

## 7.0 RISK MANAGEMENT

### 7.1 Introduction

Risk management is an important element in the development and management of assets. For asset management planning to be robust it must be integrated with other corporate risk management processes and that this encompasses strategies for Council's most critical assets, provide for the effects of asset failure and be integrated with disaster recovery plans and business continuity plans. Currently asset management planning is listed as a Top 50 Risk in the Council Risk Register.

#### 7.1.1 BACKGROUND

Council has reviewed and adopted in 1999 a Risk Management Charter. In 2013 Council's Audit & Risk Committee reviewed and adopted a revised Risk Management Charter. Council determined its overall policy would be to continually develop a Risk Management System that reflects best practice. Key objectives are:

- "to provide a logical and systematic method for identifying and managing risk within the organisation that will assist the organisation to meet its goals and objectives efficiently and effectively. This achieved by aligning key organisational objectives, risks and mitigating controls,
- to minimise losses and maximise opportunities – Risk Management is an much about defining opportunities as avoiding and mitigating losses
- to improve the decision-making capabilities of staff recognising that the greatest knowledge and capacity for management of risks often rests with those"

Overarching strategies for managing risk within Council are:

- Council's Chief Executive Officer will establish and implement a Risk Management system that is relevant to the organisation and which reflects the provisions of Council's Charter. The overarching objective of that Risk Management system will be to identify, and where feasible, mitigate risk factors that might prevent Council achieving its objectives. Risk Management systems established within Council will reflect prevailing best practice including relevant industry standards – especially AS/NZS Risk Management Standard 4360 and AS/NZS ISO 31000.
- The ongoing effectiveness of Councils Risk Management systems and compliance with them by employees will be demonstrated by appropriate reporting to Council and its appropriate Committees. Currently this is achieved by programed reporting to Council's Audit & Risk Committee who meets 3-4 times per annum.

#### 7.1.1.1 Current Risk Management Status

Council has an Audit & Risk Committee which oversees the governance of a Risk Management Programme within the Taupō District Council. Risk Management is continuously being integrated into Councils culture, philosophy, practices, activities and plans rather than being viewed or practised as a separate programme.

The accountability for the management of risk is not removed from the specific activity managers and the Senior Leadership Group or those responsible for the management of assets and this is viewed as a collaborative process between governance and management.

The high level assessment of critical assets is done and now needs to be coordinated with the other assets to determine true criticality; this work is an improvement task and will be completed over the next couple of years.

Business Continuity Plans (BCP) has been developed to maintain continuity of operations and service delivery as part of the implementation of Councils Risk Management Charter. Additionally Council had adopted a Disaster Recover Plan in 2013 which also addresses aspects of asset management during emergencies.

It is envisaged that BCPs will assist council in the following advantages

- To reduce the cost of disruptions.
- To be more resilient
- To mitigate business risks and financial exposures
- To meet compliance
- To enhance health and safety
- To benefit from insurance premium discounts, reduced excesses and doors opening to new insurance markets.

Waikato Regional Council audits the compliance with consent conditions annually, which may affect the waterways or environment. The non-compliance with any of the conditions are dealt with by either seeking a modification of that condition by WRC and or capital / operational improvement activity is planned to meet those conditions. These processes have identified components within the TDC Wastewater network that may be vulnerable to seismic, flood or volcanic events and the impact of failure of these assets. The critical assets include pump stations, treatment plants, and assets on land disposal site. Some may even need to be replaced or upgraded.

TDC is also a member of the Waikato Utility Lifelines group and the wider Waikato Civil Defence and Emergency Management Group.

The Three waters maintenance contracts includes an after hours emergency response for network issues and customer complaints. After hours staff (the Palmerston North call centre) receives calls and forward emergency calls directly to the contractor who are required to respond in a certain time. The treatment plant operations team also has on call staff to attend to all treatment plant related emergencies and the maintenance contractors do follow the emergency response plan and also the consultative process with council staff, where necessary.

## 7.2 Risk Management Process

The risk management process is an integral part of good management practice. It is an iterative process of continuous improvement that is embedded into existing practices or business improvement.

The main elements of the risk management process to be used at the Taupō District Council are as follows and reflect the risk management standards ISO 31000.2009 and AS/NZS 4360:2004.

### **a) Communicate and consult**

Communicate and consult with internal and external stakeholders of Council as appropriate at each stage of the risk management process and concerning the process as a whole.

### **b) Establish the context**

Establish the external, internal and risk management context in which the rest of the process will be undertaken. Criteria against which risk will be evaluated should be established and the structure of the analysis defined.

### **c) Identify risks**

Identify where, when, why and how events could prevent, degrade, delay or enhance the achievement of asset's objectives.

### **d) Analyse risks**

Identify and evaluate existing controls. Determine consequences and likelihood and hence the level of risk. This analysis should consider the range of potential consequences and how these could occur.

### **e) Evaluate risks**

Compare estimated levels of risk against pre-established criteria and consider the Balances between potential benefits and adverse outcomes. This enables decisions to be made about the extent and nature of treatments required and about priorities.

### **f) Treat risks**

Develop and implement specific cost effective strategies and action plans for increasing potential benefits and reducing potential costs

### **g) Monitor and review**

It is necessary to monitor the effectiveness of all steps of the risk management process. This is important for continuous improvement. Risks and the effectiveness of treatment measures need to be monitored to ensure changing circumstances do not alter priorities. To ascertain that, the condition assessment of the above ground assets were done regularly by operating staff and planned and preventive maintenance are done to manage identified risk.

## 7.3 Council Funding for Risk

Council looks to provide funding for disaster recovery through a separate reserve. It appropriates funding each year to a Disaster Recovery Fund reserve to enable access to ready cash in the event of a natural disaster. This is intended to assist reinstatement and to finance any short term needs in the time between any disaster and the recommencement of services. As at 30 June 2014, the reserve fund had a balance of approximately \$1.6 million. Council has chosen not to insure its below ground assets given the position of its reserves.

Secondly the TEL Fund was established in September 1995 when TDC sold its investments in Taupō Electricity Ltd and Taupō Generation Ltd. The use of that sale capital and subsequent investment income generated each year are included in Council's Treasury Management Policy. One requirement of that policy is that the portfolio and funds are managed in a manner that reflects their potential utilisation as a disaster recovery fund in the event of a natural disaster within the Taupō district. The value of the fund as at August 2017 is approximately \$56.3 million.

With these two funding mechanisms in place Council considers it is prudently but effectively managing the risk of being able to fund both short and long term needs with respect to potential natural disaster and subsequent recovery operations in the district.

## 7.4 Lifelines Risk Assessment

TDC is a member of Waikato utility Lifelines Group. This process aims to identify components within the TDC wastewater network that may be vulnerable to seismic, flood or volcanic events and the impact of failure of these assets.

## 7.5 Risk Register

The specific asset risk register (see following) identifies risks, the consequence of the risk, the existing controls in place, treatment options and the level of risk to the asset as assessed and updated by Council Officers. A possible improvement to the register is to provide each treatment options with an associated cost and added to the risk register; however these are yet to be costed by TDC.

## 7.6 Risk Classification Matrices

### 7.6.1 LIKELIHOOD

**Likelihood scale** for consideration based on **ANZS 4360** is as follows.

<b>Level</b>	<b>Descriptor</b>	<b>Damage / Failure Indicative Frequency</b>
A	Almost Certain	Once per year or more frequently
B	Likely	Once every three years
C	Possible	Once every ten years
D	Unlikely	Once every thirty years
E	Rare	Once every 100 years
N	Almost Impossible	Once in 10,000 years

**Table 7-1: Risk Likelihood**

### 7.6.2 CONSEQUENCE

A **consequence** scale as a result of a risk event occurring based on **ANZS 3460** is shown for consideration as follows.

<u>Level</u>	<u>Descriptor</u>	<u>Description</u>
5	Catastrophic	Extreme Impact of damage or failure
4	Major	High impact of damage or failure
3	Moderate	Medium impact of damage or failure
2	Minor	Low impact of damage or failure
1	Insignificant	Very little impact of damage or failure
N	Negligible / Nil	Assessment is Nil

**Table 7-2: Risk Consequence**

### 7.6.3 RISK RATING MATRIX

With both likelihood and consequence scales in place a qualitative risk analysis matrix/level of risk can be determined.

Likelihood	Consequences					
	<b>N</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>A</b>	N	L	M	H	E	E
<b>B</b>	N	L	M	M	H	E
<b>C</b>	N	L	L	M	M	H
<b>D</b>	N	L	L	L	M	H
<b>E</b>	N	L	L	L	L	M
<b>N</b>	N	N	N	N	N	N

**Table 7-3: Risk Matrix**

The rating legend for the matrix, in this example, can be summarized as follows

**E = Extreme risk**

**H = High risk**

**M = Moderate risk**

**L = Low risk**

**N = Negligible risk approaching nil / no risk**

### 7.6.4 RISK MITIGATION MEASURES

High to Extreme risk would normally involve more detailed studies, action plans and management responsibility specifically assigned.

Moderate risk would be managed by monitoring or response procedures and management responsibility specified.

### 7.6.4.1 Summary of Identified High Risks

This is a summary of the high risks; the complete list is included as Table 7-5.

<b>Asset Risk</b>	<b>The Risk</b>	<b>Mitigation Measures</b>
Earthquake	Damage to treatment system and water supply network	Generators, operating procedures and a list of known local contractors.
Fire	Damage to the intake pump stations, WTP and reticulation because of structural/electrical system damage of the WTP or computer system damage.	Generators, operating procedures and a list of known local contractors.
Flooding/ high stormy winds on lake shore	Wastewater /Stormwater finding its way through to WTP and or damaged water pipes due to water supply pipes movement.	Health & Safety standards, for WTP / pump stations that are built on low-lying land near the lake shore / river bed, particularly if a volcanic /seismically unstable area lies just offshore.
Tomo's	Damage to the reticulation system due to pipe fracture, disconnection of joints and/or pump failure	List of local contractors details for easy assess to a work force
Contractual Obligations not fulfilled external parties	Failure in the reticulation system due to pipe burst for failure to address new connections, capacity and maintenance issues.	Contract monitoring, performance measures.
Contractual Obligations not fulfilled external parties	Failure to comply with DWSNZ, HDWAA and resource consents	Contract monitoring, performance measures. Continuous monitoring. Sampling of reticulation samples.
Excessive costs to maintain, renew or create assets	Failure to comply with DWSNZ	Improved planning and investigation. Continuous monitoring of water leaving the WTP.
Public safety non-compliance / occupational health and safety non-compliance	Public safety and workers' safety are put at risk due to, Exposure to open manholes, Leaking pipes, Inadequate water treatment, Contaminant discharges to the environment (immediate environs and the Lake), Inadequate training on operation of machines and other devices or Inadequate occupational health and safety trainings	Public Health Risk Mgt Plans, appropriate signage on hazard areas, upgrade of the WTP and NETWORK, spill to environment procedure in place for both river and lake, adequate training provided, adequate PPE for staff)

<b>Asset Risk</b>	<b>The Risk</b>	<b>Mitigation Measures</b>
Water Treatment	Excessive or low chlorine residuals	The Telemetry is upgraded to continuously monitor FAC and the alarm is communicated to duty operator.  There are adequate spare Chlorine gas bottle and skilled staff to manage the situations.
Water Distribution	Watermain breaks and leaks, sediment being stirred up with pressure fluctuations.	Water network model review update and calibration for optimisations.

**Table 7-4: Identified High Risks**

## 7.7 Critical Assets

To date only work has been undertaken to identify critical wastewater assets such as pipes, pump stations, tanks and structures. This work continues to be developed and data is being captured in the AMS.

**Table 7-5: Water Risk Register**
**Asset Management Plan**
**Risk Register**

Division:	Corporate & Infrastructure	Compiled by:	Ramesh Sharma, Asset Manager	Date:	June 2014
Asset:	Water	Reviewed by:	Denis Lewis, Infrastructure Manager	Date:	September 14

**NATURAL RISKS**

Asset Risks	The risk: What can happen and how it can happen	The consequences of an event happening		Adequacy of existing controls	Consequence rating	Likelihood rating	Level of risk	Risk priority
		Consequences	Likelihood					
Earthquake	Damage to reticulation system due to: <ul style="list-style-type: none"> <li>- Pipe fracture</li> <li>- Disconnections in joints</li> <li>- Pump failure</li> <li>- Earth slip</li> <li>- Land subsidence causing changes of grade in pipe network</li> </ul>	Major	Unlikely	E (list of local Contractors' details available when needed)	4	D	M	
	Damage to treatment system due to: <ul style="list-style-type: none"> <li>- Electrical system failure</li> <li>- Telemetry failure</li> <li>- Earth slip failure</li> <li>- Mechanical failure</li> <li>- Structural failure (e.g. Building, Control Room, contact tanks, screen filters, process treatment unit, etc.)</li> <li>- Pipe fracture</li> </ul>	Catastrophic	Unlikely	E (built-in/ portable generators, staff trained for servicing, list of local Contractors' details available when needed)	5	D	<b>H</b>	
	Lake /Groundwater contamination due to: <ul style="list-style-type: none"> <li>- Earth slips in source intake / treatment plants with huge storage of chemicals</li> </ul>	Major	Unlikely	NC	4	D	M	
	Inaccessibility to network due to footpath/road system failure	Minor	Unlikely	E (emergency road repair)	2	D	L	
Volcanic Eruption/ Ash fall	Damage to treatment system due to: <ul style="list-style-type: none"> <li>- Clogging of open pipes/ pumps with ash in the WTPs</li> <li>- Increased solid biomass on the pumps and tanks due to ash fall</li> <li>- Corrosion of equipment due to acid content of the ash</li> </ul>	Moderate	Unlikely	E (water blasting, vacuum trucks, adequate capacity of the grit chamber in the WTP,	3	D	L	
	Inaccessibility of the WTP and inability to operate the plant	Minor	Unlikely	E (water blasting of access way)	2	D	L	
Lahar	Damage to the treatment system due to: <ul style="list-style-type: none"> <li>- Increased solid biomass on the tanks</li> <li>- Potential corrosion of pipes and machines</li> </ul>	Moderate	Rare	E (water blasting, vacuum trucks)  E	3	E	L	



Asset Risks	The risk: What can happen and how it can happen	The consequences of an event happening		Adequacy of existing controls	Consequence rating	Likelihood rating	Level of risk	Risk priority
		Consequences	Likelihood					
	Inaccessibility of the WTP and inability to operate the plant.	Minor	Rare	(water blasting of entrance)	2	E	L	
Flooding	Inaccessibility of the WTP and inability to operate the plant	Minor	Unlikely	E (use of big trucks)	2	D	L	
	Damage to the treatment system due to: - Silting of tanks - Tank overflow	Moderate	Unlikely	E (vacuum truck, WTP has 1-day storage capacity for dry-weather flow, pump out to the NETWORK which has max of 2-day irrigation capacity)	3	D	L	
	Wastewater /Stormwater finding its way through to damaged water pipes due to : - Retic pipes movement	Major	Unlikely	NC	4	D	<b>H</b>	
Tsunami	Damage to reticulation network due to: - Scouring and damage to footpath/road system - Destruction of pump stations and other structures	Major	Rare	E (pond the area and suck with vacuum truck)	4	E	L	
	Inaccessibility of the WTP and inability to operate the plant	Minor	Rare	E (water blasting of access way)	2	E	L	
Fire	Damage to the reticulation network due to: - Structural/electrical system damage of pump station	Catastrophic	Possible	E (list of local Contractors' details available when needed)	5	C	<b>H</b>	
	Damage to the treatment system due to: - Structural/electrical system damage of the WTP - Computer system damage	Catastrophic	Possible	E (built-in generators, staff trained for servicing, list of local Contractors' details available when needed)	5	C	<b>H</b>	
Lightning	Damage to the reticulation network due to: - Structural/electrical system damage of pump station	Major	Rare	E (list of local Contractors' details available when needed)	4	E	L	
	Damage to the treatment system due to: - Structural/electrical system damage of the WTP - Computer system damage	Major	Rare	E (built-in generators, staff trained for servicing, list of local Contractors' details available when needed)	4	E	L	
High winds	Damage to the reticulation network due to: - Structural/electrical system damage of pump station	Major	Unlikely	E (list of local Contractors' details available when needed)	4	D	M	
	Damage to the intake pump station / treatment system due to: - Stormy winds flooding the ipump station and Structural/electrical system damage of the WTP - Computer system damage	Major	Unlikely	E (built-in generators, staff trained for servicing, list of local Contractors' details available when needed)	4	D	M	

Asset Risks	The risk: What can happen and how it can happen	The consequences of an event happening		Adequacy of existing controls	Consequence rating	Likelihood rating	Level of risk	Risk priority
		Consequences	Likelihood					
Landslide/Slip	Damage to reticulation system due to: <ul style="list-style-type: none"> <li>- Pipe fracture</li> <li>- Disconnections in joints</li> <li>- Pump failure</li> <li>- Earth slip</li> <li>- Land subsidence causing changes of grade in pipe network</li> </ul>	Major	Possible	E (list of local Contractors' details available when needed)	4	C	M	
	Damage to treatment system due to: <ul style="list-style-type: none"> <li>- Electrical system failure</li> <li>- Earth slip failure</li> <li>- Mechanical failure</li> <li>- Structural failure (e.g. Building, Control Room, contact tanks, screen filters, WTP process equipments, etc.)</li> <li>- Pipe fracture</li> </ul>	Major	Unlikely	E (built-in generators, staff trained for servicing, list of local Contractors' details available when needed)	4	D	M	
	Groundwater contamination due to: <ul style="list-style-type: none"> <li>- Earth slips in NETWORK</li> </ul>	Major	Possible	NC	4	C	M	
	Inaccessibility to network due to footpath/road system failure	Minor	Possible	E (emergency road repair)	2	C	L	
Tomos	Damage to reticulation system due to: <ul style="list-style-type: none"> <li>- Pipe fracture</li> <li>- Disconnections in joints</li> <li>- Pump failure</li> <li>- Land subsidence causing changes of grade in pipe network and loss of support for pipe system</li> </ul>	Major	Likely	E (list of local Contractors' details available when needed)	4	B	<b>H</b>	
	Damage to treatment system due to: <ul style="list-style-type: none"> <li>- Structural failure (e.g. Building, Control Room, contact tanks, screen filters, WTP process equipments, etc.)</li> <li>- Pipe fracture</li> </ul>	Major	Possible	E (built-in generators, staff trained for servicing, list of local Contractors' details available when needed)	4	C	M	
	Groundwater contamination due to: <ul style="list-style-type: none"> <li>- Land subsidence in NETWORK</li> </ul>	Major	Possible	NC	4	C	M	
	Inaccessibility to network due to footpath/road system failure	Minor	Possible	E (emergency road repair)	2	C	L	
Geothermal activity	Damage to the reticulation system due to: <ul style="list-style-type: none"> <li>- Potential corrosion of pipes</li> </ul>	Major	Possible	E (water blasting, ceramic pipes are used in high-risk areas)	4	C	M	
	Damage to the treatment system due to: <ul style="list-style-type: none"> <li>- Potential corrosion of pipes and machines</li> </ul>	Moderate	Possible	E (immediate water blasting on-site for surfaces and engage Contractors for water blasting of pipes every 3 months)	3	C	M	
	Inaccessibility of the WTP and inability to operate the plant	Minor	Unlikely	E	2	D	L	

**EXTERNAL RISKS**

Asset Risks	The risk: What can happen and how it can happen	The consequences of an event happening		Adequacy of existing controls	Consequence rating	Likelihood rating	Level of risk	Risk priority
		Consequences	Likelihood					
War	Damage to reticulation system due to: - Pipe fracture - Disconnections in joints - Pump failure	Major	Almost impossible	NC	4	N	N	
	Damage to treatment system due to: - Electrical system failure - Mechanical failure - Structural failure (e.g. Building, Control Room, contact tanks, screen filter, WTP process equipments, etc.) - Pipe fracture - Inability to operate the WTP	Major	Almost impossible	NC	4	N	N	
	Inaccessibility to the network	Minor	Almost impossible	NC	2	N	N	
Terrorism	Damage to reticulation system due to: - Destruction by terrorists	Major	Rare	E (list of local Contractors' details available when needed)	4	E	L	
	Damage to treatment system due to: - Destruction by terrorists - Inaccessibility of the WTP and inability to operate the plant	Major	Rare	E (list of local Contractors' details available when needed, staff trained for servicing)	4	E	L	
	Inaccessibility to the network	Minor	Rare	NC	2	E	L	
Protests/Riots	Damage to reticulation system due to: - Destruction by protesters	Major	Unlikely	E (list of local Contractors' details available when needed)	4	D	M	
	Damage to treatment system due to: - Destruction by protesters - Inaccessibility of the WTP and inability to operate the plant	Major	Unlikely	E (list of local Contractors' details available when needed, staff trained for servicing)	4	D	M	
	Inaccessibility to the network	Minor	Unlikely	NC	2	D	L	
Vehicle Accident	Damage to reticulation system due to: - Ramming into the pipes, manholes and pump stations	Moderate	Possible	E	3	C	M	
	Inaccessibility of the network along the footpath/road after an accident	Minor	Possible	E (immediate clearing)	2	C	L	

Asset Risks	The risk: What can happen and how it can happen	The consequences of an event happening		Adequacy of existing controls	Consequence rating	Likelihood rating	Level of risk	Risk priority
		Consequences	Likelihood					
	Inability to address operational issues in the network and WTP if accident involves staff  Damage to treatment system due to: - Ramming of buildings and other structures - Inability to operate the WTP	Moderate	Possible	E (enough staff to cover operations)	3	C	M	
		Moderate	Possible	E (list of local Contractors' details available when needed, staff trained for servicing)	3	C	M	
Contractual obligations not fulfilled by external parties	Failure in the reticulation system due to: - Pipe bursts/ failure to address capacity and maintenance issues	Major	Likely	E (scoring system monitored closely, termination of contract for non-compliance and tendering new one)	4	B	<b>H</b>	
	Failure to undertake network maintenance and maintain the required network performance standard	Moderate	Likely	E (scoring system monitored closely, termination of contract for non-compliance and tendering new one)	3	B	M	
	Failure to comply with HDWAA / DWSNZ and Resource Consents	Major	Likely	E (scoring system monitored closely, termination of contract for non-compliance and tendering new one)	4	B	<b>H</b>	
	Failure to implement required works due to lack of feasibility and design works	Minor	Likely	E (scoring system monitored closely, termination of contract for non-compliance and tendering new one)	2	B	M	
Excessive costs to maintain, renew or create assets	Failure to maintain the required network performance standard	Moderate	Likely	E (Will allow for unplanned costs)	3	B	M	
	Failure to comply with DWSNZ / HDWAA, Resource Consents	Major	Likely	E (Will allow for unplanned costs)	4	B	<b>H</b>	
	Failure to address service demand	Moderate	Likely	E (Will allow for unplanned costs)	3	B	M	
Lack of contractors to carry out works	Failure in the reticulation system due to: - Pipe bursts for failure to address capacity and maintenance issues	Major	Possible	NE	4	C	M	
	Failure to undertake network maintenance and maintain the required	Moderate	Possible	NE	3	C	M	

Asset Risks	The risk: What can happen and how it can happen	The consequences of an event happening		Adequacy of existing controls	Consequence rating	Likelihood rating	Level of risk	Risk priority
		Consequences	Likelihood					
	network performance standard							
	Failure to comply with Resource Consents	Major	Possible	NE	4	C	M	
	Failure to implement required works	Moderate	Possible	NE	3	C	M	

**OPERATIONAL RISKS**

Asset Risks	The risk: What can happen and how it can happen	The consequences of an event happening		Adequacy of existing controls	Consequence rating	Likelihood rating	Level of risk	Risk priority
		Consequences	Likelihood					
Public health risk from Water Source	Contamination of source water i.e. lake, river, underground streams, springs and bores.							
	▪ By animal and human waste	Moderate	Almost certain	NFE	3	A	<b>H</b>	5
	▪ Algae bloom and associated bio-toxins	Major	Likely	NFE	4	B	<b>H</b>	5
	▪ Geothermal contaminants	Moderate	Almost certain	NC	3	A	<b>H</b>	8
	▪ By oil, petroleum by-products	Minor	Unlikely	NC	2	D	L	9
	▪ Water quality too poor to treat	Major	Likely	N	4	B	H	5
	▪ Volcanic activity	Catastrophic	Rare	NC	5	E	M	6
	▪ Heavy rainfall event	Moderate	Possible	NFE	3	C	M	6
	▪ Heavy wind	Moderate	Almost certain	NFE	3	A	H	7
	▪ Industrial waste	Major	Possible	NC	4	C	M	8
▪ Hazardous substances	Major	Possible	NC	4	C	M	9	
▪ Agrichemicals	Major	Unlikely	NC	4	D	M	9	
Source water unable to match demand	Unable to abstract enough water	Moderate	Rare	NC	3	E	L	11

Asset Risks	The risk: What can happen and how it can happen	The consequences of an event happening		Adequacy of existing controls	Consequence rating	Likelihood rating	Level of risk	Risk priority
		Consequences	Likelihood					
Water Treatment	Not having enough Free available Chlorine (FAC) to eliminate bacteria.	Major	Likely	E (The Telemetry is upgraded to continuously monitor FAC and the alarm is communicated to duty operator. There are adequate spare Chlorine gas bottle and skilled staff to manage the situations.)	4	B	<b>H</b>	-
	Over chlorinating – too much FAC	Moderate	Almost certain	E	3	A	<b>H</b>	-
	Total Organic Carbon increases forming chlorination by-products	Moderate	Possible	E	3	C	M	-
Fluoridation	Over dosing of fluoride <ul style="list-style-type: none"> <li>▪ Due to wrong preparation of dosing solution with powder / liquid.</li> <li>▪ Incorrect monitoring instrument</li> <li>▪ Calibration issues</li> </ul>	Moderate	Likely	E (The Fluoride monitoring standard solutions are maintained and reliable monitoring instrument is sourced with warranties and service agreements)	3	B	M	-
Pump Operations	Changes in pressure or water hammer	Major	Almost certain	NFE	4	A	E	3
Plant failure	Power failure	Major	Almost certain	E	4	A	E	-
	Natural disaster	Catastrophic	Possible	NC	5	C	<b>H</b>	6
Post Treatment Storage Risks	Not enough water to meet demand	Major	Likely	E	4	B	<b>H</b>	-
	<ul style="list-style-type: none"> <li>• Contaminating material getting into reservoir</li> </ul>	Major	Possible	E	4	C	M	-
	<ul style="list-style-type: none"> <li>• Development or re-suspension of sediment</li> </ul>	Moderate	Almost certain	E	3	A	<b>H</b>	-
	<ul style="list-style-type: none"> <li>• Material failure of reservoir</li> </ul>	Catastrophic	Possible	E	5	C	<b>H</b>	-
	<ul style="list-style-type: none"> <li>• Natural disaster</li> </ul>	Catastrophic	Possible	NC	5	C	<b>H</b>	-
<ul style="list-style-type: none"> <li>• Vandalism or sabotage</li> </ul>	Major	Possible	E	4	C	M	-	
Telemetry Monitoring	Incorrect water quality data used for water supply management	Major	Possible	E	4	C	M	-

Asset Risks	The risk: What can happen and how it can happen	The consequences of an event happening		Adequacy of existing controls	Consequence rating	Likelihood rating	Level of risk	Risk priority
		Consequences	Likelihood					
Water Distribution Risks	Contaminated material gets into main <ul style="list-style-type: none"> <li>▪ Mains breaks and leaks</li> <li>▪ Sediment being stirred up with pressure fluctuations</li> <li>▪ Inadequate backflow prevention</li> <li>▪ Poor hygiene practices during maintenance</li> <li>▪ Poor construction materials and practices</li> </ul>	Moderate	Almost certain	NFE	3	A	<b>H</b>	4
		Moderate	Almost certain	NFE	3	A	<b>H</b>	6
		Major	Almost certain	NFE	4	A	E	2
		Major	Almost certain	NFE	4	A	E	1
		Moderate	Possible	E	3	C	M	-
	Low flow or No flow <ul style="list-style-type: none"> <li>▪ Unable to meet demand</li> <li>▪ Power failure</li> <li>▪ Pipe failure</li> <li>▪ Pump failure</li> <li>▪ Natural disasters or incidental damage</li> </ul>	Major	Possible	E	4	C	M	-
		Major	Almost certain	E	4	A	E	-
		Major	Almost certain	E	4	A	E	-
		Moderate	Likely	E	3	B	M	-
		Catastrophic	Possible	NFE	5	C	<b>H</b>	6
Staff training	Unskilled / untrained staff <ul style="list-style-type: none"> <li>▪ Poor water quality and distribution management.</li> <li>▪ Water is contaminated</li> </ul>	Moderate	Likely	NFE	3	B	M	1
Legislative non-compliance	Failure to achieve Levels of Service due to: <ul style="list-style-type: none"> <li>- Non-compliance to Resource Consents</li> <li>- Unlawful discharges (without Consent) to the environment</li> </ul> Court subpoena for unlawful acts; specifically violation to RMA	Major	Possible	E (capital/renewal/maintenance works programmed)	4	C	M	
		Major	Possible	E (to be addressed accordingly)	4	C	M	
In adequate asset condition assessment and valuation	Failures in the WTP/reticulation system due to: <ul style="list-style-type: none"> <li>- Pump /motor / valve failure</li> <li>- Pipe bursts / fracture</li> </ul> Failure in the treatment system due to: <ul style="list-style-type: none"> <li>- Electrical system failure</li> <li>- Mechanical failure</li> <li>- Structural failure (e.g. Building,</li> </ul>	Major	Possible	E (The qualified maintenance staff conducting condition assessment regularly and development of an in-house Asset Management System for proper planning)	4	C	M	
		Major	Possible	E (Acquisition of proprietary AMS to replace in-house Asset Management System)	4	C	M	

Asset Risks	The risk: What can happen and how it can happen	The consequences of an event happening		Adequacy of existing controls	Consequence rating	Likelihood rating	Level of risk	Risk priority
		Consequences	Likelihood					
	Control Room, contact tanks, screen filters, WTP process equipment, etc.) - Pipe fracture  Failure in the disposal system due to: - Saturation of the field as a result of insufficient capacity  Failure to come up with robust capital works, renewal and operational programmes  Expenditures are not optimised	Major   Moderate   Minor	Possible   Possible   Possible	for proper planning)  E (Acquisition of proprietary AMS to replace in-house Asset Management System for proper planning)  E (Acquisition of proprietary AMS to replace in-house Asset Management System for proper planning)  E (Acquisition of proprietary AMS to replace in-house Asset Management System for proper planning)	4   3   2	C   C   C	M   M   L	
Incorrect financial projections to create, renew or maintain assets	Delayed project completion  Over- or under spent budget creating impact on rates and development contributions	Moderate  Moderate	Possible  Possible	E (Plan Improvement)  E (Plan Improvement)	3  3	C  C	M  M	
Not meeting community expectations	Loss of ratepayers' faith and trust to Council due to: - Failure to maintain network performance standard - Failure to deliver the target levels of service	Major	Possible	E (Plan Improvement)	4	C	M	
Public safety non-compliance/ Occupational Health and safety non-compliance	Public safety and workers' safety are put at risk due to: - Exposure to open manholes - Leaking pipes - Inadequate water treatment - Contaminant discharges to the environment (immediate environs and the Lake) - Inadequate training on operation of machines and other devices - Inadequate occupational health and safety trainings.	Major	Likely	E (Public Health Risk Mgt Plans, appropriate signage on hazard areas, upgrade of the WTP and network, spill to environment procedure in place for both river and lake, adequate training provided, adequate PPE gears for staff)	4	B	<b>H</b>	
Loss of asset data/information on	Failure to maintain network performance standard due to:	Moderate	Unlikely	E (Robust database and Asset	3	D	L	



Asset Risks	The risk: What can happen and how it can happen	The consequences of an event happening		Adequacy of existing controls	Consequence rating	Likelihood rating	Level of risk	Risk priority
		Consequences	Likelihood					
assets	<ul style="list-style-type: none"> <li>- Potential delay in work programmes</li> <li>- Unreliable asset management planning</li> </ul> <p>Increased expenditure to recollect the data.</p> <p>Failure of in-house AMS</p>	Minor	Unlikely	<p>Mgt. System)</p> <p>E (Robust database and Asset Mgt. System)</p>	2	D	L	
High staff turnover and absence of staff to undertake water asset management	<p>Failure to maintain network performance standard due to:</p> <ul style="list-style-type: none"> <li>- Loss of historical and current knowledge base</li> <li>- Planned programmes tend not to be sustainable</li> <li>- Learning periods consume significant work time as new staff comes in</li> <li>- Institutional/Organisational development is not sustained.</li> </ul>	Moderate	Likely	<p>E (Organisation restructured to ensure Network Engineers have the capability to address issues across disciplines)</p>	3	B	M	
Lack of management support to the required work programmes	<p>Failure to maintain network performance standard due to:</p> <ul style="list-style-type: none"> <li>- Disapproval of required work programmes</li> <li>- Insufficient justification to support the program proposals</li> </ul>	Moderate	Likely	<p>E (Proper investigations and scoping to justify the planned works)</p>	3	B	M	