• Operators are aware of this and it will be part of on-going operator training.</li> </ul>
1.7	Review the water quality and water source	Community	Water safety plan updated <ul style="list-style-type: none"> <li>• Review of trends</li> <li>• At least annual analysis of raw water</li> <li>• Review land changes</li> </ul>	<ul style="list-style-type: none"> <li>• Water safety plan updated</li> <li>• Water source being reviewed as part of the permanent water supply solution</li> </ul>

## 2. Lessons learned in the day-to-day operation of the water supply network

ID#	Lesson	Source	Recommended corrective action(s)	Status of corrective action
2.1	Operators, supervisors and managers must understand their drinking water supply and understand the importance of each critical element	Lutra technical report, Corrective action 5.1	They need to understand: <ol style="list-style-type: none"> <li>a) Understanding critical instruments and their function in the water supply.</li> <li>b) Understanding how the plant will respond to upset conditions (e.g. resumption of power after a power cut).</li> <li>c) Eliminate the ability to by-pass the UV treatment process.</li> <li>d) Understanding that a positive <i>E.coli</i> means the water is</li> </ol>	<ol style="list-style-type: none"> <li>a) Operators are aware of this and passed their assessments at the end of March 2019. It will also be part of on-going operator training. The water safety plan has been updated.</li> <li>b) Operators are aware of this and this will be part of on-going operator training.</li> <li>c) This has been actioned and bypass risk minimised.</li> <li>d) This is now known by operators and will be part of on-going operator training.</li> </ol>

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ID#	Lesson	Source	Recommended corrective action(s)	Status of corrective action
			contaminated with faecal matter.	
2.2	Replace existing outdated control system with a modern programmable logic controller (PLC) and SCADA system	Lutra technical report, Corrective action 1.4	a) Any failure will lead to a plant shutdown and the inability to deliver unsafe drinking water. b) Ensure that as-built documentation is accurate such that troubleshooting problems is not constrained because of lack of information.	a) The SCADA system will be part of the upgrade for the permanent solution for Martinborough water supply. b) Will be part of the upgrade for the permanent solution for Martinborough water supply.
2.3	Ensure that calibrations and verifications are carried out and recorded in accordance with the standards	Lutra technical report, Corrective action 1.5	a) Calibration and verifications are carried out by DWA approved personnel. b) Equipment required for calibrations and verifications is available. c) Calibration and verification records are available for inspection. d) Staff are competent and authorised to carry out calibrations.	a) This is part of on-going training. Note that the operators passed the assessment on 28 March 2019. b) All equipment has been reviewed, provided and calibrated. c) These were available at the Waiohine plant, and a copy will now be available at the Martinborough plant. The new program will also make it available online for contractor managers. d) This is part of on-going training. Note that the operators passed the assessment on 28 <sup>th</sup> March 2019.

**3. Lessons learned in issuing the boil water notices and during the notice periods**

<b>ID#</b>	<b>Lesson</b>	<b>Source</b>	<b>Recommended corrective action(s)</b>	<b>Status of corrective action</b>
3.1	Communication should have gone to the whole community at the first sign of an issue	Community/ Businesses	Review NZDW standards protocol on issuing BWN after the confirmed result	The BWN in April was issued on a preliminary result to the whole community due to the proximity of the previous incident.
3.2	Set up emergency management team and CIMS structure as a first priority	Staff	Develop emergency management plans for different scenarios	An EMT was used daily throughout the second BWN period. Updated emergency management plans being updated for review as part of the Wellington Water change-over from 1 October 2019.
3.3	Look to utilise the skills of staff around the organisation	Staff	Identify council staff with the skills to help and the roles they can take in an emergency situation	To be incorporated as part of the emergency management plan.
3.4	Date and time communication updates, including the original BWN	Staff	N/A	Documented here for future reference
3.5	Identify all stakeholders impacted and interested in the issue and their communication needs	Staff	Develop stakeholder checklist for quick reference in a future emergency	To be incorporated as part of the emergency management plan.
3.6	Have contingency plans in place if key staff are not at work and not available when an emergency occurs, as well as if the emergency response continues over several days	Staff	Keep media lists and other key contacts in a shared folder for anyone to access  Key staff need back-up  A staff shift roster might be required for an ongoing response	To be incorporated as part of the emergency management plan.
3.7	Use all channels of communication available to get the message out	Staff/ community	Use all broadcast media channels – radio, newswires, newspapers  Door-to-door when required  Answer all media queries  Emergency Mobile Alert when the threshold is reached	Documented here for future reference

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ID#	Lesson	Source	Recommended corrective action(s)	Status of corrective action
			Portable electronic traffic signs Corflute signs Ratepayer email database Group and organisation email lists (see 3.9 below)	
3.8	The community needs to receive regular, plain English updates on the situation, giving a date/time for the next communication	Staff/ Community	N/A	Documented here for future reference
3.9	Know who you can call on to help with door-to-door maildrops	Staff	Have contact details for community groups (including out of hours) <ul style="list-style-type: none"> <li>• Staff volunteers</li> <li>• Fire service</li> <li>• Police</li> <li>• Sports/youth groups</li> <li>• Lions Club etc.</li> </ul>	Work in progress
3.10	Use non-internet-based communication channels, and don't just rely on website and Facebook	Community	Consider developing text database and emergency text system for the District  Develop a list of contact details for organisations and groups who can help get the message out	Text and email systems are being investigated  Work in progress
3.11	Give special consideration to the elderly and vulnerable	Community	Remind people to check on their neighbours  Keep vulnerable persons register up-to-date  Give priority to the needs of medical centres, rest homes, schools and kindergartens	Documented here for future reference
3.12	The emergency water bladders can give the water a rubbery taste	Community	Feedback given to Wellington Water	Documented here for future reference

**4. Lessons learned around trying to find the source of contamination**

<b>ID#</b>	<b>Lesson</b>	<b>Source</b>	<b>Recommended corrective action(s)</b>	<b>Status of corrective action</b>
4.1	Initiate a systematic risk based approach to find the source	Staff	A full assessment from source to tap was undertaken  Develop procedure for incident response in Water safety plan  ID software tracks sample results for better analysis	Update emergency response plan  Water Safety Plan updated  Ongoing testing around network.
4.2	Don't assume there is only one source of contamination	Staff	ID software tracks sample results for better analysis  A full assessment from source to tap was undertaken  Backflow prevention device and policy amended	Ongoing testing around network.

**5. Lessons learned around the flushing of/outages of the water supply network**

<b>ID#</b>	<b>Lesson</b>	<b>Source</b>	<b>Recommended corrective action(s)</b>	<b>Status of corrective action</b>
5.1	Avoid water outages on the weekend if at all possible	Businesses	Noted	Incorporated into existing processes
5.2	Better to carry out town flushing in the daylight for H&S reasons and to assist with location of water valves and tobies	Staff	Noted	Documented here for future reference
5.3	Maintain an accurate map of where the valves and tobies are located	Staff	This is updated in Geospatial Information System	Ongoing verification and maintenance
5.4	Valves need to be confirmed as being in working order on a regular basis	Businesses/Staff	Review the maintenance schedule of the water pipe network	Current contract requires an annual test of all valves at the time of painting.

**6. Lessons learned in lifting the boil water notices**

ID#	Lesson	Source	Recommended corrective action(s)	Status of corrective action
6.1	Use the same channels of communication to notify the BWN has been lifted as those used to notify it.	Staff	N/A	Documented here for future reference
6.2	Keep a record of where all the posters and signs are so they can be removed/replaced with a lifting notice.	Staff	N/A	Documented here for future reference
6.3	Hold a community meeting as soon as possible after any event to debrief and get feedback	Staff	N/A	Documented here for future reference

## Appendices

### **Appendix 1: Correctives actions recommended by Lutra and SWDC response**

After the February incident, the Council commissioned a report by Lutra, an expert water consultancy, entitled ‘Technical Report: Martinborough Water Treatment Plant – Incident Review’. This was an independent report and, as such, SWDC, and other agencies involved in the incident, did not influence its content other than to offer factual corrections to information such as dates, times etc.

This Report describes the incident, identifies potential intervention points that could have helped prevent the incident, and makes recommendations for the future to prevent a repeat incident.

In evaluating the events and actions taken by the Council before and during the February incident, the six principles for safe drinking water, outlined in the Government Inquiry into Havelock North Drinking Water, 2017, were used as a benchmark.

Below shows the corrective actions set out in Lutra’s Technical Report with the Council’s response. The full Lutra report is available on our website at [www.swdc.govt.nz/Martinborough-town-water-situation](http://www.swdc.govt.nz/Martinborough-town-water-situation).

#### **1.1 Principle 1 – A high standard of care must be embraced**

Unsafe drinking water can cause illness, injury or death on a large-scale. All those involved in supplying drinking water (from operators to politically elected representatives) must therefore embrace a high standard of care akin to that applied in the fields of medicine and aviation where the consequences of a failure are similarly detrimental to public health and safety. Vigilance, diligence and competence are minimum requirements and complacency has no place.

Correctives actions	SWDC Response
SWDC should review the importance of drinking water supply within their organisation and those of their contractors specifically:	
<ul style="list-style-type: none"> <li>• Review the findings of the Havelock North Stage 1 and Stage 2 Reports.</li> <li>• Ensure all staff and contractors involved with the supply of drinking water understand their personal responsibility for the health of the public.</li> <li>• Ensure that the contracts with suppliers and contractors are set up for 24/7 support.</li> <li>• Ensure that all staff are adequately trained to perform their duties including calibrations.</li> </ul>	<ul style="list-style-type: none"> <li>• The reports were reviewed by SWDC. The reports have been discussed with the contractors and will continue to with Wellington water and any new operators.</li> <li>• Is part of on-going training.</li> <li>• This is already part of contract, and will continue to form an important part of this.</li> <li>• Is part of on-going training. The operators passed the assessment on 28<sup>th</sup> March.</li> </ul>
Ensure that the plant documentation is current and relevant, specifically:	

Correctives actions	SWDC Response
<ul style="list-style-type: none"> <li>• Ensure the process schematics (P&amp;IDs) are available and current.</li> <li>• Ensure the functional description describing plant operation is available and current.</li> <li>• Provide a detailed operations manual that details the plant functionality, troubleshooting and standard operating procedures for the operators.</li> <li>• Provide a schedule of maintenance checks, verifications and calibrations for the whole plant.</li> </ul>	<ul style="list-style-type: none"> <li>• There is a P&amp;ID, this will be updated as part of the permanent solution for Martinborough water supply.</li> <li>• There is a basic description that will be updated as part of the permanent solution for Martinborough water supply.</li> <li>• There is a current O&amp;M but this is kept at the Waiohine Water Treatment Plant, a copy is available at the site.</li> <li>• This schedule is being developed as part of the Infrastructure Data system that has been purchased.</li> </ul>
<p>Ensure compliance data is analysed correctly (by a system that has been through adequate quality assurance) and presented in a way that is easily understood, specifically:</p>	
<ul style="list-style-type: none"> <li>• Use an independent compliance reporting system to report compliance.</li> </ul>	<ul style="list-style-type: none"> <li>• A programme Infrastructure Data system has been purchased and is being implemented.</li> </ul>
<p>Replace existing outdated control system with a modern Programmable Logic Controller (PLC) and SCADA<sup>1</sup> system, specifically:</p>	
<ul style="list-style-type: none"> <li>• Any failure will lead to a plant shutdown and the inability to deliver unsafe drinking water.</li> <li>• Ensure that as-built documentation is accurate such that troubleshooting problems is not constrained because of lack of information.</li> </ul>	<ul style="list-style-type: none"> <li>• This is planned to be part of the upgrade for the permanent solution for Martinborough water supply.</li> <li>• This is planned to be part of the upgrade for the permanent solution for Martinborough water supply.</li> </ul>
<p>Ensure that calibrations and verifications are carried out and recorded in accordance with the standards, specifically:</p>	
<ul style="list-style-type: none"> <li>• Calibration and verifications are carried out by DWA<sup>2</sup> approved personnel.</li> <li>• Equipment required for calibrations and verifications is available.</li> <li>• Calibration and verification records are available for inspection.</li> <li>• Staff are competent and authorised to carry out calibrations.</li> </ul>	<ul style="list-style-type: none"> <li>• Is part of on-going training, though the operators passed the assessment on 28<sup>th</sup> March.</li> <li>• All equipment has been reviewed and provided.</li> <li>• Is part of on-going training, though the operators passed the assessment on 28<sup>th</sup> March.</li> <li>• Is part of on-going training, though the operators passed the assessment on 28<sup>th</sup> March.</li> </ul>

Figure 1. Actions – Principle 1  
Source: Lutra, SWDC – 2019

## 1.2 Principle 2 – Protection of the source water is of paramount importance

Protection of the source of drinking water provides the first, and most significant, barrier against drinking water contamination and illness. It is of paramount importance that risks to sources of drinking water are understood, managed and addressed appropriately. However, as pathogenic microorganisms are found everywhere, complete protection is impossible and further barriers against contamination are vital.

<sup>1</sup> Supervisory Control And Data Acquisition

<sup>2</sup> Drinking Water Assessor

Correctives actions	SWDC Response
SWDC should perform a catchment risk assessment and source protection zone study to develop a better understanding of the source risk.	SWDC already has a catchment risk assessment produced by consultants Opus, unfortunately this was not requested prior to the production of the report.

Figure 2. Actions – Principle 2  
Source: Lutra, SWDC – 2019

### 1.3 Principle 3 – Maintain multiple barriers against contamination

Any drinking water system must have, and continuously maintain, robust multiple barriers against contamination appropriate to the level of potential contamination. This is because no single barrier is effective against all sources of contamination and any barrier can fail at any time. Barriers with appropriate capabilities are needed at each of the following levels: source protection; effective treatment; secure distribution; effective monitoring; and effective responses to adverse signals. A ‘source to tap’ approach is required.

Correctives actions	SWDC Response
Chlorination of the supply is essential to provide a robust multi-barrier treatment process and to protect against contamination of the reticulation system. It is noted that dissolved iron and manganese levels in the source water will cause aesthetic issues when chlorine is added to the water. To avoid these an iron and manganese removal process will need to be installed at the water treatment plant.	The temporary chlorination of Martinborough Water supply provides the multiple barrier approach. A multiple barrier approach is planned and will be part of the upgrade for the permanent solution for Martinborough water supply.

Figure 3. Actions – Principle 3  
Source: Lutra, SWDC – 2019

### 1.4 Principle 4 – Change precedes contamination

Contamination is almost always preceded by some kind of change and change must never be ignored. Sudden or extreme changes in water quality, flow or environmental conditions (for example, heavy rainfall, flooding, earthquakes) should arouse particular suspicion that drinking water might become contaminated. Change of any kind (for example, personnel, governance, equipment) should be monitored and responded to with due diligence.

Correctives actions	SWDC Response
Ensure operators, supervisors, and managers are sufficiently trained to understand the importance of change on a treatment plant, specifically:	
<ul style="list-style-type: none"> <li>• What constitutes a change.</li> <li>• What action to take in the event of a change.</li> <li>• Authority of operators to respond to a change.</li> <li>• Understanding the change cannot compromise drinking water safety.</li> </ul>	<ul style="list-style-type: none"> <li>• Is part of on-going operator training in conjunction with Wellington Water</li> <li>• Operators have that authority, but it is part of on-going operator training in conjunction with Wellington Water</li> <li>• Part of on-going operator training in conjunction with Wellington Water</li> </ul>

Figure 4. Actions – Principle 4  
Source: Lutra, SWDC – 2019

### 1.5 Principle 5 – Suppliers must own the safety of drinking water

Drinking water suppliers must maintain a personal sense of responsibility and dedication to providing consumers with safe water. Knowledgeable, experienced, committed and responsive personnel provide the best assurance of safe drinking water. The personnel, and drinking water supply system, must be able to respond quickly and effectively to adverse monitoring signals. This requires commitment from the highest level of the organisation and accountability by all those with responsibility for drinking water.

Correctives actions	SWDC Response
Operators, supervisors and managers must understand their drinking water supply and understand the importance of each critical element, specifically:	
<ul style="list-style-type: none"> <li>• Understanding critical instruments and their function in the water supply.</li> <li>• Understanding how the plant will respond to upset conditions (e.g. resumption of power after a power cut).</li> <li>• Eliminate the ability to by-pass the UV treatment process.</li> <li>• Understanding that a positive <i>E. coli</i> means the water is contaminated with faecal matter.</li> </ul>	<ul style="list-style-type: none"> <li>• This is part of on-going operator training in conjunction with Wellington Water. The water safety plan has been updated in July 2019.</li> <li>• This is part of on-going operator training in conjunction with Wellington Water.</li> <li>• This has been actioned and bypass risk minimised. This will also be addressed in permanent solution.</li> <li>• This is part of on-going operator training in conjunction with Wellington Water.</li> </ul>

Figure 5. Actions – Principle 5

Source: Lutra, SWDC – 2019

### 1.6 Principle 6 – Apply a preventative risk management approach

A preventive risk management approach provides the best protection against waterborne illness. Once contamination is detected, contaminated water may already have been consumed and illness may already have occurred. Accordingly, the focus must always be on preventing contamination. This requires systematic assessment of risks throughout a drinking water supply from source to tap; identification of ways these risks can be managed; and control measures implemented to ensure that management is occurring properly. Adequate monitoring of the performance of each barrier is essential. Each supplier’s risk management approach should be recorded in a living WSP which is utilised on a day to day basis.

Correctives actions	SWDC Response
Undertake a systematic assessment of risks throughout the drinking water system, specifically:	
<ul style="list-style-type: none"> <li>• Identify source risks, treatment risks and reticulation risks.</li> <li>• Identify mitigation measures for each risk.</li> <li>• Monitor the performance of each barrier.</li> </ul>	<ul style="list-style-type: none"> <li>• The water safety plan has been updated in July.</li> <li>• The water safety plan has been updated in July.</li> <li>• The water safety plan has been updated in July and the monitoring will form part of the permanent solution.</li> </ul>

Figure 6. Actions – Principle 6

Source: Lutra, SWDC – 2019

## Appendix 2 - Water Safety Plan Extract

A Water Safety Plan is a legal requirement as part of the New Zealand Drinking Water Standards. The Plan describes the water network and identifies critical control points, risks, and planned improvements to mitigate the risks.

The below is an extract from the Water Safety Plan. The complete Plan is available on request.

### 1.7 Barriers to contamination

Process performance criteria at the operational monitoring point:		Correction if performance criteria are not met:
<b>GROUND WATER SOURCE - BORES</b>		
Bore or bore pump failure may result in a loss of source water for the supply. Infiltration of surface water into the bores can compromise water quality. <u>Controls:</u> Maintaining the integrity of bore heads, restricting activities in the immediate area, exclusion of stock from bore-head area. Monitoring land use in catchment. Monitoring of bore levels and turbidity.		
Target:	<ul style="list-style-type: none"> <li>• Turbidity &lt; 1.0 NTU</li> <li>• Flow &lt; 20L/s from each bore</li> </ul>	<ul style="list-style-type: none"> <li>• Operator to check and adjust flows from each bore based on weather conditions / demand. Check UVT and raw water quality</li> </ul>
Action Limits:	<ul style="list-style-type: none"> <li>• Turbidity: &gt;0.9 NTU</li> <li>• UV transmittance equals 90% minimum value for 3 min</li> </ul>	<ul style="list-style-type: none"> <li>• SCADA Shuts down bore pumps. Alarm raised</li> <li>• Duty Operator to respond to alarm on-site or dial-in to SCADA system</li> </ul>
Critical Limits:	<ul style="list-style-type: none"> <li>• Turbidity &gt; 1.0 NTU (&gt;3min)</li> <li>• Flow exceeds 253m<sup>3</sup>/h for 3 min</li> <li>• transmittance is less 89% for 3 min</li> </ul>	<ul style="list-style-type: none"> <li>• SCADA shuts plant down. Alarm raised</li> <li>• Duty Operator to respond to alarm and attend site</li> </ul>
<b>UV DISINFECTION</b>		
Failure of the reactors results in a lack of control of microorganisms. <u>Controls:</u> Monthly validation of the UVI sensors to ensure accurate and adequate UV dose, servicing and maintenance as per manufacturers specifications. Monitoring of water quality such as turbidity and UVT.		
Target:	<ul style="list-style-type: none"> <li>• UV dose: &lt;45mJ/cm<sup>2</sup> at &lt; 222 m<sup>3</sup>/h</li> <li>• Turbidity &lt; 1.0 NTU</li> </ul>	<ul style="list-style-type: none"> <li>• Operator to check UV feed operating normally and adjust flows from each bores based on weather conditions/ demand. Perform reactor sensor and lamp checks during routine checking procedures. Check UVT and raw water quality</li> </ul>
Action Limits:	<ul style="list-style-type: none"> <li>• UV dose: &lt;45mJ/cm<sup>2</sup> at 222m<sup>3</sup>/h</li> <li>• Turbidity: &gt;0.9 NTU</li> <li>• UV flow equals the maximum flow rate 230m<sup>3</sup>/h for 3 min</li> <li>• UV transmittance equals 90% minimum value for 3 min</li> <li>• UV Controller Alarm (instant)</li> </ul>	<ul style="list-style-type: none"> <li>• SCADA Shuts down bore pumps. Alarm raised</li> <li>• Duty Operator to respond to alarm on-site or dial-in to SCADA system</li> </ul>
Critical Limits:	<ul style="list-style-type: none"> <li>• UV dose: &lt;45 mJ/cm<sup>2</sup> at 160m<sup>3</sup>/h, or &lt;66 mJ/cm<sup>2</sup> at 230m<sup>3</sup>/h</li> <li>• Turbidity &gt; 1.0 NTU (&gt;3min)</li> <li>• UV unit alarm is active</li> <li>• Flow exceeds 253m<sup>3</sup>/h for 3 min</li> <li>• transmittance is less 89% for 3 min</li> </ul>	<ul style="list-style-type: none"> <li>• SCADA shuts plant down. Alarm raised</li> <li>• Duty Operator to respond to alarm and attend site</li> </ul>
<b>CHLORINATION DISINFECTION</b>		

## Martinborough Water Incidents – Lessons Learned

Process performance criteria at the operational monitoring point:		Correction if performance criteria are not met:
<p>Failure will result in a lack of bacterial and viral control.                      Over-dosing may exceed chemical MAV. Under-dosing may cause a risk of backflow contamination and loss of residual disinfection.  <u>Controls:</u> Online monitoring of chlorine levels. Monthly calibrations of dosing control equipment. Daily verification of readings.</p>		
Target:	<ul style="list-style-type: none"> <li>• FAC<sup>3</sup>: 0.5 to 0.8 mg/L</li> <li>• pH: 7 to 7.5</li> <li>• Turbidity &lt; 1.0 NTU</li> </ul>	<ul style="list-style-type: none"> <li>• Operator to monitor chlorine residuals at the end of the distribution zones and adjust the chlorine dosing systems</li> </ul>
Action Limits:	<ul style="list-style-type: none"> <li>• FAC: &lt; 0.4 mg/L (&gt; 15 m) &gt; 1.2 mg/L (&gt; 1 h)</li> <li>• pH: &gt; 7.8 (&gt; 1 h)</li> <li>• Turbidity: &gt;0.9 NTU</li> </ul>	<ul style="list-style-type: none"> <li>• SCADA shuts plant down. Alarm raised</li> <li>• Duty Operator to respond by adjusting dosing to within targets</li> <li>• Duty Operator to notify Operations Manager</li> </ul>
Critical Limits:	<ul style="list-style-type: none"> <li>• FAC: &lt; 0.3 mg/L (&gt; 10 m) &gt; 1.8 mg/L (&gt; 1 h)</li> <li>• pH: &gt; 8.0 (&gt; 15 m)</li> <li>• Turbidity: &gt;1 NTU (3 min)</li> </ul>	<ul style="list-style-type: none"> <li>• Duty Operator to notify Operations Manager</li> <li>• Operations Manager to notify Assets and Operations Manager and DHB if inadequately disinfected water needs to be supplied or has been supplied</li> <li>• For any of these thresholds excluding high chlorine, the duty operator needs to immediately action:                             <ul style="list-style-type: none"> <li>• Isolate the supply and run off storage until rectified</li> <li>• Determine where the water has travelled to using the flow timetable in the emergency response plan and scour at appropriate places until 0.4 FAC residual exists</li> </ul> </li> <li>• For high chlorine residuals, immediately rectify dosing control</li> </ul>
<b>DISTRIBUTION ZONE</b>		
<p>Possible access point for contamination due to backflow.  <u>Controls:</u> Daily monitoring of chlorine levels and turbidity. Backflow prevention policy.</p>		
<b>TREATED WATER STORAGE</b>		
<p>Possible access point for contamination  <u>Controls:</u> Weekly sanitary inspection of structure and surrounding area. Controlled access. Monitoring of chlorine residual levels.</p>		

Figure 7. Process performance and correction if needed - WSP

Source: SWDC – 2019

<sup>3</sup> Free Available Chlorine

## 1.8 Improvement of the Martinborough drinking water supply

Priority	Risk level	Water Supply area	Proposed works	Intended completion date
1	Moderate	Treatment Plant	Installation of Chlorination system at existing treatment site Continuation of temporary chlorination	May 2019
2	Moderate	New York Street West	Construction of a new Treatment building for manganese removal to allow permanent chlorination	2019
3	Medium	New York Street West	Transfer UV Disinfection process and chlorination system to new treatment building	Under review
4	Moderate	Treated Water Storage Reservoirs	Installation of Chlorine Monitor and dose control to maintain Chlorine Residual levels	Under review
5	Moderate	Reticulation	Prepare and implement a council water supply backflow prevention policy which includes preparation of a register of all backflow protection devices and a database of annual testing	Started 2019 – On Going
6	Moderate	Other	Review options for emergency power supplies	2020

Figure 8. Proposed improvements - WSP  
Source: SWDC – 2019

## 1.9 Contingency Plan

Type of Event	Required Contingency Action
Severe turbidity of source water and high turbidity in distribution zone. <u>Indicators:</u> Highly turbid water leaving the treatment plant or complaints from consumers.	<p>Cease abstraction while source is turbid and supply from treated water storage</p> <p>Identify which bore turbid water is coming from and abstract water from one of the other bores</p> <p>Check chlorine dosing level increase if residual levels are below 0.5 mg/l within reticulation network.</p> <p>Monitor storage level</p> <p>Monitor source water turbidity</p> <p>If storage is low and water with low turbidity cannot be supplied, advise DWA and issue BWN while problem is resolved.</p> <p>Keep customers informed and advise once regular supply is restored</p>
E. coli transgression in water in distribution zone <u>Indicators:</u> E. coli transgression reported following routine monitoring.	<p>Follow transgression response procedure in DWSNZ</p> <p>Advise DWA</p> <p>Commence daily <i>E. coli</i> testing at the Water Treatment Plant</p> <p>Sample in distribution system</p> <p>Check chlorine dosing level increase if residual levels are below 0.4m g/l within reticulation network</p> <p>Investigate cause, inspect plant and source</p> <p>Take remedial action</p> <p>Continue to sample for <i>E. coli</i> until 3 consecutive samples are free of <i>E. coli</i>.</p> <p>If <i>E. coli</i> is found in repeat samples consult with DWA, intensify remedial action, increase disinfection, consider 'Boil Water' notice, consider alternative supply</p>

## Martinborough Water Incidents – Lessons Learned

Type of Event	Required Contingency Action
<p>Severe microbiological contamination of source water</p> <p><u>Indicators:</u> A contamination event near to the bore-heads may be observed by or reported SWDC staff. May also be indicated by reported illness among consumers or positive <i>E. coli</i> monitoring results.</p>	<p>Issue BWN</p> <p>Advise DWA</p> <p>Inspect bore-heads and area around bores to identify source of contamination and rectify problem as quickly as possible</p> <p>Implement chlorination / Super chlorination</p> <p>Consider provision of emergency treatment or alternative water supply (e.g. tankers)</p> <p>Disinfect contaminated reservoir and flush mains</p> <p>Keep customers informed and advise once regular supply is restored</p>
<p>Chemical contamination of source water</p> <p><u>Indicators:</u> A contamination event near to the bore-heads may be observed by or reported to SWDC staff. May also be indicated by reported water quality concerns from consumers (taste, odour, colour) or illness among consumers.</p>	<p>Advise DWA</p> <p>Assess situation and advise customers regarding use/treatment/disposal of contaminated water</p> <p>Arrange emergency water supply (tankers) if necessary</p> <p>Inspect bore-heads and area around bores to identify source of contamination and rectify problem as quickly as possible</p> <p>Flush contaminated reservoir and mains</p> <p>Keep customers informed and advise once regular supply is restored</p>

Figure 9. Contingency Plan - WSP

Source: SWDC – 2019