



**Southern Grampians**  
SHIRE COUNCIL

# Climate Change Adaptation Plan

2017- 2027

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## 1 Introduction

### 1.1 Overview

Our climate is changing and Southern Grampians Shire Council has commenced planning for the associated risks. The Shire has experienced a change in rainfall patterns, an increased number of high bushfire risk days and more heatwaves. Changes in our climate are predicted to continue, so it is important to understand what climate risks the Shire is facing to ensure that Council is responding to likely risks. This Climate Change Adaptation Plan does just that; it outlines our priority risks, key adaptation actions we have already taken and actions that we are committed to taking over the next ten years to respond to the changing climate.

Adaptation aims to enable our people, businesses, infrastructure and environment to cope with an increasingly variable and volatile climate. Given the potential broad-ranging impacts of climate change in our Shire, adaptation is essential.

The Plan sets out our priority risks and action areas for the next ten years, with the prioritised risks including those to Council operations as well as those relevant to our community. To respond, we have broken down actions into short term and long term. Where there are risks that cross organisational boundaries, we are committed to working in partnership to respond.

**Adaptation is a response that aims to manage the risks of a changing climate.**

### 1.2 Objectives & Purpose

The Climate Change Adaptation Plan seeks to achieve the following objectives over the next ten years:

- Lead community and business to build resilience and proactively consider climate risk;
- Actively work with key financial partners to increase consideration of climate change for collective positive outcomes;
- Support, with advocacy, other key stakeholders to follow Council's lead on adaptation and climate change risk management;
- Embed adaptation by developing and improving Council assets, services and processes for viability under a range of climate futures; and
- Implement adaptation solutions that:
  - are cost effective and sustainable;
  - are transparent and justifiable;
  - recognise the need for equitable outcomes; and
  - minimise adverse environmental impacts.

To inform our response, Southern Grampians Shire Council relies on peer reviewed climate science from the Commonwealth Science and Industrial Research Organisation (CSIRO), The Bureau of Meteorology (BoM) and the Intergovernmental Panel on Climate Change (IPCC).

Where available, Southern Grampians Shire Council also uses state and region specific information to provide more detail about how the local climate might change. Where local information is used we will look for published and peer reviewed scientific data, government reports or guidelines, or data used by government authorities in decision-making to assess its veracity.

### 1.3 Key stakeholders & partners

We acknowledge our role in managing some of the impacts of climate change. However, the most effective climate change adaptation requires a shared response from all levels of government, stakeholders and the community.

Changes in our climate will not respect shire or organisational boundaries, which is why we have developed this plan in partnership with our neighbouring councils. A regional partnership also exists between key regional stakeholders through the Climate Resilient Communities of the Barwon South West program. Members of this include the ten councils of the

Barwon South West region, the Corangamite Catchment Management Authority, Glenelg Hopkins Catchment Management Authority (GHCMA), Barwon Water and Wannon Water.

## 2 Changes in climate

### 2.1 A changing climate for the Barwon South West Region

The climate has changed. Since 1950 average temperatures in the BSW region are over 1 degree higher and average annual rainfall has dropped by over 100 mm. Over this time the region has also experienced a number of extreme weather events. Recent examples include the 2016 Wye River bushfire, the Millennium Drought, flash flooding in Geelong in February 2016 and in Coleraine in August 2016.

Changes in our climate are predicted to increase over the coming years. By 2030, the climate of the region is expected to be hotter and drier. In general, the region can expect more hot days and warm spells, with fewer frosts, less rainfall in winter and spring with harsher fire weather and longer fire seasons. Although rainfall is predicted to decline on average, an increase in intense rainfall events is likely to result in more flooding. Figure 1 summarises the projected regional impacts.

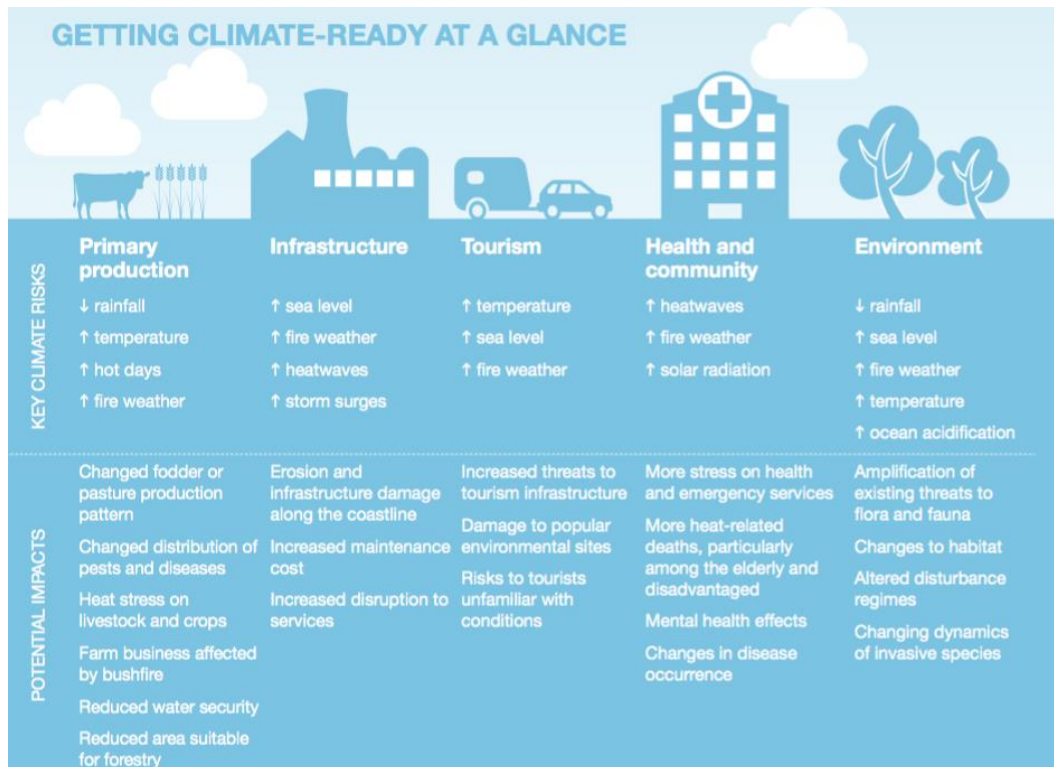


Figure 1: Summary of climate changes expected in the Barwon South West Region<sup>1</sup>

For the Barwon South West, climate change will have impacts across a number of sectors; primary production, infrastructure, tourism, health and community and environment. Figure 2 summarises these potential impacts per sector<sup>2</sup>.

<sup>1</sup> Source: Department of Environment, Land, Water and Planning (2014) Climate Ready Victoria: [http://www.climatechange.vic.gov.au/\\_\\_data/assets/pdf\\_file/0005/323456/Barwon-South-West.pdf](http://www.climatechange.vic.gov.au/__data/assets/pdf_file/0005/323456/Barwon-South-West.pdf)

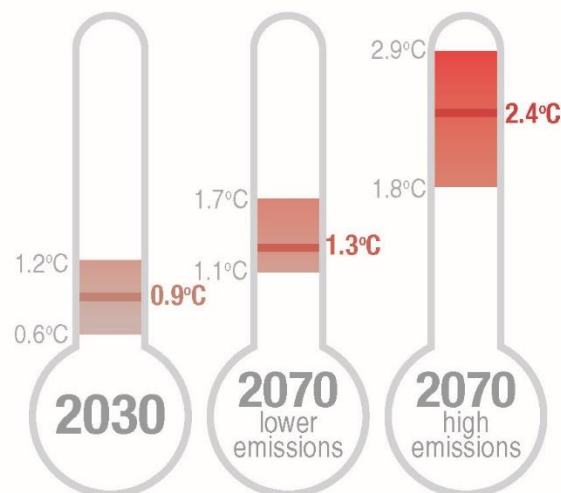
<sup>2</sup> Victorian Department of Environment, Land Water and Planning, 2016, Barwon South West – Climate Ready Victoria, [http://www.climatechange.vic.gov.au/\\_\\_data/assets/pdf\\_file/0005/323456/Barwon-South-West.pdf](http://www.climatechange.vic.gov.au/__data/assets/pdf_file/0005/323456/Barwon-South-West.pdf)



**Figure 2: Climate risks and potential impacts for the Barwon South West region**

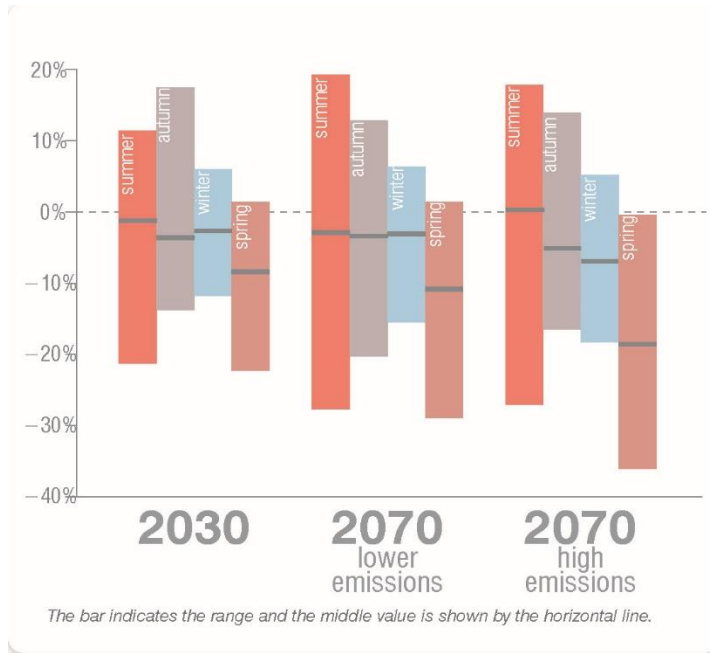
More details about the changes to each climate variable are outlined in Table 1.

Projected temperature changes for the region range from 0.6 °C to 1.2 °C for 2030 to 1.8 °C to 2.9 °C for 2070 under high emissions scenarios. These ranges are indicated at Figure 3 below.



**Figure 3: Projected annual temperature changes for the Barwon South West region**

In general, average rainfall is expected to decline across all emissions scenarios, with the most significant declines projected in winter and spring rainfall by 2030. At a high emissions scenario, autumn rainfall is expected to remain average, with a near 20% reduction in average spring rainfall by 2070. These variations are illustrated in Figure 4.



**Figure 4: Projected rainfall changes for the Barwon South West region**

It can be inferred that the regional projections for the Barwon South West region will impact the Southern Grampians Shire on a local scale. Further information on what these impacts mean is illustrated in Table 1 below.

**Table 1: Climate change impacts by climate variable for Southern Grampians Shire**

Temperature	
Regional change	What it means for Southern Grampians
<p>Historical change:<sup>3</sup></p> <ul style="list-style-type: none"> <li>• 1.2 to 1.4 degrees since 1950</li> </ul> <p>2030<sup>4</sup> forecast change:</p> <ul style="list-style-type: none"> <li>• Average temperature 0.9 degrees increase</li> <li>• Increase in number of days over 40 degrees – single days by 8%, and three consecutive days by 40%.</li> </ul> <p>2070 forecast change:</p> <ul style="list-style-type: none"> <li>• Warmer average temperatures with summer increases expected to be 1.9 degrees</li> <li>• Increase in days over 40 degrees – single days by 15%, three consecutive days by 67%.</li> </ul>	<ul style="list-style-type: none"> <li>• Getting warmer, coupled with a significant increase in extreme heat events.</li> <li>• Greatest increase in temperature will occur in the north of the Shire.</li> <li>• Least increase in temperature will occur in the high terrain areas of Grampians National Park</li> </ul> <p>Impacts</p> <ul style="list-style-type: none"> <li>• Agriculture and associated industries are likely to be affected</li> </ul>
Rainfall	
Regional change	What it means for Southern Grampians
<p>Historical change:</p> <ul style="list-style-type: none"> <li>• Between 100-200 mm annual reduction since 1950 across the region</li> </ul> <p>2030 forecast change:</p> <ul style="list-style-type: none"> <li>• Lower average annual rainfall by 3% (more reductions occurring in spring)</li> <li>• 50 mm rainfall events increase in incidence by 3%</li> </ul> <p>2070 forecast change:</p> <ul style="list-style-type: none"> <li>• Lower average rainfall by 7% with a significant decline in spring</li> <li>• 50 mm rainfall events increase in incidence by up to 10%</li> </ul>	<ul style="list-style-type: none"> <li>• Overall the Shire is getting drier, coupled with an increase in intense rainfall events which could result in localised flooding.</li> <li>• The driest area will continue to be the northern area of the Shire.</li> <li>• The wettest area will continue to be in the higher terrain areas of the Grampians National Park.</li> </ul>
Fire Danger	
Regional change	What it means for Southern Grampians
<ul style="list-style-type: none"> <li>• Fire danger conditions are projected to increase in intensity and frequency</li> </ul>	<ul style="list-style-type: none"> <li>• Higher number of days where emergency services must be ready to respond.</li> <li>• More pre-season preparation</li> <li>• Increased vulnerability of those in bushfire prone areas.</li> </ul>

<sup>3</sup> Unless otherwise stated, all historical changes have been taken from the Victorian Department of Environment, Land Water and Planning, 2016, Barwon South West – Climate Ready Victoria, [http://www.climatechange.vic.gov.au/data/assets/pdf\\_file/0005/323456/Barwon-South-West.pdf](http://www.climatechange.vic.gov.au/data/assets/pdf_file/0005/323456/Barwon-South-West.pdf)

<sup>4</sup> Unless otherwise stated, all future projections are from SimClim for Barwon South West region, based on IPCC AR5 report



## 3 Risk Assessment

### 3.1 Approach

A risk assessment approach was followed to inform the development of this Adaptation Plan, to focus the work of the Southern Grampians Shire Council on those most highly rated climate change risks.

The risk assessment approach followed the Australian Standard - AS5334: 2013 Climate change adaptation for settlements and infrastructure — A risk based approach. AS 5334 references the globally recognised risk management approach outlined in ISO 31000:2009 Risk management - Principles and guidelines.

The risk assessment process identified risks over the immediate (0-5 years) and longer (5-60 years) term. Further to risk identification and assessment, it is important to understand if risks interact with each other to result in additional or amplified consequences; therefore an analysis of risk interaction was completed, investigating potential cumulative effects and/or additional consequences that arose between risks.

Details of the risk management approach are outlined in Appendix A: Risk procedure. This includes details of the risk criteria – likelihood and consequence matrices – that were used to rate the climate change risks.

### 3.2 Prioritised risks

The threat that Southern Grampians Shire faces from bushfire is one of the most significant risks to industry (tourism, forestry and agriculture), community assets and infrastructure as well as to ecological assets and Council infrastructure.

Water availability and quality have been significant risks in the past and will be a high risk in the future with the impacts of climate change exacerbating drought conditions. Both water availability and quality are likely to be issues for community and Council operations in Southern Grampians Shire, particularly for residents and operations without access to the reticulated water supply.

Both of these risks have the most interconnections, which could result in these risks being exacerbated by each other (or by other priority risks).

The impact of heatwaves and increased average temperature on vulnerable community members is considered a high risk for the Shire, resulting in an increase in heat-related illness and demand on refuge areas.

Risk of landslides was considered a high risk for the Shire, with a recent event (January 2011) causing major disruption to tourism businesses in the region, impacting the local economy. With the increase in drought in association with fire conditions and an increase in the intensity of rainfall, the risk of these events is likely to increase with impacts to Council infrastructure, impacts to the tourism industry and the local economy.

The priority risks are outlined in Table 2 below. Southern Grampians Shire Council considered one risk extreme and six high in the short term (0 – 5 years). Further three risks were considered extreme, and nine risks high in the long term (6 – 50 years). These priority risks inform the development of adaptation actions detailed further in the document.

**Table 2: Prioritised risks for Southern Grampians resulting from the risk assessment process**

	Priority risk	Asset	Rating 0-5 years	Rating 6-50 years	Council control
1	Increased bushfire risk to homes, livestock, community assets and infrastructure	Community Wellbeing, Infrastructure, Buildings, Industry	Extreme	Extreme	L
2	Increased risk of landslides impeding access, damaging infrastructure, reducing visitation and causing increased costs for maintenance	Infrastructure, Industry, Community Wellbeing	High	High	L
3	Reduction in waterway inflow, water availability and quality and higher water temperature resulting in (a) ecosystem stress, (b) reduced ability to construct and maintain roads, (c) reduced use of waterways for recreation and (d) water stress on parks, gardens and sporting fields	(a) Natural (b) Infrastructure, Community Wellbeing (c) Recreation	Medium	Extreme	L
4	Decreased non-reticulated water supplies resulting in potential economic downturn and community wellbeing in non-serviced areas. Increased need for infrastructure investment and a change in land use planning requirements. Increased costs for road construction and maintenance	Infrastructure, Industry, Planning, Community Wellbeing	Medium	High	L
5	Increase in heat stress and solar exposure to the community leading to increased heat-related illness, demand on public spaces and services	Community Wellbeing	High	High	M
6	Increased intensity and severity of bushfires, with extended bushfire season impacting on flora and fauna	Natural	High	Extreme	L
7	Increase in heat stress and reduction in average rainfall causing degradation of ecosystems and changes to function, affecting native species and creating favourable conditions for invasive species	Natural	Medium	High	L
8	Increase in soil dryness and dust on roads, resulting in respiratory issues for community and increased demand for intervention	Community Wellbeing, Infrastructure	Medium	High	L
9	Increased demand on reticulated water supply, reducing water availability for urban and industry use	Community Wellbeing, Industry	High	High	L
10	Increased road side vegetation growth during occasional wet periods requiring more intervention	Infrastructure, Natural	Medium	High	L
11	Extremely high temperatures causing premature deterioration of roads leading to increased maintenance costs and the need to consider alternate materials for road construction	Infrastructure	Medium	Medium	M
12	Disruption of on-ground works and activities due to increased intensity of rainfall events	Infrastructure	Medium	High	M
13	Increase in localised flooding causing damage to Council buildings and infrastructure, affecting service delivery, access and increasing maintenance costs.	Infrastructure	High	High	H
14	Sewage treatment plant/septic tank overflows to the environment due to flooding, affecting drainage / sewage systems potentially leading to public health issues	Infrastructure, Environmental Health	High	High	L
15	Fewer visitors to the Shire due to increased hot days, heatwaves and average temperature, reduced visitation for region resulting in reduced revenue	Industry	Negligible	Negligible	L
16	Decreased demand on visitor economy for mountains during summer due to increased hot days, heatwaves, average temperature and fire danger resulting in decreased revenue for the region	Industry	Low	Medium	L

	Priority risk	Asset	Rating 0-5 years	Rating 6-50 years	Council control
<b>Opportunities presented by climate change</b>					
17	Increased visitation for nature-based tourism during cooler months	Industry	Beneficial	Beneficial	L
18	Changes in climate resulting in increased agricultural production for some existing crop/production systems or through the introduction of new systems	Industry	Beneficial	Beneficial	L

Of these priority risks one was considered as having high Council control:

- Increase in localised flooding damaging Council assets. Assets susceptible to flooding include roads, bridges, recreation facilities and public toilets.

Three were rated as having medium Council control:

- Increase in heat stress and solar exposure to the community leading to increased heat-related illness, demand on public spaces and services;
- Extremely high temperatures causing premature deterioration of roads, leading to increased maintenance costs and the need to consider alternate materials for road construction; and
- Disruption of on-ground works and activities due to increased intensity of rainfall events.

### 4 Adaptation actions

#### 4.1 Adaptation action already occurring

Council is already responding to the more immediate risks of climate change – those associated with emergency management, impacts on the community and the environment and planning for the future in other ways, such as implementing a Digital Strategy to guide the use of emerging technologies.

##### 4.1.1 Emergency Management

The Southern Grampians Shire Council is committed to continuously improving its preparedness and response to natural disasters. The Council works with the Department of Environment, Land, Water and Planning (DELWP), Parks Victoria, Victoria Police, Country Fire Authority (CFA), VicRoads and State Emergency Services (SES) throughout the year to build the preparedness of the Shire, and to streamline the responses when events do occur. Regular updates of the Council Emergency Management website occur to keep the community up to date with management measures.<sup>5</sup>

In October 2011 Council adopted a Heatwave Plan to manage the possible effects of heatwaves on vulnerable community members across the Shire. The Plan was developed in consultation with Council departments and community agencies, including Southern Grampians Glenelg Primary Care Partnership and the Department of Health and Human Services. This Plan outlines procedures for staff to follow when there is a heatwave<sup>6</sup>.

##### 4.1.2 Bushfire Preparedness and Fire Prevention

Council has undertaken work in bushfire preparedness to respond to the increasing bushfire weather projected under climate change. Although largely responding to current risk, action can be up-scaled to prepare for future impacts.

There has also been continuous improvement of its bushfire management plans, including training and changes to procedures, to improve the resilience of the community and the ability of Council to respond. The Council website houses information on fire prevention<sup>7</sup> and the bushfire general checklist<sup>8</sup> to support stakeholder and community members to plan for bushfire risk.

##### 4.1.3 Southern Grampians Agribusiness Land Capability Mapping

The Council has taken a significantly proactive response to the risks and opportunities associated with climate change impacting agriculture, land use and associated industries. In an applied and innovative approach to this difficult to manage issue, the Council received funding from the Victorian Government under the Victorian Adaptation and Sustainability Partnership (VASP) and partnered with Deakin University. Overlaying climate, soil, topography and water data with eight commodities across cropping, pastures and vegetable resources, models for climate scenarios for 2030, 2050 and 2070 were developed. The resulting output is an online, interactive mapping tool which allows the user to interrogate maps across the Shire to demonstrate viability of agricultural industries under future climate change. With applications from farming to real estate and land use planning, the models are being put to real use, informing everyday decisions in the Shire.

The online maps can be accessed here: [www.growinggreaterhamilton.com.au](http://www.growinggreaterhamilton.com.au)

Future expansion of this concept is currently being investigated, including:

- An economic industrial analysis to explore the possibility of establishing grain processing plants in the Southern Grampians Shire;
- Additional commodity modelling in order to have a complete understanding of the agricultural potential of Southern Grampians Shire; and

<sup>5</sup> [http://www.sthgrampians.vic.gov.au/Page/Page.asp?Page\\_Id=2272&h=1&p=1](http://www.sthgrampians.vic.gov.au/Page/Page.asp?Page_Id=2272&h=1&p=1)

<sup>6</sup> [http://www.sthgrampians.vic.gov.au/Page/page.asp?page\\_Id=1803&h=0](http://www.sthgrampians.vic.gov.au/Page/page.asp?page_Id=1803&h=0)

<sup>7</sup> [http://www.sthgrampians.vic.gov.au/page/page.asp?Page\\_Id=1452&h=0](http://www.sthgrampians.vic.gov.au/page/page.asp?Page_Id=1452&h=0)

<sup>8</sup> [http://www.sthgrampians.vic.gov.au/Page/Page.asp?Page\\_Id=1627&h=1](http://www.sthgrampians.vic.gov.au/Page/Page.asp?Page_Id=1627&h=1)

- The development of 'Blue Green Infrastructure', a holistic and innovative construct, which includes several components to secure water for agricultural and industrial uses as well as improve the environment.

### 4.1.4 Implementing the Southern Grampians Shire Digital Strategy

Council has developed a digital strategy that identifies pathways to take advantage of the opportunities in the digital age, enabled by high speed broadband internet and other emerging technologies.

A strong local digital "ecosystem" will be needed to take full advantage of the NBN and traditional broadband internet. A local digital ecosystem recognises that it takes more than infrastructure to realise these new opportunities. Also necessary are:

- Skills and capacity – technical ability, modern business skills
- Culture – leadership, entrepreneurship and curiosity
- Products and services – telecommunications product, online groups and sites
- Infrastructure – quality, speed, reliability and cost of internet

The Strategy focuses on how to develop a strong local digital ecosystem and provides a pathway for developing:

- A more digitally connected community.
- An economy that can rapidly respond to the business opportunities in the digital area.
- Council leadership in providing digital services for the community.

Digital technology can help address some of our social, economic and climate-related challenges and opportunities, including:

**Emergency Management** – Reliable digital networks will allow the deployment of remote sensing and monitoring equipment across the Shire to provide early warning of floods, fires and localised severe weather events.

**Ageing population** - Our communities are ageing faster than the Victorian regional average. This has implications for productivity, social isolation, health and services access. Digital technologies have the potential to assist vulnerable residents through raising awareness of, and responding to risks such as heatwaves and other climate-related emergencies.

**Remoteness** - some of our towns are remote with poor access to many services; something technology could help.

**Tourism** - there is potential for tourism growth and technology plays an important role in tourism markets.

**Agriculture** - is our key export and could benefit from significant productivity increases on the back of digital and allow opportunities to manage a changing climate.

### 4.1.5 Community resilience work with stakeholders across the Shire

The Council has been working with stakeholders in the community health and wellbeing sector to support adaptation action for vulnerable community members. In addition to extensive Council-led work supporting community resilience committees, heatwave preparedness and bushfire preparation, partnerships with the Southern Grampians Primary Care Partnership, Western District Health Service and Bush Nursing Centres have seen progress in climate change adaptation. Projects such as Rural People: Resilient Futures has enabled agencies across the Shire to commence the adaptation planning process collectively for a more integrated approach to planning for climate change impacts on community members. The Council developed its own case study to document their adaptation progress through the project.

More information on the project can be found here: <http://sggpcp.com/projects/rural-people-resilient-futures/>

### 4.1.6 Township septic system inspection program

Council is undertaking township wide audits of septic tanks within the six unsewered townships within the Shire. Branhholme, Peshurst and Glenthompson septic inspection programs have been completed with Cavendish, Balmoral and Tarrington to come. It is known that many of the onsite systems within the Shire are more than 30 years old and are reaching a point where maintenance and monitoring is required to ensure the systems are functional into the future.

An important outcome of the program is to develop an understanding of the locations, conditions and uses of many of the aged systems, with the intent to provide owners with the knowledge and advice to avoid any potential public health issues into the future particularly in scenarios of inundation and future flooding.

## 4.2 Prioritised adaptation actions

Southern Grampians Shire Council has prioritised adaptation actions to respond to the prioritised climate risks listed in Table 2. As part of the plan's development, workshops were held with staff responsible for the management of each of the priority risks. These workshops identified and prioritised actions to manage each prioritised risk.

Types of adaptation actions considered included:

- **Research** to improve understanding of climate change and risks;
- **Policy and design** to prevent or mitigate effects through revised design and planning;
- **Structural** to prevent effects through built solutions and maintenance; and
- **Behavioural** to raise awareness among key internal and external stakeholders and improve their capacity to respond to risks.

Further, the following criteria were considered when adaptation actions were developed as per recommendations by the Australian Standard for consideration of climate risk in settlements and infrastructure<sup>9</sup>:

- Effectiveness and robustness of the adaptation – over its lifetime, including flexibility of the option in terms of ability to respond to changing climate / socioeconomic environment;
- Practicability of implementation and ease of maintenance;
- Economic efficiency of operation and ongoing maintenance;
- Co-benefits over and above those that come from the direct treatment of the risk, or net benefits under a range of plausible future climates;
- Equity implications of the adaptation option for all potential affected stakeholders; and
- Greenhouse gas emission implications of adaptation options.

Refinement and responsibility allocation occurred across the organisation to ensure that actions were suitable to the context and risk setting of the Council.

There are six prioritised adaptation actions with a range of sub-actions that sit underneath. The full list of adaptation actions have been outlined in Section 5 with implementation details.

1. **Facilitate improved community resilience and social connectedness**
2. **Develop and deliver an Integrated Water Plan**

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<sup>9</sup> AS 5334-2013 Climate change adaptation for settlements and infrastructure — Selection of adaptation options guidance

- 3. Investigate modification of construction practices for road and Council infrastructure (new and maintenance)**
- 4. Facilitate sustainable agricultural practices through changes to land use planning and development approvals**
- 5. Develop an Urban Forest and Open Space Assets Strategy**
- 6. Investigate more dispersed and diversified tourism opportunities**

Each of the actions outlined within Section 5 include details of:

- Relevant risks linking to Table;
- Timelines around which actions should be completed;
- Action ownership (internal lead with partnerships) and partnering stakeholders;
- Resources required; and
- Key Performance Indicators (KPIs).

**5 Adaptation Implementation Plan**

Table 3: Improved community resilience and social connectedness implementation plan

Action	Action activities	Relevant risks	Timelines	Action owner and partnerships	Resources required	KPIs
1. Facilitate improved community resilience and social connectedness	a. Develop and fund the emergency management role into community resilience coordinator to reflect broadening of responsibilities (linked to Actions 1a and 1b)	1, 4, 5, 6, 8	12 months Reporting Jan 2018 Annual review ongoing	<b>Action owner:</b> Emergency Management Coordinator  <b>Internal partnerships:</b> All Directorates Councillors	1 permanent EFT funded up to 10 years required to deliver existing and new Actions (e.g. 1a & 1b)	Position resourced and KPIs established  Success linked with actions external to adaptation strategy as well as Actions 1a & 1b within
	b. Promote, encourage and facilitate community resilience committees located in each town, possibly a function of Progress Associations. Utilise opportunities provided by emerging digital technologies to improve community resilience	1, 4, 5, 6, 8, 14.	12 months – committees established Reporting Jan 2018  3 years, risks identified and mitigations: Reporting Jan 2020  Monitor and review every six months	<b>Action owner:</b> Emergency Management Officer  <b>Internal partnerships:</b> Community Planning Focus Group  <b>External partnerships:</b> EMV, DELWP (funding), CFA, VIC SES, DHHS (Part of EM Planning Committee), Progress Associations, SGGPCP	1 permanent EFT funded up to 10 years. Current funding from DELWP 50%; however Council cannot fully fund an ongoing position	Investigate and develop a workable and sustainable model for climate resilience committees in our shire  Identification of risks and action plan for each committee  Annual reporting



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Action	Action activities	Relevant risks	Timelines	Action owner and partnerships	Resources required	KPIs
1. Facilitate improved community resilience and social connectedness	c. Formation of internal community resilience advisory team	1, 4, 5, 6, 8	12 months Reporting Jan 2018 Annual review ongoing	<b>Action Owner:</b> Emergency Management Officer  <b>Internal partnerships:</b> Councillors  <b>External partnerships:</b> EMV, DELWP (funding), CFA, VIC SES, DHHS (Part of EM Planning Committee) Progress Associations, SGGPCP	Developed in coordination with Action 1a utilising the same resource pool	Advisory team established  Ongoing reporting annually  Meeting minutes
	d. Maintain Council's Vulnerable persons' register	1, 4, 5, 6, 8	12 months Reporting Jan 2018	<b>Action Owner:</b> Coordinator Aged and Disability Services  <b>Internal partnerships:</b> Manager Community Services, Emergency Management committee  <b>External partnerships:</b> WDHS, DHHS, EMV	Existing internal staff resources	Reporting on management ongoing  Internal changes made in response

## Southern Grampians Shire Climate Change Adaptation Plan 2017 - 2027

Action	Action activities	Relevant risks	Timelines	Action owner and partnerships	Resources required	KPIs
1. Facilitate improved community resilience and social connectedness	<p>e. Promote and support education programs for business and household resilience</p> <p>Topics could cover:</p> <ul style="list-style-type: none"> <li>• Energy efficiency</li> <li>• Heat stress</li> <li>• Insurance requirements</li> <li>• Heat and fire plan</li> <li>• Potable water management</li> <li>• Wastewater Management</li> </ul>	1, 4, 5, 6 13, 14	<p>Ongoing, 12 month review</p> <p>Timeframe: 2-3 years for a school based program</p>	<p><b>Action Owner:</b> Emergency Management Officer</p> <p><b>Internal partnerships:</b> All Directorates</p> <p><b>External partnerships:</b> SGGPCP, CFA, SES, DELWP EMV, DHHS, Dept. Health</p>	Administration Support, 2 days / week (in addition to 1 EFT in action 1a above)	<p>Demonstrated programs</p> <p>Number of clients met</p>
	<p>f. Investigate, promote and engage with existing programs funded by State and Federal Government to increase resilience of communities and support initiatives such as the DHHS funded Community Sector Climate Resilience Program</p>	1, 2, 4, 5 6, 15, 16	<p>Ongoing, 12 month review</p>	<p><b>Action Owner:</b> Emergency Management Officer</p> <p><b>Internal partnerships:</b> Community engagement, Sustainability Coordinator</p> <p><b>External partnerships:</b> DHHS, DELWP, EMV</p>	Existing internal staff resources	<p>Documented programs</p> <p>Number of programs Council is involved in</p>

### Southern Grampians Shire Climate Change Adaptation Plan 2017 - 2027

Action	Action activities	Relevant risks	Timelines	Action owner and partnerships	Resources required	KPIs
1. Facilitate improved community resilience and social connectedness	g. Increase awareness and deliver training around climate resilience in relation to building standards, design, orientation and material quality to improve thermal comfort and energy efficiency of housing stock	1, 5, 6	2 years: Reporting Jan 2019	<p><b>Action Owner:</b> Building Surveyors</p> <p><b>Internal partnerships:</b> Sustainability Coordinator</p> <p><b>External partnerships:</b> Australian Building Codes Board</p>	External funding can supplement existing internal capacity	Documented advice

## Southern Grampians Shire Climate Change Adaptation Plan 2017 - 2027

**Table 4: Integrated Water Plan implementation plan**

Action	Action activities	Relevant risks	Timelines	Action owner and partnerships	Resources required	KPIs
2. Develop and deliver an Integrated Water Plan	<p>a. Develop overarching Integrated Water Plan (IWP). This will include:</p> <ul style="list-style-type: none"> <li>• Update stormwater management plan</li> <li>• Update Domestic Wastewater Management Plan</li> <li>• Consideration of environmental impacts of stormwater capture</li> <li>• Reference to Lake Hamilton Management Plan</li> <li>• Consider importance and future of Old Reservoir</li> <li>• Include considerations of the water needs of recreation spaces</li> <li>• Investigate sustainable water options in unserviced areas</li> <li>• Investigate development of strategically located bores and/or catchment dams for Council use</li> <li>• Efficiently utilise existing water resources for the most appropriate use</li> <li>• Investigate options to purchase privately owned water resources</li> <li>• Further investigate recycled water opportunities</li> <li>• Further investigate feasible options for wastewater treatment and disposal in unsewered townships within Shire</li> </ul>	3, 4, 9, 10 12, 13, 14	<p>Start in 2017/18. Complete within two years</p> <p>Regular review as per council plan timelines</p>	<p><b>Action Owner:</b> Director Shire Infrastructure</p> <p><b>Internal partnerships:</b> Recreation Biodiversity Environmental Health Local laws</p> <p><b>External partnerships:</b> Wannon Water Grampians Wimmera Mallee Water Southern Rural Water GHCMA</p>	Combination of existing internal budget and external funding required	<p>Completion of plan</p> <p>Endorsement by Council</p> <p>Regular review and reporting</p>

## Southern Grampians Shire Climate Change Adaptation Plan 2017 - 2027

Action	Action activities	Relevant risks	Timelines	Action owner and partnerships	Resources required	KPIs
2. Develop and deliver an Integrated Water Plan	b. Continue to develop relationships with water authorities and other stakeholders on water use and management of water treatment	3, 4, 9 13, 14	Ongoing  Annual reporting	<b>Action Owner:</b> Director Shire Infrastructure  <b>Internal partnerships:</b> Recreation Livestock Exchange Planning  <b>External partnerships:</b> Wannon Water, GWM Water, Southern Rural Water GHCMA	Internal budget allocation	Half yearly meetings on process  Meeting minutes and reporting
	c. Council to use best practice in efficient water collection and use in all operations and service delivery. Best practice needs to include catchment and ecological considerations	3, 4, 9, 10 12, 13, 14	Ongoing  Will flow on from development of IWP	<b>Action Owner:</b> Director Shire Infrastructure  <b>Internal partnerships:</b> Sustainability Recreation Community Services Biodiversity  <b>External partnerships:</b> Community groups, user groups	Combination of existing internal budget and external funding required	Review and update Sustainable Water Use plan  Develop milestones  Measure ML water captured and report annually

## Southern Grampians Shire Climate Change Adaptation Plan 2017 - 2027

Action	Action activities	Relevant risks	Timelines	Action owner and partnerships	Resources required	KPIs
2. Develop and deliver an Integrated Water Plan	d. Support Water Authority and State Government efforts to educate residents on actions that can decrease water usage and highlight the importance of sustainable water use	3, 4, 9, 14	Ongoing  Annual reporting	<b>Action Owner:</b> Sustainability  <b>Internal partnerships:</b> Community Engagement  <b>External partnerships:</b> Community groups Schools Kindergartens	Internal budget allocation	Number of actions
	e. Continue community education on correct septic tank management to reduce risk of health and financial risks to community. This includes: <ul style="list-style-type: none"> <li>• Continued advocacy for improved domestic waste water management in townships currently not sewered.</li> <li>• Consideration of impacts on low income households requires consideration</li> <li>• Consider increasing frequency of septic tank inspections</li> </ul>	3, 4, 9, 12 13, 14	Ongoing  Annual reporting.	<b>Action Owner:</b> Environmental Health  <b>Internal partnerships:</b> Advocacy Committee Sustainability Community Engagement  <b>External partnerships:</b> Community groups	Internal budget allocation	Number of inspections conducted  Percentage of compliant systems  Number of complaints

## Southern Grampians Shire Climate Change Adaptation Plan 2017 - 2027

**Table 5: Modification of construction practices for road and council infrastructure (new and maintenance) implementation plan**

Action	Action activities	Relevant risks	Timelines	Action owner and partnerships	Resources required	KPIs
3. Investigate modification of construction practices for road and council infrastructure (new and maintenance)	a. Review existing council road and infrastructure assets to assess viability under climate change	1, 2, 3, 4 11, 12, 13	12 months Reporting Jan 2018 Ongoing annual review	<p><b>Action Owner:</b> Manager Assets</p> <p><b>Internal partnerships:</b> Sustainability Coordinator, Biodiversity Officer</p> <p><b>External partnerships:</b> Wannon Water, VicRoads, DELWP, GHCMA</p>	Existing internal staff resources  Potential external funding required	Review completed and documented  Ongoing review reporting
	b. Develop climate resilience standards for the development and delivery of more flexible assets and infrastructure (new and maintenance)	1, 2, 3, 4 11, 12, 13	18 months Reporting June 2018 Review every 2 years	<p><b>Action Owner:</b> Manager Assets &amp; Asset Managers</p> <p><b>Internal partnerships:</b> All Directorates</p> <p><b>External partnerships:</b> DELWP, all funding agencies State and Federal</p>	External support required Consultant expertise Additional funding required to undertake tasks – potentially through a grant application	Develop and complete standard  Report on bi-annual review

### Southern Grampians Shire Climate Change Adaptation Plan 2017 - 2027

Action	Action activities	Relevant risks	Timelines	Action owner and partnerships	Resources required	KPIs
3. Investigate modification of construction practices for road and council infrastructure (new and maintenance)	c. Develop repository of relevant information to support decision making around infrastructure maintenance and development under climate change. To be linked with Asset Management Plans. Utilise digital technology to optimise asset management	1, 2, 3, 4 11, 12, 13	18 months Reporting June 2018  Review every 2 years	<b>Action Owner:</b> Project Engineer  <b>Internal partnerships:</b> Manager Assets & Team Leader Construction  <b>External partnerships:</b> External knowledge required, not partnerships	Existing internal staff resources	Established repository  Ongoing review
	d. Investigate options for new and/or different materials to achieve more resilient assets	1, 2, 3, 4 11, 12, 13	Ongoing  Review every 2 years	<b>Action Owner:</b> Project Engineer & Asset Inspectors  <b>Internal partnerships:</b> Manager Assets & Team Leader Construction  <b>External partnerships:</b> External knowledge required, not partnerships	Existing internal staff resources	Ongoing review  New practices proving successful – reporting on implementation



### Southern Grampians Shire Climate Change Adaptation Plan 2017 - 2027

Action	Action activities	Relevant risks	Timelines	Action owner and partnerships	Resources required	KPIs
3. Investigate modification of construction practices for road and council infrastructure (new and maintenance)	e. Expand traffic and deterioration monitoring programs to inform development of new assets and road traffic changes (e.g. timber truck transport regulation)	1, 2, 3, 4 11, 12, 13	18 months  Reporting June 2018  Ongoing review annually	<p><b>Action Owner:</b> Manager Assets</p> <p><b>Internal partnerships:</b> Asset Managers</p> <p><b>External partnerships:</b> VicRoads, Private Industry (Timber transportation)</p>	0.5 EFT support required; new role or an addition to an existing role  New program established with new role	<p>New role established</p> <p>New program established</p> <p>Annual reporting</p>
	f. Review work practices, workforce structures and programming changes to avoid impact of increasing extreme weather on road assets	1, 2, 3, 4 11, 12, 13	Ongoing  Review every 2 years	<p><b>Action Owner:</b> Manager Assets</p> <p><b>Internal partnerships:</b> Team Leader Construction</p> <p><b>External partnerships:</b> VicRoads, External suppliers of materials</p>	Existing internal staff resources	<p>Ongoing reporting</p> <p>Meeting minutes</p>

## Southern Grampians Shire Climate Change Adaptation Plan 2017 - 2027

Action	Action activities	Relevant risks	Timelines	Action owner and partnerships	Resources required	KPIs
3. Investigate modification of construction practices for road and council infrastructure (new and maintenance)	g. Investigate drainage options prior to development or maintenance of roads to manage risk of water pooling or flooding	2, 3, 4, 8, 9 11, 12, 13	Ongoing  Include in regular maintenance regime	<p><b>Action Owner:</b> Team Leader - Maintenance</p> <p><b>Internal partnerships:</b> Works Manager</p> <p><b>External partnerships:</b> External suppliers and contractors</p>	Existing internal staff resources	<p>Documentation of maintenance and repair</p> <p>Effectiveness measured in fewer complaints and reduced repair</p>
	h. Investigate use of catchment dams or wastewater reuse for road construction and maintenance. Develop feasibility study	3, 4, 8, 9 11, 12	Delivery 2021	<p><b>Action Owner:</b> Manager - Engineering and Projects</p> <p><b>Internal partnerships:</b> Planning</p> <p><b>External partnerships:</b> DELWP, Southern Rural Water, Wannon Water, GHCMA</p>	<p>External consultant support required</p> <p>External funding required</p>	Published study with recommendations for improved water use in road construction and maintenance

### Southern Grampians Shire Climate Change Adaptation Plan 2017 - 2027

Action	Action activities	Relevant risks	Timelines	Action owner and partnerships	Resources required	KPIs
3. Investigate modification of construction practices for road and council infrastructure (new and maintenance)	i. Improve weather forecast monitoring and advocate for flood modelling to proactively manage high frequency flood areas including river and creek systems.	3, 4, 8, 9 11, 12	Delivery Jan 2019	<b>Action Owner:</b> Sustainability Coordinator  <b>Internal partnerships:</b> Engineering and Projects Planning  <b>External partnerships:</b> GHCMA, DELWP	External consultant support required  External funding required	Completed flood study and monitoring program subject to grant funding
	j. Progress IDM adoption through Council processes and update internal infrastructure guidelines, continuously monitoring and improving processes to adapt to emerging conditions by feeding back into the IDM process and implementing local variations as required.	3, 4, 8, 9 11, 12	Delivery Jan 2019  Ongoing	<b>Action Owner:</b> Engineering and Projects Manager  <b>Internal partnerships:</b> Engineering and Projects Planning  <b>External partnerships:</b> IDM, DELWP, GHCMA	Existing internal staff resources	Adoption of IDM within Council and development of a continuous improvement process

## Southern Grampians Shire Climate Change Adaptation Plan 2017 - 2027

**Table 6: Sustainable agricultural practices implementation plan**

Action	Action activities	Relevant risks	Timelines	Action owner and partnerships	Resources required	KPIs
4. Facilitate sustainable agricultural practices through changes to land-use planning and development approvals	a. Improve agricultural zoning to allow fine tuning through land use planning. Advocate for changes to the Farming Zone, Rural Living Zone and Rural Activity Zone in the planning scheme	1, 4, 8, 10 Opportunities: 18	2018-2020	<p><b>Action Owner:</b> Manager – Planning and Environment</p> <p><b>Internal partnerships:</b> Manager – Economic Development</p> <p><b>External partnerships:</b> DELWP, DEDJTR, RDV, GSC, GRDC, VFF</p>	0.8FTE for 12 months; 0.2FTE for additional 12 months  Could be shared across a group of LGAs; probably requires grant assistance	<p>Project partners identified and MoU implemented</p> <p>Project proposal developed and submitted to potential funders</p> <p>Project team appointed</p> <p>Research context and develop scenarios for PS amendments including impact assessments and sensitivity analysis</p> <p>Prepare a planning scheme amendment</p>

## Southern Grampians Shire Climate Change Adaptation Plan 2017 - 2027

Action	Action activities	Relevant risks	Timelines	Action owner and partnerships	Resources required	KPIs
4. Facilitate sustainable agricultural practices through changes to land-use planning and development approvals	b. Facilitate clarification of infrastructure provision and responsibilities regarding rural living zone infrastructure expectations from residents.	1, 3, 4, 8 10, 11	2017-2019	<p><b>Action Owner:</b> Director Shire Futures</p> <p><b>Internal partnerships:</b> Planning and Environment Infrastructure, Economic Development</p> <p><b>External partnerships:</b> RDC/PCA, HIA</p>	Existing internal staff resources	<p>Report on engagements with external bodies and progress on this action</p> <p>Annual reporting</p>
	c. Investigate how fragmented ecosystems can adapt to climate change - what interventions may be required, at what cost, likelihood of success.	3, 6, 7, 10	Action not expected until 2019 onwards	<p><b>Action Owner:</b> Biodiversity Officer</p> <p><b>Internal partnerships:</b> Manager – Planning and Environment</p> <p><b>External partnerships:</b> DELWP, Universities, NGOs and CMAs</p>	External partnerships and funding required	<p>Monitor development of approaches in this area</p> <p>Encourage/assist baseline data collection and curation through existing avenues</p> <p>Advocate for research in our region</p>

## Southern Grampians Shire Climate Change Adaptation Plan 2017 - 2027

**Table 7: Urban Forest and Open Space Assets Strategy implementation plan**

Action	Action activities	Relevant risks	Timelines	Action owner and partnerships	Resources required	KPIs
5. Develop an Urban Forest and Open Space Assets Strategy	a. Develop register of vegetation within open space assets, including Botanical Gardens, street trees, ovals and recreation spaces, schools and kindergartens. Develop hierarchy of vegetation for supplementary watering under drought conditions.	3, 4, 5, 7 9, 10	5 years  Report 2021  Review and report every 5 years	<b>Action Owner:</b> Director of Infrastructure  <b>Internal partnerships:</b> Biodiversity  <b>External partnerships:</b> Wannon Water, GHCMA, DELWP, major user groups	~\$80,000  External funding to develop existing register to useable state	Development of full register and prioritisation process  Review and report every 5 years
	b. Develop Street Tree Master Plan for whole Shire, with an overarching aim to increase canopy coverage, vertical gardens and consideration of sustainable greening in urban development areas.	3, 4, 5, 7 9, 10	12 months – 2 years  Report Jan 2019  Report and review every 5 years	<b>Action Owner:</b> Director of Infrastructure  <b>Internal partnerships:</b> Biodiversity, Community Health  <b>External partnerships:</b> Community, Progress Associations, Wannon Water, GHCMA, DELWP, major user groups	~\$150,000  Additional funding required	Development of plan, including actions and implementation  Report and review every 5 years

### Southern Grampians Shire Climate Change Adaptation Plan 2017 - 2027

Action	Action activities	Relevant risks	Timelines	Action owner and partnerships	Resources required	KPIs
5. Develop an Urban Forest and Open Space Assets Strategy	c. Develop species selection criteria for future climate conditions across all Council plantings	3, 4, 5, 7 9, 10	<p>Delivery linked with the Street Tree Master Plan</p> <p>Criteria developed 12 months – 2 years</p> <p>Report Jan 2019</p>	<p><b>Action Owner:</b> Director of Infrastructure</p> <p><b>Internal partnerships:</b> Biodiversity</p> <p><b>External partnerships:</b> Roadside Advisory Committee, VicRoads, CFA</p>	Existing internal staff resources	Development of species selection criteria and include in Street Tree Mater Plan
	d. Factor in climate change projections in weed management planning and develop ongoing monitoring program	3, 4, 5, 7 9, 10	<p>Ongoing</p> <p>Include in regular maintenance regime and report annually.</p>	<p><b>Action Owner:</b> Biodiversity Officer</p> <p><b>Internal partnerships:</b> Infrastructure</p> <p><b>External partnerships:</b> DELWP, DEDJTR, VicRoads</p>	<p>Existing internal staff resources</p> <p>Monitoring program may require \$15,000 to establish baseline</p>	Evidence of climate change inclusion and program developed

### Southern Grampians Shire Climate Change Adaptation Plan 2017 - 2027

Action	Action activities	Relevant risks	Timelines	Action owner and partnerships	Resources required	KPIs
5. Develop an Urban Forest and Open Space Assets Strategy	e. Monitor high impact invasive species that can negatively impact ecosystems and develop rapid response strategies to manage outbreaks on Council land	6, 7, 10	2-3 years to establish, then on-going	<p><b>Action Owner:</b> Biodiversity Officer</p> <p><b>Internal partnerships:</b> Infrastructure</p> <p><b>External partnerships:</b> DELWP, DEDJTR, GHCMA, Landcare Groups. VicRoads</p>	<p>~\$50,000</p> <p>Additional funding required to identify high impact species and response strategies; conduct a multi-agency response exercise</p>	<p>Monitoring and management strategies in place</p> <p>Rapid response exercise conducted</p>



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**Table 8: Dispersed and diversified tourism opportunities implementation plan**

Action	Action activities	Relevant risks	Timelines	Action owner and partnerships	Resources required	KPIs
6. Investigate more dispersed and diversified tourism opportunities	a. Support businesses to consider climate risk and exploit opportunities in operations and service delivery	2, 3, 4, 6, 7 9, 15, 16  Opportunities: 17, 18	5 years  Reporting Jan 2022	<b>Action Owner:</b> Manager Tourism Development  <b>Internal partnerships:</b> Shire Futures  <b>External partnerships:</b> Tourism Victoria (State Government), private industries	State Government support required	Level of engagement from businesses. Documentation of information provided
	b. Actively seek opportunities and encourage businesses to develop all-weather products and activities	2, 3, 4, 6, 7 9, 15, 16  Opportunities: 17, 18	Ongoing  Reviewed annually	<b>Action Owner:</b> Manager Tourism Development  <b>Internal partnerships:</b> Visitor Services  <b>External partnerships:</b> Private industry	Within existing services (current activity that is business as usual)	Number of industry development programs hosted and number of participants

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Action	Action activities	Relevant risks	Timelines	Action owner and partnerships	Resources required	KPIs
6. Investigate more dispersed and diversified tourism opportunities	c. Communicate alternate visitor experiences through print and digital media to prevent reduction in visitor numbers in the Greater Hamilton region	2, 6, 15, 16 Opportunities: 17	2 years Reporting Jan 2019	<b>Action Owner:</b> Visitor Services  <b>Internal partnerships:</b> Manager Tourism Development  <b>External partnerships:</b> Cross border network, Regional Tourism Networks, VTIC networks and industry bodies	Existing volunteers, within existing services  Additional budget required for training of volunteers with new material	Digital infrastructure established  Training delivered to volunteers  Visitor numbers maintained
	d. Distribute material for visitor education on climate related risk to inform visitation	1, 2, 3, 5, 6, 9, 10, 13, 15, 16 Opportunities: 17	2 years Reporting Jan 2019	<b>Action Owner:</b> Visitor Services  <b>Internal partnerships:</b> Manager Tourism Development  <b>External partnerships:</b> Regional Tourism Networks, VTIC networks and industry bodies	Within existing services (current activity that is business as usual)	Visitor and industry informed

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Action	Action activities	Relevant risks	Timelines	Action owner and partnerships	Resources required	KPIs
6. Investigate more dispersed and diversified tourism opportunities	e. Explore and develop digital material which showcases realistic visitor experiences that take into account the impacts of climate change across the region	1, 2, 3, 5, 6, 9 10, 13, 15, 16  Opportunities: 17	2 years  Reporting Jan 2019	<b>Action Owner:</b> Manager Tourism Development  <b>Internal partnerships:</b> Visitor Services  <b>External partnerships:</b> Telstra SmartCities Framework, Regional Tourism Networks, VTIC networks and Industry bodies	Budget from internal IT and matched external funding	Material developed and distributed. Visitor and industry informed
	f. Progress private tourism product development such as off-park private development (e.g. around Grampians National Park)	15, 16  Opportunities: 17	5 years  Reporting Jan 2022	<b>Action Owner:</b> Manager Tourism Development  <b>Internal partnerships:</b> Visitor Services  <b>External partnerships:</b> Tourism Victoria (State Government), private industries; Regional Tourism Networks, VTIC networks and Industry bodies	State Government support required	Level of engagement from businesses  Documentation of information provided

## 6 Risk Procedure

### 6.1 Introduction

Barwon South West Councils face many diverse risks. It is important that all activities undertaken are done so by using a Risk Management based approach. This risk assessment and the associated documents within the Risk Management Framework aim to provide the guidance and documentation to enable all staff to adopt this approach.

### 6.2 Purpose

The purpose of these procedures is to define the roles and responsibilities, monitoring and reporting requirements for the management of risks within Barwon South West. These procedures are intended to be an information reference and contain the minimum principles and procedures of a basic risk management process to assist Council departments in adopting a consistent approach to risk management. The application of these procedures at line management level will encourage better practice and provide support to Directors, managers and officers who have Risk Accountability in the implementation of effective risk management practices at all levels within Barwon South West Councils.

### 6.3 Risk Management process

The Risk Management process to be followed within Barwon South West is in accordance with the AS5334:2013 *Climate change adaptation for settlements and infrastructure — A risk based approach*. This is a significant development as it provides a standard methodology for approaching climate change adaptation in the built environment. AS 5334 references the globally recognised risk management approach outlined in ISO 31000:2009 *Risk management - Principles and guidelines* (as shown in Figure 5).

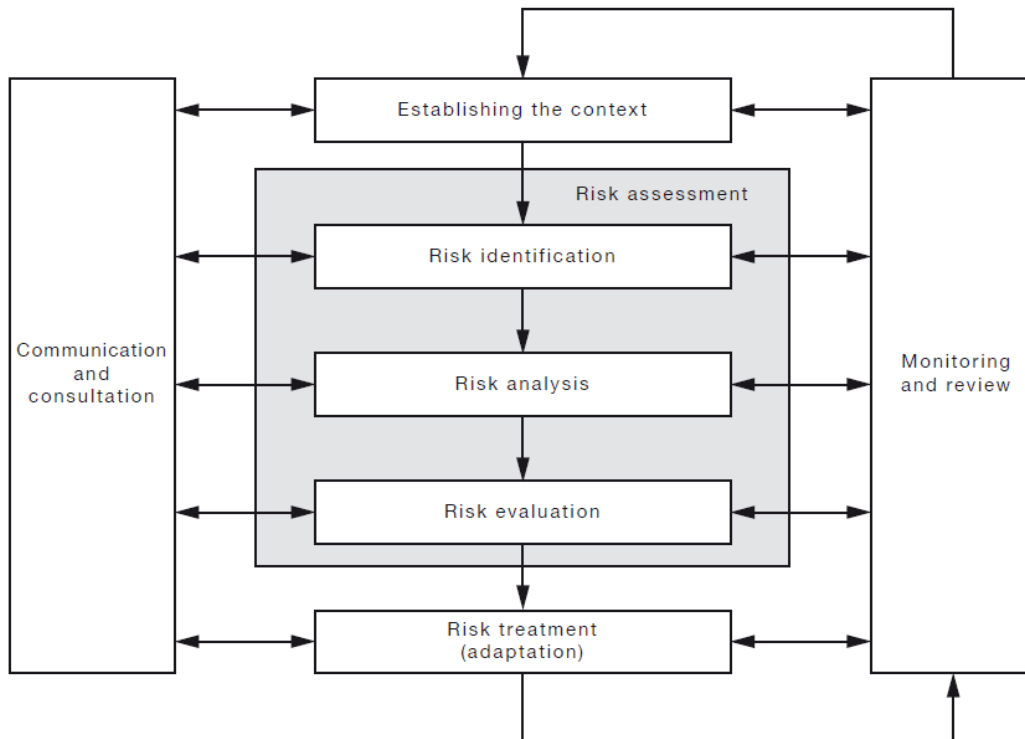


Figure 5. Risk Assessment approach (adapted from AS/NZS ISO 31000)

6.3.1 Adaption (Risk Treatment)

AS 5334 provides specific guidance on the consideration of climate change impacts and assessment of adaptation options. The guidance of AS 5334 has informed the development of this Climate Change Risk Assessment, ensuring that the process follows current best practice approaches to climate change adaptation (as shown in Figure 6 below).

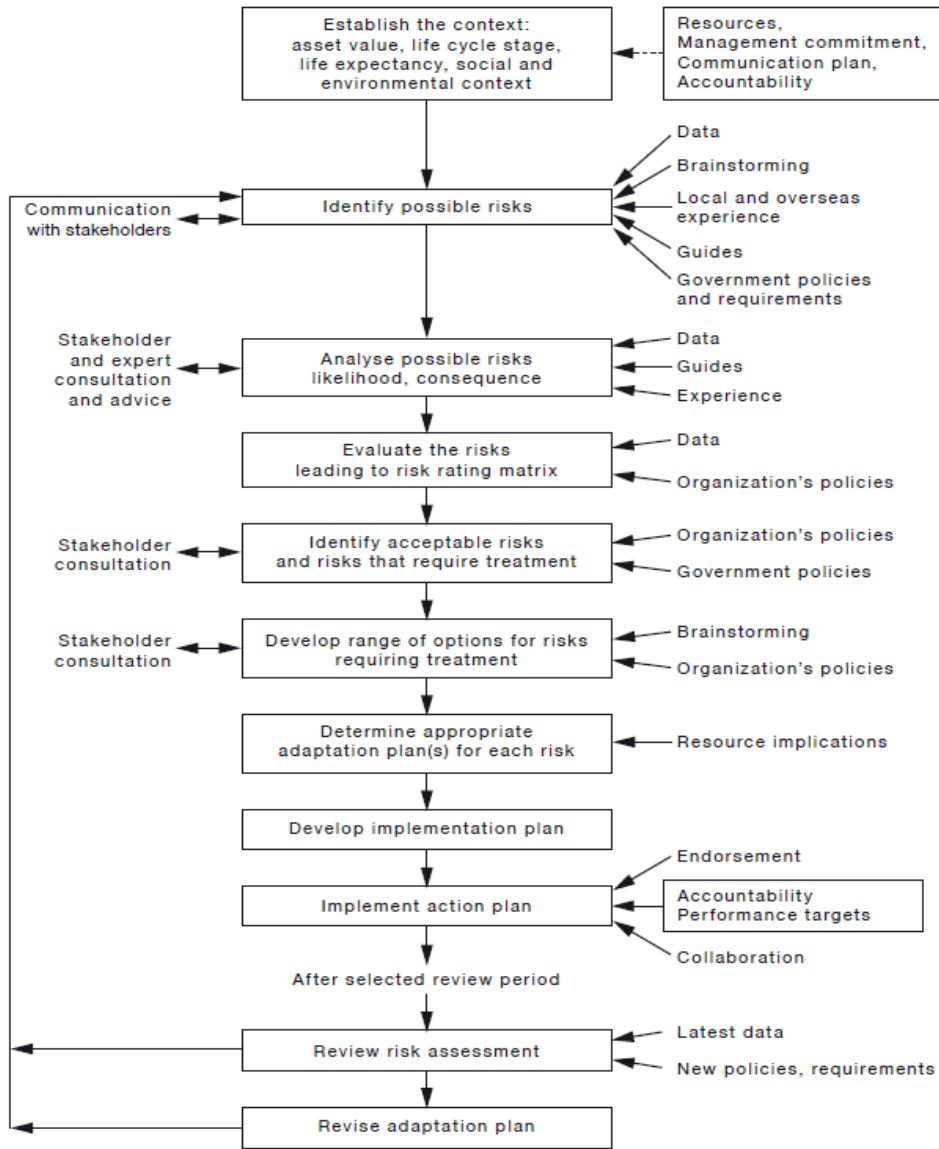


Figure 6. Risk Assessment Process (AS 5334-2013)

6.3.2 Risk Criteria

Risk criteria are the likelihood and consequence ratings that are used in order to assess the level of the risk to determine whether treatment is required.

6.3.3 Likelihood

All areas within Barwon South West will utilise the likelihood rating system shown below in Table 9 when analysing risks.

**Table 9. Likelihood Table**

Likelihood	Descriptor	Recurrent or event risks	Long term risks
<b>Almost certain</b>	Could occur several times per year	Has happened several times in the past year and in each of the previous 5 years – or – Could occur several times per year.	Has a greater than 90% chance of occurring in the identified time period if the risk is not mitigated.
<b>Likely</b>	May arise about once per year	Has happened at least once in the past year and in each of the previous 5 years – or – May arise about once per year	Has a 60–90% chance of occurring in the identified time period if the risk is not mitigated.
<b>Possible</b>	Maybe a couple of times in a generation	Has happened during the past 5 years but not in every year – or – May arise once in 25 years	Has a 40–60% chance of occurring in the identified time period if the risk is not mitigated.
<b>Unlikely</b>	Maybe once in a generation	May have occurred once in the last 5 years – or- May arise once in 25 to 50 years	Has a 10–30% chance of occurring in the future if the risk is not mitigated.
<b>Rare</b>	Maybe once in a lifetime	Has not occurred in the past 5 years – or – Unlikely to occur during the next 50 years	May occur in exceptional circumstances, i.e. less than 10% chance of occurring in the identified time period if the risk is not mitigated

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### 6.3.4 Consequence

As with likelihood for risk assessments to be effective a structured approach is required across the organisation to assessing consequence. Table 10 below is a qualitative method of estimating the consequences of the identified climate change risk. Not all risks may pose negative impacts, some may have positive impacts. The positive impacts will be captured under the beneficial category.

**Table 10 Consequence Table**

Consequence Descriptor	Residents Private Property	Economic	Human Health and Wellbeing	Social/Cultural	Political/ Reputation and Liability	Environment and Open Space	Infrastructure Service	Council Financial and Resourcing
Abbreviation	(RP)	(EC)	(HH)	(SC)	(PL)	(EO)	(IS)	(FR)
<b>Beneficial</b>	Will have positive impacts on private property with no cost to the council.	Will have positive impacts on the regional economy e.g. increase in tourism, or increased productivity in a primary product	Positive impact to human health and wellbeing e.g. favourable conditions for some medical conditions.	Positive impact on community social fabric or cultural values including, amenity, indigenous sacred sites, multicultural values or places of historical significance	Positive impacts for Council or Councillors.	Positive impact on the natural environment e.g. favourable conditions for other species Increased quality or access to open space or parks and reserves	Positive impact on infrastructure e.g. less maintenance required.	No cost to council may have a financial gain.
<b>Negligible</b>	No private property damage.	No impacts on the broader economy. Business as usual.  Minor shortfall relative to current forecasts.	No impact to human health and wellbeing.  No loss of lives.  No chronic health effect requiring medical treatment	No impact to community social fabric or cultural values including, amenity, indigenous sacred sites, multicultural values or places of historical significance.	No changes to management required.  No potential for legal ramifications from impact. No negative implications for Council or Councillors. No impact on reputation.	No adverse impact on natural environment.  No change in the quality or access to open space or parks and reserves	No infrastructure damage, little change to service	Cost to council below \$50,000.  Increase in annual operating costs less than 0.5%  Additional work for current employee but manageable

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Consequence Descriptor	Residents Private Property	Economic	Human Health and Wellbeing	Social/Cultural	Political/ Reputation and Liability	Environment and Open Space	Infrastructure Service	Council Financial and Resourcing
Abbreviation	(RP)	(EC)	(HH)	(SC)	(PL)	(EO)	(IS)	(FR)
<b>Minor</b>	<p>Cost to council of \$50,000 to \$200,000.</p> <p>Isolated private property damage (10% of residents in compartment).</p> <p>No permanent damage. Some minor restoration work required.</p>	<p>Individually significant but isolated areas of reduction in economic performance relative to current forecasts.</p> <p>Temporary impact, with no long term implications impeding trade.</p> <p>Seasonal disruption to a primary product of marginal significance to the regional economy.</p>	<p>Minor first aid required. Slight impact and threat to human health and wellbeing. No loss of lives.</p> <p>Injury to staff member results in lost time under 10 days.</p> <p>Chronic health effect requiring medical treatment for &gt;1-2% of population at-risk</p>	<p>Localised disruption to community wellbeing, amenity and social networks over a small area for a period of weeks</p> <p>Small negative impact on community social fabric</p> <p>Community feels threatened by impact in a minor way, but can tolerate a reactive management plan.</p>	<p>General concern raised by regulators requiring response action</p> <p>Inadequate probity being exercised.</p> <p>Minor/isolated concerns raised by members of public, customers, suppliers.</p> <p>Low concern for reputation of Council.</p>	<p>Minor impacts on small areas of natural environment, with short term recovery projected. No indirect impacts to wider biodiversity of areas. Minor management required.</p> <p>Required to notify EPA and / or contained temporary pollution.</p> <p>Seasonal deterioration in the quality of an open space or a park or reserve</p>	<p>Localised infrastructure service disruption.</p> <p>No permanent damage. Some minor restoration work required.</p> <p>Early renewal of up to 5% by value of total council infrastructure.</p> <p>Need for new/modified ancillary equipment.</p>	<p>Cost to council of \$50,000 to \$200,000.</p> <p>Increase in annual operating costs 0.5% to 1%</p> <p>Additional 1 FTE required</p>
<b>Moderate</b>	<p>Cost to council of \$200,000 to \$2.5m.</p> <p>Isolated private property damage (10% within compartment) in areas with low socio-economic residents (i.e. low income – ignoring asset levels).</p> <p>Private property damage recoverable by maintenance and minor repair.</p> <p>Some private property damage (20%) in areas without economic disadvantage.</p>	<p>General reduction in economic performance relative to current forecasts.</p> <p>Major investment slows in a specific locality</p> <p>Tourism trade is moderately affected with limited access to local industry.</p> <p>Seasonal disruption to a primary product of significance to the regional economy.</p>	<p>Negative impacts on human health and wellbeing for staff and general public.</p> <p>Injury to staff member results in lost time over 10 days.</p> <p>Hospital admission for check-up. No permanent damage and no lives lost.</p> <p>Chronic health effect requiring medical treatment for 2-5% of population at-risk</p>	<p>Major disruption to community wellbeing, amenity and social networks over a locality for a period of months.</p> <p>Some impact to community social fabric of cultural values including physical damage to indigenous sacred sites, multicultural values or places of historical significance.</p>	<p>Investigation by regulators.</p> <p>Changes to management actions required.</p> <p>Public/media negative attention. Coverage by local papers, with some coverage in Melbourne papers.</p> <p>Local community concern demonstrated through letters of complaint and small protests.</p> <p>Customer/supplier concern.</p> <p>Reputational risk.</p>	<p>Damage to natural environment, with interacting impacts for wider biodiversity. Potential for threat to endangered flora and fauna through indirect impacts.</p> <p>Significant release of pollutants. Residual pollution requiring clean-up.</p> <p>Large environmental footprint.</p> <p>Remedial management required, with minimal long term damage.</p> <p>Seasonal deterioration in the quality and access to open space or parks and reserves across the region</p>	<p>Limited infrastructure damage and loss of service.</p> <p>Damage recoverable by maintenance and minor repair.</p> <p>Early renewal of 5% to 10% by value of total council infrastructure.</p>	<p>Cost to council of \$200,000 to \$2.5m.</p> <p>Increase in annual operating costs 1% to 5%</p> <p>Additional 2-4 FTEs</p>



## Southern Grampians Shire Climate Change Adaptation Plan 2017 - 2027

Consequence Descriptor	Residents Private Property	Economic	Human Health and Wellbeing	Social/Cultural	Political/ Reputation and Liability	Environment and Open Space	Infrastructure Service	Council Financial and Resourcing
Abbreviation	(RP)	(EC)	(HH)	(SC)	(PL)	(EO)	(IS)	(FR)
Major	<p>Cost to council of \$2.5 to \$5m.</p> <p>Some private property damage (20% within compartment) in areas with low socio-economic residents (i.e. low income – ignoring asset levels).</p> <p>Extensive private property damage requiring major repair.</p> <p>Some private property damage (30%) in areas without economic disadvantage.</p>	<p>Investment stagnated.</p> <p>Region not growing with respect to tourism, arts or culture.</p> <p>Tourism is significantly affected, with some long term damage to reputation of local industry.</p> <p>Local traders are unable to operate for over a week, with some permanent impact.</p> <p>Seasonal disruption to more than one primary product of significance to the regional economy.</p>	<p>Emergency status due to major injury to staff or a member of the public.</p> <p>Injury to staff member results in lost time over two weeks.</p> <p>Threat to other members of the public or staff.</p> <p>Potential for ongoing danger to members of staff and public.</p> <p>Chronic health effect requiring medical treatment for &gt; 5-10% of population at-risk.</p>	<p>Reduced quality of life within community.</p> <p>Severe impact to community social fabric, amenity, community wellbeing, and social networks over a wide area for up to two years.</p> <p>Significant loss or damage to objects of cultural/heritage significance. This includes loss of large areas of cultural significance without potential for conservation.</p>	<p>Notices issued by regulators for corrective actions.</p> <p>Changes required in management.</p> <p>Senior management responsibility questionable.</p> <p>Threat of legal action against Council.</p> <p>High public/media and community concern with coverage in State newspapers, news coverage.</p> <p>Council subject to formal inquiry/sanctioned</p>	<p>Major damage to natural environment, including high impact to biodiversity across the catchment.</p> <p>EPA likely to charge.</p> <p>Major release of toxins/water resulting in high compensation or reconstruction costs.</p> <p>Significant threat to species, including endangered flora and fauna, with potential for permanent damage to ecosystems.</p> <p>Excessive environmental footprint</p> <p>Chronic deterioration in the quality and access to open space or parks and reserves across the region</p>	<p>Extensive infrastructure damage requiring major repair.</p> <p>Major loss of infrastructure service.</p> <p>Early renewal of 10% to 20% by value of total council infrastructure.</p>	<p>Cost to council of \$2.5 to \$5m.</p> <p>Increase in annual operating costs 5% to 10%</p> <p>Additional 5- 10 FTEs</p>

## Southern Grampians Shire Climate Change Adaptation Plan 2017 - 2027

Consequence Descriptor	Residents Private Property	Economic	Human Health and Wellbeing	Social/Cultural	Political/ Reputation and Liability	Environment and Open Space	Infrastructure Service	Council Financial and Resourcing
Abbreviation	(RP)	(EC)	(HH)	(SC)	(PL)	(EO)	(IS)	(FR)
Catastrophic	<p>Cost to council &gt;\$5m.</p> <p>Some private property damage (&gt;20% within compartment) in areas with low socio-economic residents (i.e. low income – ignoring asset levels).</p> <p>Substantial permanent damage to private property.</p> <p>Some private property damage (&gt;30%) in areas without economic disadvantage.</p>	<p>Major investment stagnated.</p> <p>Regional decline leading to widespread business failure, loss of employment and hardship.</p> <p>The region would not be viewed as an attractive tourist, arts or cultural destination.</p> <p>Tourism trade is extensively effected, with significant reduction in visitors to the area projected for the next 2 years.</p> <p>Long term decline of more than one primary product of significance to the regional economy.</p>	<p>Single or multiple deaths.</p> <p>Serious injury to one or many members of the public or staff, including disability and permanent damage.</p> <p>Chronic health effect requiring medical treatment for 10-15% of population at-risk.</p>	<p>Community ability to support itself severely impaired.</p> <p>Widespread loss of objects of cultural/heritage significance.</p> <p>Severe disruption to community wellbeing, amenity and social networks over the whole area or a large part of it for a period of many years.</p> <p>Extreme impact to social fabric of community with community values compromised.</p>	<p>Major policy shifts. Change to legislative requirements. Full change of management control.</p> <p>Legal action against Council undertaken.</p> <p>Significant public/media and/or community outrage with ongoing coverage in State newspapers and media outlets. National coverage in the media.</p> <p>Public pressure to curtail operations of Council.</p>	<p>Extreme impact to natural environment with extensive damage to wider biodiversity of catchment.</p> <p>Major release of toxins to environment resulting in long term damage.</p> <p>Extensive remedial action required immediately to prevent further damage to biota. Restoration and breeding programs required to manage ongoing survival of flora and fauna.</p> <p>Complete loss of one or more species.</p> <p>Permanent deterioration in the quality and access to open space or parks and reserves across the region</p>	<p>Significant permanent damage and/or complete loss of the infrastructure and the infrastructure service.</p> <p>Loss of infrastructure support and translocation of service to other sites. Cost associated with transferring services required from other areas of Council. (Is this relevant to council infrastructure?)</p> <p>Early renewal of greater than 20% by value of total council infrastructure.</p>	<p>Cost to council &gt;\$5m</p> <p>Increase in annual operating costs &gt;10%</p> <p>Additional 10 + FTEs required</p>

### 6.3.5 Risk Identification

The aim of risk identification is to develop a comprehensive list of events that may occur and, if they do, are likely to have an impact on the objectives of Barwon South West. When identifying risk a sensible approach needs to be taken. Identifying hundreds of risks will make it virtually impossible to effectively manage them; identifying only a handful will increase the likelihood that Barwon South West will experience significant issues that take it outside its tolerance levels.

### 6.3.6 Risk Analysis

The main objective of risk analysis is to separate the minor acceptable risks from the major ones, and to provide data to assist in the evaluation and treatment of the risk. Not all risk may have negative outcomes, some risk may have positive outcomes and this is captured by the beneficial column outlined in Table 11 below.

### 6.3.7 Risk Matrix

To ascertain the overall risk level for a particular risk, the likelihood and consequence scores for the risk are extrapolated into the matrix below.

**Table 11. Likelihood x Consequence risk matrix.**

		Consequence					
		Catastrophic	Major	Moderate	Minor	Negligible	Beneficial
Likelihood	Almost certain	Extreme	Extreme	High	Medium	Low	
	Likely	Extreme	High	Medium	Medium	Negligible	
	Possible	High	Medium	Medium	Low	Negligible	
	Unlikely	High	Medium	Low	Low	Negligible	
	Rare	High	Medium	Low	Negligible	Negligible	

### 6.3.8 Risk Interdependency

Post risk identification and assessment, it is important to understand if risks interact with each other to result in additional or amplified consequences. Interdependency could be represented by:

**Cumulative effect:** risks that when considered together (i.e. occurring over a similar period) increase the existing consequences of the individual risks.

For example, a bushfire occurring during a period of drought, which requires drawing on water storages to be fought, places further strain on water storages for the catchment.

**Additional consequence:** where new consequences are derived from the interaction of the two risks

For example, heavy rains on catchments that have already been de-vegetated by fire causing dramatic effects on raw water quality in storages, or a flood event directly after a bushfire, resulting in flooding of surrounding residential areas that are usually protected by vegetation.


To determine interdependencies, the following process was undertaken.

Post risk assessment, the high and extreme risks were collated to determine if any risks presented an interaction with each other. In the instance where the risk assessment workshops did not produce any high or extreme risks, a conversation with the PMG representative determined the risks that would be pushed into the interdependency activity. In an instance where a risk was not rated high or extreme, but was deemed significant enough to determine interdependency with other high or extreme risks, it was pushed through to the interdependency activity. In all instances, the PMG representative, along with the project team decided on the final risk interdependency list. The number of risks tested for interdependency varied per council. Some worked with 13 risks and some worked with five.

An interdependency matrix was used (Figure 7), with an opportunity to investigate the interdependency between each risk. A conversation was facilitated between the cross-council workshop participants in small groups as to whether additional consequences could arise as a result of the risk interaction that could change the rating of the original risk.

If an interaction presented itself, it was noted in the matrix. If there was no interaction (i.e. events were unlikely to occur together or were similar enough to hold similar consequences), no interaction was noted. Participants came back together as a larger group to discuss the common interdependencies. The noted interdependencies were used by the project team to gauge whether the original risks required an increased rating (e.g. additional consequences were noted or interaction posed a cumulative effect) and each council risk register was updated accordingly. Final council risk reporting reflected this process.

Interdependencies matrix - Coliac  
Extreme and high risks



Risk	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															
13															
14															
15															

Figure 7: Interdependency matrix used in interdependency discussions - each risk included holds an opportunity to interact with the other risks