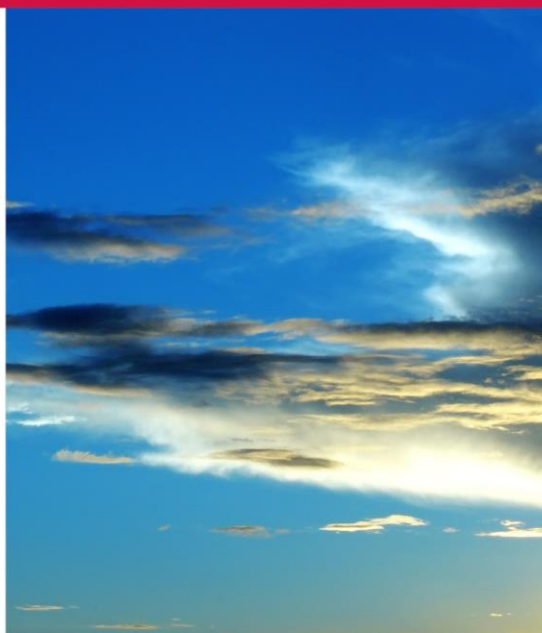


# Climate Change Risk Assessment Adaptation Report

Bega Valley Council



December 2010



## **Prepared for**

Bega Valley Council

## **Facilitated and Developed by**

Statewide Mutual Liability Scheme and Echelon Australia Pty Ltd

## **Editorial Team**

Mr Ron Barnes Statewide Mutual / Mr Steve Broom Echelon Australia

## **Echelon Australia Pty Ltd**

ABN 96 085 720 056

## **All Rights Reserved**

The climate change risk management assessments contained within this report have been developed solely on the site-specific information supplied by Bega Valley Council and have been prima facie accepted by the authors of this report and have not been independently verified for accuracy. Echelon Australia accepts no responsibility for any loss that arises out of the Bega Valley Council having failed to bring all relevant facts to our attention or having provided inaccurate information.

## **Assumptions & Limitations**

It is understood that there is a level of uncertainty regarding climate change projections, including those for New South Wales. Echelon acknowledges that climate change data may change and has committed to the CSIRO scenarios available at the time of the assessment.

The focus of the Climate Change Adaptation Risk Assessment is one of planned adaptation – not mitigation. Planned adaptation is the result of deliberate policy decisions, based on an awareness that conditions have or will change and that action is required to return to, maintain, or achieve a desired state.

Adaptation planning for low and medium impacts is outside the scope of this Project, however Councils are encouraged to continuously monitor, review and manage climate change impacts at all levels and scenarios.

## **Use of this Report**

This report has been prepared for the Bega Valley Council for the purpose of climate change risk management and adaptation planning.

# Table of Contents

## Executive Summary

Analysis of All Impacts 8

## Climate Change Background 3

Climate Change in NSW 3

Climate Change and the Impacts for Local Government 3

## Project Background 4

Project Objectives 4

Acknowledgements 5

Project Methodology 5

CSIRO Climate Change Scenarios 6

Functional Areas of Council 6

Success Criteria 6

## Recommendations 7

## Adaptation Plans Summary 12

Scenario for Temperature (T) 12

Scenario for Fire Weather (FW) 14

Scenario for Sea Level (SL) 15

Scenario for Rain Intensity (RI) 19

## Appendices 20

Appendix 1: Likelihood Descriptors 20

Appendix 2: Consequence Descriptors 21

Appendix 3: Risk Assessment Results 22



# Executive Summary

In 2006, 2007 and 2008, Board Members of the Statewide Mutual Liability Scheme (Statewide) visited London Underwriters to expand on the risk management activities undertaken by Member Councils. During the 2008 visit, Statewide was asked to elaborate on these activities and Council's management of climate change. It was agreed that Local Government has an important 'climate change' role to play given its responsibility for a wide range of issues, such as planning and development, promotion of renewable energy, land use, transport planning, asset and infrastructure management, vegetation clearance and stormwater management to name but a few.

Most underwriters acknowledged that although the task of adapting to climate change will be complex, expensive and will require long term commitment from all Councils, it needs planning, direction and a sound framework to ensure that the potential insurable losses are within expectations.

At the June 2009 meeting of the Board of Statewide Mutual, the Board commissioned a Climate Change Adaptation Project to address the potential climate change impacts confronting member Councils. For the Financial Year ending 30 June 2010, 32 Councils were selected to participate in the Project

Echelon Australia Pty Ltd (Echelon) has responded to the Board's requirement by developing an adaptation planning process that uses CSIRO climate change data and adopts an approach that is consistent with national guidelines established by the Commonwealth Department of Climate Change and the AS/NZS4 360 risk assessment process.

To be truly representative of Council's risk management activities and the broad range of their risk exposures, Echelon also felt it was important to ensure that Council's operational stakeholders were identified and engaged. A series of meetings was held that targeted this group including, but not limited to, the following members:

- Council Executives
- Council Environmental, Planning, Engineering, Maintenance, Operational, Financial and Risk Management Officers
- Council's existing Environmental Management and Risk Management Committee.

The underlying basis of this project is risk management. It relies heavily on gathering information to produce qualitative risk assessments. The objectives of the project are to:

- Undertake a risk assessment process that aligns with the AS/NZS 4360 and ISO 31000
- Develop strategies that focus on adaptation to potential climate change impacts
- Provide Statewide with comprehensive Climate Change risk assessment and adaptation planning data
- Identify strategies that can be used for Councils' strategic and integrated planning.





# Climate Change Background

Climate change can be described as any significant, long-term change in weather patterns and is the result of an increase in the earth's average temperature. This temperature increase is believed to be caused by increased greenhouse gases in the earth's atmosphere. In 2007 the Intergovernmental Panel on Climate Change (IPCC) released its fourth Assessment Report on the state of knowledge on Climate Change. It concluded that global warming is now unequivocal and that most observed increases in temperatures since the 1950s are very likely due to increased concentrations of greenhouse gases, as a result of human activities (IPCC, 2007). Although there remains some scepticism, the debate has moved beyond the causes of climate change and evaluating the credibility of its science.

Consequently, the debate has largely shifted to methods of reducing our human influence and adapting to the inevitable effects of climate change. The causes of climate change (be it human activity or other phenomena) make little difference with regard to adapting to the impacts that we cannot avoid. Whether we are prepared for the exponential impacts of climate change in the future, depends on today's effective risk management.

## Climate Change in NSW

The CSIRO has provided data in the form of climate change scenarios for the year 2030, relative to 1990 (CSIRO, 2006). By 2030, we can expect to see NSW experience the following:

- Become warmer, with more hot days and fewer cold nights
- Have an increased peak summer energy demand for cooling
- Reduced energy demand in winter for heating
- An increase in annual heat-related deaths in those aged over 65
- Potential increase in the spread of vector/water/food borne diseases
- Water resources are likely to be further stressed
- More frequent droughts
- Greater risk of fire

- Increase in flash flooding with a greater number of rain intensity events

## Climate Change and the Impacts for Local Government

The nature of Local Government, its services and functions, means it will feel the impacts of climate change considerably. Many impacts of climate change present risks that require treatment at a 'local' level which is why Councils will be heavily involved in the nation's adaptation process. Echelon have identified a number of risks that climate change presents for Local Government. These include:

- Uncertainty over development and building approvals. The potential effects of climate change have been used in the Courts to prevent building in areas at risk of sea level rise.
- Increased public liability exposure as a result of risks exacerbated by climate change impacts. For example, development or building to standards that are subsequently rendered inappropriate due to impacts such as high wind levels, flooding or increased risk of bushfire.
- Public safety issues caused by extreme weather events and temperatures. For example an increase in accidents caused by bushfires/floods and an increased risk of heat stress and disease from vectors.
- Higher insurance costs as a result of increased claims.
- Responsibility for erosion, contamination, landslides, etc due to extreme weather events.
- Failure to preserve 'community' natural assets affected by climate change e.g. water resource availability.

# Project Background

Statewide is aware that the short to medium effects of climate change may directly impact on the functionality of the Scheme. Potential increased claims in the area of property damage (physical damage to Council owned buildings, infrastructure and assets), professional indemnity (management of the development and building approvals, issuing of certificates, verbal advice) and corporate governance (failure to implement legislation, financial responsibility, strategic planning) have the potential to create adverse pressure. Statewide decided to assist Member Councils prepare adaptation plans and use this data to advise the London Underwriters on the extent that Councils are preparing for climate change.

Bega Valley Council was one of the Councils selected to participate in the Climate Change Adaptation Plan Project during the Financial Year ending 30 June 2010.

As well as the significance to Statewide, Local Government is also concerned with how to effectively identify climate change risks and adapt appropriately. Echelon has responded by designing and facilitating a Project that assists Member Councils to address these concerns. Echelon's Climate Change Adaptation Planning Process uses CSIRO climate change data as assessment criteria and adopts an approach that is consistent with national guidelines established by the Australian government and other leading authorities.

The following guides and standards were used to establish the assessment framework and project methodology:

- *Climate Change Impacts & Risk Management A Guide for Business*, Australian Green house Office 2006
- *Government and Climate Change Adaptation Actions for Local Government* Australian Government Department of Climate Change 2009
- *Australian and New Zealand Standard for Risk Management AS/NZS 4360:2004*.
- *International Standard ISO31000, Risk Management – Principles and Guidelines*
- NSW Catchment Reports, CSIRO 2007

- *A framework for stakeholder engagement on climate adaptation*, Climate Adaptation CSIRO Climate Adaptation Flagship Working Paper No.3, 2009

## Project Objectives

- Undertake a risk assessment process that aligns with AS/NZS 4360 and ISO 31000
- Develop strategies that focus on adaptation to potential climate change impacts
- Provide Statewide with comprehensive Climate Change risk assessment and adaptation planning data
- Identify strategies that can be used for Councils' strategic and integrated planning.

## Acknowledgements

The Echelon facilitation team and the Board of Management of Statewide Mutual would like to thank the following Bega Valley staff who contributed to the project:

Table 4 – Project Participants	
D Madigan	D van Bracht
A Woodley	K Tull
M Neeson	V Williamson
J Collins	L Jay
M Sandford	C McGregor

## Project Methodology

The Climate Change Adaptation Risk Assessment process is broken down into a number of sessions, facilitated by an Echelon Risk Consultant. The role of the facilitator is to guide attendees through the risk assessment and adaptation planning stages.

The Australian Standard for Risk Management, AS/NZS 4360:2004 (the Standard) was selected as the framework for assessing climate change impacts. This Standard meets or aligns with one that is typically mainstreamed within Council and has the flexibility to deal with new climate change information with efficiency.

Assessment criteria were based on likelihood and consequence descriptors provided by the Australian Greenhouse Office, which are located in Appendix 1 and 2. To evaluate the impacts, these criteria were combined with functional areas and 'Success Criteria' (or Council's objectives).

Figure 5 below represents the Standard's approach to the Climate Change Adaptation Risk Assessment process.

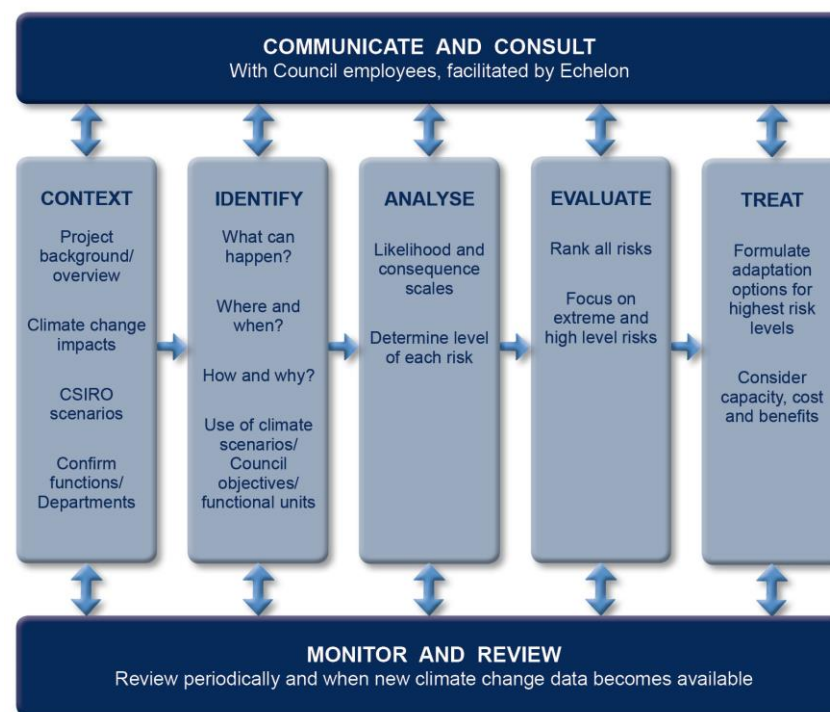


Figure 5. AS/NZS 4360 applied to climate change risk assessments



## CSIRO Climate Change Scenarios

A key feature of the Risk Assessment process is the use of CSIRO climate change scenarios to identify risks. The following scenarios have been chosen. They represent the CSIRO scenarios available at the time of the assessments that are the closest to Bega Valley Council's geographical location.

<b>T</b>	Temperature: There is a risk that the average annual temperature may increase between 0.2°C and 1.8°C by 2030.
<b>HD</b>	Hot Days above 35°C: There is a risk that there will be between 2 and 3 additional hot days by 2030.
<b>R</b>	Rainfall: There is a risk that rainfall may be up to 13% less by 2030
<b>W</b>	Wind: There is a risk that there will be an increase in average wind speed between -2% and 7.5% by 2030.
<b>FW</b>	Fire Weather: There is a risk that the number of days annually when the Forest Fire Danger Index (FFDI) is very high or extreme will be between 14 and 16 days by 2020.
<b>SL</b>	Sea Level: There is a risk that the sea level may rise to a level of 0.91m by 2100 with a linear rise over the intervening period.
<b>RI</b>	Rain Intensity: There is a risk that intense rain periods (that is number in 1 in 40 year 1 day rain fall events) will increase between -3% and +20%

## Functional Areas of Council

Potential Climate Change impacts were considered in relation to the following Council Functional Areas:

- I** Infrastructure and Property Services
- R** Recreational Facilities
- H** Health Services
- P** Planning and Development
- N** Natural Resources and Management
- W** Water and Sewage

Note: 'Functional Areas' are a summary of Council operations, as defined in the *Climate Change Adaptation Actions for Local Government*, Department of Climate Change 2009.

## Success Criteria

The success criteria were defined as:

- A** Maintain public safety
- B** Protect and enhance the local economy
- C** Protect existing community structures and the lifestyle enjoyed by the people of the region
- D** Sustain and enhance the physical and natural environment
- E** Ensure sound public administration

Note: 'Success Criteria' are a summary of Council's long term objectives, as defined in *Climate Change Impacts & Risk Management A Guide for Business*, Australian Greenhouse Office 2006.

# Recommendations

Echelon recommends that Council proceed with adoption of adaptation plans and ongoing review. It is recommended that the following key features be part of Council's ongoing climate change adaptation program:

1. Review of adaptation plans within review dates or earlier as necessary.
2. Review of all risk assessments including low and medium risks on a regular basis.
3. Consideration of new climate change risks when reviewing risk assessments, or as and when they arise.
4. Consideration of changes in relevant climate change data, operating environment, legislation, economy, demographics, and other relevant factors when reviewing adaptation plans and risk assessments.
5. Categorising of adaptation plans into e.g. short (< 1year), medium, (1-3 years) and long term (>3 years).
6. Inclusion of climate change risk management and adaptation plans into strategic and other management planning processes.

# Climate Change Impacts Data

The following section provides a summary and breakdown of the various climate change adaptation impacts and their relative risks identified by Bega Valley Shire Council. 451 impacts were identified (Table 1 & Figure 1) with 66 ranking in the Extreme and High range. These 66 impacts are the subject of adaptation plan consideration in the report.

## Analysis of All Impacts

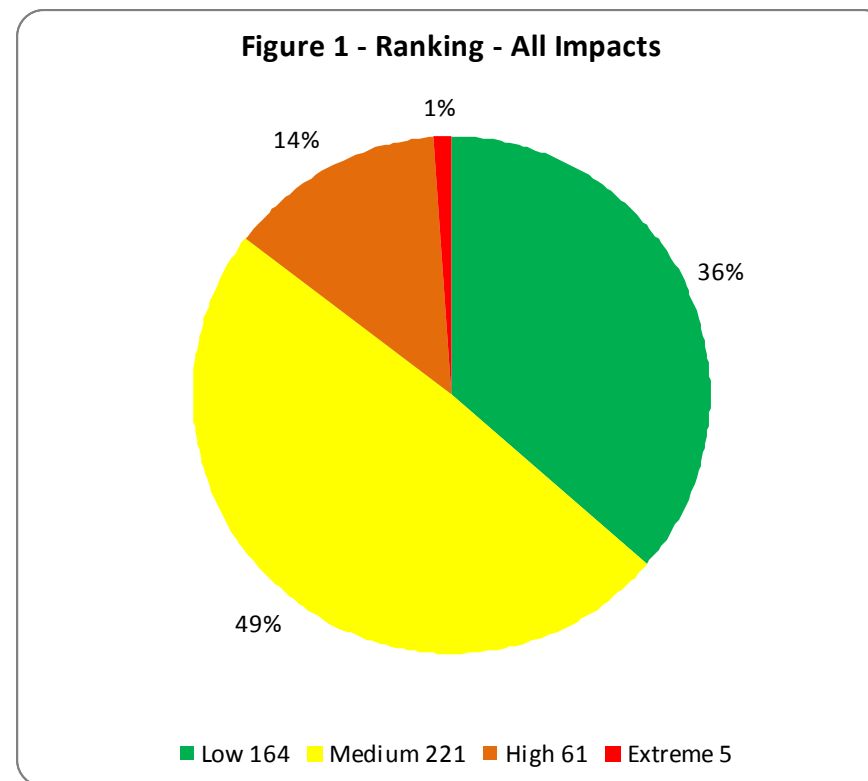


Table 1 - Impact Rankings by Scenario								Ranking All Impacts	
	Temperature	Hot Days	Rain	Wind	Fire Weather	Sea Level	Rain Intensity		
Low	59	5	38	31	5	4	22	Low	164
Medium	48	12	38	20	22	42	39	Medium	221
High	7	0	15	0	4	31	4	High	61
Extreme	0	0	0	0	0	5	0	Extreme	5
<b>Total</b>	<b>114</b>	<b>17</b>	<b>91</b>	<b>51</b>	<b>31</b>	<b>82</b>	<b>65</b>	<b>Total</b>	<b>451</b>

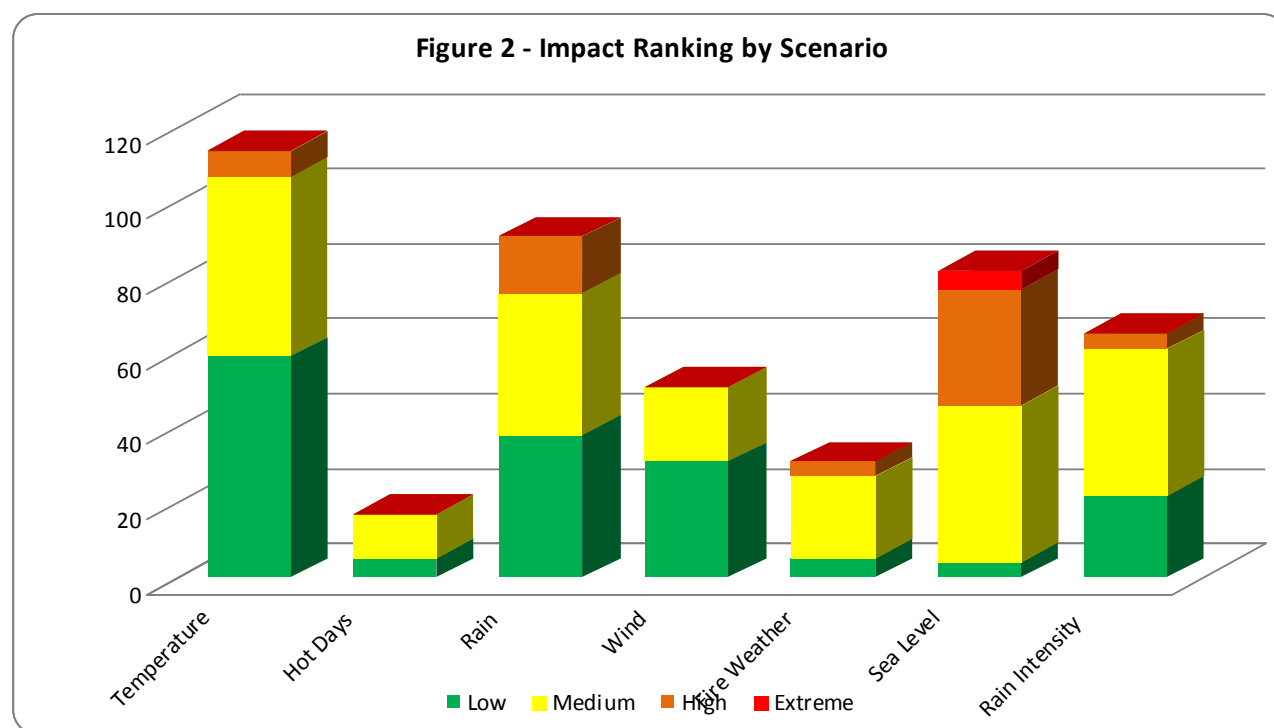


Figure 2 and Table 1 provide a scenario view of rankings. Medium & High impacts account for 63% of the total. While Medium impacts are not included in adaptation planning, they form a significant proportion of the total impacts (49%). It is recommended that Council include all impacts in future reviews and re-evaluations of its climate change program. It is of note that the Temperature scenario (114 impacts) accounts for 25% of the total .



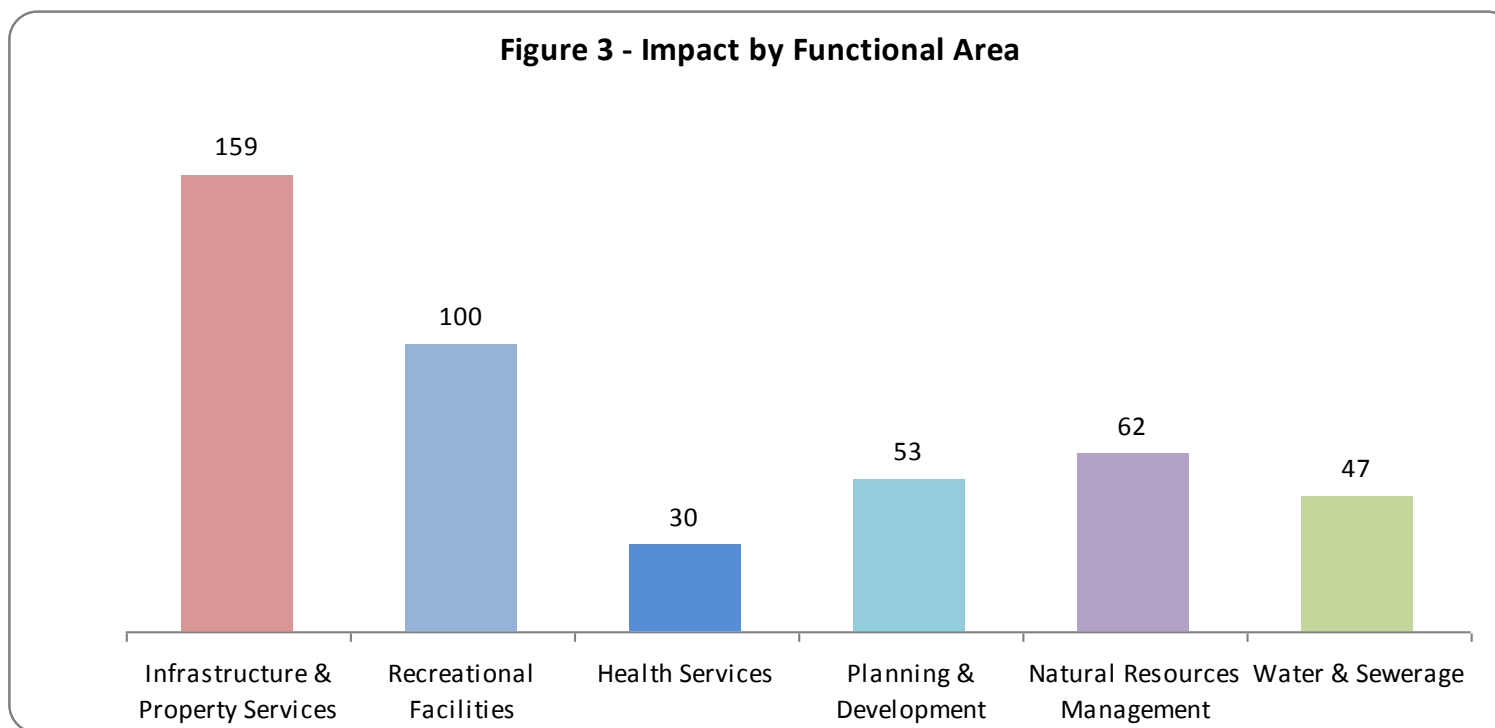


Figure 3 provides an overview of all impacts by Functional area. The greatest number of impacts are attributed to Infrastructure & Property Services; representing 35% of the total with 159 potential impacts.

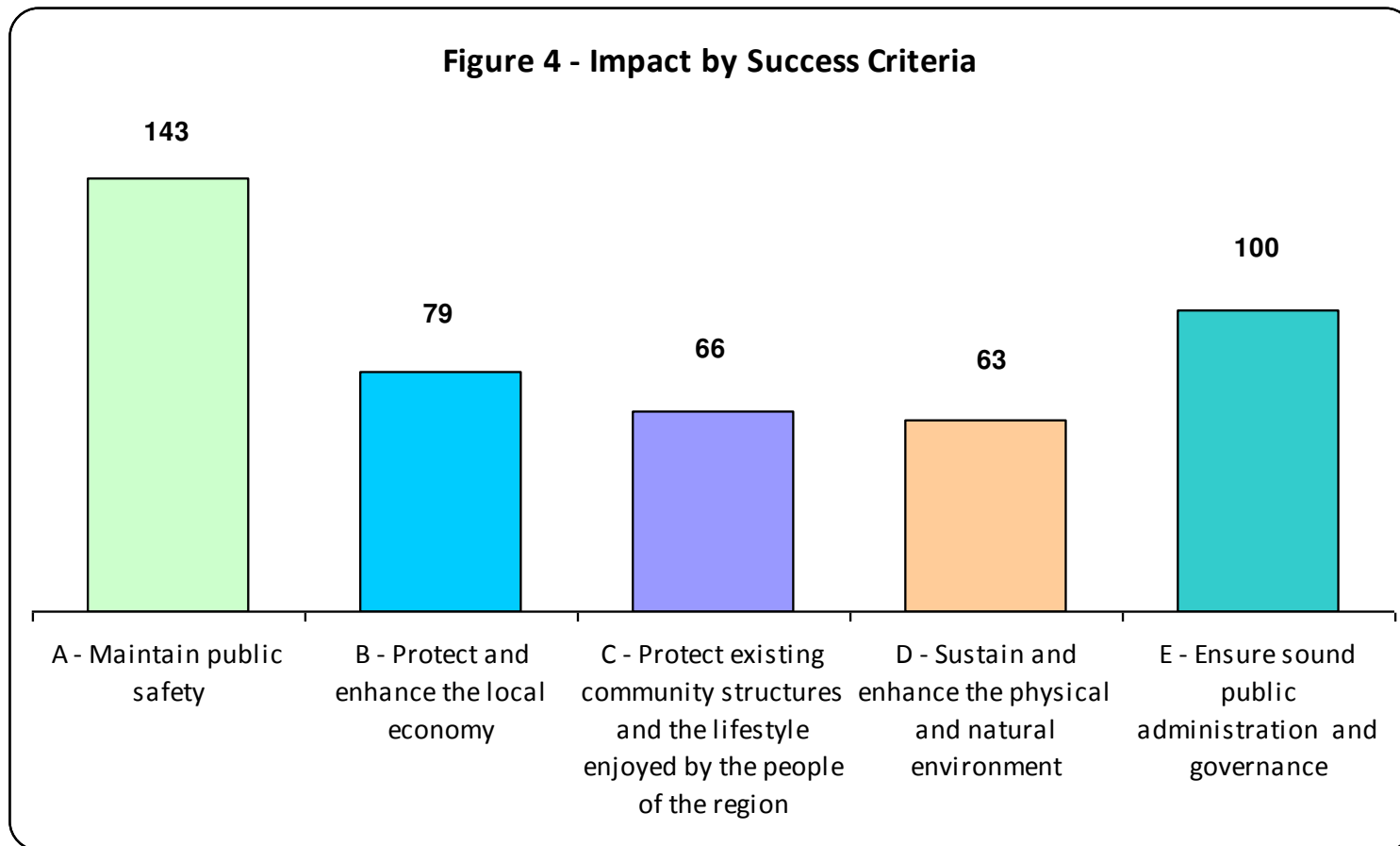


Figure 4 provides an overview of all impacts by Success Criteria. The greatest number of impacts are in the criteria of maintain public safety, representing 32% of the total impact

# Adaptation Plans Summary

The following information outlines the impacts, ratings, current controls and adaptation plans for extreme and high risks, for all scenarios. (Risk assessment results for all impacts are at Appendix 3). Bega Valley identified 5 extreme climate change risks and 61 high climate change impacts. The risks and recommended adaptation plans are summarised in the tables below.

## Scenario for Temperature (T)

There is a risk that the average annual temperature may increase between 0.2°C and 1.8°C by 2030.

RISK ID	RISK DESCRIPTION	RISK RATING	CURRENT CONTROLS	FUTURE ADAPTATION PLAN
TCI10	Increase in temperature will cause gravel roads to be drier & will increase general maintenance costs and compacted gravel costs	High	Water cart maintenance when road is being regraded	Prioritise those gravel roads deemed to require sealing and implement a staged refurbishment of the same.
TDR5	Potential increase in fire events – fire load, hotter temps, drier conditions	High	Hazard reduction programme, controlled burn regimes and APZ's	Hazard reduction programme, controlled burn regimes and APZ's based on updated science
TAH1	Outdoor staff working conditions impacted by increase in temperature	High	Current OHS policy and provision of PPE	Current OHS policy and provision of PPE based upon updated science
TCH4	Outdoor staff working conditions impacted by increase in temperature	High	Refer to TAH1	Refer to TAH1
TAN2	Potential increase in fire events – fire load, hotter temps, drier conditions	High	TDR5	TDR5
TBN2	Increase in evaporation has potential to reduce water storage levels and availability	High	Response is to introduce water restrictions at pre-determined trigger levels	Response is to introduce water restrictions at pre-determined trigger levels based upon updated science. Suggest that residential developments have a compulsory rainwater storage tank component and water saving devices. The ultimate response will be to curtail development to sustainable levels as dictated by water extraction licences and revised hydraulic source water analysis.
TBN4	Potential increase in fire events – fire load, hotter temps, drier conditions	High	TDR5	TDR5

## Scenario for Rainfall (R)

There is a risk that rainfall may be up to 13% less by 2030

RISK ID	RISK DESCRIPTION	RISK RATING	CURRENT CONTROLS	FUTURE ADAPTATION PLAN
RAI6	Potential increase in fire events – fire load, hotter temps, drier conditions	High	TDR5	TDR5
RDI5	Potential increase in fire events – fire load, hotter temps, drier conditions	High	TDR5	TDR5
RAR3	Potential increase in fire events – fire load, hotter temps, drier conditions	High	TDR5	TDR5
RBR4	Increased watering required at recreational areas	High	Reticulation or treated waste water is currently used for the irrigation and watering of Council recreational areas	Increased use of treated waste water and reduction of reticulated water usage for irrigation and watering of recreational areas
RDR3	Potential increase in fire events – fire load, hotter temps, drier conditions	High	TDR5	TDR5
RAP3	Long term water management may be impacted	High	Water Management within Bega Valley Shire is currently governed by Councils Water Supply Strategy	Amendment of strategy and identifying water efficiency and pricing controls. The ultimate response will be to curtail development to sustainable levels as dictated by water extraction licences and revised hydraulic source water analysis.
RBP3	Reduced water availability to support future growth of the City	High	Reduced water availability is currently managed through the implementation of suitable pricing and demand management strategies.	Reduced water availability will be managed through the implementation of suitable pricing and demand management strategies. The ultimate response will be to curtail development to sustainable levels as dictated by water extraction licences and revised hydraulic source water analysis.
RBP4	Income from water services may be impacted	High	Councils income from water services is governed by Water Services Business Plan	Income will be adjusted to sustainable levels in accordance with future Business Plan financial modelling calculations.
RCP3	Reduced water availability to support future growth of the City	High	Refer to RBP3	Refer to RBP3



RISK ID	RISK DISCRIPTION	RISK RATING	CURRENT CONTROLS	FUTURE ADAPTATION PLAN
RDP7	Reduced water availability to support future growth of the Shire	High	Refer to RBP3	Refer to RBP3
RAN2	Potential increase in fire events – fire load, hotter temps, drier conditions	High	TDR5	TDR5
RAW1	Resulting impact from a potentially reduced level of water supply to meet the community demand	High	Refer to RBP3	Refer to RBP3
RBW1	Resulting impact from a potentially reduced level of water supply to meet the community demand	High	Refer to RBP3	Refer to RBP3
RCW1	Resulting impact from a potentially reduced level of water supply to meet the community demand	High	Refer to RBP3	Refer to RBP3
REW3	Increased pressures on Council re water management	High	Refer to RAP3	Refer to RAP3

## Scenario for Fire Weather (FW)

There is a risk that the number of days annually when the Forest Fire Danger Index (FFDI) is very high or extreme will be between 14 and 16 days by 2020.

RISK ID	RISK DISCRIPTION	RISK RATING	CURRENT CONTROLS	FUTURE ADAPTATION PLAN
FWAI2	Increase in severity and number of bushfires causing an increased risk or injury or fatalities	High	Bushfire Risk Management Plan - Hazard Reduction Program	Review APZs in accord with current fire science, CLEP Zonings, update BFMP
FWEI3	Severe fire events may lead to a greater need for access to public buildings and larger capacity for emergency housing	High	Neighbourhood safer places program, emergency management plan	Education / promotion NSP Review emergency management plan
FWEI6	Increase in severity and number of bushfires causing potential disruption to telecommunication activities and community liaison	High	APZ's as part of Hazard Reduction Program, communication facilities high priority in BRMP	Continue / expand APZ program. Communication facilities to have more robust construction standard
FWAN1	Change in weather conditions may increase vegetation fuel accumulation and the risk of fire	High	Refer to FWAI2	Refer to FWAI2

## Scenario for Sea Level (SL)

There is a risk that the sea level may rise to a level of 0.91m by 2100 with a linear rise over the intervening period.

RISK ID	RISK DISCRIPTION	RISK RATING	CURRENT CONTROLS	FUTURE ADAPTATION PLAN
SLAI4	Septic systems may be affected by changes to water table and inundation	High	BVSC OSSM Policy	Prioritised relocation program based on LIDAR Mapping, no future ossms below 3mAHD
SLAI5	There may be a need to relocate/modify essential Council infrastructure	Extreme	Flood Policy	Commission contemporary Coastal Hazard Study / Flood Studies. Relocate where practical as part of Asset Management Planning
SLAI7	Strategies to evacuate vulnerable areas must be developed and account for heightened levels of impact during storm events	High	Emergency Management Plan	Emergency Management Plan updated based on SES / DECCW coastal hazard mapping
SLAI10	Septic systems may be affected by changes to water table and inundation	High	Refer to SLAI4	Refer to SLAI4
SLAI11	There may be a need to relocate/modify essential Council infrastructure	Extreme	Refer to SLAI5	Refer to SLAI5
SLAI13	Strategies to evacuate vulnerable areas must be developed and account for heightened levels of impact during storm events	High	Refer to SLAI7	Refer to SLAI7
00	There may be a need to relocate/modify essential Council infrastructure	Extreme	Refer to SLAI5	Refer to SLAI5
SLBI4	Sea level rise combined with storm surge events may lead to blockage of access and service routes	High	Emergency Management Plan	Emergency Management Plan, Land Use Planning, Infrastructure development based on LIDAR mapping, Coastal hazard study.
SLBI5	There may be a need to relocate/modify essential Council infrastructure	Extreme	Refer to SLAI5	Refer to SLAI5

RISK ID	RISK DISCRIPTION	RISK RATING	CURRENT CONTROLS	FUTURE ADAPTATION PLAN
SLBI10	Sea level rise combined with storm surge events may lead to blockage of access and service routes	High	Refer to SLBI4	Refer to SLBI4
SLBI11	There may be a need to relocate/modify essential Council infrastructure	Extreme	Refer to SLAI5	Refer to SLAI5
016	Sea level rise combined with storm surge events may lead to blockage of access and service routes	High	Refer to SLBI4	Refer to SLBI4
SLCI3	There may be a need to relocate/modify essential Council infrastructure	High	Refer to SLAI5	Refer to SLAI5
SLCI4	There could be a complete shift in the layout of the town	High	LEP Land Use Planning	Land Use Planning based on LIDAR, Coastal Hazard Studies, actual inundation events, continue to implement State Policy, guidelines
SLEI1	Council may need to increase preventative expenditure to protect infrastructure and property e.g. sea wall protection, sand replenishment, flood levies	High	Priorities identified through estuary program and funded by Council and State	External Funding, levies on affected properties, prioritised based on risks identified through coastal hazard study / flood studies
SLAR3	There may be a need to relocate/modify essential Council infrastructure	High	Refer to SLAI5	Refer to SLAI5
SLAR4	Changes to infrastructure may impact upon Councils ability to sustain and enhance recreational facilities/opportunities	High	Asset management plans, Plans of Management	Strategic Asset Planning based on LIDAR, Coastal Hazard Studies, actual inundation events
SLER2	Council may have to develop strategies for the abandonment of some recreational facilities and assets	High	Asset management plans, Plans of Management	Strategic Asset Planning based on LIDAR, Coastal Hazard Studies, actual inundation events
SLAH1	Sea level rise combined with storm surge events may lead to the failure of facilities such as sewerage treatment plants from inundation and flooding	High	Based on current design standards, flood / hazard information	Commission contemporary Coastal Hazard Study / Flood Studies. Relocate where practical as part of Asset Management Planning

RISK ID	RISK DISCRIPTION	RISK RATING	CURRENT CONTROLS	FUTURE ADAPTATION PLAN
SLAP3	Coastal management plans must take into account the potential for future climate change to affect the magnitude of coastline hazards	High	Currently considered n recent Estuary plans, coastal hazard reports, CLEP development	Will be central component of new Coastal Hazard Study
SLAP4	Council must continually update and review Emergency Management plans taking into consideration sea level rise impacts	High	Emergency Management Plan updated based on SES / DECCW coastal hazard mapping	Regular process of review of EMP to ensure based on current Climate Change data
SLBP2	There could be a complete shift in the layout of the town	High	Refer to SLCI4	Refer to SLCI4
SLBP4	Ensuring that LEP's take into consideration the impacts of sea level rise	High	Refer to SLCI4	Refer to SLCI4
SLCP1	Coastal zone management plans must make specific provisions for protecting and preserving beach environments, beach amenity, emergency management and measures for flexible public access to beaches, headlands and waterways	High	Existing Legislation. No current formal plan. Current planning for coastal environments takes a precautionary approach and considers coastal hazard	Future coastal zone management plan will address these issues in the context of rising sea levels.
SLCP2	Ensuring that LEP's take into consideration the impacts of sea level rise	High	Refer to SLCI4	Refer to SLCI4
SLEP1	Uncertainty about legal consequences for councils refusing or approving coastal developments causing exposure to cost and reputation risks	High	Current decisions based on case law, Department of Planning advice, available specialist studies, current climate change science	Regular review process to ensure Council policies are consistent with current law and science.
SLEP5	Flood studies, Development Control Plans and other local planning instruments should consider sea level rise impacts (e.g. foreshore building exclusion zones and restricted development sites)	High	Currently considered in recent Estuary plans, CLEP / CDCP development	Sea level rise consideration is a standard requirement of flood / coastal hazard reports. Land Use Planning based on LIDAR, Flood studies / Coastal Hazard Study, implement development control policy based on high, medium, low risk scenarios with corresponding development controls.



RISK ID	RISK DISCRIPTION	RISK RATING	CURRENT CONTROLS	FUTURE ADAPTATION PLAN
SLEP6	Zoning certificates need to adequately reflect potential sea level rise impacts	High	Data not currently available	Will be amended on receipt of coastal hazard study report
SLAN1	Council must continually update and review Emergency Management plans taking into consideration sea level rise impacts	High	Refer to SLAP4	Refer to SLAP4
SLAW1	Trunk sewers close to existing sea levels may be subject to increasing infiltration and deterioration	High	Current Asset Maintenance and Management Programs	Future priority replacement based on LIDAR Mapping , coastal hazard report
SLAW2	Ground water derived drinking water supplies may be subject to increased salt water intrusion	High	Water quality monitoring as part of water supply service	Priority concern for Towamba River Bore field. Maybe Bega Bore field, ay require relocation of bore field upstream
SLAW3	There may be a need to relocate/modify essential Council infrastructure	High	Refer to SLAI5	Refer to SLAI5
SLBW1	There may be a need to relocate/modify essential Council infrastructure	High	Refer to SLAI5	Refer to SLAI5
SLDW1	Trunk sewers close to existing sea level may be overloaded and more prone to environmental spills during high rainfall and king tides	High	Current Asset Maintenance and Management Programs	Ensure EMP adequately considers environmental emergencies, develop contingencies
SLDW3	Effluent re-use areas may become redundant and require relocation / new solutions for effluent management	High	Licensed operating approvals from DECCW	Strategic Planning for low lying resuse areas such as Tathra, parts Bermagui, Tura Beach and Merimbula Golf Courses
SLEW3	Council may need to increase funding for its new and renewed water and sewage assets	High	Asset Management Planning, Business Plan	Asset Management Planning, Business Plan

## Scenario for Rain Intensity (RI)

There is a risk that intense rain periods (that is number in 1 in 40 year 1 day rain fall events) will increase between -3% and +20%

RISK ID	RISK DISCRIPTION	RISK RATING	CURRENT CONTROLS	FUTURE ADAPTATION PLAN
RIDP2	Council infrastructure design deficiencies e.g. roads, culverts, storm water system etc	High	Based on design storm events, Australian Standards, Development Control Plans	Standards reviewed based on current science, Australian Standards, legislative requirements
RIDP5	Increased inundation on private developments as a result of failure to comply with current development conditions	High	CLEP/DCP mapping	Sea level rise consideration is a standard requirement for development of land identified as having sea level rise / coastal hazard risk. Compliance required with proposed development control policy based on high, medium, low risk scenarios with corresponding development controls.
RICW1	Inadequate stormwater system exacerbating the flooding issues	High	Based on design storm events, Australian Standards, Development Control Plans	Undertake risk study on existing stormwater network following completion of relevant flood studies and coastal
RICW2	Increased risk of low lying water/sewage equipment being damaged	High	Current Asset Maintenance, Management Replacement Programs	Future priority replacement program based on coastal hazard report.

# Appendices

## Appendix 1: Likelihood Descriptors

Likelihood Rating	Recurrent Risks	Single Events
<b>Almost Certain</b>	Could occur several times per year	More likely than not - Probability greater than 50%
<b>Likely</b>	May arise about once a year	As likely as not - 50/50 chance
<b>Possible</b>	May arise once in ten years	Less likely than not but still appreciable - Probability less than 50% but still quite high
<b>Unlikely</b>	May arise once in ten to 25 years	Unlikely but not negligible - Probability low but noticeably greater than zero
<b>Rare</b>	Unlikely during the next 25 years	Negligible -Probability very small, close to zero

## Appendix 2: Consequence Descriptors

Success Criteria	Consequence Rating				
	Insignificant	Minor	Moderate	Major	Catastrophic
<b>A</b> <b>Maintain public safety</b>	Appearance of a threat but no actual harm	Serious near misses or minor injuries	Small numbers of injuries	Isolated instances of serious injuries or loss of life	Large numbers of serious injuries or loss of lives
<b>B</b> <b>Protect and enhance the local economy</b>	Minor shortfall relative to current forecasts	Individually significant but isolated areas of reduction in economic performance relative to current forecasts	Significant general reduction in economic performance relative to current forecasts	Regional stagnation such that businesses are unable to thrive and employment does not keep pace with population growth	Regional decline leading to widespread business failure, loss of employment and hardship
<b>C</b> <b>Protect existing community structures and the lifestyle enjoyed by the people of the region</b>	There would be minor areas in which the region was unable to maintain its current services	Isolated but noticeable examples of decline in services	General appreciable decline in services	Severe and widespread decline in services and quality of life within the community	The region would be seen as very unattractive, moribund and unable to support its community
<b>D</b> <b>Sustain and enhance the physical and natural environment</b>	No environmental damage	Minor instances of environmental damage that could be reversed	Isolated but significant instances of environmental damage that might be reversed with intensive efforts	Severe loss of environmental amenity and a danger of continuing environmental damage	Major widespread loss of environmental amenity and progressive irrecoverable environmental damage
<b>E</b> <b>Ensure sound public administration and governance</b>	There would be minor instances of public administration being under more than usual stress but it could be managed	Isolated instances of public administration being under severe pressure	Public administration would be under severe pressure on several fronts	Public administration would struggle to remain effective and would be seen to be in danger of failing completely	Public administration would fall into decay and cease to be effective



## Appendix 3: Risk Assessment Results

### Scenario for Temperature (T)

T		Infrastructure and Property Services	Recreational Facilities	Health Services	Planning and Development	Natural Resources Management	Water and Sewage
		I	R	H	P	N	W
A	Maintain public safety	X	X	X	X	X	X
B	Protect and enhance the local economy	X	X	X	X		X
C	Protect existing community structures and the lifestyle enjoyed by the people of the region	X	X				X
D	Sustain and enhance the physical and natural environment	X	X		X	X	X
E	Ensure sound public administration and governance	X	X	X	X	X	

Risk Code	Risk Number	Risk Description	Likelihood	Consequence	Risk
TAI	6	There could be an increased load on air conditioning systems within Council buildings i.e. loss of a/cond efficiency and/or a/cond failure	Likely	Minor	Medium
TAI	9	Livestock Marketing - General working conditions for key stakeholders will be effected	Likely	Insignificant	Medium
TAI	8	Increased temperature could make some Council buildings less habitable	Possible	Minor	Medium
TAI	12	The condition of the roads/footpaths/cycleways/walkways/bridges may deteriorate more quickly over time.	Unlikely	Moderate	Medium
TAI	13	Change in climatic zones and impact on building codes	Unlikely	Insignificant	Low
TAI	15	Buildings integrity could be placed under additional stress due to temperature expansion of concrete joints, steel, asphalt, protective cladding, coatings and sealants. Masonry work could also be impacted by increased temperature affecting mortar.	Possible	Minor	Medium
TBI	4	Some events using Council assets may need to be cancelled due to ground conditions.	Unlikely	Minor	Low
TBI	10	The condition of the roads/footpaths/cycleways/walkways/bridges may deteriorate more quickly over time.	Unlikely	Moderate	Medium
TBI	12	Potential increase in maintenance and building infrastructure costs which could have a significant financial impact for Council.	Possible	Minor	Medium
TBI	13	Short term losses associated with increased building infrastructure maintenance and replacement program	Unlikely	Minor	Low
TCI	2	There could be an increased load on air conditioning systems within Council buildings i.e. loss of a/cond efficiency and/or a/cond failure	Likely	Minor	Medium
TCI	9	The condition of the roads/footpaths/cycleways/walkways/bridges may deteriorate more quickly over time.	Unlikely	Moderate	Medium
TCI	10	Increase in temperature will cause gravel roads to be drier & will increase general maintenance costs and compacted gravel costs	Possible	Moderate	High
TCI	11	There may be a need to provide council infrastructure such as lighting at sporting ovals for longer and more frequent occasions	Unlikely	Minor	Low
TCI	12	Increase in ambient temperature would result in increased usage of beaches and waterways, public pools thus requiring increased life saving staff	Unlikely	Minor	Low
TCI	13	Due to an increase in ambient temperature and a decrease in estuary levels there could be odour issues which arise as a result of deterioration/decomposition of vegetation	Possible	Minor	Medium

Risk Code	Risk Number	Risk Description	Likelihood	Consequence	Risk
TDI	3	Additional cost with managing dust problems and additional water usage	Possible	Minor	Medium
TDI	5	Increased risk of fire in accumulation of vegetation litter	Possible	Minor	Medium
TDI	7	Degradation of green space may lead to increased urban fire hazards	Unlikely	Minor	Low
TDI	9	Maintaining green space associated with Council property for environmental & amenity risks, e.g. salinity	Unlikely	Minor	Low
TEI	1	Some events using Council assets may need to be cancelled due to ground conditions.	Unlikely	Minor	Low
TEI	4	Reduced income due to assets becoming less suitable for purpose	Unlikely	Insignificant	Low
TEI	6	Additional maintenance costs – lowering of service level	Unlikely	Minor	Low
TEI	8	Community expectations of engagement by and direction from Council	Unlikely	Minor	Low
TEI	9	Funding the works, developing strategies to manage community expectations	Unlikely	Insignificant	Low
TEI	10	Increased cost of providing appropriate facilities	Unlikely	Insignificant	Low
TEI	14	Increased costs associated with design criteria considerations for future DAs.	Unlikely	Minor	Low
TAR	3	There could be an impact on the chemical balance of the swimming pool water	Possible	Minor	Medium
TAR	4	There may be a need to cater for a change in usage patterns at swimming pools.	Possible	Minor	Medium
TAR	5	Increase in hardness and reduced general condition of playing surfaces	Possible	Minor	Medium
TAR	7	Current maintenance levels may not be sufficient to provide attraction for visitors.	Unlikely	Insignificant	Low
TAR	8	Current leisure needs of the community and facilities provided by Council not suitable or appropriate.	Unlikely	Minor	Low
TAR	10	Degradation, failure and replacement of facilities materials	Possible	Minor	Medium
TBR	2	There could be an impact on the chemical balance of the swimming pool water	Possible	Minor	Medium
TBR	3	There may be a need to cater for a change in usage patterns at swimming pools.	Possible	Minor	Medium
TBR	4	Increasing demand for use of pool	Possible	Minor	Medium
TBR	6	Current maintenance levels may not be sufficient to provide attraction for visitors.	Unlikely	Insignificant	Low
TBR	7	Current leisure needs of the community and facilities provided by Council not suitable or appropriate.	Unlikely	Minor	Low
TCR	1	Increasing demand for use of pool	Possible	Minor	Medium
TCR	2	Increase in hardness and reduced general condition of playing surfaces	Possible	Minor	Medium

Risk Code	Risk Number	Risk Description	Likelihood	Consequence	Risk
		and recreational areas			
TCR	3	Need for more shade areas and increased need for irrigation / cost.	Unlikely	Minor	Low
TCR	6	Impact of water quality and general condition of recreational areas resulting in access restrictions	Unlikely	Minor	Low
TDR	1	Council recreational areas requiring more irrigation / change of plant profile	Possible	Minor	Medium
TDR	2	Loss of trees and plant species through drier conditions	Possible	Insignificant	Low
TDR	3	Increase in hardness and reduced general condition of playing surfaces and recreational areas	Possible	Minor	Medium
TDR	4	Current maintenance levels may not be sufficient to provide attraction for visitors.	Unlikely	Insignificant	Low
TDR	5	Potential increase in fire events – fire load, hotter temps, drier conditions	Possible	Moderate	High
TDR	6	Impact of water quality and general condition of recreational areas resulting in access restrictions	Unlikely	Minor	Low
TER	2	Council may see an impact of increased energy consumption and operational costs due to increased demand and usage for recreational facilities	Possible	Minor	Medium
TER	4	Community expectations of engagement by and direction from Council	Unlikely	Insignificant	Low
TAH	1	Outdoor staff working conditions impacted by increase in temperature	Possible	Moderate	High
TAH	3	Increase in food borne bacteria	Possible	Minor	Medium
TAH	5	Increase in water borne bacteria	Possible	Minor	Medium
TAH	6	Increase in potential for disease outbreaks	Unlikely	Minor	Low
TAH	10	Effect on general conditions at Councils after school child minding centres	Possible	Minor	Medium
TAH	11	Effect on water quality and condition at Council's semi public pools	Unlikely	Insignificant	Low
TBH	3	Increase in food borne bacteria	Possible	Minor	Medium
TBH	4	Increase in potential for disease outbreaks	Unlikely	Minor	Low
TBH	5	Increase in water borne bacteria	Possible	Minor	Medium
TBH	7	Effect on water quality and condition at Council's semi public pools	Unlikely	Insignificant	Low
TBH	8	Effect on general conditions at Councils after school child minding centres	Possible	Minor	Medium
TBH	9	Increased temps may cause increased algal blooms – effects on water quality treatment and monitoring	Possible	Minor	Medium
TCH	2	Increased temps may cause increased algal blooms – effects on water quality treatment and monitoring	Possible	Minor	Medium
TCH	3	Increased potential for legionella outbreaks	Unlikely	Insignificant	Low
TCH	4	Outdoor staff working conditions impacted by increase in temperature	Possible	Moderate	High

Risk Code	Risk Number	Risk Description	Likelihood	Consequence	Risk
TCH	6	Increase in food borne bacteria	Possible	Minor	Medium
TCH	8	Increase in water borne bacteria	Possible	Minor	Medium
TCH	9	Increase in potential for disease outbreaks	Unlikely	Minor	Low
TCH	11	Impact of water quality and general condition of recreational areas resulting in access restrictions	Unlikely	Minor	Low
TDH	1	Increase in food borne bacteria	Possible	Minor	Medium
TDH	3	Increase in water borne bacteria	Possible	Minor	Medium
TDH	4	Increase in potential for disease outbreaks	Unlikely	Minor	Low
TDH	5	Impact of water quality and general condition of recreational areas resulting in access restrictions	Unlikely	Minor	Low
TEH	5	Community expectations of engagement by and direction from Council	Unlikely	Minor	Low
TAP	2	Increased incidence of stock on roads	Rare	Insignificant	Low
TAP	3	Change in climatic zones and impact on building codes	Unlikely	Minor	Low
TBP	3	Annual temp rise may result in milder winter making the region more appealing	Unlikely	Minor	Low
TEP	1	Community expectations of engagement by and direction from Council	Unlikely	Minor	Low
TEP	2	Additional funding of works and the development of strategies to manage community expectations and legislative requirements	Unlikely	Minor	Low
TAN	1	Increased incidence of stock on roads	Rare	Insignificant	Low
TAN	2	Potential increase in fire events – fire load, hotter temps, drier conditions	Possible	Moderate	High
TAN	3	Increase in water borne bacteria in waterways – e.g. blue green algae	Possible	Minor	Medium
TAN	4	Increased risk of tree limb drop and resulting damage to property/person	Unlikely	Minor	Low
TBN	1	Poor water quality will reduce the attraction of residents/visitors to the City	Unlikely	Minor	Low
TBN	2	Increase in evaporation has potential to reduce water storage levels and availability	Possible	Moderate	High
TBN	3	Effect on the sustainable management of Councils natural resources.	Unlikely	Minor	Low
TBN	4	Potential increase in fire events – fire load, hotter temps, drier conditions	Possible	Moderate	High
TCN	1	Increase in water borne bacteria in waterways – e.g. blue green algae	Possible	Minor	Medium
TCN	2	Increase in evaporation has potential to reduce water storage levels and availability	Possible	Minor	Medium
TCN	3	Effect on the sustainable management of Councils natural resources.	Unlikely	Minor	Low
TDN	1	Changes in biodiversity and ecosystem and resulting general impact on plant and animal species	Possible	Insignificant	Low
TDN	2	Reduced water availability and quality will impact on aquatic ecosystems	Possible	Minor	Medium
TDN	3	Effect on the sustainable management of Councils natural resources.	Unlikely	Minor	Low

Risk Code	Risk Number	Risk Description	Likelihood	Consequence	Risk
TEN	1	Community expectations of engagement by and direction from Council	Unlikely	Minor	Low
TEN	2	Additional funding of works and in the development of strategies to manage community expectations	Unlikely	Minor	Low
TEN	3	Additional costs associated with the management of Councils natural env.	Unlikely	Minor	Low
TAW	1	Increase in water temperature would increase potential for higher levels of bacteria and algae	Possible	Minor	Medium
TAW	2	Resulting impact from a much higher demand for reticulated water	Unlikely	Minor	Low
TAW	3	Resulting impact from a much higher demand on Councils sewage system	Unlikely	Minor	Low
TAW	4	Resulting impact from a much higher demand for grey water	Unlikely	Minor	Low
TAW	6	Increased water treatment costs due to lower water quality of catchment supplies and associated potential health risks.	Possible	Minor	Medium
TAW	7	Reduced water availability may lead to a reduced capability to maintain gravel roads	Possible	Minor	Medium
TBW	1	Increase in evaporation has potential to reduce water storage levels and availability	Possible	Minor	Medium
TBW	2	Increased demand for water and resulting impact on water supplies	Unlikely	Minor	Low
TBW	3	Increased water and sewage costs	Unlikely	Minor	Low
TBW	4	Potential impact on industry re trade waste and water quality cost	Unlikely	Minor	Low
TBW	6	Adverse financial impacts on irrigation dependent agriculture, water intensive businesses and water supply agencies	Possible	Minor	Medium
TCW	2	Increase in evaporation has potential to reduce water storage levels and availability	Possible	Minor	Medium
TCW	4	Less regionally stored water in reservoirs	Possible	Minor	Medium
TCW	5	Domestic capture of grey water will lead to less water in the sewer system and potential odours	Unlikely	Minor	Low
TDW	1	Increase in water temperature would increase potential for higher levels of bacteria and algae	Possible	Minor	Medium
TEW	1	Community expectations of engagement by and direction from Council	Unlikely	Minor	Low
TEW	2	Additional funding of works and in the development of strategies to manage community expectations	Unlikely	Minor	Low
TEW	3	Additional costs associated with design criteria deficiencies in consideration of increased temperatures	Unlikely	Insignificant	Low



### Scenario for Hot Days (HD)

HD		Infrastructure and Property Services	Recreational Facilities	Health Services	Planning and Development	Natural Resources Management	Water and Sewage
		I	R	H	P	N	W
A	Maintain public safety	X	X				X
B	Protect and enhance the local economy						X
C	Protect existing community structures and the lifestyle enjoyed by the people of the region	X	X				X
D	Sustain and enhance the physical and natural environment						
E	Ensure sound public administration and governance	X	X		X	X	

Risk Code	Risk Number	Risk Description	Likelihood	Consequence	Risk
HDAI	1	Increased problems with dust around waste site cells which could adversely affect individuals with respiratory complaints	Possible	Minor	Medium
HDAI	3	An increase in the number of days above 35o C may result in some Council buildings being less habitable due to possible health implications for occupants	Unlikely	Minor	Low
HDAI	5	An increase in the number of hot days may place an increased load on air conditioning systems within Council buildings i.e. loss of a/cond efficiency or failure leading to unsafe/uncomfortable working conditions	Possible	Minor	Medium
HDAI	12	Effect of power outages/interruptions to council buildings and services caused by a greater demand on electricity supply during periods of extreme temperatures (a/cond, communications, equip, IT, lighting etc)	Unlikely	Moderate	Medium
HDCI	3	Access could be denied to some Council buildings.	Unlikely	Minor	Low
HDCI	9	Effect of power outages/interruptions to council buildings and services caused by a greater demand on electricity supply during periods of extreme temperatures (a/cond, communications, equip, IT, lighting etc)	Unlikely	Moderate	Medium
HDCI	10	Increased level of bitumen bleeding on roads	Possible	Minor	Medium
HDAR	4	There could be an impact on the chemical balance of the swimming pool water	Possible	Minor	Medium
HDAR	8	Effect of power outages/interruptions to council buildings and services caused by a greater demand on electricity supply during periods of extreme temperatures (a/cond, communications, equip, IT, lighting etc)	Unlikely	Moderate	Medium
HDCR	4	Extreme temps may cause increased algal blooms – effects on water quality treatment and monitoring	Unlikely	Minor	Low
HDCR	6	Outdoor staff working conditions impacted by extreme temperatures	Unlikely	Minor	Low
HDCR	15	Effect of power outages/interruptions to council buildings and services caused by a greater demand on electricity supply during periods of extreme temperatures (a/cond, communications, equip, IT, lighting etc)	Unlikely	Moderate	Medium
HDAW	1	Increase in water temperature would increase potential for higher levels of bacteria and algae	Unlikely	Minor	Low
HDAW	5	Impact of interruption to water and sewage infrastructure and supporting services	Unlikely	Moderate	Medium
HDAW	7	Effect of power outages/interruptions to council buildings and services caused by a greater demand on electricity supply during periods of extreme temperatures (a/cond, communications, equip, IT, lighting etc)	Unlikely	Moderate	Medium

<b>Risk Code</b>	<b>Risk Number</b>	<b>Risk Description</b>	<b>Likelihood</b>	<b>Consequence</b>	<b>Risk</b>
HDBW	5	Effect of power outages/interruptions to council buildings and services caused by a greater demand on electricity supply during periods of extreme temperatures (a/cond, communications, equip, IT, lighting etc)	Unlikely	Moderate	Medium
HDCW	3	Effect of power outages/interruptions to council buildings and services caused by a greater demand on electricity supply during periods of extreme temperatures (a/cond, communications, equip, IT, lighting etc)	Unlikely	Moderate	Medium

### Scenario for Rainfall (R)

R		Infrastructure and Property Services	Recreational Facilities	Health Services	Planning and Development	Natural Resources Management	Water and Sewage
		I	R	H	P	N	W
A	Maintain public safety	X	X			X	X
B	Protect and enhance the local economy	X			X		X
C	Protect existing community structures and the lifestyle enjoyed by the people of the region						X
D	Sustain and enhance the physical and natural environment		X			X	X
E	Ensure sound public administration and governance	X	X		X	X	X

Risk Code	Risk Number	Risk Description	Likelihood	Consequence	Risk
RAI	1	There could be an effect on vegetation surrounding Council assets which could cause injury or property damage.	Possible	Minor	Medium
RAI	2	Increased problem with dust levels around waste cells	Possible	Minor	Medium
RAI	3	Heritage buildings may have increased incidence of cracking due to reduced moisture in ground.	Possible	Minor	Medium
RAI	5	There could be increased problems with dust control on gravel roads.	Possible	Minor	Medium
RAI	6	Potential increase in fire events – fire load, hotter temps, drier conditions	Possible	Moderate	High
RAI	7	Increase in water borne bacteria in waterways – e.g. blue green algae	Possible	Minor	Medium
RAI	8	Increased risk of tree limb drop and resulting damage to property/person	Possible	Minor	Medium
RAI	9	There could be a significant impact on stormwater infrastructure as a result of increased intensity rain events	Unlikely	Insignificant	Low
RBI	1	Heritage buildings may have increased incidence of cracking due to reduced moisture in ground.	Possible	Minor	Medium
RBI	2	There could be an effect on vegetation surrounding Council assets which could cause injury or property damage.	Possible	Minor	Medium
RBI	4	There could be increased problems with dust control on gravel roads.	Possible	Minor	Medium
RCI	1	There could be an effect on vegetation surrounding Council assets which could cause injury or property damage.	Possible	Minor	Medium
RCI	2	Heritage buildings may have increased incidence of cracking due to reduced moisture in ground.	Possible	Minor	Medium
RCI	4	Increase in dust generated from roads impacting on Health	Unlikely	Minor	Low
RCI	5	There could be increased problems with dust control on gravel roads.	Unlikely	Minor	Low
RDI	1	Increased problem with dust levels around waste cells	Possible	Minor	Medium
RDI	2	There could be an effect on vegetation surrounding Council assets e.g. loss of tree and plant species	Possible	Insignificant	Low
RDI	3	Heritage buildings may have increased incidence of cracking due to reduced moisture in ground.	Possible	Minor	Medium
RDI	4	Loss/deterioration of native pastures- opportunity for weed invasion	Possible	Minor	Medium
RDI	5	Potential increase in fire events – fire load, hotter temps, drier conditions	Possible	Moderate	High
RDI	6	Increase in water borne bacteria in waterways – e.g. blue green algae	Possible	Minor	Medium
RDI	7	Increased risk of tree limb drop and resulting damage to property/person	Possible	Minor	Medium
REI	1	Community expectations of engagement by and direction from Council	Unlikely	Minor	Low

Risk Code	Risk Number	Risk Description	Likelihood	Consequence	Risk
REI	2	Funding the works, developing strategies to manage community expectations	Unlikely	Minor	Low
REI	3	Potential for increase in insurance claims for property damage caused by reduced moisture in ground (not tree root damage)	Unlikely	Insignificant	Low
RAR	1	Some sporting events using Council assets may need to be cancelled due to ground conditions	Unlikely	Insignificant	Low
RAR	2	Increase in hardness and reduced general condition of playing surfaces and recreational areas	Unlikely	Insignificant	Low
RAR	3	Potential increase in fire events – fire load, hotter temps, drier conditions	Possible	Moderate	High
RAR	4	Increase in water borne bacteria in waterways – e.g. blue green algae	Unlikely	Minor	Low
RAR	5	Increased risk of tree limb drop and resulting damage to property/person	Possible	Minor	Medium
RBR	1	Some sporting events using Council assets may need to be cancelled due to ground conditions	Unlikely	Insignificant	Low
RBR	2	Increase in hardness and reduced general condition of playing surfaces and recreational areas	Unlikely	Insignificant	Low
RBR	3	Sportsgrounds and general recreational facilities becoming less appealing to users	Possible	Insignificant	Low
RBR	4	Increased watering required at recreational areas	Likely	Moderate	High
RBR	5	Poorer quality water could have an adverse impact on local tourism	Possible	Minor	Medium
RBR	6	Due to reducing water levels access to and from boat ramps could be restricted and this could have a significantly detrimental effect on the local economy and tourism	Unlikely	Minor	Low
RBR	7	As a result of lower levels of rainfall there would be a decrease in tidal variation leading to significant negative impacts for shell fish fisheries	Unlikely	Insignificant	Low
RBR	8	Reducing levels of rainfall could lead to decreased viable pasture land, this in turn would result in increased pressure upon farming community to buy feed and water and the knock on effect for the local community	Likely	Minor	Medium
RCR	1	Some sporting events using Council assets may need to be cancelled due to ground conditions	Unlikely	Insignificant	Low
RCR	2	Sportsgrounds and general recreational facilities becoming less appealing to users	Unlikely	Insignificant	Low
RDR	1	Increase in hardness and reduced general condition of playing surfaces and recreational areas	Unlikely	Insignificant	Low
RDR	2	There could be an effect on vegetation in recreational areas e.g. loss of tree and plant species	Unlikely	Minor	Low

Risk Code	Risk Number	Risk Description	Likelihood	Consequence	Risk
RDR	3	Potential increase in fire events – fire load, hotter temps, drier conditions	Possible	Moderate	High
RDR	4	Increase in water borne bacteria in waterways – e.g. blue green algae	Unlikely	Minor	Low
RDR	5	Increased risk of tree limb drop and resulting damage to property/person	Unlikely	Minor	Low
RDR	6	Increased erosion and sedimentation	Unlikely	Insignificant	Low
RER	1	Community expectations of engagement by and direction from Council	Unlikely	Minor	Low
RER	2	Funding the works, developing strategies to manage community expectations	Unlikely	Minor	Low
RCH	1	Impact of the changes to water levels and associated health impacts	Unlikely	Minor	Low
RDH	1	Declining water quality in river/creek systems and resulting algal blooms	Possible	Minor	Medium
REH	1	Community expectations of engagement by and direction from Council	Unlikely	Minor	Low
RAP	1	Increased incidence of stock/ wildlife on roads	Possible	Minor	Medium
RAP	3	Long term water management may be impacted	Likely	Moderate	High
RBP	1	Inadequacy of the current plans and strategies for the consideration of future water needs and water efficiency	Possible	Minor	Medium
RBP	2	Impact on agricultural industries and businesses due to water availability	Likely	Minor	Medium
RBP	3	Reduced water availability to support future growth of the City	Likely	Moderate	High
RBP	4	Income from water services may be impacted	Possible	Moderate	High
RBP	5	Increased frequency of flood studies may be required	Unlikely	Insignificant	Low
RCP	1	Increased incidence of stock/ wildlife on roads	Possible	Minor	Medium
RCP	2	Impact on Agricultural industries and businesses due to water availability	Likely	Minor	Medium
RCP	3	Reduced water availability to support future growth of the City	Likely	Moderate	High
RCP	4	Inadequacy of the current plans and strategies for the consideration of future water needs and water efficiency	Possible	Minor	Medium
RDP	1	Inadequacy of the current plans and strategies for the consideration of future water needs and water efficiency	Possible	Minor	Medium
RDP	7	Reduced water availability to support future growth of the City	Likely	Moderate	High
REP	1	Community expectations of engagement by and direction from Council	Unlikely	Minor	Low
REP	2	Additional funding of works and the development of strategies to manage community expectations and legislative requirements	Unlikely	Minor	Low
RAN	1	There could be an effect on vegetation in recreational areas e.g. loss of tree and plant species	Possible	Minor	Medium
RAN	2	Potential increase in fire events – fire load, hotter temps, drier conditions	Possible	Moderate	High
RAN	3	Increase in water borne bacteria in waterways – e.g. blue green algae	Possible	Minor	Medium



<b>Risk Code</b>	<b>Risk Number</b>	<b>Risk Description</b>	<b>Likelihood</b>	<b>Consequence</b>	<b>Risk</b>
RAN	4	Increased risk of tree limb drop and resulting damage to property/person	Unlikely	Minor	Low
RAN	5	Increased fire mitigation strategies will be required	Possible	Minor	Medium
RBN	1	Increased cost of weed programs	Possible	Minor	Medium
RBN	2	Impact of climatic changes on the management of the lakes and waterway ecosystems	Unlikely	Minor	Low
RBN	3	Increased costs for maintaining parks and reserves	Possible	Minor	Medium
RCN	1	Impact of climatic changes on the management of the lakes and waterway ecosystems	Unlikely	Minor	Low
RCN	2	Increased threat to wetland ecosystems including rivers and creeks	Possible	Minor	Medium
RDN	1	Loss/deterioration of native pastures- opportunity for weed invasion	Likely	Minor	Medium
RDN	2	Increased pressure on landholders – weeds	Likely	Minor	Medium
RDN	3	Impact of climatic changes on the management of the lakes and waterway ecosystems	Unlikely	Minor	Low
RDN	4	Loss of vegetation due to changes in soil moisture	Possible	Minor	Medium
RDN	5	Increased threat to wetland ecosystems including river and creeks due to lower environmental flows	Possible	Minor	Medium
REN	1	Community expectations of engagement by and direction from Council	Unlikely	Minor	Low
REN	2	Additional funding of works and the development of strategies to manage community expectations	Unlikely	Minor	Low
REN	3	Increased pressure on Council re Park and reserve management	Possible	Minor	Medium
RAW	1	Resulting impact from a potentially reduced level of water supply to meet the community demand	Possible	Moderate	High
RAW	2	Due to a decrease in through flow into sewerage treatment plants there could be increasing odour issues	Unlikely	Minor	Low
RBW	1	Resulting impact from a potentially reduced level of water supply to meet the community demand	Possible	Moderate	High
RBW	2	Increased water and sewage costs	Likely	Minor	Medium
RCW	1	Resulting impact from a potentially reduced level of water supply to meet the community demand	Possible	Moderate	High
REW	1	Community expectations of engagement by and direction from Council	Unlikely	Minor	Low
REW	2	Additional funding of works and the development of strategies to manage community expectations	Unlikely	Minor	Low
REW	3	Increased pressures on Council re water management	Possible	Moderate	High

### Scenario for Wind (W)

		Infrastructure and Property Services	Recreational Facilities	Health Services	Planning and Development	Natural Resources Management	Water and Sewage
		I	R	H	P	N	W
<b>A</b>	<b>Maintain public safety</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>
<b>B</b>	<b>Protect and enhance the local economy</b>	<b>X</b>					
<b>C</b>	<b>Protect existing community structures and the lifestyle enjoyed by the people of the region</b>		<b>X</b>				<b>X</b>
<b>D</b>	<b>Sustain and enhance the physical and natural environment</b>						
<b>E</b>	<b>Ensure sound public administration and governance</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>x</b>

Risk Code	Risk Number	Risk Description	Likelihood	Consequence	Risk
WAI	1	There could be an effect on vegetation surrounding Council assets which could cause injury or property damage.	Rare	Minor	Low
WAI	2	Council's infrastructure could be damaged or affected by higher than normal wind.	Possible	Minor	Medium
WAI	3	Council buildings and other assets could be damaged or affected by higher than normal wind.	Possible	Minor	Medium
WAI	4	May have an impact on the types of outdoor tasks that can be undertaken by council	Possible	Minor	Medium
WAI	5	Increased problems with dust control on gravel roads	Possible	Minor	Medium
WAI	6	Increased risk of trees and tree limbs falling onto Council controlled areas, including roads, parks and reserves	Unlikely	Moderate	Medium
WAI	7	Increase in wind blown litter and dust throughout the community	Unlikely	Insignificant	Low
WAI	8	Increased risk of injury to outdoor workers due to the dangerous working environment associated with higher than normal winds	Unlikely	Minor	Low
WAI	9	Increased risk of injury to the community members using Council controlled facilities during higher than normal wind periods	Unlikely	Moderate	Medium
WAI	10	Effect of power outages/interruptions to council buildings and services caused by damage to electricity suppliers infrastructure during periods of extreme wind (a/cond, communications, equip, IT, lighting etc)	Unlikely	Moderate	Medium
WBI	1	There could be an effect on vegetation around Council assets which could cause injury or property damage.	Unlikely	Minor	Low
WBI	3	Increase in wind blown litter and dust throughout the community	Unlikely	Insignificant	Low
WBI	4	Effect of power outages/interruptions to council buildings and services caused by damage to electricity suppliers infrastructure during periods of extreme wind (a/cond, communications, equip, IT, lighting etc)	Unlikely	Moderate	Medium
WEI	1	Increased cost of repairs to Council assets that could be affected by higher than normal wind.	Unlikely	Minor	Low
WEI	2	Increased cost of repairs to Council buildings that could be affected by higher than normal winds.	Unlikely	Minor	Low
WEI	3	Increased cost of repairs to Council infrastructure that could be affected by higher than normal winds.	Unlikely	Minor	Low
WEI	4	Emergency Mgt issues (staffing/emergency centre/equipment/fatigue etc) during storm	Possible	Minor	Medium

Risk Code	Risk Number	Risk Description	Likelihood	Consequence	Risk
WEI	5	Increased number and costs associated with insurance claims – Public Liability/Property/Workers Comp	Unlikely	Moderate	Medium
WEI	7	Increased level of community enquiries and complaints	Possible	Minor	Medium
WEI	9	Community expectations of engagement by and direction from Council	Unlikely	Minor	Low
WAR	1	There could be an effect on vegetation surrounding Council assets which could cause injury or property damage.	Unlikely	Minor	Low
WAR	2	Council's recreational infrastructure could be damaged or affected by higher than normal wind.	Unlikely	Minor	Low
WAR	3	Increase risk of trees and tree limbs falling onto Council controlled recreational areas, including parks and reserves	Possible	Minor	Medium
WAR	4	Increase in wind blown litter and dust throughout the community	Unlikely	Minor	Low
WAR	5	Increased risk of injury to outdoor workers due to the dangerous working environment associated with high winds	Unlikely	Minor	Low
WAR	6	Increased risk of injury to the community members using Council controlled facilities during higher than normal wind periods	Unlikely	Minor	Low
WAR	7	Effect of power outages/interruptions to council buildings and services caused by damage to electricity suppliers infrastructure during periods of extreme wind (a/cond, communications, equip, IT, lighting etc)	Unlikely	Moderate	Medium
WCR	1	There could be an effect on vegetation around Council assets which could cause injury or property damage.	Unlikely	Minor	Low
WCR	2	Council's recreational infrastructure could be damaged or affected by higher than normal wind.	Unlikely	Minor	Low
WCR	3	Increased wind may lead to increased moisture loss. Increased maintenance costs of recreational infrastructure and areas	Possible	Minor	Medium
WCR	4	Increase in wind blown litter and dust throughout the community	Unlikely	Minor	Low
WCR	5	Effect of power outages/interruptions to council buildings and services caused by damage to electricity suppliers infrastructure during periods of extreme wind (a/cond, communications, equip, IT, lighting etc)	Unlikely	Minor	Low
WER	1	Increased clean up costs and maintenance costs associated with Council's recreational areas that could be affected by higher than normal winds.	Possible	Minor	Medium
WER	2	Emergency Mgt issues (staffing/emergency centre/equipment/fatigue etc) during storm	Possible	Minor	Medium
WER	3	Increased number and costs associated with insurance claims – Public Liability/Property/Workers Comp	Unlikely	Minor	Low

Risk Code	Risk Number	Risk Description	Likelihood	Consequence	Risk
WER	5	Increased level of community enquiries and complaints	Possible	Minor	Medium
WER	7	Community expectations of engagement by and direction from Council	Unlikely	Minor	Low
WAP	3	Increased potential of dust escaping from development sites	Possible	Minor	Medium
WEP	3	Increased level of community enquiries and complaints	Unlikely	Minor	Low
WEP	5	Community expectations of engagement by and direction from Council	Unlikely	Minor	Low
WAN	1	Effect of higher winds on emergency services (role and personnel)	Unlikely	Minor	Low
-	0	Effect of higher winds increasing number of emergency call out responses	Possible	Minor	Medium
WAN	2	Council assets could be damaged or affected by higher than normal wind.	Unlikely	Minor	Low
WAN	3	Increased risk of trees and tree limbs falling onto Council controlled areas.	Unlikely	Minor	Low
WEN	1	Increased clean up costs and maintenance costs of Council's natural resource areas that could be affected by higher than normal winds.	Unlikely	Minor	Low
WEN	3	Increased number and costs associated with insurance claims	Unlikely	Minor	Low
WEN	5	Increased level of community enquiries and complaints	Unlikely	Minor	Low
WEN	7	Community expectations of engagement by and direction from Council	Unlikely	Minor	Low
WAW	1	Effect of power outages/interruptions to council buildings and services caused by damage to electricity suppliers infrastructure during periods of extreme wind (a/cond, communications, equip, IT, lighting etc)	Unlikely	Minor	Low
WCW	2	Effect of power outages/interruptions to council buildings and services caused by damage to electricity suppliers infrastructure during periods of extreme wind (a/cond, communications, equip, IT, lighting etc)	Unlikely	Minor	Low
WEW	1	Increased spread of sewer treatment plant odour	Possible	Minor	Medium

### Scenario for Fire Weather (FW)

FW		Infrastructure and Property Services	Recreational Facilities	Health Services	Planning and Development	Natural Resources Management	Water and Sewage
		I	R	H	P	N	W
A	Maintain public safety	X	X		X	X	X
B	Protect and enhance the local economy				X	X	
C	Protect existing community structures and the lifestyle enjoyed by the people of the region						
D	Sustain and enhance the physical and natural environment				X	X	X
E	Ensure sound public administration and governance	X	X		X	X	X

<b>Risk Code</b>	<b>Risk Number</b>	<b>Risk Description</b>	<b>Likelihood</b>	<b>Consequence</b>	<b>Risk</b>
FWAI	1	Increased FFDI conditions increasing the risk of fires in land fill waste cells	Possible	Minor	Medium
FWAI	2	Increase in severity and number of bushfires causing an increased risk or injury or fatalities	Possible	Moderate	High
FWAI	3	After fires there may be an effect on vegetation on council property and to assets; causing an increased risk of injury e.g. loss of fences / safety barriers, walking tracks	Unlikely	Moderate	Medium
FWAI	4	Extreme FFDI conditions or fire may cause interruptions to the power supply and council services that help to protect public safety e.g. waste and cleansing services	Unlikely	Moderate	Medium
FWAI	5	Costs associated with the replacement of damaged/destroyed recreational infrastructure	Unlikely	Moderate	Medium
FWEI	1	Increased fire damage to council assets will increase clean-up and maintenance costs	Possible	Minor	Medium
FWEI	3	Severe fire events may lead to a greater need for access to public buildings and larger capacity for emergency housing	Possible	Moderate	High
FWEI	4	Increased number of fire events increases the demand on emergency management planning, facilities, resource levels and costs	Unlikely	Moderate	Medium
FWEI	5	Increase in severity and number of bushfires leading to increased costs to repair and replace above ground infrastructure	Unlikely	Moderate	Medium
FWEI	6	Increase in severity and number of bushfires causing potential disruption to telecommunication activities and community liaison	Possible	Moderate	High
FWEI	8	Fires may impact assets and vegetation on and around council property, leading to injuries, asset loss or devaluation and liability / indemnity issues	Unlikely	Moderate	Medium
FWEI	9	Extreme FFDI conditions and increased fire events may lead to increased concerns, enquiries, requests for information and council's direct assistance to protect privately-owned infrastructure and property	Possible	Minor	Medium
FWAR	2	Fire effected trees and high risk of trees falling will increase risks to people in recreational areas	Unlikely	Moderate	Medium
FWAR	3	Damage to physical assets within Council recreational areas could impact upon public health and wellbeing	Unlikely	Minor	Low
FWER	1	Community expectations of council to invest in and manage strategies that protect and maintain its recreational facilities from fire risks	Possible	Minor	Medium
FWER	2	Community access policy to recreational facilities may need to be reviewed	Unlikely	Moderate	Medium

<b>Risk Code</b>	<b>Risk Number</b>	<b>Risk Description</b>	<b>Likelihood</b>	<b>Consequence</b>	<b>Risk</b>
		in light of CC risks			
FWBP	3	Increase in severity and number of bushfires leading to potential increased costs to residential and commercial building owners, investors and developers	Possible	Minor	Medium
FWDP	1	Increase in severity and number of bushfires impacting the suitability of tree species on and around council and private property	Unlikely	Minor	Low
FWEP	2	Increase in the severity and number of bushfires may have cost and reputation impacts on council's strategic, public land use and development planning processes (e.g. maintaining adequate resources, expertise, policy reviews and updates)	Possible	Minor	Medium
FWEP	3	Increased direct costs of human capital and indirect costs (e.g. ongoing research, policy review and skill development) to keep abreast of evolving climate change impacts and legislative requirements	Possible	Minor	Medium
FWEP	4	Community expectations of council to invest in and manage strategies that ensure planning standards and controls are consistent with increased fire risks	Likely	Minor	Medium
FWAN	1	Change in weather conditions may increase vegetation fuel accumulation and the risk of fire	Possible	Moderate	High
FWAN	2	Increases in frequency and severity of bushfires have the potential to increase the risk of injury/death to members of the public	Possible	Minor	Medium
FWBN	2	Increase in severity and frequency of bushfires has the potential to negatively impact on Councils tourism finances due to a loss of natural attributes within the shire	Unlikely	Moderate	Medium
FWDN	1	Change of fire regimes may have an affect on native pastures and council owned green space e.g. increased weed growth	Possible	Minor	Medium
FWAW	2	Increased use of water in fighting fire and clean up after fires, may effect water supply levels	Unlikely	Minor	Low
FWAW	3	There is the potential for damage to water pump stations in the event of bushfires which would impact upon water supply levels	Unlikely	Moderate	Medium
FWAW	4	There could be an impact on sewerage infrastructure e.g. pump stations and STP's which would impact upon public safety and health	Unlikely	Moderate	Medium
FWDW	1	Increase in severity and number of bushfires impacting on vegetation, the siltation of waterways, drainage systems and erosion	Possible	Minor	Medium
FWEW	1	Extreme FFDI conditions and increased fire events may lead to increased concerns, enquiries, requests for information and advice to council on the water supply and quality	Unlikely	Minor	Low



Risk Code	Risk Number	Risk Description	Likelihood	Consequence	Risk
FWEW	2	Community expectations of council to invest in and manage strategies that protect water systems from harmful fire effects (e.g. contam, loss of supply).	Unlikely	Minor	Low

### Scenario for Rain Intensity (RI)

RI		Infrastructure and Property Services	Recreational Facilities	Health Services	Planning and Development	Natural Resources Management	Water and Sewage
		I	R	H	P	N	W
A	Maintain public safety	X	X		X	X	X
B	Protect and enhance the local economy						X
C	Protect existing community structures and the lifestyle enjoyed by the people of the region		X			X	X
D	Sustain and enhance the physical and natural environment		X		X	X	X
E	Ensure sound public administration and governance	X	X		X	X	X

<b>Risk Code</b>	<b>Risk Number</b>	<b>Risk Description</b>	<b>Likelihood</b>	<b>Consequence</b>	<b>Risk</b>
RIAI	1	Debris build-up exacerbating flooding issues in stormwater system	Possible	Minor	Medium
RIAI	2	Road/Bridge Closures necessary causing access problems for residents and associated health/safety reasons	Unlikely	Moderate	Medium
RIAI	3	Impact of Grids/signage/culverts damaged by the flood waters	Possible	Minor	Medium
RIAI	4	Staff Safety associated with flood effected working environment and to/from work issues	Possible	Minor	Medium
RIAI	7	Council property/buildings/bridges/road pavement/footpaths and equipment damage	Possible	Minor	Medium
RIAI	12	Risks associated with community complacency and their unsafe/unpredictable and stupid behaviour during the event	Possible	Minor	Medium
RIAI	13	Effect of power outages/interruptions to council buildings and services caused by damage to electricity suppliers infrastructure during periods of extreme rainfall periods (a/cond, communications, equip, IT, lighting etc)	Unlikely	Moderate	Medium
RIBI	1	Cost associated with repairing council property (Road/Bridge/buildings/equipment etc) damaged	Possible	Minor	Medium
RIBI	2	Costs associated with general Clean up of debris etc	Possible	Minor	Medium
RIBI	3	Impact of reduced movement between parts on the city and surrounding villages	Possible	Minor	Medium
RIBI	4	Effect of power outages/interruptions to council buildings and services caused by damage to electricity suppliers infrastructure during periods of extreme rainfall periods (a/cond, communications, equip, IT, lighting etc)	Unlikely	Minor	Low
RICI	1	Increased flooding of sportsgrounds, parks and reserves	Unlikely	Minor	Low
RICI	2	Effect of power outages/interruptions to council buildings and services caused by damage to electricity suppliers infrastructure during periods of extreme rainfall periods (a/cond, communications, equip, IT, lighting etc)	Unlikely	Minor	Low
RIDI	1	Impact of increased erosion on infrastructure/waterways	Possible	Minor	Medium
RIDI	2	Effect of power outages/interruptions to council buildings and services caused by damage to electricity suppliers infrastructure during periods of extreme rainfall periods (a/cond, communications, equip, IT, lighting etc)	Unlikely	Minor	Low
RIEI	1	Emergency Mgt issues (staffing/emergency centre/equipment/fatigue etc) during storm	Possible	Minor	Medium
RIEI	2	Loss of income from council commercial activities and deductibles	Unlikely	Minor	Low
RIEI	3	Increased number and cost associated with insurance claims – Public	Unlikely	Minor	Low

Risk Code	Risk Number	Risk Description	Likelihood	Consequence	Risk
		Liability/Property/Workers Comp			
RIEI	4	Recovery phase issues (staff/equipment/recovery centre/fatigue)	Unlikely	Minor	Low
RIEI	5	Increased level of community enquiries and complaints	Unlikely	Minor	Low
RIEI	7	Current insurance policies not covering all scenarios of the event	Unlikely	Moderate	Medium
RIEI	8	Community expectations of engagement by and direction from Council	Possible	Minor	Medium
RIAR	1	Risks associated with community complacency and their unsafe/unpredictable and stupid behaviour during the event	Possible	Minor	Medium
RIAR	2	Damage to recreational facilities e.g. playground equipment etc	Possible	Minor	Medium
RIAR	3	Increased risk of community injuries caused by damaged recreational facilities	Unlikely	Moderate	Medium
RIAR	4	Effect of power outages/interruptions to council buildings and services caused by damage to electricity suppliers infrastructure during periods of extreme rainfall periods (a/cond, communications, equip, IT, lighting etc)	Unlikely	Minor	Low
RIBR	1	Increased flooding of sportsgrounds, parks and reserves	Possible	Minor	Medium
RIBR	2	Effect of power outages/interruptions to council buildings and services caused by damage to electricity suppliers infrastructure during periods of extreme rainfall periods (a/cond, communications, equip, IT, lighting etc)	Unlikely	Minor	Low
RICR	1	Increased flooding of sportsgrounds, parks and reserves	Possible	Minor	Medium
RICR	2	Effect of power outages/interruptions to council buildings and services caused by damage to electricity suppliers infrastructure during periods of extreme rainfall periods (a/cond, communications, equip, IT, lighting etc)	Unlikely	Minor	Low
RIDR	1	Impact of increased erosion on infrastructure / waterways caused by heavy rain and flood waters	Unlikely	Minor	Low
RIDR	2	Impact of increased tree fall and other vegetation damage in the waterways and recreational areas caused by heavy water and flood waters	Possible	Minor	Medium
RIDR	3	Effect of power outages/interruptions to council buildings and services caused by damage to electricity suppliers infrastructure during periods of extreme rainfall periods (a/cond, communications, equip, IT, lighting etc)	Unlikely	Minor	Low
RIER	1	Increased number and cost associated with insurance claims – Public Liability/Property/Workers Comp	Possible	Minor	Medium
RIER	2	Current insurance policies not covering all scenarios of the event	Unlikely	Moderate	Medium
RIER	3	Increased level of community enquiries and complaints	Possible	Minor	Medium
RIER	4	Community expectations of engagement by and direction from Council	Possible	Minor	Medium
RIDP	2	Council infrastructure design deficiencies e.g. roads, culverts, storm water system etc	Possible	Moderate	High

Risk Code	Risk Number	Risk Description	Likelihood	Consequence	Risk
RIDP	4	Increased risk of erosion and sedimentation	Possible	Minor	Medium
RIDP	5	Increased inundation on private developments as a result of failure to comply with current development conditions	Possible	Moderate	High
RIEP	1	Increased level of community enquiries and complaints	Unlikely	Minor	Low
RIEP	2	Increased number and cost associated with insurance claims – Professional Indemnity	Unlikely	Minor	Low
RIEP	3	Community expectations of engagement by and direction from Council	Possible	Minor	Medium
RIEP	4	Additional funding of works and the development of strategies to manage community expectations and legislative requirements	Unlikely	Minor	Low
RIAN	1	Impact of increased erosion on infrastructure/waterways caused by heavy rain and flood waters	Possible	Minor	Medium
RIAN	2	Impact of increased tree fall and other vegetation damage in the waterways and recreational areas caused by heavy water and flood waters	Possible	Minor	Medium
RIDN	1	Impact of increased erosion on infrastructure / waterways caused by heavy rain and flood waters	Possible	Minor	Medium
RIDN	2	Impact of increased tree fall and other vegetation damage in the waterways and recreational areas caused by heavy water and flood waters	Possible	Minor	Medium
RIDN	3	Impact of increased sediment movement	Possible	Minor	Medium
RIEN	2	Community expectations of engagement by and direction from Council	Unlikely	Minor	Low
RIEN	3	-			
RIAW	1	Impact of increased infiltration into the sewage infrastructure	Possible	Minor	Medium
RIAW	2	Impact of increased level of detritus material into water	Possible	Minor	Medium
RIAW	3	Risk of dam failure or damage	Rare	Major	Medium
RIAW	4	Effect of power outages/interruptions to council buildings and services caused by damage to electricity suppliers infrastructure during periods of extreme rainfall periods (a/cond, communications, equip, IT, lighting etc)	Unlikely	Minor	Low
RIAW	5	Effect of loss of other public utility services during periods of extreme rainfall periods e.g. Telecommunications	Unlikely	Moderate	Medium
RIBW	1	Effect of power outages/interruptions to council buildings and services caused by damage to electricity suppliers infrastructure during periods of extreme rainfall periods (a/cond, communications, equip, IT, lighting etc)	Unlikely	Minor	Low
RICW	1	Inadequate stormwater system exacerbating the flooding issues	Possible	Moderate	High
RICW	2	Increased risk of low lying water/sewage equipment being damaged	Possible	Moderate	High

Risk Code	Risk Number	Risk Description	Likelihood	Consequence	Risk
RICW	3	Effect of power outages/interruptions to council buildings and services caused by damage to electricity suppliers infrastructure during periods of extreme rainfall periods (a/cond, communications, equip, IT, lighting etc)	Possible	Minor	Medium
RIDW	1	Effect of power outages/interruptions to council buildings and services caused by damage to electricity suppliers infrastructure during periods of extreme rainfall periods (a/cond, communications, equip, IT, lighting etc)	Possible	Minor	Medium
RIEW	1	Increased level of community enquiries and complaints	Unlikely	Minor	Low
RIEW	2	Increased number and cost associated with insurance claims – Public Liability/Property	Possible	Minor	Medium
RIEW	5	Current insurance policies not covering all scenarios of the event	Unlikely	Moderate	Medium
RIEW	6	Community expectations of engagement by and direction from Council	Unlikely	Minor	Low
RIEW	7	Compliance with existing operating licence conditions	Unlikely	Minor	Low

### Scenario for Sea Level (SL)

SL		Infrastructure and Property Services	Recreational Facilities	Health Services	Planning and Development	Natural Resources Management	Water and Sewage
		I	R	H	P	N	W
A	Maintain public safety	X	X	X	X	X	X
B	Protect and enhance the local economy	X	X		X		X
C	Protect existing community structures and the lifestyle enjoyed by the people of the region	X	X		X		X
D	Sustain and enhance the physical and natural environment	X	X		X	X	X
E	Ensure sound public administration and governance	X	X	X	X	X	X

Risk Code	Risk Number	Risk Description	Likelihood	Consequence	Risk
SLAI	1	Strategies to evacuate vulnerable areas must be developed and account for heightened levels of impact during storm events	Possible	Minor	Medium
SLAI	2	Maintenance funding and regimes for council's existing infrastructure and property must take into account gradual sea level rise	Possible	Minor	Medium
SLAI	4	Septic systems may be affected by changes to water table and inundation	Possible	Major	High
SLAI	5	There may be a need to relocate/modify essential Council infrastructure	Almost Certain	Major	Extreme
SLAI	7	Strategies to evacuate vulnerable areas must be developed and account for heightened levels of impact during storm events	Possible	Moderate	High
SLAI	8	Maintenance funding and regimes for council's existing infrastructure and property must take into account gradual sea level rise	Likely	Minor	Medium
SLAI	10	Septic systems may be affected by changes to water table and inundation	Possible	Major	High
SLAI	11	There may be a need to relocate/modify essential Council infrastructure	Almost Certain	Major	Extreme
SLAI	13	Strategies to evacuate vulnerable areas must be developed and account for heightened levels of impact during storm events	Possible	Moderate	High
SLAI	14	Maintenance funding and regimes for council's existing infrastructure and property must take into account gradual sea level rise	Likely	Minor	Medium
-	0	There may be a need to relocate/modify essential Council infrastructure	Almost Certain	Major	Extreme
SLBI	1	There may be an inundation of vulnerable Council assets (e.g. foreshore open space and car parks, boat ramps, bicycle paths, boardwalks, fish cleaning facilities etc), which cannot be used by the community	Likely	Minor	Medium
SLBI	4	Sea level rise combined with storm surge events may lead to blockage of access and service routes	Possible	Moderate	High
SLBI	5	There may be a need to relocate/modify essential Council infrastructure	Almost Certain	Major	Extreme
SLBI	7	There may be an inundation of vulnerable Council assets (e.g. foreshore open space and car parks, boat ramps, bicycle paths, boardwalks, fish cleaning facilities etc), which cannot be used by the community	Likely	Minor	Medium
SLBI	10	Sea level rise combined with storm surge events may lead to blockage of access and service routes	Possible	Moderate	High

Risk Code	Risk Number	Risk Description	Likelihood	Consequence	Risk
SLBI	11	There may be a need to relocate/modify essential Council infrastructure	Almost Certain	Major	Extreme
SLBI	13	There may be an inundation of vulnerable Council assets (e.g. foreshore open space and car parks, boat ramps, bicycle paths, boardwalks, fish cleaning facilities etc), which cannot be used by the community	Likely	Minor	Medium
-	16	Sea level rise combined with storm surge events may lead to blockage of access and service routes	Possible	Moderate	High
SLCI	1	Council run utilities servicing Council assets may become effected due to increasing vulnerability to structural failure and maintenance costs	Unlikely	Moderate	Medium
SLCI	2	Some Council assets may gradually become unserviceable and are retired	Possible	Minor	Medium
SLCI	3	There may be a need to relocate/modify essential Council infrastructure	Likely	Major	High
SLCI	4	There could be a complete shift in the layout of the town	Possible	Major	High
SLDI	1	Threats to historical and cultural sites (e.g. middens in close proximity to intertidal margins)	Possible	Minor	Medium
SLDI	2	Changes to infrastructure may impact upon Councils ability to sustain and enhance the physical and natural environment	Likely	Minor	Medium
SLEI	1	Council may need to increase preventative expenditure to protect infrastructure and property e.g. sea wall protection, sand replenishment, flood levies	Likely	Major	High
SLEI	2	There is the potential for an increased cost of insurance claims (e.g. personal injury, damage from Council's failed infrastructure, professional indemnity) and loss of insurance cover	Unlikely	Minor	Low
SLEI	4	Council may need to be increase capability to manage contractual issues around capital works and re/development (e.g. ensure that sea level rise implications are appropriately managed by all relevant parties to a contract)	Possible	Minor	Medium
SLEI	5	Community expectations of council to invest in and manage strategies that protect its infrastructure and property from sea level rise risks	Possible	Minor	Medium
SLEI	6	There may be increased concerns, enquiries, requests for information and council's direct assistance to protect privately-owned infrastructure and property from sea level rise damage	Possible	Minor	Medium
SLAR	1	Council may need to continually assess and inform the community of beach erosion, inundation and shoreline recession hazards	Likely	Minor	Medium
SLAR	3	There may be a need to relocate/modify essential Council infrastructure	Likely	Major	High



Risk Code	Risk Number	Risk Description	Likelihood	Consequence	Risk
SLAR	4	Changes to infrastructure may impact upon Councils ability to sustain and enhance recreational facilities/opportunities	Possible	Major	High
SLBR	1	There may be an inundation of vulnerable Council assets (e.g. foreshore open space, boat ramps, bicycle paths, boardwalks etc), which cannot be used by the community	Possible	Minor	Medium
SLBR	2	Commercial operations in coastal areas and on council property may be impacted, leading to operations being relocated or ceased	Possible	Minor	Medium
SLBR	3	Beach space above the wave run-up will be effected, impacting on visitor and tourism numbers	Likely	Minor	Medium
SLCR	1	Beach space above the wave run-up will be effected, limiting its use	Likely	Minor	Medium
SLCR	2	Commercial operations in coastal areas and on council property may be effected, impacting on the enjoyment of coastal areas	Possible	Minor	Medium
SLCR	3	Existing access to some recreational facilities may have to be altered to accommodate rises in sea level	Likely	Minor	Medium
SLDR	1	Council must monitor and plan for population growth and recreational needs, particularly in relation to the continued demand for coastal / 'waterways' living and leisure activities	Possible	Minor	Medium
SLDR	2	Existing access to some natural areas (beaches, reserves) may have to be altered to accommodate rises in sea level	Likely	Minor	Medium
SLER	1	Community expectations of council to invest in and manage strategies that protect and maintain its recreational facilities from sea level rise risks	Likely	Minor	Medium
SLER	2	Council may have to develop strategies for the abandonment of some recreational facilities and assets	Likely	Moderate	High
SLAH	1	Sea level rise combined with storm surge events may lead to the failure of facilities such as sewerage treatment plants from inundation and flooding	Possible	Major	High
SLAH	2	Increased number of water logged low lying areas may increase the propensity of vector borne diseases	Possible	Minor	Medium
SLEH	1	Community expectations of council to invest in and manage strategies that protect public health associated with sea level rise risks	Possible	Minor	Medium
SLAP	2	Planning, design, construction and maintenance of all proposed new developments must take into account sea level rise	Likely	Minor	Medium
SLAP	3	Coastal management plans must take into account the potential for future climate change to affect the magnitude of coastline hazards	Almost Certain	Minor	High

Risk Code	Risk Number	Risk Description	Likelihood	Consequence	Risk
SLAP	4	Council must continually update and review Emergency Management plans taking into consideration sea level rise impacts	Likely	Moderate	High
SLBP	1	Potential decrease or shifts in the LGA population as people move away from coastal or intertidal zones	Unlikely	Minor	Low
SLBP	2	There could be a complete shift in the layout of the town	Possible	Major	High
SLBP	3	Ensure flexibility in planning & development to allow adaptive responses to shifts in local economy	Possible	Minor	Medium
SLBP	4	Ensuring that LEP's take into consideration the impacts of sea level rise	Almost Certain	Moderate	High
SLCP	1	Coastal zone management plans must make specific provisions for protecting and preserving beach environments, beach amenity, emergency management and measures for flexible public access to beaches, headlands and waterways	Likely	Moderate	High
SLCP	2	Ensuring that LEP's take into consideration the impacts of sea level rise	Almost Certain	Moderate	High
SLDP	1	Urban / rural residential land release and development strategies must factor in ESD principles and the preservation of important environmental attributes.	Likely	Minor	Medium
SLDP	2	Council must ensure that understands and contributes to initiatives at all levels of government (e.g. protected marine areas, estuary management plans, 'Coastcare')	Possible	Minor	Medium
SLDP	3	Council must ensure that land use planning takes into consideration the geographic shifts in natural systems caused by sea level rise	Likely	Minor	Medium
SLEP	1	Uncertainty about legal consequences for councils refusing or approving coastal developments causing exposure to cost and reputation risks	Possible	Moderate	High
SLEP	2	Community expectations of council to invest in and manage strategies that ensure planning standards and controls are consistent with sea level rise risks	Possible	Minor	Medium
SLEP	3	Increased direct costs of human capital and indirect costs (e.g. ongoing research, policy review and skill development) to keep abreast of evolving climate change impacts and legislative requirements	Possible	Minor	Medium
SLEP	4	Potential cost and reputation impacts relating to council's strategic, public land use and development planning processes (e.g. Maintaining adequate resources, expertise, policy reviews and updates)	Unlikely	Minor	Low

Risk Code	Risk Number	Risk Description	Likelihood	Consequence	Risk
SLEP	5	Flood studies, Development Control Plans and other local planning instruments should consider sea level rise impacts (e.g. foreshore building exclusion zones and restricted development sites)	Almost Certain	Moderate	High
SLEP	6	Zoning certificates need to adequately reflect potential sea level rise impacts	Likely	Moderate	High
SLAN	1	Council must continually update and review Emergency Management plans taking into consideration sea level rise impacts	Likely	Moderate	High
SLBN	1	Existing qualities of natural ecosystems and the contribution that they make to the local economy must be sustained	Likely	Minor	Medium
SLBN	2	The loss or degradation of local beaches would also negatively impact upon the local economy	Likely	Minor	Medium
SLCN	1	The changes in vegetation and biodiversity on public land, dunes and headlands will need to be managed taking into consideration the potential impacts of sea level rise	Likely	Minor	Medium
SLCN	2	Council must ensure that land use planning takes into consideration the geographic shifts in natural systems caused by sea level rise	Likely	Minor	Medium
SLDN	1	Increased salt gradient, erosion and inundation may affect the condition and sustainability of natural resources	Possible	Minor	Medium
SLEN	1	Community expectations of council to invest in and manage strategies that protect the natural environment from increased sea level rise risks	Possible	Minor	Medium
SLEN	2	Council may require additional information and expertise to manage impacts such as erosion and landslide susceptibility in relation to its natural resources e.g. geotechnical reports	Unlikely	Minor	Low
SLAW	1	Trunk sewers close to existing sea levels may be subject to increasing infiltration and deterioration	Possible	Moderate	High
SLAW	2	Ground water derived drinking water supplies may be subject to increased salt water intrusion	Possible	Moderate	High
SLAW	3	There may be a need to relocate/modify essential Council infrastructure	Likely	Major	High
SLBW	1	There may be a need to relocate/modify essential Council infrastructure	Likely	Major	High
SLCW	1	Council must plan for the maintenance of services to low lying vulnerable areas	Possible	Minor	Medium
SLDW	1	Trunk sewers close to existing sea level may be overloaded and more prone to environmental spills during high rainfall and king tides	Possible	Moderate	High
SLDW	2	Increase in salt gradient and groundwater levels impacts on drainage capacity.	Possible	Minor	Medium

<b>Risk Code</b>	<b>Risk Number</b>	<b>Risk Description</b>	<b>Likelihood</b>	<b>Consequence</b>	<b>Risk</b>
SLDW	3	Effluent re-use areas may become redundant and require relocation / new solutions for effluent management	Almost Certain	Minor	High
SLEW	1	Council may need to increase maintenance costs for drainage and stormwater infrastructure as it becomes less capable over time e.g.. replacing drainage or clearing refuse from drainage points	Unlikely	Moderate	Medium
SLEW	2	Community expectations of council to invest in and manage strategies that protect water and sewage systems from sea level risk risks	Possible	Minor	Medium
SLEW	3	Council may need to increase funding for its new and renewed water and sewage assets	Possible	Moderate	High

Statewide Mutual Liability Scheme  
Echelon Australia Pty Ltd  
Level 11, 66 Clarence Street  
Sydney NSW 2000

ABN: 96 085 720 056

Ph (+61 2) 9320 2700

Fax (+61 2) 9299 2029

