

# Halls Gap Threat & Risk Assessment

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# 1 Introduction

# 1.1 Background

The Halls Gap Resilience Group was a sub-committee of the Community Association of Halls Gap Inc. The Resilience Group acted as a focal point for prevention, preparedness, response and recovery planning for Halls Gap. It no longer meets, but its publications continue to be periodically updated.

## 1.2 Purpose

This document provides an assessment of threats and risks to the Halls Gap community. It formed the basis for the work of the Resilience Group when it was active.

## 1.3 Scope

The scope of this assessment is limited

- to Halls Gap only, as broadly outlined geographically in Figure 1,
- to the facilities regarded as 'community' assets/services (regardless of whether publicly or privately owned), including critical infrastructure and essential services,
- to the threat consequences for the community, not for individuals (e.g. the loss of a single store by fire may have a major impact on the individual owner, but only a minor impact on the community as a whole), and
- to risk identification only (not risk mitigation.)

## 1.4 Audience

This document is intended for review by the Halls Gap community and relevant agency staff.

## 1.5 Caveats

This document is a 'living' one. It is updated as needed. The latest version is posted on the Halls Gap Community web site. Readers should check for the latest version available.

**Note**: Dimensions of assets are approximate (paced out rather than measured) and unless otherwise attributed, images were provided by the Resilience Group.

# 1.6 Acknowledgements

Thanks are extended to community and agency reviewers for providing feedback on earlier drafts of this document. This document does not necessarily reflect their views, or that of the organisations they belong to. All errors and omissions lie with the Resilience Group.

# 1.7 Feedback

Any queries on matters not dealt with in this assessment, or suggested refinements or corrections to matters included in this assessment, should be referred to the Resilience Group via email:

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or by mail:

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# 2 Context for Threat and Risk Assessment

# 2.1 Community Overview

An overview of the geographic context for this assessment is given in Figure 1.



Figure 1: Community Context

Imagery: Google Maps, © 2022 CNES/ Airbus, Maxar Technologies

# 2.2 Asset/Service Groups

## 2.2.1 Assets Included in the Analysis

The key asset groups which were considered are listed below.

The **people** who face hazards/risks are

- permanent residents, and their visitors and guests (including children),
- tourists and event attendees from external sources (including children),
- owners and employees of the businesses operating within the community.
- people who attend the town to complete maintenance tasks and similar activities, including contractors/ tradespeople, services technicians, infrastructure maintenance staff, etc.,
- other supplier staff including representatives of organisations that provide fresh food, gas, electricity, water, telecommunications services, transport services (including couriers), emergency services, etc., and
- unwanted intruders i.e. people who arrive in the town in order to achieve deliberately malicious, mischievous or hostile objectives.

The **personal/ business assets** which may be at risk include the assets of the people listed above, particularly

- personal houses/ units/ or other accommodation assets, including the internal contents of these assets,
- business premises and the inventories/assets within them, including
  - tourist accommodation such as short stays houses, caravan parks, hotels, motels, backpacker hostels, etc., and
  - businesses offering services to locals and tourists including restaurants, food and grocery stores, bars, visitor centres, medical centre, pharmacy, souvenir shops, etc.,
- motor vehicles, caravans, tents, boats, bicycles and other goods stored outside within the community, including maintenance materials and tools in tradesperson vehicles and work depots, and
- pets (local or brought in by tourists.)

#### Community infrastructure, equipment and services i.e.

- the Primary School including building contents and surrounding infrastructure,
- infrastructure networks spread throughout the community including
  - o power lines and poles, transformers, and street lights,
  - other energy infrastructure e.g. for LP gas
  - water supply infrastructure including Lake Bellfield, community water pipes/ tanks/ pumps/ meters, and the water treatment plant,
  - o fire plugs, and related marker posts and road markers,
  - o sewerage pipes and pumps, and the sewage treatment plant,
  - o storm water drains,
  - telecommunication towers (for cell phones, NBN fixed wireless, etc.) and the TV tower on Mt William,
  - garbage and recycling bins and collections throughout the community, and the transfer station,

- roads and road infrastructure including bridges, culverts, kerbs, footpaths, speed humps, speed limit signs, pedestrian safety islands, etc.,
- emergency services infrastructure including
  - the buildings housing the CFA, ambulance, police services, Parks Victoria (PV) and Forest Fire Management (FFM)
  - the assets associated with these services including fire trucks, police vehicles, ambulances, other emergency/communications equipment carried in these vehicles, alert sirens, personal protective equipment for emergency personnel, other emergency equipment, the PV helipad, etc.,
  - $\circ$  the medical centre, and
  - the Neighbourhood Safer Place Place of Last Resort (NSP-PLR),
- community recreational/social/information assets, including
  - o the asphalt walking/cycling track running through the town,
  - $\circ$  ~ the town trailheads for various Parks Victoria (PV) walking tracks,
  - the swimming pool,
  - the tennis courts,
  - o the recreation reserve/ sports oval and pavilion,
  - the fitness park,
  - the golf course,
  - the Neighbourhood House,
  - the Botanic Garden and community garden,
  - the Centenary Hall and town Visitor Centre,
  - o Brambuk Visitor and Cultural Centre, and
  - o community communication channels, including
    - relevant Facebook pages (Halls Gap Community & Visitors, Halls Gap Locals, Grampians Tourism Industry Group),
    - the community web site (<u>https://hallsgapcommunity.org.au/</u>),
    - the Fill the Gap monthly newsletter, and
    - the Community Noticeboard outside the newsagency.

**Operational assets** - the primary processes and related documentation that are relevant to this assessment, including those for

- fire protection and bushfire management,
- storm, flood and landslide emergency management,
- accommodation emergency management, and
- management of the other emergencies listed in Table 1.

# 2.3 Description of Assets/Services

The descriptions below are intended to inform those who are not familiar with Halls Gap assets/services. Halls Gap residents can skip straight to section 3.

### 2.3.1 People

Halls Gap's population has varied widely since it was first founded. The 2021 Census recorded 495 permanent residents, but only 350 were between 15-70 years old ('working age'.) Visitors to the town add to this in non-peak periods. In peak periods, tourists and holiday-makers swell the numbers out to 8,000 to 10,000<sup>1</sup>.

### 2.3.2 Personal/Business Assets

In 2021 there were about 472 dwellings in Halls Gap. About 184 of them were occupied by residents and the remaining 288 were unoccupied i.e. presumably they were weekenders or available as short-term holiday accommodation. Most dwellings are single story, but some are 2-story and at least two are 3-story. Based on an average value of over \$450,000, the value of these dwelling is about \$210 million.

The town is over 100 years old, and standards for the construction of dwellings in bushfire-prone areas (AS 3959) were not issued until 1991. (The current version was issued in 2018 and amended in 2020.) As a consequence, the fire protection characteristics of dwellings vary greatly, and the majority of dwellings would not meet current standards.

The external walls are constructed from a broad range of materials including fibre cement panels, natural and painted timber weatherboards, manufactured timber cladding, logs, corrugated iron/steel, brick, mud brick, and rock. Roofs are invariably corrugated iron/steel, although some are tiled.

The majority of dwellings would not meet the CFA recommendation of an inner defence clear area of 10m from dwelling walls. In some cases the proximity of dwellings to property boundaries prevents the implementation of this measure without the cooperation of neighbours.

Other accommodation assets, such as resorts, caravan parks, hotels, motels, guest houses, backpacker hostels, etc., are constructed from a similar range of building materials, and would probably add about \$30 million to the value of buildings in the town.

In 2021, residents owned about 300 motor vehicles, and in peak tourist periods there is likely to be over 4,000 motor vehicles parked in and around the town. Assuming an average vehicle value of about \$20,000 (excluding motorhomes), the value of motor vehicles in the town in peak periods would be about \$85 million.

The value of motorhomes, caravans, tents, boats, motorcycles and other goods stored outside during peak periods would probably exceed \$20 million.

There are over 20 non-accommodation businesses in the town, including restaurants, food and grocery outlets, bars, medical centre, pharmacy, souvenir shops, etc. The collective value of these business premises and the inventories/ assets within them is likely to exceed \$10 million. There may also be some 'work from home' businesses which would add to this total.

Overall, the collective value of personal/business property at risk during peak periods is likely to be of the order of \$350 million, and it can be assumed that a significant percentage of the built environment is not constructed in a way that will readily resist bushfire attack, or some of the other emergencies listed in Table 1.

<sup>&</sup>lt;sup>1</sup> SGS Economics and Planning (2015) *Halls Gap Village Masterplan: Background Report*, Northern Grampians Shire, March

### 2.3.3 Community infrastructure, equipment and services

The details of essential service infrastructure and networks, emergency services infrastructure, and community recreational/social assets are described in the following sections:

#### 2.3.3.1 Roads and Road Infrastructure

Declared arterial roads are maintained by VicRoads and its contractors. They are:

- Mount Victory Road, and
- Grampians Road.

All other (local) roads are managed by the Northern Grampians Shire Council (NGSC), including the bridges, culverts, footpaths, kerbs and other ancillary assets on these roads. Most roads in the town are sealed, but some are not.

The NGSC *Road Management Plan* sets minimum maintenance standards for the road assets and sets a program for safety and defect inspections, as well as response times for rectifying identified defects in the network.

#### 2.3.3.2 Delleys Bridge

As it is on an arterial road (Grampians Road) Delleys Bridge is managed by VicRoads. It provides the primary access to the town centre from the North. While there have been several earlier versions, the current version of the bridge was built in 2005 and it has the following characteristics<sup>2</sup>:

- It is a 2-lane road bridge over a perennial watercourse (Fyans Creek) with a pedestrian/ bicycle path on the south side.
- It is 14m wide (10.1m used for traffic) and 64.7m long, running across 3 spans i.e. it has 2 intermediate supports.
- It is constructed of reinforced concrete (slabs, beams and supports) with asphalt surfacing of the traffic section of the concrete bridge deck.



#### Figure 2: Delleys Bridge

<sup>&</sup>lt;sup>2</sup> VicRoads (2020) Bridge\_Structures\_.csv, https://vicroadsopendatavicroadsmaps.opendata.arcgis.com/datasets/ef496e07eae049a3bb94351bc496dd6 a\_0.csv?outSR=%7B%22latestWkid%22%3A3111%2C%22wkid%22%3A102171% 7D

#### 2.3.3.3 Stony Creek Bridges

There are two Stony Creek bridges, one on Grampians Road and one on School Road. They can effectively act as backups for each other i.e. if one bridge is closed, the other bridge can effectively substitute.

As it is on an arterial road, the Grampians Road bridge is managed by VicRoads. It provides the primary access to the town shopping district from the North. It has the following characteristics<sup>2</sup>:

- It is a 2-lane road bridge over a perennial watercourse (Stony Creek) with a pedestrian/ bicycle path on the west side, and a separate pedestrian bridge on the east side.
- The road bridge is 11m wide (8.1m traffic width) and 15.6m long, running across 3 spans with two supports.
- It is constructed of reinforced concrete (u-slabs resting on beams and supports) with asphalt surfacing of the concrete bridge deck.



#### Figure 3: Grampians Road Stony Creek Bridge

Pedestrian Bridge

Road Bridge

As it is on a local road, the School Road bridge is managed by the NGSC. It provides access to the central car park, the Wonderland trail head, the swimming pool, tennis courts, botanic garden, toilets and a caravan park.

It has the following characteristics:

- It is a 2-lane road bridge over a perennial watercourse (Stony Creek) with a footpath about 1.5m wide on the West side.
- The road bridge is about 8m wide and 20m long, running across a single span.
- It is constructed of precast concrete slabs which form both the span and the deck, with asphalt surfacing of the traffic section of the bridge deck.

#### Figure 4: School Road Stony Creek Bridge



#### 2.3.3.4 Walking Tracks

The town hosts an asphalt walking/cycling track which runs from the Ararat-Halls Gap Road to Lake Bellfield. Associated infrastructure includes signs, road-crossing barriers and fences at appropriate locations. People can join the path at any point along its length. A white stripe runs down the centre of the track to separate the two directions of traffic.

The town also hosts the trailheads for various Parks Victoria (PV) walking tracks, including those at Delleys Bridge, at the sports oval Pavilion, at the School Road Stony Creek bridge, at the east end of Tandara Road, at the Brambuk Cultural Centre, and at the Bellfield Dam wall. Parking is provided in separate sealed or unsealed areas nearby, or at the side of the sealed roads leading to the trailhead.

#### 2.3.3.5 Lake Bellfield Dam

The Lake Bellfield dam was built in 1966. It is owned by GWM Water. Its purpose is to provide a water supply for towns and rural customers within GWMWater's footprint of operations. Its major characteristics are<sup>3</sup>:

• It is a rock fill embankment with an earth internal core. The foundations of the dam rest partly on rock, and partly on soil.



Figure 5: Dam Wall

Southern Face of Dam Wall

Northern Face of Dam Wall

- The height of the dam, from the lowest foundation to the height of the spillway crest, is 55m, and the length of the wall is almost 800m.
- The Full Supply Level (FSL) is 276.50m above sea level, and the capacity of the dam is 78,560 mega litres (ML.)
- The spillway is uncontrolled and can release about 39,000 ML per day into Fyans Creek. (The spillway chute was deepened by 3.4m in 2002.)



#### Figure 6: Dam Spillway

Spillway from South

Spillway from North

<sup>3</sup> ANCOLD (2010) *Dams-Australia-2019.xls*, https://www.ancold.org.au > uploads > 2012/10

 A single manually operated cone valve at the base of the dam wall can release 856 ML per day into Fyans Creek. It is located around 32m below FSL so it can be operated at most storage volumes<sup>4</sup>.



#### Figure 7: Cone Valve at Base of Dam Wall

#### 2.3.3.6 Water Supply

Lake Bellfield is the main source of supply for the Wimmera Mallee Pipeline and the South West Lodden Pipeline, and provides some lakes with resupply for town use and recreation. As part of this, it supplies drinking water to Halls Gap and Pomonal.

As shown in Figure 8, the main water pipe runs from the side of the cone valve at the base of the dam wall and past the water treatment plant where the town water supply is taken off. The water is treated in the plant and pumped up to the Clear Water Tank, the elevation of which provides the water pressure in the water system.



Figure 8: Town Water Supply

Source: Adapted from the Interactive Map of GWM Water Assets

The water then flows back down via water mains which deliver water to individual properties, where usage is monitored through remotely-read water meters.

<sup>&</sup>lt;sup>4</sup> Water Technology Pty Ltd (2017) *Review of Halls Gap Flood Investigation – Final Report*, May, http://wcma.vic.gov.au/docs/default-source/flooddocs/floodmaps/4148-01r04v04\_halls\_gap\_final\_report.pdf?sfvrsn=5f56468\_0



Figure 9: Town Water Mains

Source: Interactive Map of GWM Water Assets

#### 2.3.3.7 Halls Gap (Dairy Creek) Reservoir

The Halls Gap (Dairy Creek) Reservoir (Figure 10) can be used to insert untreated water into the system as a last resort water supply (Figure 11.)

Figure 10: Halls Gap Reservoir



Figure 11: Halls Gap Reservoir Water Supply



Source: Adapted from the Interactive Map of GWM Water Assets

The reservoir has an earthen wall with rock fill on the inside face. It is estimated to hold about 60-75 ML. When full, this should be sufficient for about 2-3 weeks supply (assuming the water is not affected by blue-green algae or other contaminants.) The water would need to be boiled prior to use by residents.

#### 2.3.3.8 Water Treatment Plant

The water treatment plant was built and operated under a Build Own Operate and Transfer (BOOT) contract awarded by GWM Water to AquaTower in 2000. The shareholding in AquaTower was sold in 2014 to AMP Capital. As part of the sale, TRILITY (part of the Beijing Enterprises Water Group) was contracted to provide the operations and maintenance services under a separate agreement with AMP Capital, which owns the operations contract with GWMWater.

The building is about 15m long and 9m wide (135 m<sup>2</sup> footprint.) The external walls are brick and the roof steel. The treatment area is about 15m long and 12m wide, and the equipment and walls are steel. There are no bushes or trees within 10m of the active parts of the plant. The facility is secured by locked gates in a 2.6m high chain wire mesh fence topped by three strands of barbed wire.

The characteristics of the treatment plant are:

- Its capacity is 3.6 ML per day.
- The treatment process involves coagulation, flocculation, dissolved air flotation, filtration, disinfection, and pH correction.
- Chemicals used in the process include lime, aluminium sulphate, and chlorine.

#### Figure 12: Water Treatment Plant



#### 2.3.3.9 Clear Water Tank

The Clear Water Tank is also managed by TRILITY.

The capacity of the tank is 2 ML. It has a diameter of about 22m, a footprint of about 400m<sup>2</sup> and a height of about 5.5m. It is lined internally with a potable water supply compatible membrane.

Its construction is reinforced concrete, and its roof is steel. Bushes/trees grow within 10m of the tank walls. The entry to the site is secured by a 1.2m high locked gate but there is little fencing around the site.



Figure 13: Clear Water Tank

#### 2.3.3.10 Storm Water Drainage

Formal storm water drainage is largely targeted at moving storm water to Fyans Creek without adversely affecting other services e.g. the road networks. Drainage for arterial roads is a VicRoads responsibility, drainage for local roads is a NGSC responsibility. Beyond the roads, drainage relies on many natural gullies.

Some aspects of wider storm water drainage are relatively informal e.g. some dwelling downpipes simply empty on to the ground, some long driveways on hills have no drains, and this creates erosion problems and debris on roads down slope.

#### 2.3.3.11 Electricity Network

The characteristics of the town electricity network appear to be:

- Power is generally carried by overhead power lines, although in more recent developments (e.g. Clematis Drive) they are underground.
- The power poles are predominantly wood, but concrete poles are used along the pipe and power reserve, are used for wooden poles replacement, or when power lines are extended.
- Power from lines to properties is generally carried underground although there are exceptions to this.



Figure 14: Pipe and Power Reserve

#### 2.3.3.12 Gas Supply

There is no reticulated gas network in Halls Gap. Gas is supplied in regularly refilled gas tanks. Typically they fall into two groups – smaller home dual gas bottles (e.g. each 45kg net) connected to a bottle changeover valve, and larger bulk storage tanks (e.g. 1000kg.) Some intermediate sized tanks are used by commercial enterprises. As shown in Figure 15, the smaller tanks are typically stored against the wall of the dwelling, and the larger tanks often provide supply to multiple buildings and are installed well away from any structures.

Beyond the gas tanks described above, there are many gas BBQs distributed throughout the town, most of which would have one or two 8.5kg gas cylinders.

The number of gas bottles and tanks in the town is unknown.

#### Figure 15: Typical Gas Tanks



#### 2.3.3.13 Sewerage System and Public Toilets

Most of the town is serviced by a gravity sewerage system supplemented by seven sewer pump stations (Figure 16.) The sewer mains and pump stations are shown in Figure 18. They terminate at the sewage/ wastewater treatment plant (Figure 19).

#### Figure 16: Examples of Sewage Pumping Stations



The unsewered parts of town (e.g. the area around Reids Lane) rely primarily on septic tanks.

There are multiple public toilets in the town, including at the Lake Bellfield dam wall, next to the Lakeside Caravan Park, next to the swimming pool, and next to the sports oval. There are also public toilets at the visitor centre (Figure 30) and both Brambuk buildings (Figure 32).

#### Figure 17: Public Toilets



Lake Bellfield

Lakeside Caravan Park

Sports Oval

The Lake Bellfield toilets are irregular in shape but are roughly 9m wide and 5m deep (50m<sup>2</sup> footprint.). The external walls are constructed with rock and concrete. The roof is steel. There are no bushes/trees within 10m of the facility.

Swimming Pool

The toilets opposite the Lakeside Caravan Park are about 6m wide and 6m deep  $(35 \text{ m}^2 \text{ footprint.})$  The external walls are brick and the roof is concrete other than two small sections which are clear corrugated polycarbonate roofing supported on short wooden studs which are open to the weather. Bushes/trees are within 10m of the walls and there is a significant level of fuel burden around the structure.

The toilets next to the swimming pool are about 14m long and 5m wide (90m<sup>2</sup> footprint.) The external walls are constructed of rock and corrugated steel panels. The roof is corrugated steel. There are trees within 10m of the toilet walls.

The toilets at the sports oval are about 10m long and 3m wide (30 m<sup>2</sup> footprint.) The external walls are brick. The roof is corrugated steel. There are trees within 10m of the toilet walls.





Source Interactive Map of GWM Water Assets

#### 2.3.3.14 Sewage/Wastewater Treatment Plant

GWM Water (2006)<sup>5</sup> states that the sewage/wastewater treatment plant was last expanded in 2005. Relining of the final storage pond to fix some leakage was completed, as were works to allow use of recycled water by the golf course.

Figure 19: Sewage/ Wastewater Treatment Plant



The plant has an annual influent capacity of 180 ML, all of which is used for irrigation by the on-site farm. except for 2 ML which is used offsite (presumably by the golf course.) The on-site farm is leased to a third party via a rolling 5-year lease.

According to the shire council, peak holiday demand uses approximately 60% of the system's capacity<sup>6</sup>.

No information on the design of the sewage treatment plant was available to the author, but based on its physical characteristics (Figure 19) and feedback from GWMWater, the plant is a series of non-aerated facultative ponds. They overflow from one to the next, with screening between the ponds. There is no degritting. The site is secured by locked gates in standard 1.1m high wire fencing.

#### 2.3.3.15 Fire Plug Network

A network of fire plugs, marked by identifying posts, is distributed throughout the town to assist with firefighting (Figure 20). The network is owned by NGSC. The distribution of fire plugs is shown in Figure 21.



### Figure 20: Example Fire Plugs/Standpipes

There are three standpipes suitable for filling water tankers, one at the fire station, one on the other side of the road opposite the Police Station, and one at Bellfield Settlement.

<sup>&</sup>lt;sup>5</sup> GWM Water (2006) Water Plan 2006 to 2008

<sup>&</sup>lt;sup>6</sup> THA Landscape Architects (2001), *Halls Gap Township Urban Design Framework A Pride of Place Project*, May



Figure 21: Fire Plug/Hydrant Network

Source Interactive Map of GWM Water Assets

#### 2.3.3.16 Police, Fire and Ambulance Services (Essential Services)

Essential services are provided in the town by Victoria Police, the Country Fire Authority (CFA), and Ambulance Victoria. Fire services in the National Park are provided by Forest Fire Management Victoria (FFM.) There is no SES facility in Halls Gap. The nearest facility is in Stawell.

The Halls Gap Police Station includes a communications tower. The station is about 6m wide and 18m deep (100 m<sup>2</sup> footprint.) The external walls are brick, and the roof is corrugated steel. There are trees/bushes within 10m of the walls. It is not staffed 24/7 but officers can be sent from Stawell if needed. The officers respond to calls, conduct patrols, carry out traffic duties and are heavily involved in any search and rescue operations and natural disasters.

#### Figure 22: Ambulance, Fire and Police Facilities

The Fire Station is about 14m wide and 17m deep (about 240m<sup>2</sup> footprint.) The external walls and roof are corrugated steel. There are trees/bushes within 10m of the walls. There are three bays for two 4WD fire tankers and a 4WD utility vehicle. Behind the bays are an office, kitchen and meeting room with tables and chairs. The station is not staffed on a 24/7 basis. Trained local volunteers respond to fire emergencies, road accident rescues, incidents involving hazardous materials, and other emergencies including flood assistance.

The ambulance station is about 7m wide and 10m deep. The external walls are constructed of rock and corrugated steel. The roof is corrugated steel. There are bushes/trees within 10m of the walls. An ambulance is often stationed in Halls Gap e.g. in peak periods, but it is not there on a 24/7 basis. Other ambulances can be sent from Stawell, Ararat or Horsham. Ambulances can only respond to a 000 call. Ambulance Victoria trains local Ambulance Community Officers (ACOs), who are first responders employed on a casual basis to provide advanced first aid. They are used in communities like Halls Gap where the caseload is low and emergency facilities are not staffed full-time. They can carry out life-saving procedures and administer life-saving drugs until a paramedic/ambulance can arrive, but they also only respond to 000 emergencies.

FFM is located in the PV town works depot (see below.) It conducts fuel reduction burns in the national park and forests, and provides assistance to other emergency services when needed e.g. in response to bushfires.

#### 2.3.3.17 Works Depots

There are two Parks Victoria (PV) depots in the town (Figure 23.)

The town depot often houses PV and FFM utility vehicles which would be essential support vehicles in the event of a bush fire or emergency. It also houses an office and equipment sheds with a collective footprint of about 700m<sup>2</sup>. The sheds have corrugated steel external walls and roofs. There are trees within 10m of the walls.

The pipeline reserve depot south of Brambuk often houses equipment which would be called into play in the event of a bush fire or other emergency e.g. graders, dozers, front end loaders, trailers, etc. There are no buildings at this location.

Both works depots are secured by locked gates set in 1.5-1,8m high wire fences.

Figure 23: PV Depots



Town Depot

Pipeline Reserve Works Depot

The PV administrative offices are housed at Brambuk. The building is an irregular shape and has a footprint of about 800m<sup>2</sup>. The external walls are timber weatherboards. The roof is corrugated steel. There are trees/ bushes within 10 m of the walls.

GWM Water also has a works depot, at the base of the Lake Bellfield dam wall. It contains an office and equipment sheds (about 200m<sup>2</sup> footprint), material storage bays, and other supplies (e.g. pipes.) The external walls and roofs of the buildings are corrugated steel. There are trees/bushes within 10m of the walls. The site is secured by a locked gate in a 2.2m high chain mesh fence topped with two strands of barbed wire.

#### 2.3.3.18 Kerbside Waste and Recycling Services

The NGSC provides plastic wheelie bins for use in kerbside waste and recycling collections for both residents and businesses (Figure 24.)

Bin straps are available to prevent cockatoos from opening the bins and spreading rubbish for metres around them.

Waste is collected weekly and recycling is collected fortnightly



Figure 24: NGSC Waste and Recycling Bins

#### 2.3.3.19 Waste Transfer Station

The waste transfer station is operated by the NGSC to collect rubbish which cannot be handled by wheelie bins. It contains an office and storage sheds (about 50m<sup>2</sup> footprint.) The sheds have corrugated steel walls and roof. There are bushes/trees within 10m of the walls. The site is secured by a locked steel-faced gate set in a 1.9-2.1m high chain wire mesh fence.

A concrete ramp allows dropping of rubbish into a skip, or dropping green waste into a green waste bay. A separate area is used to collect steel objects including white goods. It does not accept recycled gas cylinders.

#### Figure 25: Waste Transfer Station



#### 2.3.3.20 Telecommunication Towers/ Coverage

The telecommunications towers next to the sports oval provide 3G/4G cell phone coverage and support the NBN Fixed wireless network. Mt William provides a relay tower for connection of Halls Gap to the broader NBN service.

Mt William also hosts a Digital TV Broadcast Tower servicing the Halls Gap area.

Figure 26: Telecommunication Towers



Next to Sports Oval

At Mt William

#### 2.3.3.21 Telstra Exchange

There is a Telstra Exchange adjacent to Delleys Bridge. Given the installation of 3G/4G cell phone networks, the exact nature of the services the exchange supports is unknown. The external walls and roof are corrugated iron/steel. There are bushes/trees within 10m of the walls.





#### 2.3.3.22 Primary School

The Primary School falls under the Victorian Department of Education and Training and is managed through an elected school council. It has five teaching staff and two support staff and teaches 40-50 students in years Prep-6.

In 2013 a new school building was completed, providing two open-plan classrooms with a project space between them. It has an irregular shape but is roughly 24m by 18m (600m<sup>2</sup> footprint.) It contains tables, chairs, lockers, whiteboards, notice boards and other school assets. The external walls are constructed of brick and corrugated steel. There are bushes/trees within 10m of the walls.

The old school building is used as a Library and Music room. It contains tables, chairs, musical instruments, books and similar assets. It is an irregular shape but roughly 10m by 9m (80m<sup>2</sup> footprint.) The external walls are timber weatherboards, and the roof is corrugated steel. There are bushes/trees within 10m of the walls.

The school also has an oval (used to host a craft market about 4 times a year), a playground, and a gym. The gym is an irregular shape but is roughly 16m by 12m (220m<sup>2</sup> footprint.) The external walls and roof are corrugated steel. There are bushes/trees within 10m of the walls. There are 0.6-1.2m high fences surrounding the property, but they provide little in the way of security.



#### Figure 28: Primary School

#### 2.3.3.23 Medical Clinic

The Budja Aboriginal Co-operative delivers necessary health and social services in response to the needs of the expanding local Aboriginal community. It offers services to all members of the community. It is the only primary health care, GP and community health facility in Halls Gap. The clinic is staffed by multiple GPs each of whom is rostered on for multiple days across the month, four Registered Nurses, and support staff. The clinic contains a reception area, doctor's rooms, a treatment room, and offices. It is roughly 10m wide and 50m long (500m<sup>2</sup> footprint.) The external walls and roof are corrugated steel. There are bushes/trees within 10m of the walls. The site is protected by two lockable gates set in 1.3m high steel fences. Other medical infrastructure includes public access (Figure 29.)

#### Figure 29: Medical Services



Medical Clinic

Public Access Defibrillator

#### 2.3.3.24 Centenary Hall, and Visitor Information Centre (Halls Gap Hub)

The Visitor Centre/Centenary Hall hub is managed by NGSC and handles meetings, conferences, exhibitions (e.g. the History Room in the Centenary Hall managed by the Historical Society), performances (e.g. films in the Centenary Hall for the Grampians Film Society), and social activities. The facilities are also hired out for private functions and commercial casual use (e.g. in the past Seppelts has rented part of the Visitor Centre for wine sales.).

The Centenary Hall is roughly 32m long and 16m wide (500m<sup>2</sup> footprint.) Its external walls are constructed of stone and corrugated steel. Its roof is corrugated steel. There are no bushes/trees within 10m of its walls.

The Visitor Centre is an irregular shape and has a footprint of about 350m<sup>2</sup> (excluding the area leased out to the Paper Scissors Rock Brewery.) The external walls are glass, polycarbonate sheeting and timber cladding. The roof is corrugated steel. There are no bushes/trees within 10m of its walls.



#### Figure 30: Centenary Hall and Visitor Information Centre

#### 2.3.3.25 Neighbourhood House

The Neighbourhood House was previously associated with the medical clinic. As at 2024 it operates out of the Halls Gap Hub. It provides learning facilities, runs exercise programs including Tai Chi, youth programs such as play group and school holiday programs, provides computer/ internet access and a venue for community groups to meet e.g. the Book Club.

#### 2.3.3.26 Neighbourhood Safer Place – Bushfire Place of Last Resort (NSP-BPLR)

The NSP-BPLR is represented by the grassed area at the Halls Gap playground and picnic reserve between Grampians Road and School Road (see Figure 31 and Figure 35.)



#### Figure 31: Bushfire Place of Last Resort

The BPLR is only intended to be used if residents' bushfire survival plans fail and they have nowhere else to go. It is not a building and welfare facilities are not available. Shelter from smoke, embers and radiant heat is unlikely to be effective i.e. use of the NSP-BPLR does not guarantee survival from a bushfire, particularly under Catastrophic conditions.

#### 2.3.3.27 Brambuk Visitor/Cultural Centre

The Visitor Centre is an irregular shape with a footprint of about 600m<sup>2</sup>. The external walls are a mix of rock, timber weatherboards, timber panels and glass. The roof is corrugated steel. There are trees/bushes within 10m of the walls. Services include information/advice on walks/hikes, map sales, activity brochures, campground bookings, permits, souvenirs and interpretive displays, as well as scheduled holiday activities for kids (Junior Ranger Program). It also hosts a café.

The Cultural Centre is a 2-story building of irregular shape with a footprint of about 880m<sup>2</sup>. The external walls are largely timber weatherboards, but there is some rock and glass. The roof is corrugated steel. There are trees/bushes within 10m of the walls. The centre was designed collaboratively with traditional owners and is managed in association with the Barengi Gadjin Land Council, Gunditj Mirring Traditional Owners Aboriginal Corporation and Eastern Maar Aboriginal Corporation. It provides displays, exhibits, activities, and a multi-media theatre in order to explore the culture and traditions of indigenous people.

Figure 32: Brambuk Visitor/Cultural Centre



Visitor Centre

**Cultural Centre** 

#### 2.3.3.28 Retail Outlets in the Town Centre

The town centre shopping centre has three main clusters – the Stony Creek stores, the Grampians Road shops and the Heath Street stores. The outlets include a licensed general store, a newsagent, a pharmacy, several licensed restaurants, take way food outlets, two ice creameries, a bakery, several souvenir/ gift shops, a jewellery store, a wine cellar, a luxury goods store, an outdoor activities and supplies outlet including Post Office services, and an e-bike hire outlet.

The Stony Creek stores are in an L-shape and have a footprint of about 950m<sup>2</sup>. The external walls are largely timber weatherboards, although there are brick walls at the rear of the stores nearest to Grampians Road. The roof is corrugated steel. There are tree/bushes within 10m of some store walls.

The Grampians Road shops are an irregular shape at the rear, but are about 78m along the street front. The footprint is about 2,000m<sup>2</sup>, but there a variety of additional sheds and storages at the rear. The external walls are brick, and the roof is corrugated steel. There are trees/bushes within 10m of the sheds at the rear.

The Heath Street stores consist of three small separate retail outlets each with a frontage of about 6m, and a larger pizzeria with a frontage of about 12m. The external walls are steel, glass, manufactured panelling and weather boards. The roofing is corrugated steel. There are trees within 10m of the walls.

#### Figure 33: Retail Outlets



Main street outlets

Stony Creek outlets

The service station is located next to the Centenary Hall. It has 10 pumps and offers octane 91 unleaded petrol, octane 95 and 98 premium petrol, and premium diesel. It also operates a gas bottle exchange and a camping/ convenience store.

The convenience store is about 20m by 10m (200 m<sup>2</sup>.) The external walls are corrugated steel and glass. The roof is corrugated steel. There are no trees/bushes within 10m of the walls.



#### Figure 34: Service Station

#### 2.3.3.29 Picnic Ground

The Halls Gap Caravan Park and Recreation Reserve Committee of Management Incorporated (HGCPRRC), is responsible for the day-to-day management, care and protection of the Caravan Park and Recreation Reserves located on Crown land in the town. The HGCPRRC operates under the auspices of the Department of Environment, Land, Water and Planning (DELWP.)

The physical areas overseen by the HGCPRRC include

- the Picnic Ground/ NSP-BPLR, which includes two picnic shelters and a playground (see Figure 35),
- the Swimming Pool (see 2.3.3.30),
- the Recreation Reserve/Sports Oval and pavilion (see 2.3.3.31),
- the Botanic Garden (see 2.3.3.34), and
- the tennis courts (see 2.3.3.32.)

Funds are received from the lease of the Caravan Park and the lease of space for the communication towers at the Recreation Reserve. Some funds are also received from renting out the Pavilion at the Recreation Reserve. These funds are committed to the upkeep of the above assets as well as investment in upgrades.

The picnic shelters ae about 8m square and 5m square respectively. They each contain 4 gas BBQs, power points, and tables and seats. The external walls are timber and roofs are corrugated iron. There are tree/bushes within 10m of the walls.

#### Figure 35: Picnic Ground



#### 2.3.3.30 Swimming Pool

The Swimming Pool is a seasonal outdoor facility. It opens on November 1st every year, and closes after the Easter weekend the following year.

The characteristics of the swimming pool complex are:

- A 25m varied depth pool (1m at the shallow end, 1.8m at the deep end.)
- A toddler's pool and a splashpad with fountains, including a bucket tree.
- Male and female change rooms with hot showers, but no family or disabled change rooms.

Other assets include the 2.6m high chain link fence topped by two rows of barbed wire which surrounds the pool, pool support equipment (pumps, filters, chlorinators, pool cover, etc.) and assets associated with pool administration (collecting entrance fees etc.)

The administration/change-rooms building is about 17m long and 15m wide (about 100m<sup>2</sup> footprint.). The external walls are brick, and the roof is corrugated steel. There are tree/bushes within 10m of the walls.

The separate water treatment shed is irregular in shape but is roughly 9m by 9m with a footprint of about 60m<sup>2</sup>. The walls and roof are corrugated steel. There are trees within 10m of the walls. It contains the chemicals used to treat the pool water.



#### Figure 36: Swimming Pool

#### 2.3.3.31 Recreation Reserve/Sports Oval and Pavilion

The recreation reserve hosts several sports clubs including cricket and pétanque. Facilities include the pavilion, cricket practice nets, and two pétanque pistes.

The pavilion can be hired. It includes a kitchen, bar, tables and chairs, crockery and cutlery etc. It is octagonal in shape and about 16m wide (about 450m<sup>2</sup> footprint.) The external walls are a mix of timber weatherboards and corrugated steel. The roof is corrugated steel. There are trees within 10m of the walls.

Figure 37: Sports Oval and Pavilion



#### 2.3.3.32 Tennis Courts

There are three asphalt tennis courts and a small club house located next to the Primary School. The club house is about 7m by 3.5m (about 20m<sup>2</sup>.) The external walls are concrete block and the roof is corrugated iron/steel, including a veranda. There are no trees/bushes within 10m of the walls.

Associated assets include the nets, 3.3m high chain mesh fences, access gates and the clubhouse contents which include tables, chairs, sink, and urn.

The Tennis Club is no longer operating.

#### Figure 38 Tennis Courts and Club House



#### 2.3.3.33 Golf Club

The Mt Difficult golf course is 9 holes, par 36. The non-profit Halls Gap Community Sports Club bought sixty-five hectares of grazing land on the Red Gum Lease Rd and the nine holes were completed on about 30 hectares.

The course is supported by members and volunteers and the club house has a limited liquor license. The club house is about 11m by 8m (about 90m<sup>2</sup> footprint.) The external walls and roof are corrugated iron. There is a wooden external deck and trees within 10m of the walls. Contents include tables, chairs and a kitchen.

#### Figure 39: Mt Difficult Golf Course



#### 2.3.3.34 Fitness Park

The Halls Gap Fitness Park was installed in 2012. It was funded through the proceeds of the annual Run the Gap event, and by the NGSC.

It consists of a collection of outdoor exercise equipment and frames.

Figure 40: Fitness Park



#### 2.3.3.35 Botanic Garden and Community Garden

The Botanic Garden displays and interprets local plants. It also hosts occasional events such as weddings, AUSLAN training, etc. It is maintained via working bees organised by the Botanic Garden Group, who are all volunteers.

Facilities include a picnic shelter, an information shelter, and an equipment shed. The picnic shelter and equipment shed have corrugated steel walls and roofs. The information shelter is timber with a corrugated steel roof. All have trees are within 10m of the shelter or shed. The garden is protected by a 1.6-1.9m high wire fence with three gates.

Associated assets include high fencing, access gates, statues/art, interpretive signs, picnic tables, and the picnic shelter contents which include tables and chairs.



Figure 41: Botanic Garden

The community garden is located on the Grampians Road side of the Halls Gap Recreation Reserve, and is maintained by volunteers. It is also used and partly maintained by the Halls Gap Primary School.

#### Figure 42: Community Garden



#### 2.3.3.36 Banking/Finance (Essential Service)

There are no bank branches in Halls Gap, and no provision of lending services.

The banking/finance services which are available are:

- Australia Post banking services (for participating financial institutions), through the LPO at Absolute Outdoors, including cash and cheques deposits, cash withdrawals and balance enquiries, pre-paid credit cards, money orders, Postbillpay, and travel insurance,
- an automated teller machine hosted by Absolute Outdoors, which does not accept deposits, and
- EFTPOS services in many retail outlets and staffed accommodation providers, including cash-out facilities in some retail outlets.



#### Figure 43: Automated Teller Machine

### 2.3.4 Operational Assets

#### 2.3.4.1 Fire Emergency Management

The processes and documents used for fire management include those associated with emergency responses to fire events, as well as fire restrictions, fire danger ratings and fire bans, and related regulations and signs.

There are four roadside fire warning signs – two at the intersection of Grampians and Mt Victory Roads which display the Fire Danger Rating, and two that display Total Fire Ban signs - one outside the Police Station and one outside the PV depot.



Figure 44: Fire Warning Signs

#### 2.3.4.2 Flood/ Water/ Landslide Management

The processes and documents used for flood/ water/ landslide management include

- flood and landslide emergency management (from the SES),
- coordination of cone valve water releases from Lake Bellfield (GWMWater), and
- water quality standards for drinking water and related testing processes (TRILITY.)

#### 2.3.4.3 Accommodation Emergency Management

The processes and documents used for accommodation management include the relevant parts of the guidelines, regulations and legislation affecting holiday accommodation including

- the Residential Tenancies (Caravan Parks and Movable Dwellings Registration and Standards) Regulations 2020,
- the CFA's Caravan Park Fire Safety Guidelines, and
- the internal processes and documents of accommodation providers e.g. fire plans, flood plans, emergency plans, evacuation plans, etc.

#### 2.3.4.4 Other Threats Management

The processes and documents used for the management of other threats (see Table 1) e.g. blue-green algal bloom, infrastructure failure, services disruption, hazardous materials release, transport incident, terrorism/ extremism/ sabotage, social unrest/ civil disturbance, cyber-attack, etc.

# 2.4 Categories of Threat/Hazard Considered

The categories of threats considered are listed in Table 1.

Some threats have been ignored in the assessments that follow, as they are not particularly relevant to the town. As examples, Halls Gap

- is not close to the coast so it is not subjected to sea-level rise, coastal storm surges, or tsunamis, and
- is outside the Newer Volcanics Province of south-eastern Australia so volcanoes are not a consideration.

Climate change has been treated as an indirect threat i.e. it is likely to progressively exacerbate the frequency and/or severity of other threats (fire, flood, drought, etc.) rather than impact the town directly.

# 2.5 Identification of Threats/Hazards

The threats/ hazards likely to affect town assets/services are given in Table 1.

Table 1: List of	Threats/	Hazards	Identified
------------------	----------	---------	------------

Threat/Hazard	Description			
Natural Hazards				
Geophysical				
Earthquake	Sudden violent shaking as a result of slippage of the earth along fault lines.			
Mass movement (dry)	A rockfall, landslide, landslip, avalanche, or subsidence of the earth			
Hydrological				
Flood	Overflow of a large quantity of water beyond its normal limits			
Flash flood	Rapid flooding of low-lying areas: washes, rivers, dry lakes and depressions			
Mass movement (wet)	A rockfall, landslide, landslip, avalanche, or subsidence caused by water			
Meteorological				
Severe Storm	A violent disturbance of the atmosphere with strong winds			
Extreme rain	Very heavy rainfall e.g. 100 mm in 24 hours			
Tornado	Mobile, destructive vortex of violently rotating winds			
Lightning	Natural electrical discharge of very short duration and high voltage			
Climatological				
Extreme temperature	Very high (well above average) or very low (below freezing) temperatures			
Drought	Inadequate precipitation reduced soil moisture diminished stream flow etc.			
Bushfire	A fire in scrub or a forest, especially one that spreads rapidly			
Urban conflagration	Residential or industrial fire that involves a significant part of the town			
Biological				
Enidemic/Pandemic	A disease which is prevalent over a whole country or the world			
Blue-green algal bloom	Hazard to water supplies potentially dangerous to humans animals fish			
Pest/animal infestation	Intolerable levels of animals, destructiveness, and adverse impact			
Weed infestation	Plants that grow wild and profusely, often crowding out native plants			
Human-made hazards				
Infrastructure failure	Structural failure of a dam bridge, or other critical asset			
Sonvice discustion	Electricity outcore, water supply disruption, and similar insidents			
Gas flare or gas explosion	Indition of looking LPC ass			
Organisational chorteomings	Ignition of leaking LFO gas			
	Limited community human and financial resources			
	Deeple can leave the town, or become chronically or terminally ill retire, etc.			
Loss of Key resources	Febple can leave the town, of become chronically of terminally in, fetne, etc.			
risks/ failure to act	to a decision to act inappropriately in response to a threat			
Inside rulans/protocols for	Inadequate plans and procedures (or improper implementation) to deal with			
	emergencies including crowd management event management venue			
errors deliberate non-compliance	management site safety evacuations and other factors affecting incidents			
Inadequate training/	Failure to educate neonle on the nature of risks they face and the needed			
communication	response to an emergency			
Human Error				
Preventable structure fire	Structure fire caused by cooking electrical heating etc			
Industrial accident	Large-scale accident arising from husiness/ service activities			
Hazardous materials release	Chemical or toxic waste spill or other industrial pollution			
Transport incident	Accident involving an beliconter, aircraft large road vehicle, or similar			
Structure fire (house, husiness)	Accidental destruction of house or husiness (outside hushfire/ conflagration)			
Service station fire/ evplosion	Ignition of fuel at the service station (may also be due to technical failure)			
Terrorism/ extremism/ sebetage	Romhing evolution shooting poisoning of water supply and similar acts			
Social uprest/ sivil disturbance	A mass act of civil disobodience (domonstration, rist, etc.)			
	A mass act of civil disobedience (demonstration, not, etc.)			
	An electronic assault against one or more computers or networks.			
	Deliberate destruction, damage, or delacing of an asset of service			
	Chealing accept including metagonalized or the environment by setting a fire			
Ineit	j stearing assets including motor vehicles, shop lifting, and similar events.			

# 3 Risk Analysis

# 3.1 Approach

The approach used to assess risks in this document is to look at the threats listed in Table 1, apply them to the portfolio of assets/services listed in 2.3, and to

- estimate the Threat Likelihood (see Table 5 in Appendix A),
- estimate the Threat Consequence (see Table 6 in Appendix A),
- provide a justification for these assessments,
- calculate the Risk Rating (see Table 7 in Appendix A), and
- determine the priority for risk mitigation (see Table 8 in Appendix A.)

The acceptable Risk Rating (where the risk cannot be eliminated) is assumed to be Low i.e. only risks with a Risk Rating greater than Low require further action.

The bigger the gap between the assessed risk and the acceptable risk, the higher the priority for action i.e. risks rated Critical or High should be the primary focus of attention.

### 3.1.1 Threat Likelihood Estimations

Some guidelines for the estimation of threat likelihoods, in the absence of mitigations/controls, are given below.

- Human error is unavoidable, even with people that take care in their work. Even with additional checking and auditing, human error is at a minimum Likely.
- Deliberate acts such as taking a less safe short-cut for reasons of convenience when a safer but more time-consuming alternative is available, is assessed as Likely.
- The threat to health and safety from visitors or tourists who ignore (or are unaware of) emergency requirements, is assessed as at least Likely.

### 3.1.2 Threat Consequence Estimations

Some general guidelines used to estimate threat consequences are:

- The consequence of an incident should be assessed on a 'worst case' basis rather than an average basis.
- There are very few events that would have an Extreme consequence, and the most severe outcome in most cases will be Major.

# 3.2 Natural Hazards

### 3.2.1 Earthquake

Over the years there have been many earthquakes in and around Halls Gap (see coloured circles in Figure 45.) The event frequency is assessed as Almost Certain.

As shown in Table 2, the worst earthquake to date measured 3.8 on the Richter scale. Earthquakes in the range 3.0–3.9 are classified as minor i.e. felt by many people, but creating no damage. (Some unstable items on shelves in stores may fall and be damaged.) The threat consequence has been assessed as Negligible.

The resulting risk rating is Medium.

(The possible effect of an earthquake on the Lake Bellfield dam wall is assessed separately in section 3.3.4.)

Date / time UTC	I	Mag	Depth	Details
01 Jun 2011 03:29	I	3.8	2km / 1.2mi	8.2 km S of Mirranatwa, Southern Grampians
14 Jan 2021 20:58	T	3.5	11km / 6.8mi	3.9 km N of Glenorchy, Northern Grampians
25 Jun 1985 21:55	I	3.3	33km / 21mi	48 km S of Horsham
16 Jan 2021 18:35	I	3.2	1.7km / 1.1mi	22 km N of Stawell, Northern Grampians
30 Mar 2013 13:22	T	2.8	11km / 6.8mi	Pomonal, 20 km SW of Stawell, Northern Grampians
22 Jul 2018 12:28	T	2.7	10km / 6.2mi	2.2 km NE of Lake Bolac, Ararat
30 Mar 2013 13:22	I	2.7	6km / 3.7mi	Southern Grampians, 41 km W of Ararat
16 Mar 2015 16:03	T	2.4	10km / 6.2mi	4.1 km SE of Wickliffe, Ararat
25 Jan 2021 20:51	T	2.3	9km / 5.6mi	Horsham Rural City, 55 km SW of Horsham
16 Sep 2014 11:09	T	2.3	unknown	53 km NE of Hamilton, Southern Grampians

 Table 2: The 10 Largest Quakes Close to Halls Gap Since 1900

Source: https://www.volcanodiscovery.com/place/325671/earthquakes/halls-gap/largest.html



Figure 45: Earthquakes Near Halls Gap

Source: https://www.volcanodiscovery.com/place/325671/earthquakes/halls-gap/largest.html

#### 3.2.2 Mass Movement (Wet and Dry)

Halls Gap is in an area which is highly susceptible to rock falls and landslides. Significant landslides are known to have occurred in 1916, 1934, 1939, 1970 and 2011. Evidence of past rock falls and landslides can be seen from the fresh rock surfaces which are visible along the escarpment facing the town and the large boulders which can be found some distance away from the escarpment (e.g. along High Road.)

In 2011, after 280 mm of rain had fallen in three days, about 170-190 landslips were identified in the Grampians National Park. The longest was almost three kilometres, the widest, about 200 metres. As shown in Figure 46, landslides adversely impacted Grampians Road.



Given the frequency of such events, the threat likelihood is assessed as Unlikely.

Figure 46: Impact of 2011 Landslides

Source: http://www.gndr.org.au/gndr\_map.php?agreement=Agree+and+Continue

The consequence of the 2011 landslides was severely restricted access to some areas. While mud and rocks affected private land, only three homes and two cars were reportedly damaged. No lives were lost. Some businesses were negatively financially impacted. The threat consequence is therefore assessed as Moderate.

The resulting risk rating is Medium.

### 3.2.3 Flood and Flash Floods

The steep sides of the Fyans Valley contribute to rapid runoff and flash flooding. Significant floods occurred in the town in 1906, 1909, 1910, 1915, 1917, 1939, 1946, 1953, 1956, 1992, 1996, 2003, 2005, 2010 and 2011<sup>7</sup>. The threat likelihood is assessed as Likely.

<sup>&</sup>lt;sup>7</sup> SES, Halls Gap Local flood and landslide guide

A 2017 model combining inflows from Fyans Creek, Stony Creek and valley gullies showed significant potential flooding (Figure 47<sup>8</sup>.) In this scenario, the ambulance, fire and police stations would be flooded, as would the shops/stores, Centenary Hall and Visitor Centre and many other personal/business assets. Most sewage pump stations would be flooded, potentially releasing human pathogens into the water.



Figure 47: Potential Extent of Future Flooding (Probable Maximum Flood)

Source: See footnote 8

If Lake Bellfield had been closer to its Maximum Operating Level (e.g. as occurred in January 2012 and 2013) the 2011 storm would have caused the spillway lip to be overtopped (see Figure 48), resulting in significant uncontrolled water flows into the valley i.e. the flood hazard would have been much worse. Coordination of any cone valve water release aimed at preventing spillway flows would be crucial for flood control, as demonstrated by the problems with the Wivenhoe dam in Queensland<sup>9</sup>.

<sup>&</sup>lt;sup>8</sup> Water Technology (2017) Review of Halls Gap Flood Investigation – Final Report

<sup>&</sup>lt;sup>9</sup> Calligeros M., (2011) "Wivenhoe Dam release caused Brisbane flood: report" *Sydney Morning Herald*, 11 March



#### Figure 48: Impact of 2011 Storm on Lake Bellfield Levels

Lake Bellfield subsequently spilled during the period October-December 2022 (see Figure 6.)

The 2011 floods resulted in landslips (see section 3.2.2) and serious damage to tourist attractions, roads and walking tracks all of which were closed for some time after the flood. In the town, 8 shops, 3 motels, 3 caravan parks, and 14 houses were directly impacted, and businesses were negatively economically affected. No lives were lost, although the potential for loss of life existed. The NGSC *Northern Grampians Shire Flood Emergency Plan* projects that a 1 in a 100-year flood would adversely impact 71 properties in Halls Gap. The threat consequence is therefore assessed as Moderate-Major.

The resulting risk rating in either case is High.

#### 3.2.4 Severe Storm, Extreme Rain, Tornado, Lightning

The SES reports the following<sup>10</sup>: Severe storms include violent storms with thunder and lightning, often accompanied by rain and sometimes hail (hailstones with a diameter of 2cm or more), gale force winds (between 52km/h and 102km/h) or greater, and tornadoes. Historic examples include 5cm hail stones in Halls Gap in 1997, the tornado at Lake Fyans in the same year, and the storm which generated the flash floods described above in 2011.

Bureau of Meteorology data for the Grampians region from 2000 to 2010<sup>9</sup> show that hail, heavy rain, severe wind, and tornado events are common (Figure 49.) On average, the region experiences at least one large storm event every year. Lighting events occur many times a year. The threat likelihood is therefore Almost Certain.

The threat consequence is assessed by the SES as potentially including loss of life or serious injury; damage to or loss of key infrastructure such as roads; loss of essential services such as power, water, sewerage, and telecommunications; loss of personal/business property; damage to the environment; significant community disruption; and isolation of properties and/or communities. Lightning strikes have caused many bushfires (see 3.2.7.) The threat consequence is assessed as Major.

The resulting risk rating is Critical.

<sup>&</sup>lt;sup>10</sup> SES (2020) *Mid-West (Grampians) Region Emergency Response Plan*, March



#### Figure 49: Storm Events in the Grampians Region, 2000 to 2010

#### 3.2.5 Extreme Temperatures

Widespread heat waves occurred in Victoria (mainly in January) in at least 1939, 1981, 2001, 2009, 2014 and 2019. As shown in Figure 50, the frequency of extreme heat events in Australia is increasing. The threat likelihood is assessed as Likely.



Figure 50: Frequency of Extreme Heat Events

Source: https://environmentvictoria.org.au/our-campaigns/safe-climate/victoria-heatwaves-climate-change/

A heat wave can kill if a body is pushed too far beyond its limits e.g. through overexposure to heat or over-exercise for the person's age and physical condition. Older adults, young children, and those who are sick or overweight are more at risk. (In 2021, Halls Gap had 22 permanent residents under the age of 5, and 20 over the age of 80.) Deaths reported in Victoria as a result of a heatwave were 374 in 2009, and 167 in 2014<sup>11</sup>. Extreme heat can also adversely impact power supplies, roads, and other infrastructure, and can exacerbate drought and bushfire conditions. Firefighting aircraft may be grounded. The risk consequence is assessed as Major.

The resulting risk rating is High.

#### 3.2.6 Drought

Records from the Bureau of Meteorology show that a severe drought has occurred in Australia on average once every 18 years since the 1860s<sup>12</sup>. The threat likelihood is therefore assessed as Rare.

Wikipedia<sup>13</sup> states that the most recent Millennium Drought commenced with low rainfall conditions in late 1996 and worsened through 2001 and 2002. By 2003 it was recognised as the worst drought on record, and conditions remained hot and dry through to 2010 when it ended.

The drought placed extreme pressure on water supplies in much of southern Australia, including on the supplies managed by GWM Water. Lake Bellfield remained at a level of less than 20 GL for much of this period (Figure 51) but water continued to be supplied to the town.

The threat consequence has been assessed as Moderate due to the potential need for water carting.

The resulting risk rating is nevertheless Low.

#### Figure 51: Example Lake Bellfield Water Levels During the Millennium Drought



#### 3.2.7 Bushfire

Many parts of Halls Gap are designated bushfire prone areas. Halls Gap as a whole has been assessed by the CFA to have an EXTREME bushfire risk.

<sup>&</sup>lt;sup>11</sup> Health Victoria, *Research and reports - extreme heat and heatwaves*, https://www2.health.vic.gov.au/public-health/environmental-health/climate-weatherand-public-health/heatwaves-and-extreme-heat/heatwave-research

<sup>&</sup>lt;sup>12</sup> Anderson D. (2014), Endurance, CSIRO Publishing

<sup>&</sup>lt;sup>13</sup> Wikipedia (2021) *2000s Australian drought*, https://en.wikipedia.org/wiki/2000s\_Australian\_drought

The adjacent national park has a history of major bushfires including in 1923, 1939 (Black Friday), 1958, 1960, 1983, 1985, 1986, 1988, 1989, 1990, 1992, 1994, and 1999. More recently, in 2006 fire burned 49% of the park, in 2013 fire burned 15% of the park (largely in Victoria Valley), in 2014 fire burned 23% of the park, and in 2024 a fire started in the park near Pomonal and burned over 2200 Ha, much of it outside the park (see Figure 55.) Over the years, many readily controlled small fires have occurred nearby - see example of 4 bushfires on 21/12/2019 in Figure 52.



Figure 52: Example of Smaller Fires

Source: https://emergency.vic.gov.au

Overall, the threat likelihood is assessed as Possible.

The 2006 fire killed two people, destroyed 41 homes, and threatened Halls Gap, coming as close as 200m away from High Road (see Figure 53.)



Figure 53: Proximity of 2006 Fire

https://www.ffm.vic.gov.au/\_\_data/assets/pdf\_file/0014/20264/Mt\_Lubra\_Media\_revised\_3.10.2006v2.pdf

The 2014 fire killed one person, destroyed about 30 homes, and reached as close as Boroka Lookout (see Figure 54) i.e. about 2.5 km from Halls Gap.



Figure 54: Proximity of 2014 Fire

The 2024 fire reportedly destroyed 44 homes in Pomonal, and reached as close as five kilometres from Halls Gap (see Figure 55.)

Source: Northern Grampians Fire Recovery Update, 31 March 2015

#### Figure 55: Proximity of 2024 Fire



Source: Map from https://emergency.vic.gov.au, photo from FFMVic

Overall the threat consequence is assessed as Major-Extreme.

The resulting risk rating in either case is High.

#### 3.2.8 Urban Conflagration

Most homes in bushfire prone areas are not defendable on Catastrophic days, regardless of the facilities installed, or the preparation completed beforehand. Urban conflagrations in rural Victorian towns have occurred in the past. For example in 2009 (Black Saturday) bushfire swept through Kinglake and Kinglake West, with 38 people confirmed dead and more than 500 homes destroyed. Similarly, Marysville was devastated by the Murrindindi Mill bushfire. The official death toll was 45, and around 90% of the town's buildings were destroyed. While not really comparable, Roses Gap has only 3 permanent residents, but in the 2014 Grampians fire, 4 buildings were lost and 1 person died.

An urban conflagration triggered by a bushfire could occur in Halls Gap. For example, if a bushfire on a Catastrophic day approached from the North down the west side of Mt Zero Road, the entire block of dwellings through to the sports oval, including the Medical Centre, could be destroyed.

The likelihood of an urban conflagration is less than that of a bushfire, as not all bushfires lead to conflagrations. The threat likelihood is assessed as Rare.

If the Police Station, Fire Station, Ambulance Station or PV works depots were destroyed as part of the conflagration, the effectiveness of the response to the fire may be reduced and the threat consequences could be even greater. Given the potential loss of life, the threat consequence is assessed as Extreme.

The resulting risk rating is High.

### 3.2.9 Epidemic/Pandemic

Disease pandemics have been common throughout history, including cholera, influenza, typhus, smallpox, measles, tuberculosis, leprosy, malaria, yellow fever and HIV/AIDS. While many of these diseases have been successfully controlled, flu is more problematic because it rapidly mutates. Pandemics include the Spanish flu (1918–19), Asian flu (1957–58); Hong Kong flu (1968), and Russian flu (1977–1979). Beyond this, coronavirus infections include about 15% of all cases of the common cold, and coronavirus pandemics have also become common e.g., SARS (2002), MERS (2012) and COVID-19 (2019.) In the absence of a lockdown, the influx of up to 10,000 visitors/tourists during peak periods makes the town vulnerable to external sources of infection. The threat likelihood is Unlikely.

Pandemics can cause significant, widespread illness, and in some cases death. Halls Gap is a relatively isolated town and in the COVID-19 case a few residents served a self-isolation period, with no permanent health effects. Pandemics can also cause economic damage and undermine economic growth. Businesses in the town were certainly adversely affected economically by COVID-19 restrictions. The NGSC has a sub-plan of the *Municipal Emergency Management Plan* targeted at an influenza pandemic but its effectiveness is unknown.

The overall threat consequence is assessed as Moderate-Major.

The risk rating in either case is Medium.

#### 3.2.10 Blue Green Algae

Blue-green algae are a natural component of most aquatic systems, including streams and lakes. When numbers of bacteria increase rapidly, blooms or scums become visible on the water surface. Some forms of blue-green algae are toxic.

The author is unaware of any algae incidents at Lake Bellfield, and internet searches did not reveal any such incidents. They have occurred in other nearby water resources e.g. Lake Lonsdale. The threat likelihood is rated as Rare.

High levels of blue-green algae in water can be toxic to humans i.e. major blooms can involve substantial risk of serious injury or death. DELWP<sup>14</sup> states that for Halls Gap: Alternative water supply options are limited; residents will be required to cease using water, and the water treatment plant will have to isolate its supply from Lake Bellfield; water will need to be carted in to the town; but it may be possible to establish emergency powder activated carbon (PAC) dosing at the water treatment plant. The threat consequence is rated (at a worst case) as Major.

The resulting risk rating is Medium.

#### 3.2.11 Pest/Animal Infestation

Pest/animal infestations include foxes, goats, deer, rabbits, and feral cats. Insect infestations can also occur e.g. the locust plagues in 2010-2011.

While the town has officially been a cat-free zone since 1993, feral cats are still being identified e.g. see the posting by the Friends of Grampians Gariwerd (FOGG) in 2009<sup>15</sup>. Similarly, while PV has run an ongoing program to trap and shoot feral deer and goats, they have continued to persist e.g. herds of about 15 animals, both of deer and goats, were identified in 2021 in the paddocks behind Brambuk. Rabbits have been identified on multiple occasions in 2021 by walkers in and around the town. Overall, the threat likelihood is Almost Certain.

Feral cats and foxes predate on birds and small mammals in the park. Feral goats and deer can have a significant effect on native vegetation through soil damage and overgrazing, which can in turn cause erosion and prevent regeneration of native species. These impacts can negatively affect the amenity of the national park. Deer/goats can also adversely affect gardens, particularly on the fringes of the town. Feral animals are unlikely to attack humans unless threatened under conditions where they cannot readily escape. While locusts adversely impact on crops and gardens, they have historically had little impact on tourism<sup>16</sup>. Overall, the threat consequence for the town itself is assessed as Negligible.

The resulting risk rating is Medium.

<sup>&</sup>lt;sup>14</sup> DELWP, Wimmera–Mallee Water Resource Plan,

https://www.water.vic.gov.au/\_\_data/assets/pdf\_file/0018/420534/Wimmera-Mallee-WRP-Part-9.pdf

<sup>&</sup>lt;sup>15</sup> Cats (2009) <u>http://friendsofgrampiansgariwerd.org.au/2009/01/cats/</u>

<sup>&</sup>lt;sup>16</sup> ABC News (2011) "Locusts fail to deter Grampians tourists", 4 Feb, <u>https://www.abc.net.au/news/2011-02-04/locusts-fail-to-deter-grampians-tourists/1930150</u>

### 3.2.12 Weed Infestation

Weed infestations are common in the national park near the town, and in the town itself e.g. see *Halls Gap Weed Species*<sup>17</sup>, the FOGG reports of the spread of Sallow wattle south along Mt Zero road and the spread of South African weed orchids in both the Victoria and Mt Difficult range, and the recent Project Platypus project on kunzia. The threat likelihood is assessed as Almost Certain.

Heavy weed infestations can restrict human access, increase fire hazards, crowd out native plants, and reduce the amenity of the national park. However, the threat consequence for the town itself is assessed as Negligible.

The resulting risk rating is Medium.

## 3.3 Human-Made Hazards

#### 3.3.1 Failure of Delleys Bridge

Delleys Bridge does not appear to have a VicRoads condition rating. A physical inspection identified some very minor cracking, efflorescence and spalling (Figure 56) but no serious issues. The threat likelihood of failure is assessed as Rare.



#### Figure 56: Delleys Bridge Defects

Cracking and efflorescence

Efflorescence

Spalling

Given the height of the bridge (about 9m) and the fact that it is in a 60km/hr zone, a catastrophic failure when traffic was passing over it could lead to serious injury or death. Access to the town centre from the North will be affected, although there is a steep track and concrete floodway about 100m North of the bridge, and the Red Gum Lease Track (unsealed, single lane) could provide limited alternative access. Overall the threat consequence is assessed as Major.

The resulting risk rating is Medium.

### 3.3.2 Failure of Grampians Road Stony Creek Bridge

VicRoads rates bridges according to their condition. In general, bridges that are free of defects affecting structural performance, integrity and durability will have a condition rating of <30. Structures with a rating of 30 to 60 are deemed to have defects that could affect serviceability/durability. The Grampians Road Stony Creek Bridge has a rating of 29, which is marginal. A physical inspection identified problems of waterwash, spalling, cracking and efflorescence (Figure 57.)

<sup>&</sup>lt;sup>17</sup> https://42gzear11a731my7i1ryfi0m-wpengine.netdna-ssl.com/wpcontent/uploads/sites/79/2017/03/Halls-Gap-Weed-Species.pdf



#### Figure 57: Grampians Road Stony Creek Bridge Defects

Waterwash

Spalling

Cracking and efflorescence

The bridge is believed to have been built in 1956 so has existed for 65 years, but ongoing deterioration of its condition may affect the future likelihood of failure. Transport loads have increased since it was built (e.g. truck rear axle loads can now be as high as 22.5 tonnes.) The condition of the Stony Creek bridge was referred to VicRoads. In response the Department of Transport stated they perform a Level 1 inspection of the bridge every 6 months, and they are comfortable that it is currently structurally sound and not a concern. The threat likelihood is rated as Rare.

Given the low height of the bridge (about 3.5m) and the fact that it is in a 40km/hr speed zone, a catastrophic failure of the bridge when traffic was passing over it is assumed to lead to serious injury but not death. Alternative access is available using the School Road Bridge. The threat consequence is assessed as Moderate.

The resulting risk rating is Medium.

#### 3.3.3 Failure of the School Road Stony Creek Bridge

The School Road Stony Creek bridge is relatively new. A physical inspection identified no obvious defects. The threat likelihood is assessed as Rare.

Given the low height of the bridge (about 3m) and the fact that it is in a 40km/hr speed zone, a catastrophic failure of the bridge when traffic was passing over it is assumed to lead to serious injury but not death. Alternative access is available using the Grampians Road Bridge. The threat consequence is Moderate.

The resulting risk rating is Low.



Figure 58: School Road Stony Creek Bridge

#### 3.3.4 Failure of Lake Bellfield Dam Wall

The probability of the Lake Bellfield dam failing is estimated by GWMWater to be 1 in 590,000 i.e. it is very low, but not zero. More broadly:

- In 1992 the NSW Dams Safety Committee identified fifteen dams with "serious deficiencies" and at some risk of failure<sup>18</sup>
- Some dam failures have only been avoided by lowering the water levels e.g.
   the Torquay irrigation dam in 2020 in which six fire pumps operated to remove about half of the water in the dam<sup>19</sup>, and
  - the Queensland Paradise/Burnett River dam, where water levels were lowered to 42% of capacity.

Dam wall failure could occur in a number of ways. For example

- erosion of the earthen core or soil foundations, including piping, where erosion leads to the formation of a pipe which leads to a breach of the wall,
- geotechnical slope instability of the embankment,
- seismic failure e.g. from an earthquake (see section 3.2.1) or
- terrorism (see section 3.3.21.)

Prolonged exposure to dry weather. as occurred with the Millennium Drought which lasted through to 2010 (see 3.2.6) can cause ground shrinkage and movement in dam foundations. When drought is followed by flooding, as was experienced in January 2011 (see 3.2.3), this can result in increased seepage through cracks, joints and other defects that may have developed during the period of drought.

Studies by the Rural Water Corporation in the early1990s deemed the Lake Bellfield spillway inadequate. Its flood capacity was later determined to be about 40% of the Probable Maximum Flood (PMF.) This meant that overtopping of the dam wall itself would occur which would likely lead to the failure of the dam wall. In 2002, the wall height was raised by a metre, a 0.9m concrete parapet was built along the top of the raised wall, and the spillway channel was deepened by 3.4 metres. This implies heavier spillway outflows, with consequences for any downstream flooding.

As the dam wall was upgraded in 2002, and GWMWater has an ongoing extensive monitoring and inspection program for the dam wall, the threat likelihood is rated as Rare.

The fact that Halls Gap is immediately downstream of the dam wall means that the ANCOLD hazard impact is rated as Extreme i.e. a Population at Risk (PAR) of >1,000 people and catastrophic damage and loss to the community. The threat consequence for this assessment is also assessed as Extreme.

The resulting risk rating is High.

#### 3.3.5 Failure of Halls Gap Reservoir

As per the assessment of the Lake Bellfield dam wall above, the threat likelihood is rated as Rare.

<sup>&</sup>lt;sup>18</sup> Keys C., (1992) "Preparing for Dam-Failure Flooding: The Development of Special Emergency Plans in New South Wales" ANCOLD Bulletin, Issue 90, pp. 15-24.

<sup>&</sup>lt;sup>19</sup> McMillan A. and Sakkal P. (2020) "Potential catastrophic failure: Torquay residents face night away from home over dam threat", *The Age*, October 3

Silverband Road is immediately downstream of the dam wall, and it would be flooded if the dam failed. Grampians Road could be cut as the released water travels down Dairy Creek. Any tourist traffic on either road may be impacted, and in a worst case a fatality by drowning could occur. Access to Silverband Falls from the east would be blocked. The threat consequence is rated as Major.

The resulting risk rating is Medium.

#### Failure of the Water Treatment Plant 3.3.6

Research in 2015 into failures of water treatment plants in developed countries globally found one failure of treatment (i.e. coagulation, flocculation, sedimentation and filtration) in Australia in the 10 years between 2003 and 2013<sup>20</sup>. The Halls Gap plant has operated for over 20 years without any major failures. The threat likelihood is therefore assessed as Rare.

The fire plug network is dependent on water pumped from the plant, so a prolonged failure of the plant could result in the effective failure of the fireplug network (see 3.3.9.)

Other consequences will depend on the severity of the failure and the time taken to fix it. The water already in the clear water tank would provide a buffer for any plant downtime. In a worst-case water carting may be needed. The threat consequence has been assessed as Moderate.

The resulting risk rating is Low.

#### 3.3.7 Failure of the Clear Water Tank

As shown in Figure 59 physical inspection of the clear water tank identified examples of

- extensive cracks, some of which had been repaired and others that had not,
- efflorescence below many cracks, suggesting a possible alkali-aggregate reaction and deterioration of the concrete, and
- some unrepaired surface defects which may indicate deeper problems.

TRILITY has advised that the clear water storage is routinely inspected (6 monthly) externally as part of its on-going maintenance schedule. The tank has an internal membrane that ensures no leaking can occur, minimizing the risks of loss of supply. Any staining or corrosion is from weather conditions on the outside of the tank.



Repaired cracks





Unrepaired cracks, efflorescence

Surface defects

<sup>&</sup>lt;sup>20</sup> Onyango L., Quinn C., Tng K., Wood J., Leslie G. (2015) "A Study of Failure Events in Drinking Water Systems as a Basis for Comparison and Evaluation of the Efficacy of Potable Reuse Schemes", Environ Health Insights, no.9 pp.11-18 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4818024/

Internal inspections and cleaning are conducted on a 5 yearly basis with the formal reports and video footage stored in TRILITY's maintenance system. The internal water level (volume) is continuously monitored with level alarms, which have backup power, and the alarms which are linked to a remote operator on a constant basis. The tank has existed for over 20 years, and the internal membrane reduces the risk of supply failure. The threat likelihood of tank failure has been assessed as Rare.

The consequence will depend on the severity of the failure, a leak is unlikely due to the internal membrane. A catastrophic failure could release up to 2 ML on to the Grampians Road and up to a dozen houses in the Bellfield Settlement. Water carting may be required. The threat consequence has been assessed as Moderate.

The resulting risk rating in either case is Low.

#### 3.3.8 Failure of Sewers or the Sewage/Wastewater Treatment Plant

Possible failure of the sewers and sewage treatment plant could occur from

- hydraulic or organic overload (more sewage than the plant can handle),
- failure or blockage of sewerage pipes feeding the plant, or failure of a sewage pumping station, either of which may result in backflow of sewage in the system, or
- introduction of chemicals or antibiotics that kill bacteria or otherwise disrupt biological processes in the treatment plant.

Organic overload is unlikely as peak holiday demand uses only about 60% of the plant's capacity (see section 2.3.3.14.) In the past excessive rain (hydraulic overload) has forced GWM Water to discharge treated water into Back Creek. Sewerage pipes were washed away during the 2011 floods (see section 3.2.3) but were readily repaired. During the period 2010-2013 there were 9 sewer blockages and 5 sewage spills<sup>21</sup>, but none had a serious impact. No instance of disruption of biological processes is known. The threat likelihood is assessed as Rare.

The major consequences from the failures listed above could include:

- the temporary inability to use toilets in the town, requiring sourcing of alternative options like pit, bucket, chemical, portable or septic toilets,
- downstream water bodies may be contaminated with human pathogens,
- surface water and groundwater may become polluted causing harm to aquatic fauna and indigenous vegetation, and
- the amenity of the area around the treatment plant or sewage spill may be degraded by unacceptable smells, and unsightly discharges or seepage.

The threat consequence for the town itself would probably be Minor.

The resulting risk rating is Low.

#### 3.3.9 Failure of the Fire Plug (FP) Network

The fire plug (FP) network could fail to deliver the expected water flow and pressure due to a progressive loss of pressure in the network (e.g. due to leaks, or excessive use by many parties during an urban conflagration) or due to a burst main in the network itself, or similar events. For example,

<sup>&</sup>lt;sup>21</sup> GWM Water (2014) Section 53V Environmental Audit - Sewerage System Management Plan, S/O 8004161, CARMS No. 66901-2, June

- a 60-metre section of a large trunk water main between Brambuk and the water treatment plant was washed out by the floods in 2011<sup>22</sup>, and
- during the 2014 fires, residents who stayed to defend their properties did not have access to water as there was no backup power for the water treatment plant, and the clear water tank couldn't be filled to maintain water pressure<sup>23</sup>.

A 2022 audit of the FP network found that over 60% of the FPs were silted up, making the FPs unusable until the silt is cleared out. Effectively the network has already failed (at least temporarily until the silt is removed.)

The threat likelihood is assessed as Possible.

The threat consequence will depend on the timing of the failure, but in a worst case it would be during a bushfire or urban conflagration (as occurred in the example above.) The lack of water to defend life and property could lead to death and/or a significant loss of dwellings. The threat consequence is assessed as Major.

The resulting risk rating is High.

#### 3.3.10 Failure of Telecommunication Towers/ Coverage

Failure of telecommunications towers/ coverage could result from a number of causes such as inadequate infrastructure coverage, technical faults, excessively high winds (see section 3.2.4), fire (see section 3.2.7), terrorism (see section 3.3.21) or simply too great a demand on the networks. For example,

- there are permanent intermittent mobile 'black spots' in and around the town, and capacity problems even for areas of good coverage during peak periods,
- TRILITY and GWMWater experience difficulties in remotely monitoring instruments for the treatment plant, clear water tank, and Lake Bellfield dam during peak tourist periods when the demand on the network is high,
- a hardware fault created a two-day outage for mobiles in Halls Gap in 2019,
- the 2QN Tower in Deniliquin collapsed in 2009 during a severe storm, and
- over 100 mobile phone towers were impacted by the 2019-20 bushfires in Victoria and NSW, mostly due to insufficient backup power at the towers.

Overall, the threat likelihood of a major outage has been assessed as Rare, while the threat likelihood of reduced network access is assessed as Likely.

The consequences of a major outage could include a total loss of cell phone coverage (including the potential loss of medical alert services with an associated risk to life), loss of monitoring of the Water Treatment Plant, of the Clear Water Tank, and Bellfield Dam, a loss of banking/ finance services, and a loss of TV reception (Mt William Tower.) In a worst-case injury or death caused by the falling tower (the towers at the sports oval are next to the Clematis Falls and Chautauqua Peak walking trail.) The worst-case threat consequence of a major outage has therefore been assessed as Major. The threat consequence of reduced network access is assessed as Minor.

The resulting risk rating in either case is Medium.

 $<sup>^{\</sup>rm 22}$  King C., (2011) "Burst sewerage and water mains leave Halls Gap and Pomonal without water", ABC Local,

https://www.abc.net.au/local/stories/2011/01/14/3113202.htm#:~:text=A%2060%20 metre%20section%20of,reticulation%20system%20until%20further%20notice.

<sup>&</sup>lt;sup>23</sup> Schetzer A., and Dow A (2014) "Halls Gap residents begin evacuation as fire approaches" *The Age*, Jan 17, https://www.theage.com.au/national/victoria/halls-gap-residents-begin-evacuation-as-fire-approaches-20140117-30yso.html

The destruction of the Telstra Exchange could also have threat consequences, but the services it supports are unknown and its risks have not been rated.

#### 3.3.11 Long Term Disruption to Water Supply

Natural disasters in past years, such as the Mt Lubra fires in 2006 and the floods of January 2011 have affected water quality, turbidity and the colour of water at Lake Bellfield<sup>24</sup>, but the disruption to the water supply has not been long term. Long term disruption of the water supply is assessed as Unlikely.

The consequence may be a requirement for water carting i.e. a Moderate impact.

The risk rating would be Medium.

#### 3.3.12 Long Term Disruption to Electricity Supply

Historically, significant power outages have occurred in Victoria as a result of events such as bushfires, storms/strong winds, and record heatwaves. However few outages in Halls Gap have lasted longer than 24 hours. The threat likelihood of long-term power disruptions is therefore assessed as Rare.

Long term disruption of the electricity supply could

- disrupt the town water supply, telecommunications, and community communication channels,
- close retail businesses e.g. the general store, the service station, the ATM,
- cause spoilage of food/perishables,
- prevent the use of medical devices, including those supporting home emergency alerts, in a worst case leading to loss of life, and
- potentially adversely impact on visitor/tourist numbers, and the town economy.

The threat consequence is therefore assessed, in a worst case, as Major.

The resulting risk rating is Medium.

#### 3.3.13 Gas Flare or Explosion

In general, if gas tanks are exposed to excessive temperatures, a safety relief valve will operate, releasing gas into the air<sup>25</sup>. In the presence of a bushfire, either a burning gas flare, or an explosion of the accumulated gas could result. (LPG gas cylinders themselves do not explode easily or often.)

The event frequency of an individual safety valve gas release during a bushfire is assessed as Unlikely. The threat likelihood of major damage to the community as a result of multiple gas flares or explosions is assessed as Rare.

As the impact of a single/dual gas tank is limited, the threat consequence has been assessed as Minor-Moderate.

In either case, the resulting risk rating is Low.

#### 3.3.14 Inadequate Human Resources or Loss of Key Human Resources

With only 350 people between 15 and 70 years old, the town has limited human resources to call on. Of the 350, about 150 were fully employed and therefore less available for other roles.

<sup>&</sup>lt;sup>24</sup> GWM Water (2021) *Lake Bellfield*, https://www.gwmwater.org.au/using-lakes-and-reservoirs/our-reservoirs/lake-bellfield

<sup>&</sup>lt;sup>25</sup> Elgas (2019) *LPG Gas Bottles in the Sun - Can a Propane Tank Explode in the Sun: High Temperatures*, https://www.elgas.com.au/blog/479-gas-bottles-in-the-sun

Most community support people are volunteers. (In 2021, 102 residents had performed voluntary work through an organisation or group in the previous 12 months.) Some volunteers are relied upon too heavily, and are looking to step back, but are finding it difficult to identify replacements. Very few are looking to take on additional community responsibilities. The event frequency of inadequate numbers of emergency response volunteers is assessed as Almost Certain, as some turnover occurs every year. The likelihood of an adverse impact from the loss of capacity, or loss of knowledge of the town and its hazards and risks, is assessed as Rare, as generally there are sufficient people in a response group to provide a basic service, and training is conducted regularly. The threat consequence has been assessed as Major, as a failure to adequately respond to an emergency could lead in a worst case to a fatality.

The resulting risk rating is Medium.

#### 3.3.15 Inadequate Understanding of Risks/ Failure to Act

Whilst somewhat outdated, a 2003 survey of fire risks<sup>26</sup> involving both Halls Gap accommodation providers and overnight tourists revealed some serious concerns:

- Most visitors/tourists were unaware of bushfire risks.
- The majority of tourists would still travel to Halls Gap on a day of total fire ban.

A similar lack of understanding can be assumed to exist for other emergencies e.g. severe storms and floods. The likelihood of inadequate understanding or risks is therefore Almost Certain.

The lack of understanding of a risk may lead to either a failure to act or to inappropriate actions in the face of the risk. The consequence of non-action or inappropriate action during a bushfire on a Catastrophic day, or a severe storm or flood, could be fatal. The worst-case consequence is therefore Major-Extreme.

The risk rating in either case is Critical.

#### 3.3.16 Inadequate Plans/ Protocols for Managing Emergencies, Implementation Errors, Deliberate Non-Compliance

The survey described above found that

- 70% of accommodation providers believed that Halls Gap was inadequately prepared for a bushfire as a result of a shortage of firefighting resources, limited evacuation routes and perceived excessive fuel loads.
- Absentee landlord accommodation providers often had no emergency plans.
- A significant number of accommodation providers indicated they would not be confident advising guests in a bushfire.
- Accommodation providers see the CFA as their main support and they expect assistance during a bushfire event. However, the local CFA is limited in its firefighting capacity and unlikely to be able to assist individual accommodation providers during a bushfire.
- There does not appear to be an emergency plan for the town as a whole, with particular attention to issues surrounding evacuation.

The same sorts of problems can be assumed to exist for other emergencies e.g. severe storm or flood. Response plans are unknown for many other threats e.g. blue-green algal bloom, infrastructure failure, long term services disruption, terrorism/ extremism/ sabotage, social unrest/ civil disturbance, cyber-attack, etc.

<sup>&</sup>lt;sup>26</sup> Centre for Risk and Community Safety (2003) *Halls Gap Fire Risk Management Project*, August, http://royalcommission.vic.gov.au/getdoc/d6a3d683-4ea5-499c-a7fd-9cfca12f6c37/WIT.005.001.0784.pdf

Similarly there are people in the town who are formally responsible for emergency response to fire (e.g. in the CFA and FFM organisations) and these people are also responsible for response to some other events (e.g. road accidents, trees down across roads, chemical spills) but the author is unaware of any one person who is responsible for many of the remaining events listed in Table 1. (Who is the first point of call? 000? SES - 132 500? Someone in Halls Gap?)

There is no formal Halls Gap evacuation plan for any emergency. A traffic jam is a likely outcome. Access and egress are a major priority for the CFA, which attempts to ensure that Grampians Road is always free of fallen trees and branches. For those evacuating on foot at night, the lack of luminescence on the central stipe of the asphalt walking track through the town may be an issue.

While things may have improved since 2003 for fire planning, the threat likelihood of inadequate plans/ protocols, is assessed as Almost Certain.

The threat consequence of inadequate plans/ protocols, or errors in implementation of plans/ protocols, or deliberate non-compliance with plans/ protocols during a bushfire on a Catastrophic day or other serious emergency could be fatal. The worst-case threat consequence is therefore Major-Extreme.

The risk rating in either case is Critical.

#### 3.3.17 Inadequate Training/ Communication

The survey described above also revealed

- The numbers, diversity and short duration stays of most visitors increases the difficulty of effective risk communication prior to and during an emergency.
- Almost half the tourist respondents had not received any advice or educational material on what to do in a bushfire. Many who had received advice couldn't remember what it told them or indicated actions that were not appropriate.
- Tourists preferred to rely on their accommodation provider for bushfire warnings but absentee landlords were less likely to accept this responsibility.

The same sorts of communication problems can be assumed to exist for other emergencies e.g. severe storm or flood. There is only one relevant sign (Figure 60.)



Figure 60: Emergency Advice Sign

The threat likelihood of inadequate training/ communication of risks and what to do in response to these risks is assessed as Almost Certain.

The threat consequence of inadequate training/ communication/ warning during a severe emergency could be fatal. The worst-case threat consequence is therefore Major-Extreme.

The risk rating in either case is Critical.

#### 3.3.18 Industrial Accident

Industrial accidents could include

 operational errors associated with key processing plants (e.g. the town water treatment plant, the sewage/ wastewater treatment plant, the swimming pool water treatment plant, or the brewery),

- accidental fires initiated from kitchens in restaurants/cafes, or at the service station, and
- similar sorts of incidents.

The threat likelihood of human error is Likely, but the likelihood of such errors leading to serious harm to the town itself is much lower, and has been assessed as Possible.

In 2019, the 5-year average across Australia for work fatalities in the electricity, gas, water and waste services industry was 4 per year, and in the accommodation and food services industry was 2 per year<sup>27</sup>. While these figures are very low, a fatality is a possible worst-case outcome i.e. the threat consequence is Major.

The resulting risk rating is High.

#### 3.3.19 Hazardous Material Release

Hazardous substances in Halls Gap include

- Petrol and diesel fuel, which are flammable and poisonous, can cause respiratory irritation, headache, dizziness, nausea and loss of coordination if inhaled, and in high concentrations may cause loss of consciousness, cardiac sensitisation, coma and death.
- LP gas, which is extremely flammable. Over exposure may result in dizziness, drowsiness, weakness, fatigue, breathing difficulties and unconsciousness.
- Hydrated lime, which can cause irritation to the respiratory tract if inhaled, irritation of the gastrointestinal tract if ingested, dermatitis from prolonged exposure, or severe and permanent eye damage if in contact with the eyes.
- Aluminium sulphate, which can result in nausea, vomiting, diarrhoea, and gastrointestinal irritation if ingested, permanent injury to the eyes if in contact with eyes, and respiratory irritation if inhaled.
- Chlorine, which at room temperature is a toxic gas, and can causes skin irritation, serious eye damage/irritation, and at high concentrations severe corrosion to the respiratory tract and even death.

The service station underground tank storage has recently been upgraded to resolve a leak problem. However, spills during refilling the underground tanks, or during fuel delivery to vehicles, are still a risk. The conditions surrounding the delivery, storage and use of the other substances are unknown. Spills may also occur as a result of accidents associated with hazardous loads being transported through the town.

The frequency of a hazardous material release is Likely, as human error is a factor, but the likelihood of such a release leading to serious harm to the town or its people is much lower, and has been assessed as Possible.

The worst-case consequence could be as severe as a fatality (see comments above) so has been assessed as Major.

The resulting risk rating is High.

#### 3.3.20 Transport Incident

Emergency helicopters, commercial helicopters, firefighting aircraft, and large commercial road vehicles (e.g. B-doubles, buses, garbage trucks, fire trucks etc.,) all operate in or over Halls Gap, including aerial shooters operating from the PV helipad in the paddock behind Brambuk. The sports oval has also been used as a helipad on occasion.

<sup>&</sup>lt;sup>27</sup> Safe Work Australia (2019) Work-related Traumatic Injury Fatalities, Australia

The likelihood of an accident or incident involving any of these assets is assessed as Likely as human error is a factor. Improperly controlled drones are a threat to aircraft. However, the likelihood of such an incident leading to serious harm to the town itself is somewhat lower, and has been assessed as Possible.

The threat consequence is rated as Major, as loss of life is a possibility.

The resulting risk rating is High.

#### 3.3.21 Structure Fire (House or Business)

The scope of this risk does not include bushfires or urban conflagrations or industrial accident fires, all of which are covered elsewhere.

The causes of structure fires include unattended cooking; electrical faults in appliances, power boards and extension leads; flammable items that are too close to sources of heat; improper use of home heating appliances; overloaded power boards; chimney fires; and similar problems. Formal statistics for Halls Gap are not published, but based on news reports, there are 0-2 structure fires a year i.e. the threat likelihood is Likely.

In a worst case the structure will be completely destroyed, but hopefully the loss will be offset by insurance. While devastating for the owner, the impact of the loss on the community as a whole is assessed as Moderate.

The resulting risk rating is High.

#### 3.3.22 Service Station Fire or Explosion

Service station fires/ explosions are not uncommon in Australia. Examples include

- the petrol tanker explosion at a Melbourne service station in 2011<sup>28</sup>,
- the deliberate lighting of petrol at a petrol station in Perth in 2019<sup>29</sup>, and
- the accidental service station fire and a second incident in Hamilton in 2020<sup>30</sup>

While uncommon, some service station fires are caused by the discharge of static electricity from the human body, either when refuelling a vehicle, or when filling an unearthed container with fuel<sup>31</sup>.

Given the number of service stations in operation, the frequency of a fire incident at any one service station is assessed as Unlikely. The threat likelihood of an incident that resulted in significant harm to the town or its people is assessed as Rare.

People can be killed or seriously injured at a service station if petrol ignites. The threat consequence is assessed as Major.

The resulting risk rating is Medium.

#### 3.3.23 Terrorism/ Extremism/ Sabotage

Examples of terrorist/extremist activity against assets which are similar to those in Halls Gap are:

<sup>&</sup>lt;sup>28</sup> ABC News (2011) 12 December,

https://www.youtube.com/watch?v=GkB6Pg9GpLk

<sup>&</sup>lt;sup>29</sup> 9 News (2019) 26 February, https://www.youtube.com/watch?v=VVRV2gNdoWQ

<sup>&</sup>lt;sup>30</sup> MirageNews (2020 "Service station scares for Hamilton CFA" 20 October

<sup>&</sup>lt;sup>31</sup> Australian Transport Safety Bureau (2005) Static Fires at Retail Petrol Stations

- The US Homeland Security agency identified 25 terrorist attacks on dams globally between 2001 and 2011, although few were in Western developed countries<sup>32</sup>. The most common attack was via explosives.
- In 2001, Al Qaeda had an objective of destroying the Brooklyn Bridge by cutting the suspension cables<sup>33</sup>, and during the New Zealand waterfront dispute and strike in 1951, an explosion destroyed the Huntly rail bridge<sup>34</sup>.
- Also in 2001, the FBI warned US water utilities of a threat from a very credible, well-funded, terrorist group to disrupt water operations in 28 US cities<sup>35</sup>.

The director-general of the Australian Security Intelligence Organisation (ASIO) has stated that due to the growth in nationalist and racist violent extremism ASIO anticipates there will be a terrorist attack in Australia in 2021-22<sup>36</sup>.

Extremists are known to have visited Halls Gap twice to date e.g. neo-Nazis in January 2021, which included camping illegally at Lake Bellfield<sup>37</sup>. Nevertheless the threat likelihood of actual harm to Halls Gap people or assets/ services as a result of terrorist/ extremist activity is rated as Rare, as the motivation for an attack on Halls Gap is probably questionable, and no incidents have occurred to date.

The threat consequence of such activity could be serious. For example:

- An attack on the Lake Bellfield dam wall could be conducted by explosives (whether vehicle–borne, human-portable, water-borne, or underwater) leading to a collapse of the wall (see section 3.3.4.)
- An explosives attack on Delleys Bridge could lead to its collapse (see 3.3.1.)
- The poisoning or contamination of the Clear Water Tank could threaten the lives of all residents, including visitors/tourists.

The worst-case threat consequence would be Extreme.

The resulting risk rating is High.

#### 3.3.24 Social Unrest/ Civil Disturbance

The likelihood of social unrest (e.g. a riot) or civil disturbance (e.g. a protest) in Halls Gap is assessed as Rare. While there have been disputes (e.g. between indigenous parties, PV and climbers over rock climbing sites in the national park) the author is unaware of any riots or protests associated with this or any other issue. None were identified through internet searches.

A riot or protest may result in property damage or injury, but death is very unlikely. The worst-case threat consequence is therefore rated as Moderate.

<sup>&</sup>lt;sup>32</sup> Homeland Security (2012) *Worldwide Attacks Against Dams*, https://damfailures.org/wp-content/uploads/2019/04/Worldwide-Attacks-Against-Dams.pdf

<sup>&</sup>lt;sup>33</sup> Weiser B., and Baker A., (2011) "A Bridge Under Scrutiny, by Plotters and the Police", *New York Times*, 26 April

<sup>&</sup>lt;sup>34</sup> Wikipedia (2020) "Huntly rail bridge bombing", https://en.wikipedia.org/wiki/Huntly\_rail\_bridge\_bombing

<sup>&</sup>lt;sup>35</sup> Powers S., (2013) "The Threat of Cyberterrorism to Critical Infrastructure", Sep 2. https://www.e-ir.info/2013/09/02/the-threat-of-cyberterrorism-to-criticalinfrastructure/

<sup>&</sup>lt;sup>36</sup> Burgess M. (2021) ASIO input to Parliamentary Joint Committee on Intelligence and Security, 29 April

<sup>&</sup>lt;sup>37</sup> McKenzie N, and Tozer J (2021) "Neo-Nazis go bush: Grampians gathering highlights rise of Australia's far right" *Sydney Morning Herald*, 21 January

The resulting risk rating is Low.

#### 3.3.25 Cyber Attack

As a small regional town, Halls Gap does not have much infrastructure that would represent an attractive target for a cyber-attack e.g. most local government information systems would be located at NGSC in Stawell, most water management systems would be located at GWM Water in Horsham, and most electricity management systems would be located at Powercor in Melbourne. However, cyber-attacks on these external parties could have consequences for Halls Gap.

Some town infrastructure may be potential targets for attack e.g. the internal control systems of the water treatment plant, the systems used within the ambulance, fire and police stations, and the systems in the medical centre, primary school, and pharmacy. As an example, in 2000, Queensland police arrested a man for using a computer and a radio transmitter to take control of the Maroochy Shire wastewater system and to release sewage into parks, rivers and property.

Potentially electricity smart meters and remotely-read water meters might also be targets, although the payoff from such attacks is questionable. The frequency of attempted cyber-attacks is daily (if not hourly) but the threat likelihood of a successful attack is assessed as Possible.

The threat consequence of an attack could be the financial cost to resolve a ransomware attack, the loss or alteration of sensitive information, the inability to deliver services supported by computers, and the loss of reputation/ trust in the organisation successfully attacked. It is doubtful whether any lives would be lost. The threat consequence is assessed as Moderate.

The resulting risk rating is Medium.

#### 3.3.26 Vandalism

There have been many incidents of vandalism in and around Halls Gap. Examples include

- the vandalism and break-ins at the golf club in January 2008,
- the graffiti on the beams and supports of Delleys Bridge (Figure 61),
- the graffiti on rock faces in the park e.g. near Venus Baths,
- the vandalism of the PV hut on the west side of the Fyans Creek Loop,
- the removal of the memorial plaque from Arch and Penny's seat in 2019,
- the unauthorised destruction of scrub around Lake Fyans in July 2020,
- the obscenities marked into freshly laid concrete at a private residence on Mt Zero Rd in August 2020,
- the graffiti on the seats along the asphalt walking track in 2021,
- the tacks/spikes scattered along the asphalt walking track in 2021, and
- the graffiti on signs at the Lake Bellfield Dam wall in 2021.

The threat likelihood is assessed as Likely.

The threat consequence relates to the cost of rectification of damage, over-painting graffiti, etc., and is assessed as Minor.

The resulting risk rating is Medium.



#### Figure 61: Examples of Delleys Bridge Graffiti

### 3.3.27 Arson

There were 6 cases of arson in Halls Gap during the 10 year period from 2013 to 2022. The threat likelihood is assessed as Likely.

The threat consequence of a deliberately lit bushfire has already been covered in 3.2.7, so this assessment relates to non-bushfire consequences. Arson could result in the total loss of a house, rental accommodation or business premises, and depending on the size of the property/business and its level of insurance, the financial consequences could be Moderate.

The resulting risk rating is High.

#### 3.3.28 Theft

About 10 cases of theft in Halls Gap are reported to Victoria Police each year. According to the Halls Gap General Store, cases of pilfering/ shop lifting during peak tourist periods occur on a daily basis. The threat likelihood is Almost Certain.

The cost of a shop lifting incident is about \$100 i.e. it is Negligible.

The resulting risk rating is Medium.

# 4 Risk Evaluation

# 4.1 Risk Mitigation Priorities

# Table 3: Risk Ratings/Mitigation Priorities

#	Threat	Threat Likelihood	Threat Consequence	Risk Rating	Required Rating	Priority
1	Earthquake	Almost certain	Negligible	Medium	Low	3
2	Mass movement/landslide	Unlikely	Moderate	Medium	Low	3
3	Flood and flash floods	Likely	Moderate	High	Low	2
4	Severe storm, extreme rain, tornado, lightning	Almost certain	Major	Critical	Low	1
5	Extreme temperature	Likely	Major	High	Low	2
6	Drought	Rare	Moderate	Low	Low	-
7	Bushfire	Possible	Extreme	High	Low	2
8	Urban conflagration	Rare	Extreme	High	Low	2
9	Epidemic/pandemic	Unlikely	Major	Medium	Low	3
10	Blue green algae	Rare	Major	Medium	Low	3
11	Pest/animal infestation	Almost certain	Negligible	Medium	Low	3
12	Weed infestation	Almost certain	Negligible	Medium	Low	3
13	Failure of Delleys Bridge	Rare	Major	Medium	Low	3
14	Failure of Grampians Rd Bridge	Rare	Moderate	Low	Low	-
15	Failure of School Rd Bridge	Rare	Moderate	Low	Low	-
16	Failure of Lake Bellfield Dam	Rare	Extreme	High	Low	2
17	Failure of Halls Gap Reservoir	Rare	Major	Medium	Low	3
18	Failure of water treatment plant	Rare	Moderate	Low	Low	-
19	Failure of Clear Water Tank	Rare	Moderate	Low	Low	-
20	Failure of Sewerage/ Wastewater treatment	Rare	Moderate	Low	Low	-
21	Failure of fire plug network	Possible	Major	High	Low	2
22	Disruption of water supply	Unlikely	Moderate	Medium	Low	3
23	Disruption of electricity supply	Rare	Major	Medium	Low	3
24	Gas flare or explosion	Rare	Moderate	Low	Low	-
25	Inadequate human resources	Rare	Major	Medium	Low	3
26	Inadequate understanding of risks/ failure to act	Almost certain	Major	Critical	Low	1
27	Inadequate protocols for managing emergencies, implementation errors, deliberate non-compliance	Almost certain	Major	Critical	Low	1
28	Inadequate training/ communication	Almost certain	Major	Critical	Low	1
29	Technological or industrial accident	Possible	Major	High	Low	2
30	Hazardous materials release	Possible	Major	High	Low	2
31	Transport incident	Possible	Major	High	Low	2
32	Structure fire (house or business)	Likely	Moderate	High	Low	2
33	Service station fire or explosion	Rare	Major	Medium	Low	3
34	Terrorism/ extremism/ sabotage	Rare	Extreme	High	Low	2
35	Social unrest/ civil disturbance	Rare	Moderate	Low	Low	-
36	Cyber attack	Possible	Moderate	Medium	Low	3
37	Vandalism	Likely	Minor	Medium	Low	3
38	Arson	Likely	Moderate	High	Low	2
39	Theft	Almost Certain	Negligible	Medium	Low	3

# 4.2 Risk Profile Summary

The risk profile for Halls Gap Community is provided in Figure 62 and Table 4:

#### Figure 62: Halls Gap Community Risk Profile



Table 4.	Halls	Gan	Community	Risk	Profile
	nans	Jap	Community	INION	I I UIIIE

Risk Rating	Priority	Number of Risks	Percent of Risks
Critical	1	4	10.3%
High	2	12	30.8%
Medium	3	15	38.5%
Low	No action required	8	20.5%
	Totals	39	100.0%

The 4 Critical risks relate to the threats of

- severe storm, extreme rain, tornado, lightning, and
- inadequate management of serious risks, particularly in the context of large tourist populations i.e.
  - o inadequate understanding of risks and failure to act,
  - inadequate protocols for managing emergencies, implementation errors, and deliberate non-compliance, and
  - inadequate training/ communication.

The reason severe storms rate highly is that their frequency (one event a year) is far higher than the frequency of severe bushfires (one event every 6 years on average.)

There are 12 High risks. The major concerns are

- those related to the Critical risks above i.e.
  - o floods and flash floods, and
  - o bushfires and urban conflagrations,
- extreme temperatures,
- those related to infrastructure failures, i.e.
  - o the failure of the Lake Bellfield dam wall, and
  - the failure of the fire plug network,
- those related to human error or deliberate acts i.e.
  - o industrial accidents,
  - hazardous materials releases,
  - o transport incidents,

- o structure fire (house or business)
- o terrorism/ extremism/ sabotage, and
- o arson

There are also 15 Medium risks i.e.

- earthquake,
- mass movement (wet or dry),
- epidemic/pandemic,
- blue green algae,
- pest/animal infestation,
- weed infestation,
- failure of Delleys Bridge,
- failure of the Halls Gap Reservoir dam wall,
- long term disruption of the water supply,
- long term disruption of the electricity supply,
- inadequate human resources,
- service station fire or explosion,
- cyber-attack,
- vandalism, and
- theft.

Overall, this constitutes a risk profile which should be addressed, particularly in the case of the Critical and High risks. (The scope of this report assesses risks only, and does not cover risk mitigation.)

# 4.3 Recommendations

- 1. Given the limited resources available in the Halls Gap community, any work program to address risks should focus on the Critical and High risks initially, and address the Medium risks at a later date.
- 2. The three Critical risks of
  - inadequate understanding of risks,
  - o inadequate protocols for managing emergencies, and
  - o inadequate training/ communication,

should be left until last on the list of risks, as they cannot realistically be addressed until the mitigations of other risks are finalised.

(As at 2024, the Halls Gap Resilience Group was no longer meeting, and none of these risks were being formally addressed.)

# **Appendix: Definitions of Risk Ratings and Mitigation Priorities**

#### Table 5: Threat Likelihood Ratings

Likelihood	Description	Example frequency
Rare	May occur in exceptional circumstances	Less than once in 10 years
Unlikely	May occur at some time	Once in 4-10 years
Possible	Should occur at some time	Once in 2-4 years
Likely	Will probably occur in most circumstances	Once in 1-2 years
Almost certain	Is expected to occur in most circumstances	More than once in 1 year

#### Table 6: Threat Consequence Ratings

	Consequence Severity						
Consequence Type	Lowest 🖌 🔶 Highest						
	Negligible	Minor	Moderate	Major	Extreme		
Threat to people (health and	No injury, or first aid	Single injury, minor medical	Multiple injuries, or significant	A fatality, or a few irreversible	Multiple fatalities, many		
safety)	treatment only, minimal risk	attention (e.g. stitches by	reversible disabilities (e.g.	disabilities (e.g. loss of limb),	irreversible disabilities, very		
	to health and safety of	doctor), low risk to personal	broken bones), moderate risk to	high risk to health and safety	high risk to health and safety		
	people.	health and safety of people.	health and safety of people.	of people.	of people.		
Threat to assets/services (Loss)	\$0-5,000	\$5,000-50,000	\$50,000-\$500,000	\$500,000-5,000,000	>\$5,000,000		

#### Table 7: Risk Ratings

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

#### **Table 8: Mitigation Priority Rating**

Risk Rating	Required Risk Rating	Mitigation Priority	Comment
Critical	Low	1	Highest priority
High	Low	2	I I I I I I I I I I I I I I I I I I I
Medium	Low	3	Lowest priority
Low	Low	-	No action required