Ashburton DISTRICT COUNCIL

Mayfield Water Supply

Water Safety Plan

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Version 2.1: August 2018

Authorised by: _____

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Review Date: June 2016

Document Control

Version No	Description	Authorised	Approval Date
V 1.0	For submission to DWA for approval	AG	March 2008
V 2.0	Five yearly revision to DWA for approval	AG	June 2015
V 2.1	Revision to include CCPs	CS	August 2018

Contents

1 Background

Ashburton District Council (ADC) own and operate the Mayfield drinking water supply. Under the Health (Drinking Water) Amendment Act 2007 (the Act) water suppliers have a duty to prepare and implement Water Safety Plans (WSP), formerly Public Health Risk Management Plans (PHRMP) [Section 69Z].

Under the Act Council has a responsibility to take all practicable steps to comply with the drinking water standards [Section 69V]. This requirement can be met in part by implementing the provisions of an approved Water Safety Plan that relate to the drinking water standards.

The purpose of a Water Safety Plan is to identify the public health risks associated with a drinking water supply. A Water Safety Plan includes a list of what could go wrong with a supply and what measures can be put in place to prevent or eliminate risk to public health.

Mayfield is classified as a small supply under the legislation and is required to be compliant with the Act by 01 July 2015. In 2008 Ministry of Health (MoH) approved a PHRMP for Mayfield. The approved PHRMP expired in 2013. This WSP has been prepared to meet the requirements of section 69Z of the Act.

2 Implementation, Review and Reporting

2.1 Implementation of the Plan

The Assets Manager is responsible for implementation of the WSP within the timeframes indicated, subject to community and Council approvals, funding constraints and availability of resources. The Assets Manager is also responsible for the ongoing review and updating of the WSP and associated Improvement Schedule.

2.2 Reviewing Plan Performance

The WSP will be fully reviewed and updated at least every five years by the ADC Assets Manager in conjunction with Council Assets staff and Maintenance Contractor staff. If significant changes are made to the water supply during this time, the WSP will be reviewed and updated as appropriate.

The review will include an assessment of any events, non-compliances, near misses and unexpected situations that have occurred; progress against the improvement schedule; and any changes to any of the supply elements. Adjustments will be made to the plan as a result of information provided by this assessment.

2.3 Duration of the Plan

This Plan shall remain in force for a period of up to five years following approval.

2.4 Revision and Re-approval of the Plan

It is a requirement that the WSP be reviewed, revised and submitted for re-approval within five years of approval. During the five year period, the document will be kept current through the following steps:

- Collating comments from those regularly using the WSP and making any required changes;
- Monitoring customer complaints and making any required changes;
- Incorporating any minor changes that have been made to the water supply;
- Updating the risk tables as required;
- Updating the improvement schedule.

2.5 Links to other Quality Systems

This Water Safety Plan will contribute improvement measures to the Activity Management Plan (AMP) for prioritisation and funding via the Long Term Plan (LTP).

3 Supply Details

Supply	
Supply Name	*Mayfield*
WINZ Community Code	*MAY001*
Supply Owner	*Ashburton District Council*
Supply Manager	*Andrew Guthrie*
Supply Operator	*Ashburton Contracting Ltd – Robin Jenkinson (NZCE Civil, R.E.A.)*
Population Served by Supply	*160* (WINZ)
Supply Grading	*Uu (current)*
Source	
Source Name	*Mayfield Deep Well*
Source WINZ Code	*G01968*
Location	*Arundel Rakaia Gorge Road*
Map Reference of Source	*NZTM 1472972 easting, 5146557 northing*
Type of Source	*Bore*
Depth of Bore	*119.0m*
Consent Number	*CRC120547*
Consent Expires	*17 May 2045*
Maximum Consented water take:	*3.5 L/s, 300 m^3/day*
Treatment Plant	
Treatment Plant Name	*Mayfield*
Treatment Plant WINZ Code	*TP00330*
Location	*1971 Arundel Rakaia Gorge Road*
Map Reference	*NZTM 1472881 easting, 5146725 northing*
Treatment Processes	*Chlorination*
Consented Daily Volume	*300 m^3/day*
Peak Daily Volume	*224.86 m^3/day*
Distribution	
Distribution Zone Name	*Mayfield*
Distribution Zone WINZ Code	*MAY001MA*
Distribution Zone Population	*160*

Regulatory Compliance	
Standards compliance assessed against	*DWSNZ 2005 (rev 2008)*
Laboratory undertaking analyses	*Ashburton District Council*
Secure bore water	*Yes*
Bacterial compliance criteria used for water leaving the treatment plant	*Criterion 1*
Bacterial compliance for water leaving the treatment plant has been achieved for the last 4 quarters.	*Yes*
Protozoa log removal requirement required for the supply	*Not required*
Protozoa treatment process	*None*
Protozoa compliance for water leaving the treatment plant has been achieved for the last 4 quarters.	*N/A*
Compliance criteria used for water in the distribution zone.	*Criterion 6A*
Bacteria compliance for water in the distribution zone has been achieved for the last 4 quarters.	*Yes*
P2 determinands allocated to supply	*None*
Chemical compliance achieved for the last 4 quarters.	*N/A*
Cyanobacteria identified in the supply	*No*
Cyano bacterial compliance has been achieved for the last 4 quarters.	*N/A*
Identify any transgressions that have occurred in the last 4 quarters *Nil*	

3.1 Contact Information

The Mayfield water supply is owned and managed by Ashburton District Council. Ashburton Contracting Ltd (ACL) are contracted to operate and maintain the water supply. The personnel involved in the day-to-day management and operation of the water scheme are adequately trained and qualified, and ACL staff undertake on-going training. Water samples are taken by regulatory staff and tested at the Ashburton District Council laboratory for bacteriological testing.

Water Supply Owner:

Ashburton District Council
PO Box 94, Ashburton
Contact: Andrew Guthrie, Assets Manager
Phone: 03 307-7741

Water Supply Operator:

Ashburton Contracting Ltd
PO Box 264, Ashburton
Contact: Robin Jenkinson
Phone: 03 308-4039

4 Methodology

The general methodology used to prepare this WSP has been developed appropriate to the needs of neighbourhood, small and medium sized drinking water supplies. This plan has been prepared with regard to "Small Drinking-water Supplies: Preparing a Water Safety Plan", Ministry of Health (2014).

A qualitative risk assessment approach based on the guidance notes in Appendix 2 of "A Framework on How to Prepare and Develop Water Safety Plans for Drinking-water Supplies", Ministry of Health (2014), has been undertaken.

4.1 System Description

Within this WSP the water supply is been described and a schematic diagram prepared to illustrate the key elements of the supply. Critical points and barriers to contamination are also illustrated.

4.2 Consultation

In November 2013 a site visit was undertaken. A meeting with the plant operator was held to discuss the critical points, barriers to contamination, risks to the supply, preventative measures in place, monitoring requirements and the corrective actions necessary.

The draft WSP was reviewed and discussed with Andrew Guthrie, Assets Manager, Ashburton District Council, and Robin Jenkinson, Ashburton Contracting Ltd, prior to completion.

4.3 Risk Assessment

A qualitative risk assessment approach has been taken following a similar approach to that outlined in Appendix 2 of "A Framework on How to Prepare and Develop Water Safety Plans for Drinking-water Supplies", Ministry of Health (2014). This allows for the prioritisation of improvement needs and the development of the Improvement Schedule.

Risk tables have been prepared to summarise:

a) What could happen that may cause drinking water to become unsafe,
b) What measures are in place to prevent this from occurring and whether this is sufficient,
c) The assessed level of risk, and
d) What could be done to eliminate, isolate or minimise the risks.

Potential public health risks have been evaluated using the Likelihood and Consequence scales tabulated below (tables 1-3) to determine a risk level from low to extreme.

The scales used have been adapted from those suggested in Appendix 2 of "A Framework on How to Prepare and Develop Water Safety Plans for Drinking-water Supplies", Ministry of Health (2014). Changes have been made to achieve a better spread of risk level outcomes, and to ensure relativity between the risks assessed for supplies of varying sizes. This is necessary as it is intended that improvement schedule items from individual supplies can be consolidated into a master list for implementation.

Table 1, Table 2 and Table 3 detail the criteria used and their definitions.

Table 1 Likelihood Scale

Likelihood	Frequency	Description
Likely	More than once per year	The threat can be expected to occur
Quite Common	Once per 1-5 years	The threat will quite commonly occur
Unlikely	Once per 5-10 years	The threat may occur occasionally
Unusual	Once per 10-50 years	The threat could infrequently occur
Rare	Less than once per 50 years	The threat may occur in exceptional circumstances

Table 2 Consequence Scale

Consequences	Microbiologically contaminated water	Chemically contaminated water	Supply interruption	Poor aesthetic water quality
Negligible		Minor chemical contamination event	Unplanned supply interruption for up to 8 hours	Poor aesthetic water quality of nuisance value only
Minor	Microbiological contamination (<100 population)	Recurrent chemical contamination (<100 population)	Unplanned supply interruption for in excess of 8 hours (<100 population)	
Medium	Microbiological contamination (100-500 population)	Recurrent chemical contamination (100-500 population)	Unplanned supply interruption for in excess of 8 hours (100-500 population)	Ongoing poor aesthetic water quality (may lead consumers to obtain water from other sources)
Major	Microbiological contamination (500-5000 population)	Recurrent chemical contamination (500-5000 population)	Unplanned supply interruption for in excess of 8 hours (500-5000 population)	
Substantial	Microbiological contamination (>5000 population) OR high potential for loss of life or hospitalisation with life threatening or long-term consequences	Recurrent chemical contamination (>5000 population). OR high potential for loss of life or hospitalisation with life threatening or long-term consequences.	Unplanned supply interruption for in excess of 8 hours (>5000 population)	

Table 3 Risk Level Allocation Table

	Consequence				
Likelihood	**Negligible**	**Minor**	**Medium**	**Major**	**Substantial**
Likely	Low	Medium	Very High	Extreme	Extreme
Quite Common	Low	Medium	High	Very High	Extreme
Unlikely	Low	Medium	High	Very High	Very High
Unusual	Low	Low	Medium	High	Very High
Rare	Low	Low	Medium	Medium	High

4.4 Improvement Schedule

An Improvement Schedule has been derived from the risk tables and is prioritised according to the assessed level of public health risk associated with hazards that are not adequately controlled at present.

4.5 Approval of Improvement Schedule for Implementation

Improvement measures identified in this WSP will be carried forward to the next AMP and LTP for approval and inclusion in annual budgets following the statutory public consultation process. Implementation of the improvement schedule is ultimately subject to Council funding approval, and/or obtaining alternative funding.

4.6 Benefits of Proposed Improvements

The proposed improvements will provide public health benefits by reducing the risk of adverse health outcomes associated with drinking water quality. In particular, risks will be reduced through the provision of water treatment systems that are appropriate to the raw water quality and catchment conditions, and that are compliant with the Drinking-water Standards for New Zealand.

4.7 Contingency Plans

Contingency plans have been prepared (section 13) 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. The Water Supply Operator is responsible for implementation of the contingency plans when monitoring has identified the occurrence of a risk event.

5 General Description

The Mayfield water supply scheme supplies water to 63 connections serving a population of 160 (WINZ). Mayfield School is the only critical consumer in the system.

Water abstraction is consented under CRC120547. This water permit allows a flow rate of 3.5L/s and a total volume of 300m^3/day and 50,000m^3 between 1 July and 30 June the following year.

5.1 Description of Source

The Mayfield water supply is sourced from a new deep bore (K37/3290) (119m) on Arundel Rakaia Gorge Road. The new bore replaced the previous stockwater race and shallow bore sources used at the time of the initial PHRMP.

A variable speed Lowara Z612-15-L6W pump is installed in the bore. The operation of the bore is controlled by a level probe mounted in Reservoir North Tank 1. There is a level transmitter installed to monitor the ground water level in the bore.

The new bore (K37/3290) was granted secure groundwater status in April 2013. Figure 1 below illustrates the Mayfield water supply system from source to reticulation.

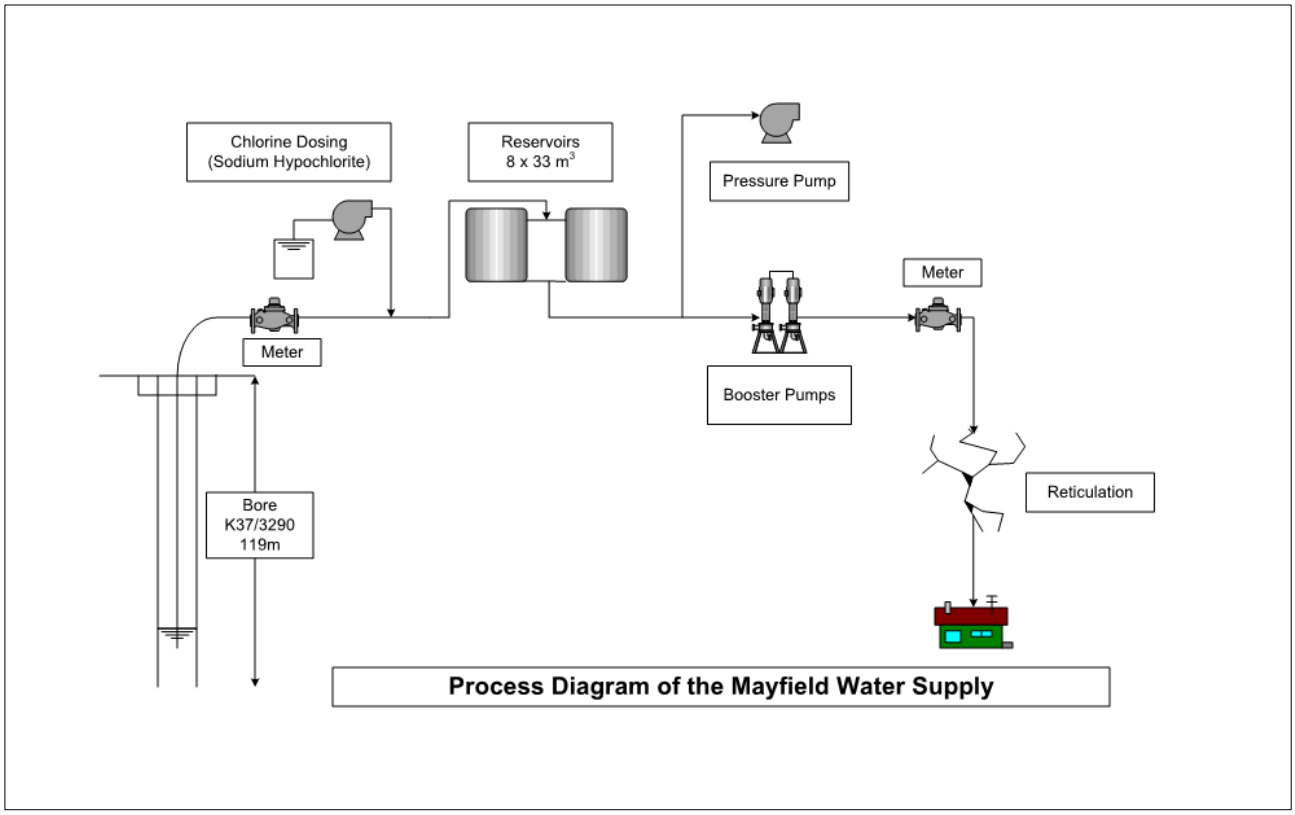

Figure 1: Mayfield Water Supply Process Diagram

5.2 Treatment Processes

The raw water is treated by direct injection of sodium hypochlorite solution through a dosing pump. The dosing pump only runs when the bore pump is running. The solution is administered at a flow proportional rate which is controlled by the bore flow meter. The dosage can be manually adjusted by the operator if required.

Council and the operator manually check the free available chlorine (FAC) in the reticulation and at the treatment plant. These results are recorded in the WINZ database.

5.3 Monitoring and Alarms

The treated water is manually sampled weekly for FAC, pH and turbidity. While not required for compliance, this monitoring helps to provide a check on the treatment process and allows a higher source-treatment grading.

Three E. coli samples per quarter are required from the distribution zone. The samples must be taken with a maximum of 45 days between samples and cover at least 2 days of the week. Immediate action is required if a positive E. coli test result occurs.

Mayfield drinking water supply is connected to the district wide telemetry system. The bore and storage tank levels are monitored to ensure a continuous supply is maintainable. The system pressure is monitored to ensure the pressure in the distribution zone does not drop too low, creating a backflow risk.

Key alarms include low level alarms for the bore and storage tanks, alarms for pump and generator faults, and a power failure alarm. The list of monitored measures and alarms is shown below in figure 2.

State	Equipment Name	Point Name	Value	Units	Notes Available	Output	I/O Point Reference
	Site	Comms Useage Today (%)	2.79	????			
NML	Site	Battery Low	0				
NML	Site	Comms Fail	0				
	Site	Comms Useage Yesterday (%)	1.92	????			
	Site	Last Comms	2014-05-05 14:3..				
NML	Site	Low Flow Fault	0				RDI 4
NML	Site	Power Fail	0				RDI 1
NML	Booster Pump 1	Fault	0				RDI 9
	Booster Pump 1	Hours Run	0	Hours			
	Booster Pump 1	HoursLast2	0				
	Booster Pump 1	HoursLast24	0	Hours			
OFF	Booster Pump 1	Run	0				RDI 6
	Booster Pump 1	Starts	0	Starts			
	Booster Pump 1	StartsLast2	0				
	Booster Pump 1	StartsLast24	0	Starts			
NML	Booster Pump 2	Fault	0				RDI 11
	Booster Pump 2	Hours Run	0.57	Hours			
	Booster Pump 2	HoursLast2	2				
	Booster Pump 2	HoursLast24	24	Hours			
ON	Booster Pump 2	Run	1				RDI 10
	Booster Pump 2	Starts	0	Starts			
	Booster Pump 2	StartsLast2	0				
	Booster Pump 2	StartsLast24	0	Starts			
NML	Booster Pumps	Cutout	0				RDI 12
	Booster Pumps	Flow	0.96	l/s			RAI 2
	Bore 1	Flow	3	l/s			RAI 1
	Bore 1	Level	18.93	%			RAI 3
NML	Bore 1	Low Level	0				RDI 5
NML	Bore Pump 1	Fault	0				RDI 3
	Bore Pump 1	Hours Run	6.85	Hours			
	Bore Pump 1	HoursLast2	0				
	Bore Pump 1	HoursLast24	0	Hours			
ON	Bore Pump 1	Run	1				RDI 2
	Bore Pump 1	Starts	1	Starts			
	Bore Pump 1	StartsLast2	0				
	Bore Pump 1	StartsLast24	0	Starts			
NML	Generator	Fault	0				RDI 14
	Generator	Hours Run	????	Hours			
	Generator	HoursLast2	0				
	Generator	HoursLast24	0	Hours			
OFF	Generator	Run	0				RDI 13
	Generator	Starts	0	Starts			
	Generator	StartsLast2	0				
	Generator	StartsLast24	0	Starts			
NML	Storage Tanks	High	0				NDI 3
	Storage Tanks	High Level Setpoint (%)	98	????			NAO 1
	Storage Tanks	Level %	84.36	????			RAI 5
NML	Storage Tanks	Low	0				NDI 4
	Storage Tanks	Low Level Setpoint (%)	40	????			NAO 2
NML	System Pressure	Low	0				NDI 5
	System Pressure	Low Setpoint	200	????			NAO 3
	System Pressure	Pressure (kPa)	343.83	????			RAI 4
	Totalised Flow	Booster Daily Flow Total	61.65	????			NAI 4
	Totalised Flow	Booster Derrived Inst Flow	3	????			NAI 6
	Totalised Flow	Booster Instantaneous	1.204	????			RAI 2
	Totalised Flow	Booster Weekly Flow Total	482	????			NAI 5
	Totalised Flow	Bore Daily Flow Total	78.12	????			NAI 1
	Totalised Flow	Bore Derrived Inst Flow	3	????			NAI 3
	Totalised Flow	Bore Instantaneous	2.999	????			RAI 1
	Totalised Flow	Bore Weekly Flow Total	482	????			NAI 2
OFF	Totalised Flow	Daily Quantity Reset	0				NDO 1
OFF	Totalised Flow	Daily Reset Chkbk	0				NDI 1
OFF	Totalised Flow	Weekly Quantity Reset	0				NDO 2
OFF	Totalised Flow	Weekly Reset Chkbk	0				NDI 2

Figure 2: Telemetry monitoring and alarms

5.4 DWSNZ Compliance

The treatment processes and programmed monitoring are fully compliant with the DWSNZ requirements for a secure groundwater source.

6 History

A PHRMP was prepared and approved for the Mayfield scheme in 2008. At this time the water supply source was sourced from a shallow bore and the Ashburton Main Stockwater Race. When the Ashburton Main Stockwater Race was closed, or water quality very poor, the Limestone Creek Stockwater Race was available as an alternative source.

6.1 Plant Upgrade

In 2011 a major upgrade of the water supply was undertaken. The upgrade was largely implemented to improve water quality and scheme reliability.

The upgrade included the installation of a new deep bore, eight new 33m^3 reservoirs, a pump station, treatment plant and the associated pipework.

A standby generator was relocated to the new site and is sufficient to fully operate the plant in the event of power supply interruption.

As a result of the upgrade the shallow bore and old stockwater intake were decommissioned and isolated from the supply.

6.2 Water Quality

The Mayfield water quality is very good being from a deep bore with full security groundwater status. No P2 determinands have been assigned to the scheme.

Regular water quality monitoring of the Mayfield drinking water supply is undertaken by ADC Environmental Services staff and the Plant Operator.

There have been no E.coli detections in the water sourced from the deep bore. No transgressions have occurred in the time the new plant has been in operation.

7 Water Supply Distribution

7.1 Description of Storage

There are eight 33m^3 PE tanks in two parallel rows. Each row of tanks has high level inlets, low level outlets and over flow pipes. The tanks are interlinked for balancing and constant water turnover. The tanks are plumbed in a parallel series so maintenance works can be undertaken simultaneously without affecting the supply.

The storage tanks are all contained in a fenced and locked compound to restrict casual access.

7.2 Description of Distribution

The trunk reticulation consists of a 65mm diameter uPVC raw trunk main from the bore to the treatment plant, and an 80mm uPVC treated water main from the treatment plant to the reticulation. It provides for an average daily demand of 1820 litres/house. The township reticulation is constructed of PVC for all pipes greater than 80mm diameter.

Figure 3 below shows the location of the bore, reservoirs, pump station and distribution zone.

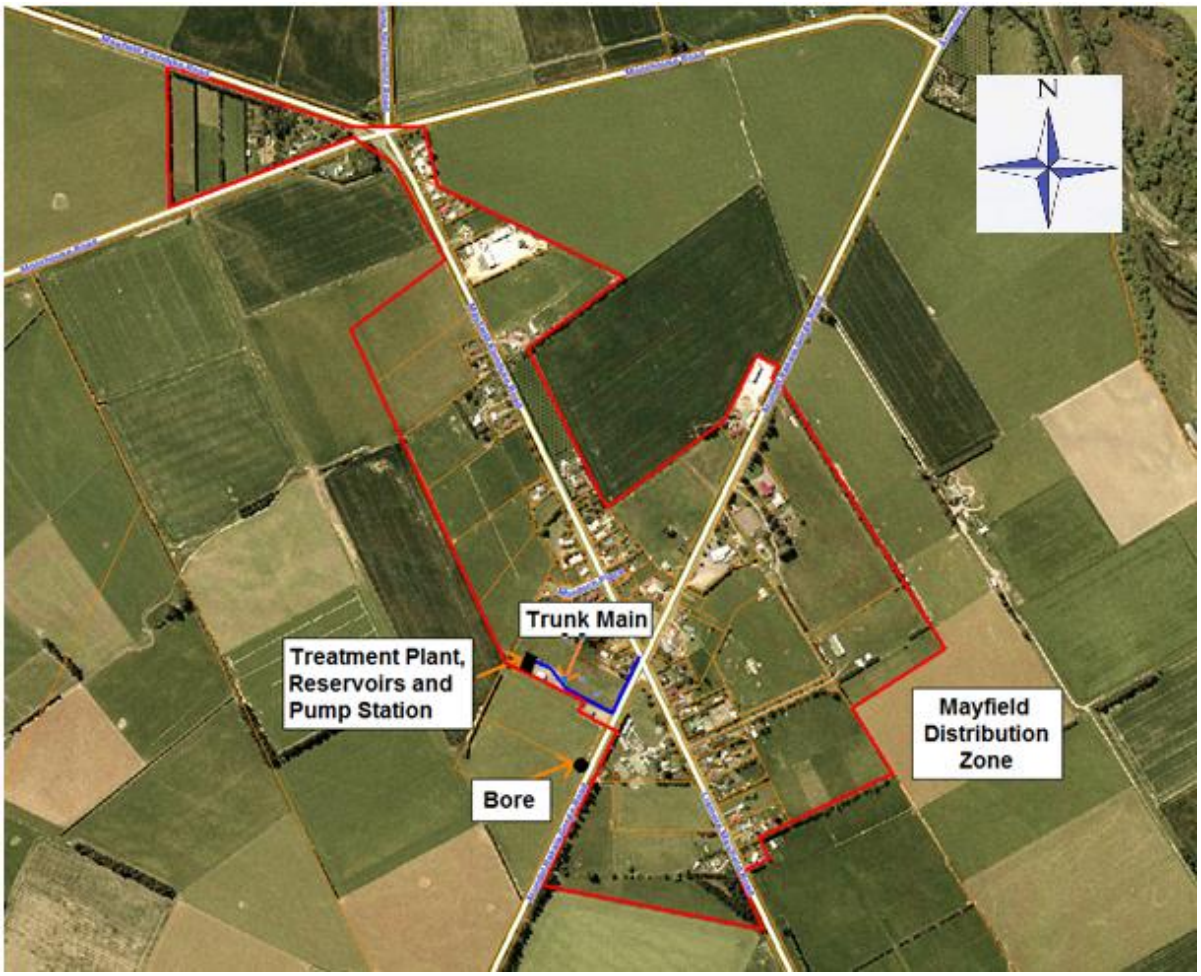

Figure 3: Water Supply Distribution Map

7.3 Pump Systems

A submersible pump extracts water from the bore. Two fixed speed pumps (duty and standby) supply the distribution zone using a pressure vessel and a pressure sensor control system.

7.4 Power Supply Reliability

In the event of power failure, a standby generator is in place to maintain supply. The generator is capable of powering the treatment plant equipment, booster pumps and bore pump as required.

7.5 Backflow Prevention

There is a back flow prevention system installed directly after the well head.

7.6 Maintenance

The scheme is administered at the main council offices in Baring Square West, Ashburton and operated and managed by ACL (Council's utilities contractor). Experienced field staff are appointed to operate and maintain the water supply.

ADC is implementing an Asset Management and Information System (AMIS) to assist with programming, monitoring and tracking regular maintenance and inspection/monitoring tasks. This will also allow regular condition assessments and signal areas at increased risk.

8 Critical Points for Hazard Management

Figure 4 presents a schematic of the water supply from source to customer. Critical points, where hazards can be eliminated, minimised or isolated are indicated in blue. Barriers to contamination are indicated in red.

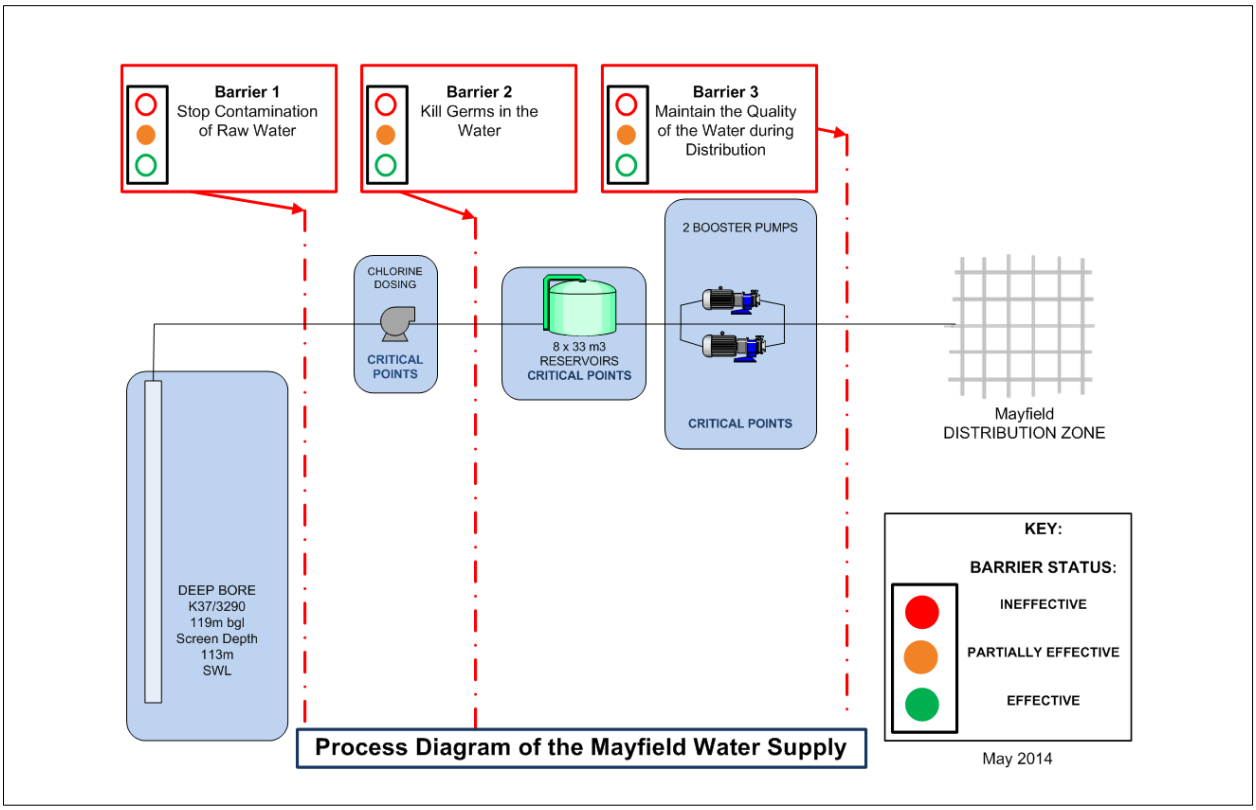

Figure 4: Mayfield Water Supply Schematic

Critical points where hazards can be eliminated, minimised or isolated are tabulated below.

Critical Point	Description
Wellhead	*Possible point for microbiological contamination* *Possible point for loss of supply*
Chlorine Dosing	*Overdosing may exceed chemical MAV* *NOTE: Chlorination is not required for raw water disinfection as the source is secure groundwater*
Treated Water Storage	*Possible point for microbiological contamination* *Possible point for loss of supply*
Pump Station	*Possible point for loss of supply*
Reticulation	*Possible point for microbiological contamination* *Possible point for loss of supply*

9 Barriers to Contamination

The following section discusses what barriers are in place to reduce the risk to public health from the Mayfield drinking water supply. A Framework on How to Prepare and Develop Water Safety Plans for Drinking-water Supplies by the Ministry of Health (2014) states the barriers should:

- Prevent contaminants entering the raw water
- Remove particles from the water
- Kill germs in the water
- Maintain the quality of the water during distribution

9.1 Prevent Contaminants entering the Raw Water

The abstraction bore is 119m deep, the large depth minimises the risk from surface contamination. The well head is constructed to prevent ingress of contaminants. It has a sealed well cap, a high air vent with a screen and a surrounding concrete pad. It is in a clean, locked chamber.

The raw water is tested regularly to ensure that there is no contamination. There is a sampling tap on the outside of the treatment plant that is labelled. A backflow prevention system at the well head prevents any flow of water back into the source.

9.2 Remove particles from the water

This water source was granted full security status on April 18th 2013 by the Ministry of Health (MoH). Being deep groundwater turbidity levels are low, generally below 0.5NTU.

9.3 Kill Germs in the Water

Although the groundwater source is secure, a chlorination system is used to provide a disinfection residual in the distribution zone. There is a high level of control with a dosing pump that turns on/off when the bore pump turns on/off. The solution is administered at a flow proportional rate. The rate can be manually adjusted but this is not usually necessary due to the consistent quality of the raw water.

Although not strictly necessary, the disinfection process further enhances the barrier to contamination that is provided by the secure groundwater source.

9.4 Maintain the Quality of Water during Distribution

Disinfection

- Sodium hypochlorite is dosed at a concentration to ensure there is a residual available to protect against microbiological contamination throughout the system.
- The outflow from the pump station can be tested by a sample tap outside of the pump shed.
- Council staff and the Plant Operator regularly test the chlorine levels in the reticulation system to ensure that FAC is maintained at an appropriate level.

Reservoirs

- The reservoirs are covered with screw lid access hatches to prevent unauthorised access, ingress of rainwater or contaminants. The air vents have rodent protection.
- Each row of tanks have high level inlets and low level outlets to promote circulation to ensure that water does not remain in the tank for long periods.
- Each row of four tanks can be isolated independently, to allow for cleaning, inspection and repair without disrupting supply.

Pumpstation

- There are two variable speed pumps (one duty and one standby), a pressure sensor, and a pressure vessel to ensure that adequate pressure is maintained in the network.
- Hygiene procedures are documented and followed for all distribution system maintenance.
- The personnel involved with the operation and maintenance of the plant are trained and experienced.

General

- The shed housing the treatment equipment and pump station is clean and locked. The area surrounding the shed, reservoir and bore is fenced and locked.
- The plant is on mains electricity supply with a backup generator that is regularly tested and the results recorded. The generator is fenced and locked.
- New connections are fitted with a backflow prevention device.

These measures contribute to the provision of a partial barrier against contamination of water following treatment. Adopting a backflow prevention policy may help to enhance this barrier.

10 Photographs of supply elements

Photo 1: Wellhead chamber

Photo 2: Wellhead

Photo 3: Mayfield treatment plant and pump station building

Photo 4: Chlorine tank, scale tube, and dosing pump

Photo 5: Flow meter equipment

Photo 6: Eight 33m^3 supply reservoirs in fenced compound

Photo 7: Water distribution (booster) pumps

Photo 8: Mayfield generator

11 Risk Tables

11.1 Risk Assessment Worksheet – Bore Source and Abstraction

List what could happen that may cause drinking-water to become unsafe (deterioration in water quality)			*Is this under control?*		*If not, judge whether this needs urgent attention. Urgent attention is needed for something that happens a lot and/or could cause significant illness.*			*What improvements could be made?*
Ref	**Risk Event**	**Potential Cause of Risk Event**	**Measures in Place to Control and/or Identify Risk Event**	**Controlled Yes/ No/ Partial**	**Likelihood of Risk Event**	**Consequences of Risk Event**	**Risk Level**	**Additional Measures to Control Risk Event**
B1	Microbiological contamination of source	Contaminated source water – humans, livestock, septic tanks, agricultural activities, surface runoff, etc.	Supply is from deep bore which is confirmed to be a secure source under Section 4.5 of NZDWS, therefore contamination is unlikely.	Yes				
B2	Chemical contamination of source	Contaminated source water – agrichemicals, surface runoff, chemical spills, etc.	As per above. Annual basic water chemistry testing undertaken. Monthly nitrate testing undertaken.	Partial	Unusual	Medium	Medium	Use the Ministry of Health 'Priority 2 Determinand Identification Guide September 2012' to determine if there are any other chemical risks, e.g. disinfection by-products.
B3	Contamination of source water	Contaminant entry via wellhead e.g. vandalism, unauthorised entry, flooding	The wellhead is sealed at the surface and is within a locked enclosure.	Yes				

List what could happen that may cause drinking-water to become unsafe (deterioration in water quality)			*Is this under control?*		*If not, judge whether this needs urgent attention. Urgent attention is needed for something that happens a lot and/or could cause significant illness.*			*What improvements could be made?*
Ref	**Risk Event**	**Potential Cause of Risk Event**	**Measures in Place to Control and/or Identify Risk Event**	**Controlled Yes/ No/ Partial**	**Likelihood of Risk Event**	**Consequences of Risk Event**	**Risk Level**	**Additional Measures to Control Risk Event**
B4	Contamination of source water	Catastrophic failure, e.g. seismic activity disrupting the aquifer confinement or wellhead protection	Inspection of facilities following a significant earthquake. Annual water chemistry profiles to determine that the water quality is relatively unchanged over time. Monthly monitoring of nitrate-nitrogen both in abstracted water and in distribution zone. Monthly E. coli sampling of source water.	Partial	Unusual	Medium	Medium Risk	Investigate resilience of plant to natural hazards. Develop Emergency Response Plan and implement if water supply cannot be maintained from this source.
B5	Insufficient water available	Catastrophic failure, e.g. seismic activity disrupting the aquifer confinement or wellhead protection	Inspection of facilities following a significant earthquake. Bore water level and faults with the bore pump are monitored on telemetry so any changes would be evident. Annual water chemistry profiles to determine water quality changes over time.	Partial	Unusual	Medium	Medium	Investigate resilience of plant to natural hazards. Develop Emergency Response Plan and implement if water supply cannot be maintained.

List what could happen that may cause drinking-water to become unsafe (deterioration in water quality)			*Is this under control?*		*If not, judge whether this needs urgent attention. Urgent attention is needed for something that happens a lot and/or could cause significant illness.*			*What improvements could be made?*
Ref	**Risk Event**	**Potential Cause of Risk Event**	**Measures in Place to Control and/or Identify Risk Event**	**Controlled Yes/ No/ Partial**	**Likelihood of Risk Event**	**Consequences of Risk Event**	**Risk Level**	**Additional Measures to Control Risk Event**
B6	Insufficient water available	Drought conditions will lead to lower groundwater levels	Monitoring resource consent applications nearby for possible impacts on the bore. New bores must be approved by ECan, therefore effects on ground water are assessed before new supplies are approved. Bore water levels are monitored through telemetry and alarmed. On-site storage to buffer short-term dips in groundwater levels, allowing time to put alternatives in place. Application of water restrictions to manage demand.	Yes				
B7	Insufficient water available	Power supply interruption	Generator provides a permanent source of backup power should power failure occur.	Yes				

List what could happen that may cause drinking-water to become unsafe (deterioration in water quality)			*Is this under control?*		*If not, judge whether this needs urgent attention. Urgent attention is needed for something that happens a lot and/or could cause significant illness.*			*What improvements could be made?*
Ref	**Risk Event**	**Potential Cause of Risk Event**	**Measures in Place to Control and/or Identify Risk Event**	**Controlled Yes/ No/ Partial**	**Likelihood of Risk Event**	**Consequences of Risk Event**	**Risk Level**	**Additional Measures to Control Risk Event**
B8	Insufficient water available	Peak day demand exceeds pumping capacity	Staged water restrictions implemented based on water usage trends. Storage contains 120m^3 of water to buffer short-term peaks in demand.	Yes				
B9	Insufficient water available	Damage to well head structure – vandalism	Well head structure is secured against unauthorised access and is not situated in a location prone to vandalism.	Yes				
B10	Insufficient water available	Bore pump failure	There are eight reservoirs that have a combined storage of over two and a half average days water demand. The bore pump is on telemetry so any failure will be immediately investigated and remedied. Water tankers are available for use as an alternative water supply.	Partial	Rare	Medium	Medium	Regularly check bore pump records for any anomalies that may indicate a potential pump fault.

List what could happen that may cause drinking-water to become unsafe (deterioration in water quality)			*Is this under control?*		*If not, judge whether this needs urgent attention. Urgent attention is needed for something that happens a lot and/or could cause significant illness.*			*What improvements could be made?*
Ref	**Risk Event**	**Potential Cause of Risk Event**	**Measures in Place to Control and/or Identify Risk Event**	**Controlled Yes/ No/ Partial**	**Likelihood of Risk Event**	**Consequences of Risk Event**	**Risk Level**	**Additional Measures to Control Risk Event**
B11	Insufficient water available	Catastrophic failure, e.g. seismic activity damaging equipment	Wellhead and associated equipment inspected following a significant earthquake. Pump status monitored and alarmed through the telemetry system.	Partial	Unusual	Medium	Medium	Investigate resilience of plant to natural hazards. Develop Emergency Response Plan and implement if water supply cannot be maintained.
B12	Insufficient water available	Drought, low river levels.	Intake water level monitoring. Demand management when intake level is low.	Partial	Unusual	Medium	Medium	Review need for increased demand management.

11.2 Risk Assessment Worksheet – Treatment

List what could happen that may cause drinking-water to become unsafe (deterioration in water quality)			*Is this under control?*		*If not, judge whether this needs urgent attention. Urgent attention is needed for something that happens a lot and/or could cause significant illness.*			*What improvements could be made?*
Ref	**Risk Event**	**Potential Cause of Risk Event**	**Measures in Place to Control Risk Event**	**Controlled Yes/ No/ Partial**	**Likelihood of Risk Event**	**Consequences of Risk Event**	**Risk Level**	**Additional Measures to Control Risk Event**
T1	Inadequate disinfection (not enough free available chlorine)	Dosing pump malfunction, control system malfunction, power supply interruption, or SCADA malfunction or inaccuracy	The bore has secure groundwater status. Disinfection is therefore not required as a primary means of treatment. The chlorination process is aimed at disinfection in the reticulation network. Routine treatment plant checks and inspections are undertaken. Standby power generation is onsite. Regular manual E. coli, FAC, pH and turbidity monitoring. A sample tap is available for testing on the pump station output.	Partial	Unlikely	Negligible	Low	Consider installing telemetry alarms for a chlorine dosing pump faults and chlorine dosing pump power failure.

List what could happen that may cause drinking-water to become unsafe (deterioration in water quality)			*Is this under control?*		*If not, judge whether this needs urgent attention. Urgent attention is needed for something that happens a lot and/or could cause significant illness.*			*What improvements could be made?*
Ref	**Risk Event**	**Potential Cause of Risk Event**	**Measures in Place to Control Risk Event**	**Controlled Yes/ No/ Partial**	**Likelihood of Risk Event**	**Consequences of Risk Event**	**Risk Level**	**Additional Measures to Control Risk Event**
T2	Inadequate disinfection (not enough free available chlorine)	Incorrect dose rate or solution strength too high/low Chlorine solution runs out	Secure groundwater (see T1) Routine checks and inspections. Regular manual E. coli, FAC, pH and turbidity monitoring. Sodium hypochlorite solution supplied by regular and reputable supplier. Chlorine solution is in a clear marked storage container. Chlorine solution is diluted to reduce rate of decay while in storage. Instructions for refilling the chlorine solution are on site.	Yes				

List what could happen that may cause drinking-water to become unsafe (deterioration in water quality)			*Is this under control?*		*If not, judge whether this needs urgent attention. Urgent attention is needed for something that happens a lot and/or could cause significant illness.*			*What improvements could be made?*
Ref	**Risk Event**	**Potential Cause of Risk Event**	**Measures in Place to Control Risk Event**	**Controlled Yes/ No/ Partial**	**Likelihood of Risk Event**	**Consequences of Risk Event**	**Risk Level**	**Additional Measures to Control Risk Event**
T3	Inadequate disinfection (not enough free available chlorine)	High chlorine demand as a result of high turbidity	Secure groundwater (see T1) Regular manual E. coli, FAC, pH and turbidity monitoring. The water quality of the deep secure groundwater source is very stable and the dose rate does not need to be adjusted to maintain a steady FAC in the distribution zone.	Yes				
T4	Inadequate disinfection (not enough free available chlorine)	Short-circuiting through reservoir reducing contact time	Secure groundwater (see T1) High level inlets, low level outlet to promote circulation. Reservoirs essentially joined in a series to increase contact time. Regular manual E. coli, FAC, pH and turbidity monitoring.	Yes				

List what could happen that may cause drinking-water to become unsafe (deterioration in water quality)			*Is this under control?*		*If not, judge whether this needs urgent attention. Urgent attention is needed for something that happens a lot and/or could cause significant illness.*			*What improvements could be made?*
Ref	**Risk Event**	**Potential Cause of Risk Event**	**Measures in Place to Control Risk Event**	**Controlled Yes/ No/ Partial**	**Likelihood of Risk Event**	**Consequences of Risk Event**	**Risk Level**	**Additional Measures to Control Risk Event**
T5	Over-chlorination (too much free available chlorine)	Dosing pump, control system or SCADA malfunction or inaccuracy	Routine plant checks and inspections. Regular manual E. coli, FAC, pH and turbidity monitoring. The dosing pump only turns on when the bore pump is on.	Partial	Unlikely	Negligible	Low	Consider installing telemetry alarms for chlorine dosing pump faults and chlorine dosing pump power failure. Consider installing chlorine residual high/low alarms.
T6	Over-chlorination (too much free available chlorine)	Incorrect dose rate or solution strength too high	Sodium hypochlorite solution delivered by regular and reputable supplier. Regular manual E. coli, FAC, pH and turbidity monitoring. Operators are trained and experienced. Instructions for refilling the chlorine solution are on site. Calibration device for the dosing pump installed.	Partial	Unlikely	Negligible	Low	Consider installing chlorine residual high/low alarms.

List what could happen that may cause drinking-water to become unsafe (deterioration in water quality)			*Is this under control?*		*If not, judge whether this needs urgent attention. Urgent attention is needed for something that happens a lot and/or could cause significant illness.*			*What improvements could be made?*
Ref	**Risk Event**	**Potential Cause of Risk Event**	**Measures in Place to Control Risk Event**	**Controlled Yes/ No/ Partial**	**Likelihood of Risk Event**	**Consequences of Risk Event**	**Risk Level**	**Additional Measures to Control Risk Event**
T7	Failure to remove chemical contaminants from raw water	Treatment system inadequate	No known chemical contaminants in source water (i.e. no P2 determinands in source water) Water chemistry profile carried out annually. Regular monitoring for nitrate – results all well under MAV.	Yes				
T8	Inadequate protozoa removal/ inactivation	Treatment system inadequate	The supply bore has full ground water security status under Section 4.5 of NZDWS, therefore treatment is not required.	Yes				
T9	Insufficient water available	Inadequate treatment plant capacity	Capacity adequate for existing peak day with reservoir storage to meet peak instantaneous flow rate.	Yes				

List what could happen that may cause drinking-water to become unsafe (deterioration in water quality)			*Is this under control?*		*If not, judge whether this needs urgent attention. Urgent attention is needed for something that happens a lot and/or could cause significant illness.*			*What improvements could be made?*
Ref	**Risk Event**	**Potential Cause of Risk Event**	**Measures in Place to Control Risk Event**	**Controlled Yes/ No/ Partial**	**Likelihood of Risk Event**	**Consequences of Risk Event**	**Risk Level**	**Additional Measures to Control Risk Event**
T10	Insufficient water available	Damage to plant by natural hazard	Storage on-site in the event of damage to treatment plant. Contingency plans in place for alternative supply (e.g. tankers) if necessary.	Partial	Rare	Medium	Medium Risk	Investigate resilience of plant to natural hazards. Develop Emergency Response Plan and implement if water supply cannot be maintained.

11.3 Risk Assessment Worksheet – Storage and Distribution

List what could happen that may cause drinking-water to become unsafe (deterioration in water quality)			*Is this under control?*		*If not, judge whether this needs urgent attention. Urgent attention is needed for something that happens a lot and/or could cause significant illness.*			*What improvements could be made?*
Ref	**Risk Event**	**Potential Cause of Risk Event**	**Measures in Place to Control Risk Event**	**Controlled Yes/ No/ Partial**	**Likelihood of Risk Event**	**Consequences of Risk Event**	**Risk Level**	**Additional Measures to Control Risk Event**
S1	Stored water quality deterioration	Inadequate reservoir turnover	High level inlets, low level outlets on each row of tanks. Row of tanks isolated during periods of low demand/consumption.	Partial	Quite Common	Negligible	Low	Monitor tank levels and consumer demand to ensure tanks are isolated at appropriate time.
S2	Introduction of contaminants into the distribution system	Contamination via storage reservoir – bird/vermin entry, roof runoff, unauthorised access	Reservoirs covered and the area is fenced and locked. Chlorine residual maintained in system. Air vents have rodent protection.	Yes				

List what could happen that may cause drinking-water to become unsafe (deterioration in water quality)			*Is this under control?*		*If not, judge whether this needs urgent attention. Urgent attention is needed for something that happens a lot and/or could cause significant illness.*			*What improvements could be made?*
Ref	**Risk Event**	**Potential Cause of Risk Event**	**Measures in Place to Control Risk Event**	**Controlled Yes/ No/ Partial**	**Likelihood of Risk Event**	**Consequences of Risk Event**	**Risk Level**	**Additional Measures to Control Risk Event**
S3	Introduction of contaminants into the distribution system	Backflow	Chlorine residual maintained in system. New connections have backflow prevention devices. Pressure maintained with two booster pumps for redundancy.	Partial	Unlikely	Medium	High	Adopt and implement backflow prevention policy. Audit existing premises for risky activities.
S4	Introduction of contaminants into the distribution system	Operation and maintenance activities	Operators follow documented hygiene procedures to minimise risk. Contractor is experienced in working with water supplies. Chlorine residual maintained in system.	Yes				
S5	Introduction of contaminants into the distribution system	Pipe materials, age and condition, plumbosolvency	Consumers are notified of plumbosolvency twice a year as required by DWSNZ.	No	Unusual	Medium	Medium	Review and maintain Activity Management Plans and associated asset renewal programmes.

List what could happen that may cause drinking-water to become unsafe (deterioration in water quality)			*Is this under control?*		*If not, judge whether this needs urgent attention. Urgent attention is needed for something that happens a lot and/or could cause significant illness.*			*What improvements could be made?*
Ref	**Risk Event**	**Potential Cause of Risk Event**	**Measures in Place to Control Risk Event**	**Controlled Yes/ No/ Partial**	**Likelihood of Risk Event**	**Consequences of Risk Event**	**Risk Level**	**Additional Measures to Control Risk Event**
S6	Insufficient water	Reservoir failure	There are eight reservoirs, of which each row can be isolated. Reservoir level is monitored (SCADA alarm). Reservoirs new and are inspected regularly.	Yes				
S7	Insufficient water	Pump or power failure	There are two pumps, either of which could temporarily supply the system. There is a backup generator for the event of a power failure. This is regularly tested.	Yes				

List what could happen that may cause drinking-water to become unsafe (deterioration in water quality)			*Is this under control?*		*If not, judge whether this needs urgent attention. Urgent attention is needed for something that happens a lot and/or could cause significant illness.*			*What improvements could be made?*
Ref	**Risk Event**	**Potential Cause of Risk Event**	**Measures in Place to Control Risk Event**	**Controlled Yes/ No/ Partial**	**Likelihood of Risk Event**	**Consequences of Risk Event**	**Risk Level**	**Additional Measures to Control Risk Event**
S8	Insufficient water	Damage to storage or distribution systems, e.g. reservoir failure, water main failure, earthquake damage	Each of the rows in the reservoir can be isolated. Reservoir level is monitored on the telemetry system. Damaged sections of the reticulation can be isolated. Ability to tanker water in to meet demand.	No	Unlikely	Medium	High	Undertake a criticality analysis of the network to assist renewals planning. Implement and use Asset Management System (AMS) for programming and monitoring regular maintenance and inspection/monitoring tasks. Investigate resilience of plant to natural hazards. Develop Emergency Response Plan and implement if water supply/quality cannot be maintained.
S9	Insufficient water	Vandalism of reservoir	Reservoirs covered and the area is fenced and locked. Reservoir level is monitored and alarmed. Reservoir site is not situated in a location prone to vandalism.	Yes				

11.4 Risk Assessment Worksheet – Other

List what could happen that may cause drinking-water to become unsafe (deterioration in water quality)			*Is this under control?*		*If not, judge whether this needs urgent attention. Urgent attention is needed for something that happens a lot and/or could cause significant illness.*			*What improvements could be made?*
Ref	**Risk Event**	**Potential Cause of Risk Event**	**Measures in Place to Control Risk Event**	**Controlled? Yes / No**	**Likelihood of Risk Event**	**Consequences of Risk Event**	**Risk Level**	**Additional Measures to Control Risk Event**
O1	Incorrect water quality data used for supply management (failure to identify inadequate water quality)	Inappropriate/inadequate/ incorrect sampling and reporting	Council have a sampling calendar for sampling compliance. Staff are trained to take samples and alternate personnel are available to cover for absences. Results are reported through the WINZ system to the Drinking Water Assessor. Sampling locations are clearly labelled. Annual IANZ accreditation for Council laboratory.	Yes				

List what could happen that may cause drinking-water to become unsafe (deterioration in water quality)			*Is this under control?*		*If not, judge whether this needs urgent attention. Urgent attention is needed for something that happens a lot and/or could cause significant illness.*			*What improvements could be made?*
Ref	**Risk Event**	**Potential Cause of Risk Event**	**Measures in Place to Control Risk Event**	**Controlled? Yes / No**	**Likelihood of Risk Event**	**Consequences of Risk Event**	**Risk Level**	**Additional Measures to Control Risk Event**
O2	System does not perform as intended	Incorrect operation, inadequate maintenance.	Operators have sound knowledge of systems. There is an Operation and Maintenance manual. Key operation instructions are displayed permanently on site. An operations log is kept on site. Plant records are copied and filed.	Partial	Unusual	Negligible	Low	Ensure all plant records – including manuals, drawings, procedure instructions and emergency response plan are up to date and available at the plant. Council to place a requirement in the service provider to ensure Operation and Maintenance Procedure Manual is up to date and available at the plant.
O3	System does not perform as intended	Inadequate skills or training.	Staff are skilled and experienced.	Partial	Unusual	Negligible	Low	Council to place a requirement on the service provider to provide staff with relevant training and skills.

List what could happen that may cause drinking-water to become unsafe (deterioration in water quality)			*Is this under control?*		*If not, judge whether this needs urgent attention. Urgent attention is needed for something that happens a lot and/or could cause significant illness.*			*What improvements could be made?*
Ref	**Risk Event**	**Potential Cause of Risk Event**	**Measures in Place to Control Risk Event**	**Controlled? Yes / No**	**Likelihood of Risk Event**	**Consequences of Risk Event**	**Risk Level**	**Additional Measures to Control Risk Event**
O4	System damaged or contaminated by construction/ maintenance work	Inadequate controls on construction and maintenance work.	All maintenance is undertaken by contractor's trained/authorised staff. Construction work is appropriately supervised. Carriageway Access Request (CAR) and Before You Dig used to permit maintenance and construction works.	Yes				
O5	Inability to access site for operation/ maintenance/ emergency works	Flood, slip, bridge washout, snow fall or other hazard preventing vehicular access.	Access roads are in good condition and are not generally vulnerable to natural hazards. Operations staff are equipped with suitable 4WD vehicles and given training in these use of these.	Yes				

12 Improvement Schedule

The Improvement Schedule is presented in two sections:

Part I: Major Projects and Capital Works

These projects will generally provide the greatest benefits in terms of addressing public health risks but typically require high levels of funding that may not be realistic for the community involved. It is noted that Council operate a targeted rating system such that costs associated with each water supply are borne by those ratepayers with connections to the supply. In many instances, major projects (e.g. new water source, additional treatment process) will require specific investigation and evaluation of options prior to confirmation of a suitable improvement solution. The Improvement Schedule may present a timetable for progressing such investigations, with the intention of incorporating specific upgrade projects in future versions of the WSP.

Part II: Management and Operational Improvements

These improvements will generally not provide the same degree of risk reduction as the proposed capital works upgrades but collectively they contribute to providing and maintaining effective barriers to contamination and can often be undertaken within existing operational budgets. These works are prioritised on the basis of the risk level identified and budget/resource availability.

Prioritisation

The priority for implementation is initially based on the identified risk level as follows:

Extreme risk	=	Priority 1
Very High risk	=	Priority 2
High risk	=	Priority 3
Medium risk	=	Priority 4
Low risk	=	Priority 5

Priorities have then been modified (generally elevated) where improvement items are related or need to be sequenced together.

Responsibility

Responsibility for implementation of specific improvement items is identified.

AM	=	Assets Manager
ACL	=	Ashburton Contracting Limited

Timeframes

The proposed timeframe for implementation reflects the assessed priority, anticipated funding arrangements and availability of resources. Some lower priority, low cost improvements may be completed at an earlier date where staff resources are available.

Compliance Timeframe

The Mayfield water supply falls in the category of a Small drinking water supply under the Health Act. This requires that all practicable steps are taken to comply with the Drinking Water Standards by 1 July 2015.

As Mayfield has been granted secure groundwater status under Section 4.5 of DWSNZ, and E. coli and nitrate sampling is being carried out according to the DWSNZ requirements with no transgressions recorded, the Mayfield water supply is already compliant with the DWSNZ.

12.1 Improvement Schedule - Part I

Mayfield Water Supply Improvement Schedule				Part I: Major Projects and Capital Works			
Priority	**Risk Level**	**Water Supply Area**	**Reference to Risk Table**	**Details of Proposed Works**	**Person Responsible**	**Expected Cost**	**Intended date of Completion**
Given the recent upgrade no major projects or capital works are anticipated at this stage.							

12.2 Improvement Schedule - Part II

Mayfield Water Supply Improvement Schedule				Part II: Minor Projects and Operational Improvements			
Priority	**Risk Level**	**Water Supply Area**	**Reference to Risk Table**	**Details of Proposed Works**	**Person Responsible**	**Expected Cost**	**Intended date of Completion**
4	Medium	Source	B2	Use the Ministry of Health 'Priority 2 Determinand Identification Guide September 2012' to determine if there are any other chemical risks, e.g. disinfection by-products.	AM	Staff time	Ongoing
4	Medium	Source, treatment, distribution	B4, B5, B11, S8, T10	Investigate resilience of plant to natural hazards.	AM	Staff time	1/12/15
4	Medium	Source, storage and distribution	B4, B5, B11, S8, T10	Develop Emergency Response Plan and implement if water supply/quality cannot be maintained.	AM	$5,000 + staff time	1/7/18
4	Medium	Source	B10	Regularly check bore pump records for any anomalies that may indicate a potential pump fault.	ACL	Staff time	Ongoing
4	Medium	Source	B12	Review need for increased demand management.	AM	Staff time	1/12/2015
5	Low	Treatment	T1, T5, T6	Consider installing telemetry alarms for a chlorine dosing pump fault and chlorine dosing pump power failure.	AM	$1,000	1/7/16
5	Low	Storage and distribution	S1	Monitor tank levels and consumer demand to ensure tanks are isolated at appropriate time.	AM	Staff time	Ongoing

3	High	Distribution	S3	Adopt and implement backflow prevention policy for customer connections. Audit existing premises for risky activities.	AM	$15,000 + staff time	1/7/2016
3	High	Distribution	S5	Review and maintain Activity Management Plans and associated asset renewal programmes to minimise failures.	AM	Staff time	Ongoing
3	High	Distribution	S8	Undertake a criticality analysis of the network to assist renewals planning.	AM	Staff time	1/7/18
3	High	Distribution	S8	Implement and use Asset Management System (AMS) for programming and monitoring regular maintenance and inspection/monitoring tasks.	AM	Not yet specified + staff time	1/7/2018
4	Medium	Other	O2	Ensure all plant records – including manuals, drawings, procedure instructions and emergency response plan are up to date and available at the plant.	ACL	Staff time	1/12/2015
5	Low	Other	O2	Council to place a requirement on the service provider to ensure the Operation and Maintenance Manual is up to date and available at the plant.	AM	Staff time	1/7/2016
5	Low	Other	O3	Council to place a requirement on the service provider to provide staff with relevant training and skills.	AM	Staff time	1/7/2016

13 Contingency Plan

The following contingency plan outlines appropriate responses to a range of potential situations where risk control measures fail to prevent a hazard event that may result in a situation of acute risk to public health.

The occurrence of a hazard, or risk event, may be indicated by monitoring systems, observed by ADC or ACL staff or reported by the public. Consumer complaints of illness or water quality issues may also indicate that a risk event has occurred.

The contingency actions identified are intended to provide a general guide and may need to be adapted to suit specific hazard situations.

13.1 Insufficient Source Water Available

Indicators	Observed or reported low ground water levels
Actions	Advise customers to conserve water Implement demand management strategies as required Arrange emergency water supply if necessary Keep customers informed and advise once regular service is restored
Responsibility	Assets Manager

13.2 Microbiological Contamination of Source Water

Indicators	A contamination event in the catchment may be observed by or reported to ADC staff Positive E. coli monitoring results Reported illness among consumers
Actions	Issue “Boil Water’ notice Advise Drinking Water Assessor (DWA) Inspect catchment and intake to identify source of contamination and rectify problem as quickly as possible Consider provision of emergency treatment or alternative water supply (e.g. use tankers) Disinfect contaminated reservoirs and flush mains Keep customers informed and advise once regular service is restored
Responsibility	Assets Manager

13.3 Chemical Contamination of Source Water

Indicators	A contamination event in the catchment may be observed by or reported to ADC staff Reported water quality concerns from consumers (taste, odour, colour) or illness among consumers
Actions	Advise Drinking Water Assessor (DWA) Assess situation and advise customers regarding use/treatment/disposal of contaminated water Arrange emergency water supply if necessary Inspect catchment and intake to identify source of contamination and rectify problem as quickly as possible Flush contaminated reservoirs and mains Keep customers informed and advise once regular service is restored
Responsibility	Assets Manager

13.4 E. coli Transgression in Water leaving the Treatment Plant

Indicators	E. coli transgression reported following routine monitoring
Actions	Follow transgression response procedure in DWSNZ Advise Drinking Water Assessor (DWA) Commence daily E. coli testing at Water Treatment Plant Use an enumeration test method Sample in distribution system Investigate cause, inspect plant and source Take remedial action Continue to sample for E. coli until three consecutive samples are free of E. coli If E. coli is found in repeat samples consult with DWA, intensify remedial action, consider alternative supply
Responsibility	Assets Manager

13.5 Over Disinfection

Indicators	Monitoring shows high FAC
Actions	Assess potential hazard to consumers and advise accordingly Inspect treatment plant to identify cause of problem and rectify as quickly as possible Flush system if necessary Keep customers informed and advise once regular service is restored
Responsibility	ACL and Assets manager

13.6 Inadequate Disinfection

Indicators	Monitoring shows low FAC
Actions	Identify cause of contamination and rectify problem as quickly as possible Assess the situation and consider issuing a precautionary boil water notice if deemed appropriate Notify DWA of situation and actions taken Consider provision of emergency treatment equipment or alternative water supply (e.g. tankers) Disinfect contaminated reservoirs and flush mains Keep customers informed and advise once regular service is restored
Responsibility	Assets Manager

13.7 E. coli Transgression in Water in the Distribution Zone

Indicators	E. coli transgression reported following routine monitoring
Actions	Follow transgression response procedure in DWSNZ (Figure 4.2 in 2008 version), and ADC response procedures Advise Drinking Water Assessor (DWA) Inspect plant/source Collect sample at plant for E. coli test Resample distribution at original and adjacent sites Enumerate E. coli Investigate cause Take remedial action If E. coli < 10 per 100mL consult DWA, resample distribution zone and enumerate for E. coli for three days, continue investigation of fault. If E. coli > 10 per 100mL consult DWA, consider 'Boil Water' notice, continue investigation of cause, begin disinfection, consider flushing contaminated water to waste, intensify action, consider providing alternative supply Continue until fault is corrected and E. coli is absent for three consecutive days and DWA is satisfied that there is no remaining contamination
Responsibility	Assets Manager

13.8 Chemical Contamination of Water in Distribution Zone

Indicators:	Chemical contaminant in distribution zone (including over-chlorination)
Actions:	Advise Drinking Water Assessor (DWA) Assess situation and advise customers regarding use/treatment/disposal of contaminated water Arrange emergency water supply (tankers) if necessary Inspect catchment and intake to identify source of contamination and rectify problem as quickly as possible Flush contaminated reservoirs and mains If necessary Keep customers informed and advise once regular service is restored
Responsibility:	Assets Manager

13.9 Insufficient Water Available in the Distribution Zone

Indicators	Low pressure and flow in the distribution
Actions	Advise customers to conserve water Implement demand management strategies as required Arrange emergency water supply if necessary Keep customers informed and advise once regular service is restored
Responsibility	Assets Manager

13.10 Insufficient Water Available due to Unplanned Shutdown

Indicators	Unplanned shutdown will be reported to ADC staff by contractor
Actions	Contractor informs Mayfield School immediately Keep customers informed and advise once regular service is restored Arrange emergency water supply if necessary
Responsibility	ACL and Assets Manager

14 Critical Control Points

14.1 Chlorine Disinfection - Plant

Process objectives:

- Provide a **residual disinfection Quality Control Point** to help inactivate pathogens entering downstream of the dosing point

Operational monitoring of control process:	
What	Free available chlorine (FAC) concentration in mg/L
When	ADC weekly ACL twice weekly
Where	Sampling point at the treatment plant, sampling water leaving the reservoirs
How	Hand-held pocket colorimeter with vendor-supplied reagents
Who	ADC Environmental Monitoring Officer and ACL Operator
Records	ACL: Log-book ADC: Water Outlook

Process performance criteria at the operational monitoring point:		**Correction if operating criteria are not met:**
Target Range:	FAC: 0.6-0.8 mg/L	Operator to adjust dosing system to achieve target range if noticed to be outside of target range during routine checking procedures.
Action Limits:	FAC: < 0.3 mg/L > 0.8 mg/L	Duty Operator to respond by adjusting dosing to within target limits Duty Operator to notify Duty Supervisor.
Critical Limits:	FAC: < 0.25 mg/L > 1.0 mg/L	Duty Operator to respond by adjusting dosing to within target limits Duty Operator to notify Duty Supervisor. Duty Supervisor to contact ADC Compliance Officer. Contingency plan 13.5 (over disinfection) or contingency plan 13.6 (inadequate disinfection) is to be followed.

Supporting programs:

- Monthly monitoring (or manufacturer timescales) instrument checking and calibration by Operator as necessary.
- Monthly Operator check of accuracy of reagents and discarding of outdated reagents.
- Training and competency of Operator in chlorination of drinking water.
- Only utilise potable water grade chlorine stock solution from approved supplier.

14.2 Chlorine Disinfection - Reticulation

Process objectives:

- Provide a **residual disinfection Quality Control Point** to help inactivate pathogens entering downstream of the dosing point

Operational monitoring of control process:	
What	Free available chlorine (FAC) concentration in mg/L
When	ADC monthly ACL twice weekly
Where	ADC staff: Mayfield has two zone sample taps, located on Arundel Rakaia Gorge Road and Mayfield Klondyke Road. ACL operators: Sampling bollards as above
How	Hand-held pocket Colorimeter with vendor-supplied reagents
Who	ADC Environmental Monitoring Officer and ACL Operator
Records	ACL: Log-book ADC: Water Outlook

Process performance criteria at the operational monitoring point:		**Correction if operating criteria are not met:**
Target Range:	FAC: 0.6-0.8 mg/L	Operator to adjust dosing system to achieve target range if noticed to be outside of target range during routine checking procedures.
Action Limits:	FAC: < 0.3 mg/L > 0.8 mg/L	Duty Operator to respond by adjusting dosing to within target limits Duty Operator to notify Duty Supervisor.
Critical Limits:	FAC: < 0.25 mg/L > 1.0 mg/L	Duty Operator to respond by adjusting dosing to within target limits Duty Operator to notify Duty Supervisor. Duty Supervisor to contact ADC Compliance Officer. Contingency plan 13.5 (over disinfection) or contingency plan 13.6 (inadequate disinfection) is to be followed.

Supporting programs:

- Monthly monitoring (or manufacturer timescales) instrument checking and calibration by Operator as necessary.
- Monthly Operator check of accuracy of reagents and discarding of outdated reagents.
- Training and competency of Operator in chlorination of drinking water.
- Only utilise potable water grade chlorine stock solution from approved supplier.