Environmental Scan Report

Grampians Region

Table of Contents

1. Introduction

Planning by agencies has traditionally focused on each hazard type e.g. fire, flood or storm, using risk-based decision-making processes to inform preparedness, response, relief and recovery (PPRR) activities. Victorian emergency management arrangements also support agencies and relevant stakeholders to work together across all hazard types. This includes creating opportunities to identify and manage priorities to effectively manage risks, together with communities and organisations from within and outside the emergency management sector.

In 2020, the *Emergency Management Act 2013* was amended by the *Emergency Management Legislation Amendment Act 2018*. In response to this, new State, Regional and Municipal plans are required to comply with the new legislation. Some of the key inclusions are information on regional context, and mitigation, response and recovery strategies, along with supporting roles and responsibilities for regional collaboration. The new arrangements also require the establishment of regional emergency management planning committees (REMPCs) and the preparation of regional emergency management plans (REMPs).

Emergency Management Victoria (EMV) is providing guidance to the REMPCs for each of the eight emergency management regions in Victoria to assist with the development of updated regional plans.

2. Purpose

The aim of this is to produce a document containing consistent, accurate contextual data and information for each REMPC to use as a resource when preparing the context section of their REMP.

The outputs from this analysis will link directly to the context section of the REMPs. The standard headings from the State plan reference natural, built, economic and social environments for consideration. While the relative importance of each of these will vary between regions, they will still provide a good overview of the key regional context.

3. Structure of document

The structure of this document first summarises the process used to investigate the environment under which each region operates. This environmental scanning process was undertaken using a PESTEL analysis (Political, Economic, Social, Technological, Environmental and Legal). The content of the document then explores the data and information found, grouped under the standard headings from the State Emergency Management Plan, Natural, Built, Social and Economic environments. Each of these has sub-headings relevant to the region. Finally, a data source section shows the data and information attribution and summarises the metadata for each source used in the document. This gives context to the data and information as well as an assessment of reliability, credibility and currency of the data.

4. Environmental scan process

The categories of a PESTEL analysis are often used for business analysis to cover all aspects of context for a project or business proposal to expand the thinking outside of the standard considerations. This will broaden the scope of the emergency management sector to cover all emergencies and all communities. Further detail for each key area is in the image below.

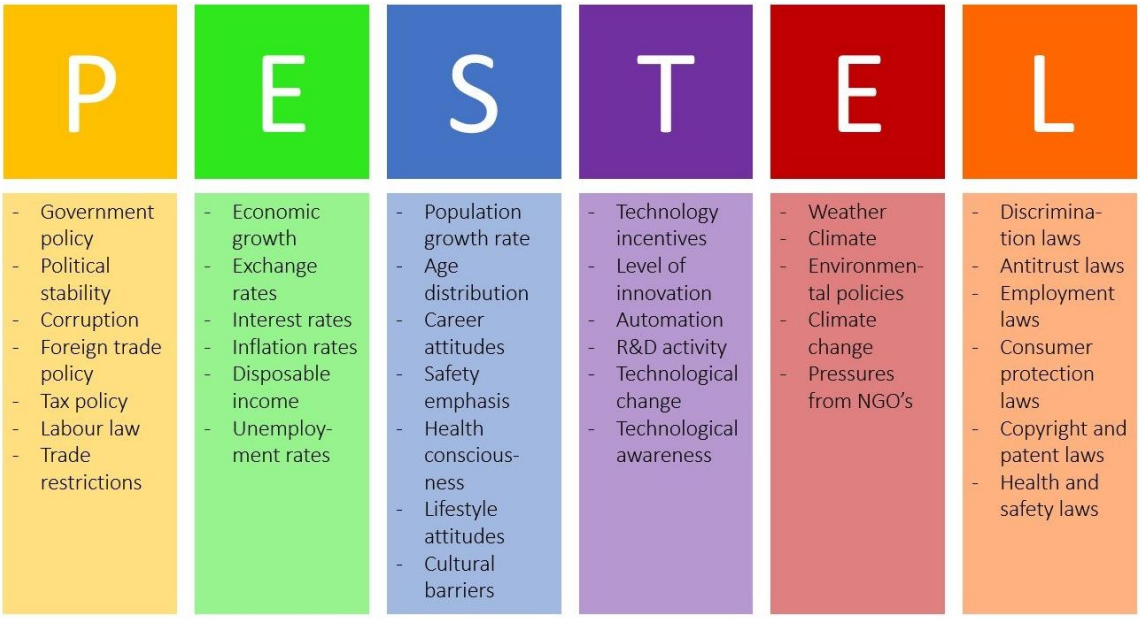


Figure 1. PESTEL analysis[1]

The broad environmental scanning process ensured that all impacts on the region were considered, including those influences outside of the regional boundaries.

5. Regional Context

The Grampians Region includes the traditional lands of the of the Wotjobaluk, Jaadwa, Jadawadjali, Wergaia, Jupagalk, Dja Dja Wurrung, Wadawurrung and Djab Wurrung peoples and sections of the land of the Taungurong people and the Yorta Yorta people[2], and is one of eight regions for emergency management in Victoria, declared under Section 63 of the *Emergency Management Act 2013*.

1 B2U (2020): https://www.business-to-you.com/scanning-the-environment-pestel-analysis/
2 ACHRIS (2020): https://achris.vic.gov.au/weave/wca.html

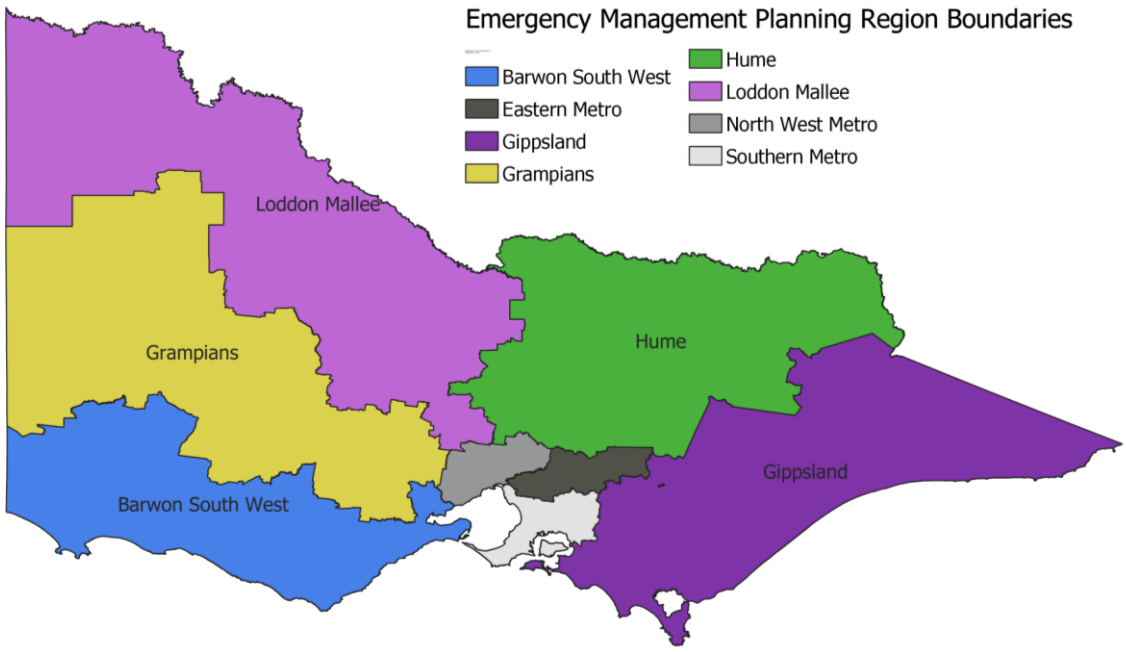


Figure 2. Victorian Emergency Management Regions

The Grampians Region shares boundaries with the Barwon South West and Loddon Mallee Regions, as well as the North West Metropolitan Region. It covers 48,627 square kilometres (21% of Victoria) and includes 11 local government areas (LGAs).

Figure 3. Grampians Region including LGA boundaries

The LGAs located within the Grampians Region, and their corresponding populations (2019) are:

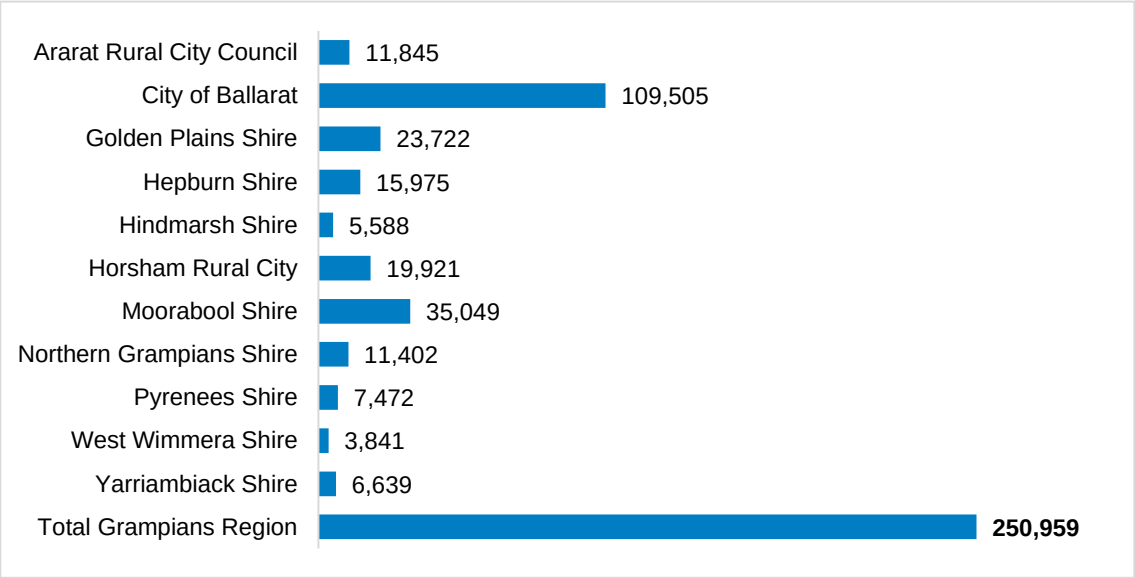


Figure 4. Population of Grampians Region by LGA[3]

The Grampians Region extends from the western edge of Melbourne to the South Australian border and incorporates two sub-regions – the Central Highlands and Wimmera Southern Mallee.[4]

It is one of the five regions which borders metropolitan Melbourne, with some areas in the east (parts of the Central Highlands sub-region) falling within Melbourne's peri-urban fringe. As a result, these areas experience elevated population and development pressures on landscapes, agricultural, waterway and environmental assets. For the areas falling in the western part of the region (the Wimmera Southern Mallee sub-region) there are fewer development pressures, with more rural landscapes and smaller towns.

Central Highlands sub-region

The Central Highlands sub-region includes the LGAs of Ararat Rural City, City of Ballarat, Golden Plains Shire, Hepburn Shire, Moorabool Shire and Pyrenees Shire. It is situated in the state's central west along the corridor which stretches from the outskirts of Melbourne, along the Western Highway to the Grampians National Park. Its main regional centre is Ballarat, with the regional city of Ararat located towards the centre of the sub-region. Other main regional centres include Bacchus Marsh, along with regional towns such as Bannockburn, Daylesford, Creswick, Ballan and Beaufort.

It has well-developed business, higher education and training networks, as well as road and rail access to major markets and proximity to supply chains, raw material and agricultural products. Tourism is also a

3 DJPR (2020): https://www.rdv.vic.gov.au/information-portal/table-and-chart
4 DJPR (2020): https://www.rdv.vic.gov.au/victorias-regions/grampians

major drawcard, including the historic goldfields and heritage architecture, emerging wine regions, mineral springs and spas. Its rural areas are dominated by agriculture.

Wimmera Southern Mallee sub-region

The Wimmera Southern Mallee sub-region includes the LGAs of Hindmarsh Shire, Horsham Rural City, Northern Grampians Shire, West Wimmera Shire and Yarriambiack Shire. It stretches along the Western Highway corridor connecting Melbourne and Adelaide and has its main regional centre in Horsham. Regional towns include Stawell, Warracknabeal, St Arnaud, Nhill and Dimboola.

Agriculture is the dominant land use, economic driver and employment sector in the region, predominantly comprising broadacre cropping of cereals, pulses and oilseeds in the central and northern parts of the region, and livestock grazing in the southern parts. The Grampians, Little Desert and Wyperfeld National Parks and Mount Arapiles represent significant tourist attractions.

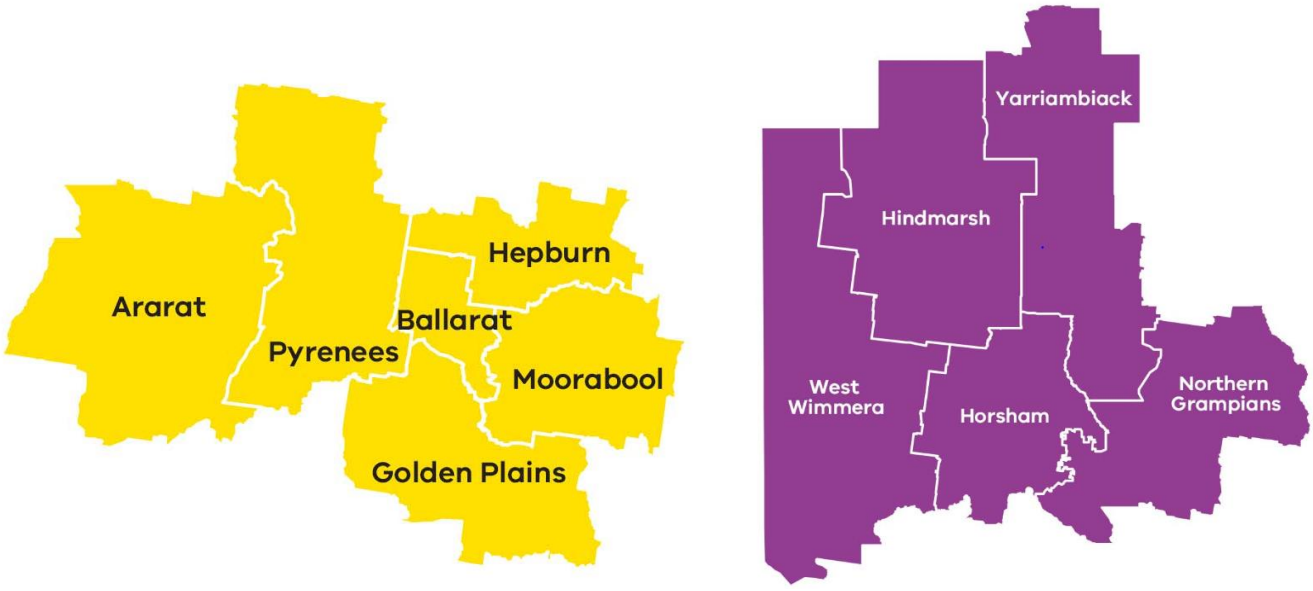


Figure 5. Central Highlands and Wimmera Southern Mallee sub-regions including LGA boundaries[5]

6. Natural Environment

The natural environment of the Grampians Region differs between the Central Highlands sub-region in the south and the Wimmera Southern Mallee sub-region in the North.

The Central Highlands sub-region contains many of Victoria's significant environmental features, including Grampians National Park, St Arnaud Range National Park, the Pyrenees Ranges (part of the Great Dividing

5 DJPR (2020): https://www.rdv.vic.gov.au/victorias-regions/grampians

Range), Daylesford and Hepburn Springs, Werribee Gorge State Park, and many significant rivers, wetlands and lakes.[6] These features of the natural environment represent significant attractions for both residents and visitors and provide a major contribution to the sub-region's social and economic wellbeing.

The Wimmera Southern Mallee sub-region comprises a diverse environment with mountains, plains and deserts, moist foothill forest, box ironbark forest, woodlands, grasslands, Mallee heath and Mallee woodlands.[7] Key natural assets of the region include Little Desert National Park, Big Desert National Park, the Wyperfeld National Park, and wetlands designated as being of international importance under the Ramsar convention, including Lake Albacutya and Lake Hindmarsh. The sub-region hosts an estimated 1,900 plant species and 440 animal species.[8]

6.1 Climate

6.1.1 Average Temperatures

In the Grampians Region summers are warm to hot, with average maximum temperatures of between 27° and 30° in the west of the region, and 25° in the east.[9] In winter, average maximum temperatures in the west are between 13° to 15° and around 10° in the east.

Average maximum (max) and minimum (min) temperatures from a 30-year climate period from (1961-1990) are outlined below:

6 DJPR (2014): https://www.planning.vic.gov.au/__data/assets/pdf_file/0025/106549/Central-Highlands-Regional-Growth-Plan-Background-Report-May-2014.pdf
7 DJPR (2014): https://www.planning.vic.gov.au/__data/assets/pdf_file/0020/106562/Wimmera-Southern-Mallee-Regional-Growth-Plan-Background-Report-March-2014.pdf
8 DJPR (2014): https://www.planning.vic.gov.au/__data/assets/pdf_file/0020/106562/Wimmera-Southern-Mallee-Regional-Growth-Plan-Background-Report-March-2014.pdf
9 DELWP (2015): https://www.climatechange.vic.gov.au/__data/assets/pdf_file/0018/60741/Grampians.pdf

Table 1. Seasonal average temperatures for GMPR by LGA[10]

LGA	Summer (°C)		Winter (°C)	
	Max	Min	Max	Min
Ararat Rural City Council	25.6	11.0	12.0	3.9
City of Ballarat	24.6	10.3	11.0	2.8
Golden Plains Shire	24.9	11.4	12.6	4.4
Hepburn Shire	24.8	10.5	10.5	2.5
Hindmarsh Shire	29.7	12.9	14.7	4.3
Horsham Rural City	28.2	11.9	13.5	3.9
Moorabool Shire	23.9	10.9	11.0	3.5
Northern Grampians Shire	27.7	12.2	12.8	3.9
Pyrenees Shire	25.8	10.9	11.6	3.3
West Wimmera Shire	28.3	11.5	14.1	4.2
Yarriambiack Shire	29.9	13.5	14.7	4.3
Grampians Average	**26.7**	**11.5**	**12.6**	**3.7**

6.1.2 Rainfall

Average annual rainfall in the Grampians Region varies from up to 1,000mm in the Grampians, to as low as 300mm in the northern plains, with rainfall generally being greatest in winter and spring.[11] Since the 1960s, average rainfall has declined, especially in Autumn.

10 BOM (2020): http://www.bom.gov.au/climate/averages/maps.shtml
11 DELWP (2015): https://www.climatechange.vic.gov.au/__data/assets/pdf_file/0018/60741/Grampians.pdf

Table 2. Annual and seasonal average rainfalls (mm) for Grampians Region by LGA[12]

LGA	Mean Rainfall (mm)				
	Annual	Summer	Autumn	Winter	Spring
Ararat Rural City Council	612.4	109.3	142.4	189.1	171.7
City of Ballarat	693.4	140.1	161.0	204.2	188.0
Golden Plains Shire	622.9	130.9	147.7	166.2	178.1
Hepburn Shire	778.4	141.7	178.9	252.8	205.0
Hindmarsh Shire	373.4	66.4	80.5	118.0	108.6
Horsham Rural City	491.6	79.3	110.6	164.8	136.8
Moorabool Shire	747.3	153.6	175.6	207.9	210.2
Northern Grampians Shire	538.0	89.9	121.2	178.0	148.9
Pyrenees Shire	621.6	117.0	145.9	189.5	169.2
West Wimmera Shire	527.9	76.8	113.8	189.7	147.7
Yarriambiack Shire	369.6	69.7	85.0	108.3	106.6
Grampians Average	**579.7**	**106.8**	**133.0**	**179.0**	**161.0**

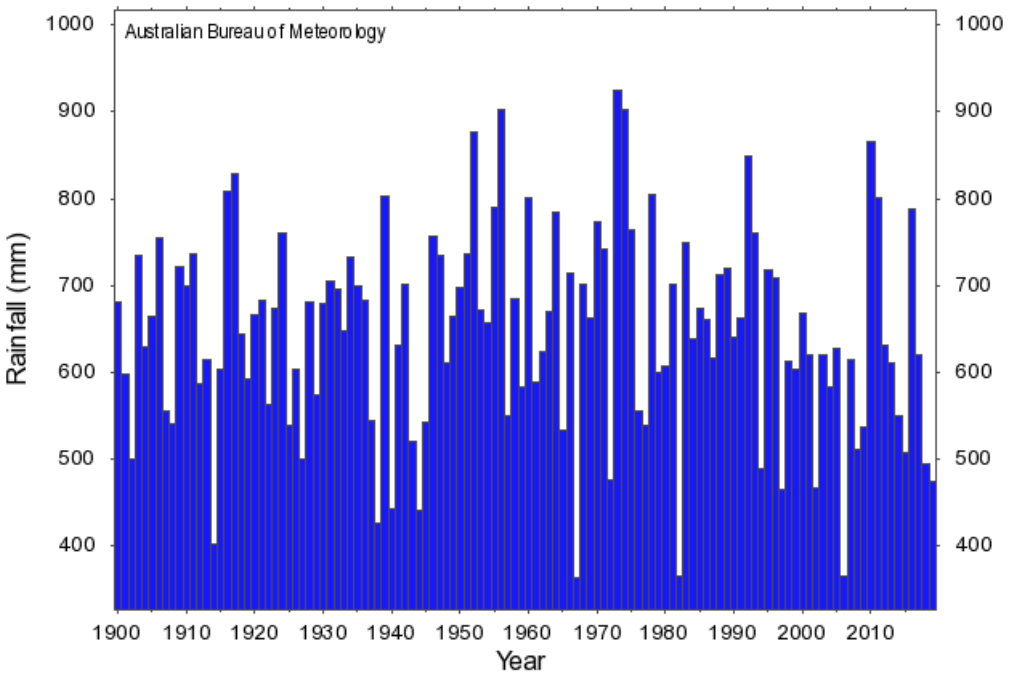


Figure 6. Annual rainfall Victoria (1900 to 2019) [13]

12 DELWP (2015): https://www.climatechange.vic.gov.au/__data/assets/pdf_file/0018/60741/Grampians.pdf
13 Bureau of Meteorology
http://www.bom.gov.au/climate/change/index.shtml#tabs=Trackerandtracker=timeseriesandtQ=graph%3Drain%26area%3Dvic%26season%3D0112%26ave_yr%3D0

Intensity–Frequency–Duration (IFD) design rainfall intensities (mm/h) or design rainfall depths (mm) corresponding to selected standard probabilities, are based on the statistical analysis of historical rainfall. Design rainfall are used in the design of infrastructure including gutters, roofs, culverts, stormwater drains, flood mitigation levees, retarding basins and dams. They can also be used to assess the severity of observed rainfall events.

The following tables summarise the design rainfalls that could be of interest for critical infrastructure planning. They give an indication of heavy rainfall probability across the region and can be used as potential triggers for response based on observed or forecast rainfall.[14] The standard probabilities shown here for reference are 10% annual exceedance probability (AEP), equivalent to 1 in 10 year average recurrence interval (ARI), and 1% AEP, equivalent to 1 in 100 year ARI.

Table 3. Grampians Design rainfalls by LGA – 5 Min[15] [16]

LGA	5 min 10% AEP (mm)				5 min 1% AEP (mm)			
	Mean	Min	Max	Range	Mean	Min	Max	Range
Ararat Rural City Council	9.0	8.1	10.1	2.0	15.2	13.5	17.1	3.6
City of Ballarat	9.1	8.7	9.7	0.9	15.6	14.9	16.6	1.7
Golden Plains Shire	7.9	7.0	9.1	2.1	13.2	11.5	15.5	4.0
Hepburn Shire	9.4	8.5	10.0	1.6	16.2	14.4	17.4	3.0
Hindmarsh Shire	8.9	8.3	9.5	1.2	15.7	14.5	17.1	2.6
Horsham Rural City	8.5	8.1	9.0	0.9	14.5	13.6	15.8	2.2
Moorabool Shire	8.7	7.3	10.0	2.7	14.6	12.2	17.3	5.1
Northern Grampians Shire	9.1	8.3	10.1	1.7	15.8	14.3	17.0	2.7
Pyrenees Shire	8.6	8.0	9.9	1.9	14.6	13.4	16.7	3.4
West Wimmera Shire	8.1	7.4	8.5	1.1	13.9	12.3	15.0	2.7
Yarriambiack Shire	9.4	8.7	10.0	1.3	16.8	15.0	18.4	3.4

14 Further values can be obtained from: http://www.bom.gov.au/water/designRainfalls/revised-ifd/
15 BOM (2016): http://www.bom.gov.au/water/designRainfalls/revised-ifd/
16 The standard probabilities shown here for reference are 10% annual exceedance probability (AEP) equivalent to 1 in 10 year average recurrence interval (ARI) and 1% AEP, equivalent to 1 in 100 year ARI

Table 4. Grampians Design rainfalls by LGA – 1 hour[17] [18]

LGA	1hr 10% AEP (mm)				1hr 1% AEP (mm)			
	Mean	Min	Max	Range	Mean	Min	Max	Range
Ararat Rural City Council	26.9	24.3	30.4	6.1	45.8	40.3	51.2	10.8
City of Ballarat	27.2	26.2	28.9	2.7	46.7	44.6	49.6	5.0
Golden Plains Shire	23.8	21.0	27.3	6.3	39.7	34.6	46.6	12.0
Hepburn Shire	28.2	25.4	30.0	4.5	48.8	43.6	51.7	8.1
Hindmarsh Shire	26.8	25.1	28.8	3.7	47.2	43.5	51.6	8.1
Horsham Rural City	25.4	24.2	27.0	2.8	43.5	40.6	47.5	6.8
Moorabool Shire	26.0	22.1	29.9	7.8	43.8	36.8	51.3	14.5
Northern Grampians Shire	27.2	25.1	30.2	5.1	47.6	43.5	51.2	7.7
Pyrenees Shire	25.9	23.9	29.7	5.8	43.8	39.8	50.1	10.3
West Wimmera Shire	24.4	22.2	25.7	3.6	41.7	36.6	45.2	8.5
Yarriambiack Shire	28.2	26.0	30.3	4.3	50.4	45.1	55.8	10.7

Table 5. Grampians Design rainfalls by LGA – 1 Day[19] [20]

LGA	1 day 10% AEP (mm)				1 day 1% AEP (mm)			
	Mean	Min	Max	Range	Mean	Min	Max	Range
Ararat Rural City Council	72.4	64.5	105.6	41.0	114.8	101.6	167.4	65.8
City of Ballarat	76.7	73.2	84.6	11.4	119.6	112.8	131.3	18.4
Golden Plains Shire	73.8	64.3	86.1	21.8	116.4	101.5	139.0	37.4
Hepburn Shire	82.3	70.8	102.7	31.9	127.5	109.5	160.7	51.2
Hindmarsh Shire	70.4	65.5	74.3	8.8	132.4	121.6	143.7	22.1
Horsham Rural City	68.9	66.1	79.7	13.6	119.5	112.2	134.8	22.5
Moorabool Shire	84.5	72.3	104.6	32.3	134.8	117.2	163.3	46.1
Northern Grampians Shire	72.8	64.7	97.9	33.2	114.3	96.8	154.9	58.2
Pyrenees Shire	75.8	64.2	103.7	39.5	118.8	101.1	161.3	60.1
West Wimmera Shire	65.9	61.0	72.2	11.2	116.3	102.6	132.5	29.9
Yarriambiack Shire	69.4	65.0	74.2	9.1	119.8	106.9	136.1	29.2

17 BOM (2016): http://www.bom.gov.au/water/designRainfalls/revised-ifd/
18 The standard probabilities shown here for reference are 10% annual exceedance probability (AEP) equivalent to 1 in 10 year average recurrence interval (ARI) and 1% AEP, equivalent to 1 in 100 year ARI
19 BOM (2016): http://www.bom.gov.au/water/designRainfalls/revised-ifd/
20 The standard probabilities shown here for reference are 10% annual exceedance probability (AEP) equivalent to 1 in 10 year average recurrence interval (ARI) and 1% AEP, equivalent to 1 in 100 year ARI

For the Grampians Region, there is little variation in the shorter duration events which are generally driven by convective activity. Statistical analysis shows that that patterns of heavy rainfall from these storm events are similar across the region. This is shown by similar mean design rainfall values across all LGAs and low ranges between maximums and minimums for the selected probabilities.

The largest difference is observed in the longer duration events, where regions with variable topography experience higher rainfall.

It is expected that the impact of climate change will be to have less days with rain, but higher intensity rain events when those do happen. This is because a warmer atmosphere can hold more moisture. Australia's heavy rainfall patterns have a high natural variability and some sites are witnessing a larger increase in heavy rainfall for shorter duration events that may increase the risk of flash flooding.[21]

For the Grampians Region, despite an overall trend of declining rainfall, it is expected that more of the rain which does fall will be in increasingly extreme downpours, increasing the incidence of flood events.[22]

Rain Days >5mm by LGA

This rainfall calculation is based on the standard 30-year reference climate period (1961–1990). This threshold was chosen as 5mm is the threshold to exceed canopy and interception losses in the Keetch-Byram Drought Index, which is used to estimate soil moisture as a surrogate for heavy fuel availability in fires. The high range between the maximum and minimum number of rain days highlights the rainfall variability across the region with the drier areas to the west and wetter around the elevated areas.

21 BOM (2020): http://www.bom.gov.au/state-of-the-climate/australias-changing-climate.shtml
22 DELWP (2015): https://www.climatechange.vic.gov.au/__data/assets/pdf_file/0018/60741/Grampians.pdf

Table 6. Grampians Rain Days >5mm by LGA[23]

	Rain Days >5mm (days)			
LGA	**Mean**	**Min**	**Max**	**Range**
Ararat Rural City Council	42	35	78	43
City of Ballarat	45	43	50	7
Golden Plains Shire	39	33	45	12
Hepburn Shire	50	36	67	31
Hindmarsh Shire	23	20	30	10
Horsham Rural City	32	25	47	22
Moorabool Shire	43	25	66	41
Northern Grampians Shire	34	26	56	30
Pyrenees Shire	40	31	59	28
West Wimmera Shire	33	23	44	21
Yarriambiack Shire	23	19	29	10
Grampians Average	**36.7**	**28.7**	**51.9**	**23.2**

6.1.3 Climate Change

The Grampians Region has been getting warmer and drier, with the rate of warming increasing since 1960 and rainfall declining. In the future, the region can expect:[24]

- Temperatures to continue to increase year-round;
- More frequent and intense downpours;
- Less rainfall in autumn, winter and spring;
- Fewer frosts;
- More hot days and warm spells; and
- Harsher fire weather and longer fire seasons.

By 2050, as a result of these changes, the climate of Ararat is expected to be more like the climate of Bathurst currently, while the climate of Horsham will be more like the current climate of Echuca, and Warracknabeal will be more like Swan Hill.[25]

23 BOM (2016): http://www.bom.gov.au/jsp/ncc/climate_averages/raindays/index.jsp?period=anandproduct=5mm#maps
24 DELWP (2015): https://www.climatechange.vic.gov.au/__data/assets/pdf_file/0018/60741/Grampians.pdf
25 DELWP (2015): https://www.climatechange.vic.gov.au/__data/assets/pdf_file/0018/60741/Grampians.pdf

Figure 7. Grampians climate in 2050[26]

The potential impacts of these changes in climate affects all aspects of the natural, built, social and economic environments of the region, including primary production, infrastructure, tourism, health and community and the natural environment, as outlined below:[27]

Primary production

The impacts on primary production are likely to be more acutely felt in the Wimmera Southern Mallee sub-region, where the economy is less diversified and heavily dependent on agriculture. This particularly relates to cereal cropping and the wool and sheep meat industries, where the impacts of climate change may include lower cereal and wool production, less reproduction and lower growth rates.

Infrastructure

Critical services such as power, water, sewerage and telecommunications will be susceptible to the more extreme weather events caused by the changing climate.

Health and community

An ageing population, coupled with an increase in older 'tree-changers' choosing to move to the region, will increase the number of people who may need assistance to manage extreme heat, bushfires and flooding, which will subsequently increase pressure on health and community services.

26 DELWP (2015): https://www.climatechange.vic.gov.au/__data/assets/pdf_file/0018/60741/Grampians.pdf
27 DELWP (2015): https://www.climatechange.vic.gov.au/__data/assets/pdf_file/0018/60741/Grampians.pdf

Tourism

Harsher fire weather and warmer conditions, especially during peak tourist seasons, as well as reduced water availability for the region's wetlands and lakes, poses significant challenges for tourism in the region.

Environment

The region's environment is under threat from warmer and drier conditions, with reduced stream flows, more severe droughts, extreme weather events and harsher fire weather all contributing to reduced ecosystem health. A loss of biodiversity due to climate change will increase pressure on social and economic wellbeing in the region, which is largely dependent on nature-based tourism and a healthy environment.

6.2 Land Use

Land use in the Grampians Region is dominated by primary production, with over 75% of total land used for agricultural and horticultural purposes.[28]

In the Central Highlands sub-region, majority of the land is used for either agricultural and horticultural or parkland purposes. Most native forests, woodlands, grasslands and seasonal wetlands are located in parks and reserves, with the remainder of the land used for agriculture and horticulture, urban or other uses. Agricultural and horticultural uses are predominantly broadacre grazing and cropping in the southern parts of the sub-region, while the Bacchus Marsh Irrigation District supports intensive horticulture in the east. [29] There are also some areas of viticulture and poultry.

In the Wimmera Southern Mallee sub-region, agriculture is also the dominant land use, comprising broadacre cropping of cereals, pulses and oilseeds in the central and northern parts, and livestock grazing in the southern parts.[30]

Victoria's forestry and wood products industry is one of Australia's largest. In Victoria, it accounts for 9 million cubic metres or 27.5% of Australia's log harvest volume.[31] It accounts for approximately $7.3 billion or 31% of Australia's forest product manufacturing sales and service income.[32] [33] While the Grampians region is home to many sprawling state forests, the forestry industry is not a large source of revenue or jobs in comparison to other regions. Grampians is home to over 5,180 businesses in the agriculture, forestry and fishing industries, creating an approximate total of 7,241 jobs for the region.[34]

28 DJPR (2020): https://www.rdv.vic.gov.au/information-portal/table-and-chart
29 DJPR (2014): https://www.planning.vic.gov.au/__data/assets/pdf_file/0026/94445/Central-Highlands-Regional-Growth-Plan-May-2014.pdf
30 DJPR (2014): https://www.planning.vic.gov.au/__data/assets/pdf_file/0028/94690/Wimmera-Southern-Mallee-Regional-Growth-Plan-May-2014.pdf
31 DJPR (2020) https://djpr.vic.gov.au/forestry
32 DJPR (2020) https://djpr.vic.gov.au/__data/assets/pdf_file/0008/1924811/DJPR-Inclusion-Forestry-Plan-1.pdf
33 DJPR (2020) https://djpr.vic.gov.au/forestry
34 DJPR (2020): https://www.rdv.vic.gov.au/information-portal/table-and-chart

Table 7. Land usage by type across the Grampians Region (2017)[35]

Land Use Type	Area (Sq. Km)	% Area
Primary Production	37,793	*77.7%*
Parkland	9,249	*19.0%*
Other	647	*1.3%*
Residential	452	*0.9%*
Water	438	*0.9%*
Industrial	19	*0.0%*
Commercial	10	*0.0%*
Transport	10	*0.0%*
Education	10	*0.0%*
Hospital/Medical	0	*0.0%*
Total	**48,627**	***100.0%***

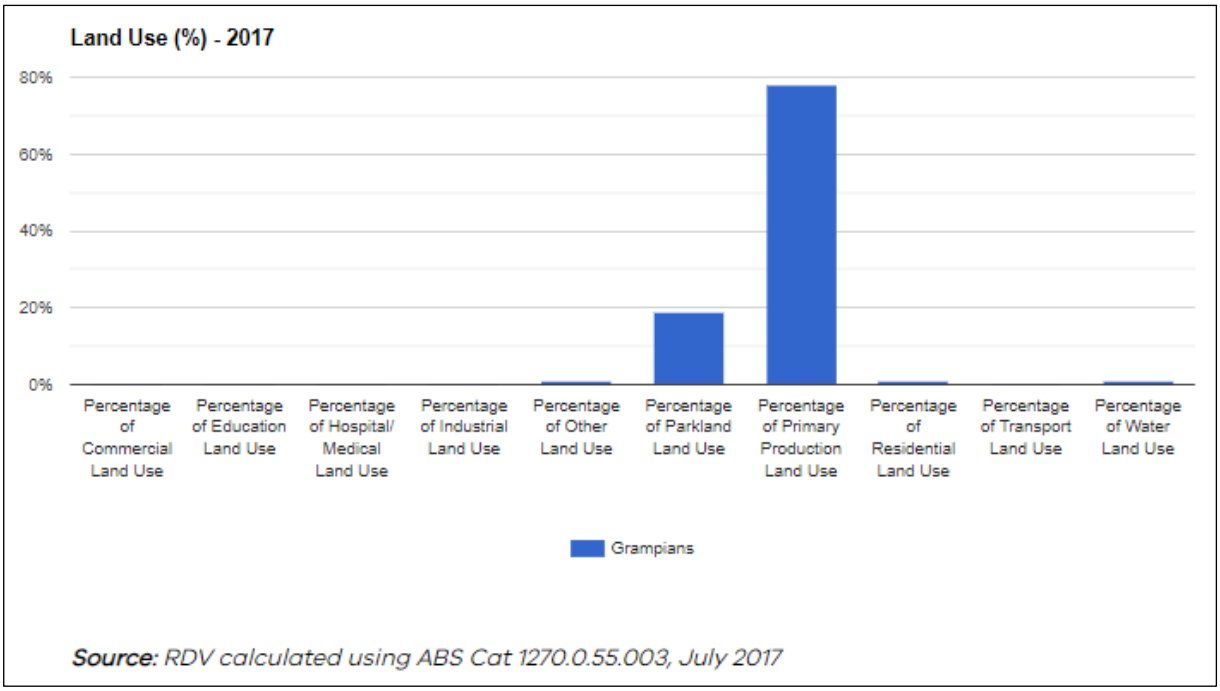


Figure 8. Land use in Grampians Region

35 DJPR (2020): https://www.rdv.vic.gov.au/information-portal/table-and-chart

The significant State and National parks located in the region are outlined below:

Table 8. State and National Parks in Grampians Region [36]

LGA	State and National Parks
Ararat Rural City Council	Grampians National Park (part), Langi-Ghiran State Park, Mount Buangor State Park (part), Ararat Hills Regional Park
City of Ballarat	N/A
Golden Plains Shire	Brisbane Ranges National Park (part), Enfield State Park
Hepburn Shire	Creswick Regional Park, Wombat State Forest (part), Hepburn Regional Park, Upper Loddon State Forest
Hindmarsh Shire	Little Desert National Park (part), Wyperfeld National Park (part)
Horsham Rural City	Black Range State Park
Moorabool Shire	Brisbane Ranges National Park (part), Lerderderg State Park, Werribee Gorge State Park, Bungal State Forest, Lal Lal State Forest, Wombat State Forest (part)
Northern Grampians Shire	Grampians National Park (part), St Arnaud Regional Park
Pyrenees Shire	Mount Buangor State Park (part), Ben Major State Forest, Waterloo State Forest, Musical Gully State Forest, Mt Lonarch State Forest
West Wimmera Shire	Big Desert Wilderness Park, Little Desert National Park, Dergholm State Park, Mount Arapiles-Tooan State Park
Yarriambiack Shire	Wyperfeld National Park (part)

6.3 Bushfire Risk

Like the rest of Victoria, a large portion of the Grampians Region is prone to bushfires, particularly whenever grassland vegetation and forest litter become very dry.

In the Central Highlands sub-region, there are many high bushfire hazard areas which intersect with settlements and areas that are experiencing rural residential and tourism expansion.[37] Some of the settlements identified for focused growth are also located in areas with bushfire hazards, including Ararat, Ballarat, Beaufort, Creswick and Smythesdale.[38]

The diverse landscapes of the Wimmera Southern Mallee sub-region create varying levels of bushfire risk. Many of the most attractive areas for residents and visitors such as Halls Gap and rural living areas surrounding Horsham and Stawell are at the greatest risk from bushfire.[39]

The Fire Danger Period (FDP) in Victoria has become longer over time, indicating a trend towards extended fire seasons. Seasonal fire restriction dates are set by municipalities and depend on amounts of rain,

36 https://profile.id.com.au/
37 DJPR (2014): https://www.planning.vic.gov.au/__data/assets/pdf_file/0026/94445/Central-Highlands-Regional-Growth-Plan-May-2014.pdf
38 DJPR (2014):https://www.planning.vic.gov.au/__data/assets/pdf_file/0026/94445/Central-Highlands-Regional-Growth-Plan-May-2014.pdf
39 DJPR (2014):https://www.planning.vic.gov.au/__data/assets/pdf_file/0028/94690/Wimmera-Southern-Mallee-Regional-Growth-Plan-May-2014.pdf

grassland curing and other local conditions. In 2019-2020, fire restriction dates for Victoria extended from as early as 23 September 2019 to 23 March 2020.[40]

Smoke from fires, including from planned burns, can also be a hazard within the Grampians Region. Those most at risk from smoke exposure include young children, adults over 65 years of age, people with asthma or existing heart or lung conditions, pregnant women, outdoor workers and smokers.[41]

In January 2020, smoke from bushfires across Victoria (and from New South Wales) rendered Melbourne's air quality the worst in the world[42] with the smoke haze estimated to cost the cities of Melbourne, Sydney and Canberra over $500 million.[43]

6.3.1 Bushfire prone areas

Bushfire prone areas are subject to or likely to be subject to bushfires, and to which specific bushfire construction standards apply.[44] Nearly all the land in the Grampians Region is a designated bushfire area.

Table 9. Bushfire Risk in Grampians Region by LGA[45]

LGA	Bushfire Prone Area (km^2)[46]	Total area (km^2)[47]	% Area Bushfire Prone	Plan Number
Ararat Rural City Council	4,194	4,211	*99.6%*	LEGL./13-162
City of Ballarat	678	739	*91.7%*	LEGL./20-098
Golden Plains Shire	2,701	2,703	*99.9%*	LEGL./19-215
Hepburn Shire	1,472	1,473	*99.9%*	LEGL./13-165
Hindmarsh Shire	7,401	7,524	*98.4%*	LEGL./13-166
Horsham Rural City	4,237	4,267	*99.3%*	LEGL./16-468
Moorabool Shire	2,090	2,111	*99.0%*	LEGL./20-111
Northern Grampians Shire	5,719	5,730	*99.8%*	LEGL./13-187
Pyrenees Shire	3,434	3,435	*100.0%*	LEGL./13-183
West Wimmera Shire	9,108	9,108	*100.0%*	LEGL./13-168
Yarriambiack Shire	7,321	7,326	*99.9%*	LEGL./13-169
Grampians Total or Average	**48,357**	**48,627**	***99.4%***	

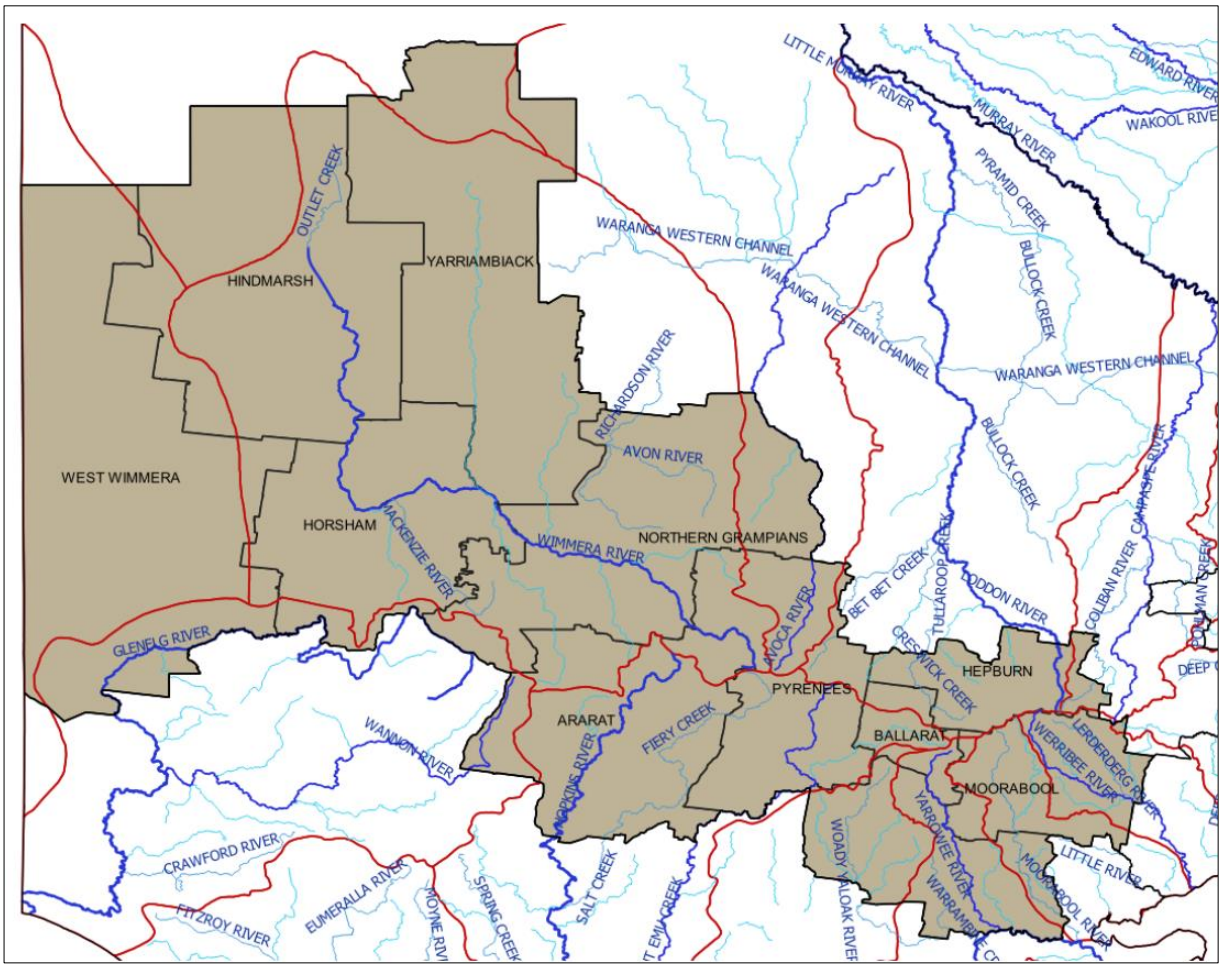
40 FFMV (2020): https://www.ffm.vic.gov.au/permits-and-regulations/fire-restriction-dates
41 DHHS (2020): https://www2.health.vic.gov.au/public-health/environmental-health/climate-weather-and-public-health/bushfires-and-public-health/smoke-from-fires-and-public-health
42 The Guardian (2020): https://www.theguardian.com/australia-news/2020/jan/14/melbourne-choked-by-hazardous-smoke-as-bushfires-continue-to-burn-across-victoria
43 City of Melbourne (2020): https://www.melbourne.vic.gov.au/about-council/vision-goals/eco-city/Pages/adapting-to-climate-change.aspx
44 DELWP (2020): https://www.planning.vic.gov.au/policy-and-strategy/bushfire-protection/building-in-bushfire-prone-areas
45 DELWP (2020): https://discover.data.vic.gov.au/dataset/designated-bushfire-prone-area-bpa
46 DELWP (2020): https://discover.data.vic.gov.au/dataset/designated-bushfire-prone-area-bpa
47 DJPR (2020): https://www.rdv.vic.gov.au/information-portal/table-and-chart

6.4 Waterways

The Central Highlands sub-region is part of the Murray-Darling Basin as well as several river catchments which drain to Victoria's coast. Parts of the Avoca, Barwon, Campaspe, Glenelg, Hopkins, Loddon, Maribyrnong, Moorabool, Werribee and Wimmera-Avon river catchments, and the Lake Corangamite catchment occur within the region. There are also numerous wetlands and wetland complexes throughout the region, as well as lakes which are important tourism assets, including Lake Wendouree, Green Hill Lake, Lake Bolac, Lake Learmonth, Lake Burrumbeet and Lake Buninyong.[48] Also of note are the mineral waters of Hepburn Shire, which are a significant tourism asset.

The Wimmera Southern Mallee sub-region is also part of the Murray-Darling Basin, and features significant assets including wetlands of national importance such as Lake Albacutya and Lake Hindmarsh. The region is also home to the Wimmera River, which flows to Lake Hindmarsh.[49] The Grampians region has solely inland waters. Several lakes and rivers occupy the region, however generally large distances separate each of the major water storages. The area is known for flash flooding and landslides, while the riverine flood response is generally long and slow to recede. There are high concentrations of boats on small waterways in peak periods and drownings occur in Iconic Grampians swimming holes.

48 DJPR (2014): https://www.planning.vic.gov.au/__data/assets/pdf_file/0026/94445/Central-Highlands-Regional-Growth-Plan-May-2014.pdf
49 DJPR (2014): https://www.planning.vic.gov.au/__data/assets/pdf_file/0028/94690/Wimmera-Southern-Mallee-Regional-Growth-Plan-May-2014.pdf



Red lines – catchment boundaries Dark Blue lines – main rivers Light blue lines – main tributaries

Figure 9. Natural waterways in the Grampians Region[50] [51]

Natural waterways across the Grampians Region have been heavily impacted by historical land use changes, including clearing and agriculture, which have resulted in poor conditions relative to waterways in the east of Victoria, as shown in the figure below.[52]

50 Data Vic (2020): https://discover.data.vic.gov.au/dataset/vicmap-lite

51 https://discover.data.vic.gov.au/dataset/awrc-major-river-basins-of-victoria

52 DELWP (2016): https://www.water.vic.gov.au/__data/assets/pdf_file/0030/58827/Water-Plan-strategy2.pdf

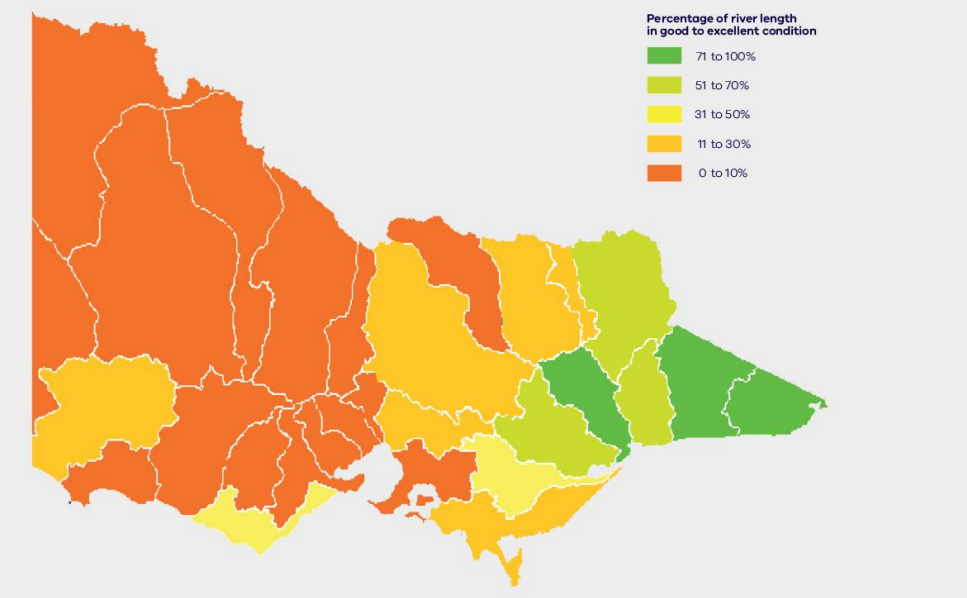


Figure 10. River length condition for Victoria[53]

Many of these waterways are managed by appointed waterway managers who are responsible for managing vessel activities on waters under their control. Some of the key roles of waterway managers include providing and maintaining navigational aids, appropriate signage of water levels and hazards, and rules applying to their waters.[54]

Table 10. Managed waterways across the Grampians Region[55]

LGA	Waterway Name	Appointed Waterway Manager
Ararat Rural City Council	Green Hill Lake	Ararat Rural City Council
	Lake Bolac	Lake Bolac Foreshore Committee Inc.
	Alexandra Lake	Unmanaged
City of Ballarat	Lake Burrumbeet Lake Learmonth Lake Wendouree Lake Buninyong	City of Ballarat
Golden Plains Shire	Stony Creek Reservoir	Barwon Water
Hepburn Shire	St Georges Lake	Director, Transport Safety Victoria
Hindmarsh Shire	Lake Hindmarsh Wimmera River within the Shire of Hindmarsh	Hindmarsh Shire
	Nhill Lake	Nhill Lake Reserve Committee of Management
	Lake Albacutya	DELWP
Horsham Rural City	Green Lake	Horsham Rural City

53 DELWP (2016): https://www.water.vic.gov.au/__data/assets/pdf_file/0030/58827/Water-Plan-strategy2.pdf
54 DOT (2020): https://transportsafety.vic.gov.au/maritime-safety/ports-and-waterways
55 DOT (2020): https://transportsafety.vic.gov.au/maritime-safety/ports-and-waterways/waterway-managers

LGA	Waterway Name	Appointed Waterway Manager
	Lake Natimuk Lake Toolondo Wimmera River within the boundaries of Horsham Rural City	
	Dock Lake Pine Lake Taylors Lake	Grampians Wimmera Mallee Water
Moorabool Shire	Bolwarra Weir Bostock Reservoir Korweinguboora Reservoir Railway Weir	Barwon Water
	Pykes Creek Reservoir	Southern Rural Water
Northern Grampians Shire	Lake Batyo Catyo Lake Fyans Lake Lonsdale Teddington Reservoir Volcano Reservoir Walkers Lake Lake Jil Jil	Northern Grampians Shire
	Lake Bellfield Lake Wartook Moora Moora Reservoir	Grampians Wimmera Mallee Water
Pyrenees Shire	Beaufort Park Lake	Pyrenees Shire
West Wimmera Shire	Lake Wallace	West Wimmera Shire
	Lake Charlegrark	The Lake Charlegrark Recreation Reserve Committee Inc.
Yarriambiack Shire	Yarriambiack Creek (within the Yarriambiack Shire)	Yarriambiack Shire
	Lake Coorong Lake Lascalles	Lake Lascalles and Coorong Committee of Management Inc.
	Lake Marma	Lake Marma Public Park and Gardens Reserve Committee of Management
	Waters within Wyperfeld National Park	DELWP

Water supplies and catchments are discussed further in Section 7 – Built Environment.

6.4.1 Floods

Floods cause more damage – including loss of life and livelihoods and damage to property and infrastructure – than any other type of natural disaster in Australia.[56] Victoria is prone to riverine flooding, which occurs in low-lying areas near rivers and streams, and flash flooding, which can happen anywhere in the event of intense rainfall. Flash flooding can be unpredictable, overwhelming drainage systems and causing localised threats.

In the Central Highlands sub-region there are a number of urban settlements which are particularly susceptible to flood risk, while other areas which have been identified as growth areas also present elevated flood risks, such as Avoca, Bacchus Marsh, Ballan, Ballarat, Beaufort, Creswick, Clunes and Smythesdale.[57]

In the Wimmera Southern Mallee sub-region many flood hazard areas are attractive places for residents and visitors due to their proximity to waterways, while the Horsham regional hub is located on the Wimmera River floodplain.[58]

Flood management guidelines, including prevention, response and recovery activities, are provided in the *State Emergency Response Plan Flood Sub-Plan,* published in 2016. [59] This strategy relies on the combined efforts of various agencies including local government, SES, Catchment Management Authorities and community partnerships.[60]

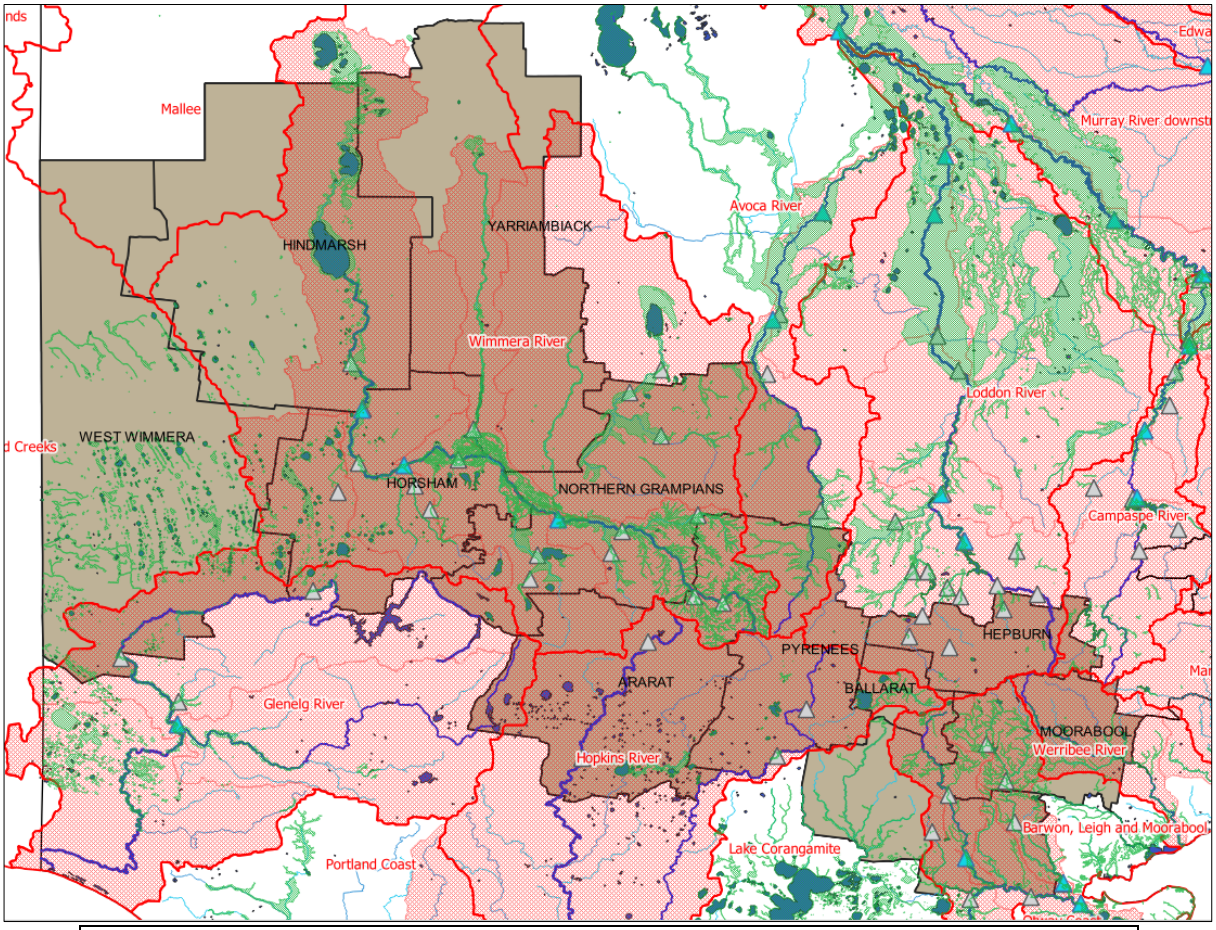
The Bureau of Meteorology is responsible for providing a flood warning service for riverine flooding resulting from heavy rainfall in Victoria in cooperation with other government, water and emergency management agencies[61]. The coverage of this flood warning service is shown in Figure 11 with both the Flood Watch and Flood Warning catchment shown. The products from the Service Level Specification that cover the catchments in Grampians Region are listed in Table 11. The river observations sites when flood levels are defined are shown as blue triangles and are listed in Table 11.

56 Flood Victoria (2020): https://www.floodvictoria.vic.gov.au/
57 DJPR (2014): https://www.planning.vic.gov.au/__data/assets/pdf_file/0026/94445/Central-Highlands-Regional-Growth-Plan-May-2014.pdf
58 DJPR (2014): https://www.planning.vic.gov.au/__data/assets/pdf_file/0028/94690/Wimmera-Southern-Mallee-Regional-Growth-Plan-May-2014.pdf
59 EMV (2016): https://www.ses.vic.gov.au/documents/112015/2504320/State+Emergency+Response+Plan+-+Flood+Sub-Plan+-+Edition+1.pdf/e4d997fa-080b-39fd-366b-42b5cb23443f
60 DELWP (2016): https://www.water.vic.gov.au/managing-floodplains/new-victorian-floodplain-management-strategy
61 http://www.bom.gov.au/water/floods/document/National_Arrangements_V4.pdf

Table 11. Flood Warning products and Flood Warning Locations[62]

Product	Warning Area	Site	Minor	Moderate	Major
IDV36400	Flood Warning for the Barwon River Flood Warning for the Leigh River Flood Warning for the Moorabool River	Leigh River at Shelford (Hwy Bridge)	6.0	7.0	8.0
IDV36830	Flood Warning for the Wimmera River	Wimmera River at Glenorchy	4.0	4.5	4.8
		Wimmera River at Horsham (Walmer)	2.8	3.1	3.6
		Wimmera River U/S Dimboola	5.3	5.7	6.0
IDV36510	Flood Warning for the Hopkins River				
IDV36390	Flood Warning for the Werribee River				
IDV36520	Flood Warning for the Glenelg River				
IDV36810	Flood Warning for the Loddon River				
IDV36820	Flood Warning for the Avoca River				

62 http://www.bom.gov.au/vic/flood/brochures/VIC_SLS_current.pdf



Red Boundaries – Bureau of Meteorology Flood Watch areas Dark Blue areas – Lakes and dams Green areas – 1:100-year ARI modelled inundation area	Red Shading – Bureau of Meteorology Flood Warning Catchments Blue lines – rivers and streams Triangles – River observations sites

Figure 11. Flood warning and 1:100-year ARI inundation[63] [64] [65] [66] [67] [68]

The flood risk and area impacted by flooding varies around the region.

Table 12 shows the percentage of each LGA which is impacted by flooding at the 1:100-year average recurrence interval (ARI). This is shown in Green in Figure 11. There is a one percent chance (1% annual exceedance probability (AEP)) of these areas experiencing flooding of this level in any given year[69] based on flood modelling results from flood studies. The localities listed have some defined built up area in or near

63 http://www.bom.gov.au/metadata/catalogue/19115/ANZCW0503900441?template=full
64 http://www.bom.gov.au/metadata/catalogue/19115/ANZCW0503900561?template=full
65 http://www.bom.gov.au/metadata/catalogue/19115/ANZCW0503900563?template=full
66 http://www.bom.gov.au/metadata/catalogue/19115/ANZCW0503900564?template=full
67 https://discover.data.vic.gov.au/dataset/1-in-100-year-flood-extent
68 Data Vic (2020): https://discover.data.vic.gov.au/dataset/vicmap-lite
69 http://arr.ga.gov.au/arr-guideline

the flood impact area defined by the 1:100-year ARI. This list may not be exhaustive, and some areas may experience impacts from flash flooding due to heavy rainfall that are not shown here.

Table 12. Areas potentially impacted by flooding inundation [70]

LGA	Percent included in 1:100 ARI area	Main Localities With Affected Built Up Areas
Ballarat	*8.2%*	Bakery Hill, Ballarat Central, Ballarat East, Ballarat North, Black Hill, Brown Hill, Buninyong, Canadian, Delacombe, Golden Point (Ballarat), Lake, Wendouree, Miners Rest, Mount Clear, Mount Pleasant, Nerrina, Newington, Redan, Sebastopol, Soldiers Hill
Golden Plains	*5.4%*	Enfield, Inverleigh, Linton, Smythesdale
Hepburn	*1.3%*	Clunes, Creswick, Trentham
Hindmarsh	*5.9%*	Dimboola, Jeparit, Nhill
Horsham	*9.1%*	Horsham, Natimuk
Moorabool	*5.8%*	Bacchus Marsh, Ballan, Darley, Hopetoun Park, Maddingley
Northern Grampians	*11.8%*	Great Western, Halls Gap
Pyrenees	*6.4%*	Avoca, Beaufort
West Wimmera	*5.0%*	Edenhope
Yarriambiack	*2.7%*	Beulah, Rupanyup, Warracknabeal

6.5 Geology

There are significant aspects of the Victorian environment that rely on natural workings underground. Victoria's geology contributes to a large cluster of volcanic plains, the frequency of weak to medium magnitude earthquakes and the versatility of groundwater.

There is an extensive area of volcanism in Victoria. Large basaltic formations (formed after the rapid cooling of lava) are present along the western coast of Victoria. The time of the last volcanic eruption in Victoria is contested by volcanologists, however common consensus is that it occurred approximately 7000 years ago at Mount Napier. In volcanology terms, this classifies the Western Victorian Volcanic Plains as an active volcanic region, with many volcanologists considering the area dormant rather than extinct.[71] The plains span approximately 2.3 million hectares or 10% of the state's land mass. The eastern side of Victoria experienced volcanic activity significantly earlier than in the west. [72] Older Volcanic Plains are scattered

70 https://discover.data.vic.gov.au/dataset/1-in-100-year-flood-extent

71 http://vro.agriculture.vic.gov.au/dpi/vro/vrosite.nsf/pages/landform_geomorphological_framework_6.1

72 New 40Ar/39Ar ages for selected young (<1 Ma) basalt flows of the Newer Volcanic Province, Southeastern Australia (2011) https://www.sciencedirect.com/science/article/abs/pii/S1871101411000112

throughout eastern Victoria and, experienced an estimated 400 eruptions that were sporadic, relatively low volume and widespread.[73]

The volcanic plains of the Grampians region were built up by sporadic volcanic eruptions over a period of about 5 million years, and are known geologically as the Newer Volcanics, the deposits which form the Newer Volcanic Province of Victoria, which includes parts of the Western Uplands, the Western Plains, and the area across the border around Mt Gambier. Much of the plains were formed from lobes of lava which flowed from the eruption points, overlapping to form a veneer of basalt lava flows. The flow varies in thickness according to both the underlying topography and the present-day surface. The flows are interleaved in places with pyroclastic deposits (scoria and tuff) and discontinuous buried palaeosoils of variable thickness.

Scoria cones, lava shields, composite cones (of both scoria and lava), and maars — indicate the most recent eruptive activity. Mount Anakie (398 m) and Mount Elephant (393 m) on the eastern and western boundary of the Corangamite CMA region respectively, form the highest cones.[74] This scoria cone and shield volcano field last erupted some 5,000 years ago. The two newest eruptive centres are Mounts Gambier and Mount Schank. Both produced a complex eruptive sequence including scoria cone, lava flows and maar formation toward the end of the eruptive cycle.[75] The landform of the Western Volcanic Plain is flat to gently undulating rising only up to 20 metres. This flat plain is dramatically relived by volcanic features the highest of which is Mount Elephant at nearly 200 metres.[76] Approximately 100 extinct volcanoes can be found in this Character Type in the Western Volcanic Plain.

73 New 40Ar/39Ar ages for selected young (<1 Ma) basalt flows of the Newer Volcanic Province, Southeastern Australia (2011) https://www.sciencedirect.com/science/article/abs/pii/S1871101411000112

74 https://www.planning.vic.gov.au/__data/assets/pdf_file/0031/94846/01-The-Western-Volcanic-Plains-Part-1.pdf

75 https://ui.adsabs.harvard.edu/abs/2012AGUFM.T31B2594R

76 http://vro.agriculture.vic.gov.au/dpi/vro/vrosite.nsf/pages/landform_geomorphological_framework_2

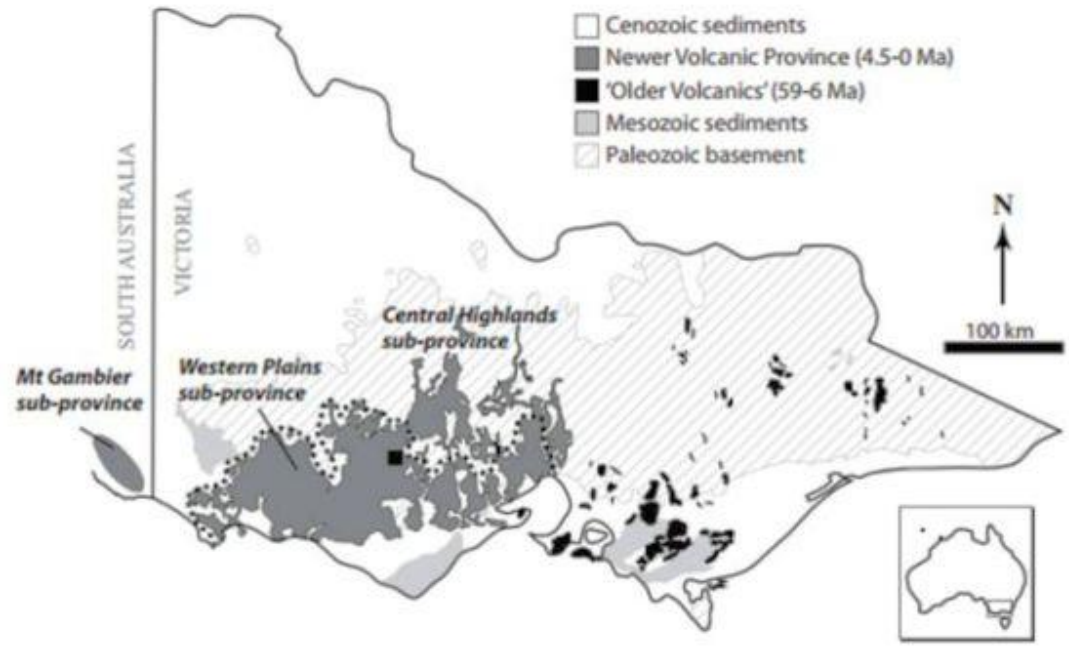


Figure 12. Map of Victoria with Volcanic overlay[77]

On average, there are approximately 100 earthquakes in Australia per year that register above 3 magnitude.[78] As a nation, Australia experiences significantly less earthquakes than other parts of the world near tectonic boundaries, where large earthquakes occur more often. [79] However, the country experiences earthquakes due to a series of interlocking, interspersed fault lines that spread throughout the nation. In Victoria, several vault lines have been identified including the Strzelecki Ranges, The Mornington Peninsula and the Otway Ranges. However, the frequency of earthquakes in the state indicates that there are multiple minor fault lines that have not been formally identified. [80] Included below is a table that lists earthquakes in Victoria with a magnitude over 4.5 since records began with damage reported:

77 New 40Ar/39Ar ages for selected young (<1 Ma) basalt flows of the Newer Volcanic Province, Southeastern Australia (2011) https://www.sciencedirect.com/science/article/abs/pii/S1871101411000112

78 Geology Australia (2020) https://www.ga.gov.au/scientific-topics/community-safety/earthquake

79 Geology Australia (2020) https://www.ga.gov.au/scientific-topics/community-safety/earthquake

80 Geology Australia (2020) https://www.ga.gov.au/scientific-topics/community-safety/earthquake

Table 13. List of earthquakes above 4.5 magnitude in Victoria since records began[81] [82]

Location	Date	Magnitude	Damage Reported
Cape Liptrap	02 July 1885	5.7	Tied Victoria's largest earthquake – minor damage reported around epicentre
Warrnambool	14 July 1903	5.3	Minor damage over wide geographical area near epicentre
Alpine National Park	10 April 1904	5.0	No damage reported – epicentre in national park
Ocean Grove (offshore)	10 April 1922	5.7	Reports of minor item damage in Cranbourne, East Malvern, Pakenham and Portalington – aftershock 4.7 magnitude
Mornington	03 September 1932	4.5	Minor damage
Bass Strait (offshore)	15 September 1946	6.2	Minor damage reported in Gippsland region and Tasmanian northern coast
Cape Otway	25 December 1950	5.3	No Damage Reported
Mt Hotham	5 May 1966	5.5	Windows broken in ski village
Boolarra	20 June 1969	5.3	5.0 magnitude aftershock, cracked walls and windows near epicentre
Western Port	7 July 1971	5.0	Damage reported in Cowes
Balliang	2 December 1979	4.7	Felt across south eastern suburbs, minor damage caused in Anakie area
Wonnangatta	21 November 1982	5.4	Felt across state, no damage reported
Mount Baw Baw	25 September	5.0	No damage reported
Boolarra	29 August 2000	5.0	Minor damage
Swan Hill	27 October 2001	4.8	Minor damage, power disruption
Wonthaggi	6 March 2011	4.5	Minor damage near epicentre
Gippsland	19 June 2012	5.4	Minor damage

Groundwater is water found under the ground that flows through layers known as aquifers. Surface water from rainfall seeps into cracks or pores in the ground (aquifers), however aquifers can also be recharged from streams or indirectly from other aquifers.[83] Groundwater resources eventually flow into rivers, lakes or the ocean. Many surface environments known as 'groundwater dependent ecosystems' rely on groundwater including wetlands and river baseflows. Groundwater is also important as a water resource in semi-arid parts of Victoria where rainfall is infrequent or inadequate to reliably meet water needs.[84] In areas where groundwater may be replenished on a regular basis (through rainfall), extraction can be managed on a

81 Seismology Research Centre (2020) https://www.src.com.au/earthquakes/older-quakes/

82 Earthquake Tracker (2020) https://earthquaketrack.com/p/australia/victoria/recent?mag_filter=4

83 Southern Rural Water – Groundwater Atlas (2012) http://www.srw.com.au/wp-content/uploads/2016/03/GGA_SmallSize-1.pdf

84 Geology Australia (2020) https://www.ga.gov.au/scientific-topics/water/groundwater/basics/what-is-groundwater

renewable basis. However, in many areas in Australia the extraction greatly exceeds the rate at which groundwater is replenished - Australian Water Resources 2005 concluded that 30 per cent of groundwater extraction sites were approaching or beyond sustainable extraction limits.[85]

The Grampians region relies upon groundwater to provide water supply redundancy in the more rural communities. Like other regions, Grampians mainly utilises groundwater for industry and agribusinesses. Water Vic has reported that good-quality groundwater is found in paleochannels in the northern Grampians. Most of this water is found in the West Wimmera Groundwater Management Area which is excluded from the SDL resource units for the Wimmera-Mallee water resource plan.[86] Elsewhere, the groundwater in the region is generally high in saline and therefore has limited usability.[87] In 2015, media reported that groundwater to the 700 residents of Penshurst may have been contaminated with PFOS from a CFA training centre.[88] These residents were provided with bottled water to prevent consumption of the water out of an abundance of caution.

Peat consists of decayed vegetation or organic matter. Peat can pose a major fire hazard and a smouldering peat fire cannot be extinguished by light rain.[89] Peat fuelled fires can burn for extended periods of time and have also been observed as smouldering underground resulting in reignition if an oxygen source is present.[90] The minimum rainfall intensity required to extinguish a peat fire is roughly 4mm/h.[91] The Grampians region peat deposits are spread throughout the region's area. It is mainly located in the south west are and surrounding Ballarat. A full map of peat deposits can be found on EM-COP, below is a screenshot of the BSW region with the peat hazard layer shown in yellow.

85 Geology Australia (2020) https://www.ga.gov.au/scientific-topics/water/groundwater/basics/what-is-groundwater
86 Water Victoria (2020) https://www.water.vic.gov.au/__data/assets/pdf_file/0013/420520/Wimmera-Mallee-WRP-Part-4.pdf
87 Water Victoria (2020) https://www.water.vic.gov.au/__data/assets/pdf_file/0013/420520/Wimmera-Mallee-WRP-Part-4.pdf
88 https://www.abc.net.au/news/2015-07-30/contamination-scare-forces-grampians-community-onto-bottle-water/6660938
89 Lin and Huang (2020) https://www.sciencedirect.com/science/article/abs/pii/S0048969720319811
90 Lin and Huang (2020) https://www.sciencedirect.com/science/article/abs/pii/S0048969720319811
91 Lin and Huang (2020) https://www.sciencedirect.com/science/article/abs/pii/S0048969720319811

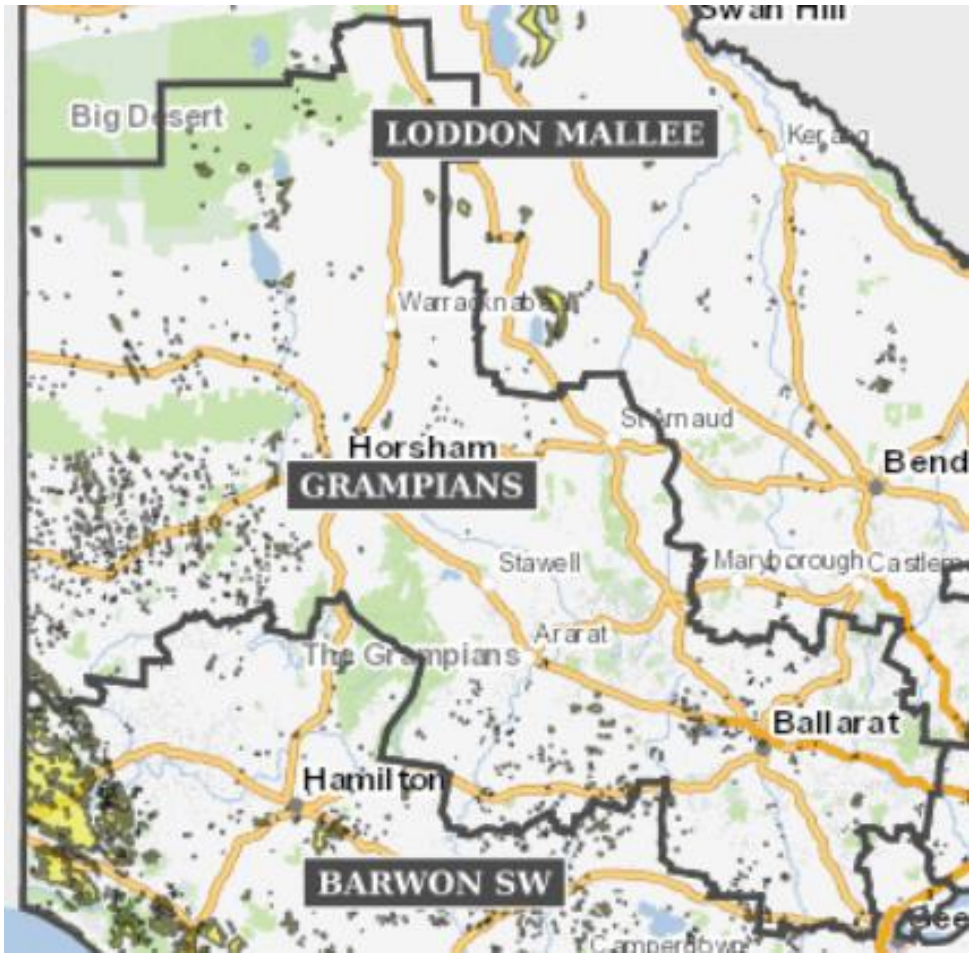


Figure 13 EM-COP layer depicting peat deposits in Grampians[92]

92 EM-COP – Peat Overlay Layer

7. Built Environment

Key infrastructure includes major roads and rail lines, water, power, sewerage, telecommunications, airports and seaports, all of which support ongoing growth in the Grampians Region.

Extreme weather events however threaten this critical infrastructure and increase maintenance costs, with the critical services outlined below particularly susceptible to extreme weather.

7.1 Information and telecommunications

The communications sector – incorporating internet, phone, radio, television, online transactions and business operations – is a foundation for economic and social development and stability within Victoria. These interconnected networks are owned by both national and international providers and are regulated by the Commonwealth.[93]

Key assets and infrastructure include:

- Networks – copper, hybrid fibre-coaxial, fibre-optic cable
- Towers – mobile telephone, wireless internet (e.g., 3G, 4G)
- Satellites
- Base stations
- Exchanges or points of interconnect
- Data centres
- Backhaul infrastructure (which transfers high data volumes to and from the core network)
- Cables – between onshore nodes and other countries

Key risks to the sector include:

- Natural disasters – fire, flood, storm, extreme weather
- Pandemic
- Security breaches
- Technical issues (e.g., electricity disruption, asset failure)

In the Grampians Region the quality of digital infrastructure, including fixed broadband and mobile access, is highly variable. While for cities and large towns such as Ballarat and Horsham, access is generally comparable to metropolitan Melbourne, smaller towns and localities such as Beaufort and Murtoa generally have less capacity and reliability.[94]

93 EMV (2018): https://files-em.em.vic.gov.au/public/EMV-web/2018_All_Sectors_Resilience_Report.pdf
94 Infrastructure Victoria (2019): https://www.infrastructurevictoria.com.au/wp-content/uploads/2019/04/Aither-Central-Highlands-Regional-Profile-March-2019.pdf

For the Grampians Region, key assets and infrastructure are summarised below:

Table 14. Key communications infrastructure in Grampians Region by LGA[95]

LGA	Radio Broadcast	Television Broadcast	Radio Communication	Telephone Exchanges
Ararat Rural City Council	5	15	5	17
City of Ballarat	1	10	2	11
Golden Plains Shire	0	0	0	19
Hepburn Shire	0	0	1	11
Hindmarsh Shire	0	0	3	20
Horsham Rural City	4	10	4	20
Moorabool Shire	6	4	7	11
Northern Grampians Shire	4	0	2	19
Pyrenees Shire	0	0	0	20
West Wimmera Shire	2	10	8	33
Yarriambiack Shire	3	5	6	31
Grampians Total	**25**	**54**	**38**	**212**

7.2 Energy

Energy – including electricity, gas and liquid fuels – is one of eight critical infrastructure sectors identified for Victoria. All three of these sub-sectors are privately owned and operated, and form part of extensive national networks to import and export energy between Victoria and other States.[96]

Victoria's primary energy sources are electricity generated from brown coal in the La Trobe Valley, and natural gas sourced from the Gippsland Basin.[97]

7.2.1 Energy distribution

Energy distribution in the Grampians Region is summarised by LGA in the below table and discussed further by form in the following sections.

95 Data Vic (2020): https://discover.data.vic.gov.au/dataset/foi-point-vicmap-features-of-interest
96 EMV (2018): https://files-em.em.vic.gov.au/public/EMV-web/2018_All_Sectors_Resilience_Report.pdf
97 DELWP (2020): https://www.energy.vic.gov.au/

Table 15. Energy distribution (km) in Grampians Region by LGA[98]

LGA	Major Electricity Transmission Lines	Oil Pipelines	Gas Pipelines
Ararat Rural City Council	41.7	0.0	29.9
City of Ballarat	110.1	0.0	8.9
Golden Plains Shire	165.6	0.0	12.0
Hepburn Shire	33.7	0.0	61.9
Hindmarsh Shire	56.0	0.0	0.0
Horsham Rural City	246.4	0.0	35.5
Moorabool Shire	144.4	0.0	96.8
Northern Grampians Shire	151.7	0.0	57.1
Pyrenees Shire	93.0	0.0	27.1
West Wimmera Shire	23.3	0.0	69.5
Yarriambiack Shire	132.2	0.0	0.0
Total	**1,198.1**	**0.0**	**398.7**

For the energy sector overall, key risks include:

- Fire
- Severe weather
- Extreme temperatures
- Cyber-attack
- Earthquake
- Earthworks damaging underground infrastructure
- Loss of communication
- Workforce issues (which could arise for any number of reasons but include industrial issues, heat stress, pandemic, an ageing workforce and lack of experience or specialist staff).[99]

Key dependencies for the energy sector include:

- Production infrastructure
- Supporting infrastructure (e.g., energy supplies for operations)
- Water and wastewater
- Transport infrastructure
- Human resources and management systems

98 EMV (2020): Potential Impact Reports (by LGA)
99 EMV (2018): https://files-em.em.vic.gov.au/public/EMV-web/2018_All_Sectors_Resilience_Report.pdf

- Information technology and communications[100]

7.2.2 Electricity

The key assets and infrastructure for the electricity sector include generators, high and low voltage transmission and distribution systems.[101]

Most of Victoria's electricity is generated by brown coal generators in the La Trobe Valley.[102]

Terminal stations are key centres for receiving high voltage electricity from transmission lines and converting it to lower voltages for distribution to zone substations.[103] Zone Substations receive electricity from bulk supply substations and transform the voltage to 11,000 volts for distribution to customers' homes and businesses along powerlines or cables.[104]

Within the Grampians Region, there are 9 terminal stations and no zone substations, with terminal station owned and maintained by Powercor[105], as outlined below:

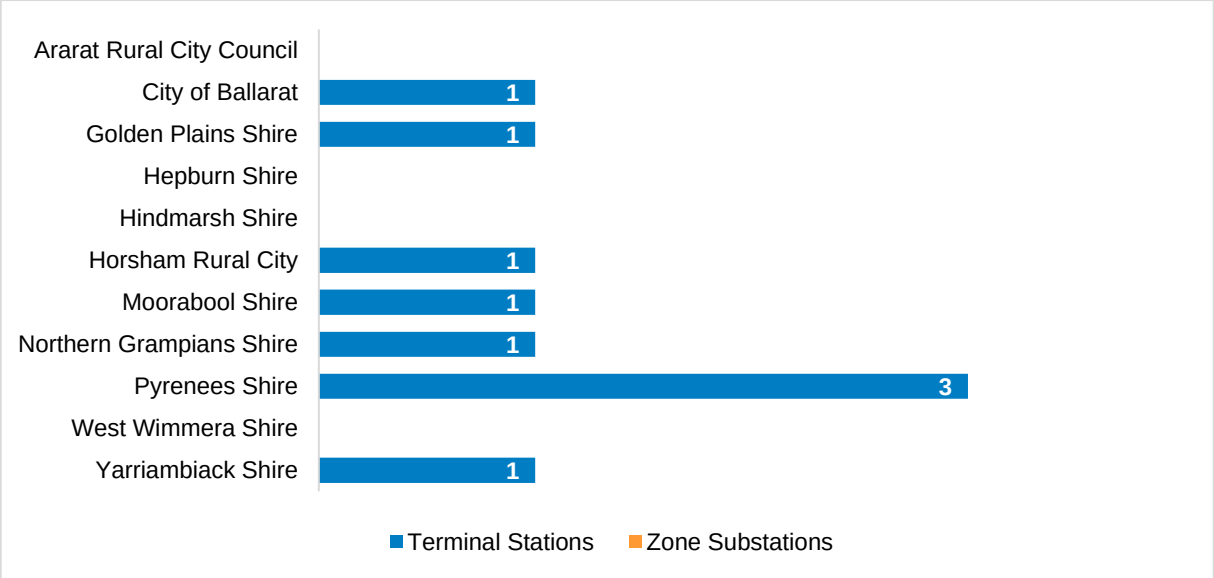
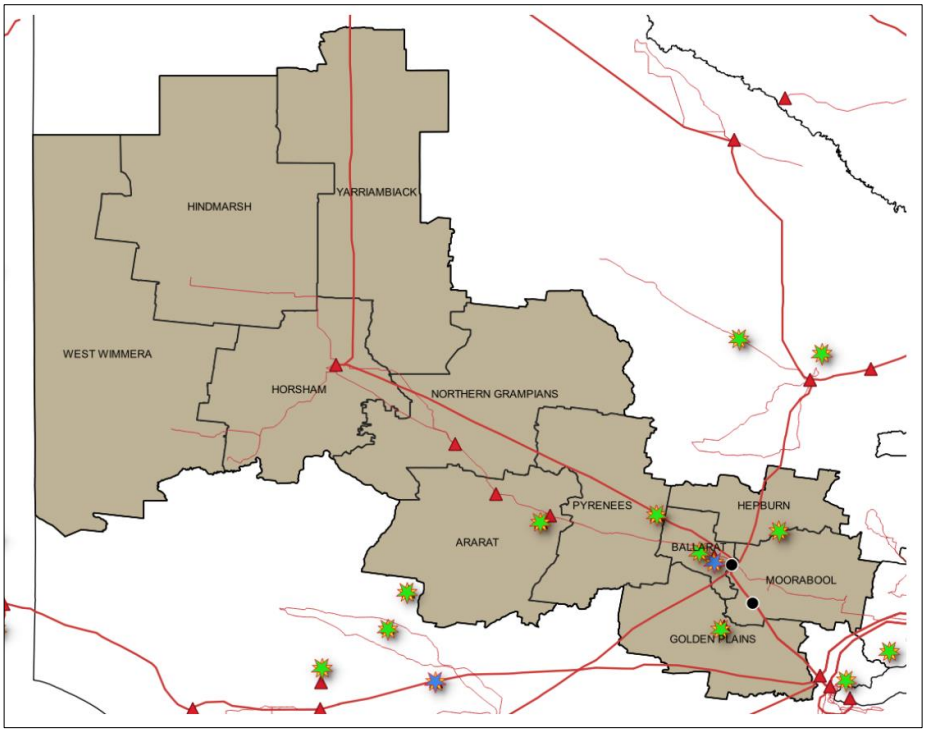


Figure 14. Terminal stations and zone substations in Grampians Region by LGA[106]

100 EMV (2018): https://files-em.em.vic.gov.au/public/EMV-web/2018_All_Sectors_Resilience_Report.pdf
101 EMV (2018): https://files-em.em.vic.gov.au/public/EMV-web/2018_All_Sectors_Resilience_Report.pdf
102 DELWP (2020): https://www.energy.vic.gov.au/electricity/about-the-electricity-sector
103 AusNet Services (2018): https://www.ausnetservices.com.au/-/media/Files/AusNet/About-Us/Determining-Revenues/Distribution-Network/Customer-Forum/Week-1/Networks-101-Customer-Forum.ashx?la=en
104 AusNet Services (2018): https://www.ausnetservices.com.au/-/media/Files/AusNet/About-Us/Determining-Revenues/Distribution-Network/Customer-Forum/Week-1/Networks-101-Customer-Forum.ashx?la=en
105 https://www.energy.vic.gov.au/electricity/electricity-distributors
106 EMV (2020): Potential Impact Reports (by LGA)

A map of electrical infrastructure is provided below:



Green star – renewable power generation	Blue star – non-renewable power generation
Red triangle – Electrical substation	Green triangle – Electrical switchyard
Yellow triangle – Electrical transmission	Blue triangle – Electrical zone
Black dot – Electrical terminal	Thick red line – Power transmission
Thin red line – Power sub-transmission	

Figure 15. Transmission lines within Grampians Region[107] [108] [109]

7.2.3 Solar and Wind

In the Central Highlands sub-region, renewable energy development has predominantly been focused on wind, with the sub-region currently home to several existing and proposed wind farms, including a large facility at Waubra.[110]

In the Wimmera Southern Mallee sub-region, as with the Central Highlands, renewable energy development has also focused on wind, as well as bioenergy and hydroelectricity.

There are 15 wind farms and 2 solar farms in the Grampians Region, including:

107 https://data.gov.au/dataset/ds-aurin-aurin%3Adatasource-AU_Govt_GA-UoM_AURIN_DB_national_major_power_stations_2016/details?q=Major%20Power%20Stations

108 https://data.gov.au/dataset/ds-aurin-aurin%3Adatasource-AU_Govt_GA-UoM_AURIN_DB_national_electricity_transmission_substations_2017/details?q=electricity%20transmission%20substations

109 https://discover.data.vic.gov.au/dataset/foi-line-vicmap-features-of-interest

110 DJPR (2014): https://www.planning.vic.gov.au/__data/assets/pdf_file/0026/94445/Central-Highlands-Regional-Growth-Plan-May-2014.pdf

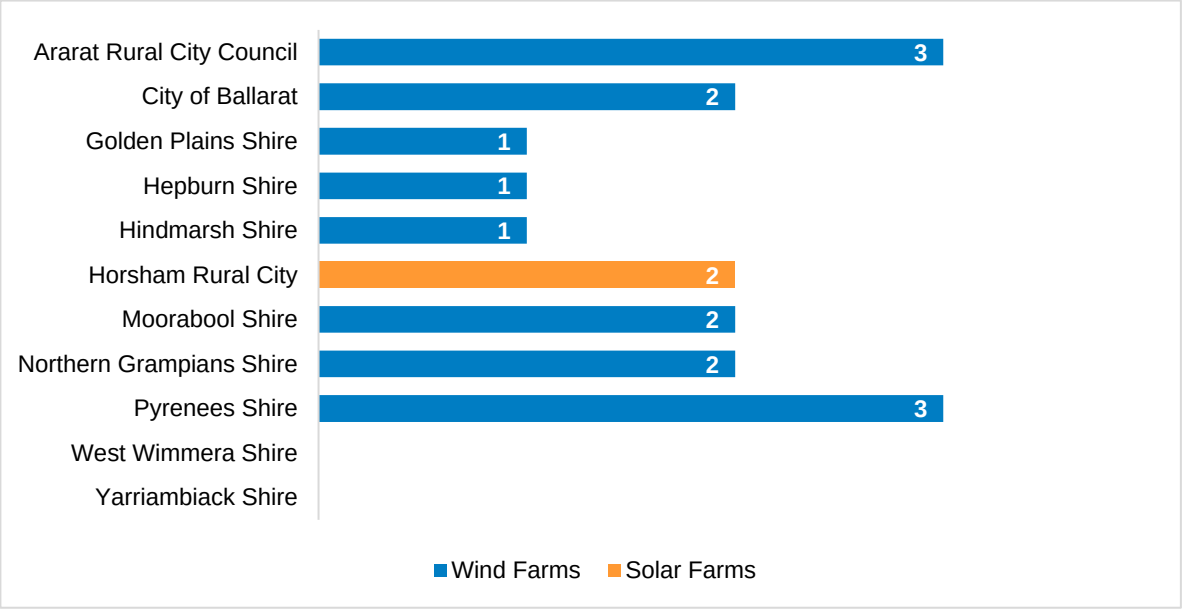


Figure 16. Wind and solar farms in Grampians Region[111]

7.2.4 Gas

The key assets and infrastructure for the gas sector include production, receiving, processing and storage facilities, and transmission and distribution systems.

Victoria's natural gas supply is sourced predominantly in the Gippsland Basin and processed in Longford. The Principal Transmission System, which covers Melbourne and central Victoria, is owned by GasNet and operated by the Australian Energy Market Operator (AEMO).[112]

Approximately 399km of gas pipelines traverse the Grampians Region, including:[113]

111 EMV (2020): Potential Impact Reports (by LGA)
112 DELWP (2017): https://www.energy.vic.gov.au/gas/about-the-gas-sector
113 EMV (2020): Potential Impact Reports (by LGA)

Table 16. Main gas pipelines in Grampians Region by LGA[114]

LGA	Gas Pipelines (km)	Location/Route
Ararat Rural City Council	29.9	Carisbrook to Horsham
City of Ballarat	8.9	Ballan to Ballarat Ballarat City Gate to Dana Street
Golden Plains Shire	12.0	Lara to Iona
Hepburn Shire	61.9	Ballan to Bendigo Guildford to Maryborough Mt Franklin to Bendigo Mt Franklin to Kyneton
Hindmarsh Shire	0.0	Nil
Horsham Rural City	35.5	Carisbrook to Horsham
Moorabool Shire	96.8	Ballan to Ballarat Ballan to Bendigo Brooklyn to Ballan
Northern Grampians Shire	57.1	Carisbrook to Horsham
Pyrenees Shire	27.1	Carisbrook to Horsham
West Wimmera Shire	69.5	Iona to South Australia Border Poolaijelo to Katnook South East Australia Gas Pipeline
Yarriambiack Shire	0.0	Nil
Total	**398.7**	

114 EMV (2018): https://files-em.em.vic.gov.au/public/EMV-web/2018_All_Sectors_Resilience_Report.pdf

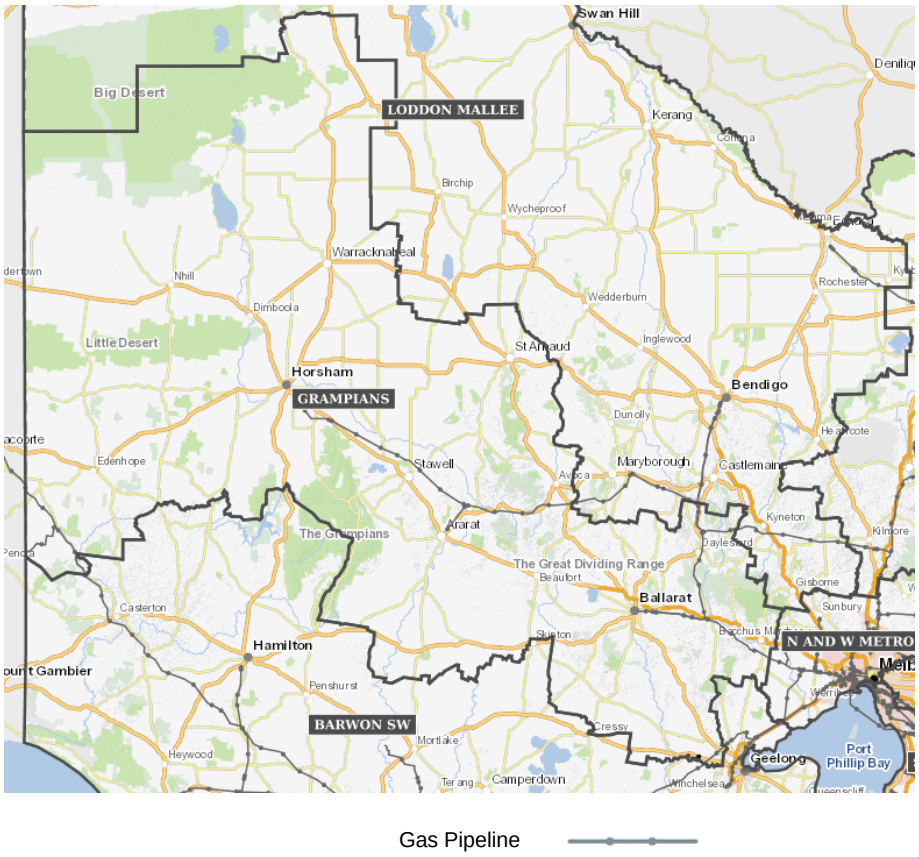


Figure 17. Natural gas pipelines within the Grampians Region[115]

7.2.5 Liquid fuels

The key assets and infrastructure for the liquid fuels sector include production and import facilities, fuel refineries, storage, distribution systems (including pipelines and transport) and retail outlets.[116]

There are no oil refineries located in the Grampians Region, with only two refineries situated in Victoria – at Altona (Mobil) and Geelong (Viva Energy).[117]

7.3 Food, grocery and manufacturing

Victoria is the epicentre of manufacturing in Australia, home to more than 13,000 manufacturing firms employing over 280,000 people and generating $30 billion for the Victorian economy.[118]

A number of large businesses operate home bases or sites in the Grampians Region including:[119]

- McCains Foods at Wendouree

115 EM-COP – Gas Pipelines Overlay Layer
116 EMV (2018): https://files-em.em.vic.gov.au/public/EMV-web/2018_All_Sectors_Resilience_Report.pdf
117 Australian Institute of Petroleum (2017): https://aip.com.au/sites/default/files/download-files/2017-09/At%20a%20Glance%20Australian%20Oil%20Refineries.pdf
118 DJPR (2020): https://djpr.vic.gov.au/about-us/overview/strategies-and-initiatives/advancing-victorian-manufacturing
119 DJPR (2020) https://www.rdv.vic.gov.au/victorias-regions/grampians

- Ararat Meat Exports at Ararat (mutton, lamb and sheepskins)
- Frew Group Abattoir at Stawell (lamb wholesaler and exporter)
- Masterfoods (Mars) factory at Wendouree
- Haymes Paints factory at Wendouree
- MaxiTrans manufacturing site at Wendouree
- AME Systems manufacturing site at Ararat
- Alstom Ballarat Workshops (train and tram maintenance)

Key assets and infrastructure may include:

- Warehousing and distribution centres
- Complex logistics networks
- Multiple modes of transport

Other key infrastructure in the Grampians Region includes the Wimmera International Freight Terminal, which is a 23.5ha terminal providing a central location for grain storage facilities and access to ports, freight depots, grain silos and processing plants.[120]

7.3.1 Food supply chain

The safety, security and continuity of Australia's food supply is complicated. It is a nationally distributed system, generally owned and operated by the private sector, with oversight from the Department of Agriculture, Water and the Environment (DAWE) and other industry and government agencies. However, "States and territories have the lead responsibility for planning for and responding to emergency events within their jurisdictions."[121] Emergency situations that could give rise to supply chain disruptions, with downstream effects on consumers, include:

- Pandemic
- Biosecurity concern (e.g., foot and mouth disease)
- Drought
- Industrial action
- Natural disaster

120 The Wimmera (2011): http://www.thewimmera.com.au/images/stories/Investment/WDAWIFTFactSheetApril11.pdf
121 DAWR (2020): https://www.agriculture.gov.au/ag-farm-food/food/food-chain-resilience

- Severe weather event
- Terrorist attack
- Food or water contamination
- Power, water or communications outage

The figure below provides an overview of the food supply chain and its dependencies.

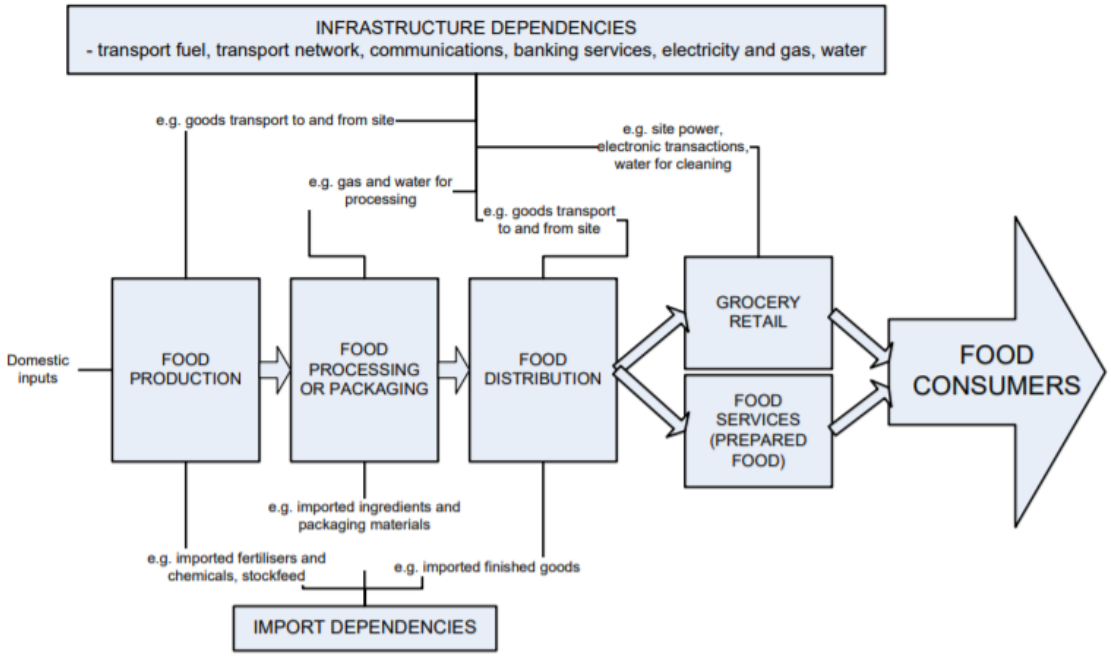


Figure 18. Overview of food supply chain and dependencies[122]

7.4 Transport

Transport in the Central Highlands sub-region is mainly focused around the Western Highway and rail corridors linking Melbourne to Adelaide and Melbourne to Ararat. Other significant roads include the Glenelg, Pyrenees Sunraysia and Midland highways.[123] The Central Highlands sub-region is also home to the Alstom Ballarat Workshops, a railway systems engineering facility.

Road and rail links are also important in the Wimmera Southern Mallee sub-region for the movement of bulk commodities such as grain. While relatively remote, the sub-region is well connected via Melbourne, Adelaide and Portland to a number of key economic centres. There are challenges in terms of transport

122 DAFF (2012): https://www.agriculture.gov.au/sites/default/files/sitecollectiondocuments/ag-food/food/national-food-plan/submissions-received/resilience-food-supply.pdf
123 DJPR (2014): https://www.planning.vic.gov.au/__data/assets/pdf_file/0026/94445/Central-Highlands-Regional-Growth-Plan-May-2014.pdf

services within the sub-region, as declining populations in many areas and significant distances between small settlements create vulnerability in terms of social isolation and reduced access to employment.[124]

Across the Grampians Region, the percentage of the population close to public transport declines as the distance from larger population centres increases.

7.4.1 Transport infrastructure

Major transport infrastructure in the Grampians Region is outlined below, and discussed further by mode in the following sections:

Table 17. Transport infrastructure (km) by LGA[125]

LGA	Major Roads	Major Rail	Distance to Melbourne CBD[126]	% Population close to Public Transport (2015)[127]
Ararat Rural City Council	344.3	191.3	200	*48.3%*
City of Ballarat	242.7	80.6	115	*67.4%*
Golden Plains Shire	167.8	86.0	86	*2.4%*
Hepburn Shire	202.3	25.6	108	*11.3%*
Hindmarsh Shire	350.7	165.2	369	*20.6%*
Horsham Rural City	418.7	57.9	294	*55.4%*
Moorabool Shire	302.1	118.5	54	*27.5%*
Northern Grampians Shire	533.3	118.4	231	*39.2%*
Pyrenees Shire	314.3	73.0	157	*7.6%*
West Wimmera Shire	544.6	45.3	408	*8.6%*
Yarriambiack Shire	663.7	229.2	334	*7.6%*
Grampians Total	**4,084.5**	**1,191.0**		

7.4.2 Roads

More than 5,084km of major roads traverse the Grampians Region, including major highways, freeways, arterial roads, bridges and tunnels.

The road network is shown in the figure below, with darker red representing arterial roads, and lighter red municipal roads and tracks. This network includes:

- Western Highway – Melbourne-Ballarat-Ararat-Stawell-Horsham-Adelaide link
- Midland Highway – Ballarat-Geelong and Ballarat-Bendigo link

124 DJPR (2014): https://www.planning.vic.gov.au/__data/assets/pdf_file/0028/94690/Wimmera-Southern-Mallee-Regional-Growth-Plan-May-2014.pdf
125 EMV (2020): Potential Impact Reports (by LGA)
126 DJPR (2020): https://www.rdv.vic.gov.au/information-portal/table-and-chart
127 DJPR (2020): https://www.rdv.vic.gov.au/information-portal/table-and-chart

- Glenelg Highway – Ballarat-Hamilton-Portland link
- Sunraysia Highway – Ballarat-Mildura link and Ouyen-Lascelles-Donald-St Arnaud-Bendigo link
- Pyrenees Highway – Ararat-Bendigo link

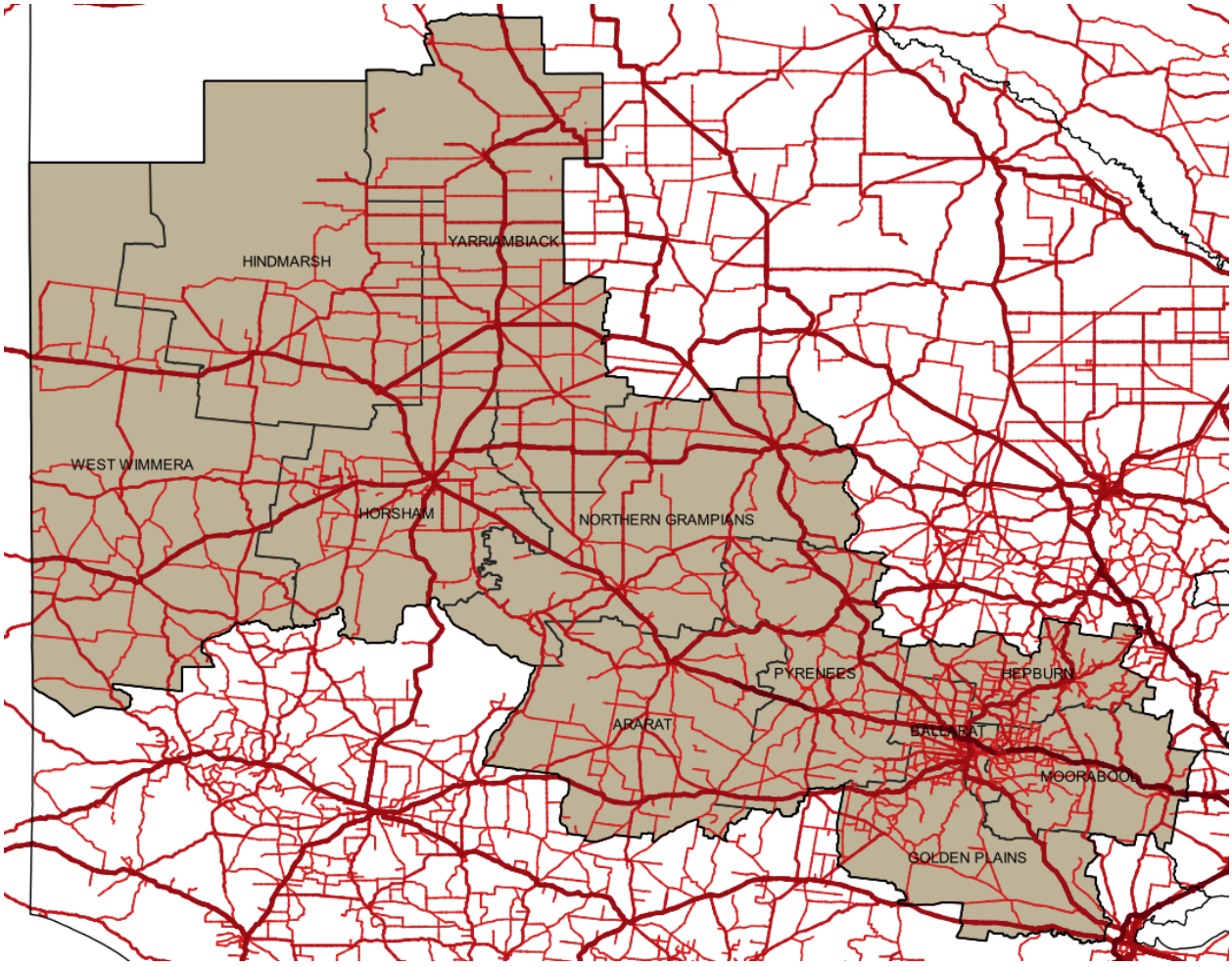


Figure 19. Main roads within the Grampians Region[128]

128 Data Vic (2020): https://discover.data.vic.gov.au/dataset/road-network-vicmap-transport

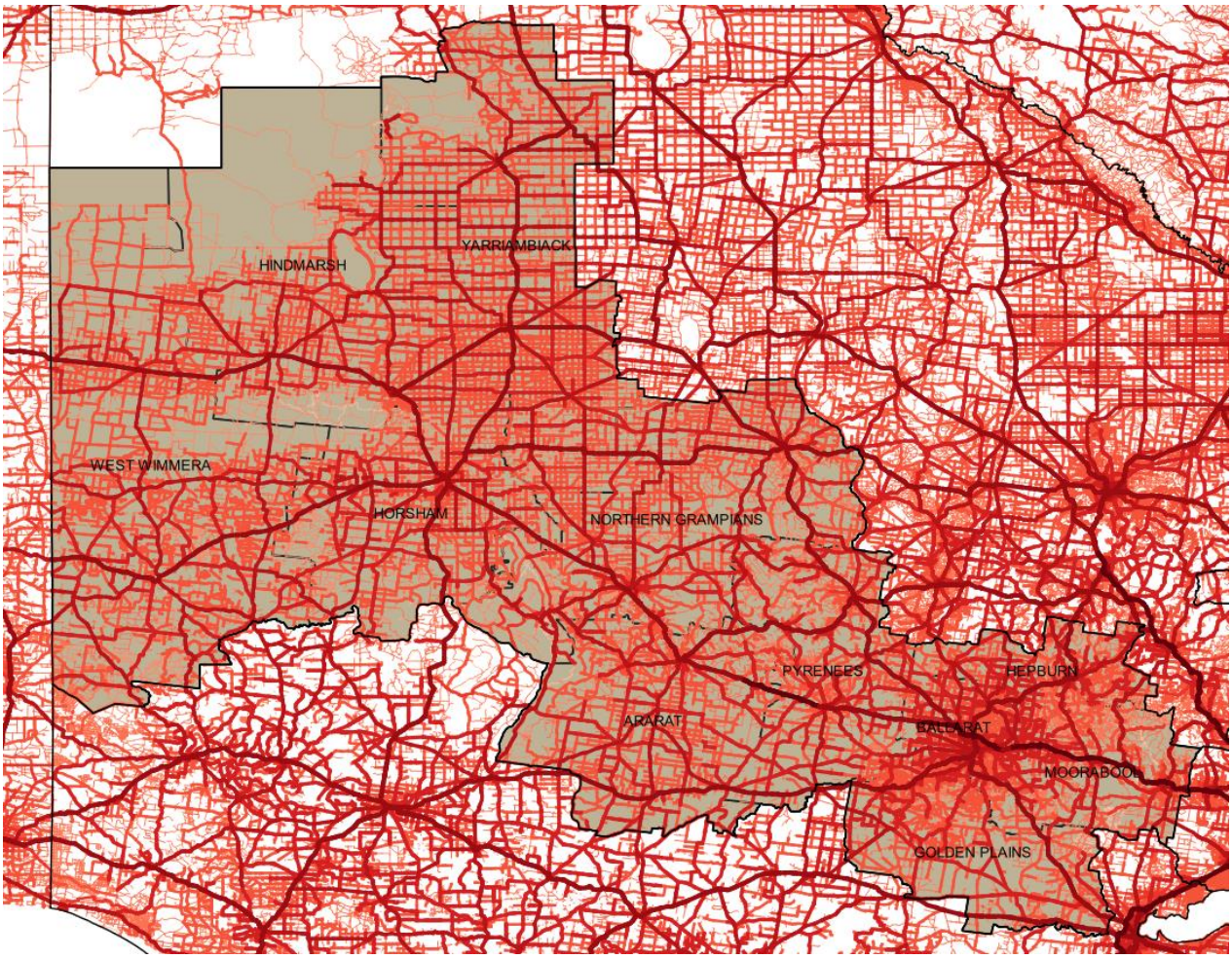


Figure 20. Density of road network within the Grampians Region[129]

The calculated road lengths (km) for each LGA in the Grampians Region below are based on the Department of Transport's standard categories:

129 Data Vic (2020): https://discover.data.vic.gov.au/dataset/road-network-vicmap-transport

Table 18. Road Lengths (km) in Grampians Region by LGA:[130]

LGA	Freeway	Highway	Arterial	Sub-Arterial	Collector	Local	2WD	4WD	Walking Track	Bike Path
Ararat Rural City Council	25	111	219	555	25	1,640	1,517	203	45	0
City of Ballarat	55	74	112	267	56	989	617	63	109	9
Golden Plains Shire	-	106	53	438	5	1,199	1,196	341	111	-
Hepburn Shire	-	57	145	372	7	823	1,307	244	94	1
Hindmarsh Shire	-	69	185	280	-	1,409	1,047	966	95	-
Horsham Rural City	-	197	197	447	23	1,552	1,245	745	50	-
Moorabool Shire	105	15	103	62	30	198	1,044	397	154	1
Northern Grampians Shire	-	176	357	429	159	2,362	2,449	632	98	16
Pyrenees Shire	20	154	153	570	27	1,182	2,119	219	58	-
West Wimmera Shire	-	102	325	442	-	2,153	2,003	888	6	-
Yarriambiack Shire	-	231	312	447	22	2,480	1,588	494	31	-
Grampians Total	**206**	**1,293**	**2,160**	**4,307**	**354**	**15,987**	**16,133**	**5,193**	**852**	**28**

A listing of the major roads is also provided below:

Table 19. Major roads in Grampians Region by LGA[131]

LGA	Major Roads	
Ararat Rural City Council – 344.3km	Ararat - Halls Gap Rd	Mortlake - Ararat Rd
	Ararat - St Arnaud Rd	Palmerston St
	Barkly St	Pomonal Rd
	Barkly St West	Port Fairy Rd
	Campbell St	Pyrenees Hwy
	Collings St	Rossbridge - Streatham Rd
	Glenelg Hwy	Victoria Valley Rd
	Grampians Rd	Vincent St
	High St	Walker St
	Lambert St	Western - Armstrong Deviation Hwy
	Maroona - Glenthompson Rd	Western Hwy

130 Data Vic (2020): https://discover.data.vic.gov.au/dataset/road-network-vicmap-transport
131 EMV (2020): Potential Impact Reports (by LGA)

LGA	Major Roads	
	Montgomery St	
City of Ballarat – 242.7km	Albert St	Macarthur St
	Ballarat - Burrumbeet Rd	Main Rd
	Ballarat - Carngham Rd	Mair St
	Ballarat - Daylesford Rd	Mair St East
	Ballarat - Maryborough -Western In Ramp	Midland -Western In Ramp
	Ballarat - Maryborough -Western Out Ramp	Midland -Western Out Ramp
	Ballarat - Maryborough Rd	Midland Hwy
	Barkly St	Mount Clear - Sebastopol Rd
	Bradshaw St	Norman St
	Bridge St	Princes St North
	Clunes - Creswick Rd	Princes St South
	Coronet St	Remembrance Dr
	Creswick Rd	Ross Creek Rd
	Crown St	Sebastopol - Smythesdale Rd
	Dawson St North	Skipton St
	Dawson St South	Smythes Rd
	Daylesford -Western In Ramp	Sturt St
	Daylesford -Western Out Ramp	Sunraysia - Western In Ramp
	Daylesford Rd	Sunraysia Hwy
	Doveton St North	Victoria St
	Doveton St South	Warrenheip St
	Drummond St North	Western Fwy
	Drummond St South	Western Hwy
	Eyre St	Western In - Ballarat - Maryborough Ramp
	Geelong Rd	Western In - Daylesford Ramp
	Gillies - Western In Ramp	Western In - Midland Ramp
	Gillies St North	Western In - Sunraysia Ramp
	Gillies St South	Western Out - Ballarat - Maryborough Ramp
	Glenelg Hwy	Western Out - Daylesford Ramp
	Grant St	Western Out - Gillies Ramp
	Heinz Lane	Western Out - Midland Ramp
	Hertford St	Western Out - Sunraysia Ramp
	High St	Whitehorse Rd
	Howe St	Wiltshire Lane
	Howitt St	
	La Trobe St	
	Learmonth Rd	
Golden Plains Shire – 167.8km	Ballarat - Carngham Rd	Midland Hwy
	Brooke St	Rokewood - Skipton Rd

LGA	Major Roads	
	Geelong - Ballan Rd	Sebastopol - Smythesdale Rd
	Geelong Rd	Sussex St
	Glenelg Hwy	Sutherland St
	Hamilton Hwy	Wallace St
	Lismore - Scarsdale Rd	
Hepburn Shire – 202.3km	Albert St	Daylesford - Newstead Rd
	Bailey St	Dunach - Eddington Rd
	Ballan - Daylesford Rd	Dysart St
	Ballarat - Daylesford Rd	Greendale - Trentham Rd
	Ballarat - Maryborough Rd	Hepburn Rd
	Ballarat Rd	High St
	Barkly St	Howe St
	Blackwood Rd	King St
	Bridge St	Knox St
	Broomfield Rd	Kyneton - Trentham Rd
	Bungaree - Creswick Rd	Main Rd
	Calder Hwy	Malmsbury Rd
	Castlemaine Rd	Melbourne Rd
	Clunes - Creswick Rd	Midland Hwy
	Clunes Rd	Powell Connection Rd
	Cosmo Rd	Raglan St
	Creswick - Newstead Rd	Service St Talbot Rd
	Creswick Rd	Vincent St
	Daylesford - Malmsbury Rd	Vincent St North
Hindmarsh Shire – 350.7km	Albacutya Rd	Nelson St
	Birchip - Rainbow Rd	Nhill - Harrow Rd
	Borung Hwy	Nhill - Jeparit Rd
	Broadway	Nhill - Netherby Rd
	Charles St	Nhill - Yanac Rd
	Dimboola - Rainbow Rd	Nhill Rd
	Dimboola Rd	Queen St
	High St	Rainbow Rd
	Hopetoun - Rainbow Rd	Taverner St
	Horsham Rd	Victoria St
	Jeparit - Warracknabeal Rd	Warracknabeal - Rainbow Rd
	Kurnbrunin Rd	Western Beach Rd
	Lloyd St	Western Hwy
	Lower Ray St	
Horsham Rural City – 418.7km	B Hateleys Rd	Mcpherson St
	Baillie St	Natimuk - Frances Rd

LGA	Major Roads	
	Ballyglunin North Rd	Natimuk - Hamilton Rd
	Blue Ribbon Rd	Natimuk Cemetery Rd
	Dimboola Rd	Natimuk Rd
	Dooen Rd	Northern Grampians Rd
	Grampians Rd	Stowell Rd
	Henty Hwy	Three Chain Rd
	Horsham - Lubeck Rd	Western Hwy
	Horsham - Minyip Rd	Williams Rd
	Horsham - Noradjuha Rd	Wilson St
	Laharum Rd	Wimmera Hwy
	Lake Av	Wombelano Rd
	Main St	Wyn Wyn Rd
Moorabool Shire – 302.1km	Bacchus Marsh-Gisborne-Western In Ramp	Old Geelong Rd
	Bacchus Marsh-Gisborne-Western Out Ramp	Old Melbourne -Western In Ramp
	Bacchus Marsh-Western Out Ramp	Old Melbourne -Western Out Ramp
	Bacchus Marsh Rd	Old Melbourne Rd
	Ballan-Daylesford- Western In Ramp	Old Western Hwy
	Ballan-Daylesford-Western Out Ramp Ballan-Daylesford Rd	Ormond -Western In Ramp
	Ballan Rd	Ormond -Western Out Ramp
	Ballarat -Daylesford Rd	Parwan Rd
	Bungaree -Creswick Rd	Western Fwy
	Bungaree -Wallace Rd	Western Hwy
	Garrards -Western Out Ramp	Western In -Bacchus Marsh -Gisborne Ramp
	Geelong -Bacchus Marsh Rd	Western In -Bacchus Marsh Ramp
	Geelong - Ballan Rd	Western In -Ballan -Daylesford Ramp Western In -Moorabool Ramp
	Gisborne Rd	Western In -Myrniong -Trentham Ramp Western In -Old Melbourne Ramp
	Grant St	Western In -Ormond Ramp
	Greendale -Myrniong Rd	Western In -Pykes Creek Ramp
	Greendale -Trentham Rd	Western Out - Bacchus Marsh - Gisborne Ramp
	High St	Western Out - Bacchus Marsh Ramp
	Inglis St	Western Out -Ballan -Daylesford Ramp Western Out -Garrards Ramp
	Main St	Western Out -Moorabool Ramp
	Midland Hwy	Western Out -Mortons Ramp
	Moorabool -Western In Ramp	Western Out -Myrniong -Trentham Ramp
	Mortons - Western In Ramp	Western Out -Old Melbourne Ramp
	Myrniong - Trentham - Western In Ramp	Western Out -Ormond Ramp
	Myrniong -Trentham -Western Out Ramp	

LGA	Major Roads	
Northern Grampians Shire – 533.3km	Alfred St Ararat -Halls Gap Rd Ararat -St Arnaud Rd Ararat Rd Black Range Rd Byrne St Charlton -St Arnaud Rd Charlton Rd Church St Darlington Rd Donald -Stowell Rd Escort St Grampians Rd High St Horsham Rd Inglewood Rd Inkerman St Kings Av Layzell St London Rd Longfield St Main St Maryborough -St Arnaud Rd Melbourne Rd	Mill St Mt Victory Rd Murtoa -Glenorchy Rd Napier St Navarre Rd Newall St Newington Rd North Western Rd Northern Grampians Rd Patrick St Pomonal Rd Scallan St Sea by St Silverband Rd Silvermines Rd St Arnaud -Wycheproof Rd Stowell -Avoca Rd Stowell -Warracknabeal Rd Sunraysia Hwy Wartook Rd Watsons Lake Rd Western - Armstrong Deviation Hwy Western Hwy Wimmera Hwy
Pyrenees Shire – 314.3km	Albert St Ararat -St Arnaud Rd Ararat Rd Bailey St Ballarat -Carngham Rd Beaufort -Carngham Rd Beaufort -Lexton Rd Bridport St Brooke St Burke St Cemetery Rd Clarke St Glenelg Hwy Gray St High St	Lawrence St Lexton -Talbot Rd Lexton Rd Maryborough -5t Arnaud Rd Montgomery St Navarre St Neill St Pyrenees Hwy Skipton Rd St Arnaud - Maryborough Rd Stowell -Avoca Rd Sunraysia Hwy Western Hwy Williamson St

LGA	Major Roads	
West Wimmera Shire – 544.6km	Border Rd Casterton - Edenhope Rd Casterton - Naracoorte Rd Coleraine - Edenhope Rd Commercial St East Commercial St West Dukes Hwy Edenhope - Penola Rd Elizabeth St Harrow Rd Kaniva - Edenhope Rd	Koolomurt Rd Main St Naracoorte -Apsley Rd Natimuk -Frances Rd Nhill - Harrow Rd Serviceton North - Telopea Downs Rd Wallace St Western Hwy Wimmera Hwy Wombelano Rd
Yarriambiack Shire – 663.7km	Albacutya Rd Audrey St Austin St Baring Rd Bell St Birchip -Rainbow Rd Blue Ribbon Rd Borung Hwy Brook St Campbell St Chamberlain St Church St Comyn St Cromie St Dimboola Rd Donald -Murtoa Rd Federation St Garrard St Gloucester Av Henty Hwy Hopetoun -Rainbow Rd Hopetoun -Sea Lake Rd Hopetoun -Walpeup Rd Hopetoun -Yaapeet Rd Hopetoun Aerodrome Rd	Hopetoun St Hopetoun West Rd Horsham -Minyip Rd Jeparit -Warracknabeal Rd Kelsall St Lake St Lascelles St Lyle St Main St Marmo St Murtoa -Glenorchy Rd Park Rd Patchewollock -Sea Lake Rd Rainbow Rd Riverside St Station St Stowell - Warracknabeal Rd Sunraysia Hwy Thomas Rd Warracknabeal - Birchip Rd Wimmera Hwy Wyperfeld Entrance Rd

7.4.3 Rail

Nearly 1200km of major rail crosses the Grampians Region, including stations, lines and hubs.

The rail network is shown in the figure below and includes:[132]

- Direct passenger rail routes from Ararat to Melbourne through Ballarat and from Maryborough to Melbourne through Ballarat.
- Limited passenger rail connections to Melbourne and Adelaide from Nhill, Dimboola and Stawell via the twice weekly Overland service.
- Freight routes to Melbourne, Geelong and Portland, as well as lines from Yaapeet and Hopetoun that can connect with Horsham and with the major ports.
- Interstate freight line between Adelaide and Melbourne via Geelong.

Figure 21. Rail networks in the Grampians Region[133]

Train stations

There are 12 train stations in the Grampians Region with locations and services as outlined below:

132 EMV (2020): Potential Impact Reports (by LGA)
133 Data Vic (2020): https://discover.data.vic.gov.au/dataset/road-network-vicmap-transport

Table 20. Train stations in Grampians Region by LGA[134,135]

LGA	No. Train Stations	Station name(s)	Services	Latitude and Longitude
Ararat Rural City Council	1	Ararat Railway Station	V/Line – Ararat Line (Terminus) Journey Beyond – The Overland	-37.282205; 142.936914
City of Ballarat	2	Ballarat Railway Station (Ballarat Central) Wendouree Railway Station	V/Line – Ararat Line; Maryborough Line V/Line – Ararat Line	-37.558791; 143.859457 -37.539716; 143.820068
Golden Plains Shire	0	Nil	Nil	Nil
Hepburn Shire	2	Creswick Railway Station Clunes Railway Station	V/Line – Maryborough Line V/Line – Maryborough Line	-37.424605; 143.888124 -37.303141; 143.781577
Hindmarsh Shire	2	Dimboola Railway Station Nhill Railway Station	Overland service Overland service	-36.45418; 142.032464 -36.332222; 141.65389
Horsham Rural City	1	Horsham Railway Station	Overland service	-36.707501; 142.200555
Moorabool Shire	2	Bacchus Marsh Railway Station (Maddingley) Ballan Railway Station	V/Line – Ballarat Line V/Line – Ballarat Line	-37.687517; 144.436855 -37.6043; 144.225448
Northern Grampians Shire	1	Stawell Railway Station	Overland service	-37.05924; 142.773538
Pyrenees Shire	1	Beaufort Railway Station	V/Line – Ararat Line	-37.427875; 143.382234
West Wimmera Shire	0	Nil	Nil	Nil
Yarriambiack Shire	0	Nil	Nil	Nil
Grampians Total	**12**			

134 Data Vic (2020): https://discover.data.vic.gov.au/dataset/foi-point-vicmap-features-of-interest
135 DOT (2020): https://www.vline.com.au/getattachment/f8a1e2c3-5d60-4abe-b608-2bc18e9f8197/V-Line-Network-Map

7.4.4 Air

The Grampians Region does not have any major airports; however, it is serviced by several smaller regional airports such as Ballarat Airport, and small aerodromes including Horsham, Warracknabeal, Nhill and Stawell. The Central Highlands sub-region also has relatively close access to Avalon Airport, Victoria's second largest airport, while the eastern fringe of the sub-region is less than 50km from Melbourne Tullamarine airport.

Airports/Aerodromes

The Grampians Region is served by 11 airports/aerodromes, with many registered by the Australian Civil Aviation Safety Authority, as outlined below. There are several other air bases used for firefighting and emergency evacuations throughout Grampians.

Table 21. Registered airports and aerodromes in Grampians region by LGA [136]

LGA	No. Airports	Airport Name	Airport Codes
Ararat Rural City Council	1	Ararat Airport	IATA: ARY; ICAO: YARA
City of Ballarat	1	Ballarat Airport	ICAO: YBLT
Golden Plains Shire	1	Lethbridge Airport	ICAO: YLED
Hepburn Shire	0	Nil	N/A
Hindmarsh Shire	1	Nhill Aerodrome	ICAO: YNHL
Horsham Rural City	1	Horsham Aerodrome	IATA: HSM; ICAO: YHSM
Moorabool Shire	1	Bacchus Marsh Aerodrome	ICAO: YBSS
Northern Grampians Shire	2	St Arnaud Aerodrome Stawell Aerodrome	ICAO: YSTA IATA: SWC; ICAO: YSWL
Pyrenees Shire	1	Beaufort Aerodrome	ICAO: YBEF
West Wimmera Shire	0	Nil	N/A
Yarriambiack Shire	2	Hopetoun Aerodrome Warracknabeal Aerodrome	IATA: HTU; ICAO: YHPN IATA: WKB; ICAO: YWKB
Total	**11**		

7.5 Water and Wastewater

Treated water supplies and wastewater services are essential to human health, liveability and the environment. As the population grows and expands across Victoria the criticality of these services and their associated infrastructure will also increase.

136 CASA (2020): https://www.casa.gov.au/aerodromes/aerodromes-register/registered-aerodromes

7.5.1 Water

Large parts of the Grampians region are included in declared water supply catchments, which provide potable water for settlements within and outside the region.[137]

Different land uses in the region place varying levels of demand on water use, with some land uses posing potential threats to water quality and river health if not carefully managed. Land use changes in the past decade have resulted in periods of reduced run-off into some watercourses. These changes have included increased farm forestry in the southern parts of the Wimmera Southern Mallee sub-region and changes from grazing and mixed farming to dry land cropping in the west.[138] This means there is a need to balance the competing demands for water for both agriculture and domestic use.

Water security is heavily impacted by both long-term trends – such as increasing population growth, urbanisation and climate change – and sudden events, including floods and oil spills. Some examples of the impacts such events could have include:

- Diminished agricultural production leading to a decline in gross domestic product.
- Health risks, such as blue-green algae outbreaks, which can be triggered by changes in nutrients and salinity, storage volumes, water flow and warmer weather. Large numbers of blue-green algae can produce toxins harmful to humans, animals, birds, livestock and the environment.[139]
- An increasing reliance on groundwater, which in Victoria is primarily used by dairy farms and other livestock, for irrigating crops, power generation and town water supplies.[140]

In a range of emergencies, including blue-green algae incidents, dam safety issues and disruption to water services – DELWP is charged with responsibility for responding to and mitigating the impact of such events.[141]

Since 2006 the water sector has been identified as an essential service according to an Act of Parliament,[142] which requires Victoria's water organisations to have risk management plans in place which include provisions for terrorist acts. Water resources are also particularly susceptible to all hazard events, including bushfires, drought, floods, earthquakes, cyclones, contamination and epidemics. Individual disruptions to infrastructure in one area can have an impact on the response and recovery efforts in other areas because water is both dependent and interdependent on infrastructure networks across Victoria. For example, water supplies rely on electric power to operate distribution pumps while electric power requires water for electricity

137 DJPR (2014): https://www.planning.vic.gov.au/__data/assets/pdf_file/0026/94445/Central-Highlands-Regional-Growth-Plan-May-2014.pdf
138 DJPR (2014): https://www.planning.vic.gov.au/__data/assets/pdf_file/0028/94690/Wimmera-Southern-Mallee-Regional-Growth-Plan-May-2014.pdf
139 DELWP (2020): https://www.water.vic.gov.au/waterways-and-catchments/rivers-estuaries-and-waterways/blue-green-algae
140 DELWP (2020): https://www.water.vic.gov.au/groundwater/victorias-groundwater-resources
141 DELWP (2019): https://www.water.vic.gov.au/managing-dams-and-water-emergencies/emergency-management
142 The Terrorism (Community Protection) Act 2003.community protection

generation. So too, the water sector relies on supply chains, including the transport sector, to provide chemicals for water treatment and disinfection and may share common service corridors.[143]

Several government departments and agencies share responsibility for managing and protecting Victoria's bays, rivers and ports, including:

- Parks Victoria
- Fisheries Victoria
- Department of Environment, Land, Water and Planning (DELWP)
- Department of Transport
- Environmental Protection Agency (EPA)
- Water Police[144]

Key water storages in the Grampians Region are managed by Grampians Wimmera Mallee Water, Central Highlands Water, Barwon Water, Goulburn Murray Water and Southern Rural Water.

Reservoirs

There are 21 reservoirs in the Grampians Region, as outlined below:

143 Global Terrorism Research Centre (2015): https://www.researchgate.net/publication/275658307_Plan_Prepare_and_Safeguard_Water_Critical_Infrastructure_Protection_in_Australia
144 Parks Victoria (2020): https://www.parks.vic.gov.au/water-management

Table 22. Reservoirs in Grampians Region[145]

LGA	No. Reservoirs	Reservoir Name(s)	Capacity (ML)	Water Authority
Ararat Rural City Council	1	Mt Cole Reservoir	801	Grampians Wimmera Mallee Water
City of Ballarat	2	White Swan Reservoir	14,107	Central Highlands Water
		Gong Gong Reservoir	1,902	
		Kirks Reservoir	400	
Golden Plains Shire	1	Stony Creek Reservoir	9,494	Barwon Water
Hepburn Shire	3	Cosgrave Reservoir	680	Central Highlands Water
		Newlyn Reservoir	3,012	Goulburn Murray Water
		Hepburns Lagoon	2,424	
Hindmarsh Shire	0	Nil	N/A	N/A
Horsham Rural City	3	Taylors Lake	27,060	Grampians Wimmera Mallee Water
		Lake Toolondo	50,530	
		Green Lake	5,350	
Moorabool Shire	7	Lal Lal Reservoir	59,549	Central Highlands Water
		Moorabool Reservoir	6,192	
		Wilsons Reservoir	1,010	
		Beales Reservoir	415	
		Pincotts Reservoir	218	
		Korweinguboora Reservoir	2,237	Barwon Water
		Bostock Reservoir	7,360	
		Pykes Creek Reservoir	22,119	Southern Rural Water
		Merrimu Reservoir	32,516	
Northern Grampians Shire	5	Lake Bellfield	78,560	Grampians Wimmera Mallee Water
		Lake Fyans	18,460	
		Lake Lonsdale	53,300	
		Moora Moora Reservoir	6,300	
		Lake Wartook	29,300	
Pyrenees Shire	0	Nil	N/A	N/A
West Wimmera Shire	0	Nil	N/A	N/A
Yarriambiack Shire	0	Nil	N/A	N/A
Total	**21**			

For areas with mains drinking water, most of these systems are treated to potable standard meeting the Australian Drinking Water Guidelines. While the main systems are predominately based around surface water supplies from reservoirs, there are also some communities that rely on groundwater for drinking water.

145 DELWP (2019): https://www.water.vic.gov.au/water-reporting/water-in-your-region

Table 23 outlines the areas serviced by water supply systems in the region. These include networks of system storages (tanks and basins), pumping stations and pipes.

In areas where mains drinking water is not available, rural communities rely on local rainwater, groundwater and surface water sources as private water supplies[146]. Understanding where these sources might be is important when looking at the impacts of a range of water quality and contamination events including waterborne diseases, chemical runoff, aquifer contamination and airborne particulates.

Table 23. Key water providers and water supply systems [147] [148]

Provider	Supply System	Source
Central Highlands Water	Amphitheatre	Amphitheatre Reservoir Amphitheatre Bore
	Avoca	Bung Bong Bore
	Ballarat	White Swan Reservoir and connected in-feed storages (Beales, Cosgrave, Gong Gong, Kirks, Moorabool, Newlyn, Pincotts, Wilsons) Lal Lal Reservoir Goldfields Pipeline Ballarat West Bores Bungaree Bore
	Beaufort and Raglan	Musical Gully Reservoir Mt Cole Pipeline Raglan Bore
	Blackwood	Blackwoods Basins Barry's Reef Bore
	Clunes	Tourello Bores
	Daylesford	Bullarto Reservoir Wombat Reservoir Hepburn Reservoir Coomoora Bore
	Dean	Dean Bore
	Forest Hill	Forest Hill Bore
	Landsborough	Landsborough Bore
	Learmouth	Bankin Hill Bores
	Lexton	Gordon Hill Bore

146 https://www2.health.vic.gov.au/public-health/water/private-drinking-water

147 https://www.gwmwater.org.au/images/Urban_and_Rural_Water_Strategy_2017_-_Final_July_6_2017.pdf

148 https://www.chw.net.au/mvc/k12webapi/media/education_sustainability/future%20planning/chw_2017_uws_-_final_version_4.pdf

Provider	Supply System	Source
Central Highlands Water	Redbank	Redbank Bores
	Waubra	Waubra Bores
Goulbourn Wimmera Mallee Water	Grampians (Ararat, Horsham, Yarriambiack, North Grampians, Hindmarsh)	Wimmera Mallee Pipeline Lake Bellfield Taylors Lake Lake Wartook Moora Reservoir Lake Fyans Mt Cole Reservoir Lake Lonsdale Rocklands Reservoir Toolondo Reservoir
	Pyrenees (Elmhurst, Buangor)	Hicksmans Creek McLeods Creek
	Eastern Grampians (Lake Bolac, Moyston, Wickcliffe, Willaura)	Mount William Creek Stoney Creek Masons Creek
	Eastern Grampians (Streatham, Westmere, Willaura)	Groundwater
	West Wimmera (Kaniva, Kiata, Lillimur, Miram, Serviceton, Apsley, Edenhope, Harrow, Garoke)	Groundwater
	Western Grampians (Horsham, Natimuk)	Groundwater

7.5.2 Emergency water supply points

Victoria also has more than 300 emergency water supply points, overseen by DELWP and managed by various state agencies, for use during drought and bushfires. Some can be used to supply water to firefighting vehicles.[149]

7.5.3 Wastewater

There are also numerous water and wastewater treatment plants across the region, with plants in most towns and multiple plants spread across each LGA. Wastewater treatments plants are regulated by the Victorian Environment Protection Authority (EPA).

149 DELWP (2020): https://data.aurin.org.au/dataset/vic-govt-delwp-datavic-water-ewsp-na

Notable locations include the Ballarat North Wastewater Treatment Plant, which can produce Class A wastewater able to be used for gardening, but not for high risk uses such as drinking water.[150]

Wastewater can be treated to different levels to allow reuse activities and support safe discharge to the receiving environment. Class A is the highest grade of recycled water and can be used in residential areas and to irrigate food crops. Class D is the lowest class and can only be used in areas with low risk of human contact such as irrigation outside of agricultural food production[151]. Most treatment plants in Grampians treat water to Class C standard or above for recycled use or discharge to environment[152]. Table 24 summarises the areas in the region serviced by wastewater treatment systems. Local Governments are responsible for the regulation of septic tanks in areas without sewerage systems.

Table 24. Key sewerage service providers and service areas [153] [154] [155]

Provider	Service area	Treatment Plant
Barwon Water	Greater Geelong	Bannockburn
Central Highlands Water	Avoca	Avoca
	Ballan	Ballan
	Ballarat North	Ballarat North
	Ballarat South	Ballarat South
	Beaufort	Beaufort
	Cardigan	Cardigan
	Clunes	Clunes
	Creswick	Creswick
	Daylesford	Daylesford
	Gordon	Gordon
	Skipton	Skipton
	Snake Valley	Snake Valley
Grampians Wimmera Mallee Water	Ararat	Ararat
	Edenhope	Edenhope
	Horsham	Horsham
	Warracknabeal	Warracknabeal
	Local town systems	Various

150 Central Highlands Water (2019): https://www.chw.net.au/community/water-quality/water-treatment/

151 https://ref.epa.vic.gov.au/our-work/licences-and-approvals/~/media/Publications/464%202.pdf

152 http://www.barwonwater.vic.giv.au/water-and-waste/sewage

153https://www.barwonwater.vic.gov.au/_data/assets/pdf_file/0008/20501/Urban-Water-Strategy-2017-notation.pdf

154 https://www.gwmwater.org.au/images/Urban_and_Rural_Water_Strategy_2017_-_Final_July_6_2017.pdf

155 https://www.chw.net.au/mvc/k12webapi/media/education_sustainability/future%20planning/chw_2017_uws_-_final_version_4.pdf

7.6 Waste and recycling

7.6.1 Landfill

Landfill, the below ground disposal of waste materials that cannot be recycled, continues to be a part of Victoria's waste management strategy. Many landfill sites are licensed to accept low-hazard (Category C) industrial waste. However, prescribed industrial waste can only be accepted at one hazardous (Category B) landfill in Victoria – this is in Taylors Road in Dandenong South in the City of Greater Dandenong.[156]

Closed landfills also pose environmental risks, including from:

- Leachate – a liquid formed by decomposing waste and rainwater – which can contaminate groundwater; and
- Landfill gas – from decomposing waste – which can migrate to the atmosphere.[157]

A study conducted by the Fire Services Commissioner in 2012 found that a series of significant fires in Victorian landfill sites had been costly and resource intensive for fire services to suppress. The need to work more closely with operators of landfill sites was identified as a recommendation to improve operating practices and develop fire management plans.[158]

There are currently 18 sites in the Grampians Region listed in the EPA's Priority Sites Register which have been issued a Clean Up Notice or a Pollution Abatement Notice, as the current condition of the sites is incompatible with the current or approved use and poses a risk to human health or the environment.[159] Examples of contamination and pollution issues experienced in the region include former landfill sites, current and former industrial sites and dumped industrial waste.[160]

156 EPA Victoria (2020): https://ref.epa.vic.gov.au/your-environment/waste/landfills
157 EPA Victoria (2020): https://ref.epa.vic.gov.au/your-environment/waste/landfills/closed-landfills.html
158 EMV (2012): https://www.emv.vic.gov.au/how-we-help/reviews-and-lessons-management/operational-reviews/fire-management-at-landfill-sites
159 EPA Victoria (2020): https://www.epa.vic.gov.au/for-community/environmental-information/land-groundwater-pollution/priority-sites-register
160 EPA Victoria (2020): https://www.epa.vic.gov.au/for-community/environmental-information/land-groundwater-pollution/priority-sites-register

There are 57 landfill sites across the region, as below:

Table 25. Landfill sites in Grampians Region by LGA[161]

LGA	No. Sites	Operating Status and Waste Type
Ararat Rural City Council	5	General waste – 3 Closed – 2
City of Ballarat	10	Solid inert waste – 1 Closed – 9
Golden Plains Shire	3	Asbestos, contaminated soil (Cat. C), tyres, solid inert waste, general waste – 1 Closed – 2
Hepburn Shire	5	Closed – 5
Hindmarsh Shire	3	Closed – 3
Horsham Rural City	1	Asbestos, contaminated soil (Cat. C), tyres, solid inert waste, general waste – 1
Moorabool Shire	5	Contaminated soil (Cat. C), paper pulp, tyres, solid inert waste, foundry sands, food waste, biosolids, green waste – 1 Closed – 4
Northern Grampians Shire	6	Closed – 5 Asbestos, ashing waste, contaminated soil (Cat. C), tyres, solid inert waste, general waste – 1
Pyrenees Shire	13	Closed – 13
West Wimmera Shire	1	Closed – 1
Yarriambiack Shire	5	General waste and solid inert waste – 3 Closed – 2
Total	**57**	

161 Data Vic (2020): https://discover.data.vic.gov.au/dataset/foi-point-vicmap-features-of-interest

7.6.2 Recycling

There are 59 transfer stations and 93 stockpile sites registered by the EPA (waste in storage for recycling or reuse), across the region as outlined below:

Table 26. Transfer Stations and EPA Stockpile Sites in Grampians Region by LGA[162] [163]

LGA	No. Transfer Stations	No. EPA Stockpile Sites
Ararat Rural City Council	9	9
City of Ballarat	2	18
Golden Plains Shire	0	2
Hepburn Shire	3	4
Hindmarsh Shire	7	7
Horsham Rural City	7	12
Moorabool Shire	3	6
Northern Grampians Shire	5	12
Pyrenees Shire	5	7
West Wimmera Shire	8	7
Yarriambiack Shire	10	9
Grampians Total	**59**	**93**

7.7 Government services

REMPs should consider how to ensure the continuation of government services to the community during an emergency – a time when they are likely to need vital support. The coronavirus pandemic of 2020 has already demonstrated the precarious nature of government workforces and the impact that absenteeism as a direct consequence of a disaster can have flow on effects (e.g., health care workers in an emergency department who are required to self-isolate for a period of 14 days following exposure to the virus can lead to the closure of wards or the cessation of elective surgeries which may lead to diversions for Ambulance Victoria and other care settings being required to pick up the slack).

Government services not already covered in this scan include prisons, community correctional services and law courts, which can have their own unique issues in the face of an emergency.

7.7.1 Prisons and community correctional facilities

There are two prisons/community correctional facilities in the Grampians Region:[164]

162 Data Vic (2020): https://discover.data.vic.gov.au/dataset/foi-point-vicmap-features-of-interest
163 EMV (2020): Potential Impact Reports (by LGA)
164 EMV (2020): Potential Impact Reports (by LGA)

- Hopkins Correctional Centre (Ararat Rural City)
- Langi Kal Kal Prison (Pyrenees Shire)

7.7.2 Law courts

There is one County Court and eight Magistrates courts in the region, as outlined below:

Table 27. Law Courts in Grampians Region by LGA[165]

LGA	No. Courts	Name
Ararat Rural City Council	1	Ararat Magistrates Court
City of Ballarat	2	Ballarat Magistrates Court Ballarat County Court
Golden Plains Shire	0	N/A
Hepburn Shire	0	N/A
Hindmarsh Shire	1	Nhill Magistrates Court
Horsham Rural City	1	Horsham Magistrates Court
Moorabool Shire	1	Bacchus Marsh Magistrates Court
Northern Grampians Shire	2	St Arnaud Magistrates Court Stawell Magistrates Court
Pyrenees Shire	0	N/A
West Wimmera Shire	0	N/A
Yarriambiack Shire	1	Hopetoun Magistrates Court
Total	**9**	

7.8 Emergency services

The Grampians Region is served by 25 ambulance stations, 48 police stations, 242 fire stations and 16 SES units.

165 Data Vic (2020): https://discover.data.vic.gov.au/dataset/foi-point-vicmap-features-of-interest

7.8.1 Ambulance

There are 25 ambulance stations across the region.

Table 28 includes the Ambulance response time performance for Code 1 calls across LGAs for Q4 2019-20 reporting period:

Table 28. Ambulance stations and response times in Grampians Region by LGA[166] [167]

LGA	No. Stations	Locations	Code 1 – % Responses within 15 mins	Code 1 – Average Response Time (mins)
Ararat Rural City Council	1	Ararat	*60.3%*	16:52
City of Ballarat	3	Ballarat, Sebastopol, Wendouree	*83.0%*	11:44
Golden Plains Shire	1	Bannockburn	*28.7%*	20:13
Hepburn Shire	2	Creswick, Daylesford	*42.5%*	18:07
Hindmarsh Shire	3	Dimboola, Nhill, Rainbow	*44.6%*	21:50
Horsham Rural City	1	Horsham	*77.7%*	12:06
Moorabool Shire	2	Bacchus Marsh, Ballan	*66.0%*	13:42
Northern Grampians Shire	3	Halls Gap, St Arnaud, Stawell	*72.8%*	13:48
Pyrenees Shire	2	Avoca, Beaufort	*39.1%*	19:29
West Wimmera Shire	3	Edenhope, Goroke, Kaniva	*29.4%*	22:35
Yarriambiack Shire	4	Hopetoun, Patchewollock, Rupanyup, Warracknabeal	*32.6%*	23:41
Grampians Total	**25**			

166 Ambulance Victoria (2019): https://www.ambulance.vic.gov.au/ambulance-victoria-data-sets/
167 Data Vic (2020): https://discover.data.vic.gov.au/dataset/foi-point-vicmap-features-of-interest

7.8.2 Police

There are 48 police stations across the region as follows:

Table 29. Police stations in Grampians Region by LGA[168]

LGA	No. Stations	Locations
Ararat Rural City Council	4	Willaura, Elmhurst, Ararat, Lake Bolac
City of Ballarat	5	Learmonth, Ballarat, Ballarat North, Ballarat West, Buninyong
Golden Plains Shire	6	Linton, Smythesdale, Rokewood, Meredith, Inverleigh, Bannockburn
Hepburn Shire	4	Creswick, Clunes, Daylesford, Trentham
Hindmarsh Shire	4	Nhill, Dimboola, Rainbow, Jeparit
Horsham Rural City	2	Natimuk, Horsham
Moorabool Shire	3	Gordon, Ballan, Bacchus Marsh
Northern Grampians Shire	3	Halls Gap, Stawell, St Arnaud
Pyrenees Shire	4	Avoca, Landsborough, Lexton, Beaufort
West Wimmera Shire	5	Kaniva, Edenhope, Goroke, Apsley, Harrow
Yarriambiack Shire	8	Murtoa, Warracknabeal, Minyip, Rupanyup, Speed, Hopetoun, Beulah, Woomelang
Total	**48**	

168 Data Vic (2020): https://discover.data.vic.gov.au/dataset/foi-point-vicmap-features-of-interest

7.8.3 Fire stations, lookouts and refuges

There are 240 fire stations across the region, as well as two CFA forest industry brigades, as outlined below:

Table 30. Fire stations and Forest Industry Brigades in Grampians Region by LGA[169]

LGA	No. Stations (and Brigades)	Locations
Ararat Rural City Council	17	Ararat Fire Station, Bornes Hill Fire Station, Buangor Middle Creek Fire Station, Elmhurst Fire Station, Lake Bolac Fire Station, Langi Logan Fire Station, Maroona Fire Station, Mininera Fire Station, Moyston Fire Station, Pomonal Fire Station, Streatham Fire Station, Tatyoon Fire Station, Warrak Fire Station, Westmere Fire Station, Wickliffe Fire Station, Willaura Fire Station, Yalla-Y-Poora Fire Station
City of Ballarat	17 (1 Forest Industry Brigade)	Ascot District Fire Station, Ballarat City Fire Station, Ballarat Fire Station, Buninyong-Mt Helen Fire Station, Buninyong-Mt Helen Satellite Fire Station (Mount Helen), Burrumbeet Fire Station, Cardigan-Windermere Fire Station, Glen Park Fire Station, Glendaruel Mt Beckworth Fire Station, Invermay Fire Station, Learmonth-Addington Fire Station, Lucas Fire Station, Miners Rest Fire Station, Mt Buninyong Fire Station, Mt Warrenheip Fire Station, Sebastopol Fire Station, Wendouree Fire Station, Ballarat Plantations CFA Forest Industry Brigade
Golden Plains Shire	27	Bannockburn Fire Station, Barunah Plains North Fire Station, Cape Clear Fire Station, Cape Clear Satellite Fire Station (Berringa), Dereel Fire Station, Haddon Fire Station, Haddon Satellite Fire Station (Smythes Creek), Hardies Hill Fire Station, Inverleigh Fire Station, Lethbridge Fire Station, Linton Fire Station, Mannibadar Fire Station, Maude Fire Station, Meredith Fire Station, Mount Mercer Fire Station, Napoleons-Enfield Fire Station, Napoleons-Enfield Satellite Fire Station (Enfield), Rokewood Fire Station, Rokewood Junction Dist Fire Station, Shelford Fire Station, Smythesdale Fire Station, Smythesdale Satellite Fire Station (Ross Creek), Smythesdale Satellite Fire Station (Scarsdale), Teesdale Fire Station, Wallinduc District Fire Station, Werneth Fire Station, Wingeel Fire Station
Hepburn Shire	19	Campbelltown Fire Station, Clunes Fire Station, Creswick Fire Station, Daylesford Fire Station, Franklinford Fire Station, Glenlyon Fire Station, Hepburn Fire Station, Kingston Fire Station, Kingston Satellite Fire Station (Allendale), Kooroocheang Werona Fire Station, Leonards Hill District Fire Station, Musk Fire Station, Newlyn Dean Fire Station, Porcupine Ridge Fire Station, Slaty Creek Fire Station, Smeaton Fire Station, Spring Hill Fire Station, Trentham Fire Station, Ullina Fire Station
Hindmarsh Shire	20	Antwerp Fire Station, Broughton Fire Station, Detpa Lake Hindmarsh Fire Station, Diapur Fire Station, Dimboola Fire Station, Gerang Fire Station, Jeparit Fire Station, Kenmare Fire Station, Lawloit Fire Station, Lorquon Fire Station, Netherby Fire Station, Nhill Fire Station, Pigick Fire Station, Propodollah Fire Station, Rainbow Fire Station, Tarranyurk Fire Station, Werrap Fire Station, Winiam District Fire Station, Woorak Fire Station, Yanac Fire Station
Horsham Rural City	23	Brimpaen Fire Station, Clear Lake Fire Station, Dadswells Bridge Fire Station, Dooen Fire Station, Grass Flat Fire Station, Green Lake Fire Station, Green Lake Satellite Fire Station (St Helens Plains), Horsham Fire Station, Jung Fire Station, Laharum Fire Station, Laharum Satellite Fire Station (Laharum), Mitre Fire Station, Natimuk Fire Station, Noradjuha Fire Station, Noradjuha Satellite Fire Station (Lower Norton), North Wimmera Fire Station, Pimpinio Fire Station, Telangatuk Fire Station, Toolondo Fire Station, Toolondo Satellite Fire Station (Nurrabiel), Vectis Fire Station, Vectis Satellite Fire Station (Vectis South), Wonwondah Fire Station
Moorabool Shire	20 (1 Forest Industry Brigade)	Bacchus Marsh Fire Station, Bacchus Marsh Satellite Fire Station (Darley), Ballan Fire Station, Balliang District Fire Station, Blackwood Fire Station, Bungaree Fire Station, Coimadai Fire Station, Elaine Fire Station, Gordon Fire Station, Greendale Fire Station, Millbrook Fire Station, Mollongghip Fire Station, Morrisons District Fire Station, Mt Egerton Fire Station, Mt Wallace Fire Station, Myrniong Fire Station,

169 Data Vic (2020): https://discover.data.vic.gov.au/dataset/foi-point-vicmap-features-of-interest

LGA	No. Stations (and Brigades)	Locations
		Parwan Fire Station, Rowsley Fire Station, Trentham Satellite Fire Station (Lyonville), Wallace Fire Station, Central Highlands Water CFA Forest Industry Brigade
Northern Grampians Shire	18	Beazleys Bridge Fire Station, Callawadda Fire Station, Carapooee Fire Station, Glenorchy Riachella Fire Station, Gooroc Fire Station, Gre Gre Village Fire Station, Great Western Fire Station, Halls Gap Fire Station, Joel Joel Fire Station, Kooreh Fire Station, Marnoo Fire Station, Navarre Fire Station, Rich Avon Fire Station, St Arnaud Fire Station, Stawell Fire Station, Stuart Mill Fire Station, Traynors Lagoon Fire Station, Wallaloo East Fire Station
Pyrenees Shire	20	Amphitheatre Fire Station, Avoca Fire Station, Barkly Frenchmans Fire Station, Beaufort Fire Station, Brewster Fire Station, Burnbank Fire Station, Carranballac Fire Station, Cross Roads Fire Station, Crowlands Fire Station, Lake Goldsmith-Stockyard Fire Station, Landsborough Fire Station, Langi Kal Kal Fire Station, Lexton Fire Station, Natte Yallock Fire Station, Raglan Fire Station, Redbank Fire Station, Snake Valley District Fire Station, Stoneleigh Fire Station, Warrenmang District Fire Station, Waubra Fire Station
West Wimmera Shire	31	Apsley Fire Station, Benayeo Fire Station, Bringalbert South Fire Station, Charam Fire Station, Chetwynd Fire Station, Connewirricoo Fire Station, Dergholm Fire Station, Dergholm Satellite Fire Station (Dorodong), Dinyarrak Fire Station, Douglas Fire Station, Edenhope Fire Station, Goroke Fire Station, Gymbowen Fire Station, Harrow Fire Station, Kadnook Fire Station, Kaniva Fire Station, Karnak Fire Station, Langkoop Fire Station, Leeor Fire Station, Miga Lake Fire Station, Minimay Fire Station, Neuarpurr Fire Station, Ozenkadnook Fire Station, Patyah Fire Station, Peronne Fire Station, Poolaijelo Fire Station, Sandsmere Fire Station, South Lillimur Fire Station, Telopea Downs Fire Station, Ullswater Fire Station, Yearinga - Yarrock Fire Station
Yarriambiack Shire	28	Areegra Fire Station, Bangerang Fire Station, Beulah Fire Station, Boolite Fire Station, Brim Fire Station, Cannum Fire Station, Coromby Fire Station, Crymelon Fire Station, Hopetoun Fire Station, Hopetoun West Fire Station, Kellalac Fire Station, Lah Fire Station, Lascelles Fire Station, Lubeck Fire Station, Minyip Fire Station, Murtoa Fire Station, Patchewollock Fire Station, Rosebery Fire Station, Rupanyup Fire Station, Sheep Hills Fire Station, Speed Fire Station, Tempy Fire Station, Turriff Fire Station, Warracknabeal Fire Station, Wilkur South Fire Station, Willenabrina Fire Station, Woomelang Fire Station, Yaapeet Fire Station
Grampians Total	**242**	

There are 12 fire lookouts across the region, as below:

Table 31. Fire lookouts in Grampians Region by LGA[170]

LGA	No. Lookouts	Locations
Ararat Rural City Council	2	Mt Lonarch, Ben Nevis
City of Ballarat	1	Mt Buninyong
Golden Plains Shire	1	Cherrytree Hill
Hepburn Shire	1	FT 5 Mt Franklin
Hindmarsh Shire	0	Nil
Horsham Rural City	2	Mt Arapiles, Reeds Grampians
Moorabool Shire	2	FT 3 Blue Mountain, FT 2 Blackwood
Northern Grampians Shire	2	Big Hill Stawell, West of England
Pyrenees Shire	0	Nil
West Wimmera Shire	1	Chetwynd
Yarriambiack Shire	0	Nil
Grampians Total	**12**	

There is one Community Fire Refuge in the region – the Blackwood Community Fire Refuge located in Moorabool Shire at the Blackwood CFA Fire Station.[171] There are also 49 Neighbourhood Safer Places (NSP), as outlined below:

Table 32. Neighbourhood Safer Places in Grampians Region by LGA[172]

LGA	No. NSPs	Locations
Ararat Rural City Council	6	Lake Bolac, Moyston, Ararat, Willaura, Streatham, Elmhurst
City of Ballarat	5	Buninyong, Mount Clear, Canadian Lakes, Ballarat, Invermay
Golden Plains Shire	6	Cape Clear, Dereel, Haddon, Linton, Ross Creek, Smythesdale
Hepburn Shire	6	Clunes, Creswick, Daylesford, Glenlyon, Hepburn, Trentham
Hindmarsh Shire	4	Dimboola, Jeparit, Nhill, Rainbow
Horsham Rural City	3	Horsham, Laharum, Natimuk
Moorabool Shire	3	Darley, Gordon, Greendale
Northern Grampians Shire	3	Halls Gap, St Arnaud, Stawell
Pyrenees Shire	9	Avoca, Beaufort, Landsborough, Lexton, Moonambel, Natte Yallock, Redbank, Snake Valley, Waubra
West Wimmera Shire	3	Apsley, Dergholm, Edenhope
Yarriambiack Shire	1	Warracknabeal
Grampians Total	**49**	

170 Data Vic (2020): https://discover.data.vic.gov.au/dataset/foi-point-vicmap-features-of-interest
171 CFA (2020): https://www.cfa.vic.gov.au/plan-prepare/community-fire-refuges
172 CFA (2020): http://www.saferplaces.cfa.vic.gov.au/cfa/search/default.htm

7.8.4 SES

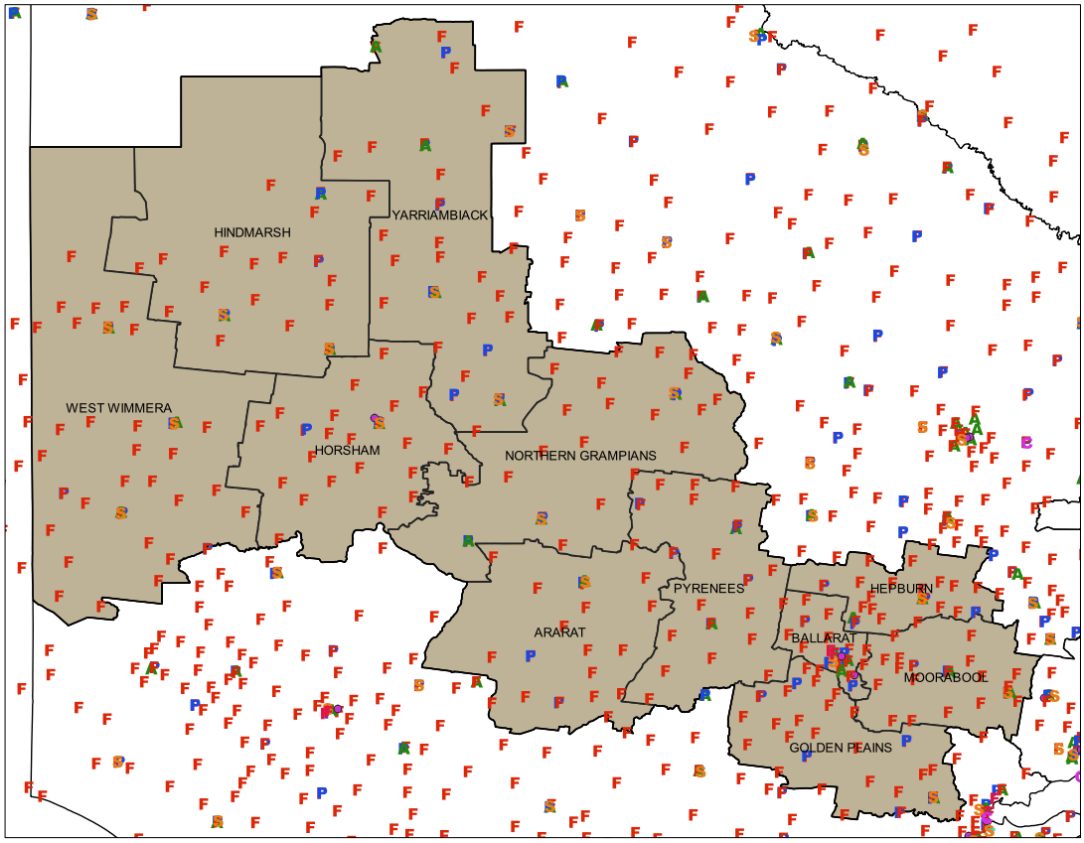
There are 16 SES units across the region, including:

Table 33. SES Units in Grampians Region by LGA[173]

LGA	No. Units	Locations
Ararat Rural City Council	1	Ararat
City of Ballarat	1	Ballarat
Golden Plains Shire	1	Bannockburn
Hepburn Shire	1	Hepburn Shire
Hindmarsh Shire	2	Dimboola, Nhill
Horsham Rural City	1	Horsham
Moorabool Shire	1	Bacchus Marsh
Northern Grampians Shire	2	St Arnaud, Stawell
Pyrenees Shire	0	Nil
West Wimmera Shire	3	Edenhope, Goroke, Kaniva
Yarriambiack Shire	3	Dunmunkle, Warracknabeal, Woomelang
Grampians Total	**16**	

A map of emergency services is provided in the figure below:

173 Data Vic (2020): https://discover.data.vic.gov.au/dataset/foi-point-vicmap-features-of-interest



Red = Fire station (CFA and FRV)	Orange = SES
Green = Ambulance station	Light Blue = Life saving
Blue = Police station	Purple = Coast Guard

Figure 22. Emergency services for the Grampians Region[174]

7.8.5 Emergency Coordination Facilities

Emergency services agencies are supported by the State Control Centre (SCC) in East Melbourne (the State's primary control centre for the management of Class 1 and Class 2 emergencies), a Regional Control Centre (RCC) in Ballarat (a facility that enables the implementation of Command, Control and Coordination arrangements within a set regional boundary) and Incident Control Centres (ICCs) in Ararat Rural City Council (Ararat), City of Ballarat (Ballarat) and Horsham Rural City (Horsham) – where an Incident Controller and Incident Management Teams can manage response activities in an emergency.[175]

In total there are 25 emergency coordination centres across the region, including 21 Local Command Facilities (LCF), as outlined below:

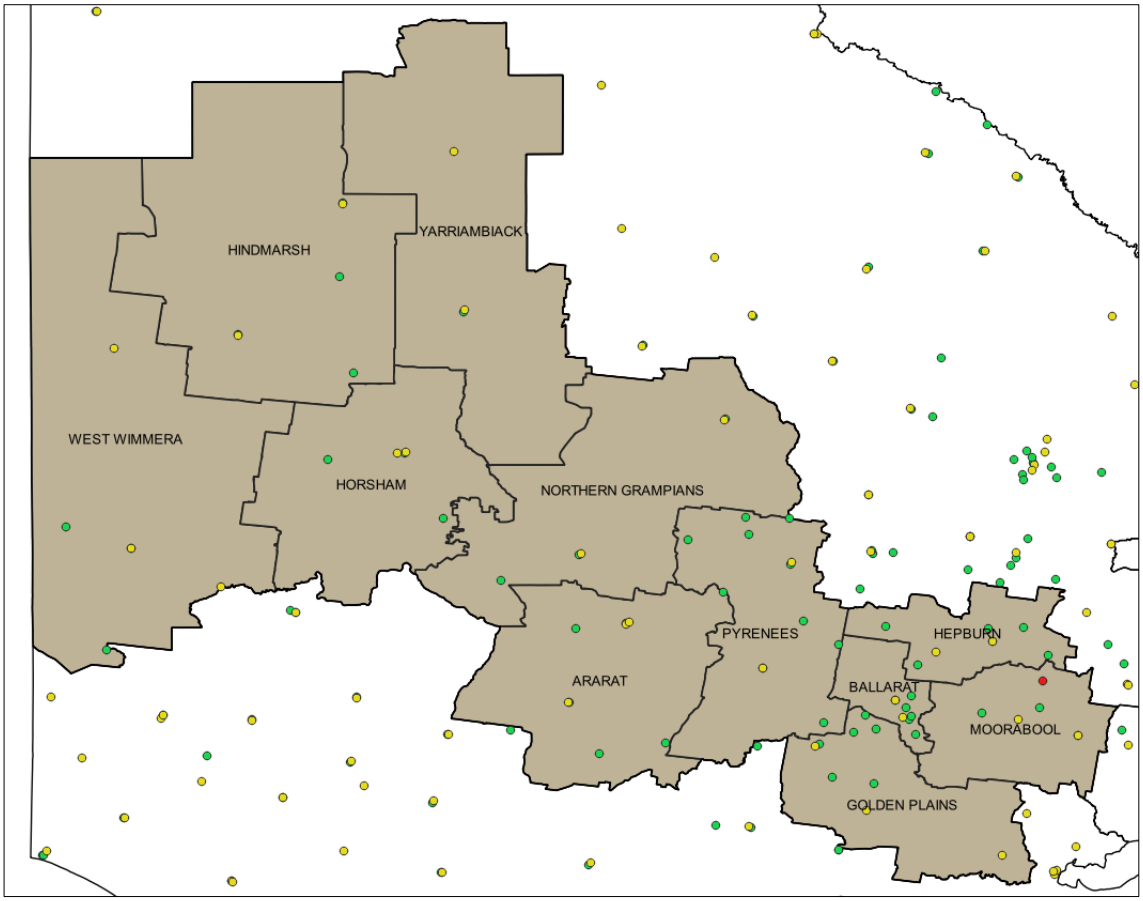
174 Data Vic (2020): https://discover.data.vic.gov.au/dataset/foi-point-vicmap-features-of-interest
175 EMV (2019): https://files-em.em.vic.gov.au/public/Doctrine/ManHand/VIC-EOpsHandbook.pdf

Table 34. Emergency Coordination Facilities in Grampians Region by LGA[176]

LGA	Facility			Locations (RCC, ICC, LCF)
	RCC	ICC	LCF	
Ararat Rural City Council	-	1	2	Ararat Ararat, Willaura
City of Ballarat	1	1	1	Ballarat Ballarat Ballarat
Golden Plains Shire	-	-	3	Linton, Rokewood, Bannockburn
Hepburn Shire	-	-	1	Daylesford
Hindmarsh Shire	-	-	2	Nhill, Rainbow
Horsham Rural City	-	1	1	Horsham Horsham
Moorabool Shire	-	-	2	Ballan, Bacchus Marsh
Northern Grampians Shire	-	-	2	Stawell, St Arnaud
Pyrenees Shire	-	-	2	Avoca, Beaufort
West Wimmera Shire	-	-	3	Kaniva, Edenhope, Harrow
Yarriambiack Shire	-	-	2	Warracknabeal, Hopetoun
Grampians Total	**1**	**3**	**21**	**25**

A map of emergency coordination facilities is provided in the figure below:

176 Data Vic (2020): https://discover.data.vic.gov.au/dataset/foi-point-vicmap-features-of-interest



Yellow = Emergency Coordination Centres
Red = Community Refuge
Green = Neighbourhood Safer Places

Figure 23. Emergency Coordination facilities, Fire refuges and NSPs for the Grampians Region[177]

7.9 Other infrastructure assets and industries

7.9.1 Infrastructure and industries

Grampians Region is home to a number of infrastructure assets and industries, including:

- Abattoirs (7)
  - Ararat Meats Exports
  - Deutsher's Turkey Farm Abattoir
  - Edenhope Abattoir
  - Frewstal Abattoir
  - Goldfields Turkeys

177 Data Vic (2020): https://discover.data.vic.gov.au/dataset/foi-line-vicmap-features-of-interest

- Luv-a-duck Abattoir
- Westside Meats

- Backpackers (2)
  - Halls Gap – Grampians YHA
  - Neds Other Beds
- Rooming Houses (21)
- Supported Residential Facilities (7)
- Major Hazard Facilities [178] (1)
  - Arch Wood Protection (Aust) Pty Ltd

7.9.2 Dependencies

The following infrastructure assets are key dependencies for this region:

- Iona to South Australia Border Gas Pipeline
- South East Australia Gas Pipeline
- Western Highway – Melbourne-Ballarat-Ararat-Stawell-Horsham-Adelaide link
- Midland Highway – Ballarat-Geelong and Ballarat-Bendigo link
- Glenelg Highway – Ballarat-Hamilton-Portland link
- Sunraysia Highway – Ballarat-Mildura link and Ouyen-Lascelles-Donald-St Arnaud-Bendigo link
- Pyrenees Highway – Ararat-Bendigo link
- Interstate freight line between Adelaide and Melbourne via Geelong.
- Limited passenger rail connections to Melbourne and Adelaide from Nhill, Dimboola and Stawell via the twice weekly Overland service

7.9.3 Tourism infrastructure

Other significant infrastructure includes sites such as event facilities and stadiums, major tourist attractions and shopping centres. These sites are outlined below:

178 https://content.api.worksafe.vic.gov.au/sites/default/files/2019-06/ISBN-Licensed-registered-major-hazard-facilities-2019-05.pdf

Table 35. Significant tourism infrastructure in Grampians Region by LGA[179]

LGA	Infrastructure Category	Name
Ararat Rural City Council	Event and Entertainment Facilities	Ararat Racecourse
City of Ballarat	Event and Entertainment Facilities Tourist attractions Shopping Centres	Mars Stadium Ballarat Turf Club Ballarat Showgrounds Sovereign Hill Historical Park Ballarat Wildlife Park Stockland Wendouree Central Square Shopping Centre Delacombe Town Centre
Golden Plains Shire	N/A	-
Hepburn Shire	N/A	-
Hindmarsh Shire	N/A	-
Horsham Rural City	Shopping Centres Event and Entertainment Facilities	Horsham Plaza Shopping Centre Horsham Gateway Centre Horsham Racecourse
Moorabool Shire	Shopping Centres Event and Entertainment Facilities	The Village Bacchus Marsh Shopping Centre Rolling Thunder Raceway
Northern Grampians Shire	Event and Entertainment Facilities Tourist attractions	Stawell Racecourse Halls Gap Zoo
Pyrenees Shire	Event and Entertainment Facilities	Avoca Turf Club
West Wimmera Shire	N/A	-
Yarriambiack Shire	N/A	-

179 https://profile.id.com.au/

7.9.4 Cladding fire safety risk

The Victorian Building Authority (VBA) is in the process of conducting a State-wide audit of non-compliant building materials in Victoria, with a focus on reducing fire safety risks for buildings found to have combustible cladding.[180]

- On 25 November 2014, a fire in the 23-storey Lacrosse high-rise building in Docklands highlighted the fire safety risks of non-compliant external wall coverings. The fire, which spread vertically, directly affected approximately 500 residents who required immediate evacuation and accommodation.[181]

To date, more than 2,200 inspections have been undertaken and Grampians Region has been identified to have 11 privately owned buildings with cladding.

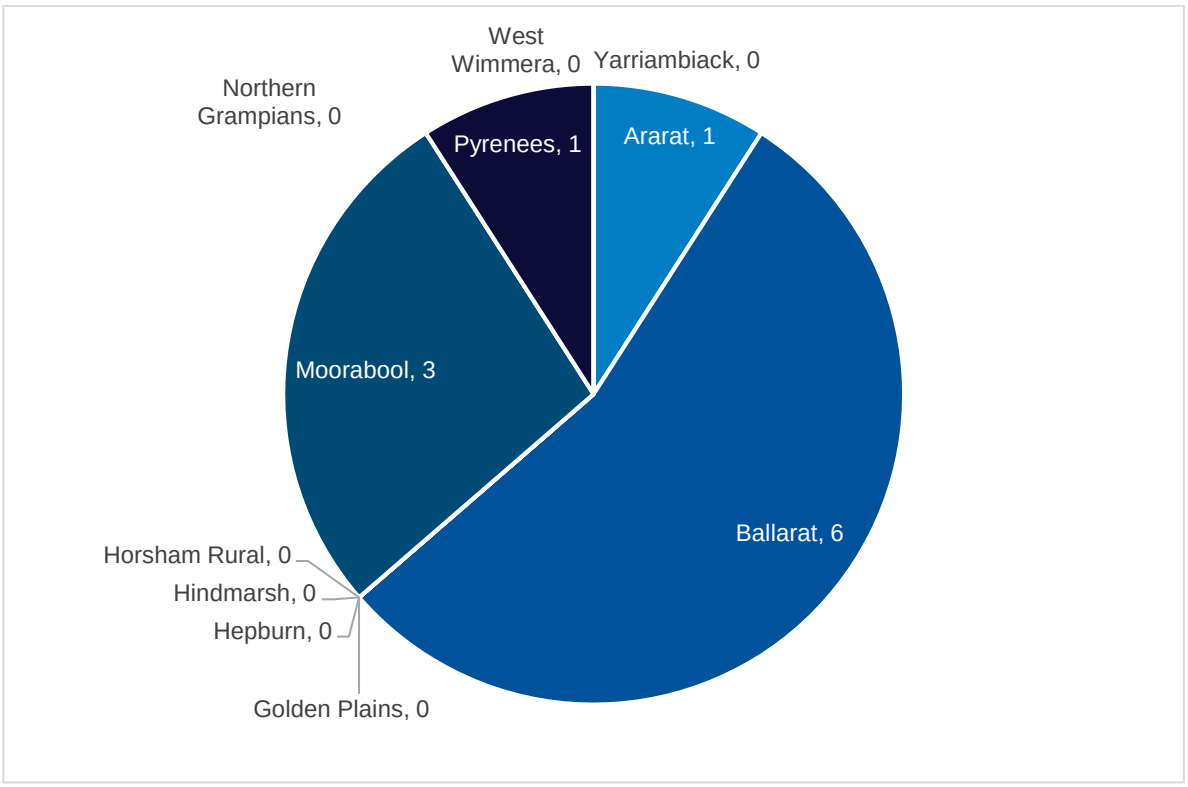


Figure 24. Number of privately owned buildings with cladding by LGA[182]

180 https://www.vba.vic.gov.au/cladding/audit

181 https://www.melbourne.vic.gov.au/sitecollectiondocuments/mbs-report-lacrosse-fire.pdf

182 https://www.vba.vic.gov.au/cladding/cladding-by-municipality

8. Social Environment

Social factors that influence the culture and institutions of the Grampians Region include demographic characteristics and trends, and the values, norms and customs of the people who reside or work within or travel through the region.

8.1 Population

8.1.1 Current population

Over 250,000 people live in the Grampians Region, with a significant portion of the population (44%) living in the City of Ballarat.

Population density for Grampians Region ranged from 0.42 persons per km^2 in West Wimmera Shire to 148.2 persons per km^2 in the City of Ballarat, with an average of 5.2 persons per km^2 across the region.

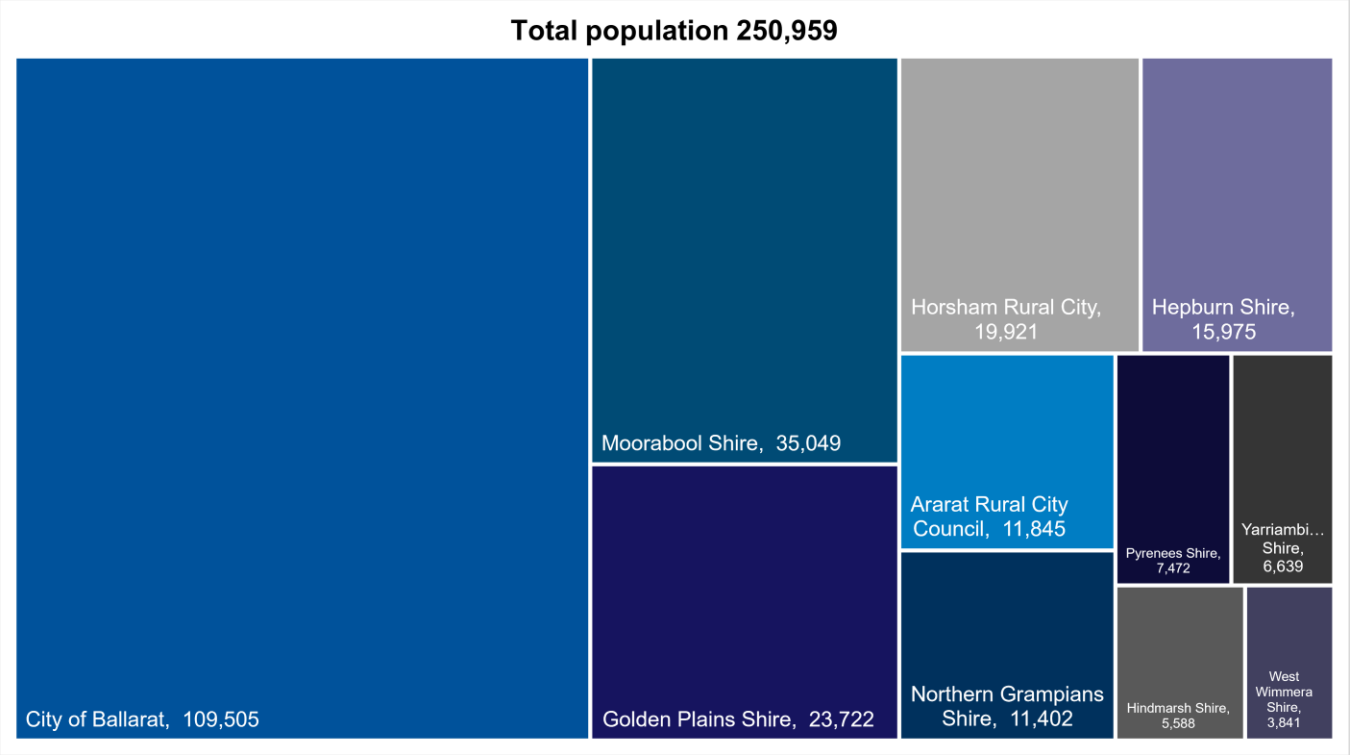


Figure 25. Grampians Region Population by LGA (2019) [183]

183 ABS (2020): https://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3218.02018-19?OpenDocument

Table 36. Grampians Region Population by LGA (2019) [184] [185]

LGA	Total Population	Area (sq km)	Population Density (persons/km^2)
Ararat Rural City Council	11,845	4,211	2.8
City of Ballarat	109,505	739	**148.2**
Golden Plains Shire	23,722	2,703	8.8
Hepburn Shire	15,975	1,473	10.8
Hindmarsh Shire	5,588	7,524	0.7
Horsham Rural City	19,921	4,267	4.7
Moorabool Shire	35,049	2,111	16.6
Northern Grampians Shire	11,402	5,730	2.0
Pyrenees Shire	7,472	3,435	2.2
West Wimmera Shire	3,841	9,108	**0.4**
Yarriambiack Shire	6,639	7,326	0.9
Grampians Region Average	**250,959**	**48,627**	**5.2**

8.1.2 Population forecast

By 2036, the population of the region is forecast to increase by 59,229 people (24%) to 310,188 people, with the majority taking up residence in the City of Ballarat (+36,421 people), Moorabool Shire (+14,890 people) and Golden Plains Shire (+9,351 people). The LGAs of Hindmarsh Shire, Northern Grampians Shire, West Wimmera Shire and Yarriambiack Shire are forecast to experience declines in population by 2036.

Refer to the below tables and visualisations for Local Government population breakdowns and forecasts.

184 ABS (2020): https://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3218.02018-19?OpenDocument
185 DJPR (2020): https://www.rdv.vic.gov.au/information-portal/table-and-chart

Table 37. Estimated Population and Projections for Grampians Region by LGA[186]

LGA	Estimated Population and Projections			
	2019[187]	**2036**[188]	**No. Increase**	**% Growth**
Ararat Rural City Council	11,845	11,865	20	*0.2%*
City of Ballarat	109,505	145,926	**36,421**	***33.3%***
Golden Plains Shire	23,722	33,073	9,351	*39.4%*
Hepburn Shire	15,975	17,700	1,725	*10.8%*
Hindmarsh Shire	5,588	4,559	**-1,029**	***-18.4%***
Horsham Rural City	19,921	20,599	678	*3.4%*
Moorabool Shire	35,049	49,939	**14,890**	***42.5%***
Northern Grampians Shire	11,402	10,209	**-1,193**	***-10.5%***
Pyrenees Shire	7,472	7,712	240	*3.2%*
West Wimmera Shire	3,841	3,038	-803	*-20.9%*
Yarriambiack Shire	6,639	5,568	-1,071	*-16.1%*
Grampians Total	**250,959**	**310,189**	**59,230**	***23.6%***
VICTORIA	**6,596,039**	**8,722,766**	**2,126,727**	***32.2%***

186 DJPR (2020): https://www.rdv.vic.gov.au/information-portal/table-and-chart
187 ABS (2017): https://www.rdv.vic.gov.au/information-portal/table-and-chart
188 VIF2019 projections: https://www.planning.vic.gov.au/land-use-and-population-research/victoria-in-future/tab-pages/victoria-in-future-data-tables

Table 38. Population by age group (2017)[189]

LGA	Age Group (Years)												
	0-14	15-19	*0-19 Subtotal*	20-24	25-34	35-44	45-54	55-64	65-74	75-84	85+	*65+ Subtotal*	Total No.
Ararat Rural City Council	1,881	608	2,489	573	1,307	1,387	1,636	1,758	1,437	815	343	2,595	**11,745**
City of Ballarat	20,244	6,800	27,044	8,024	13,801	12,584	12,884	11,951	9,522	5,333	2,357	17,212	**103,500**
Golden Plains Shire	5,077	1,517	6,594	1,044	2,260	3,154	3,279	2,883	1,965	642	195	2,802	**22,016**
Hepburn Shire	2,521	706	3,227	602	1,215	1,750	2,307	2,765	2,216	1,003	440	3,659	**15,525**
Hindmarsh Shire	909	320	1,229	276	517	542	802	930	737	455	296	1,488	**5,784**
Horsham Rural City	3,870	1,206	5,076	1,182	2,408	2,227	2,515	2,627	1,951	1,290	608	3,849	**19,884**
Moorabool Shire	6,765	2,154	8,919	1,827	3,741	4,382	4,798	4,106	3,194	1,235	470	4,899	**32,672**
Northern Grampians Shire	1,802	670	2,472	556	1,147	1,195	1,638	1,802	1,557	829	374	2,760	**11,570**
Pyrenees Shire	1,187	320	1,507	281	611	800	1,052	1,324	1,139	444	158	1,741	**7,316**
West Wimmera Shire	703	215	918	148	381	368	587	594	511	315	115	941	**3,937**
Yarriambiack Shire	1,115	367	1,482	296	595	584	928	1,061	915	548	334	1,797	**6,743**
Grampians	**46,074**	**14,883**	**60,957**	**14,809**	**27,983**	**28,973**	**32,426**	**31,801**	**25,144**	**12,909**	**5,690**	**43,743**	**240,692**
%	***19.1%***	***6.2%***	***25.3%***	***6.1%***	***11.6%***	***12.0%***	***13.5%***	***13.2%***	***10.4%***	***5.4%***	***2.4%***	***18.2%***	***100.0%***
VICTORIA	**1,166,502**	**374,125**	**1,540,627**	**466,102**	**991,712**	**849,923**	**809,781**	**705,704**	**532,826**	**294,754**	**130,219**	**957,799**	**6,321,648**
%	***18.5%***	***5.9%***	***24.4%***	***7.4%***	***15.7%***	***13.4%***	***12.8%***	***11.2%***	***8.4%***	***4.7%***	***2.1%***	***15.2%***	***100.0%***

189 ABS (2017): https://www.rdv.vic.gov.au/information-portal/table-and-chart

Table 39. Projected population by age group (2036)[190]

LGA	Age Group (Years)												
	0-14	15-19	*0-19 Subtotal*	20-24	25-34	35-44	45-54	55-64	65-74	75-84	85+	*65+ Subtotal*	Total No.
Ararat Rural City Council	1,521	439	1,961	505	1,489	1,591	1,483	1,576	1,552	1,165	545	3,262	**11,865**
City of Ballarat	25,360	8,743	34,104	9,887	18,123	18,733	17,529	15,341	15,673	11,668	4,869	32,210	**145,926**
Golden Plains Shire	6,644	2,068	8,712	1,764	3,720	4,674	4,628	3,819	3,129	1,931	697	5,757	**33,073**
Hepburn Shire	2,200	611	2,811	490	1,453	1,819	2,041	2,730	3,097	2,290	970	6,357	**17,700**
Hindmarsh Shire	598	187	785	142	442	544	547	602	700	541	256	1,497	**4,559**
Horsham Rural City	3,336	1,204	4,540	1,258	2,496	2,429	2,336	2,128	2,418	2,138	856	5,412	**20,599**
Moorabool Shire	9,183	2,975	12,157	2,669	5,726	7,328	6,926	5,375	4,869	3,368	1,521	9,758	**49,939**
Northern Grampians Shire	1,376	486	1,862	410	946	1,120	1,208	1,265	1,478	1,269	650	3,397	**10,209**
Pyrenees Shire	1,044	226	1,270	177	511	881	984	1,250	1,416	954	269	2,639	**7,712**
West Wimmera Shire	521	161	681	162	374	335	300	280	440	315	151	906	**3,038**
Yarriambiack Shire	818	290	1,108	213	592	698	669	483	768	697	340	1,805	**5,568**
Grampians Total	**52,601**	**17,389**	**69,991**	**17,675**	**35,873**	**40,151**	**38,651**	**34,849**	**35,539**	**26,337**	**11,124**	**73,000**	**310,189**
%	***17.0%***	***5.6%***	***22.6%***	***5.7%***	***11.6%***	***12.9%***	***12.5%***	***11.2%***	***11.5%***	***8.5%***	***3.6%***	***23.5%***	***100.0%***
VICTORIA	**1,484,771**	**511,324**	**1,996,095**	**585,796**	**1,232,559**	**1,266,034**	**1,146,896**	**886,495**	**771,700**	**568,029**	**269,162**	**2,948,620**	**8,722,766**
%	***17.0%***	***5.9%***	***22.9%***	***6.7%***	***14.1%***	***14.5%***	***13.1%***	***10.2%***	***8.8%***	***6.5%***	***3.1%***	***33.8%***	***100.0%***

190 ABS (2017): https://www.rdv.vic.gov.au/information-portal/table-and-chart

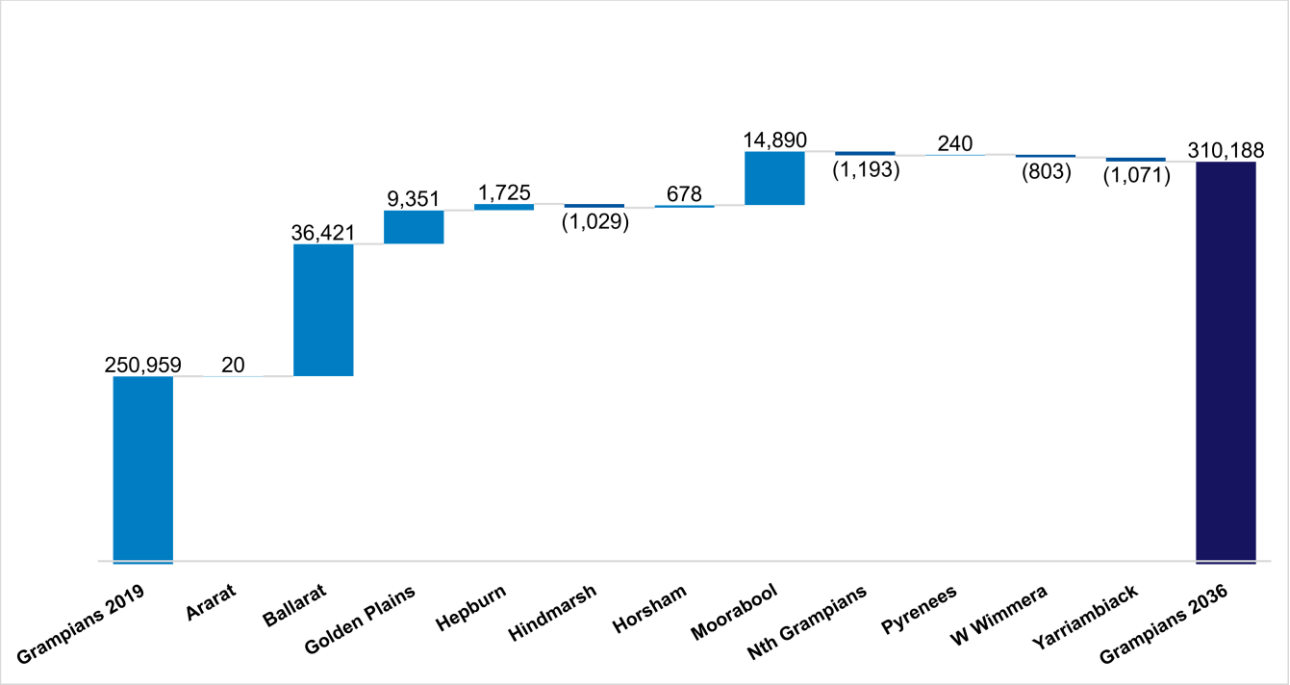


Figure 26. Population growth for Grampians Region by LGA (2019-2036)[191]

8.2 Vulnerability indicators

In emergency management there are many population vulnerability indicators that have a geographical distribution and are relevant to natural hazard risk analysis. These include:

- The young, the elderly and those needing assistance, who may be dependent on others for care;
- Single parents, who may lack support for their dependent children;
- Income and public housing residency, which are indicators of socio-economic disadvantage and can have an impact on a household's ability to recover from a disaster;
- Education level and proficiency in English, which can limit understanding of warnings, risks and preparation advice;
- Car ownership, which may have an impact on a household's ability to evacuate;
- Unoccupied dwellings, which may reduce owners' engagement levels with the local community and reduce the likelihood that relevant preparations will be undertaken for their properties.

Some of these indicators for the Grampians Region are summarised below. Of note, more than a quarter (27.1%) of Grampians Region households are lone person and more than 1 in 5 (20.6%) households indicated that they had no internet connection at home in 2016.

191 DJPR (2020): https://www.rdv.vic.gov.au/information-portal/regional-snapshot

Table 40. Vulnerable Communities Indicators by LGA (2016)[192]

LGA	Vulnerability Indicators (%)						
	Population aged 65+	Lone person households	People with a disability	People with poor English proficiency	Estimated homeless population	Population with no motor vehicles	Population with no internet connection at home
Ararat Rural City Council	*23.0%*	*28.3%*	*6.5%*	*0.6%*	*0.4%*	*5.4%*	*23.1%*
City of Ballarat	*17.3%*	*26.6%*	*6.2%*	*0.7%*	*0.4%*	*5.8%*	*16.0%*
Golden Plains Shire	*13.4%*	*15.4%*	*4.6%*	*0.3%*	*0.1%*	*0.9%*	*12.1%*
Hepburn Shire	*24.5%*	*28.1%*	*5.9%*	*0.4%*	*0.2%*	*2.9%*	*17.6%*
Hindmarsh Shire	*26.8%*	*30.4%*	*7.7%*	*1.8%*	*0.2%*	*4.0%*	*25.1%*
Horsham Rural City	*20.1%*	*28.7%*	*6.0%*	*0.5%*	*0.2%*	*5.3%*	*21.2%*
Moorabool Shire	*15.6%*	*20.2%*	*5.1%*	*0.5%*	*0.2%*	*2.8%*	*14.1%*
Northern Grampians Shire	*24.9%*	*30.0%*	*7.7%*	*0.6%*	*0.2%*	*5.3%*	*23.6%*
Pyrenees Shire	*24.8%*	*28.4%*	*7.0%*	*0.3%*	*0.4%*	*2.6%*	*24.8%*
West Wimmera Shire	*24.7%*	*31.1%*	*5.0%*	*0.2%*	*0.3%*	*2.5%*	*25.1%*
Yarriambiack Shire	*27.4%*	*31.3%*	*8.9%*	*0.4%*	*0.0%*	*4.0%*	*24.0%*
Grampians Average	***22.0%***	***27.1%***	***6.4%***	***0.6%***	***0.2%***	***3.8%***	***20.6%***

192 https://blog.id.com.au/2020/population/demographic-trends/interactive-chart-is-your-community-demographically-vulnerable/#chart

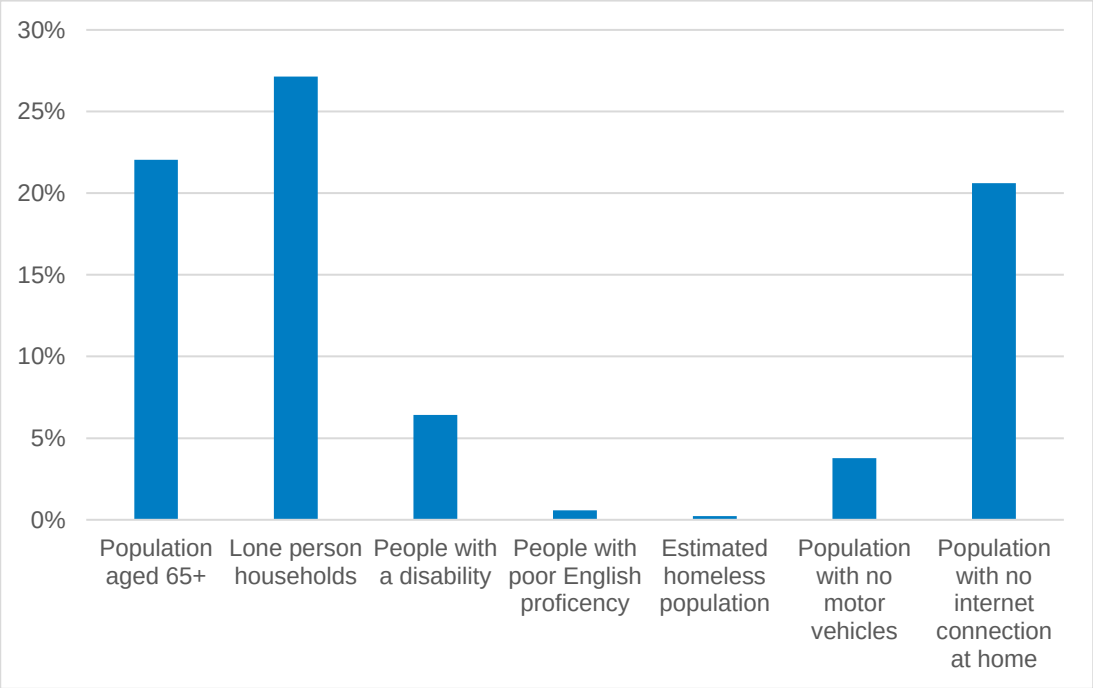


Figure 27. Vulnerable Communities Indicators for Grampians Region (2016) [193]

8.2.1 The young and the elderly

Within the Grampians Region, 25.1% of the population was aged 19 years or younger in 2018, while 18.9% was aged 65 years or older.

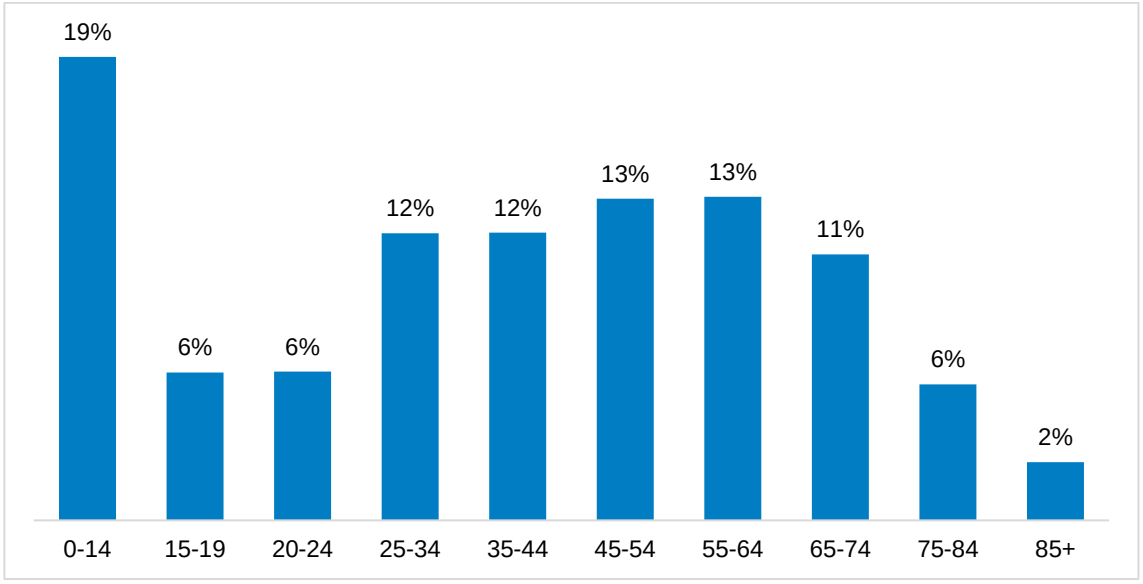


Figure 28. Population in Grampians Region by age group (2018) [194]

193 https://blog.id.com.au/2020/population/demographic-trends/interactive-chart-is-your-community-demographically-vulnerable/#chart
194 DJPR (2020): https://www.rdv.vic.gov.au/information-portal/table-and-chart

However, these vulnerable groups were not evenly distributed across the region, with Golden Plains Shire having the highest number of people aged 0-19 years (30%), while Hepburn Shire had the lowest number of people aged 0-19 years (14%). Conversely, Hindmarsh Shire had the highest number of people aged 65+ years (28%), while Golden Plains Shire had the lowest number of people aged 65+ years (20%).

Table 41. Proportion of the Grampians Region by age and LGA (2018)[195]

LGA	19 years or younger (%)	65 years + (%)
Ararat Rural City Council	*21%*	*23%*
City of Ballarat	*26%*	*17%*
Golden Plains Shire	***30%***	***14%***
Hepburn Shire	***20%***	*25%*
Hindmarsh Shire	*22%*	***28%***
Horsham Rural City	*25%*	*20%*
Moorabool Shire	*27%*	*16%*
Northern Grampians Shire	*22%*	*25%*
Pyrenees Shire	*21%*	*25%*
West Wimmera Shire	*23%*	*24%*
Yarriambiack Shire	*22%*	*27%*

8.2.2 Those needing assistance

When it comes to assistance with core activities, approximately 6.5% of the population of the Grampians Region have a need – in real terms representing 14,328 people. However, the number of people in need varies according to LGA, from just 4.9% of the population of Golden Plains Shire (1,003 people) in 2016 to 9.7% of the population of Yarriambiack Shire (591 people).

195 DJPR (2020): https://www.rdv.vic.gov.au/information-portal/table-and-chart

Table 42. Need for assistance with core activities in Grampians Region by LGA (2016) [196]

LGA	Total	Percentage
Ararat Rural City Council	750	*7.4%*
City of Ballarat	6,263	*6.6%*
Golden Plains Shire	**1,003**	***4.9%***
Hepburn Shire	903	*6.5%*
Hindmarsh Shire	440	*8.3%*
Horsham Rural City	1,179	*6.4%*
Moorabool Shire	1,624	*5.5%*
Northern Grampians Shire	875	*8.3%*
Pyrenees Shire	504	*8.0%*
West Wimmera Shire	196	*5.3%*
Yarriambiack Shire	**591**	***9.7%***
Total Grampians Region	**14,328**	***6.5%***

8.3 Diversity

8.3.1 Birthplaces and languages spoken

Ethnic and cultural indicators reflect a population's composition and can be useful indicators of socio-economic status. These characteristics can help inform decision-makers about a population's ability to access services and information and assist service providers determine the need to communicate in languages other than English.

The population of Grampians Region is less culturally diverse than metro regions with about 10.3% of the population born overseas. However, the populations of Hepburn and Moorabool Shires are slightly higher than the rest of Grampians Region with each LGA above 13% born overseas but no more than 15%, while the population of the Horsham Rural City 8.45% were born overseas. Refer Table 43.

In Grampians Region the most common countries of birth (other than Australia) were:

- England – which featured in the top three for all 10 LGAs
- New Zealand – which featured in the top three of 8 of the 10 LGAs
- India – which featured in the top three of 3 of the 10 LGAs

196 DJPR (2020): https://www.rdv.vic.gov.au/information-portal/table-and-chart

About 5% of the population of Grampians Region speaks a language other than English at home. In all LGAs, the number of people who speak only English at home is above 94%. The Shire of Hindmarsh observed the lowest percentage with about 94.24% of the population only speaks English at home.

The variety of most common languages spoken at home other than English is observed to be somewhat diverse in Grampians Region with 13 languages listed as common language to speak at home for the 10 LGAs.

In Grampians Region the most common languages spoken (other than English) were:

- Malayalam – which featured in the top three for 5 of the 10 LGAs
- Mandarin – which featured in the top three for 4 of the 10 LGAs
- German – which also featured in the top three for 4 of the 10 LGAs

As a proportion of Grampians Region, Aboriginal and Torres Strait Islanders represent 1.4% of the total Grampians population, ranging between 0.9% of the population in West Wimmera to 1.6% of the population in the Rural City of Ararat.

There are many Aboriginal languages. However, they do not have geographic boundaries. The most widespread in Victoria are the Kulin languages.[197]

Figure 29. Map of Aboriginal languages of Victoria[198]

[197] https://www.vcaa.vic.edu.au/Documents/alcv/History.pdf

[198] https://cv.vic.gov.au/stories/aboriginal-culture/our-story/vacl-language-map-of-victoria/

Table 43. Grampians Population by Aboriginal and Torres Strait Islander (ATSI) status and birthplace and LGA (2016) [199]

LGA	Birthplace						Total		Top 3 Countries of Birth (other than Australia)[200]		
	Australia				Elsewhere						
	ATSI		All								
	No.	% EMR	No.	%	No.	%	No.	%	1	2	3
Ararat	175	*1.6%*	9,549	*89.5%*	1,124	*10.5%*	10,673	*100.0%*	**England**	**New Zealand**	Philippines
Ballarat	1,470	*1.6%*	85,069	*89.8%*	9,638	*10.2%*	94,707	*100.0%*	**England**	India	**New Zealand**
Hepburn	150	*1.1%*	11,648	*85.2%*	2,021	*14.8%*	13,669	*100.0%*	**England**	**New Zealand**	Netherlands
Hindmarsh	82	*1.6%*	4,776	*91.2%*	461	*8.8%*	5,237	*100.0%*	**England**	Myanmar	Thailand
Horsham	297	*1.6%*	17,207	*93.6%*	1,186	*6.4%*	18,393	*100.0%*	**England**	**India**	Philippines
Moorabool	368	*1.2%*	25,638	*86.7%*	3,924	*13.3%*	29,562	*100.0%*	**England**	**New Zealand**	Scotland
Northern Grampians	168	*1.6%*	9,640	*92.0%*	839	*8.0%*	10,479	*100.0%*	**England**	**New Zealand**	Philippines
Pyrenees	135	*2.1%*	5,865	*89.6%*	679	*10.4%*	6,544	*100.0%*	**England**	**New Zealand**	Netherlands
West Wimmera	34	*0.9%*	3,398	*93.5%*	235	*6.5%*	3,633	*100.0%*	**England**	**New Zealand**	**India**
Yarriambiack	81	*1.3%*	5,653	*93.3%*	404	*6.7%*	6,057	*100.0%*	**England**	**New Zealand**	**India**
Grampians Region	**2,960**	***1.5%***	**178,443**	***89.7%***	**20,511**	***10.3%***	**198,954**	***100.0%***			

199 ABS Census 2016: https://www.rdv.vic.gov.au/information-portal/table-and-chart
200 .id (2020): profile.id.com.au

Table 44. Grampians Region population by language spoken at home (2016) [201]

LGA	Language Spoken at Home								
	English Only		Other Language		Total		Top 3 Languages Spoken (other than English)[202]		
	No.	%	No.	%	No.	%	1	2	3
Ararat	9,696	*95.8%*	421	*4.2%*	10,117	*100.0%*	**Mandarin**	Filipino	**German**
Ballarat	89,997	*94.2%*	5,502	*5.8%*	95,499	*100.0%*	**Mandarin**	Punjabi	**Malayalam**
Hepburn	13,233	*94.9%*	716	*5.1%*	13,949	*100.0%*	Italian	**German**	Greek
Hindmarsh	5,035	*94.2%*	308	*5.8%*	5,343	*100.0%*	Karen	**Malayalam**	Filipino
Horsham	17,822	*96.0%*	744	*4.0%*	18,566	*100.0%*	Karen	**Malayalam**	**Mandarin**
Moorabool	28,162	*94.3%*	1,691	*5.7%*	29,853	*100.0%*	Italian	Maltese	Punjabi
Northern Grampians	10,264	*96.6%*	361	*3.4%*	10,625	*100.0%*	**Mandarin**	Dutch	Tamil
Pyrenees	6,124	*97.6%*	152	*2.4%*	6,276	*100.0%*	Dutch	French	Greek
West Wimmera	3,606	*97.8%*	82	*2.2%*	3,688	*100.0%*	**German**	**Malayalam**	Telugu
Yarriambiack	5,947	*97.4%*	161	*2.6%*	6,108	*100.0%*	**Malayalam**	Greek	**German**
Grampians	**189,886**	***94.9%***	**10,138**	***5.1%***	**200,024**	***100.0%***			

201 ABS (2016): https://www.rdv.vic.gov.au/information-portal/table-and-chart
202 .id (2020): profile.id.com.au

8.3.2 Income and housing

According to Socio-Economic Indexes for Areas (SEIFA), which measure the relative level of socio-economic advantage or disadvantage based on a range of Census characteristics (where higher scores indicate lower levels of disadvantage), LGAs within the Grampians Region were ranked as follows:

Table 45. SEIFA rankings for Grampian Region by LGA (2016)[203]

LGA	SEIFA Score	Ranking (Most Disadvantaged)
Ararat Rural City Council	941	8th
City of Ballarat	980	29th
Golden Plains Shire	1,035	**61st**
Hepburn Shire	995	44th
Hindmarsh Shire	945	10th
Horsham Rural City	980	30th
Moorabool Shire	1,010	53rd
Northern Grampians Shire	937	**6th**
Pyrenees Shire	952	17th
West Wimmera Shire	985	33rd
Yarriambiack Shire	941	7th
Grampians Average	**973**	**-**
VICTORIA Average	**997**	**-**

Within Grampians Region, Northern Grampians Shire was the most disadvantaged (and was the 6th most disadvantaged LGA in Victoria) and Golden Plains Shire was the least disadvantaged (and was the 61st most disadvantaged LGA in Victoria). Overall, Grampians Region is more disadvantaged than the average for Victorian LGAs.

Other indicators of socio-economic status include income and housing. In the Grampians Region in 2016:[204]

- There were 94,388 occupied private dwellings, with an average of 2.5 persons per dwelling.
- 5.6% of households had no vehicle.

Refer also Table 46

203 DJPR (2020): https://www.rdv.vic.gov.au/information-portal/table-and-chart
204 DJPR (2020): https://www.rdv.vic.gov.au/information-portal/table-and-chart

Table 46. Socio-economic indicators for Grampians Region

Indicator	Total	Percentage
Low income households with rental stress (2016)	6,332	*30.7%*
Low income households with mortgage stress (2016)	2,956	*9.4%*
Home ownership (2016)	64,625	*74.5%*
Separate houses (2016)		*87.8%*
Occupied private dwellings (2016)	94,388	-
Households with internet connected (2016)	70,537	*80.9%*

These findings provide an indication of the number of properties that could be impacted in the event of an emergency and the relative ease with which people might be able to leave their dwellings by motor vehicle as well. It also indicates the availability of personal financial resources to support any actions required in the event of an emergency.

8.4 Education

8.4.1 Educational institutions

There are 163 schools and 32,925 enrolments in the region, with government schools making up 74% of all schools and 62% of all enrolments:

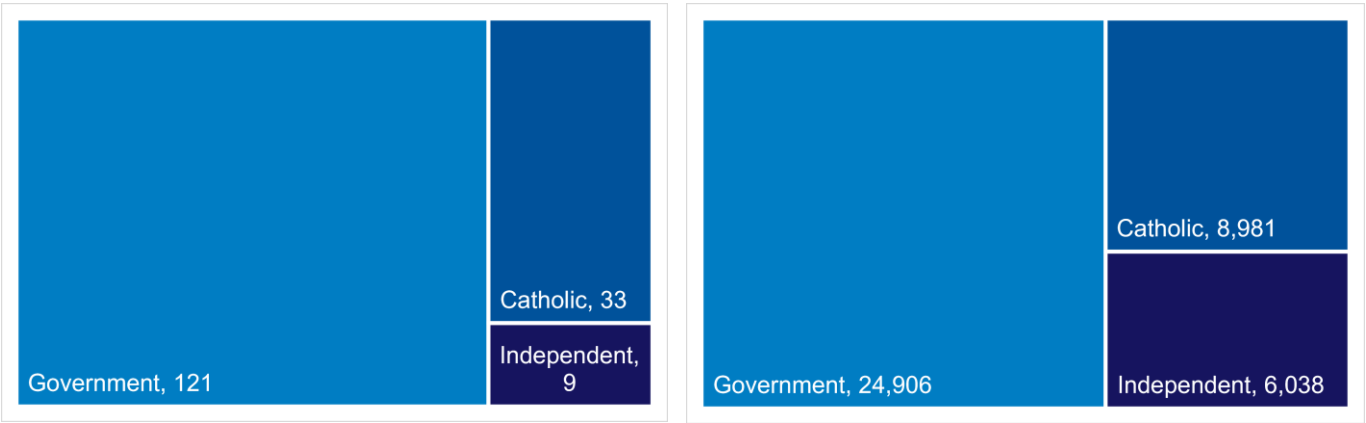


Figure 30. Schools and enrolments in Grampians Region[205]

The number of schools and full-time enrolments in the region are distributed across LGAs as follows, with the City of Ballarat having the highest number of schools (47) and the largest number of full-time enrolments (20,972):

205 DET (2020): https://www.education.vic.gov.au/about/department/Pages/factsandfigures.aspx

Table 47. Schools and full-time enrolments in Grampians Region by LGA (2019)[206]

LGA	No. Schools	Full-time Enrolments
Ararat Rural City Council	13	1,698
City of Ballarat	47	20,972
Golden Plains Shire	13	2,273
Hepburn Shire	14	1,569
Hindmarsh Shire	8	788
Horsham Rural City	9	3,326
Moorabool Shire	19	5,815
Northern Grampians Shire	13	1,418
Pyrenees Shire	9	606
West Wimmera Shire	5	481
Yarriambiack Shire	13	979
Total Grampians	**163**	**39,925**

There are five universities and one TAFE with multiple campuses across the region, including:

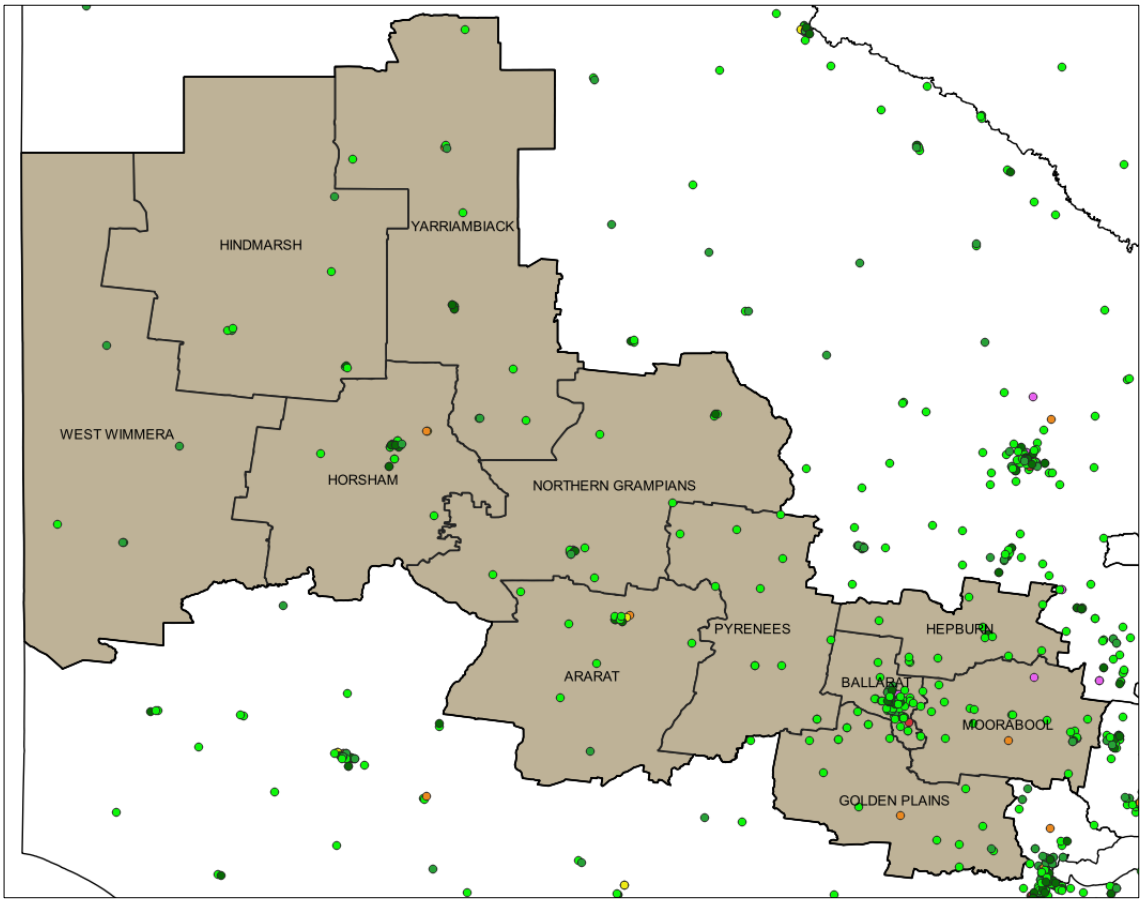
Table 48. Universities and TAFEs in Grampians Region[207]

University/TAFE	Campuses
Federation University	Ballarat – Mt Helen, SMB, Camp Street Horsham
University of Melbourne	Creswick
Longerenong College	Longerenong
Melbourne Polytechnic	Ararat
Australian Catholic University	Ballarat (Lake Wendouree)
Sunraysia Institute of TAFE	Horsham

There are also 174 childcare facilities across the region (including childcare centres, pre-schools and kindergartens).[208]

The below figure shows the location of educational facilities in the Grampians Region:

206 DET (2020): https://www.education.vic.gov.au/about/department/Pages/factsandfigures.aspx
207 Data Vic (2020): https://discover.data.vic.gov.au/dataset/foi-point-vicmap-features-of-interest
208 Data Vic (2020): https://discover.data.vic.gov.au/dataset/foi-point-vicmap-features-of-interest



Light Green = Primary school Mid-green = Primary/secondary school Dark Green = Secondary school Pink = Special school	Orange = Further education Yellow = Tertiary institution Red = University

Figure 31. Map of Educational Facilities within the Grampians Region[209]

8.4.2 Education Level

Approximately 1 in 3 persons (34.1%) of people over 15 years of age in the Grampians Region have a bachelor's degree or higher non-school qualification. However, more than 1 in 2 persons (55.1%) did not complete Year 12.

Table 49. Education levels in Grampians Region (2016) [210]

Education level	Total	Percentage
People over 15 with bachelor's degree or higher non-school qualification	29,973	*34.1%*
Did not complete Year 12	95,801	*55.0%*
15-19 years old not in school or employment	989	*6.8%*

209 Data Vic (2020): https://discover.data.vic.gov.au/dataset/foi-point-vicmap-features-of-interest
210 DJPR (2020): https://www.rdv.vic.gov.au/information-portal/table-and-chart

8.5 Health

The State Health Emergency Response Plan outlines arrangements for managing health emergencies (i.e., incidents requiring a significant and coordinated response from the health system, the Department of Health and Human Services and the emergency management sector, in partnership with the community) to ensure an effective response and ease adverse consequences.[211] Practitioners, health professionals, service organisations and government agencies may also be required to respond to local emergencies to care for the injured or unwell directly affected.

In Grampians Region in 2011 there were 113 General Medical Practitioners per 100,000 people.[212]

8.5.1 Hospitals and health centres

In an emergency, vulnerable populations such as those in hospitals, health care facilities and retirement villages, may require significant and coordinated priority interventions, responses and support for their safety.

There are 24 hospitals, five community health centres and 11 maternal and child health services across the region, as outlined below:

Table 50. Hospitals and Health Centres in Grampians Region by LGA[213]

LGA	Hospitals	Community Health Centres	Maternal and Child Health Services
Ararat Rural City Council	2	2	0
City of Ballarat	5	0	0
Golden Plains Shire	0	0	1
Hepburn Shire	2	1	1
Hindmarsh Shire	4	0	0
Horsham Rural City	1	0	0
Moorabool Shire	2	0	6
Northern Grampians Shire	2	0	0
Pyrenees Shire	1	0	0
West Wimmera Shire	2	1	0
Yarriambiack Shire	3	1	3
Total Grampians Region	**24**	**5**	**11**

211 DHHS (2020): https://www2.health.vic.gov.au/emergencies/shera
212 DJPR (2020) https://www.rdv.vic.gov.au/information-portal/table-and-chart
213 Data Vic (2020): https://discover.data.vic.gov.au/dataset/foi-point-vicmap-features-of-interest

Details of the 24 hospitals across the Grampians Region are further outlined below:

Table 51. Hospitals in Grampians Region by LGA[214]

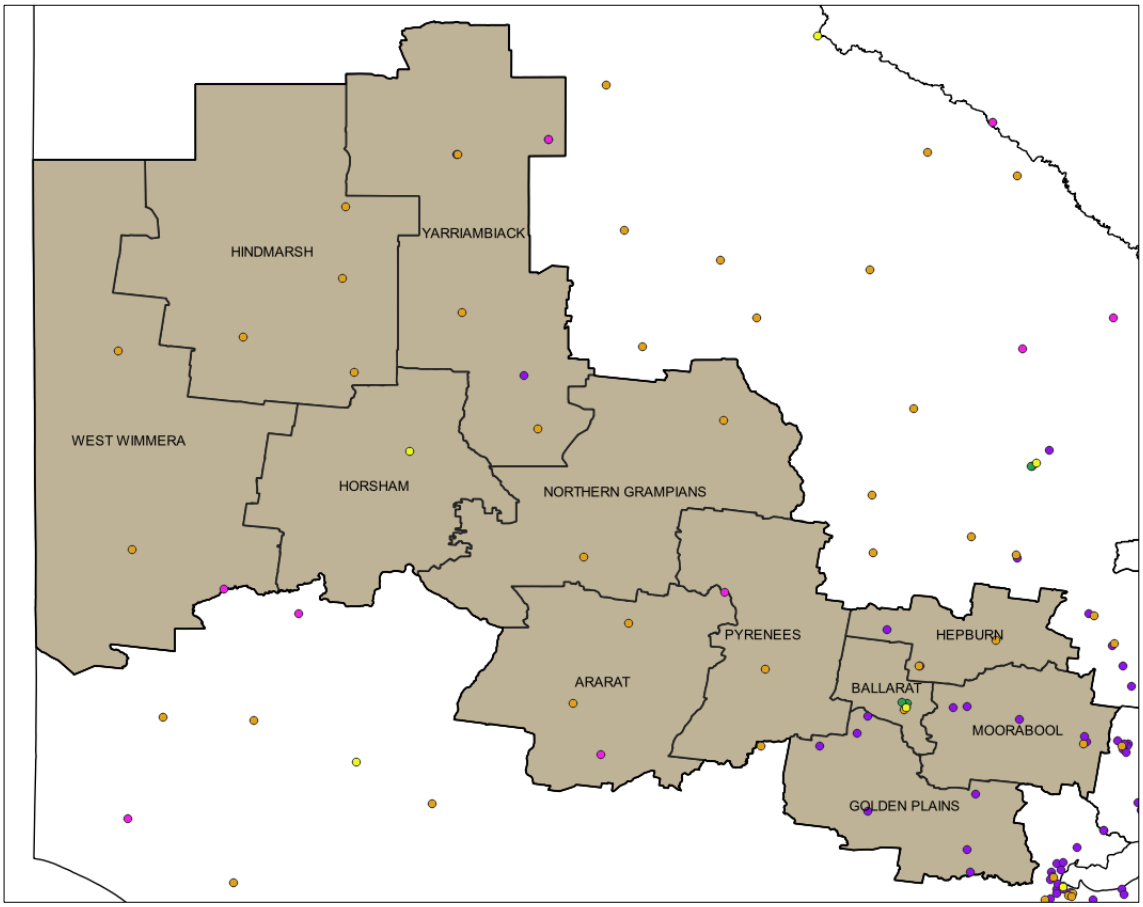
LGA	No. Hospitals	Name
Ararat Rural City Council	2	Ararat Public Hospital Willaura Public Hospital
City of Ballarat	5	Ballarat Day Procedure Centre Ballarat Surgicentre St John of God – Ballarat Ballarat Base Public Hospital Queen Elizabeth – Ballarat
Golden Plains Shire	0	Nil
Hepburn Shire	2	Creswick Public Hospital Daylesford Public Hospital
Hindmarsh Shire	4	Dimboola Public Hospital Jeparit Public Hospital Nhill Public Hospital Rainbow Public Hospital
Horsham Rural City	1	Horsham Public Hospital
Moorabool Shire	2	Ballan Bush Nursing Hospital Bacchus Marsh Public Hospital
Northern Grampians Shire	2	St Arnaud Public Hospital Stawell Public Hospital
Pyrenees Shire	1	Beaufort Public Hospital
West Wimmera Shire	2	Edenhope Public Hospital Kaniva Public Hospital
Yarriambiack Shire	3	Hopetoun Public Hospital Rupanyup Public Hospital Warracknabeal Public Hospital
Total Grampians Region	**24**	

Grampians Region has a total of three hospitals that have an intensive care unit with a total of 19 ICU beds available across the region:

- Ballarat Base Public Hospital (13)
- Horsham Public Hospital (4)
- St John of God – Ballarat (2)

214 DHHS (2017): http://data-dhs.opendata.arcgis.com/datasets/5000b3c446ed419eb590baa3832eb8f7_0

The below figure shows the location of the above healthcare services, with hospitals centred closer to larger towns, while community health centres are located in more remote areas.



Pink = Community health centre Purple = Maternal/child health centre Green = Day procedure centre	Orange = General hospital Yellow = General hospital (emergency)

Figure 32. Map of hospitals and health care facilities in the Grampians Region[215]

8.5.2 Aged Care

There are 72 aged care facilities across the region, as outlined below:

215 Data Vic (2020): https://discover.data.vic.gov.au/dataset/foi-line-vicmap-features-of-interest

Table 52. Aged Care Facilities in Grampians Region by LGA[216]

LGA	No. Facilities
Ararat Rural City Council	6
City of Ballarat	22
Golden Plains Shire	1
Hepburn Shire	7
Hindmarsh Shire	7
Horsham Rural City	6
Moorabool Shire	5
Northern Grampians Shire	4
Pyrenees Shire	4
West Wimmera Shire	4
Yarriambiack Shire	6
Total Grampians Region	**72**

The locations of these facilities are also provided below:

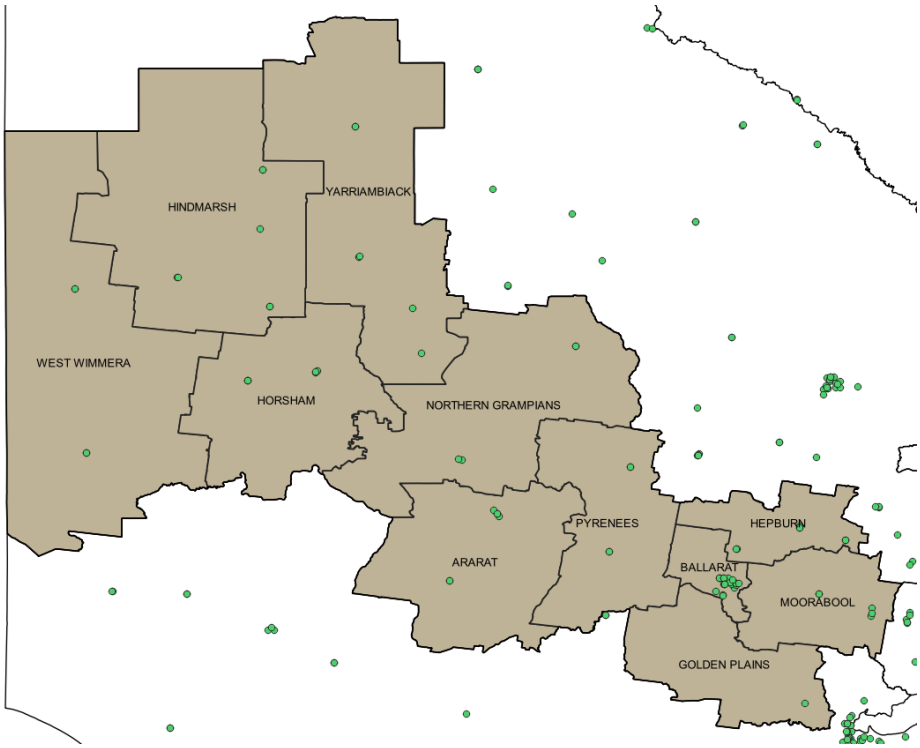


Figure 33. Map of aged care facilities in the Grampians Region[217]

216 Data Vic (2020): https://discover.data.vic.gov.au/dataset/foi-point-vicmap-features-of-interest
217 Data Vic (2020): https://discover.data.vic.gov.au/dataset/foi-point-vicmap-features-of-interest

The number of people in the Grampians Region who access aged care support at some stage during the 2018-19 reporting period is outlined in the following table[218]. This number forms part of the total number of people in the community who may need some form of assistance during an evacuation or emergency.

Table 53. Aged Care Support in Grampians Region[219]

Age Bracket	Home Care	Residential Care	Transition Care	Total
0–49	1	7	1	**9**
50–54	1	9	1	**11**
55–59	2	24	1	**27**
60–64	23	33	1	**57**
65–69	71	97	4	**172**
70–74	133	142	7	**282**
75–79	146	250	10	**406**
80–84	204	415	8	**627**
85–89	199	603	7	**809**
90–94	116	577	6	**699**
95–99	30	215	3	**248**
100+	1	21	0	**22**
Total	**927**	**2,393**	**49**	**3,369**

There were 78.2 residential care places per 100,000 population aged 70 years and over in 2016.[220]

8.6 Cultural values and assets

The Grampians Region includes the traditional lands of the Wotjobaluk, Jaadwa, Jadawadjali, Wergaia, Jupagalk, Dja Dja Wurrung, Wadawurrung and Djab Wurrung peoples and sections of the land of the Taungurong people and the Yorta Yorta people.[221]

The land of the Wadawurrung people is in the west of the Central Highlands sub-region, including Ballarat in the north, Golden Plains in the south, Moorabool in the east and Beaufort in the west. [222] The land of the Djab Wurrung people stretches from the south eastern edge of the Grampians National Park to the Pyrenees Ranges in the east, and between Penshurst and Mortlake in the south to Landsborough in the north.[223] The land of the Wotjobaluk, Jaadwa, Jadawadjali, Wergaia and Jupagalk people stretches from Ouyen in the

218 https://www.gen-agedcaredata.gov.au/Resources/Access-data/2020/March/GEN-data-People-using-aged-care
219 https://www.gen-agedcaredata.gov.au/Resources/Access-data/2020/March/GEN-data-People-using-aged-care
220 Victorian Health Information Surveillance System (VHISS): http://vhiss.reporting.dhhs.vic.gov.au/ViewContent.aspx?TopicID=1
221 ACHRIS (2020): https://achris.vic.gov.au/weave/wca.html
222 ACHRIS (2020): https://achris.vic.gov.au/weave/wca.html
223 ACHRIS (2020): https://achris.vic.gov.au/weave/wca.html

Mallee region in the north and includes Stawell and Ararat in the south, spanning from the Victoria-South Australian border to Birchip and the southern tip of Lake Tyrrell in the east.[224] The land of the Dja Dja Wurrung people is located in the east of the Wimmera Southern Mallee region near St Arnaud and continues east into the Loddon Campaspe region. [225]

8.6.1 Aboriginal cultural heritage assets

The land of the Djab Warrung people includes the Wimmera River and the Hopkins River. The Grampians National Park, or Gariwerd, is an important site for several Aboriginal groups including the Djab Wurrung people. It contains the Brambuk Centre near Halls Gap, which preserves and promotes Aboriginal community history including that of the Djab Warrung. There are numerous important assets in the Park, including the majority of surviving Aboriginal rock art sites in south-east Australia. Other important heritage assets include ancient sacred trees, including a birthing tree in the Ararat area where infrastructure construction has occurred.[226]

Important sites on the land of the Wotjobaluk, Jaadwa, Jadawadjali, Wergaia and Jupagalk people occur along the Wimmera River, including between the Yarriambiack Creek head through to the northern end of Lake Albacutya. Lake Hindmarsh, or Gurru, and Lake Albacutya, or Ngalpakatia/Ngelpagutya, are important sites.[227] Wirrengan Plain and Lake Buloke are important heritage sites with a history of social and economic activity. There are numerous heritage areas within Little Desert National Park, Big Desert Wilderness Park, and Wyperfield National Park Heritage, where sites such as shell middens, oven mounds, scar trees and artefacts can be found.[228]

Other significant cultural assets in the Grampians region include art galleries and museums, as outlined below:

224 ACHRIS (2020): https://achris.vic.gov.au/weave/wca.html
225 ACHRIS (2020): https://achris.vic.gov.au/weave/wca.html
226 Infrastructure Victoria (2019):https://www.infrastructurevictoria.com.au/wp-content/uploads/2019/04/Aither-Central-Highlands-Regional-Profile-March-2019.pdf
227 Infrastructure Victoria (2019):https://www.infrastructurevictoria.com.au/wp-content/uploads/2019/04/Aither-Wimmera-Southern-Mallee-Regional-Profile-March-2019.pdf
228 Infrastructure Victoria (2019):https://www.infrastructurevictoria.com.au/wp-content/uploads/2019/04/Aither-Wimmera-Southern-Mallee-Regional-Profile-March-2019.pdf

Table 54. Significant Cultural Assets in Grampians Region by LGA[229]

LGA	Art Galleries and Museums
Ararat Rural City Council	Ararat Regional Art Gallery Gum San Chinese Heritage Centre J Ward Museum Complex Langi Morgala Museum
City of Ballarat	Art Gallery of Ballarat Ballarat Tramway Museum Museum of Australian Democracy At Eureka The Gold Museum
Golden Plains Shire	Linton And District Museum Steiglitz Courthouse
Hepburn Shire	Clunes Museum Creswick Museum The Convent Gallery
Hindmarsh Shire	Nhill Aviation Heritage Centre Wimmera Mallee Pioneer Museum
Horsham Rural City	Horsham Art Gallery Horsham Historical Society Natimuk Courthouse Historic Museum
Moorabool Shire	Bacchus Marsh Blacksmiths Cottage and Forge Complex
Northern Grampians Shire	Stawell Gift Hall of Fame Stawell Historical Society Museum Stawell Railway Station Gallery
Pyrenees Shire	Lake Goldsmith Steam Preservation Society
West Wimmera Shire	Harrow Discovery Centre Kaniva Historical Museum Serviceton Historic Railway Station
Yarriambiack Shire	Warracknabeal District Historical Society Warracknabeal Historical Centre Water Tower Museum

The region also hosts a number of major events and festivals throughout the year, including:

229 Data Vic (2020): https://discover.data.vic.gov.au/dataset/foi-point-vicmap-features-of-interest

Table 55. Major events and festivals in Grampians Region by LGA[230]

LGA	Major events and festivals
Ararat Rural City Council	Jailhouse Rock Festival
City of Ballarat	Ballarat Begonia Festival, Ballarat Heritage Weekend, Ballarat Winter Festival, Cycling Australia Road National Championships, Spilt Milk, Ballarat International Foto Biennale, Royal South Street Society Eisteddfod, Ballarat Beer Festival, Summer Sundays, White Night, SpringFest
Golden Plains Shire	Golden Plains Festival
Hepburn Shire	Daylesford Chill Out Festival, Clunes Back to Booktown
Hindmarsh Shire	Dimboola Rowing Regatta, Wimmera Mallee Pioneer Museum Vintage Rally
Horsham Rural City	Horsham Country Music Festival, Horsham German Fest, Horsham Show, Wimmera Machinery Field Days
Moorabool Shire	Nil
Northern Grampians Shire	Stawell Easter Gift, Grampians Grape Escape, Grampians Wildflower Festival, Grampians Jazz Festival
Pyrenees Shire	Lake Goldsmith Steam Rally, Pyrenees Unearthed Food and Wine Festival, Avoca Cup
West Wimmera Shire	Nil
Yarriambiack Shire	Nil

Figure 34 shows two layers that represent areas of cultural and heritage sensitivity. The first in Orange, shows the areas of cultural heritage sensitivity that are known or likely to contain places and objects of significance to Aboriginal cultural heritage. These are defined in the *Aboriginal Heritage Regulations 2018* and include areas around designated watercourses and waterways, areas surrounding known Aboriginal cultural heritage places and areas with landforms and soil types that are similar to known cultural heritage places. While the areas shown are more likely to contain a higher number of cultural heritage places and objects, these places can be found all over Victoria where Aboriginal people have lived.[231] The areas in blue highlight locations that have been included in the Victorian Heritage Register showing places, objects and shipwrecks that are currently protected under the *Heritage Act 2017*.[232]

230 https://profile.id.com.au/
231 https://www.aboriginalvictoria.vic.gov.au/cultural-heritage-sensitivity
232 https://vhd.heritagecouncil.vic.gov.au/

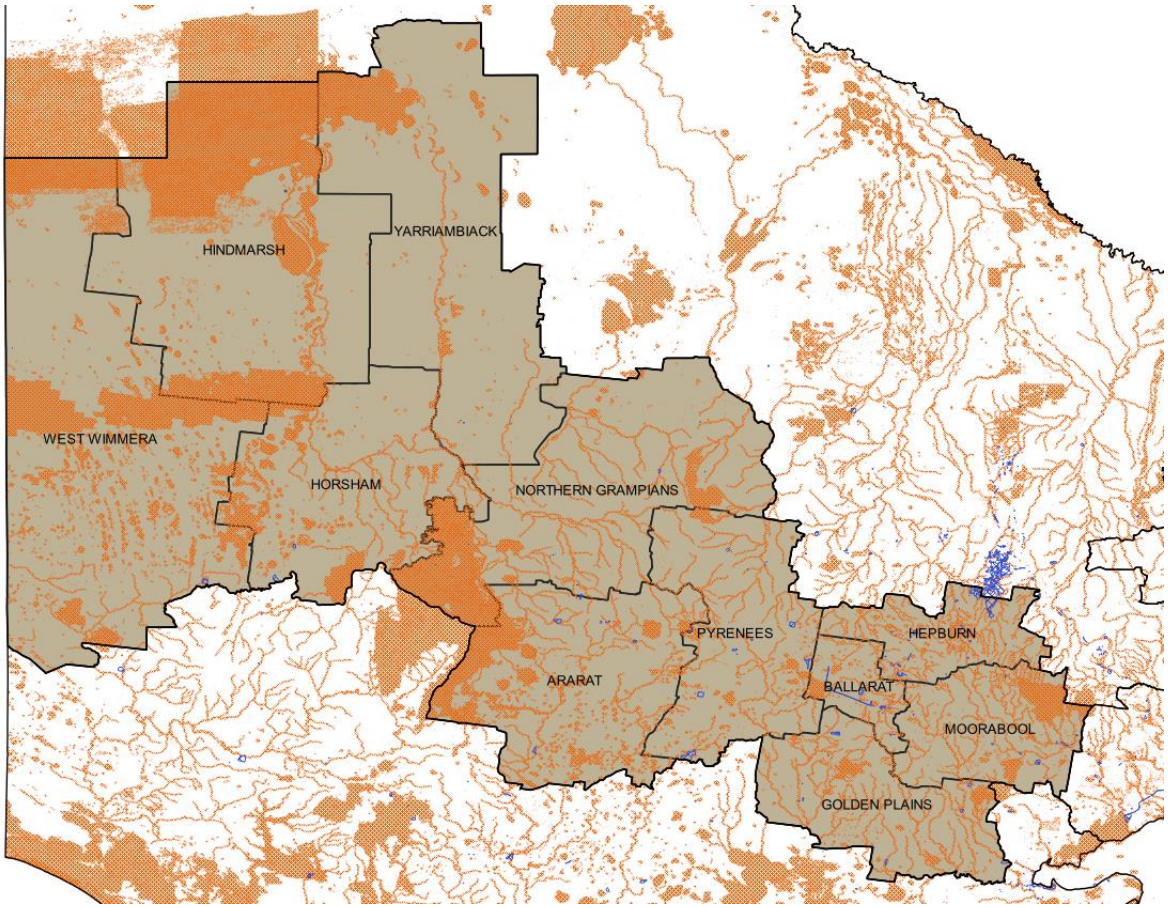


Figure 34. Areas of cultural and heritage significance[233] [234]

8.7 Volunteerism

An indication of a region's level of community volunteering is also an important vulnerability factor because volunteers and their social networks can be of assistance during emergencies.

In 2016, 48,820 people indicated that they volunteered in Grampians Region, representing approximately 27.8% of the population.[235]

According to the Ministerial Council for Volunteers (2017), approximately 4% of volunteers work for an emergency services organisation[236] and EMV estimates over 100,000 people in Victoria volunteer across a wide range of emergency management agencies.[237]

233 https://discover.data.vic.gov.au/dataset/areas-of-cultural-heritage-sensitivity
234 https://discover.data.vic.gov.au/dataset/victorian-heritage-register
235 DJPR (2020) https://www.rdv.vic.gov.au/information-portal/table-and-chart
236 Ministerial Council for Volunteers (2017): https://iepcp.org.au/wp-content/uploads/2018/11/MCV-Volunteers-in-Victoria-report.pdf
237 EMV (2015): https://www.emv.vic.gov.au/volunteerstatement

- As at 1 July 2020, CFA Victoria noted its volunteer membership at 53,311 people, with an additional 1,486 junior members.[238]

Volunteering is evolving in Victoria, particularly with respect to growing expectations around community responsibility for emergency preparedness, the impact on operations of new communications technology, and the characteristics of volunteers. For example, volunteering styles are becoming more diverse, but also more episodic, while physical locations and office hours are becoming less of a constraint to people volunteering their time and staying connected. However, in their series of reports, *Emergency Volunteering 2030*,[239] the authors found that:

- Community sector groups anticipate a serious shortage of volunteers in the future, mounting expectations to deliver emergency services, a rise in costs and poorer outcomes for communities.
- Volunteerism managers foresee growing regulation and corporatisation impacting negatively on volunteer sustainability.
- Local government managers have flagged the need to examine how resourcing and funding options and restrictions may be hindering the emergency management sector's ability to respond to the changing landscape of volunteering.

9. Economic Environment

An understanding of the Grampian Region's economic resilience can play an important role in emergency management planning by providing some context to how adversity might affect local economies and the degree to which different communities are likely to cope with the ongoing effects of emergencies.

The Central Highlands sub-region is a diverse economy focused on manufacturing, services and agriculture, while the Wimmera Southern Mallee sub-region has an economy based on agriculture, health services and manufacturing.

9.1 Economic situation

Economic characteristics differ across the region, with the Central Highlands sub-region characterised by a high concentration of agriculture and manufacturing industries, as well as healthcare. The economy is driven by the economy of Ballarat and its proximity to Melbourne, with agriculture, manufacturing and tertiary education being key exports for the sub-region.

238 CFA (2020): https://www.cfa.vic.gov.au/about/cfa-at-a-glance
239 DIIS (2019): https://emergencyvolunteeringau.dropmark.com/594398?q=%23Emergency-Volunteering-2030-study%20%23report

The Wimmera Southern Mallee sub-region is also characterised by a high concentration of agriculture and healthcare services, with agriculture being the key export for the region.

New modelling from the Department of Treasury and Finance suggests the coronavirus pandemic has had a potentially unprecedented impact on Victoria's economy. It is likely the State will record negative economic growth for the current and next financial years.

- Gross regional product (GRP) is expected to drop by 14% in the June and September quarters as a consequence of lower incomes, loss of consumer and business confidence and disruptions to global supply chains.
- Unemployment is expected to rise to 11% in the September quarter and the number of jobs has already fallen by almost 7% across Victoria since March 2020.[240]

While the true extent of the impact on the Grampians Region is unclear, it is likely to reflect the economic trends for Victoria.

9.1.1 Key economic indicators

Key economic indicators across the Grampians Region for the period 2018-19 are summarised below:[241]

Gross Regional Product (GRP) reflects the region's contribution to the broader State economy and the value of the regional economy.

- Overall, the Grampians Region contributed $11.9 billion to the Victorian economy, which was 2.6% of the total for the State (Gross State Product is estimated at $454.6 billion).

GRP per worker provides an indication of workforce participation.

- Overall, the Grampians Region had a lower than average rate of productivity at $115,138 compared with $166,496 per worker for Victoria.

240 DTF (2020): https://www.dtf.vic.gov.au/economic-and-financial-updates/coronavirus-economic-outlook
241 DJPR (2020): https://www.rdv.vic.gov.au/information-portal/table-and-chart

Table 56. Economic Indicators for Grampians Region[242] [243]

Indicators	
Gross Regional Product ($ million) (2019)	$11,993m
Gross Regional Product per worker ($) (2018)	$115,138
10-year average annual GRP growth rate (2009-2019)	*1.97%*
Total Jobs (2019)	104,158
Annual jobs growth rate (2018-2019)	*0.47%*
5-year average annual jobs growth rate (2014-2019)	*1.77%*
10-year average annual jobs growth rate (2009-2019)	*1.55%*

The number of local jobs reflects the health of the labour market.

- Overall, the Grampians Region provided over 104,000 jobs, which was 3.8% of the total number of jobs for the state (2.73 million jobs).

Labour force participation measures an economy's active workforce, while the unemployment rate measures the loss of productive resources to the economy.

- Overall, the Grampians Region's labour force participation rate in 2016 was 61.5%, which is higher than the Victorian average (60.5%)
- The unemployment rate (3.87%) in 2019 Q4, was below the State average (4.8%).

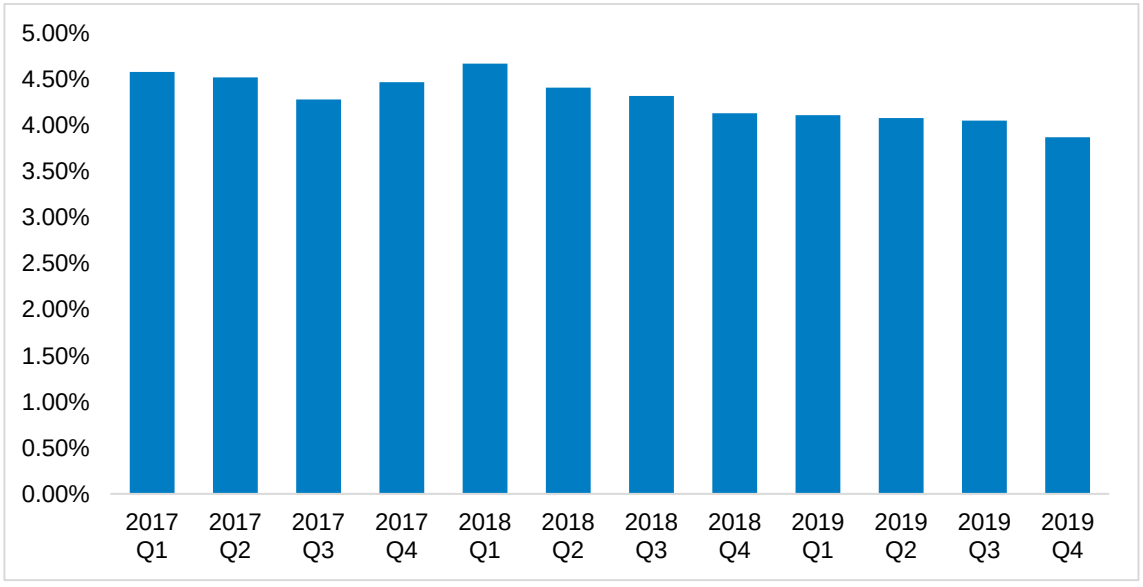


Figure 35. Quarterly Unemployment Rate % for Grampians Region (2017-2019)

242 DJPR (2020): https://www.rdv.vic.gov.au/information-portal/table-and-chart
243 DJPR (2020): https://www.rdv.vic.gov.au/information-portal/table-and-chart

Table 57. Employment indicators for Grampians Region (2016)[244]

Economic Indicators	Total	Percentage
Labour force participation	110,683	*61.5%*
Participation at 65 years plus	*5,848*	*13.0%*
People receiving an unemployment benefit	9,860	*6.8%*
Receiving an unemployment benefit for more than 180 days	*8,454*	*5.9%*
Youth unemployment (ages 15-24)	2,366	*12.3%*

9.1.2 Industry and employment

The main industries by number of jobs in the Grampians Region overall in 2016 were Health Care and Social Assistance (17% of all jobs), Retail Trade (11% of all jobs), Education and Training (10% of all jobs), and Agriculture, Forestry and Fishing (9% of all jobs), as shown below:

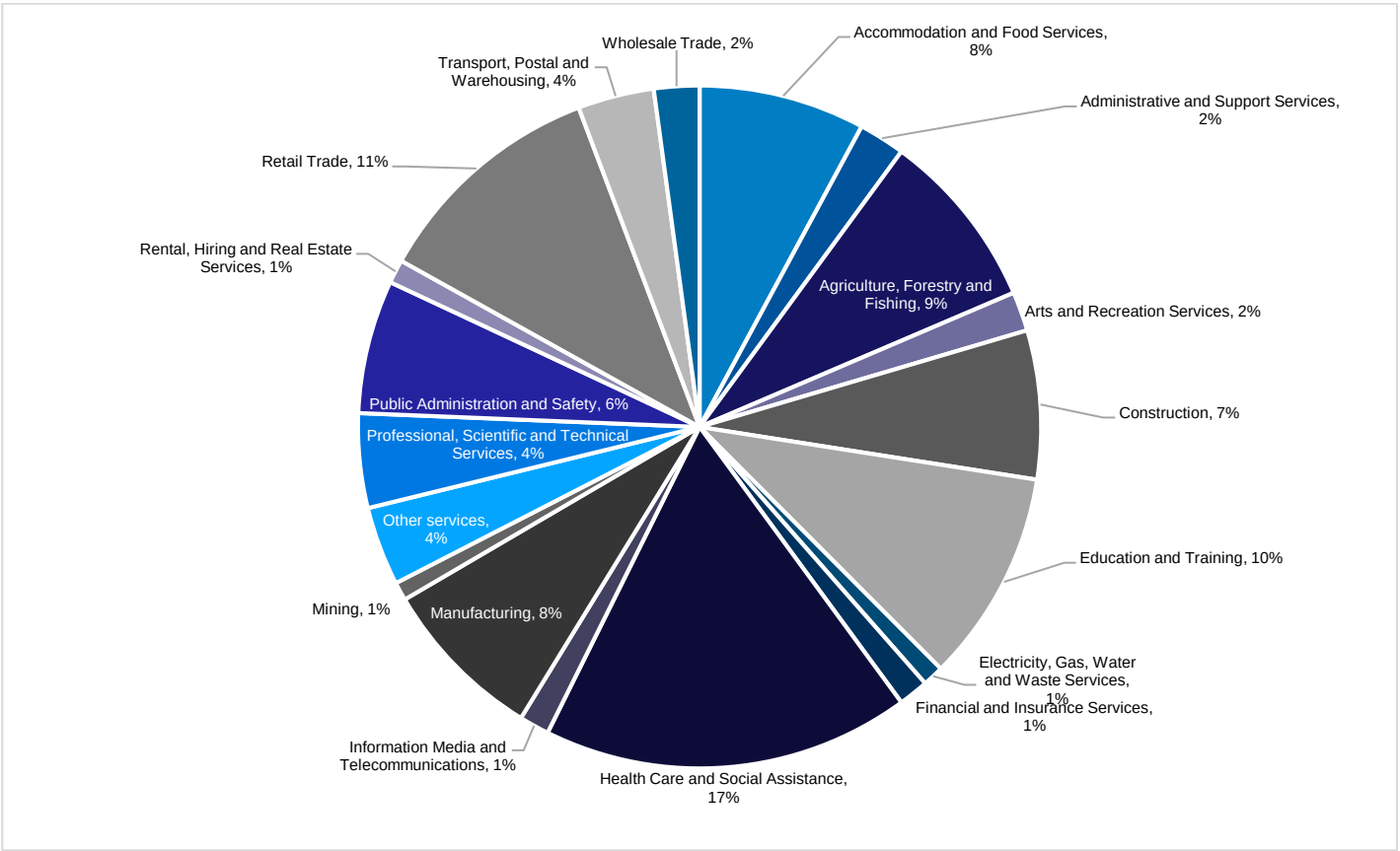


Figure 36. Jobs by Industry for Grampians Region (2016) [245]

244 DJPR (2020): https://www.rdv.vic.gov.au/information-portal/table-and-chart
245 DJPR (2020): https://www.rdv.vic.gov.au/information-portal/table-and-chart

The main industries by number of businesses in the Grampians Region overall in 2019 were Agriculture, Forestry and Fishing (23% of all businesses), Construction (17% of all businesses) and Rental, Hiring and Real Estate services (8% of all businesses), as shown below:

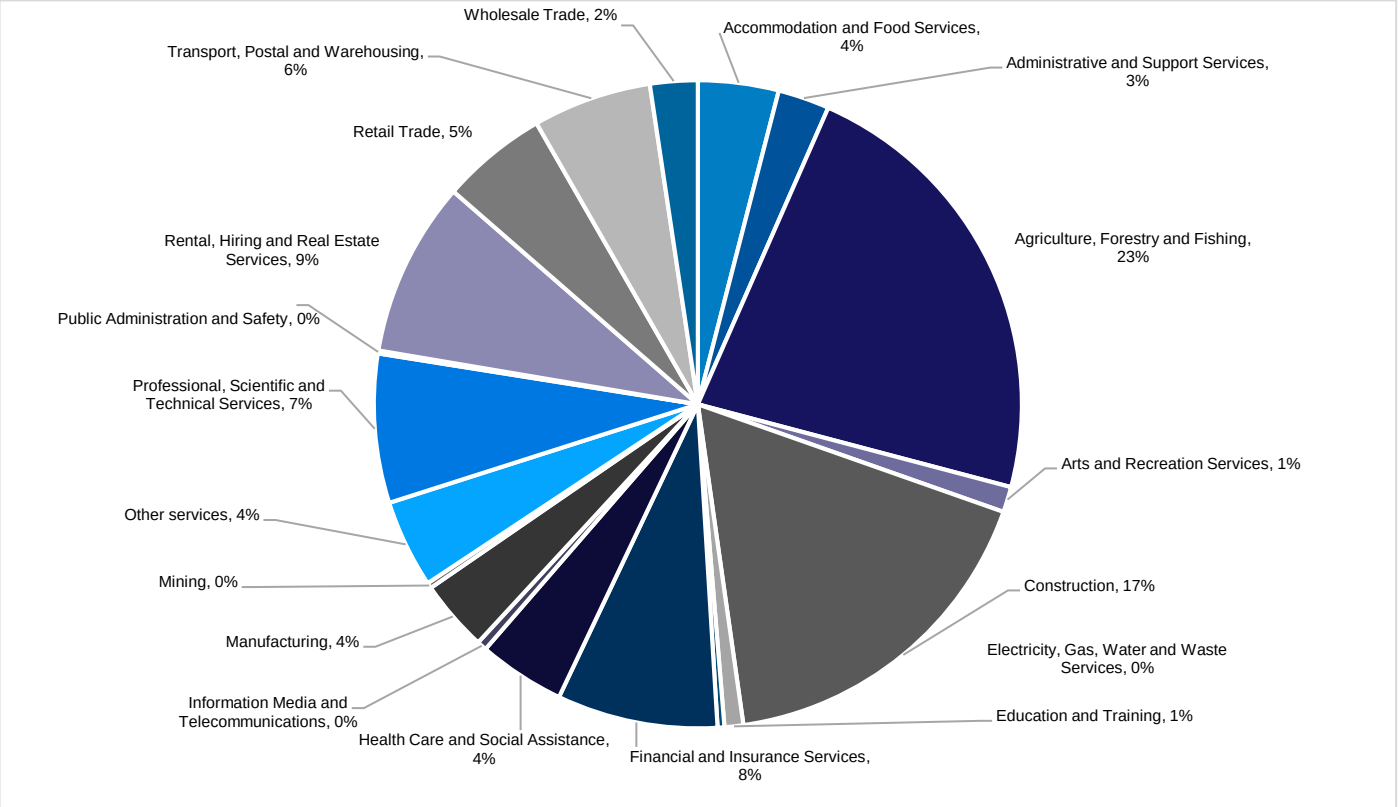


Figure 37. Business by Industry for Grampians Region (2019) [246]

Of the 23,066 businesses in the region, over 60% are non-employing businesses, while nearly 38% are small businesses with less than 20 employees.

Table 58. Businesses by size in Grampians Region (2018) [247]

Type of Business	Percentage
Large businesses (200+ employees)	*0.1%*
Medium businesses (20-199 employees)	*2.0%*
Small businesses (<20 employees)	*37.5%*
Non-employing businesses	*60.4%*

246 DJPR (2020): https://www.rdv.vic.gov.au/information-portal/table-and-chart
247 DJPR (2020): https://www.rdv.vic.gov.au/information-portal/table-and-chart

9.2 Political and legal factors

There are eight electoral Regions in Victoria. Five Members of Parliament (MPs) represent each Region in the Victorian Parliament's Legislative Council (Upper House). The principal role of people who are elected to represent a Region is to review legislation that has been passed by the Lower House. Grampians sits within the Western Victorian Region.

A breakdown of state and federal electoral divisions can be found below. The Victorian Electoral Commission and the Federal Electoral Commission use different borders distinctions that Emergency Management Regions due to the need to separate groups by population.[248] Therefore, the list below includes all divisions that cross into Grampians Region:

State electorate:

- Buninyong
- Lowan
- Melton
- Mildura
- Murray Plains
- Polwarth
- Ripon
- Wendouree

Federal Divisions:

- Ballarat
- Corangamite
- Mallee
- Wannon

[248] Victorian Electoral Commission Map of districts: https://www.parliament.vic.gov.au/findelectorate/

10. Operational Learnings

The Victorian emergency management sector supports a culture of continuous improvement by:

- Encouraging the sector to share lessons, both positive actions to sustain and areas for improvement
- Encouraging learning from both assurance activities and contemporary good practice
- Focusing on systems of work, rather than the performance of individuals
- Recognising that identifying and implementing sustainable solutions takes time, resources and opportunity

In November 2015, Victoria's first sector-wide lessons management framework, EM-LEARN, was approved. This framework further supports the development of a culture of continuous improvement and outlines a model for lessons management and how it will be implemented into the sector, particularly operational activities initially.

Lessons management involves the identification and learning of lessons captured through assurance and learning activities (including debriefing, monitoring and reviews) occurring before, during and after emergencies. This process of moving from identifying lessons to learning lessons is guided by the lessons management life cycle within the EM-LEARN framework, and should inform emergency management planning to ensure ongoing continuous improvement.

Operational learnings identified from across the State over the past 12 months include:

Declarations

- It was observed that there was little discussion/communications with the regions regarding the State of Disaster declaration for the summer fires, which resulted in confusion around what arrangements were required to be put in place at the regional level to support this. However, the declaration did result in the appointment of a State Relief Coordinator to support relief activities at the regional level and the State Response Controller at the State level which was viewed positively.
- Observations indicate that during the lead-up to a Code Red Declaration on 21 November 2019, there were issues with responding agencies accessing timely intelligence, information and predictions to enhance their operations due to how quickly the data was being updated. specifically, accessing EM-COP was highlighted as challenging at times.

IT

- IMT's highlighted the difficulties encountered with IT systems, connecting to networks and the hardware in operational facilities. Observations indicate that there are challenges in accessing and using multiple systems including EM-Drive, Webmail, EM-COP, IMS, Fireweb and FIRS.

Evacuation

- Observations indicate that Controllers were hesitant to consider robust evacuation planning until the exact location of the towns requiring evacuation was known. Evacuation planning highlighted the need for targeted messaging to people within evacuation areas, and the importance of having local agencies (i.e. CFA) involved in the evacuation planning process and ensuring that relief centres are located in 'safe' areas.
- Observations indicate that it is difficult to plan for or assume where people will want to go post evacuation or assuming what their needs might be. It is also very important that local councils are involved in the planning and implementation of any evacuation or reception centres.

Planning

- Early identification of potential storm/flood hazards allowed for planning and pre-positioning of storm and flood teams in IMT's. The adoption of standard processes for assuring the implementation of safety alerts related to thunderstorms worked well.

Information Management and Intelligence

- Observations indicate that relief information on VicEmergency was not always consistent with information distributed via community newsletters and other channels and that community communications need to be clear and targeted to the audience.
- Observations indicate that communications between the incident, regional and State tiers could be improved, in terms of building relationships, information sharing and reporting - and that all tiers need to be proactive and take responsibility for ensuring this is done in a clear and timely manner.
- Observations indicate that the lack of an intelligence unit within IMT's and Sector Commanders in the field impedes data collection at the incident level. There is value in establishing an intelligence within ICCs to centrally and consistently coordinate and manage damage assessment and other data which is collected from sources in various formats.
- It was observed that the SCC experienced difficulties in obtaining sufficient intelligence from across the incident and regional tiers. At times there was a divergence of views between the State and incident tiers regarding what the priority intelligence requirements were, which was exacerbated by

the fact that the State tier implemented new requirements - which were added to the existing procedures and products during times of peak operational demand on intelligence teams across all levels.

Personnel

- Fatigue management is a continuing issue. Personnel have concerns on shift length, rostering principles, rostering practices, entitlements and their general understanding of how to self-manage fatigue in relation to assigned shifts.
- Observations indicate staff are being activated into functional roles when they do not necessarily have the right accreditation or experience to perform the role effectively. In addition to being a potential safety issue of having unaccredited staff performing functional roles in an emergency, it also places pressure on others within the functional cell to cover the knowledge/experience gap and can cause frustration across the entire IMT.

11. Data sources

Table 59. Metadata

Item	Details
Report section	5. Regional Context 6. Natural Environment 7. Built Environment 8. Social Environment 9. Economic Environment
Data set	Regional Development Victoria Information Portal
Data source	Online
Location	https://www.rdv.vic.gov.au/information-portal/table-and-chart
Data accessed	July 2020
Data type	Geospatial database
Custodian	DJPR
Publisher	DJPR
Coverage	Victoria
Frequency	Approx. every four years

Item	Details
Report section	6. Natural Environment
Data set	Mean monthly and mean annual temperature data - maximum, minimum and mean (based on standard 30-year period 1961-1990)
Data source	Online
Location	http://www.bom.gov.au/jsp/ncc/climate_averages/temperature/index.jsp
Data accessed	August 2020
Data type	Geospatial database
Custodian	BOM
Publisher	BOM
Coverage	Australia
Frequency	Unknown

Item	Details
Report section	6. Natural Environment
Data set	Mean monthly, seasonal and annual rainfall data (based on standard 30-year period 1981-2010)
Data source	Online
Location	http://www.bom.gov.au/jsp/ncc/climate_averages/rainfall/IDCraingrids.jsp
Data accessed	August 2020
Data type	Geospatial database
Custodian	BOM
Publisher	BOM
Coverage	Australia
Frequency	Unknown

Item	Details
Report section	6. Natural Environment
Data set	Design Rainfall Data System
Data source	Online
Location	http://www.bom.gov.au/water/designRainfalls/revised-ifd/
Data accessed	August 2020
Custodian	BOM
Publisher	BOM
Coverage	Australia
Frequency	Unknown

Item	Details
Report section	6. Natural Environment
Data set	Average annual and monthly days of rain
Data source	Online
Location	http://www.bom.gov.au/jsp/ncc/climate_averages/raindays/index.jsp?period=anandproduct=5mm#maps
Data accessed	August 2020
Custodian	BOM
Publisher	BOM
Coverage	Australia
Frequency	Unknown

Item	Details
Report section	6. Natural Environment
Data set	Bushfire Prone Areas
Data source	Online
Location	https://discover.data.vic.gov.au/dataset/designated-bushfire-prone-area-bpa
Date produced	Last updated 24/3/2020 – produced 07/09/2011
Data accessed	09/05/2020
Data type	Geospatial database
Custodian	DELWP
Publisher	DELWP
Coverage	Victoria
Frequency	Unknown

Item	Details
Report section	6. Natural Environment
Data set	Major River Basins of Victoria
Data source	Online
Location	https://discover.data.vic.gov.au/dataset/awrc-major-river-basins-of-victoria
Date produced	Last updated 05/09/2020 – produced 01/08/2014
Data accessed	August 2020
Data type	Geospatial database
Custodian	DELWP
Publisher	DELWP
Coverage	Victoria
Frequency	Unknown

Item	Details
Report section	6. Natural Environment
Data set	Vicmap Lite: Statewide data series depicting major features, public land, vegetation, hydrology, transport and administrative data
Data source	Online
Location	https://discover.data.vic.gov.au/dataset/vicmap-lite
Date produced	Last updated 05/09/2020 – produced 01/08/2014
Data accessed	August 2020
Data type	Geospatial database
Custodian	DELWP
Publisher	DELWP
Coverage	Victoria
Frequency	As required

Item	Details
Report section	6. Natural Environment
Data set	1 in 100 year flood extent
Data source	Online
Location	https://discover.data.vic.gov.au/dataset/1-in-100-year-flood-extent
Date produced	Last updated 11/4/2020 – produced 01/08/2014
Data accessed	August 2020
Data type	Geospatial database
Custodian	DELWP
Publisher	DELWP
Coverage	Victoria
Frequency	As required

Item	Details
Report section	6. Natural Environment
Data set	Flood Warning Catchment Areas
Data source	Online
Location	http://www.bom.gov.au/metadata/catalogue/19115/ANZCW0503900441?template=full
Data accessed	August 2020
Data type	Geospatial database
Custodian	BOM
Publisher	BOM
Coverage	Australia
Frequency	Unknown

Item	Details
Report section	7. Built Environment
Data set	Potential Impact Reports (by LGA)
Data source	EM-COP
Location	EM-COP
Date produced	May 2020
Data accessed	July 2020
Data type	Geospatial database
Custodian	EMV
Publisher	EMV
Coverage	Victoria
Frequency	As required

Item	Details
Report section	7. Built Environment
Data set	FOI – Point – Vicmap Features of Interest
Data source	Online
Location	https://discover.data.vic.gov.au/dataset/foi-point-vicmap-features-of-interest
Date produced	Last updated 28/05/2020 – produced 1/05/2009
Data accessed	July 2020
Data type	Geospatial database
Custodian	DELWP
Publisher	DELWP
Coverage	Victoria
Frequency	As required

Item	Details
Report section	7. Built Environment
Data set	Electricity
Data source	Online
Location	https://data.gov.au/dataset/ds-aurin-aurin%3Adatasource-AU_Govt_GA-UoM_AURIN_DB_national_major_power_stations_2016/details?q=Major%20Power%20Stations
Date produced	Last updated December 2016
Data accessed	August 2020
Data type	Geospatial database
Custodian	Australian Government
Publisher	Australian Government
Coverage	Australia
Frequency	As required

Item	Details
Report section	7. Built Environment
Data set	PTV Public Transport
Data source	Online
Location	https://discover.data.vic.gov.au/dataset/public-transport-a-collection-of-ptv-datasets
Date produced	Last updated 30/1/2020 – produced 07/06/2012
Data accessed	09/05/2020
Data type	Geospatial database
Custodian	Public Transport Victoria
Publisher	Public Transport Victoria
Coverage	Victoria
Frequency	Quarterly

Item	Details
Report section	7. Built Environment
Data set	Roads
Data source	Online
Location	https://discover.data.vic.gov.au/dataset/road-network-vicmap-transport
Date produced	Last updated 05/09/2020 – produced 1/08/2014
Data accessed	August 2020
Data type	Geospatial database
Custodian	DELWP
Publisher	DELWP
Coverage	Victoria

Frequency	As required

Item	Details
Report section	7. Built Environment
Data set	EPA Victoria Landfill Register
Data source	Online
Location	https://discover.data.vic.gov.au/dataset/epa-victoria-victorian-landfill-register-vlr-location-polygons
Date produced	11/01/2020
Data accessed	09/05/2020
Data type	Geospatial database
Custodian	EPA
Publisher	EPA
Coverage	Victoria
Frequency	As required

Item	Details
Report section	7. Built Environment
Data set	Emergency Services
Data source	Ambulance Victoria Data Sets
Location	https://www.ambulance.vic.gov.au/ambulance-victoria-data-sets/
Data accessed	August 2020
Data type	Database
Custodian	AV
Publisher	AV
Coverage	Victoria
Frequency	Annually

Item	Details
Report section	8. Social Environment
Data set	Population
Data source	Australian Bureau of Statistics
Location	https://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3218.02018-19?OpenDocument
Data accessed	August 2020
Data type	Database
Custodian	ABS
Publisher	ABS
Coverage	Australia
Frequency	As needed – next issue expected for release on 30/03/2021

Item	Details
Report section	8. Social Environment
Data set	Hospital locations
Data source	Online
Location	http://data-dhs.opendata.arcgis.com/datasets/5000b3c446ed419eb590baa3832eb8f7_0
Date produced	Last updated 20/11/2019 – produced 28/07/2016
Data accessed	09/05/2020
Data type	Spatial
Custodian	DHHS
Publisher	DHHS
Coverage	Victoria

Frequency	Unknown

Item	Details
Report section	8. Social Environment
Data set	School enrolments
Data source	Online
Location	https://www.education.vic.gov.au/about/department/Pages/factsandfigures.aspx
Date produced	Last updated 01/07/2019 – produced 01/01/2010
Data accessed	16/06/2020
Data type	Spreadsheet
Custodian	DET
Publisher	DET
Coverage	Victoria
Frequency	Six-monthly

Item	Details
Report section	8. Social Environment
Data set	Aged Care
Data source	Online
Location	https://www.gen-agedcaredata.gov.au/Resources/Access-data/2020/March/GEN-data-People-using-aged-care
Date produced	Last updated 03/03/2020
Data accessed	August 2020
Data type	Spreadsheet
Custodian	Australian Institute of Health and Welfare
Publisher	GEN Aged Care Data
Coverage	Australia
Frequency	Unknown

Item	Details
Report section	8. Social Environment
Data set	Areas of Aboriginal cultural heritage sensitivity
Data source	Online
Location	https://discover.data.vic.gov.au/dataset/areas-of-cultural-heritage-sensitivity
Date produced	Last updated 11/07/2020 – produced 23/05/2018
Data accessed	06/08/2020
Data type	Shapefile
Custodian	DPC
Publisher	DPC
Coverage	Victoria
Frequency	Quarterly

Item	Details
Report section	8. Social Environment
Data set	Victorian Heritage Register
Data source	Online
Location	https://discover.data.vic.gov.au/dataset/victorian-heritage-register
Date produced	Last updated 05/09/2020 – produced 11/05/2016
Data accessed	06/08/2020
Data type	Geospatial database
Custodian	DELWP

Publisher	DELWP
Coverage	Victoria
Frequency	Fortnightly

Item	Details
Report section	8. Social Environment
Data set	Areas of Cultural Heritage Sensitivity
Data source	Online
Location	https://discover.data.vic.gov.au/dataset/areas-of-cultural-heritage-sensitivity
Date produced	Last updated 18/05/2020 – produced 20/06/2019
Data accessed	06/08/2020
Data type	Geospatial database
Custodian	DPC
Publisher	DPC
Coverage	Victoria
Frequency	Quarterly

Item	Details
Report section	Natural Environment
Data set	Climate average maps reference period 1961 - 1990
Data source	Online
Location	http://www.bom.gov.au/climate/averages/maps.shtml
Data accessed	1/07/2020
Data type	ASCII grid
Custodian	Bureau of Meteorology
Publisher	Bureau of Meteorology
Coverage	Victoria
Frequency	Fortnightly

12. List of Abbreviations

Table 60. List of Abbreviations

Acronym	Description
ABC	Australian Broadcasting Corporation
ABS	Australian Bureau of Statistics
ACHRIS	Aboriginal Cultural Heritage Register and Information System
AEMO	Australian Energy Market Operator
AEP	Annual Exceedance Probability
ARI	Average Reference Interval
BOM	Bureau of Meteorology
CFA	Country Fire Authority
CMA	Catchment Management Authority
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAFF	Department of Agriculture
DAWR	Department of Agriculture and Water Resources
DELWP	Department of Environment, Land, Water and Planning (VIC)
DET	Department of Education and Training (VIC)
DHHS	Department of Health and Human Services (VIC)
DISER	Department of Industry, Science, Energy and Resources
DJPR	Department of Jobs, Precincts and Regions (VIC)
DOT	Department of Transport
DTF	Department of Treasury and Finance
EMLA	Emergency Management Legislation Amendment
EMV	Emergency Management Victoria
EPA	Environment Protection Authority
FDP	Fire Danger Period
FFMV	Forest Fire Management Victoria
GRP	Gross Regional Product
ICC	Incident Control Centre
ICU	Intensive Care Unit
IFD	Intensity-Frequency-Duration
LGA	Local Government Area
MEMP	Municipal Emergency Management Plan
NWMR	North West Metro Region
PTV	Public Transport Victoria
RCC	Regional Control Centre
REMP	Regional Emergency Management Plan
REMPC	Regional Emergency Management Planning Committee
SCC	State Control Centre
SEIFA	Socio-Economic Indexes for Areas
SEMP	State Emergency Management Plan
SES	State Emergency Service (VIC)
SLS	Surf Life Saving (VIC)
SSIP	State Significant Industrial Precinct

13. Document information

13.1 Document details

Criteria	Details
Document title:	Environmental Scan Report: Grampians Region
Document owner:	Information Management and Intelligence Team, EMV

13.2 Version control

Version	Date	Description	Author
0.1	14/05/2020	Initial template created	C. Jolly
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1.2	08/09/2020	Proof reading	J. Kaye
2.0	14/09/2020	Final release	C. Jolly

13.3 Document approval

This document requires the following approval:

Name	Title	Organisation
Debra Abbott	Deputy Emergency Management Commissioner	EMV
Andrew Crisp	Emergency Management Commissioner	EMV