



Murrindindi and Strathbogie Shire Road Trauma Research

Crash Analysis Report

Client:

Murrindindi Shire Council

Project No. 190953

Draft Report – 20/01/21

1st Floor 132 Upper Heidelberg Road Ivanhoe Vic 3079
PO Box 417 Ivanhoe Vic 3079 Ph: (03) 9490 5900
www.trafficworks.com.au

DOCUMENT CONTROL RECORD

Document prepared by:

Trafficworks Pty Ltd

ABN 59 125 488 977

1st Floor 132 Upper Heidelberg Rd Ivanhoe Vic 3079

PO Box 417 Ivanhoe Vic 3079


Ph (03) 9490 5900

Fax (03) 9490 5910

www.trafficworks.com.au

DISCLAIMER

The information contained in this document is intended to be received, used and relied upon by the named addressee or client only for the purpose for which it has been prepared. Trafficworks Pty Ltd does not warrant the accuracy or relevance of the information, including by implication, contained in this document if it is used or relied upon by any person other than the named addressee or client. Copying, reproduction including by electronic means, unauthorised use or disclosure of this document is prohibited except with the express written authorisation of Trafficworks Pty Ltd.

Document Control				
Report Title		Murrindindi and Strathbogie Councils – Road Trauma Research		
Project Number		190953		
Client		Murrindindi Shire Council		
Client Contact		Larry Kelly		
Rev	Date Issued	Revision Details / Status	Prepared by	Authorised by
Draft1	20/01/21	Draft	David Do / Daniel Goh / Bernadette Sargeant	Bernard Chan / Paul Mihailidis

EXECUTIVE SUMMARY

Trafficworks has undertaken a statistical analysis of crashes in the shires of Murrindindi and Strathbogie using 10 years (2010 – 2019) of available data sourced from *VicRoads Crashstats*. The analysis investigates crash trends within the two municipalities, identifying distinct trends and a comparison to state-wide statistics.

Examination of crash statistics for Murrindindi found a significant 44 % reduction in crashes from 2016 to 2018. However, crashes increased 42 % from 2018 to 2019. While the proportion of crashes resulting in casualties were average when compared to other rural shires, Murrindindi had higher overall crash numbers than all small rural shires and 15 out of the 19 large rural shires in Victoria. Crash statistics indicate that 72 % of persons involved in crashes resided outside the shire while 56 % of crashes occurred on weekends. More than half of all crashes that occurred in Murrindindi involved a motorcyclist. These results indicate that travel for recreation and the use of motorcycles are a significant cause of many crashes in Murrindindi. Additionally, the windy roads and rolling terrain within Murrindindi Shire may have contributed to many crashes in the area.

Recommendations for the Shire of Murrindindi include consultation with motorcycle groups to inform of motorcyclist high-risk areas and to identify appropriate treatments at these locations. General crash clusters should also be investigated to address road safety deficiencies specific to each location. Initiatives may also be considered to encourage road safety for tourists.

Analysis of data for Strathbogie found that almost two-thirds of crashes have occurred on arterial roads. 44 % of all crashes within Strathbogie were located on Hume Freeway, Goulbourn Valley Highway and Odwyer Road / High Street / Grimwade Road in Nagambie. Besides major arterial roads, there are few notable crash clusters within the shire. Overall crash numbers have decreased by 29 % from 2015 to 2019. However, the proportion of crashes resulting in casualties are extremely high (55 %) when compared to other rural municipalities in Victoria. Speed, driver fatigue and unprotected roadside hazards may be contributing factors to this.

Potential road safety initiatives for Strathbogie include investigating major arterial roads to address lengths of unshielded roadside hazards as well as ensuring adequate rest areas are in place. Implementing safety treatments may also be investigated for High Street in Nagambie.

Crash statistics for both shires indicate that most crashes have occurred outside of townships and in high-speed environments of 100 km/h or more. About two-thirds of crashes in both shires were classified as run off road (DCA 170 – 189) crashes. Re-evaluation of speed limits for high-speed environments in both shires may be investigated. Additionally, increased police enforcement at high-risk locations may mitigate dangerous driving behaviour, particularly on weekends.

.

TABLE OF CONTENTS

1	INTRODUCTION	8
2	BACKGROUND.....	9
2.1	Study area	9
2.2	Key demographics	11
2.3	Travel patterns	13
2.4	Regional towns.....	15
2.5	Road environment.....	17
3	METHODOLOGY.....	21
3.1	Data analysis.....	21
3.2	Assumptions and limitations.....	22
4	STATISTICAL COMPARISON	24
4.1	Total crashes within Victoria over 10 years.....	24
4.2	Total crashes over 10 years within small rural shires	25
4.3	Proportion of FSI over 10 years within small rural shires.....	26
4.4	Total fatalities over 10 years within small rural shires.....	27
4.5	Total crashes over 10 years within all rural shires	28
4.6	Proportion of FSI over 10 years within all rural shires.....	29
4.7	Total fatalities over 10 years within all rural shires.....	30
4.8	Total crashes over 10 years within all rural shires and interface councils	31
4.9	Proportion of FSI over 10 years within all rural shires and interface councils.....	32
4.10	Total fatalities over 10 years within all rural shires and interface councils.....	33
4.11	Fatality rate per 10,000 population over 10 years.....	34
5	STATISTICAL OVERVIEW IN MURRINDINDI AND STRATHBOGIE	35
5.1	Locations of crashes within Murrindindi	35
5.2	Total crashes within Murrindindi over 10 years.....	36
5.3	Locations of crashes within Strathbogie	37
5.4	Total crashes within Strathbogie over 10 years.....	38
5.5	Average crashes per month (Murrindindi).....	39
5.6	Average deaths per month (Murrindindi)	40
5.7	Average crashes per month (Strathbogie).....	41
5.8	Average deaths per month (Strathbogie)	42
5.9	Average crashes per month (Victoria).....	43
5.10	Average deaths per month (Victoria)	44
5.11	Proportion of FSI to total crashes each month	45

5.12	Location of fatalities - Murrindindi	46
5.13	Location of fatalities and serious injuries - Murrindindi	47
5.14	Location of fatalities - Strathbogie	48
5.15	Location of fatalities and serious injuries - Strathbogie	49
5.16	Two-hourly crashes – Murrindindi.....	50
5.17	Two-hourly crashes – Strathbogie.....	51
5.18	Two-hourly crashes – Victoria.....	52
5.19	Crashes by day of week – Murrindindi	53
5.20	Crashes by day of week – Strathbogie	54
5.21	Crashes by day of week – Victoria	55
6	CRASHES BY ROAD USER	56
6.1	Gender of drivers – Murrindindi.....	56
6.2	Age group - Murrindindi	57
6.3	Age Group – Strathbogie	58
6.4	Age Group – Victoria	59
6.5	Number of Crashes by Road User Type – Murrindindi	60
6.6	Number of Crashes by Road User Type – Strathbogie	61
6.7	Proportion of Crashes by Road User Type – Murrindindi	62
6.8	Passenger vehicle crashes - Murrindindi.....	63
6.9	Motorcycle crashes - Murrindindi.....	64
6.10	Pedestrian crashes - Murrindindi.....	65
6.11	Proportion of Crashes by Road User Type – Strathbogie	66
6.12	Passenger vehicle crashes - Strathbogie	67
6.13	Motorcycle crashes - Strathbogie.....	68
6.14	Pedestrian crashes - Strathbogie.....	69
6.15	Residency of persons involved in crashes - Murrindindi	70
6.16	Residency of persons involved in crashes – Strathbogie.....	71
6.17	Number of Tourist Crashes by Road User Type – Murrindindi.....	72
6.18	Number of Tourist Crashes by Road User Type – Strathbogie.....	73
7	CRASHES BY LOCATION	74
7.1	Proportion of arterial vs local road crashes - Murrindindi	74
7.2	Arterial vs local road crashes per year - Murrindindi	75
7.3	Location of arterial and local road crashes - Murrindindi	76
7.4	Proportion of arterial vs local road motorcycle crashes – Murrindindi	77
7.5	Arterial vs local road motorcycle crashes per year – Murrindindi	78
7.6	Proportion of arterial vs local road crashes - Strathbogie	79

7.7	Arterial vs local road crashes per year - Strathbogie	80
7.8	Location of arterial and local road crashes - Strathbogie	81
7.9	Proportion of arterial vs local road motorcycle crashes – Strathbogie	82
7.10	Arterial vs local road motorcycle crashes per year – Strathbogie	83
7.11	Crashes in towns vs rural areas – Murrindindi	84
7.12	Proportion of FSI crashes in towns vs rural areas – Murrindindi.....	85
7.13	Crashes in towns vs rural areas – Strathbogie	86
7.14	Proportion of FSI crashes in towns vs rural areas – Strathbogie.....	87
8	CRASHES BY TYPE	88
8.1	Intersection vs non-intersection crashes	88
8.2	Crashes by DCA type – Murrindindi	89
8.3	Crashes by DCA type – Strathbogie	90
8.4	Crashes by DCA type – Victoria	91
8.5	Location of run-off road crashes - Murrindindi.....	92
8.6	Location of run-off road crashes - Strathbogie	93
9	CRASHES BY ENVIRONMENTAL FACTORS	94
9.1	Proportion of Crashes by Road Surface – Murrindindi.....	94
9.2	Annual Crashes by Road Surface – Murrindindi	95
9.3	Proportion of Crashes by Road Surface – Strathbogie.....	96
9.4	Annual Crashes by Road Surface – Strathbogie.....	97
9.5	Proportion of Crashes by Road Surface for Motorcycles – Murrindindi	98
9.6	Annual Crashes by Road Surface for Motorcycles – Murrindindi	99
9.7	Proportion of Crashes by Road Surface for Motorcycles – Strathbogie	100
9.8	Yearly Crashes by Road Surface for Motorcycles – Strathbogie.....	101
9.9	Average Crashes by Speed Zone – Murrindindi.....	102
9.10	Average Crashes by Speed Zone – Strathbogie.....	103
9.11	Average Crashes by Speed Zone – Victoria.....	104
9.12	Day vs dark crashes.....	105
10	CRASHES BY CAUSE	106
10.1	Alcohol related crashes	106
10.2	Map of alcohol related crashes - Murrindindi	107
10.3	Map of alcohol related crashes – Strathbogie.....	108
10.4	Proportion of animal related crashes	109
11	CRASH CLUSTERS.....	110
11.1	Crash clusters in Murrindindi	110

11.2	Crash clusters in Strathbogje	111
11.3	Survey results.....	112
12	KEY FINDINGS	113
13	RECOMMENDATIONS.....	115

1 INTRODUCTION

Trafficworks has been engaged by Murrindindi Shire Council to investigate crash statistics within the shires of Murrindindi and Strathbogie. The purpose of this analysis is to understand crash trends within the two municipalities and identify contributing factors to these issues. High level recommendations are provided for potential safety treatments and initiatives aimed at addressing crashes and improving safety for road users in the two shires.

2 BACKGROUND

2.1 Study area

The study is primarily focused on road accident statistics within the Shire of Murrindindi and Shire of Strathbogrie local government areas. Crash trends within these two shires are compared to other municipalities in Victoria in addition to state-wide statistics.

Figure 1: Shire of Murrindindi Study Area



2.2 Key demographics

This section presents some of the key demographics that influence road safety for pedestrians, cyclists, and motorcyclists.

Murrindindi Shire

Figure 3: Shire of Murrindindi – Age Profile (Source: 2016 Census, Australian Bureau of Statistics)

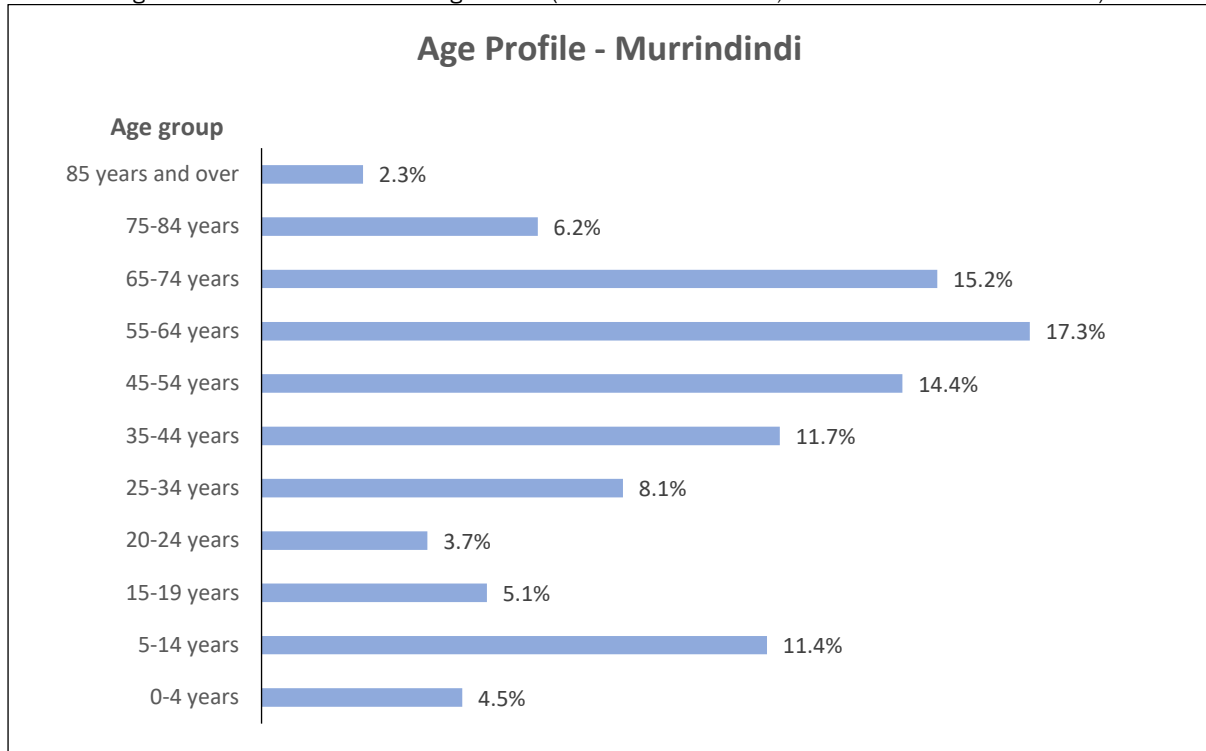
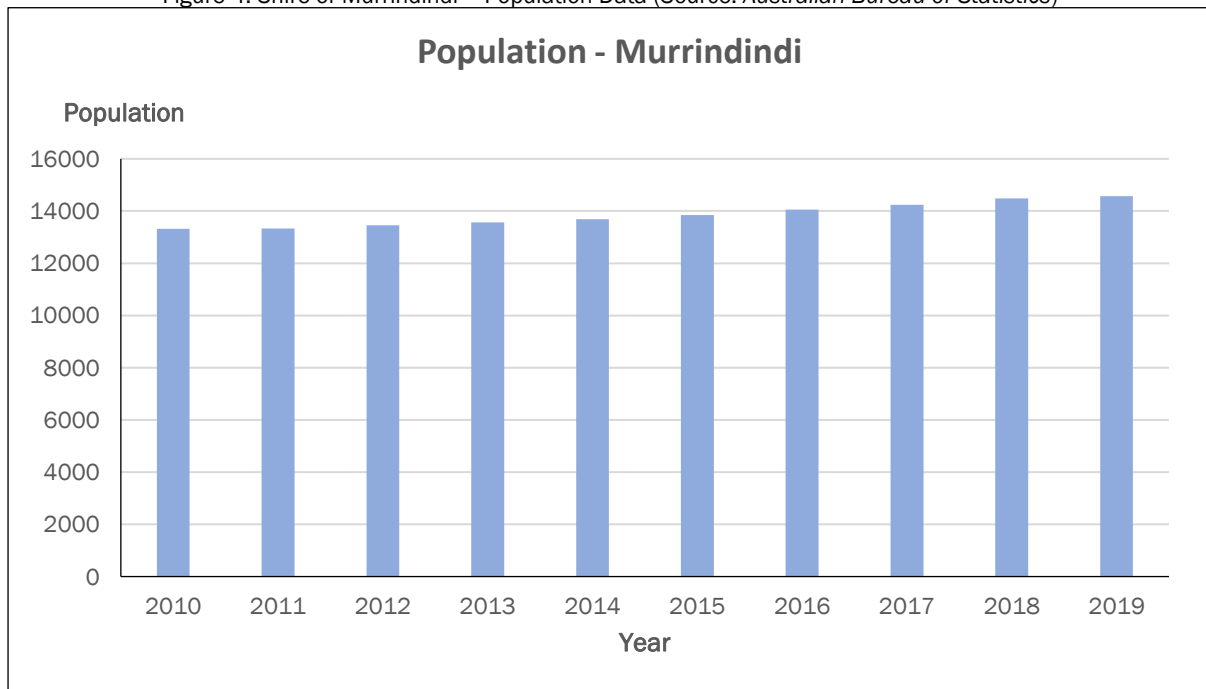


Figure 4: Shire of Murrindindi – Population Data (Source: Australian Bureau of Statistics)



Strathbogie Shire

Figure 5: Shire of Strathbogie – Age Profile (Source: 2016 Census, Australian Bureau of Statistics)

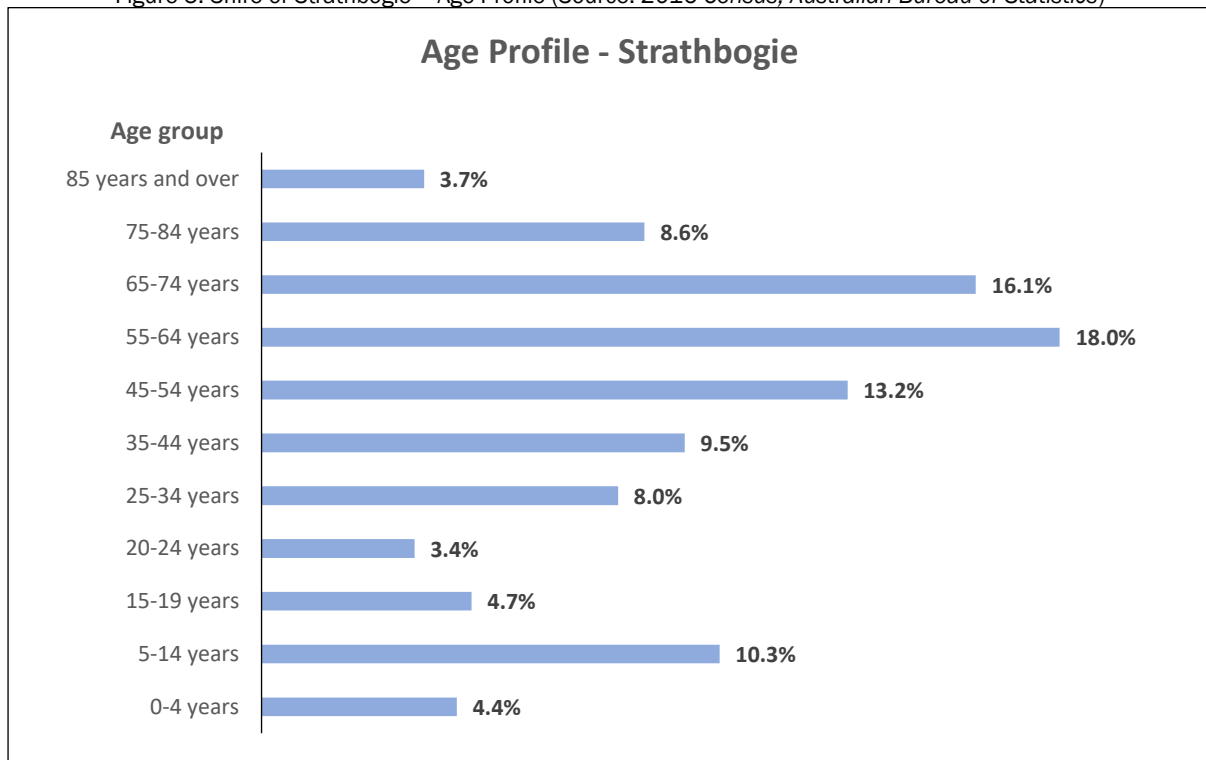
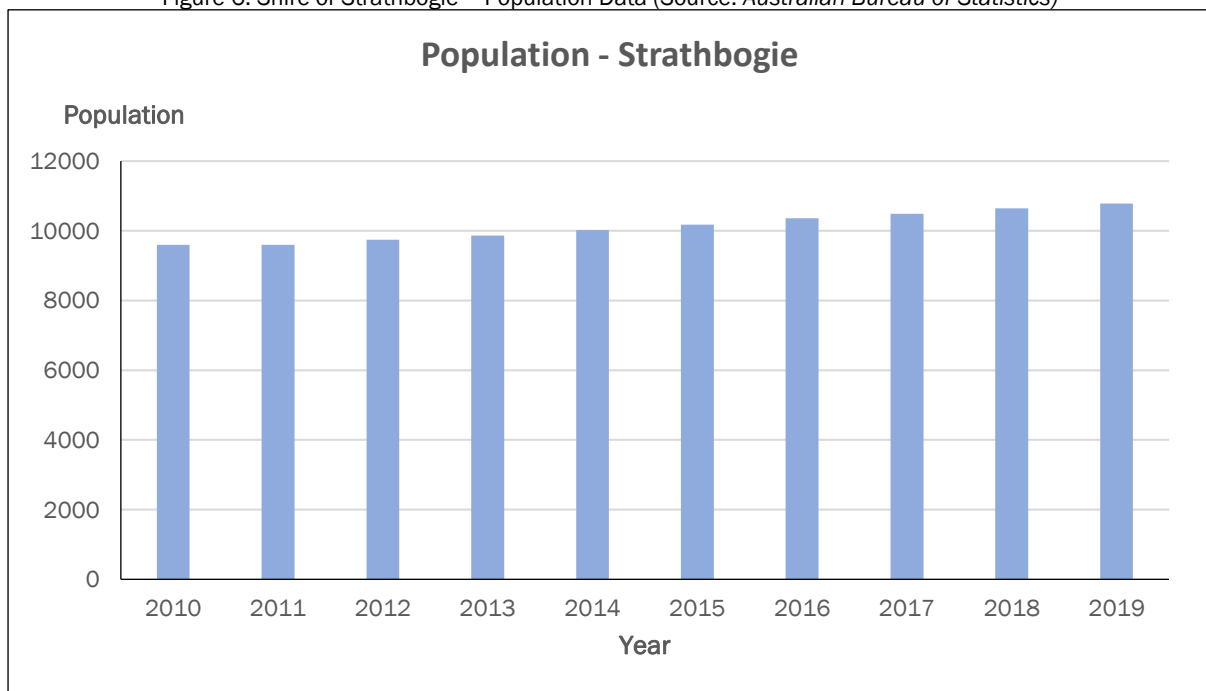


Figure 6: Shire of Strathbogie – Population Data (Source: Australian Bureau of Statistics)

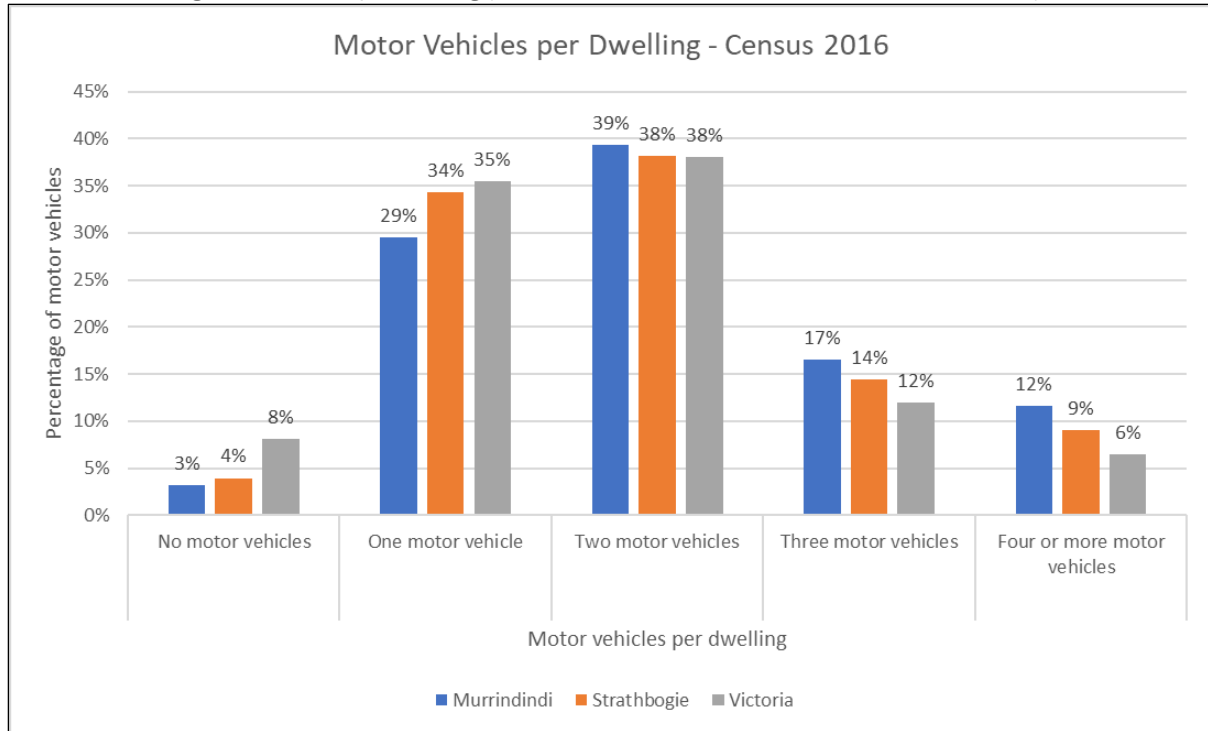


2.3 Travel patterns

This section presents some of the key travel methods to work and motor vehicles owned per dwelling within Murrindindi and Strathbogie, as well as Victoria:

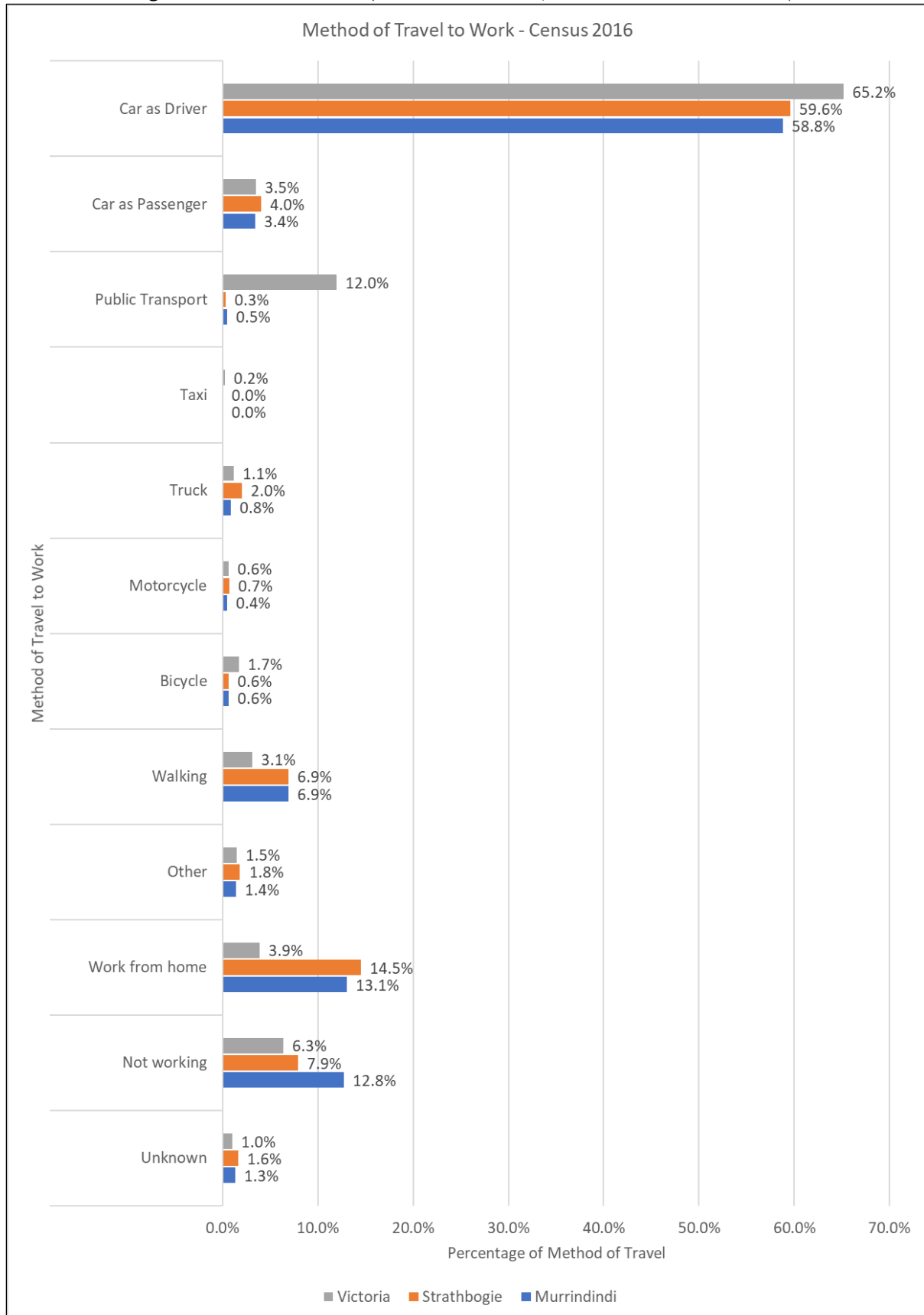
Motor vehicles per dwelling

Figure 7: Vehicles per dwelling (Source: 2016 Census, Australian Bureau of Statistics)



Travel mode to work

Figure 8: Travel mode to work (Source: 2016 Census, Australian Bureau of Statistics)



2.4 Regional towns

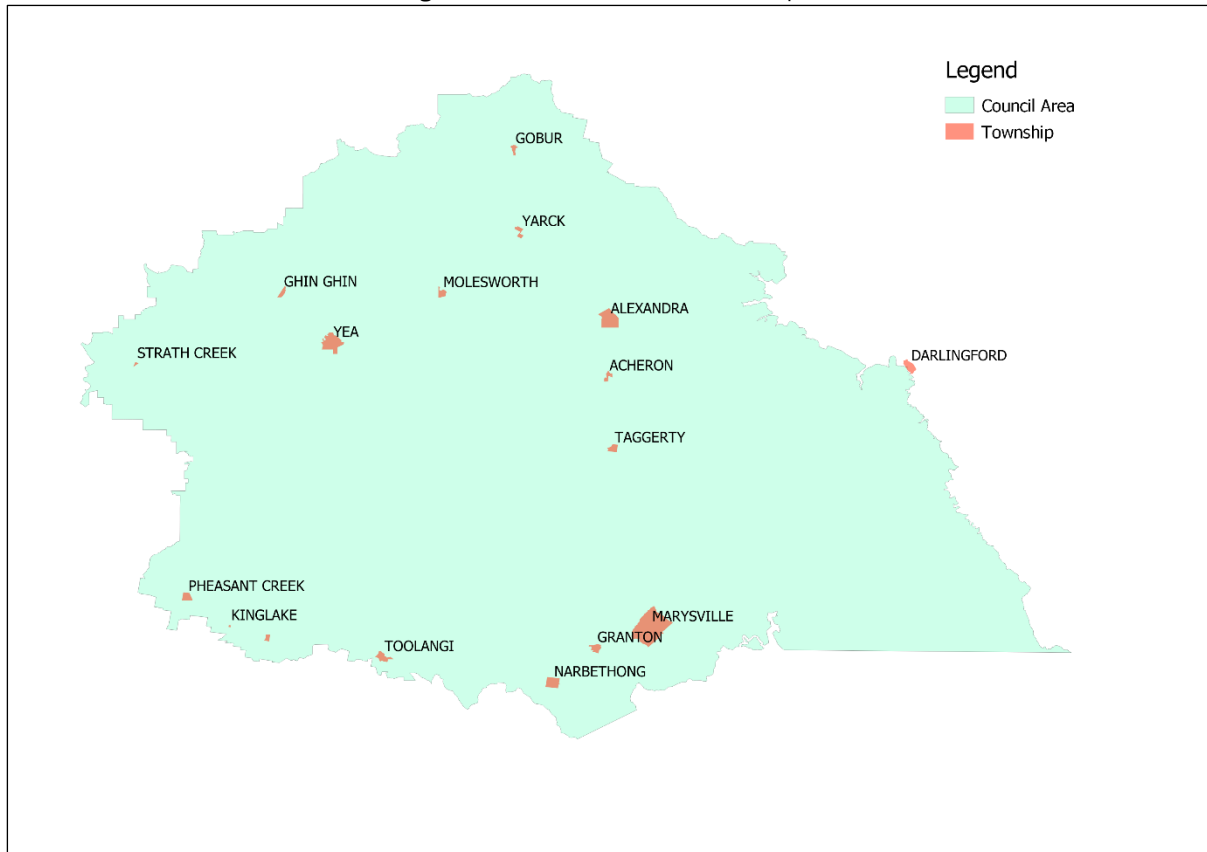
Murrindindi Shire

Townships that are located within the Shire of Murrindindi are listed in Table 1 below.

Table 1: Shire of Murrindindi Townships

Murrindindi Shire townships		
Acheron	Kinglake	Strath Creek
Alexandra	Kinglake East	Taggerty
Darlingford	Marysville	Toolangi
Ghin Ghin	Molesworth	Yarck
Gobur	Narbethong	Yea
Granton	Pheasant Creek	

Figure 9: Shire of Murrindindi Townships



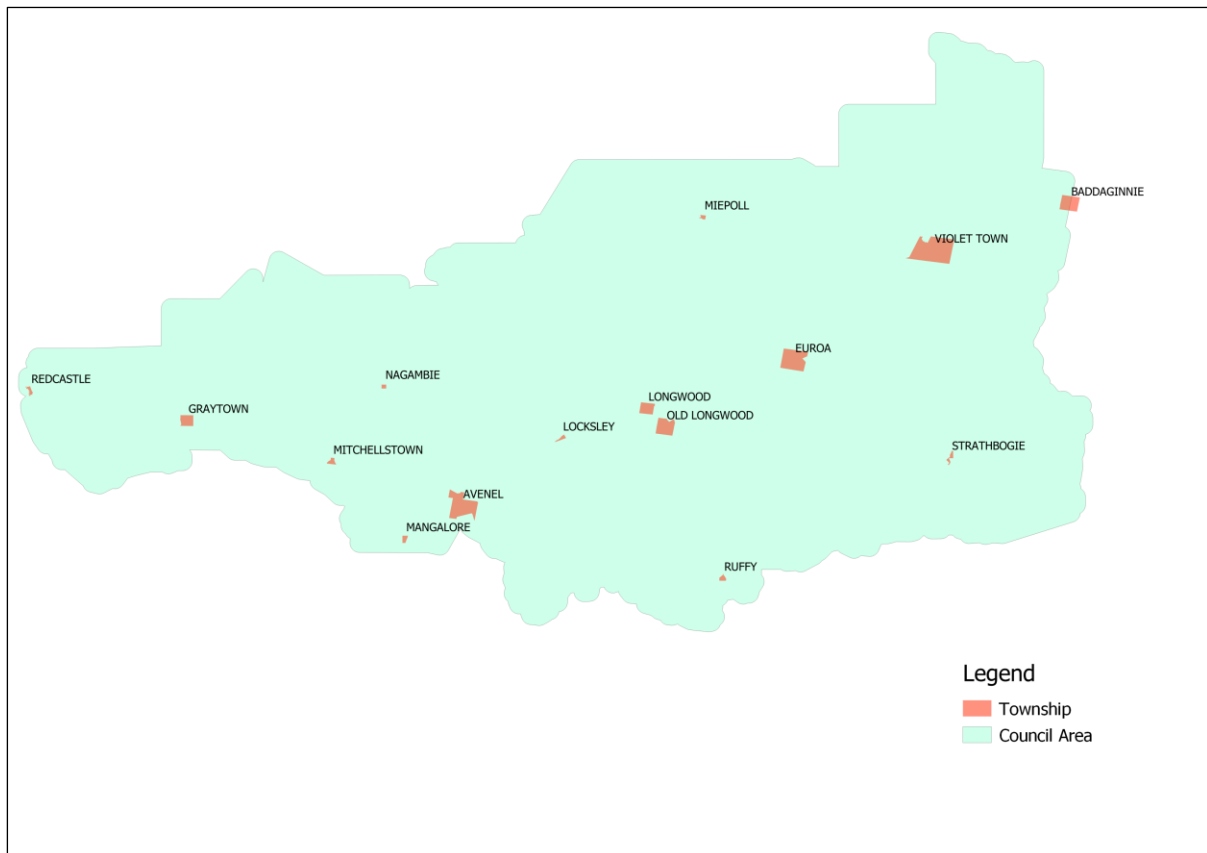
Strathbogie Shire

Townships that are located within the Shire of Strathbogie are listed in Table 2 below.

Table 2: Shire of Strathbogie Townships

Strathbogie Shire townships		
Avenel	Longwood	Old Longwood
Baddaginnie	Mangalore	Redcastle
Euroa	Miepoll	Ruffy
Graytown	Mitchellstown	Strathbogie
Locksley	Nagambie	Violet Town

Figure 10: Shire of Strathbogie Townships



2.5 Road environment

Murrindindi Shire

Arterial roads

There are 13 declared arterial roads within the shire of Murrindindi, classified as B and C class arterials. They carry a wide range of traffic volumes, ranging from a two-way annual average daily traffic (AADT) of 770 vehicles on Taggerty-Thornton Road to 4000 vehicles on Melba Highway. Major north-south arterials in the area include Maroondah Highway, Melba Highway and Whittlesea-Yea Road while east-west arterials include Goulburn-Valley Highway and Broadford-Flowerdale Road. All arterial roads in the Shire of Murrindindi are permitted B-double routes.

Typical speeds and cross sections

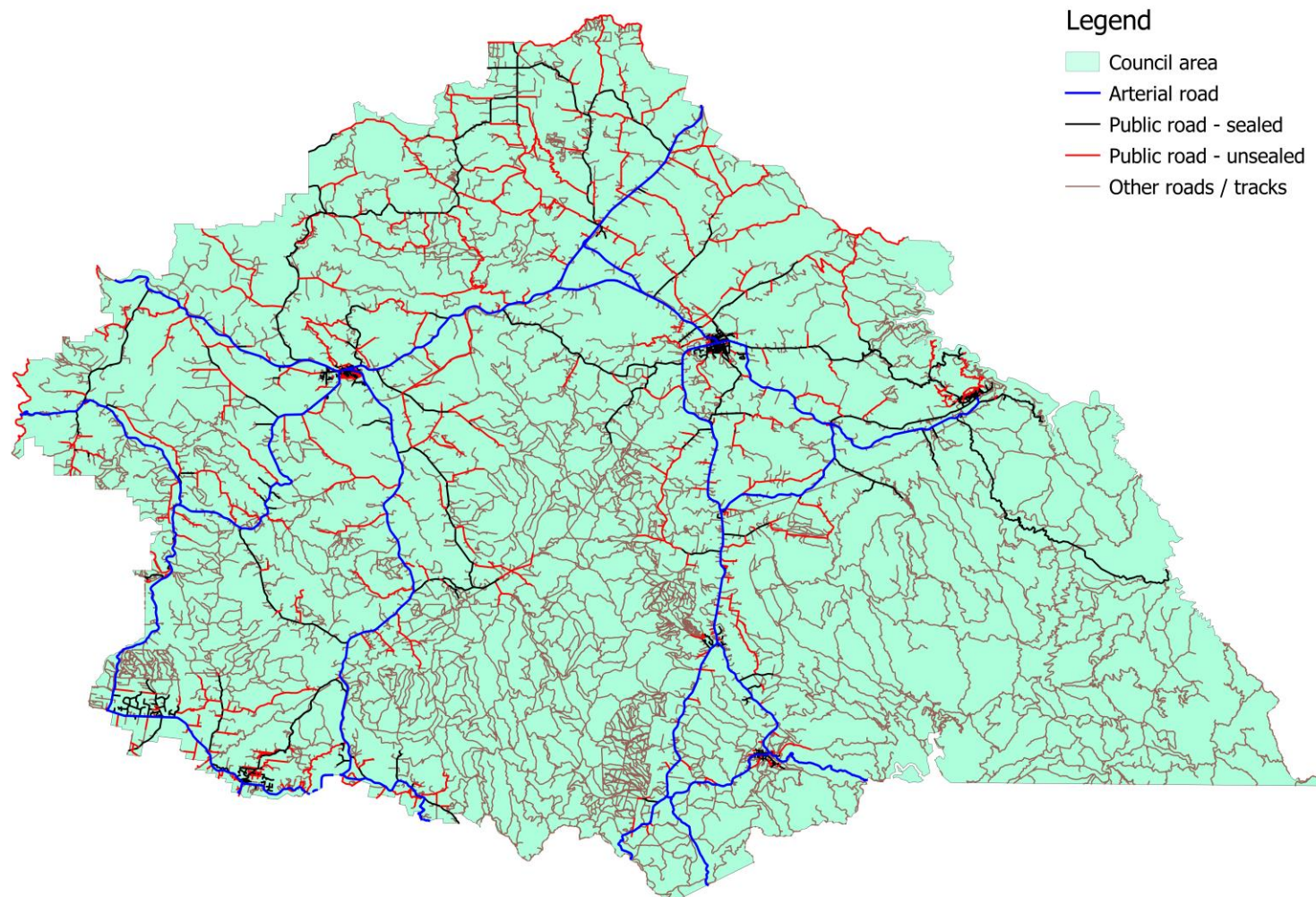
Most of the roads in the Shire are sealed or unsealed high speed (80 – 100 km/h) rural undivided roads with generally one traffic lane in each direction and narrow (1.0 m or less) unsealed road shoulders. Roads within townships generally consist of either sealed roads with a posted speed limit (40 – 60 km/h) or sealed and unsealed roads with a default speed limit (50 km/h).

Topography

There is a great variation of surface elevation within the shire, ranging from approximately 150 m to 950 m above sea level. While most arterial roads are within lower-lying areas, most of the land is in hilly or mountainous regions that are accessed by local roads. Major town centres such as Alexandra, Marysville and Yea are situated in areas with lower altitudes and flatter terrain.

A map of road types within the shire of Murrindindi as per *VicPlan* township overlays are shown in Figure 11.

Figure 11: Shire of Murrindindi - Road types



Strathbogie Shire

Arterial roads

There are 12 declared arterial roads within the shire, predominantly categorised as C and M classed arterials roads, with Midland Highway being the only A-class arterial. Traffic volumes range from a two-way AADT of 150 vehicles on Dookie-Violet Town Road to 13,000 vehicles on Hume Freeway. Major east-west connecting arterials include Murchison-Violet Town Road, Heathcote-Nagambie Road and Hume Freeway. North-south connecting arterials include Goulburn Valley Freeway, Euroa-Shepparton Road and Euroa-Mansfield Road. All arterial roads within the shire are classed as B-double routes.

Typical speeds and cross sections

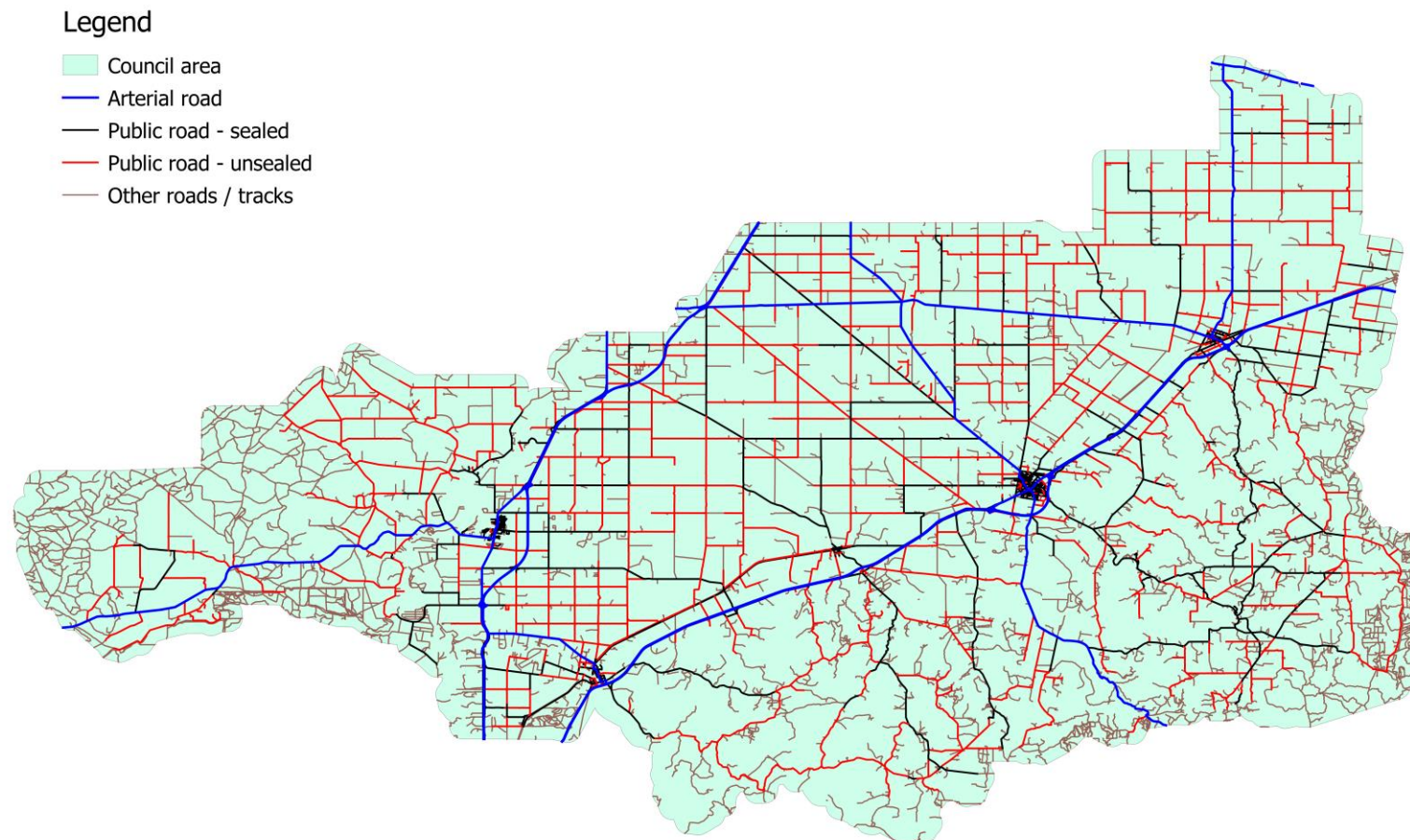
As per Murrindindi, roads in Strathbogie are typically in high-speed zones (80 – 110 km/h) with generally one traffic lane in each direction and sealed or unsealed road shoulders. Local roads in town areas are generally sealed with a 40 – 60 km/h speed limit.

Topography

The central, north, and northeast regions of the shire are within low lying regions with generally flat elevation, situated at approximately 100 to 200 m above sea level. This includes most townships such as Euroa, Violet Town, Longwood, Avenel, and Nagambie. There are areas of hilly terrain to the east including Spring Creek Nature Conservation Reserve with up to approximately 320 m in elevation. The south and east regions of the shire cover mountainous areas including the Strathbogie Ranges with up to approximately 500 m in elevation.

A map of road types within the shire of Strathbogie as per *VicPlan* township overlays are shown in Figure 12.

Figure 12: Shire of Strathbogie - Road types



3 METHODOLOGY

3.1 Data analysis

Crash data

Information used for the crash statistics analysis was sourced from VicRoads Crashstats. This provides detailed information on individual road accidents in Victoria as sourced from police reports. The period of 2010 to 2019 has been analysed as the most recent 10-year period with complete data for each year.

Number of crashes

Each crash is determined by their unique accident number. Each person involved in a crash with the same accident number are treated as being involved in the same crash. Thus, the number of crashes is lower than the number of persons involved.

Location

Crash numbers and casualties across Murrindindi and Strathbogie shires are compared to other rural municipalities, interface councils and Victoria as whole. Crash numbers within the two councils are also analysed for townships compared to rural areas as well as speed zones.

Heat maps

Heat maps for both shires are analysed including type of road user involved in crashes, run-off road crashes and casualties to identify notable accident hotspots.

Road types

Analysis of road type where crashes have occurred include arterial roads against local roads, intersection against midblock and sealed against unsealed roads as classified in the VicRoads Road Crash Information System (RCIS).

Time

The time of crashes is classified by the year, month, day of week and time of day it occurred. Times of day are categorised into two-hourly intervals over the 24-hour period. Crashes were also categorised into daytime or dark crashes based on individual report as retrieved from RCIS.

Crash type and severity

Crash types were determined based on Definition for Classifying Accidents (DCA) as reported for each accident in the dataset. Crash severities were categorised into fatal crashes, serious injury crashes (injuries requiring hospitalisation) and other injury crashes (not a fatal or serious crash). The proportion of crashes resulting in fatal or serious injuries (FSI) are considered in the analysis.

Road user

Crashes were categorised based on the most vulnerable road user involved in each crash. The following road users are considered from most to least vulnerable – pedestrian, cyclist, motorcyclist, or driver. For example, if a crash involved a driver striking a pedestrian with a car, the incident is considered a pedestrian crash. Individual road users for all crashes were also analysed based on age, gender or whether they were locals or tourists in the two shires.

Fatalities

The number of fatalities resulting from road accidents in both shires were analysed by month and compared to state-wide statistics. This area of the analysis considers all persons involved in

crashes and thus, figures would be higher than the number of crashes. In addition, a fatality rate resulting from road incidents for Murrindindi, Strathbogrie and Victoria is determined per 10,000 residents in each respective area.

Cause of crashes

Contributing factors to crashes including whether they were alcohol related, or if the crash resulted from striking an animal (DCA 167) are analysed.

Survey

In addition to the crash data analysis, a questionnaire was prepared and distributed to Victoria Police within Murrindindi and Strathbogrie. The questionnaire discusses the hot spot areas or road lengths for crashes for different road users, the road safety issues that contribute to the majority of crashes and contributing factors for high fatality rates within the two shires compared to other regional areas.

3.2 Assumptions and limitations

Completeness of data

Traffic Incident System (TIS) is used to record details of road crashes and is the source of the data that is available in CrashStats. When a crash record is processed within TIS, it is assigned a unique status such as 'Draft', 'Ready for Review' or 'Approved'. An 'Approved' incident means that the record has been finalised and is ready for coding and analysis by VicRoads. VicRoads can only process 'Approved' incidents and these records are subsequently loaded into CrashStats. Unfortunately, not all incidents are available within CrashStats, i.e., the data is 'incomplete'. Various reasons for this include:

- an incident has not yet been approved by Victoria Police, perhaps due to ongoing investigation and/or prosecution via the courts
- an incident has been approved but cannot be processed by VicRoads, due to incorrect and/or missing information
- the incident record has been returned to Victoria Police for amendment. (a) For 2009, approximately 99.9% of incidents have been provided to VicRoads (b) For January-May 2010, approximately 0.4% of incidents have not yet been provided to VicRoads (c) For June-December 2010, approximately 2.6% of incidents have not yet been provided to VicRoads.

In addition, it is well understood that many crashes involving pedestrians, cyclists, and motorcyclists are not reported unless someone is killed or seriously injured.

Township locations

Crashes that are identified as located in town areas are based in the vicinity of townships overlays as sourced from *VicData*. These areas may be inconsistent with actual town areas within the shires.

Tourist data

Persons involved in crashes for the two shires are also analysed as either locals or tourists based on the reported postcode of their residency. Those that reported as residing outside the shire are assumed as tourists.

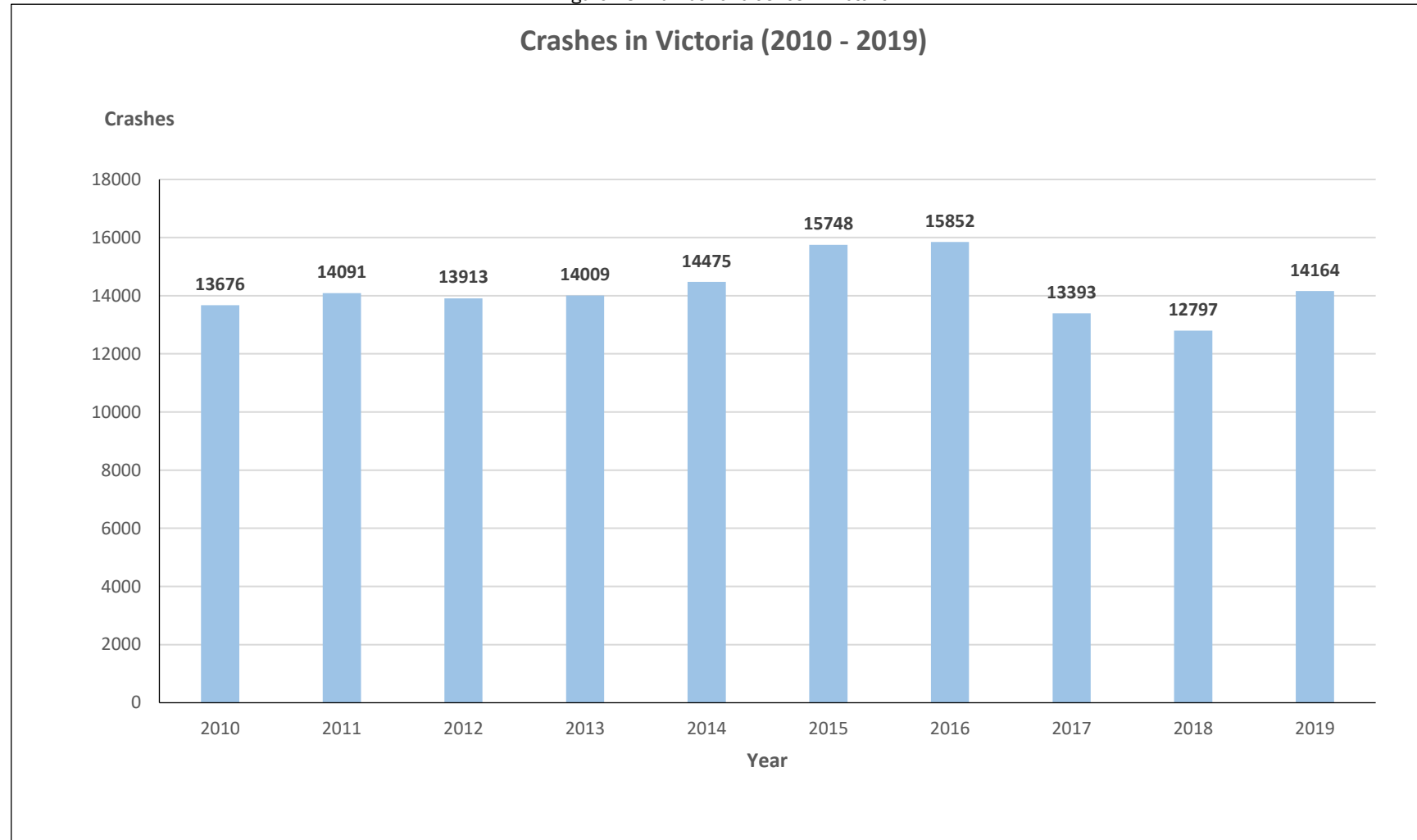
Alcohol-related crashes

Data is taken from *VicRoads Opendata* to determine if crashes were alcohol related as this field is not included in *VicRoads Crashstats*. However, *VicRoads Opendata* only has available statistics between the dates of 1 July 2013 and 21 March 2019 (approximately five years and 10 months) as opposed to the 10-year period observed for the rest of the analysis.

4 STATISTICAL COMPARISON

4.1 Total crashes within Victoria over 10 years

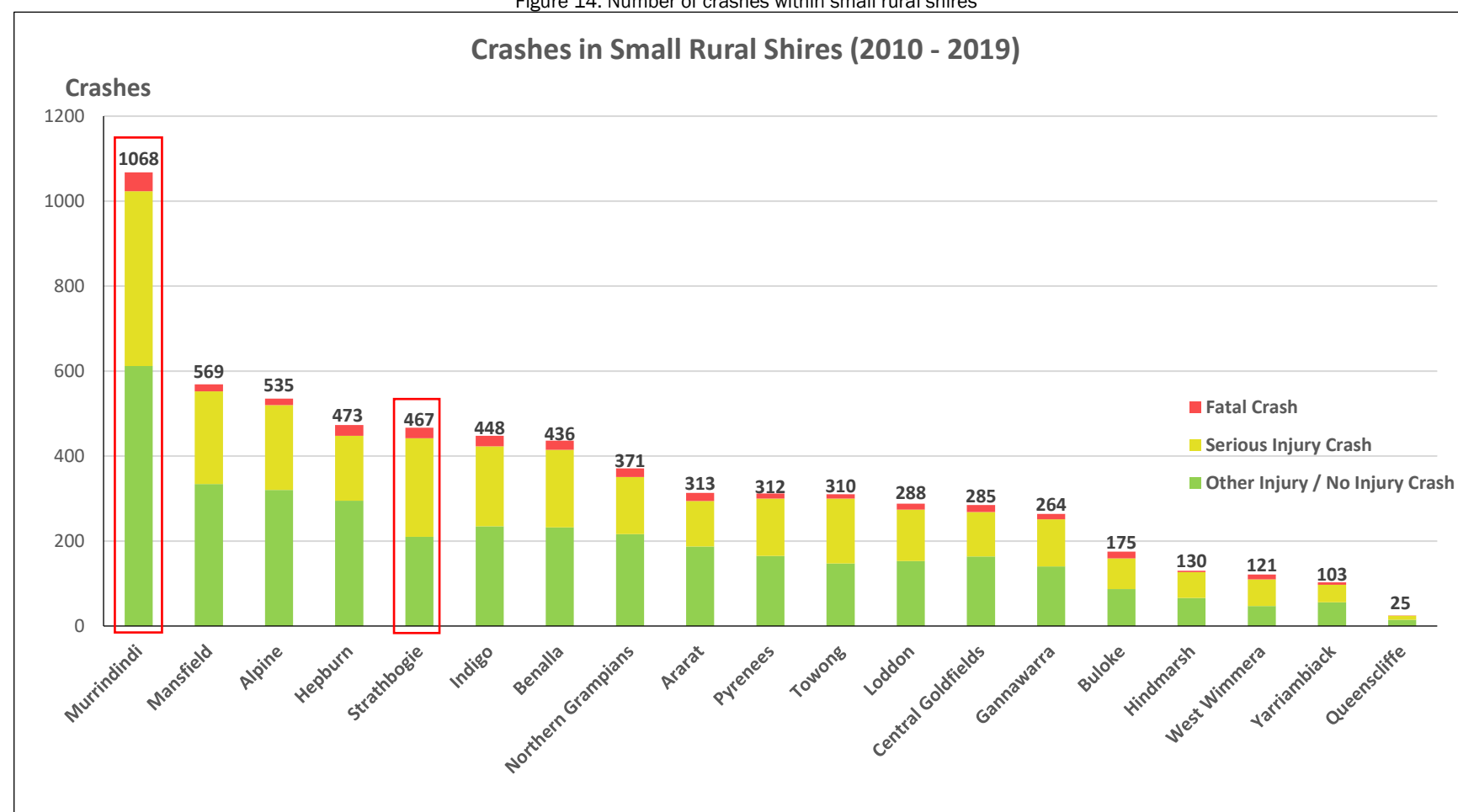
Figure 13: Number of crashes in Victoria



- The number of crashes in Victoria was increasing every year from 2012 to 2016.
- There was a 16 % reduction in crashes from 2016 to 2017 but a 10 % decrease from 2018 to 2019.

4.2 Total crashes over 10 years within small rural shires

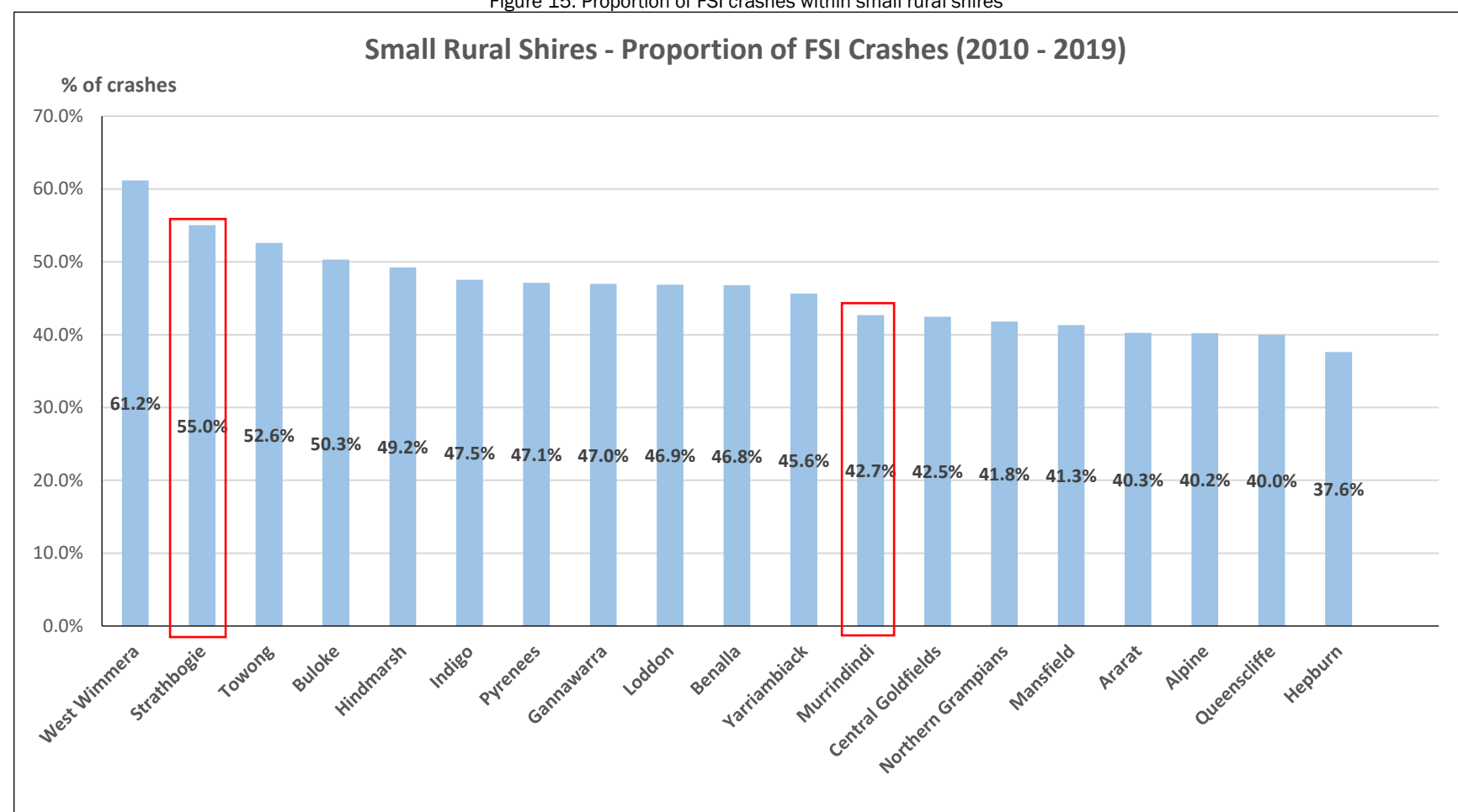
Figure 14: Number of crashes within small rural shires



- The Shire of Murrindindi has the greatest number of crashes among small rural shires in Victoria, with at least double the number of crashes compared to most other shires.
- Strathbogie ranks second for the number of fatal and serious injury crashes (257) behind Murrindindi (456), despite recording less crashes than Mansfield, Alpine and Hepburn shires.

4.3 Proportion of Fatal and Serious Injury (FSI) crashes over 10 years within small rural shires

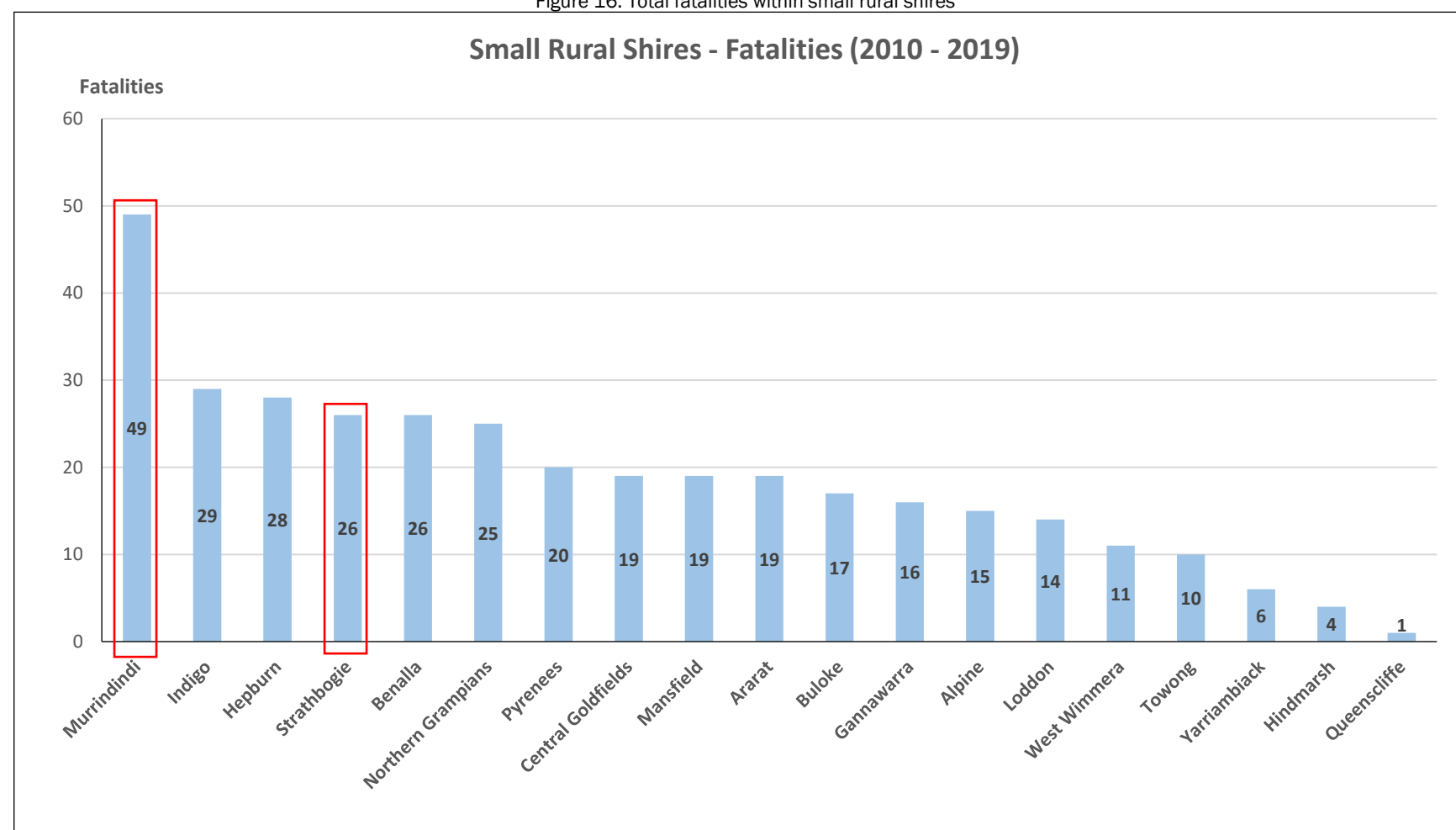
Figure 15: Proportion of FSI crashes within small rural shires



- There is a smaller proportion of FSI crashes in Murrindindi Shire compared to most other small rural shires, despite having the highest number of crashes.
- Strathbogie has the second highest rate of FSI crashes. This indicates that the nature of road accidents in Strathbogie tend to be more severe than in Murrindindi, despite having a lower number of crashes.

4.4 Total fatalities over 10 years within small rural shires

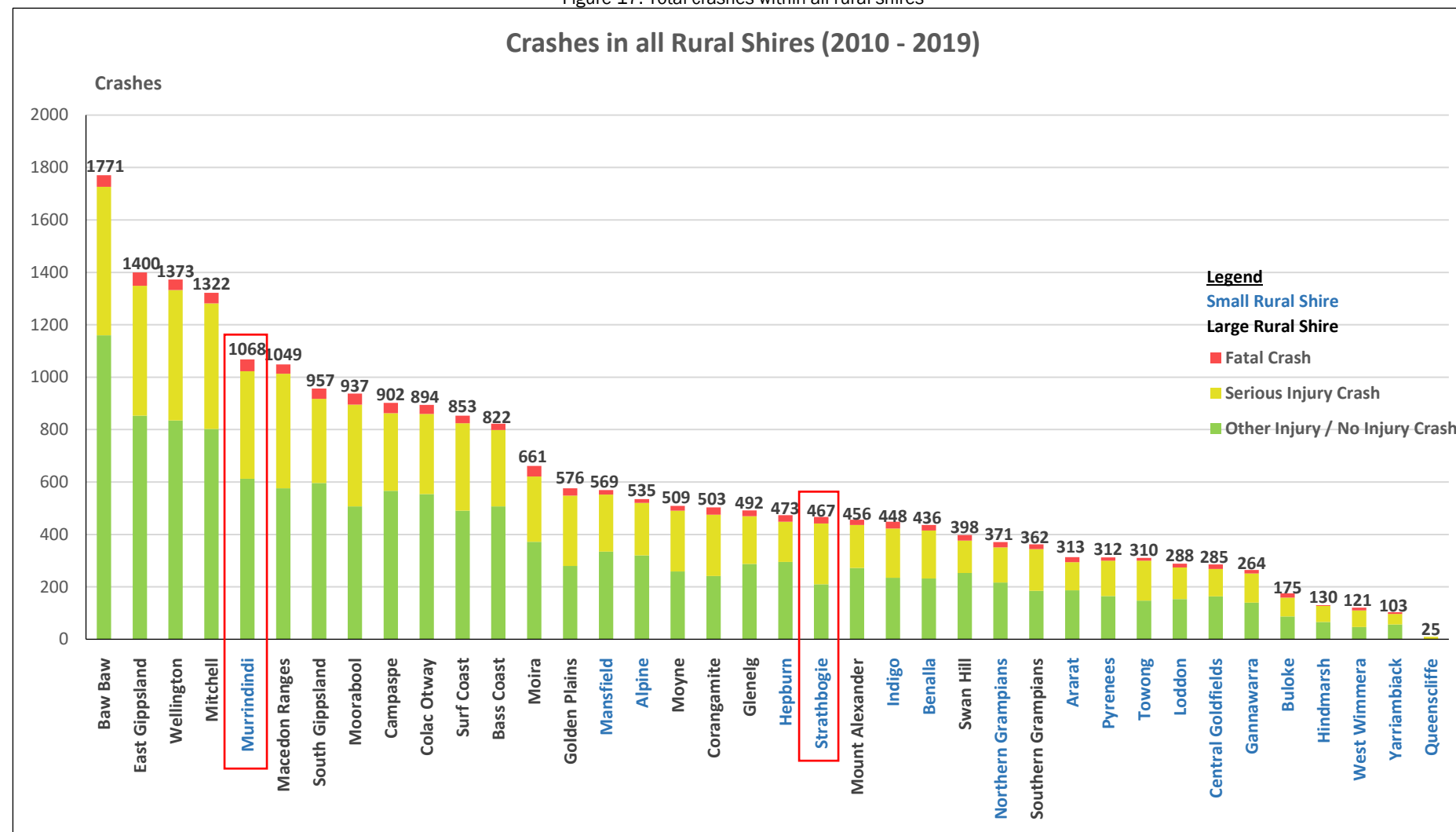
Figure 16: Total fatalities within small rural shires



- Murrindindi has the highest number of road-related fatalities. The high number of crashes in the Shire contributes to this.
- Strathbogie Shire ranks fourth highest in the number of road related fatalities out of all the small rural shires in Victoria.

4.5 Total crashes over 10 years within all rural shires

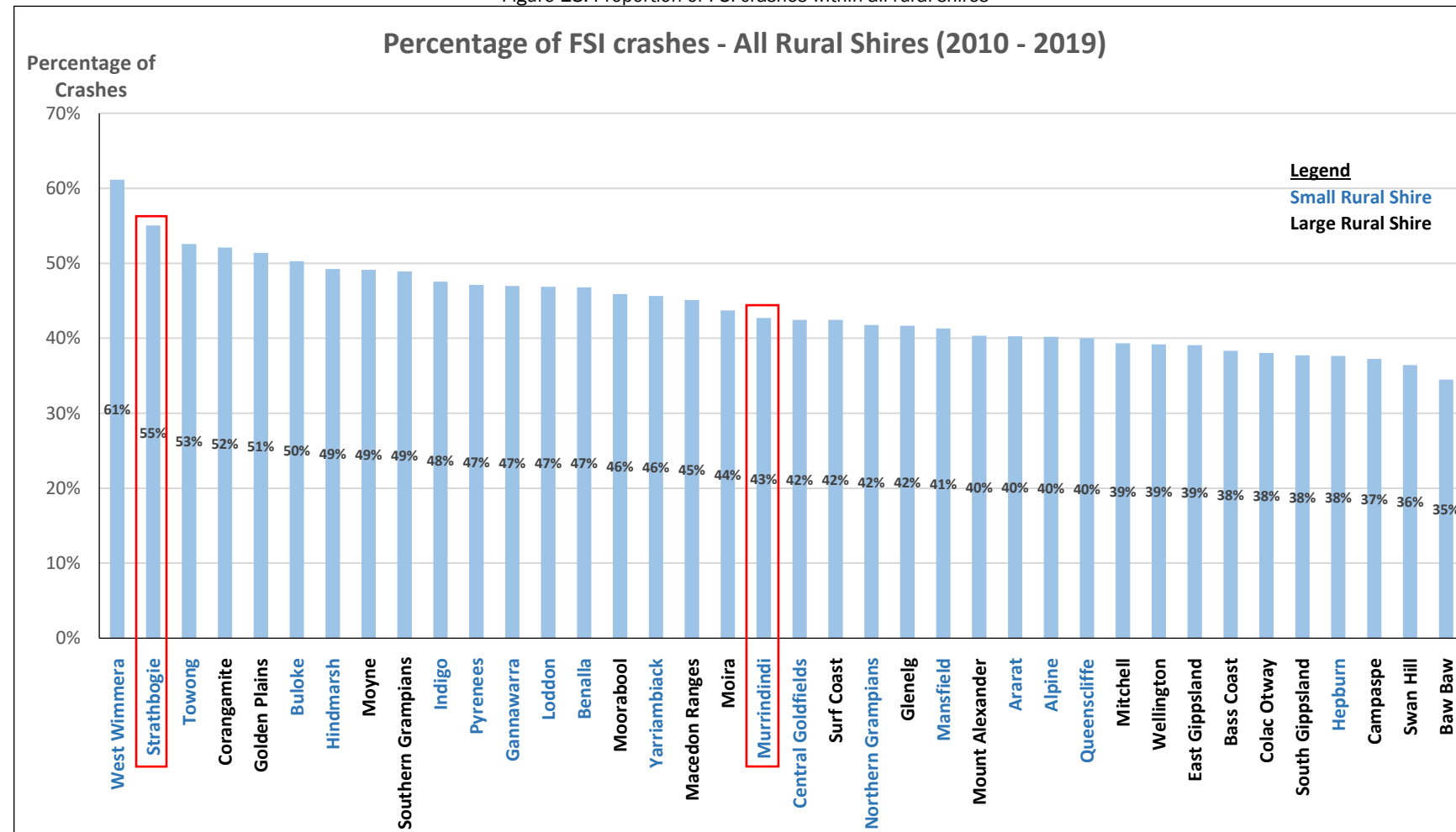
Figure 17: Total crashes within all rural shires



- Although Murrindindi is classified as a small shire, it has more crashes than 15 out of the 19 large rural shires. The number of crashes in Murrindindi is comparable to the Macedon Ranges, despite having a much smaller population (approximately 14,000 versus 50,000). This indicates that there is a very high number of crashes per capita in Murrindindi.
- The number of crashes in Strathbogie is higher than three large rural shires, Mount Alexander, Swan Hill and Southern Grampians.

4.6 Proportion of FSI over 10 years within all rural shires

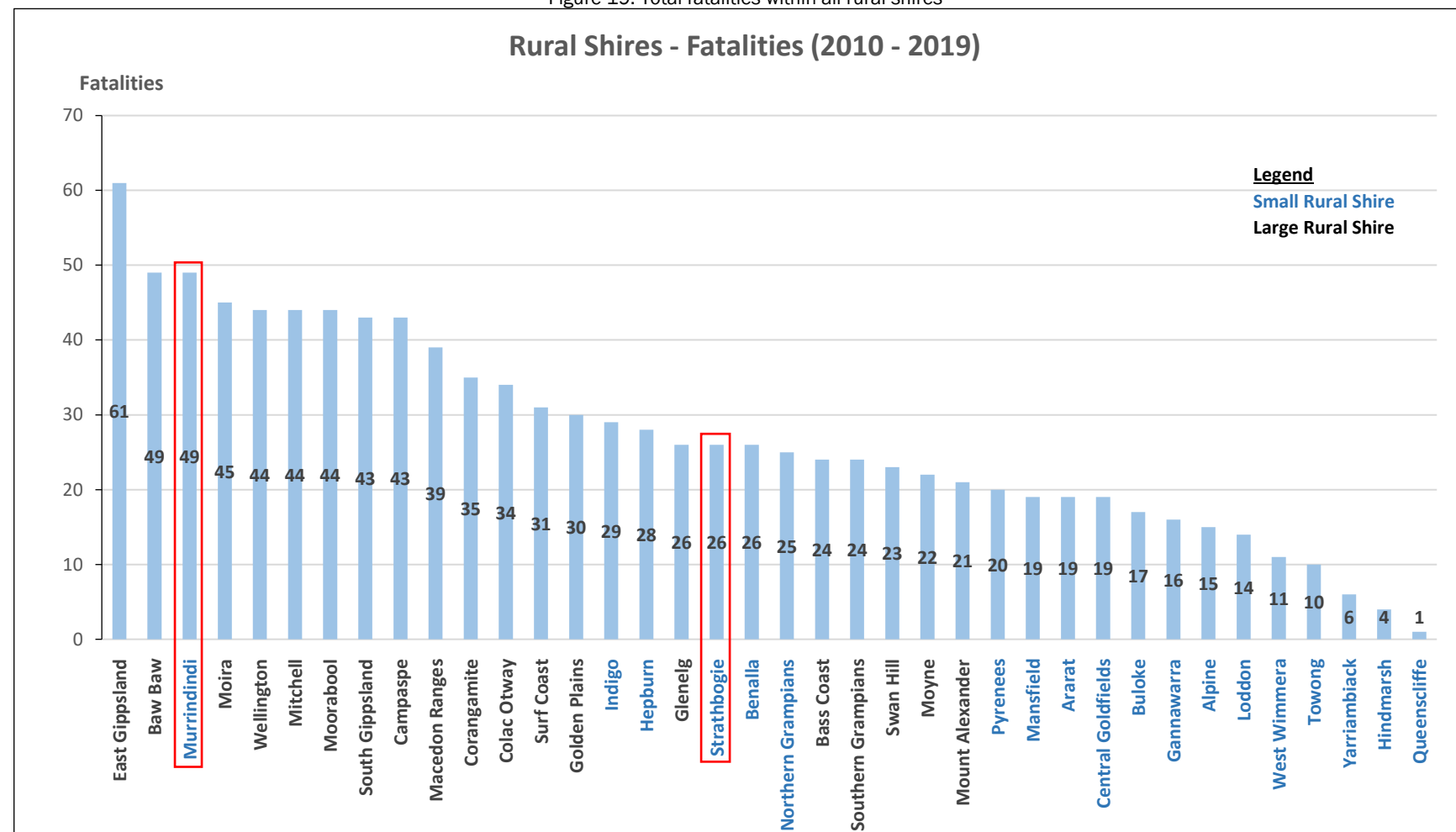
Figure 18: Proportion of FSI crashes within all rural shires



- The shire of Strathbogie has a higher proportion of FSI crashes than all large rural shires. This indicates that crashes in the area tend to have a higher severity as compared to most of rural Victoria.
- The proportion of FSI crashes in Murrindindi is average when compared to other rural shires.

4.7 Total fatalities over 10 years within all rural shires

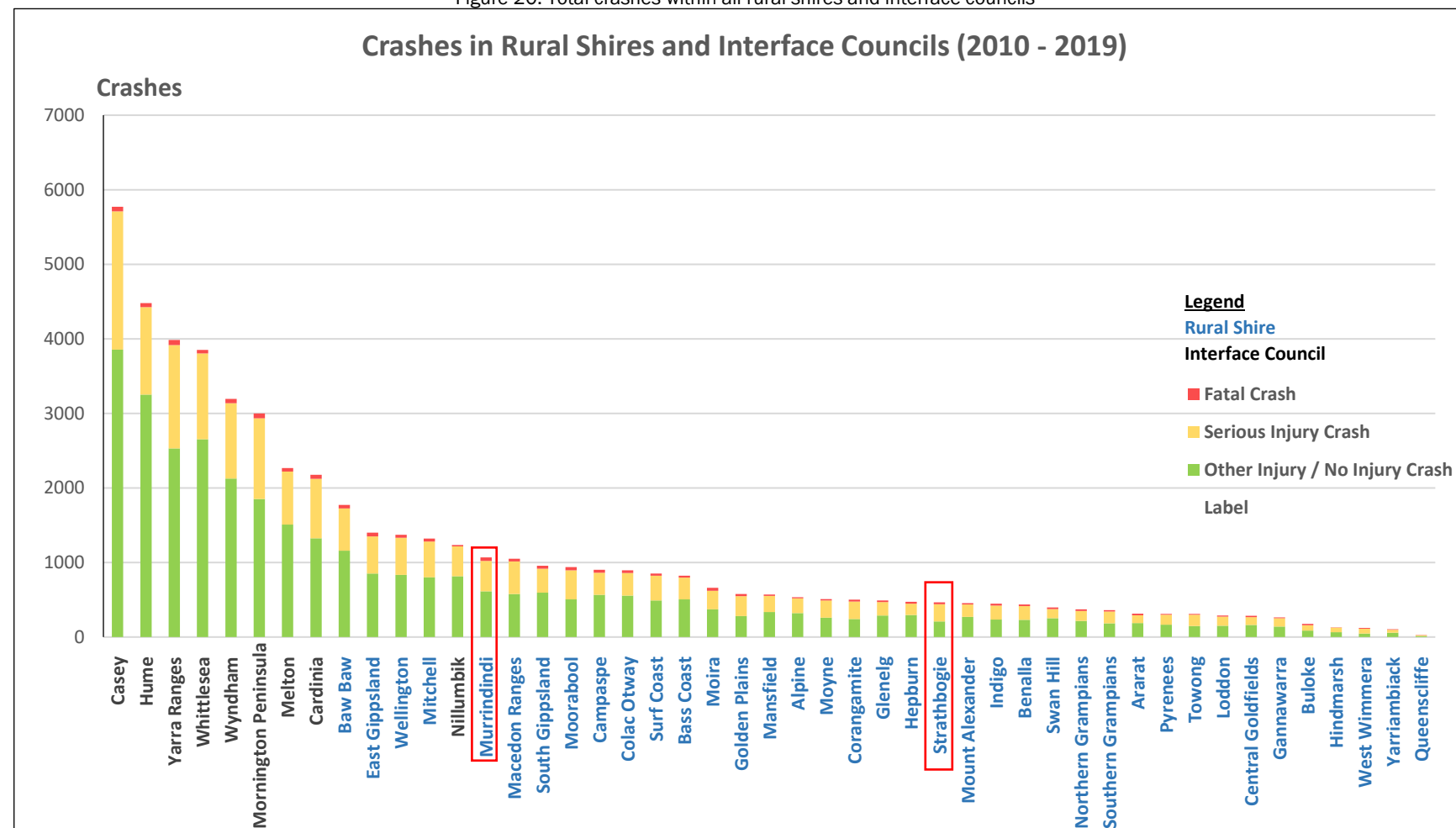
Figure 19: Total fatalities within all rural shires



- Murrindindi has more fatalities than 17 out of the 19 large rural shires while Strathbogie has more road-related fatalities than five large rural shires.
- This indicates that both Murrindindi and Strathbogie may have a high fatality rate as compared to the rest of Rural Victoria.

4.8 Total crashes over 10 years within all rural shires and interface councils

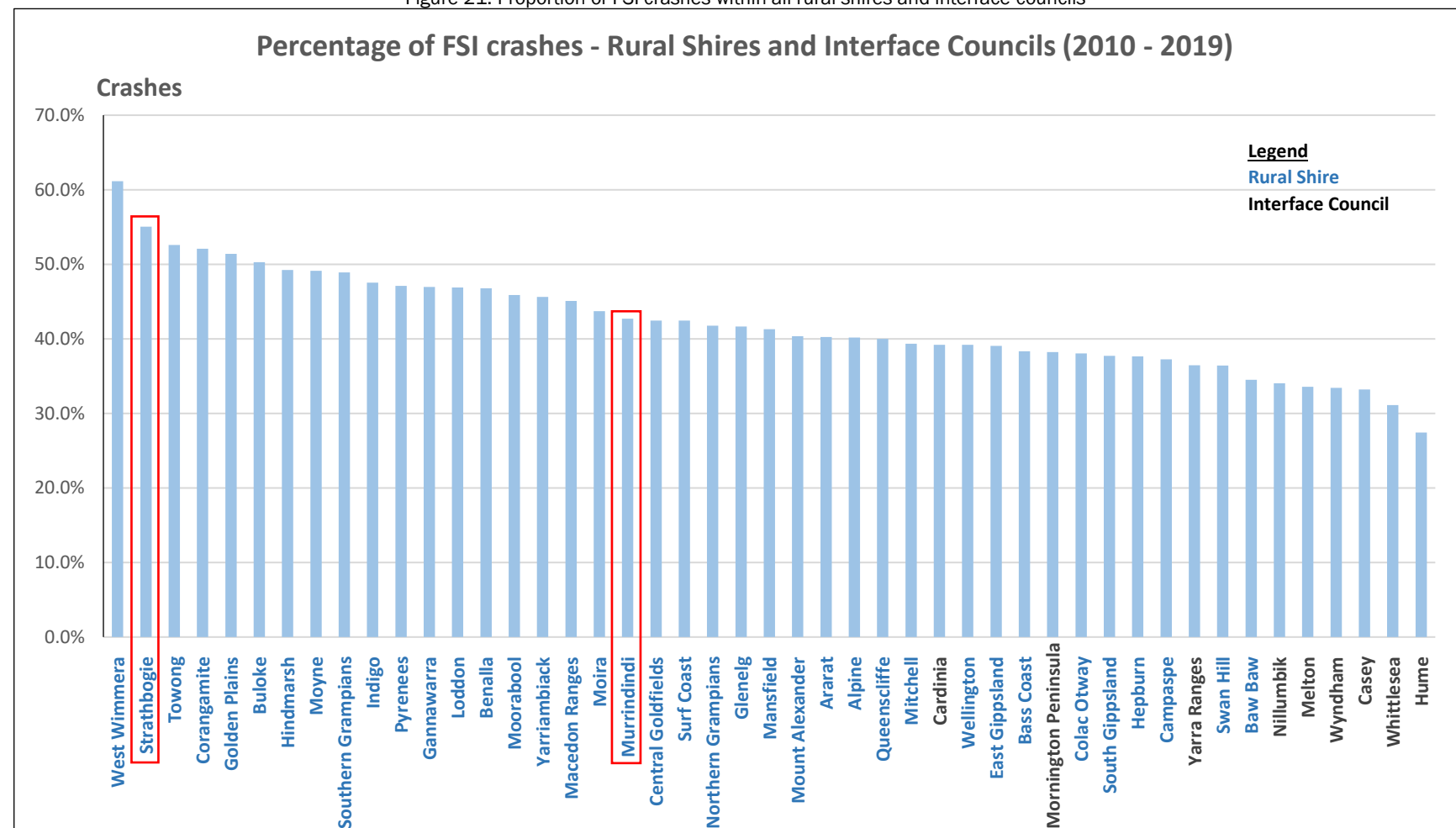
Figure 20: Total crashes within all rural shires and interface councils



- The top eight municipalities which have recorded the highest number of crashes are all interface councils. However, the Shire of Nillumbik recorded fewer crashes than the shire of Mitchell (1234 vs 1322) but more than Murrindindi (1068).

4.9 Proportion of FSI over 10 years within all rural shires and interface councils

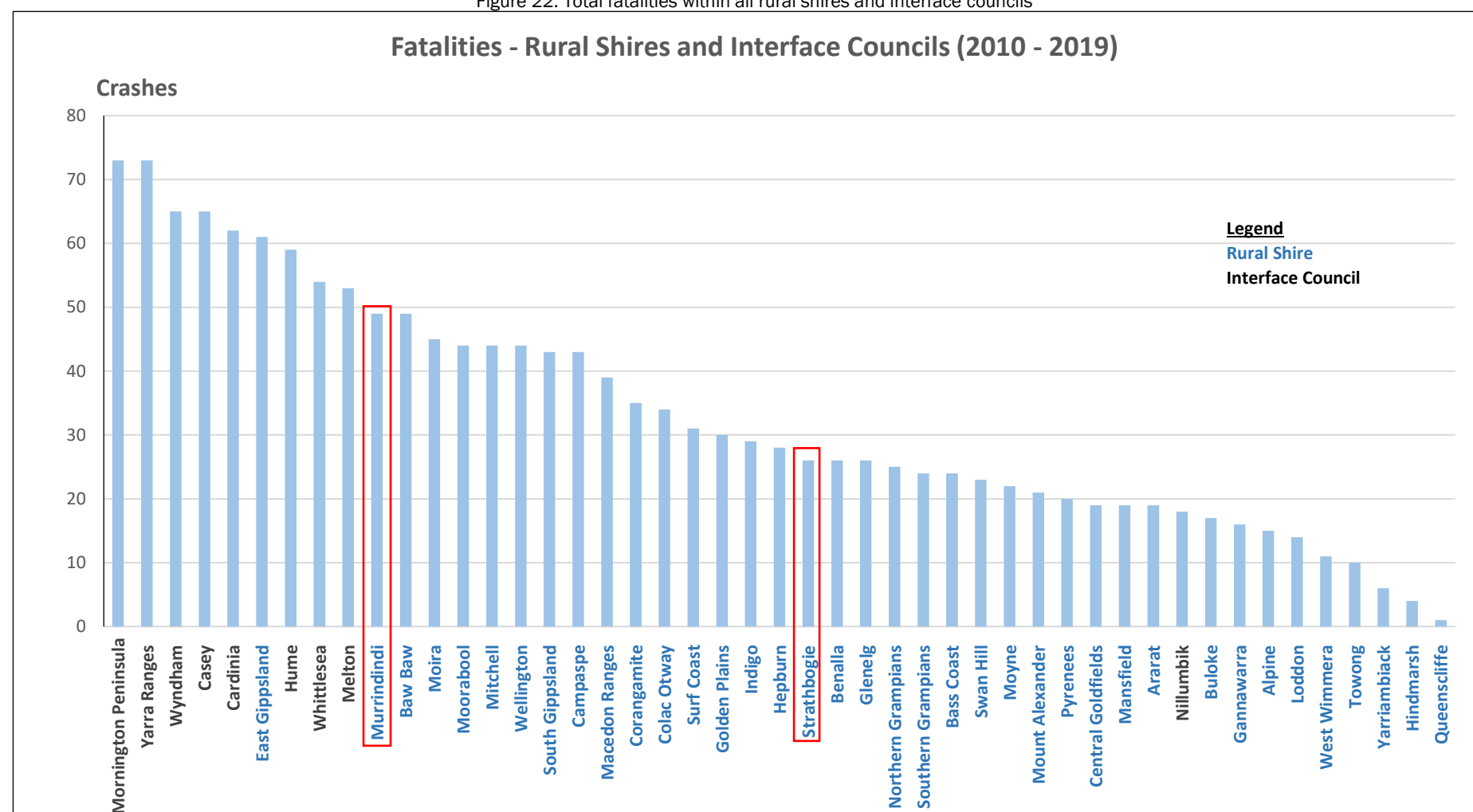
Figure 21: Proportion of FSI crashes within all rural shires and interface councils



- Six out of the nine interface councils have a lower proportion of FSI cashes compared to all rural shires. Cardinia shire recorded the highest number out of all interface councils but is only ahead of nine out of the 38 rural councils.
- Both Murrindindi and Strathbogie have a higher percentage of FSI crashes than all interface councils.
- These results indicate that crashes tend to be more severe in outer regional areas as compared to metropolitan regions. This suggest that speed is a considerable contributing factor to crashes.

4.10 Total fatalities over 10 years within all rural shires and interface councils

Figure 22: Total fatalities within all rural shires and interface councils



- Most interface councils recorded higher fatalities than rural shires, however, this is only due to high overall crash numbers which may be a result of higher populations in these councils.
- There are more than double the number of fatalities in Murrindindi compared to Nilumbik (49 vs 18) despite having 13 % fewer crashes overall.

4.11 Fatality rate per 10,000 population over 10 years

Figure 23: Total fatalities per 10,000 population within all rural shires and interface councils

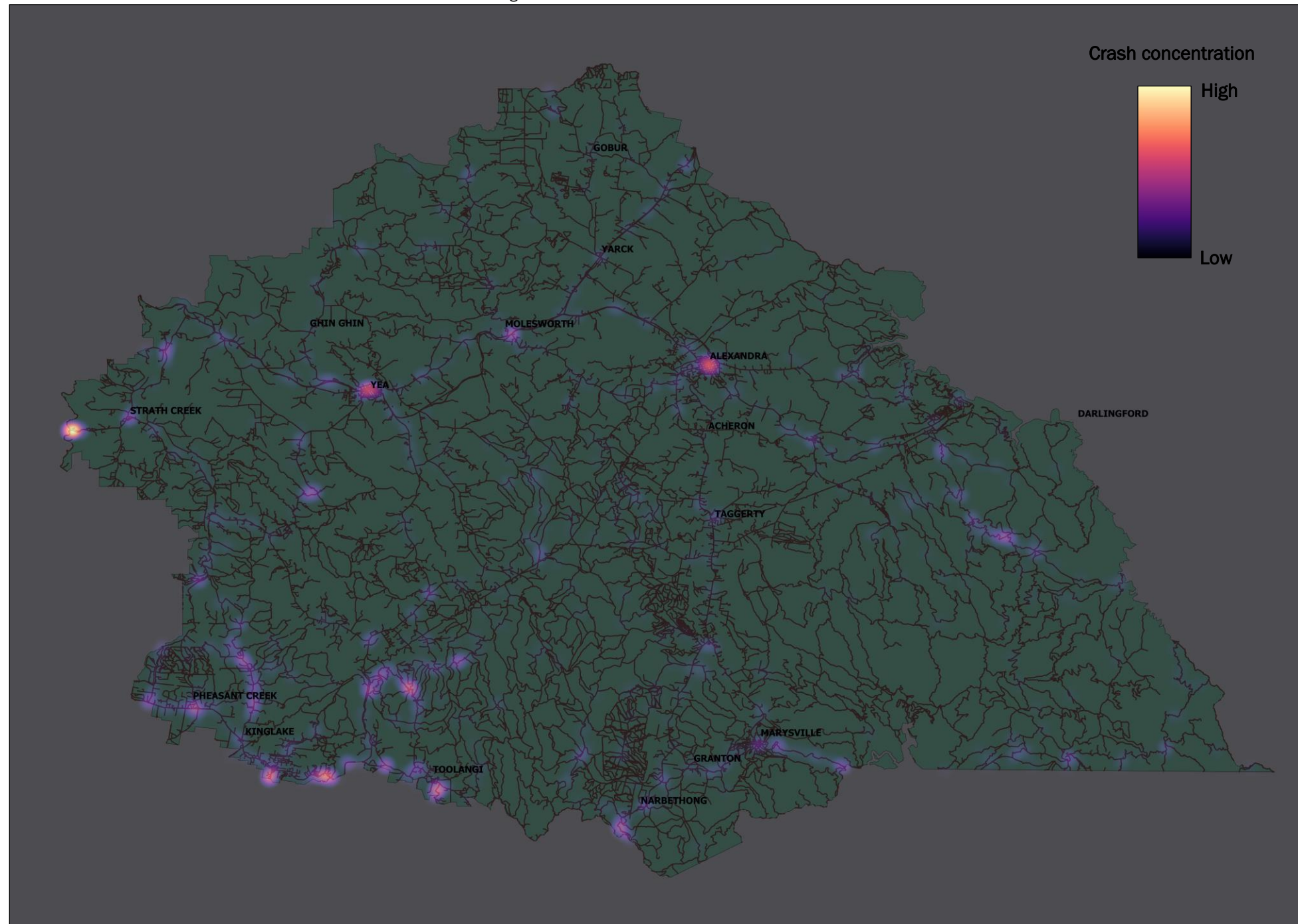


- Both Murrindindi and Strathbogie recorded a much higher average fatality rate per capita than Victoria (Murrindindi – 3.5, Strathbogie – 2.6, Victoria – 0.4 per 10,000 people).
- There is a greater variation in this figure every year from the two shires due to the smaller sample size compared to the rest of the state. However, both Murrindindi and Strathbogie recorded their highest rate of fatalities per capita in 2015 (6.5 and 4.9).
- Both shires recorded relatively lower figures in 2018 and 2019 compared to the average in the 10-year period.
- The figures do not account for road users travelling from outside the shire. Thus, travellers may have a considerable effect on the number of fatalities recorded.

5 STATISTICAL OVERVIEW IN MURRINDINDI AND STRATHBOGIE

5.1 Locations of crashes within Murrindindi

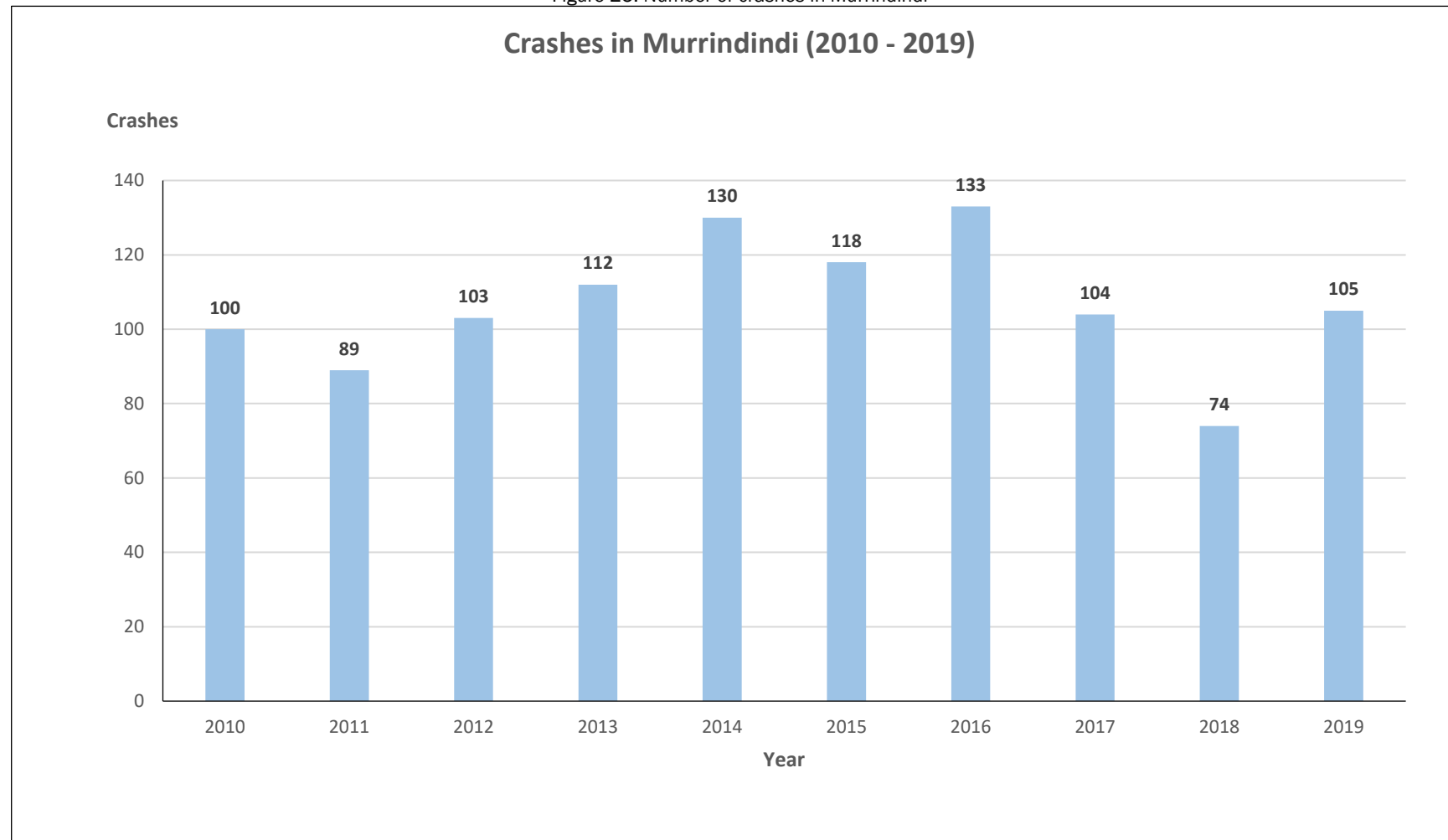
Figure 24: Location of crashes within Murrindindi



- There are several clusters of crashes in town areas such as Yea or Alexandra. This may only be an indicator of the density of roads or traffic volume in town areas.
- Most crashes are in rural areas. There are clusters of crashes along lengths of road such as Extons Road, Heidelberg-Kinglake Road, Healesville-Kinglake Road and Eildon-Jaimeson Road.

5.2 Total crashes within Murrindindi over 10 years

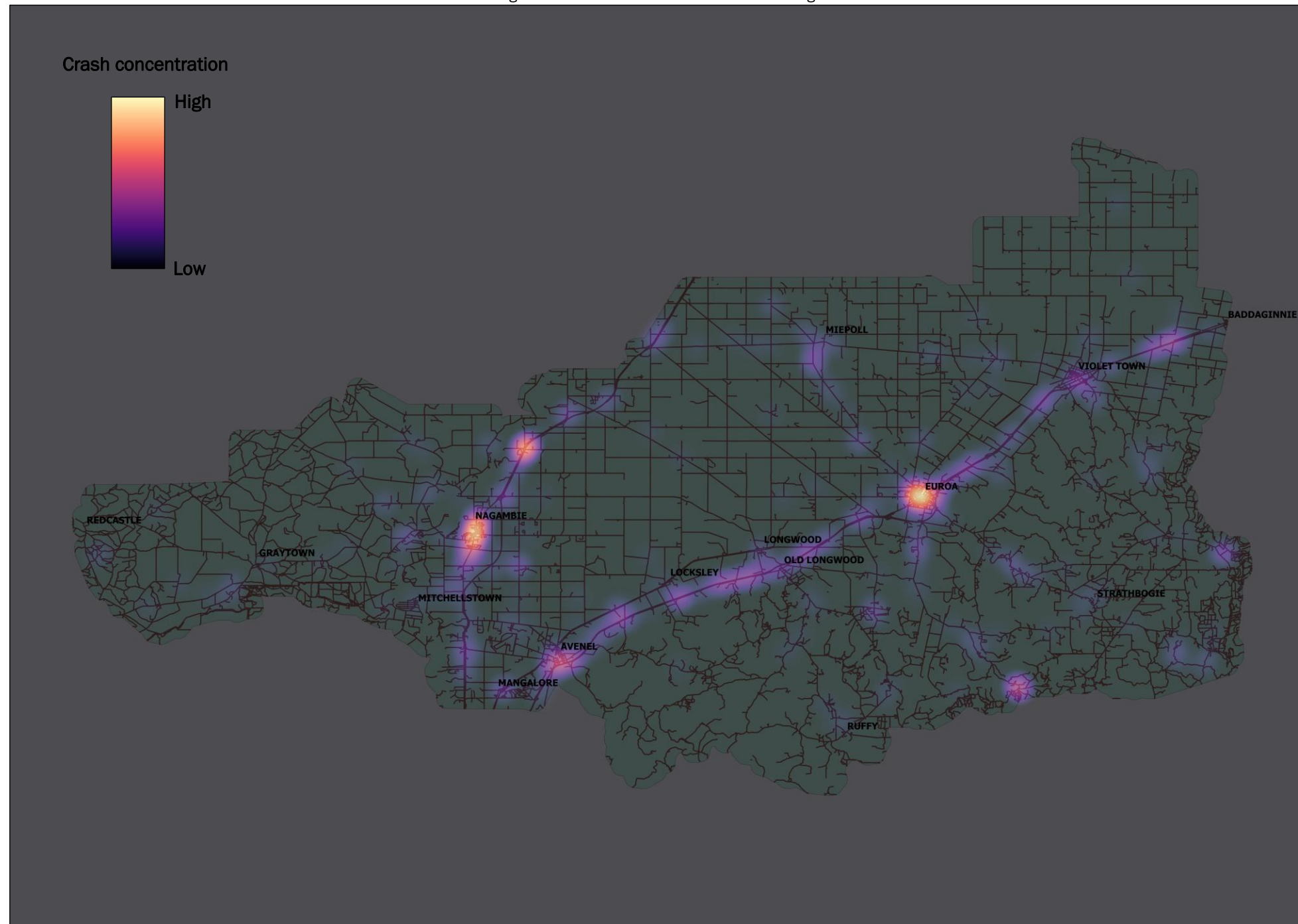
Figure 25: Number of crashes in Murrindindi



- The average number of crashes in Murrindindi is 106.8 per year.
- The number of crashes in Murrindindi increased by 46 % from 2011 to 2014.
- There was a significant reduction in crashes from 2016 to 2018, with 44 % fewer crashes overall. However, crashes increased again in 2019, with a 42 % increase from the previous year.

5.3 Locations of crashes within Strathbogie

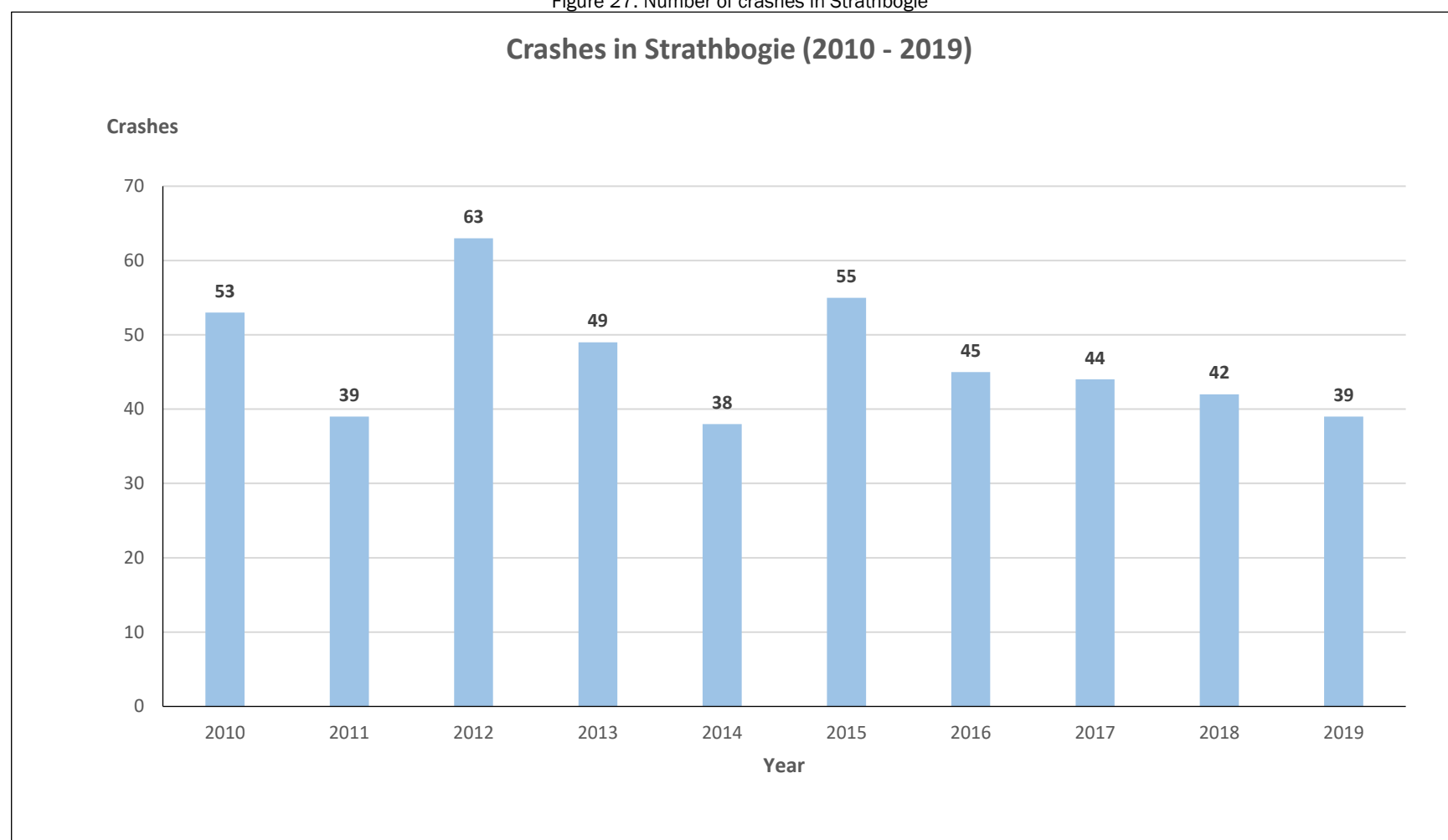
Figure 26: Location of crashes within Strathbogie



- There are clusters of crashes in towns such as Euroa (mostly intersections) and Nagambie (intersections and midblock).
- Crashes are prevalent on major arterial roads such as Goulburn Valley Highway, Hume Freeway and High Street in Nagambie.
- Crashes are scattered across local roads in many areas, including non-public roads such as Gerars Track and Dry Creek Road (east of Strathbogie township).

5.4 Total crashes within Strathbogie over 10 years

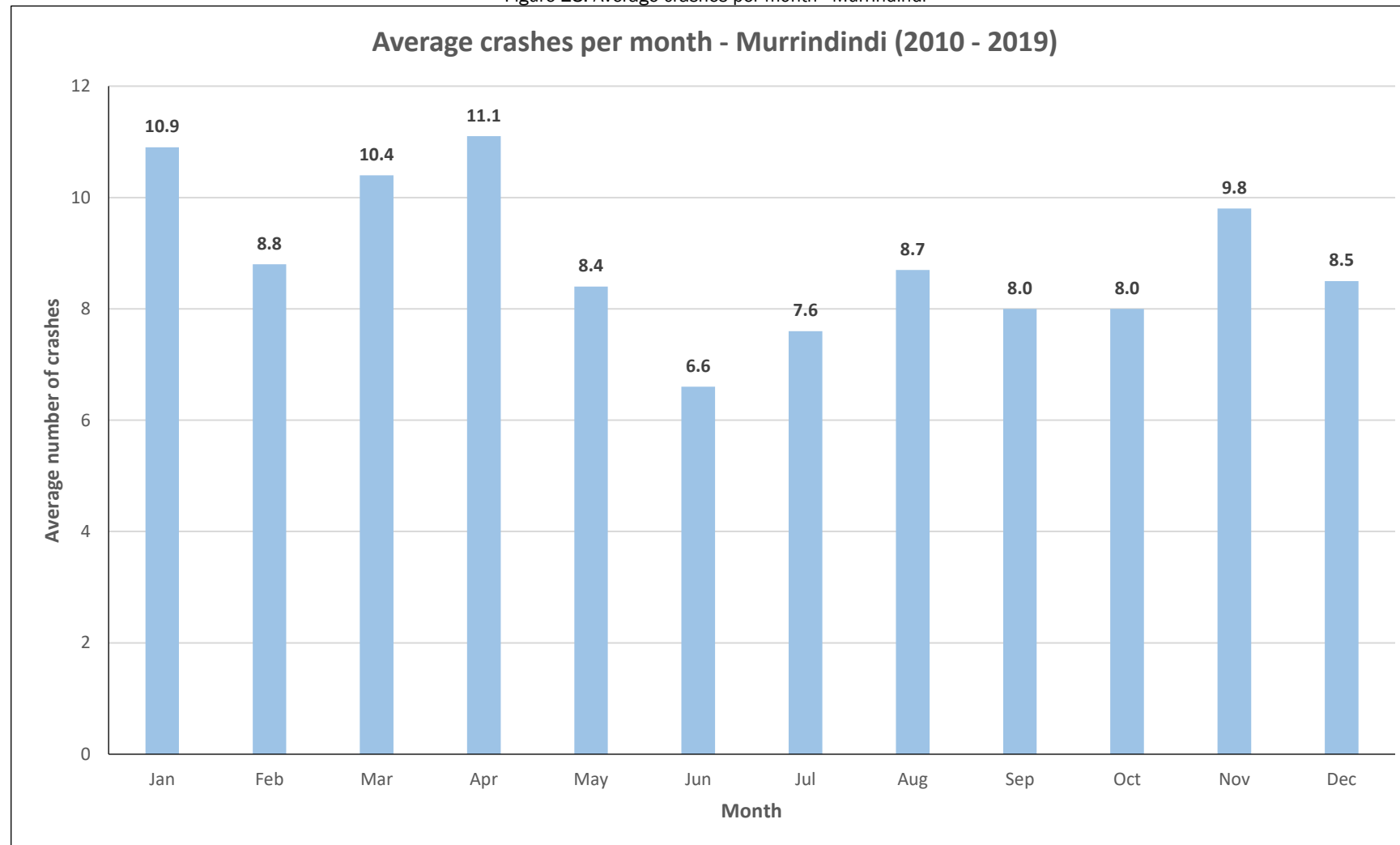
Figure 27: Number of crashes in Strathbogie



- The average number of crashes in Strathbogie is 46.7 per year.
- There was a spike in crashes in 2012, with an increase of 60 % following the previous year.
- There was a large increase of crashes (45 %) in Strathbogie from 2014 to 2015. However, the number of crashes remained similar from 2016 to 2019 with an overall decreasing trend from 2015.

5.5 Average crashes per month (Murrindindi)

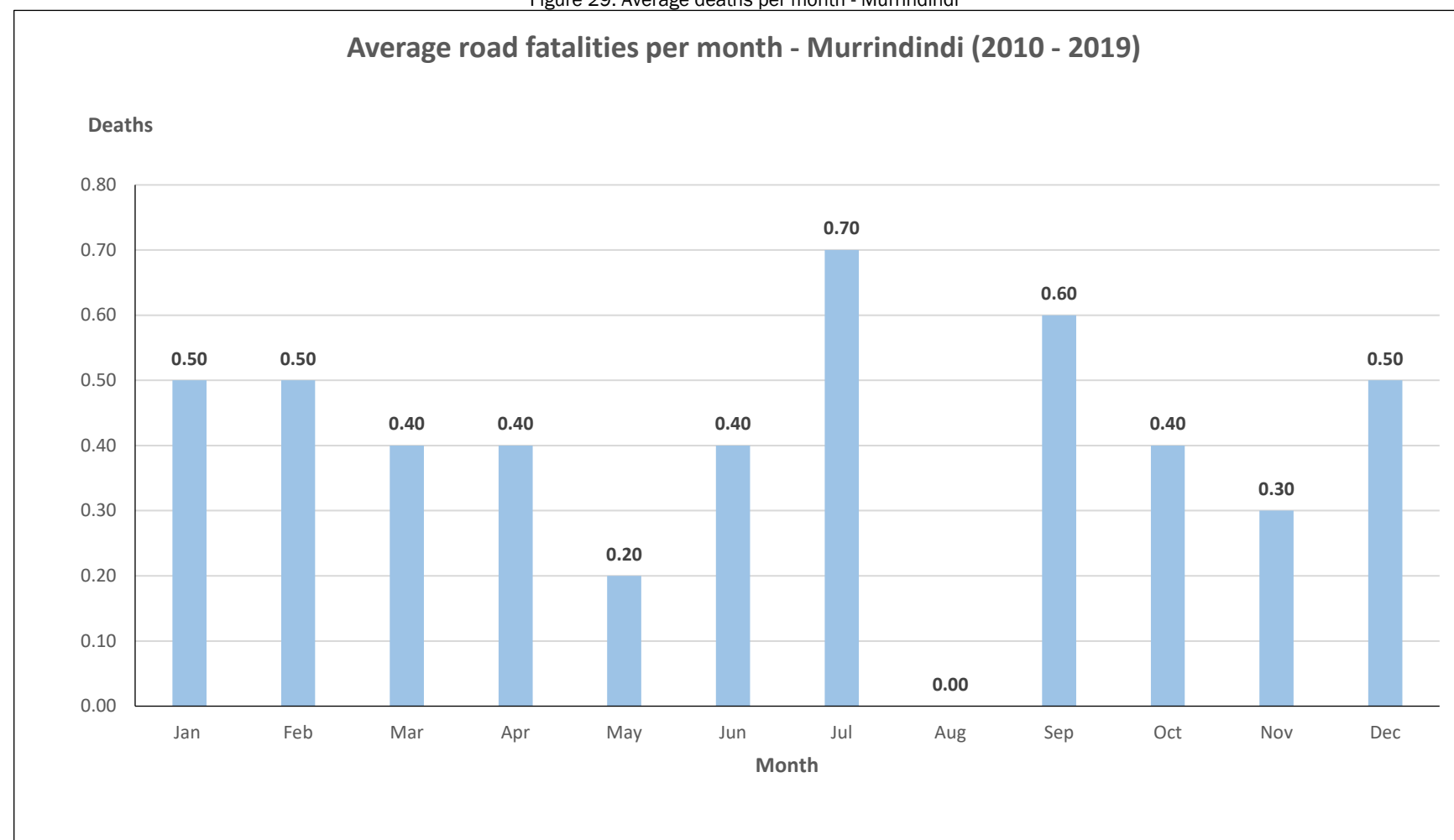
Figure 28: Average crashes per month - Murrindindi



- There are generally more crashes occurring in the first half of each year. Spikes in crashes occur in the months of January, March, and April, recording more than 10 crashes on average. This could be correlated back to the increased number of tourists arriving in the region during the Christmas and Easter breaks.

5.6 Average deaths per month (Murrindindi)

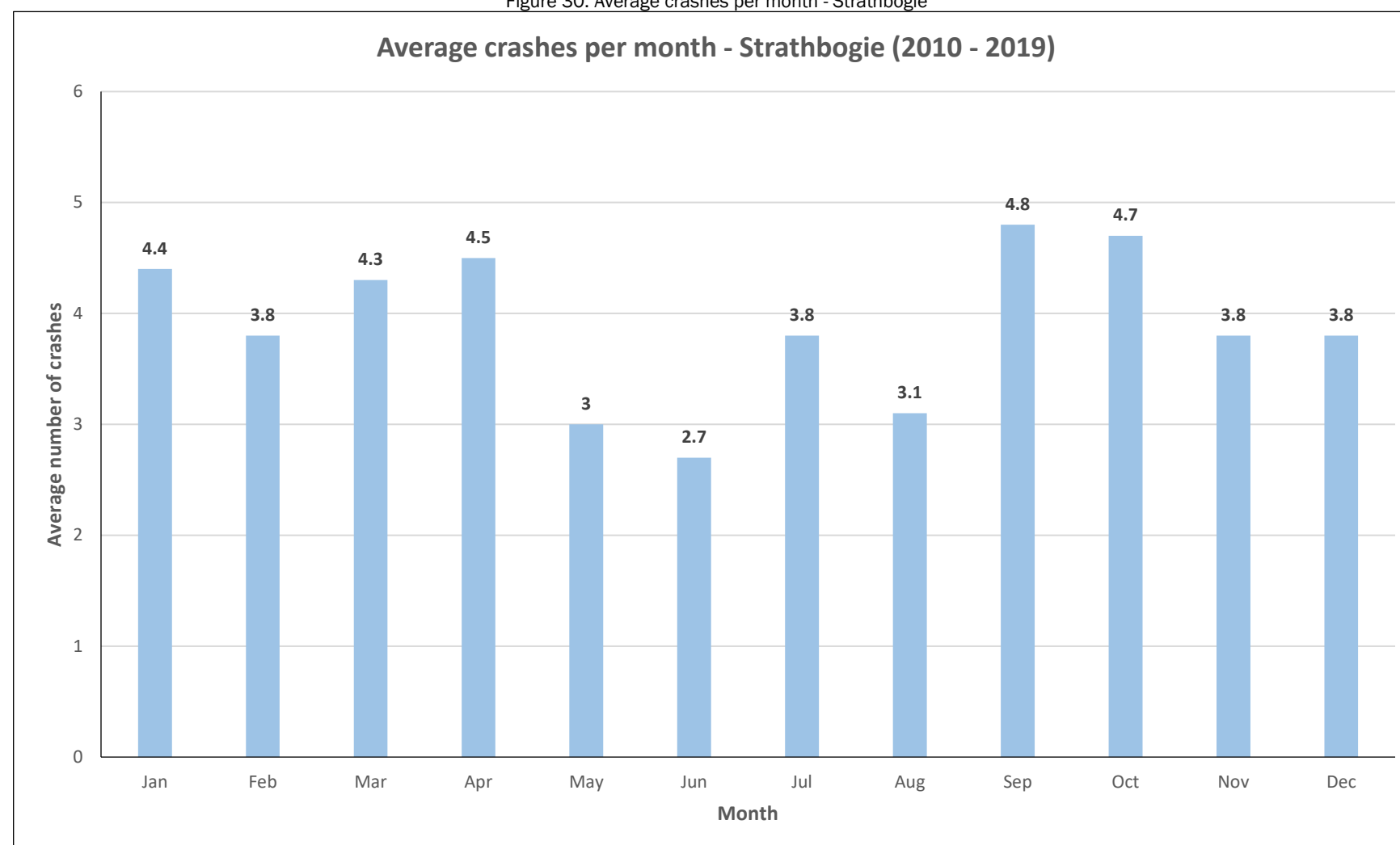
Figure 29: Average deaths per month - Murrindindi



- There is a high number of road-related fatalities in Strathbogie over most months of the year. They appear to be most frequent in summer months (average of 0.5 per month from December to February), mid-winter (0.7 in July) and September (0.6).
- The average number of fatalities each month is not strongly associated with the number of crashes. The month of July recorded the second lowest number of crashes while having the greatest number of fatalities on average.
- There were no recorded deaths in August months during the 10-year period despite recording 8.7 crashes on average.

5.7 Average crashes per month (Strathbogie)

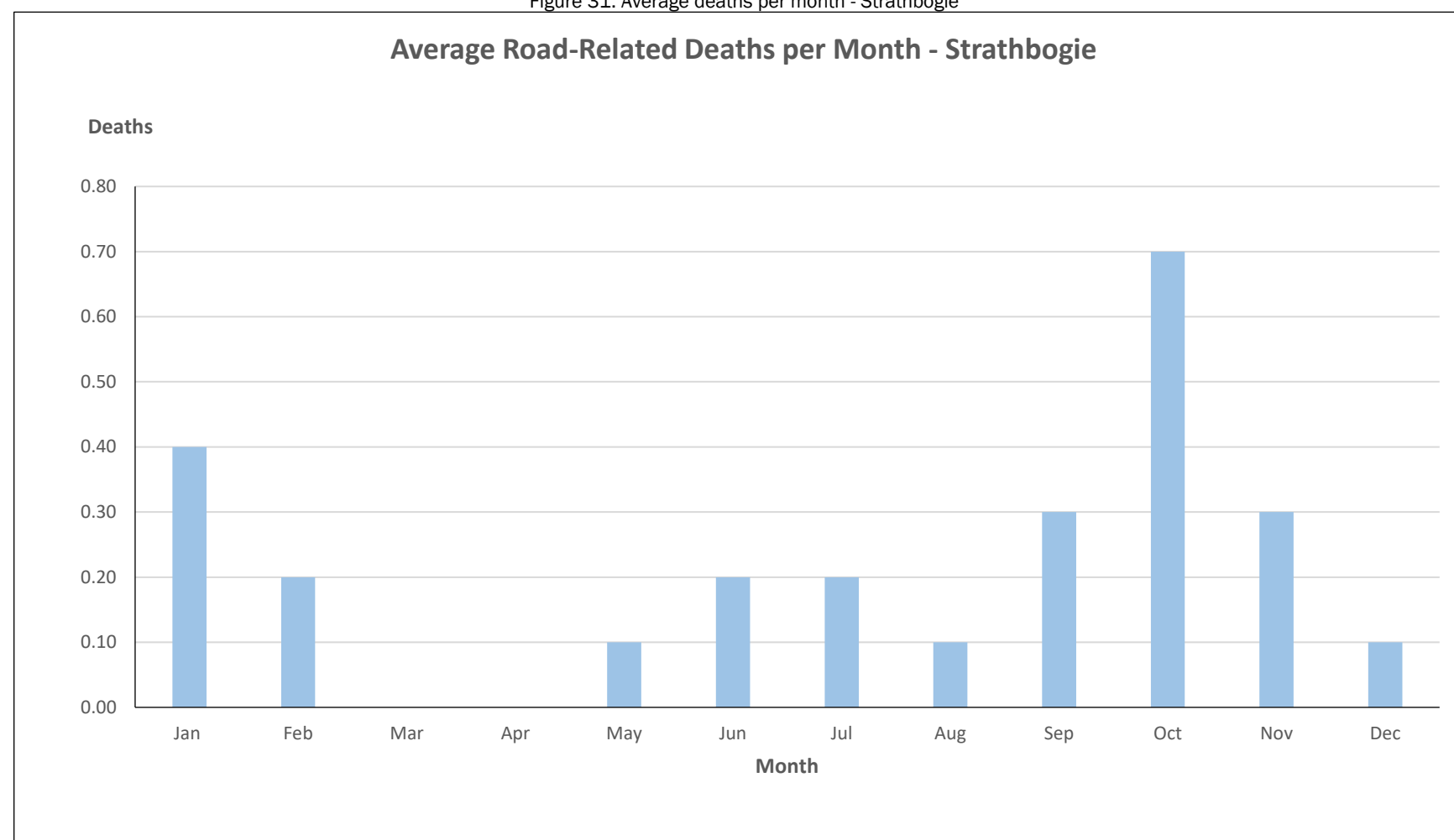
Figure 30: Average crashes per month - Strathbogie



- Except for the months of May, June, and August where crashes are generally lower, the number of crashes in Strathbogie do not appear to go through great seasonal variation.
- The months of September and October recorded the greatest number of crashes in Strathbogie.

5.8 Average deaths per month (Strathbogie)

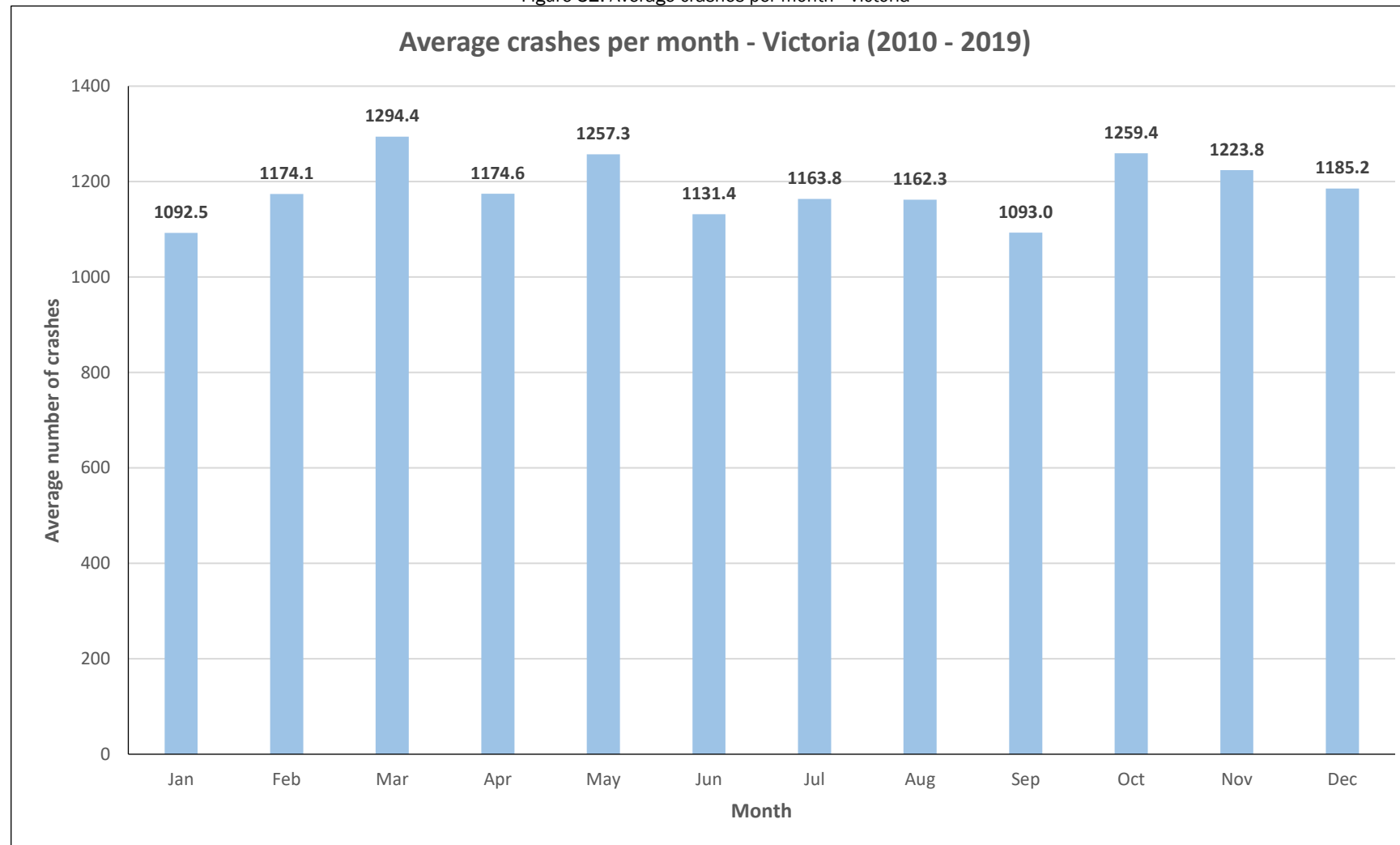
Figure 31: Average deaths per month - Strathbogie



- The number of fatalities in Strathbogie appear to be largely dependent on the time of year. There was a high average number of road-related fatalities in October (0.7) and January (0.4). However, other months have relatively fewer fatalities, with no records for the months of March and April despite having high numbers of crashes.
- The month of October appears to be the most dangerous month in Strathbogie. In addition to recording the greatest number of fatalities, it is also second highest for the number of crashes on average behind September (4.7 versus 4.8).

5.9 Average crashes per month (Victoria)

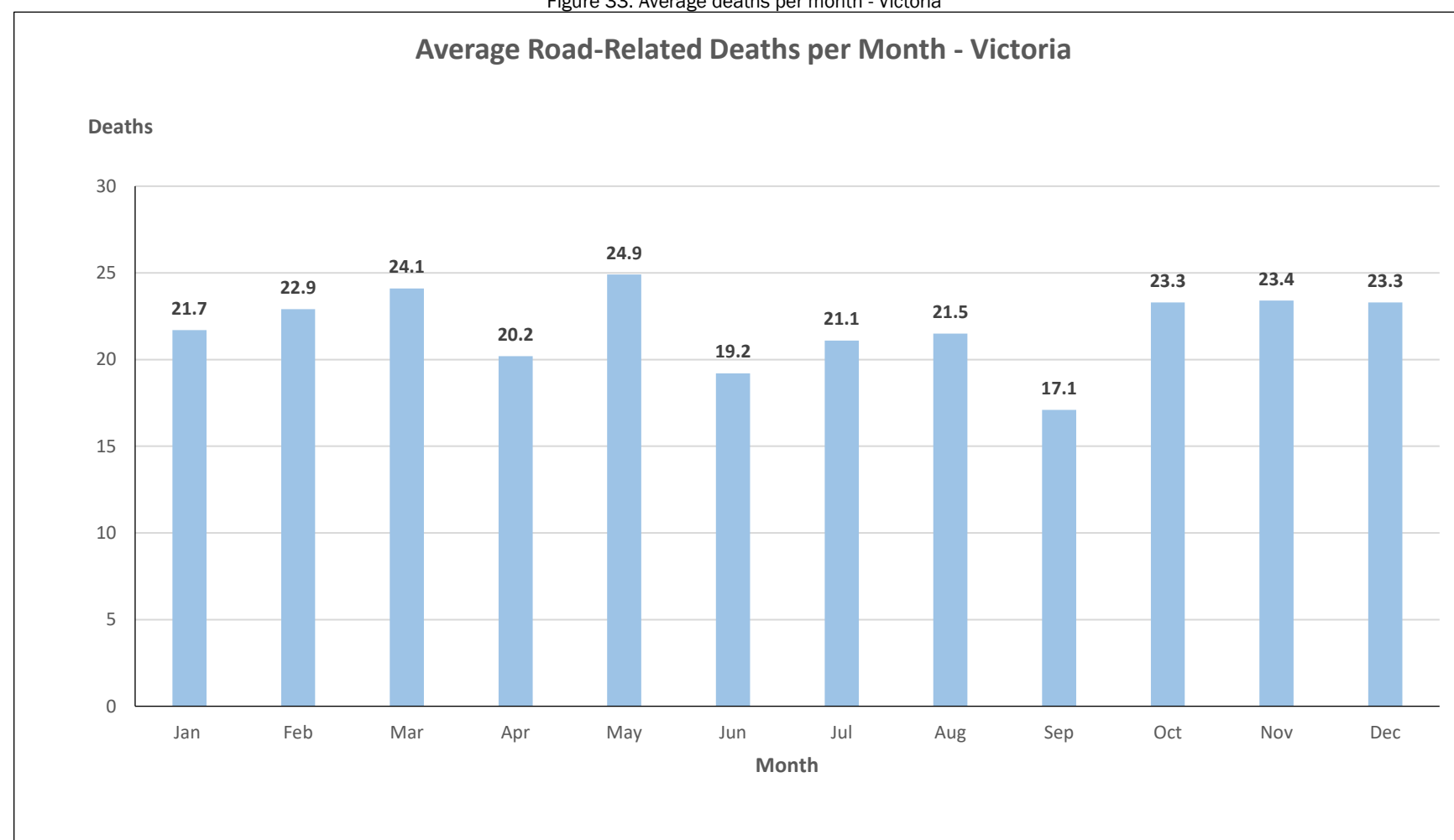
Figure 32: Average crashes per month - Victoria



- The number of crashes in Victoria over each month of the year appear to be more evenly distributed than the two shires analysed with no distinct peaks. This is likely due to the larger area observed.

5.10 Average deaths per month (Victoria)

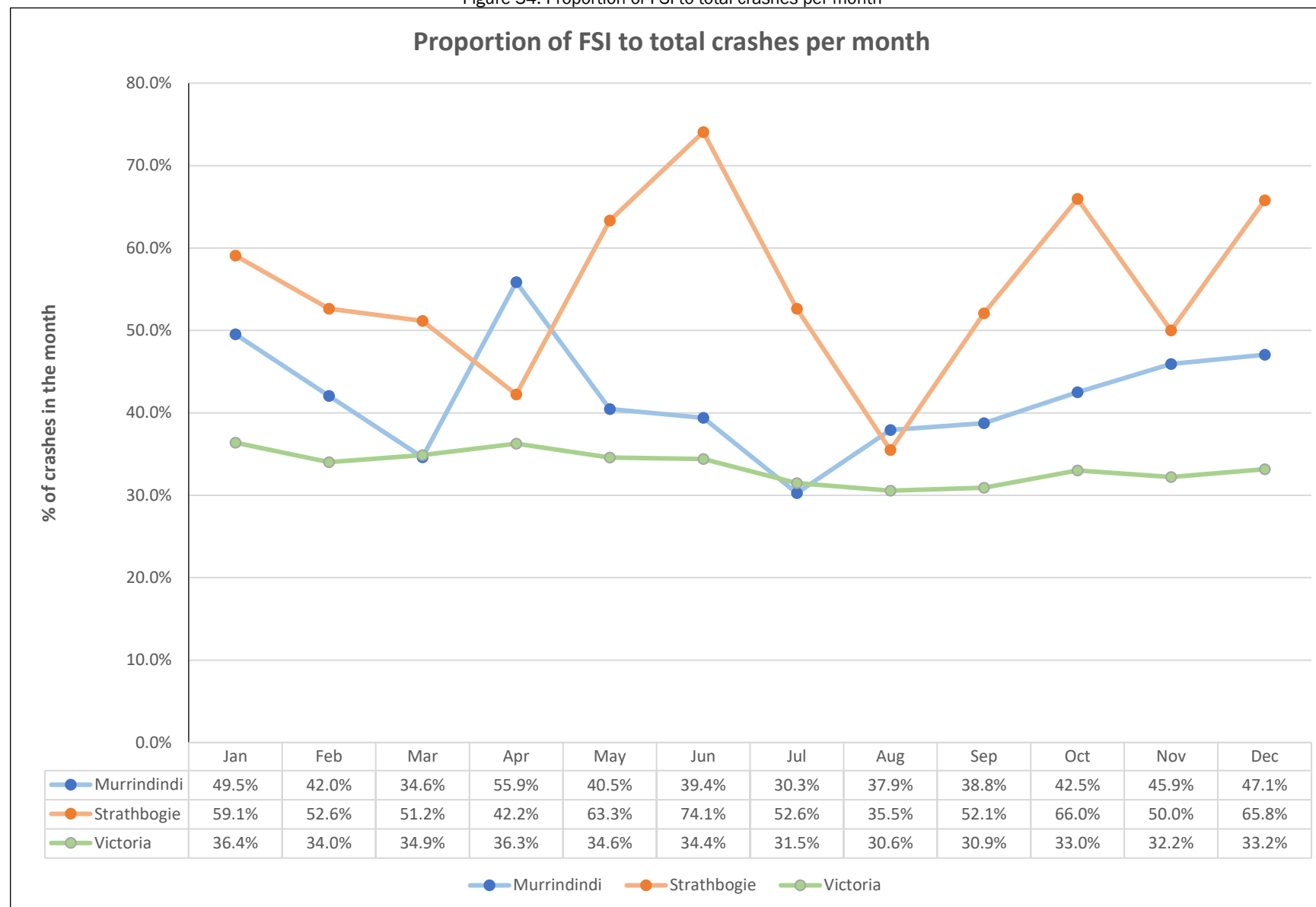
Figure 33: Average deaths per month - Victoria



- Like the number of crashes, fatalities over different months of the year in Victoria appear to be much more uniform than the two shires analysed.
- The month of May recorded the highest average number of deaths. However, Strathbogie and Murrindindi recorded relatively low numbers in this month as compared to most other times of year.
- While September was the lowest month for fatalities in Victoria, it was the second highest for Murrindindi.
- These observations indicate that factors leading to crashes in Strathbogie and Murrindindi are atypical when compared to the rest of Victoria, being more seasonal-dependent.

5.11 Proportion of FSI to total crashes each month

Figure 34: Proportion of FSI to total crashes per month



- The average proportion of FSI crashes for the two shires are much higher than Victoria, with 42.0 % for Murrindindi, 55.4 % for Strathbogie and 33.4 % for Victoria.
- Months with the highest proportion of FSI crashes are April for Murrindindi (55.9 %) and June for Strathbogie (74.1 %). The high result for Strathbogie is due to many serious injury crashes despite having a low number of incidents overall.

5.12 Location of fatalities - Murrindindi

Figure 35: Fatalities – Murrindindi



- There were 49 fatalities resulting from road crashes between 2010 and 2019 in Murrindindi.
- Clusters are found on road lengths such as Healesville-Kinglake Road, Goulburn Valley Freeway, Broadford-Flowerdale Road and Marysville-Woods Point Road.
- There is a cluster in Alexandra (one intersection and three midblock crashes)

5.13 Location of fatalities and serious injuries - Murrindindi

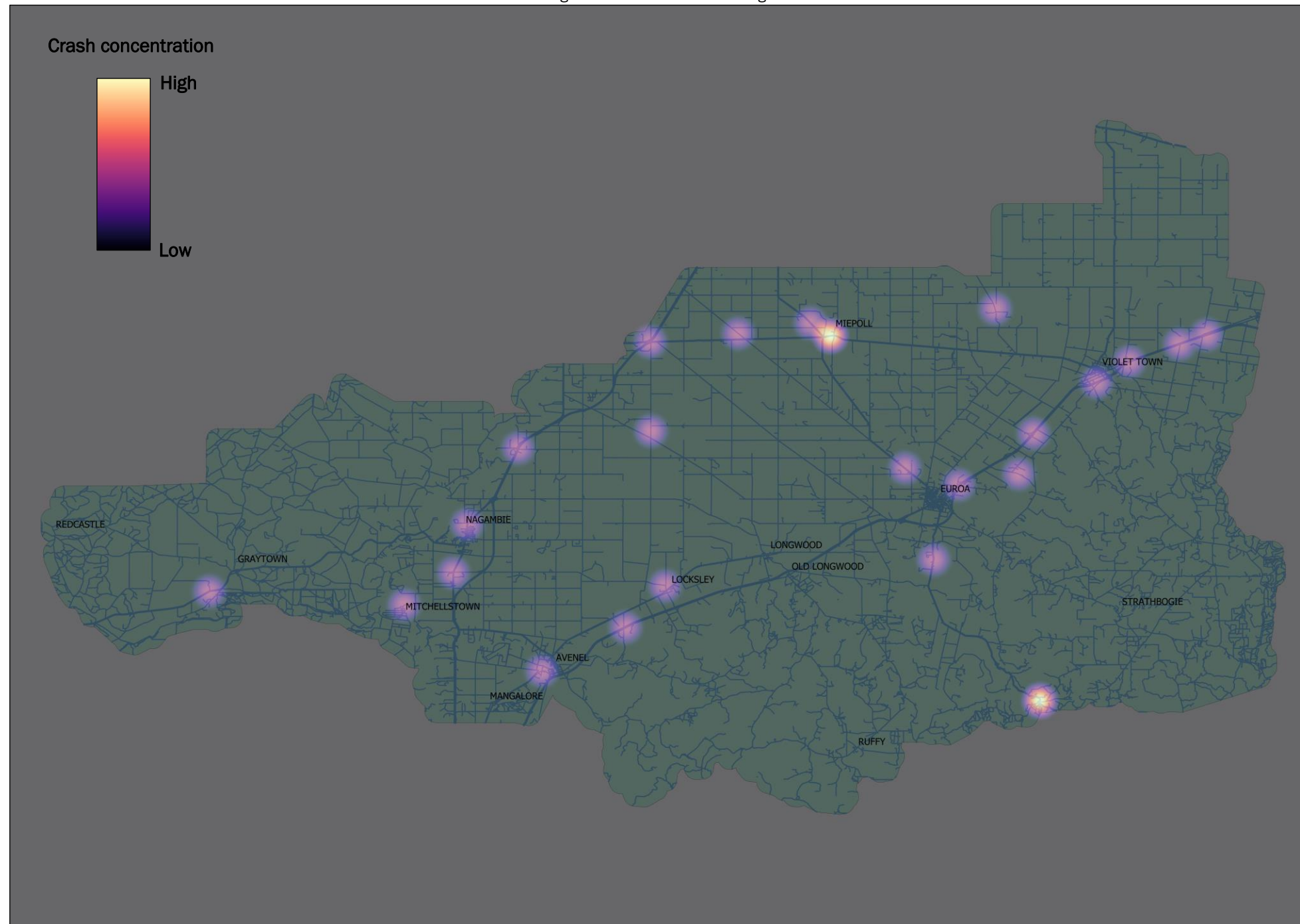
Figure 36: Fatalities and serious injuries – Murrindindi



- There were 525 fatalities and serious injuries resulting from road crashes in the 10-year period.
- Clusters for FSIs generally follow the same areas as for fatalities. There were also many serious injury crashes on Eildon-Jaimeson Road and Extons Road (north of Kinglake).
- In addition to Alexandra, the townships of Yea, Pheasant Creek, Marysville recorded several FSIs resulting from crashes.

5.14 Location of fatalities - Strathbogie

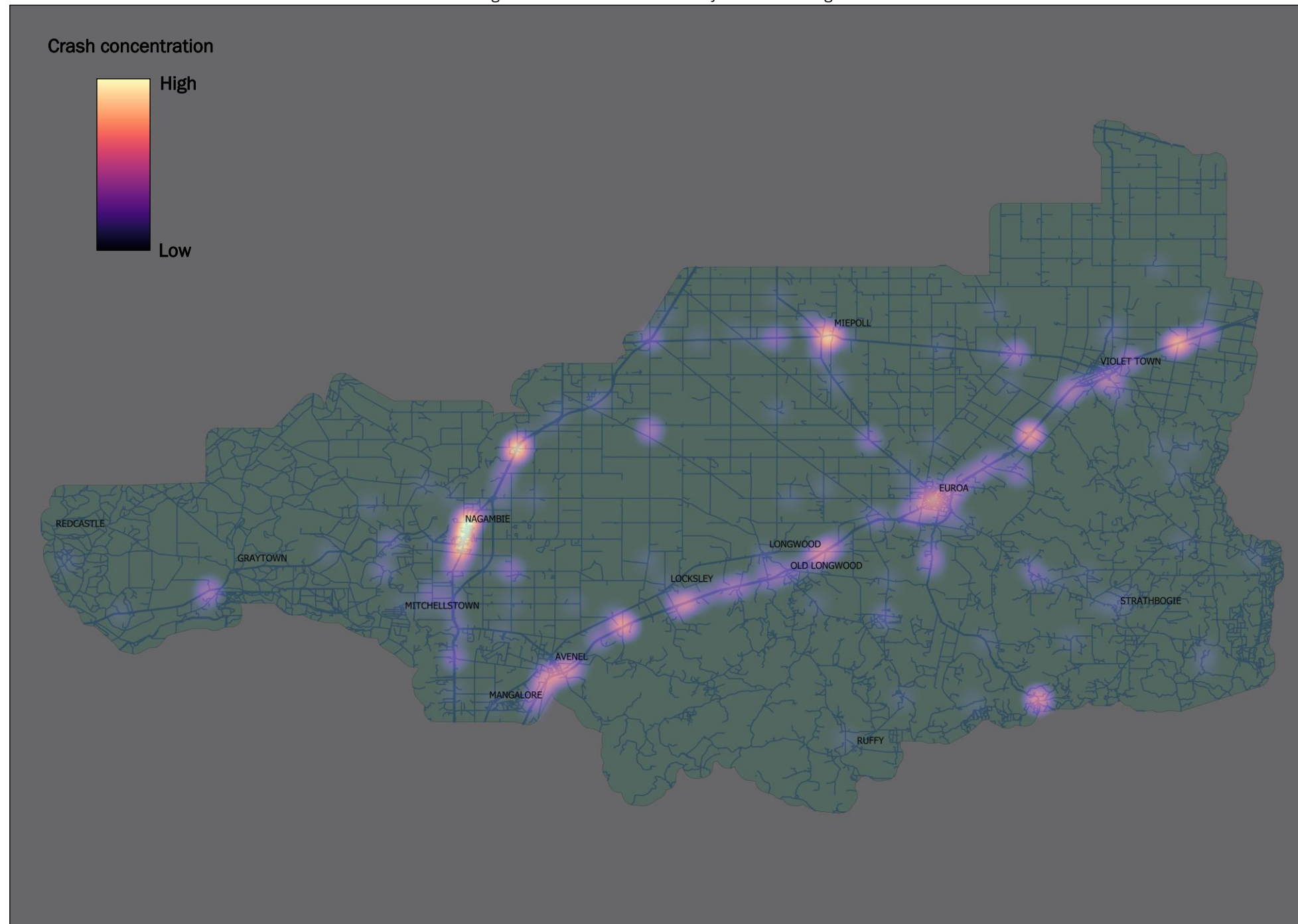
Figure 37: Fatalities – Strathbogie



- There were 26 fatalities in Strathbogie from 2010 to 2019. They are mainly scattered on arterial road sections such as the Hume Freeway, Goulburn Valley Freeway and Euroa-Mansfield Road.
- Fatalities have occurred in townships such as Violet Town, Euroa, Miepoll and Avenel.

5.15 Location of fatalities and serious injuries - Strathbogie

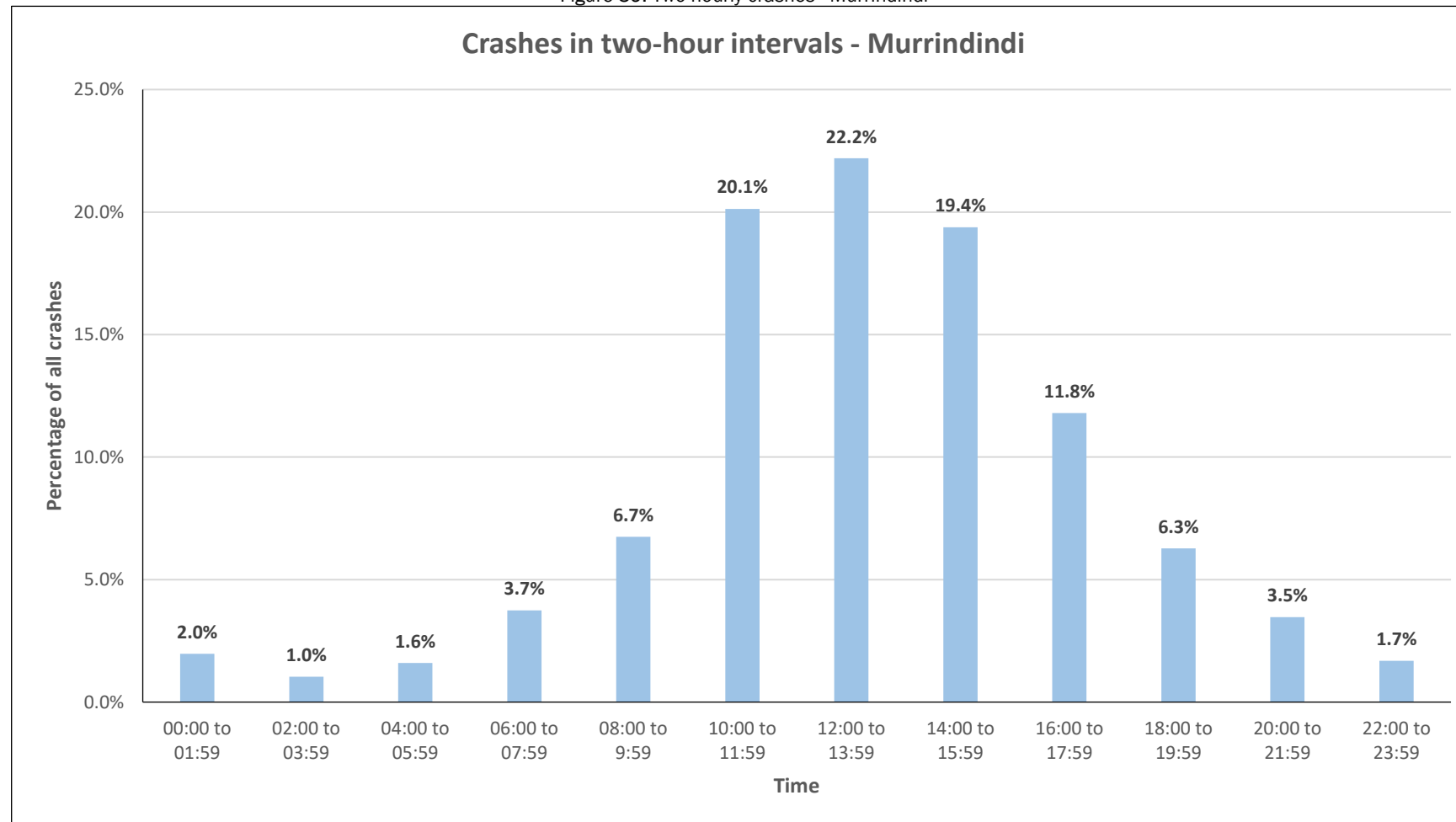
Figure 38: Fatalities and serious injuries – Strathbogie



- There were 326 fatalities and serious injuries in Strathbogie, resulting from 55% of crashes (257 out of 467).
- In addition to areas where fatalities have occurred, there were several FSIs in Nagambie, Mangalore, Longwood, and Old Longwood.

5.16 Two-hourly crashes – Murrindindi

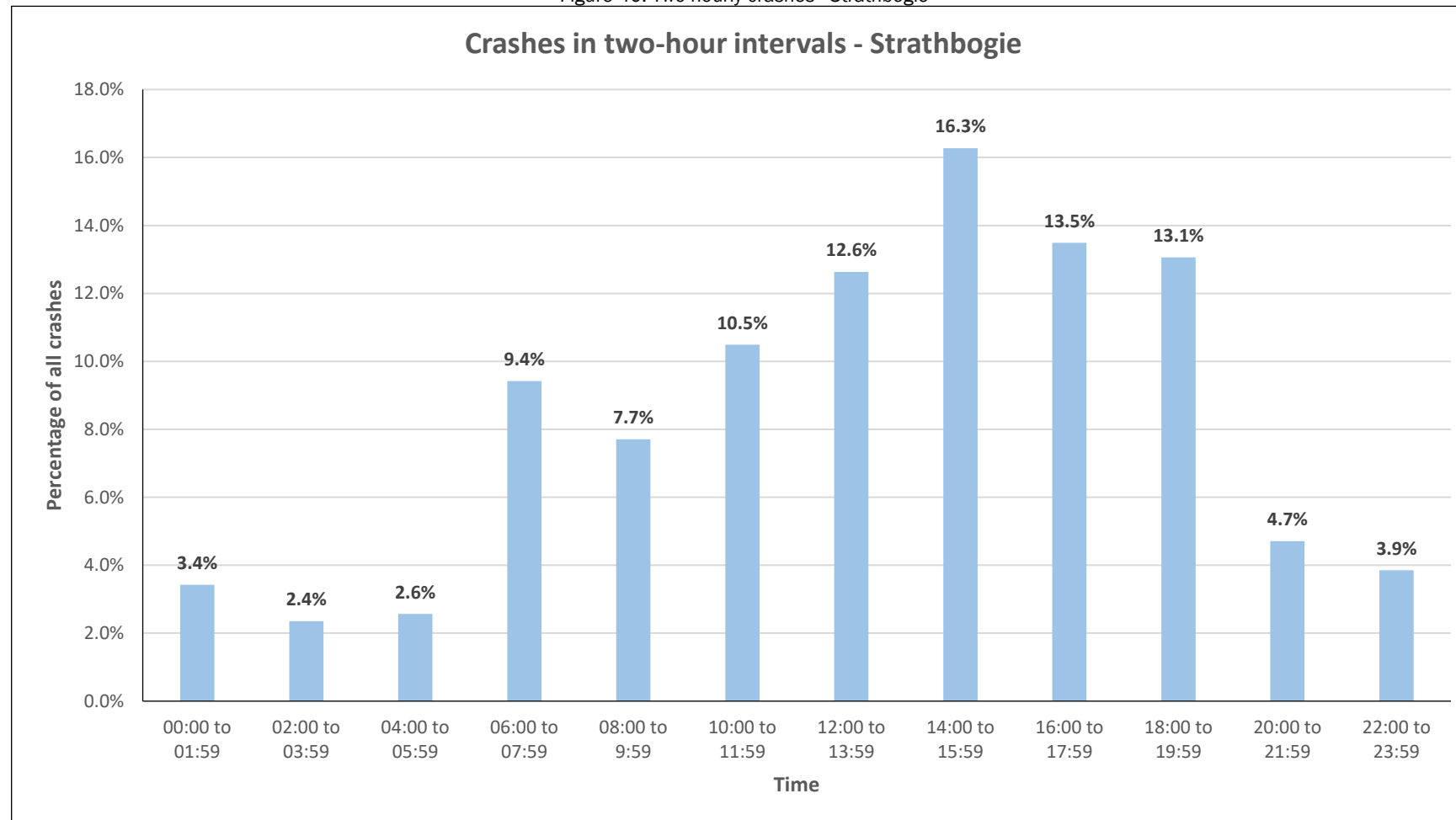
Figure 39: Two-hourly crashes - Murrindindi



- Crashes most commonly occur in late morning to mid-afternoon periods in Murrindindi.
- This is not correlated to standard peak traffic morning and evening times. The high number of crashes during midday periods might be a result of travel for recreation rather than work purposes.

5.17 Two-hourly crashes – Strathbogie

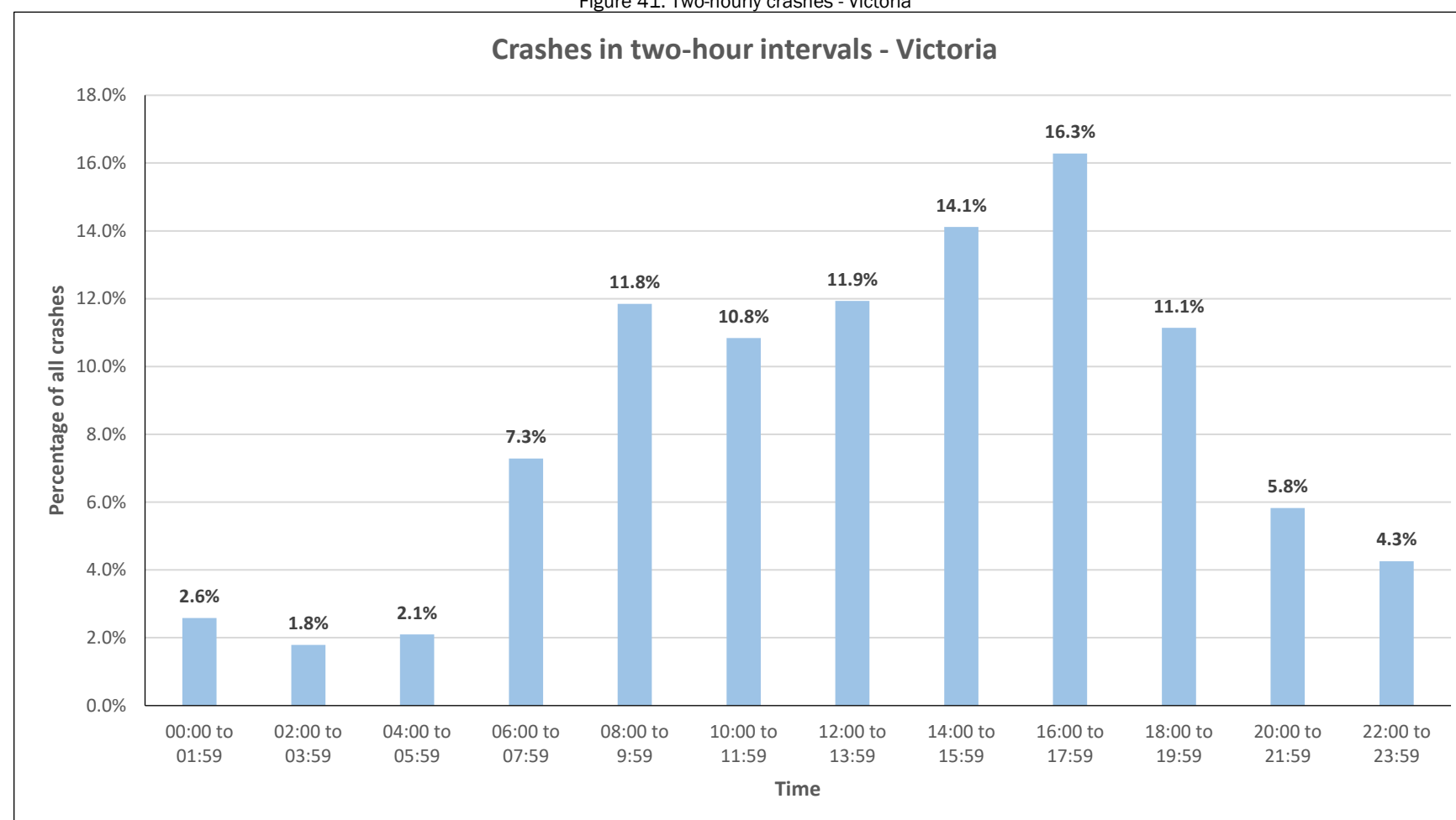
Figure 40: Two-hourly crashes - Strathbogie



- Crash occurrences in Strathbogie are more distributed over the day when compared to Murrindindi. Crashes commonly occur during early afternoon to evening periods. There is also a spike in crashes in the morning (6 – 8 am).
- This trend indicates that work-related travel in Strathbogie may also take a reasonable proportion of crashes in addition to recreational travel.
- There is a much higher percentage of crashes in dark hours in Strathbogie compared to Murrindindi (17.0% versus 8.8%). However, the number of night-time crashes in Strathbogie might still be lower overall (Murrindindi has more than twice the number of crashes than Strathbogie). The low percentage of dark crashes in Murrindindi is skewed by high numbers in midday periods.

5.18 Two-hourly crashes – Victoria

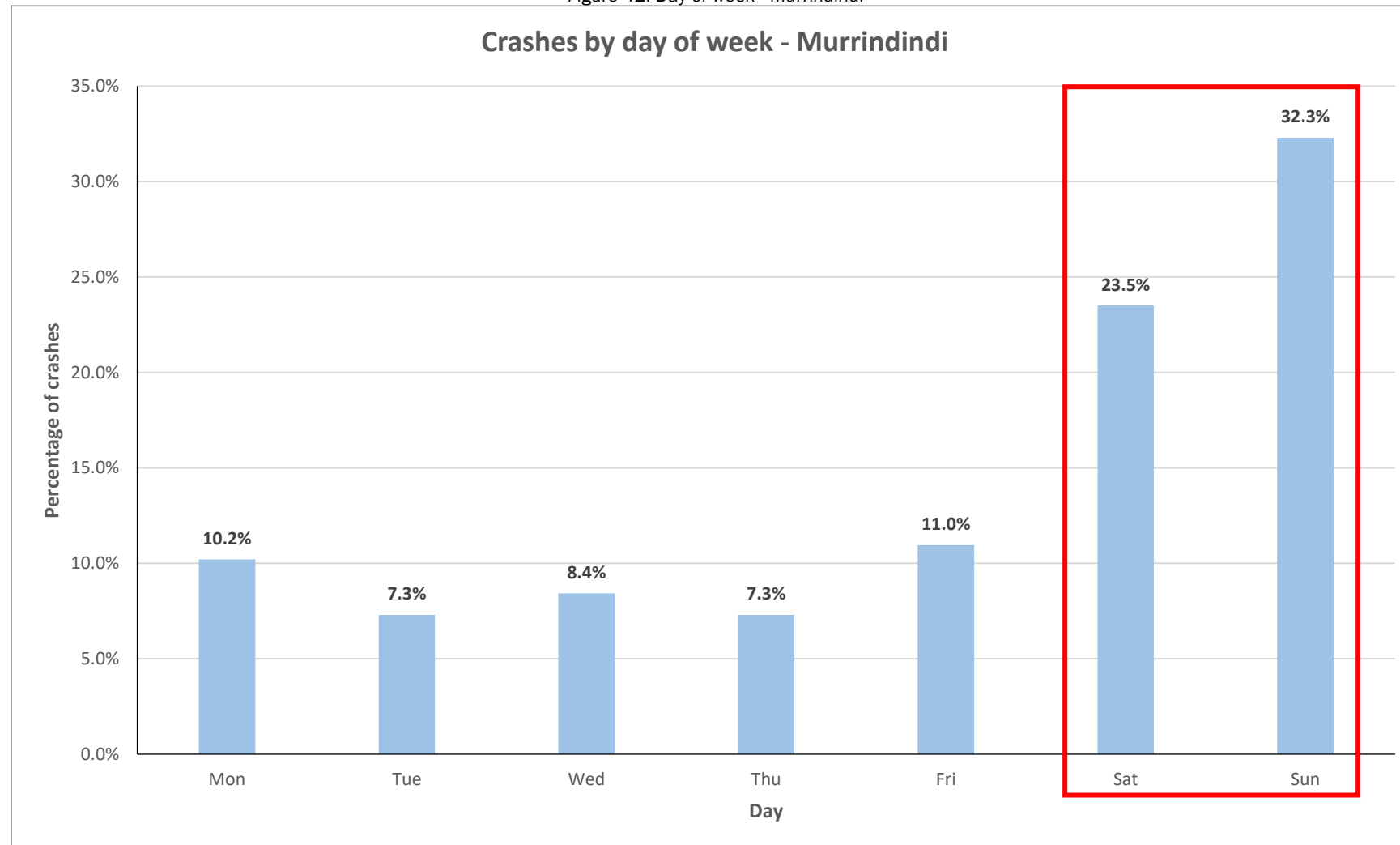
Figure 41: Two-hourly crashes - Victoria



- Peak afternoon or evening crash times for Victoria appear to occur in later parts of the day when compared to the two shires. However, the trend is closer to Strathbogie than to Murrindindi.
- There is a more pronounced peak in crashes in the morning from 8 to 10 AM and may reflect the morning peak period. This morning spike occurs later than Strathbogie (6 to 8 AM).
- While Murrindindi shows many hours where the percentage of overall crashes are low, crashes in the shire are overall very high per capita. There are still significant amounts of crashes in most periods of the day when compared to other localities. The midday peak for Murrindindi may be an indicator of certain activities in the area (e.g. tourism).

5.19 Crashes by day of week – Murrindindi

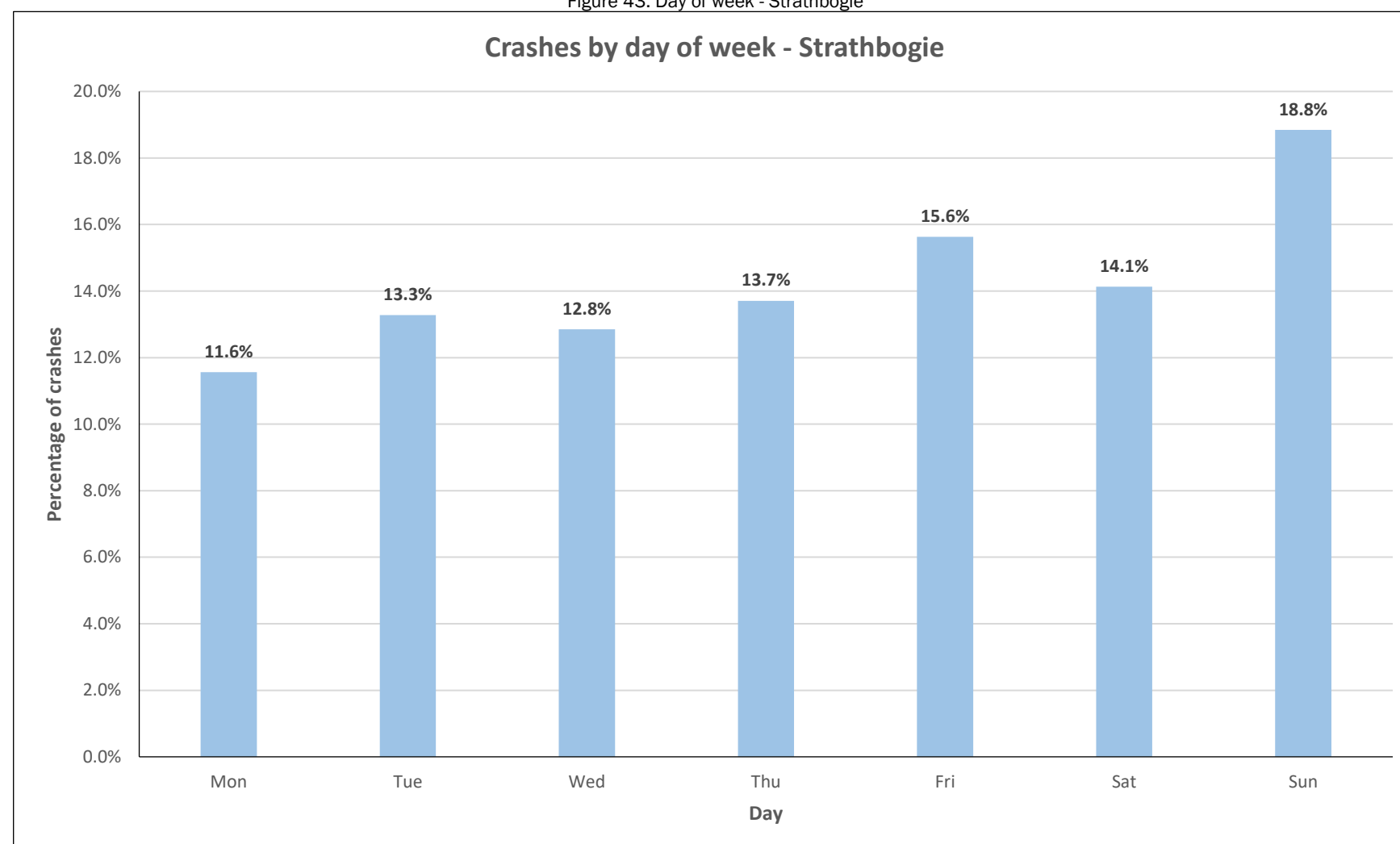
Figure 42: Day of week - Murrindindi



- Crashes in Murrindindi are heavily skewed towards the weekend (55.8 %) with mid-week having relatively lower crashes.
- Along with the distribution of crashes during the day (most commonly midday), this result indicates that a high proportion of crashes resulting from travel for recreation.

5.20 Crashes by day of week – Strathbogie

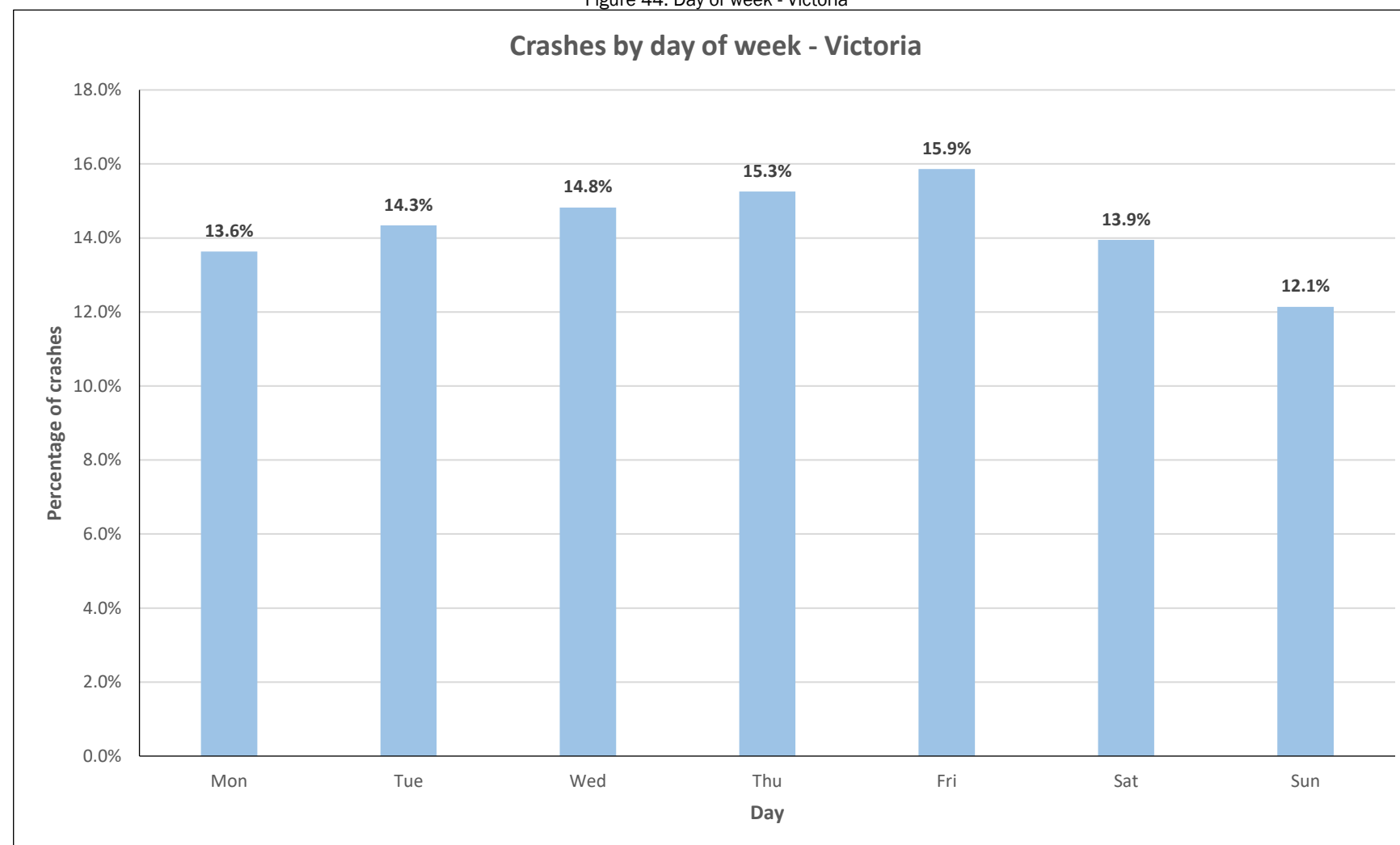
Figure 43: Day of week - Strathbogie



- Similarly to Murrindindi, Sunday recorded the greatest number of crashes in Strathbogie compared to other days of the week. However, the proportion of weekend crashes are still much lower than Murrindindi (32.9 % versus 55.8 %).
- As per the times of day, crashes in Strathbogie are more evenly distributed over the week when compared to Murrindindi.

5.21 Crashes by day of week – Victoria

Figure 44: Day of week - Victoria

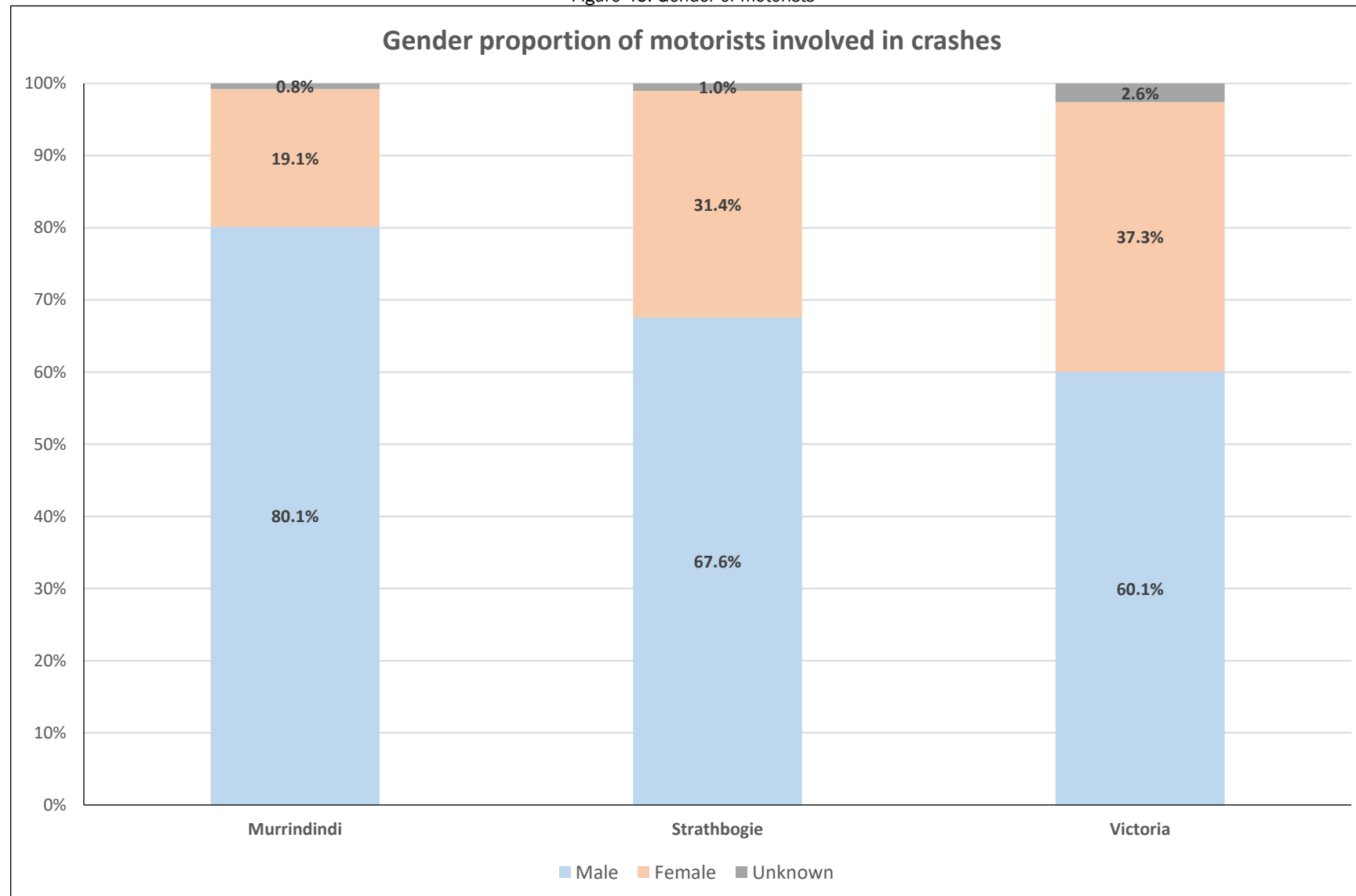


- Unlike the two shires analysed, Sunday recorded the least number of crashes in Victoria when compared to other days. Weekend crashes account for only about a quarter of all crashes (26.0 %).
- This further supports the notion that a high number of crashes result from tourism and recreation in Murrindindi and Strathbogie where a higher proportion of crashes are on the weekend.

6 CRASHES BY ROAD USER

6.1 Gender of drivers – Murrindindi

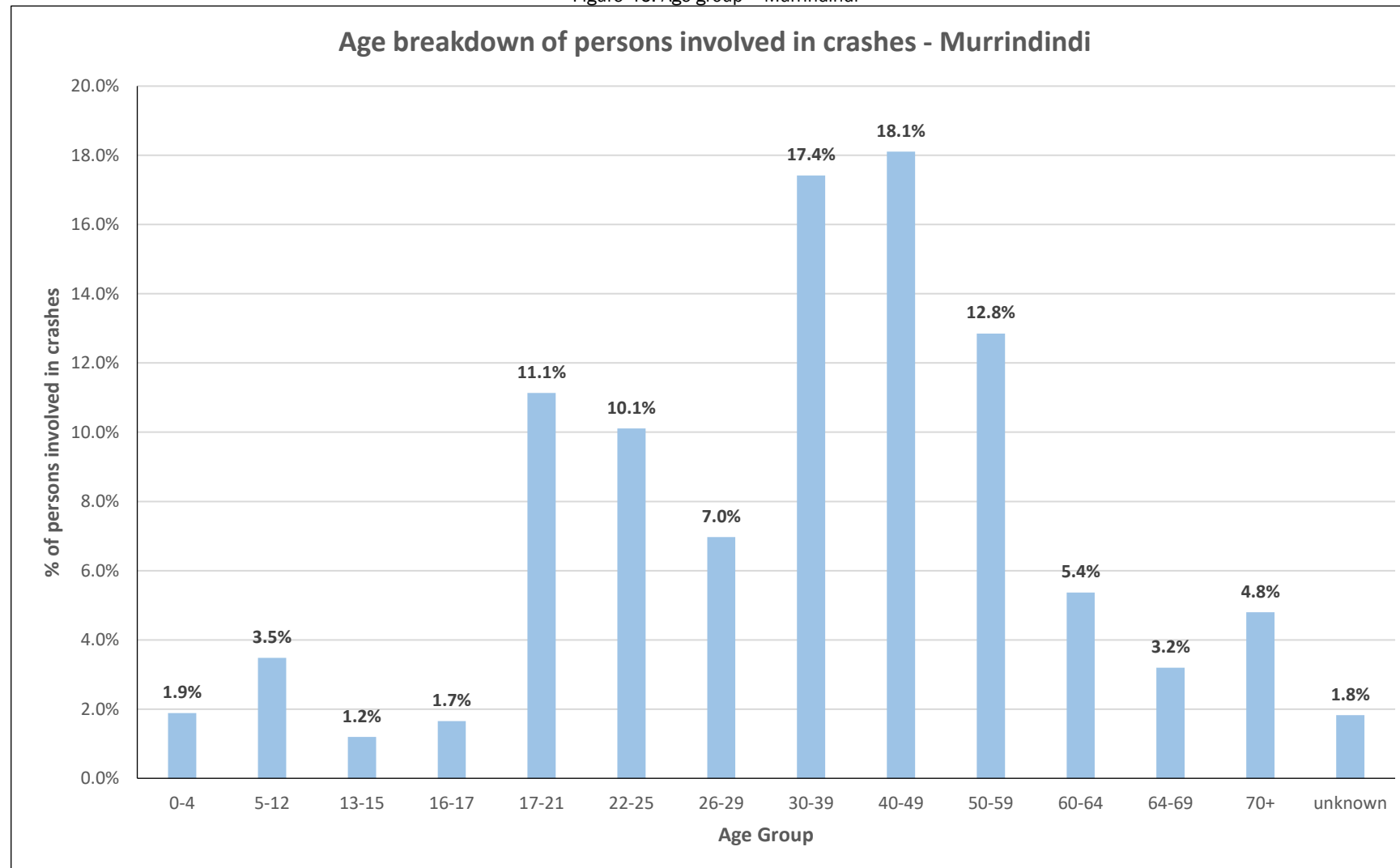
Figure 45: Gender of motorists



- Approximately 60 % of drivers and motorcyclists involved in crashes in Victoria are male. This figure is lower than Strathbogie (67.6 %) and Murrindindi (80.1 %)
- Road users in the two shires may consist of more males than average in Victoria. This may reflect the popular use of motorcycles in the area.

6.2 Age group - Murrindindi

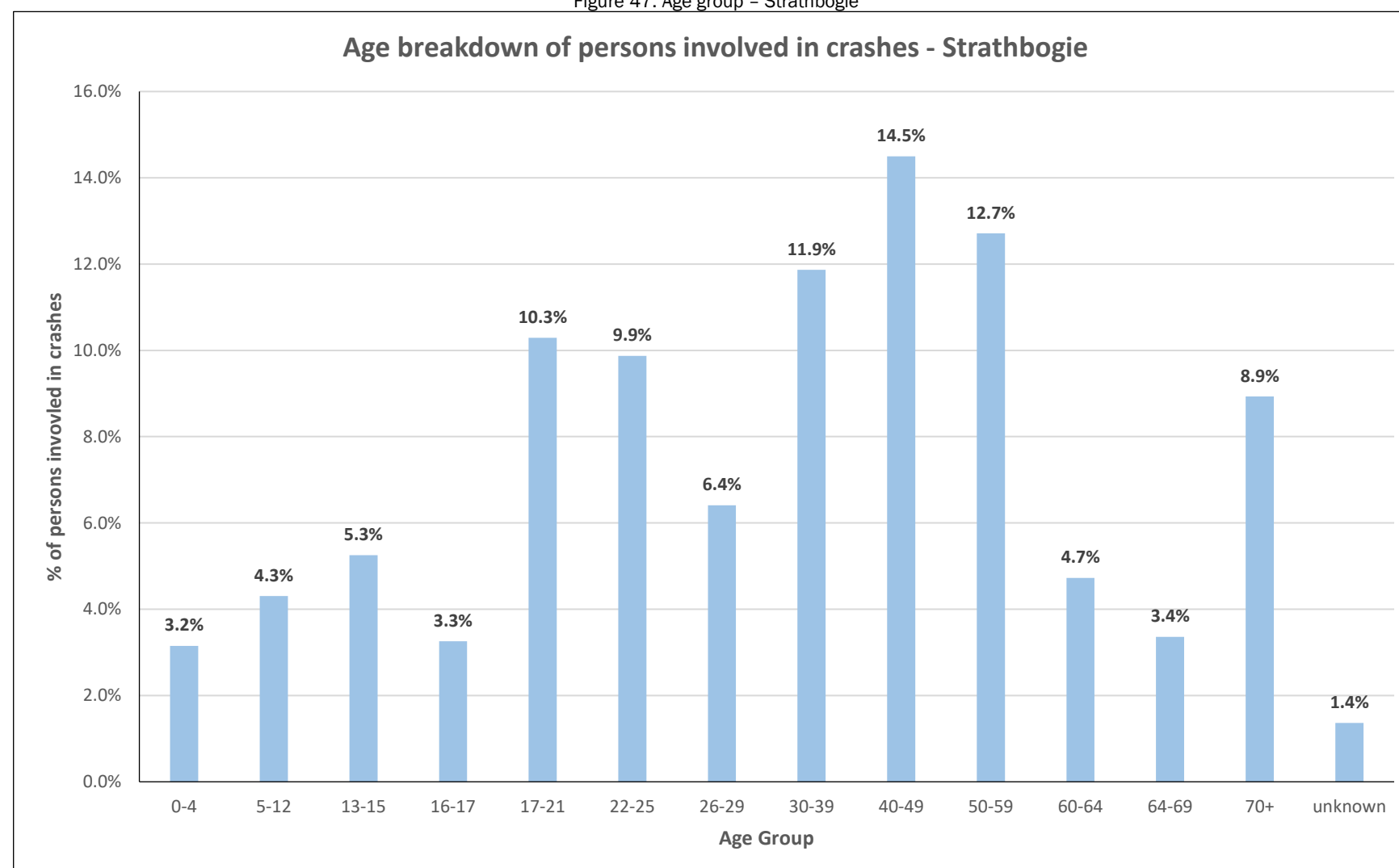
Figure 46: Age group – Murrindindi



- Age groups recorded with the highest number of road users involved in crashes in Murrindindi include 30 to 49 years of age.
- The result is not strongly associated with the age profile for Murrindindi where the most common age groups are from 55 to 74 years of age. This may be a result of the varying degree of risk for each age group being involved in crashes, the number of road users for each age group, or crashes involving persons living outside the shire.

6.3 Age Group – Strathbogie

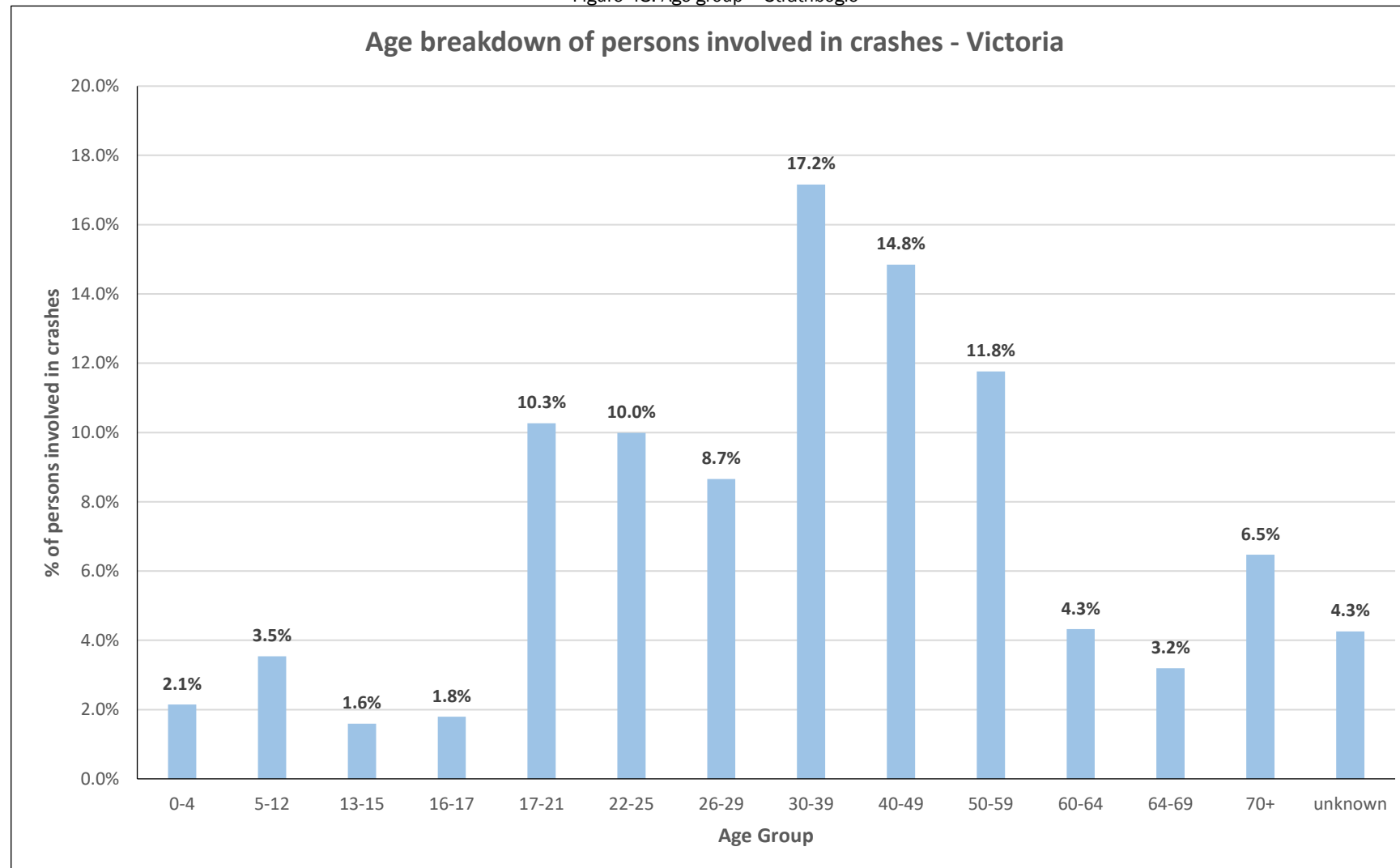
Figure 47: Age group – Strathbogie



- Age groups of road users involved in crashes in Strathbogie are more evenly distributed than Murrindindi. 16.0 % of persons involved in crashes are aged one to 17 years in Strathbogie as opposed to 8.2 % in Murrindindi. This is associated with a greater proportion of persons involved in crashes being passengers in Strathbogie (35.1 %) as opposed to Murrindindi (23.3 %).
- There is also a greater proportion of persons aged above 60 years of age in Strathbogie (17.0 %) as opposed to Murrindindi (13.4 %). Road users involved in crashes for this age group are mostly drivers and passengers for both shires.
- As per Murrindindi, the overall age breakdown for persons involved in crashes is not strongly associated with its age profile (most common age groups being 55 to 74 years of age).

6.4 Age Group – Victoria

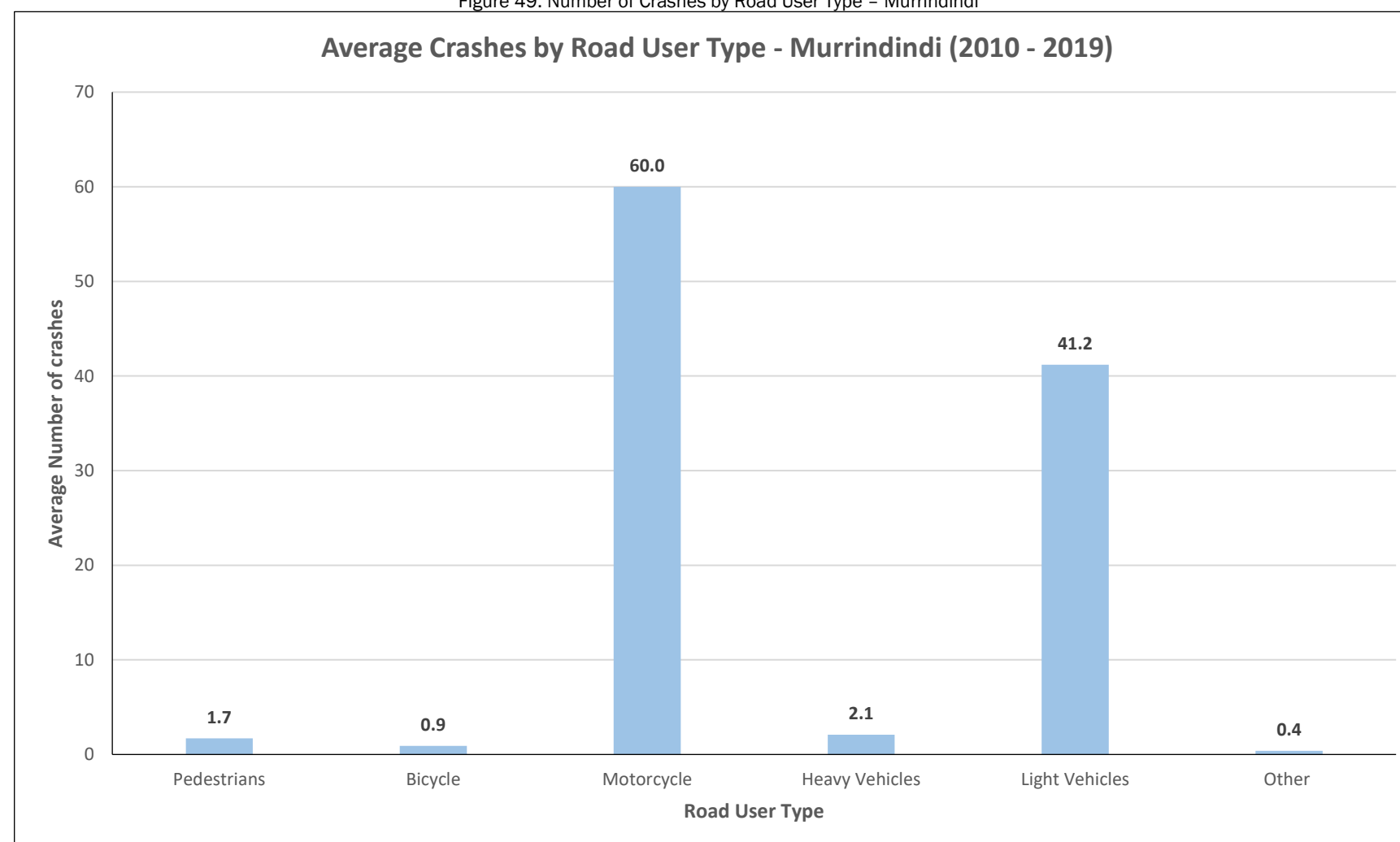
Figure 48: Age group – Strathbogie



- The category of 30 – 39 year-old persons recorded the greatest number of crashes in Victoria compared to other age groups. This is different to both shires where the most recorded age group is 40 to 49 years old.
- However, the difference in proportion of each age group generally has no significant differences between Victoria and the two shires. This indicates that different crash trends over all three areas may not have a strong association with the age of road user involved.

6.5 Number of Crashes by Road User Type – Murrindindi

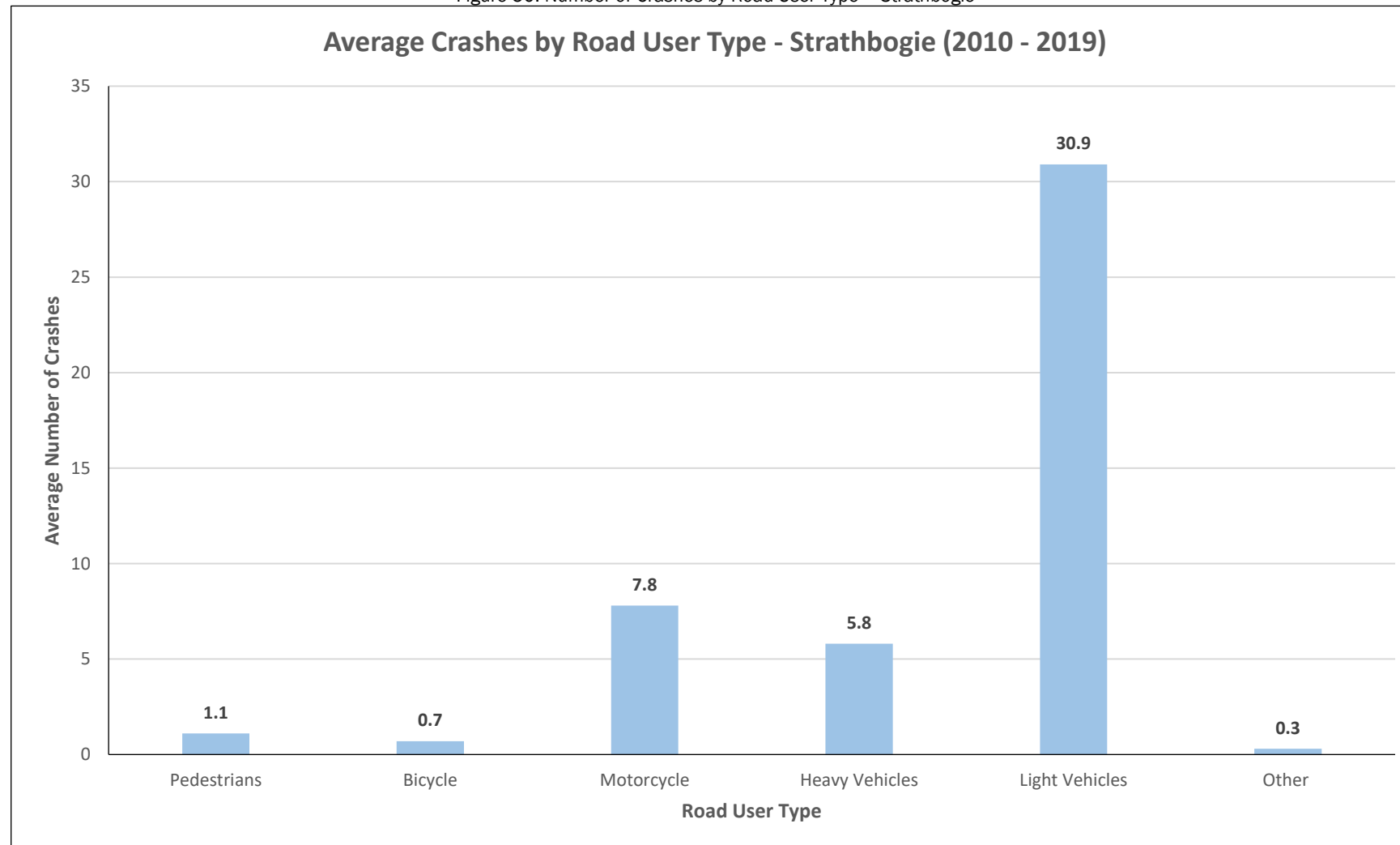
Figure 49: Number of Crashes by Road User Type – Murrindindi



- Motorcycle type road users recorded the highest average number of crashes (60 crashes per year) within Murrindindi, which indicates that there is a significant crash trend associated with motorcycles within Murrindindi.
- The travel to work survey indicates only a very small proportion of people travel to work with motorcycle (0.7 %). This indicates that the motorcyclist crashes that are occurring are associated with recreational motorcycling
- The next peak average number of crashes are from light vehicle type road users, where an average of 41.2 crashes occurred each year between 2010 and 2019.

6.6 Number of Crashes by Road User Type – Strathbogie

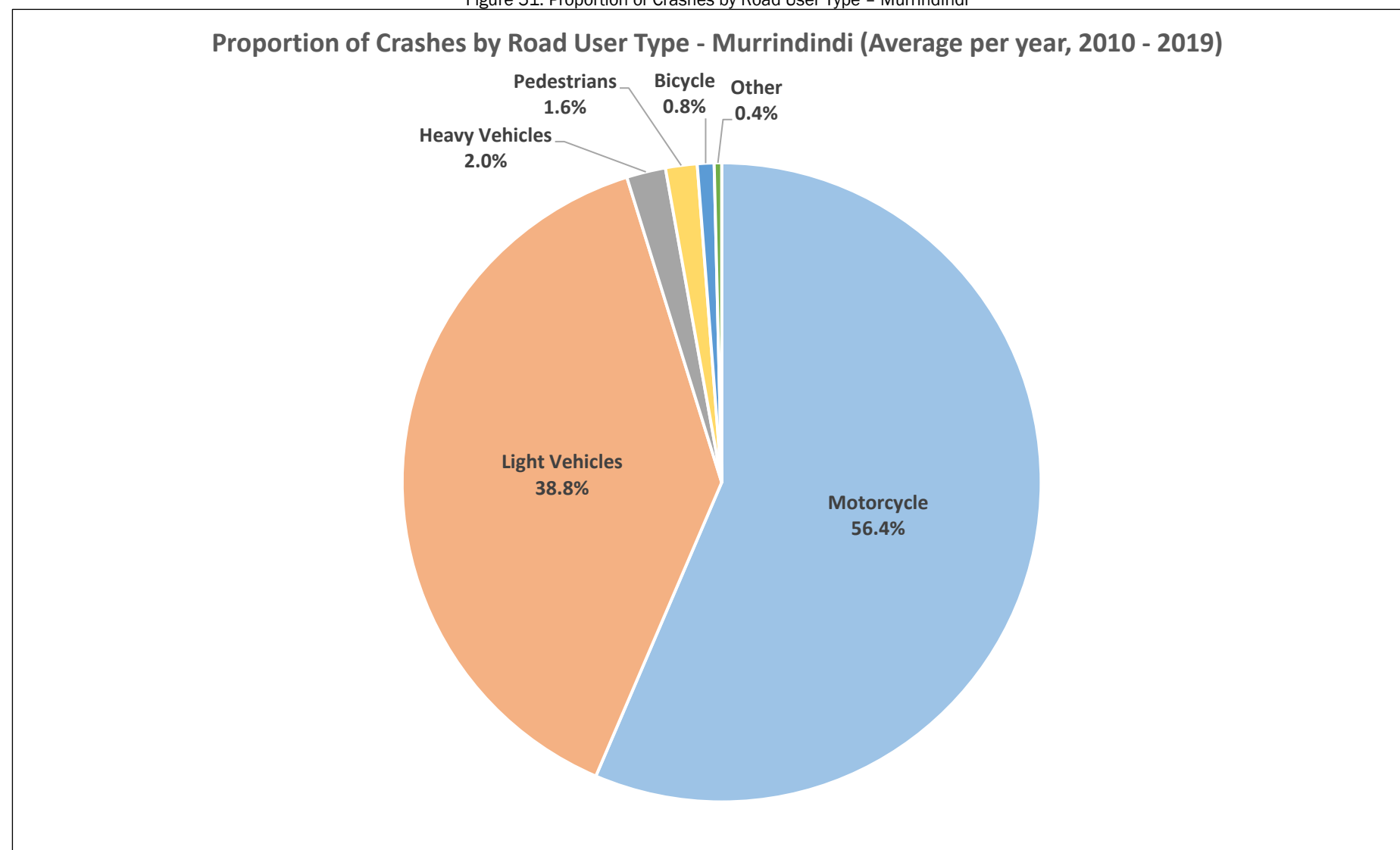
Figure 50: Number of Crashes by Road User Type – Strathbogie



- Light vehicle type road users recorded the highest average number of crashes, which is 30.9 crashes per year, within Strathbogie.
- The next two peak average number of crashes are motorcycle and heavy vehicle type road users, with an average of 7.8 and 5.8 crashes per year, respectively.

6.7 Proportion of Crashes by Road User Type – Murrindindi

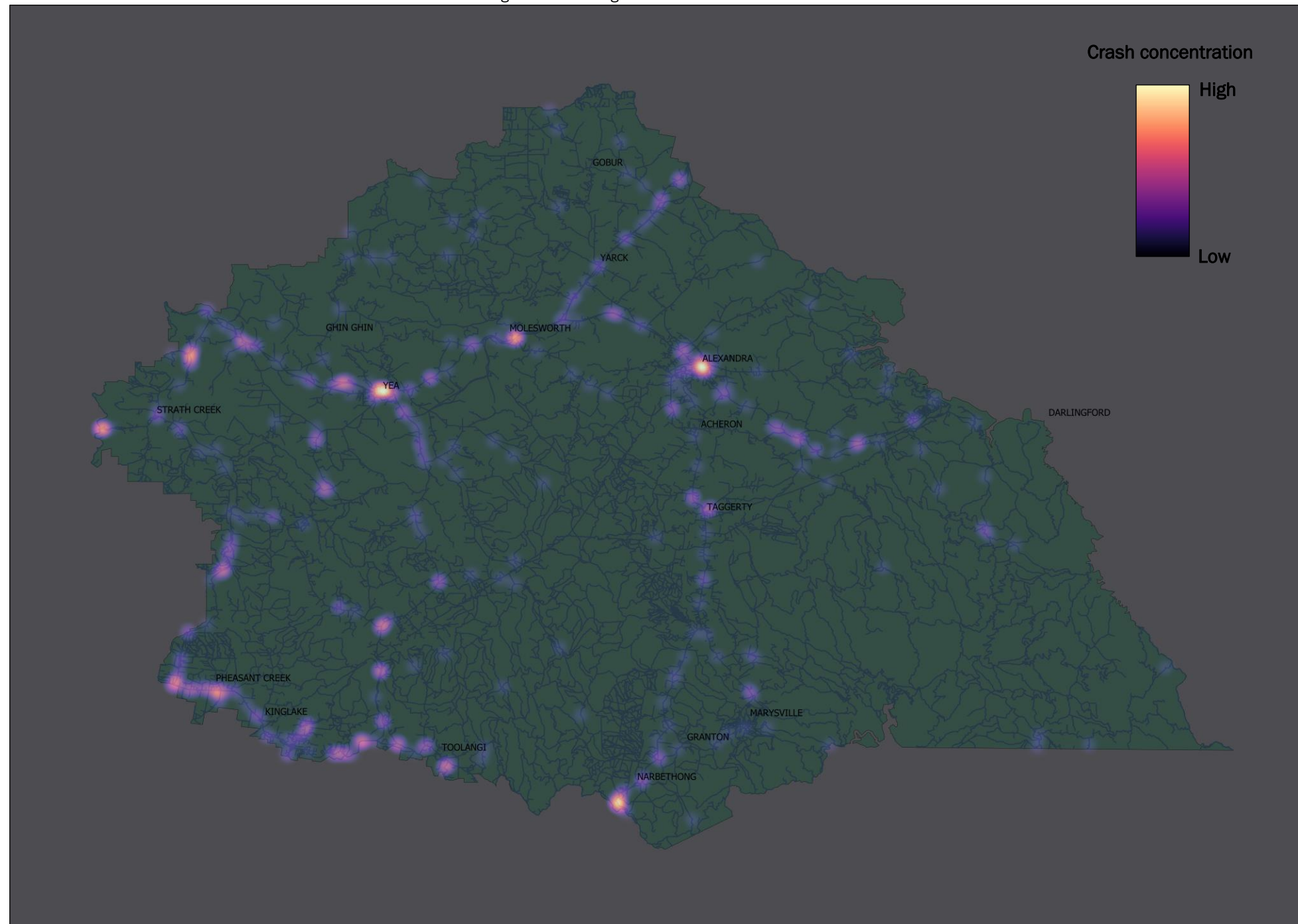
Figure 51: Proportion of Crashes by Road User Type – Murrindindi



- Most crashes for Murrindindi involve motorcyclists with an average of 56.4% of the crashes per year.
- Where there are no vulnerable road users involved, light vehicles account for an average of 38.8% per year.

6.8 Passenger vehicle crashes - Murrindindi

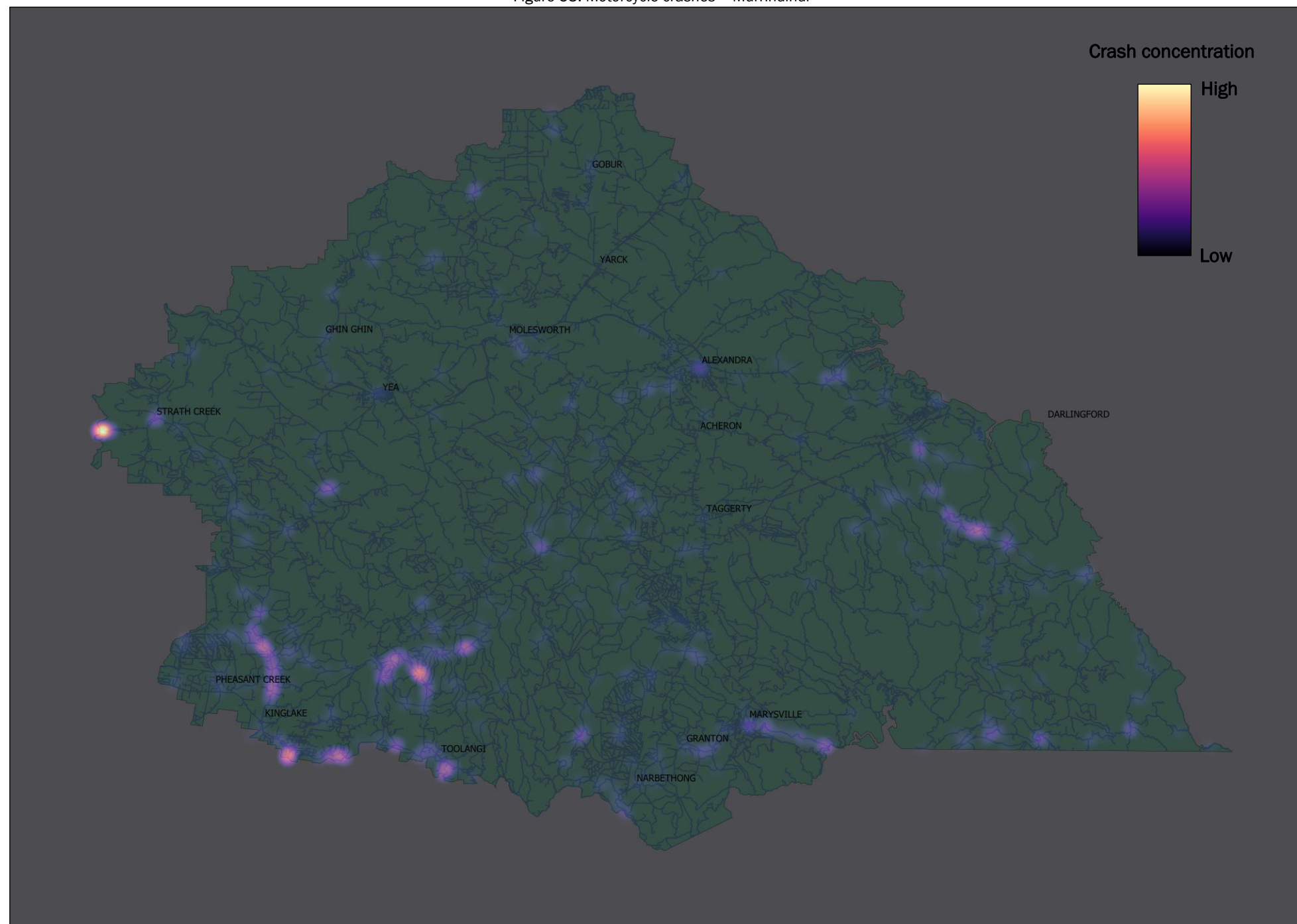
Figure 52: Passenger vehicle crashes – Murrindindi



- Where no vulnerable road users are involved (pedestrians, cyclists and motorcyclists), passenger vehicles make up 413 out of 1068 crashes in the 10-year period.
- These crashes are mainly on arterial roads with clusters in town areas.

6.9 Motorcycle crashes - Murrindindi

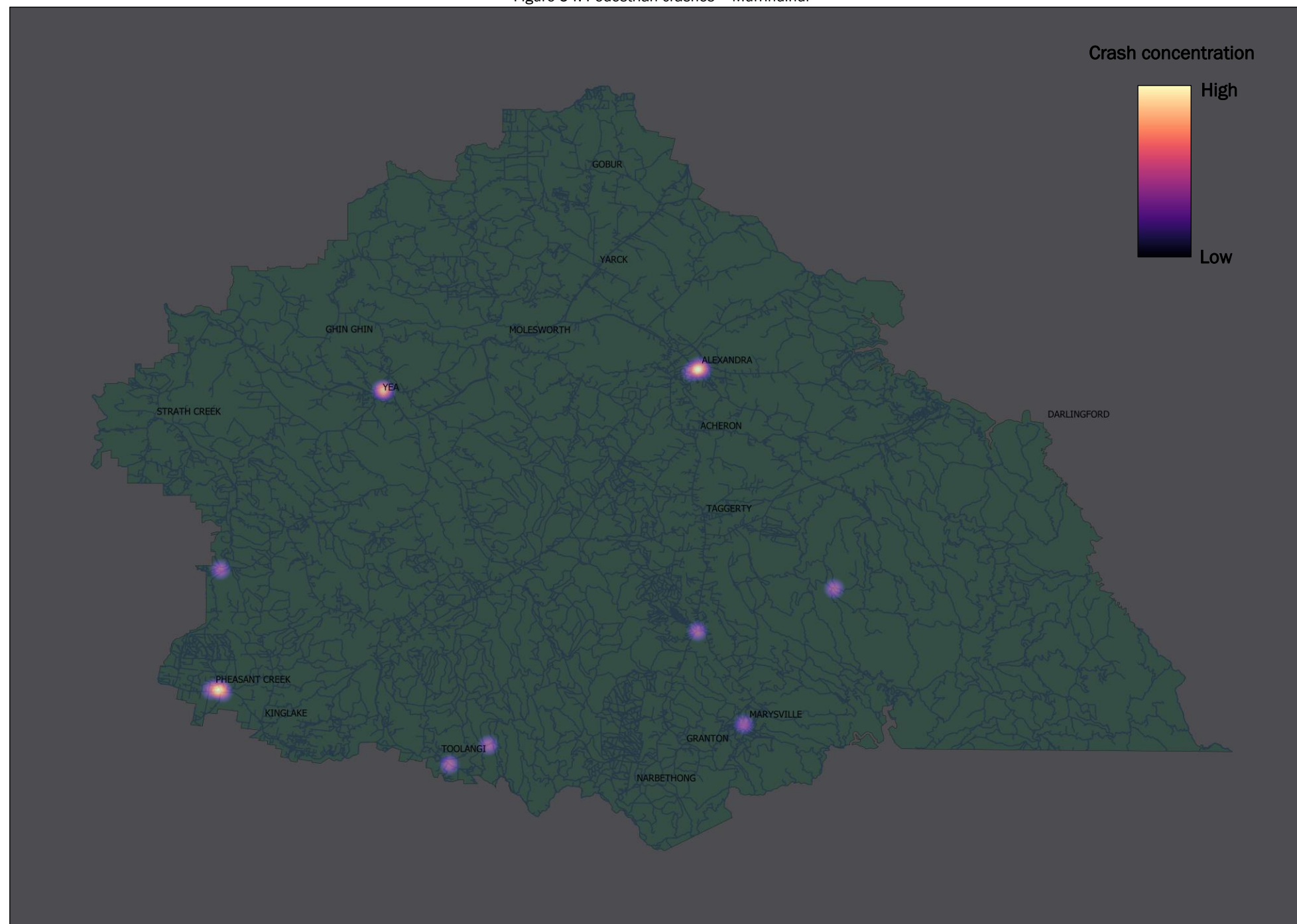
Figure 53: Motorcycle crashes – Murrindindi



- Crashes involving motorcyclists make up for 604 out of the 1068 total crashes.
- There are clusters along road lengths such as Broadford-Flowerdale Road, Eildon-Jaimeson Road, Healesville-Kinglake Road, Heidelberg-Kinglake Road and Extons Road (north of Kinglake).
- Motorcycle crashes are widespread across non-public roads and tracks within the shire.

6.10 Pedestrian crashes - Murrindindi

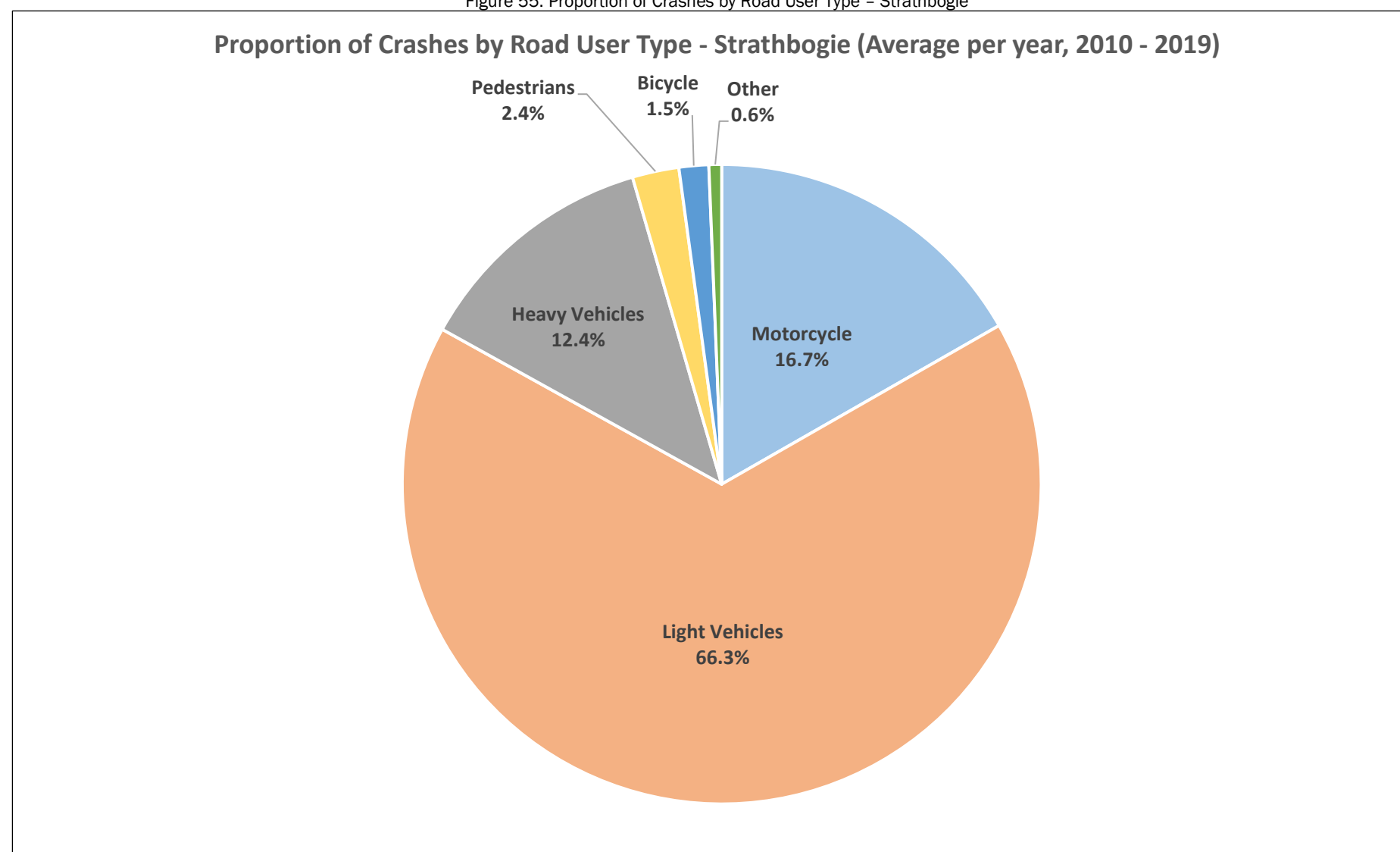
Figure 54: Pedestrian crashes – Murrindindi



- There are 14 crashes classified as pedestrian crashes (DCA 100 – 109) with the majority being close to, or in town areas.

6.11 Proportion of Crashes by Road User Type – Strathbogie

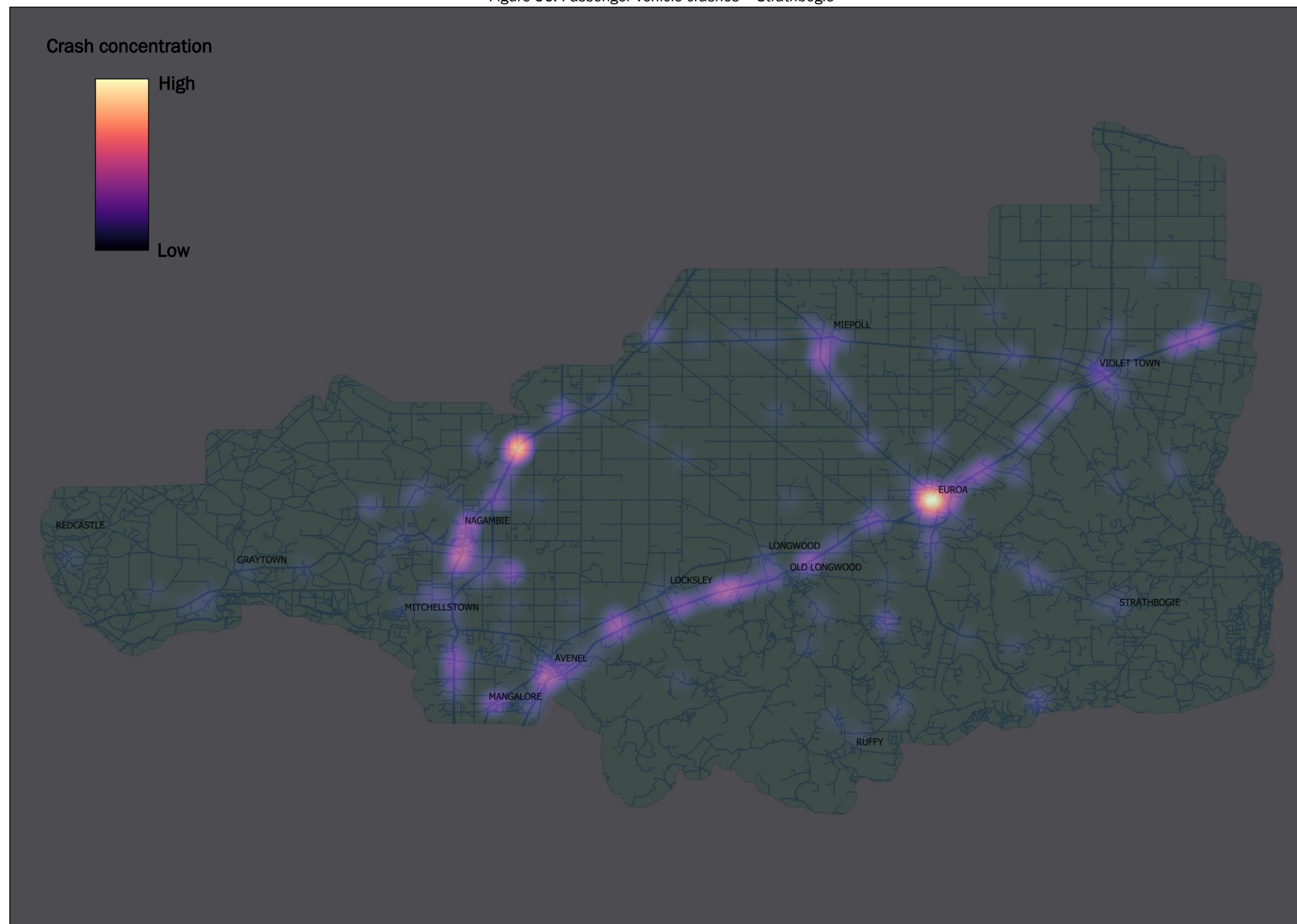
Figure 55: Proportion of Crashes by Road User Type – Strathbogie



- Most crashes that occurred within Strathbogie involved light vehicles, with an average of 66.3 % of the crashes per year.
- The proportion of crashes relating to heavy vehicle type road users in Strathbogie is higher when compared to Murrindindi.
- In addition, there is a greater proportion of pedestrians and bicycle related crashes in Strathbogie when compared Murrindindi.

6.12 Passenger vehicle crashes - Strathbogie

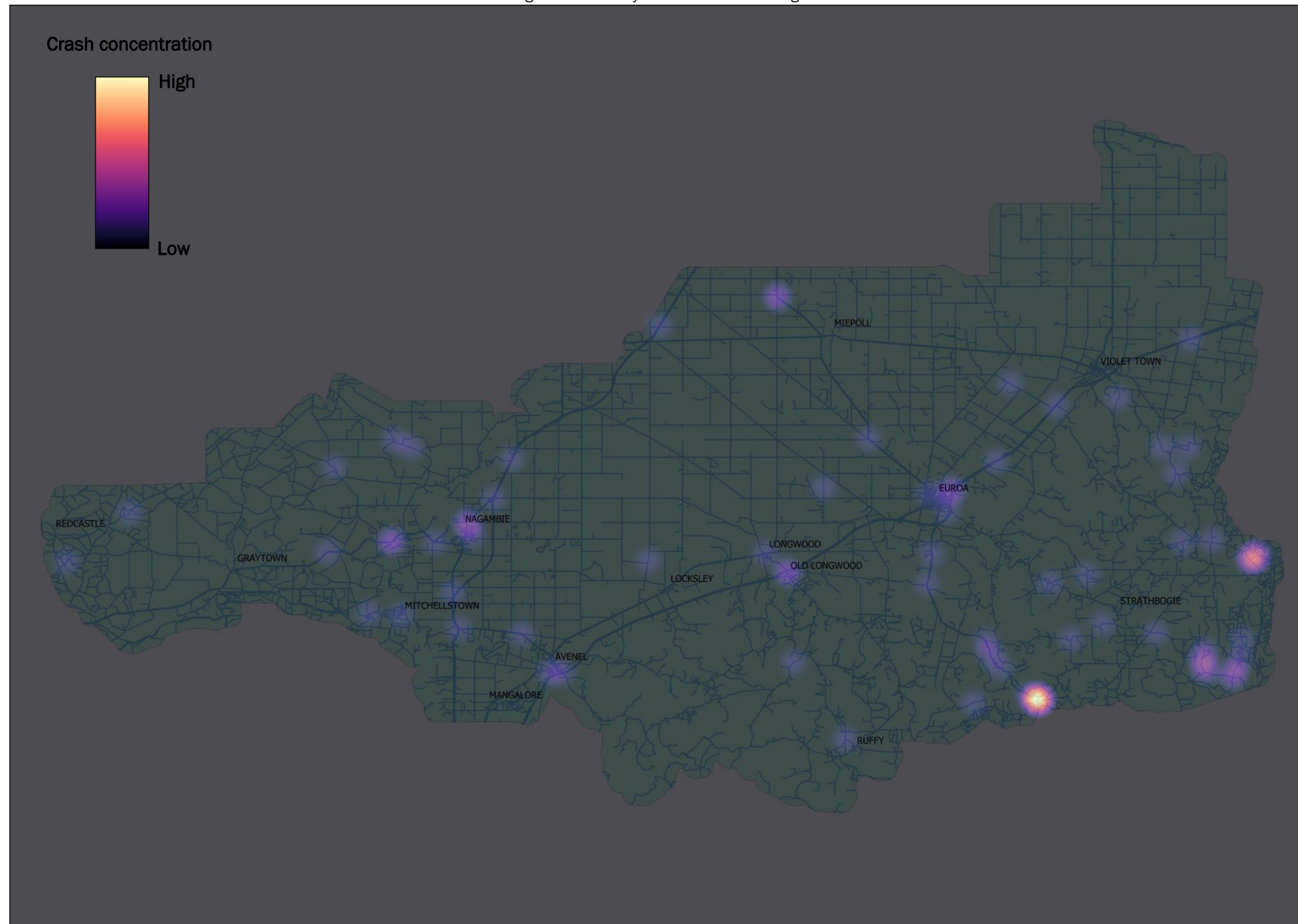
Figure 56: Passenger vehicle crashes – Strathbogie



- Where no vulnerable road users are involved, passenger vehicle crashes make up for 309 out of 467 crashes in Strathbogie.
- Most are on arterial road sections with town clusters in Nagambie, Avenel, Euroa and Violet Town.

6.13 Motorcycle crashes - Strathbogie

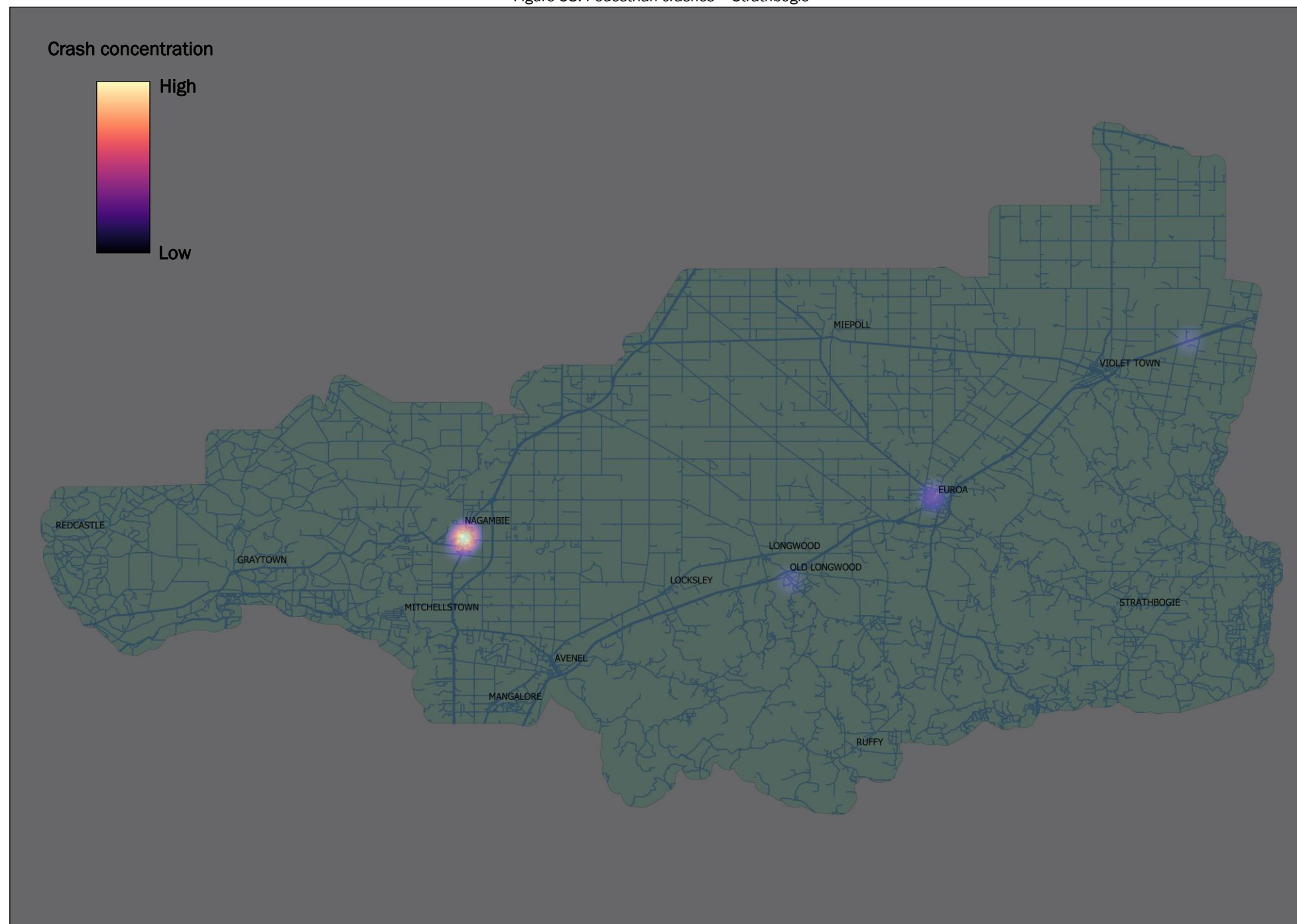
Figure 57: Motorcycle crashes – Strathbogie



- There were 78 motorcycle crashes in Strathbogie.
- There are clusters on arterial roads such as Euroa-Mansfield Road and Goulburn Valley Freeway.
- However, there appears to be more motorcycle crashes on local roads, including a number on Gardiners Road (northeast of Strathbogie township), Gerars Track and Dry Creek Road (both southeast of Strathbogie township).

6.14 Pedestrian crashes - Strathbogie

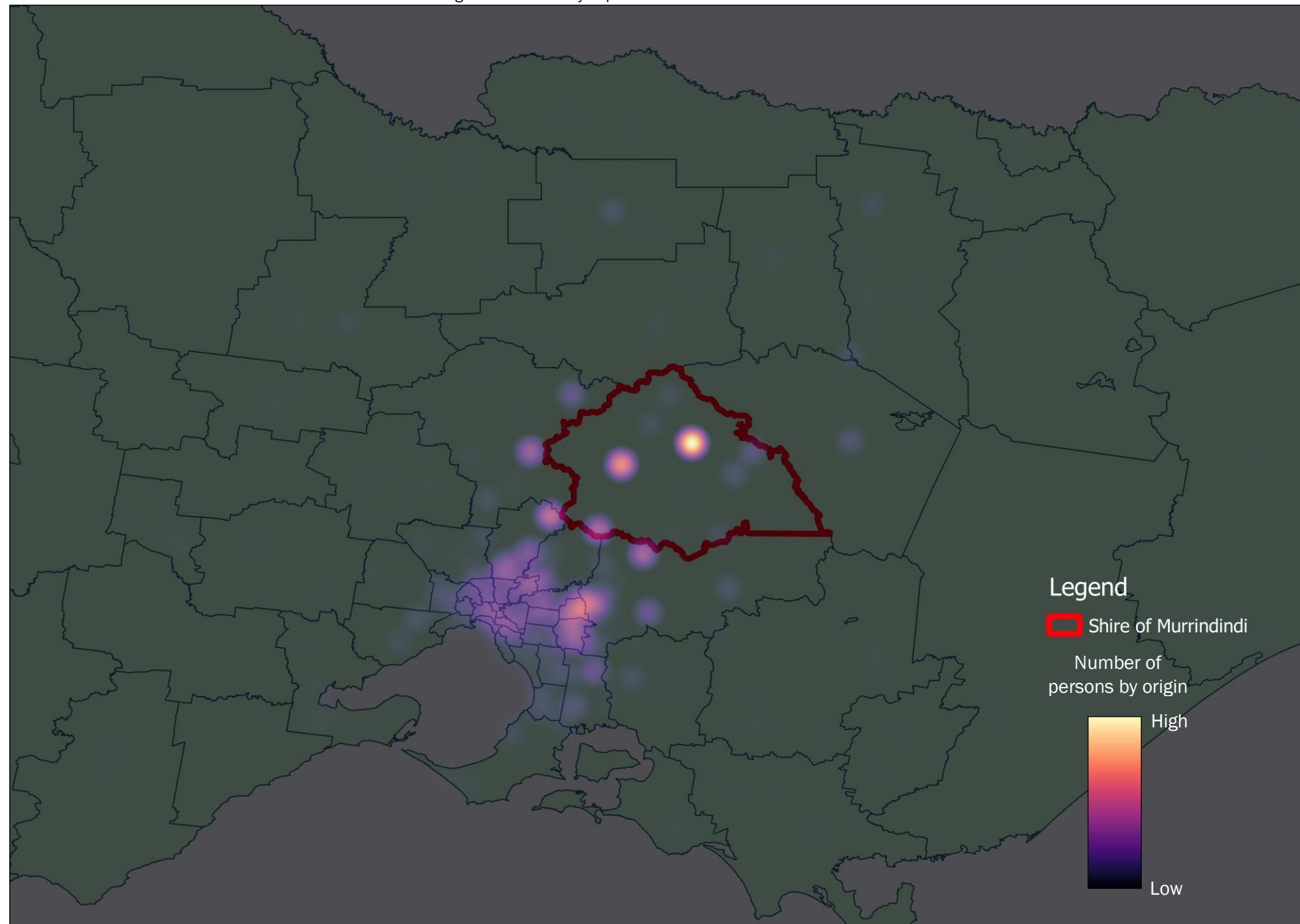
Figure 58: Pedestrian crashes – Strathbogie



- There were 11 pedestrian crashes in Strathbogie, with most having occurred in Nagambie and Euroa.

6.15 Residency of persons involved in crashes - Murrindindi

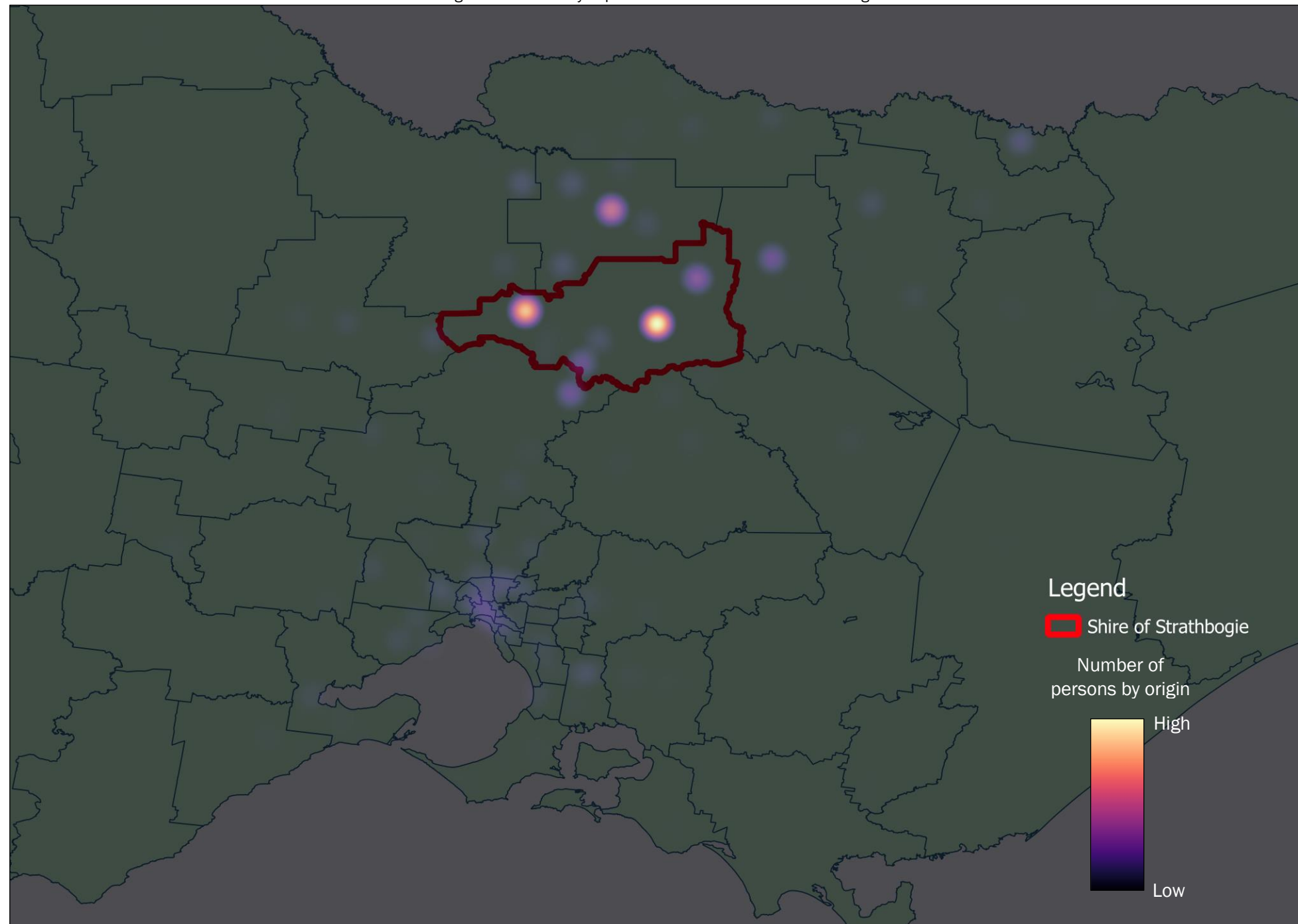
Figure 59: Residency of persons involved in crashes - Murrindindi



- 439 (27.6%) persons involved in crashes resided inside the shire while 1150 (72.4%) persons were from other regions.
- Most persons from outside the shire were from Metropolitan Melbourne. This indicates that tourist activity has accounted for many crashes.
- Despite the relatively low representation of locals from Murrindindi, the overall number is still very high compared to other small rural shires. This indicates that crashes involving local road users is still a major issue.

6.16 Residency of persons involved in crashes – Strathbogie

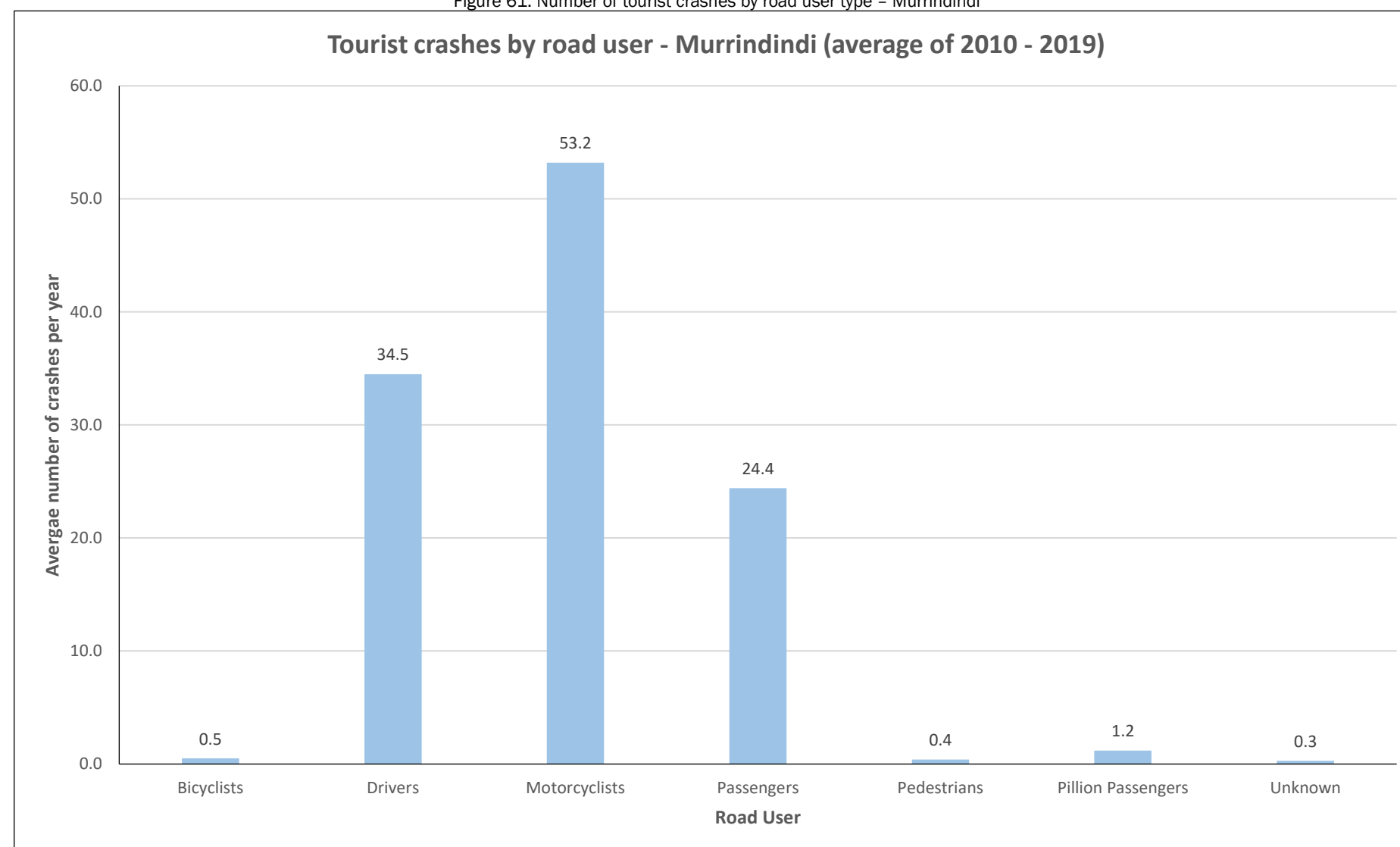
Figure 60: Residency of persons involved in crashes - Strathbogie



- 292 (34.8%) persons involved in crashes resided inside the shire while 546 (65.2%) were from other regions, indicating that many crashes resulted from tourist activity.
- Persons from outside the shire were mainly distributed from Metropolitan Melbourne, Greater Shepparton and surrounding rural shires.

6.17 Number of Tourist Crashes by Road User Type – Murrindindi

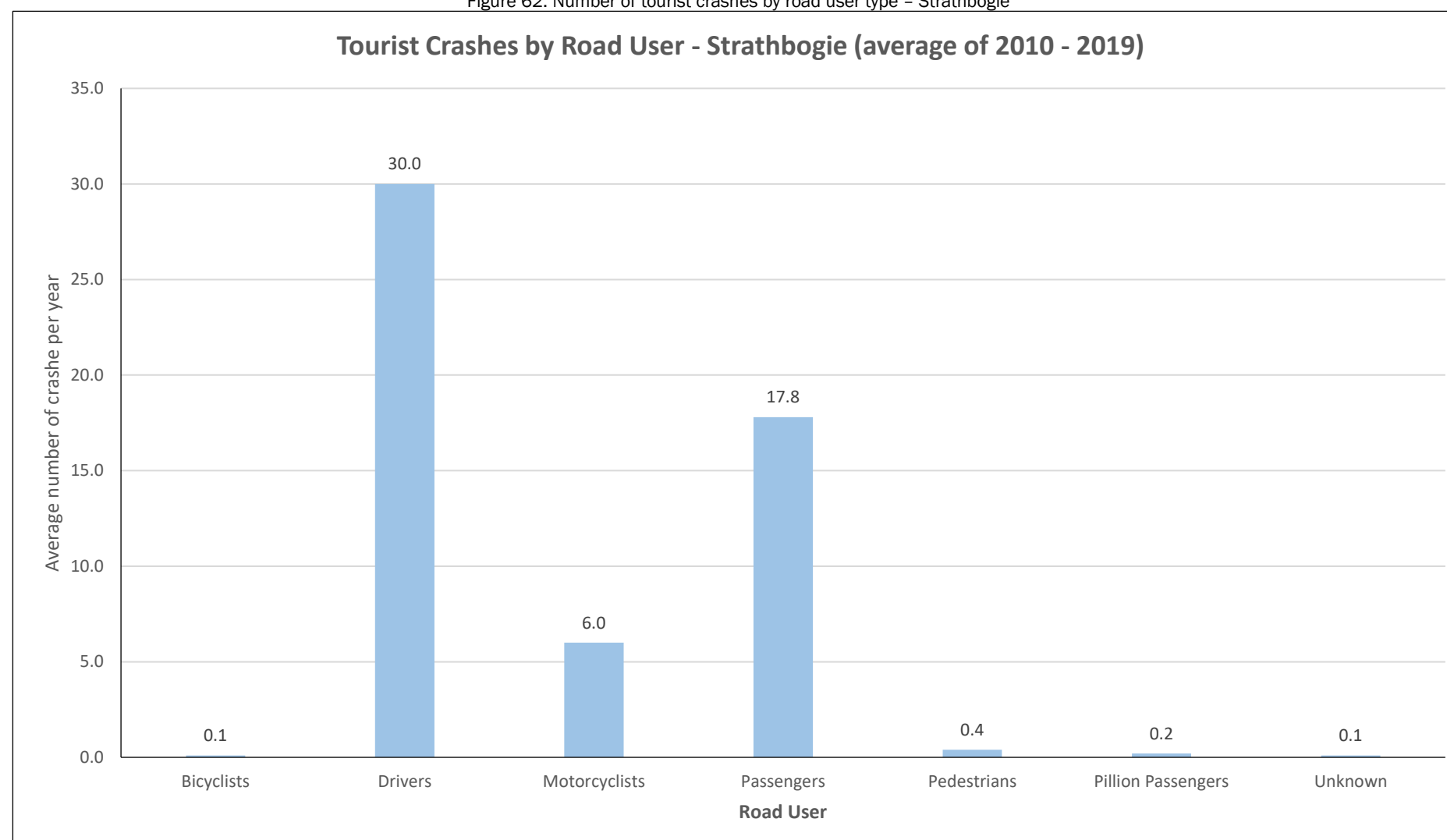
Figure 61: Number of tourist crashes by road user type – Murrindindi



- The majority of tourist (non-local) crashes for Murrindindi involve motorcyclists with an average number of 53.2 crashes per year.
- Driver and passenger road users are the next highest for tourist crashes with an average number of 34.5 and 24.4 crashes per year, respectively.

6.18 Number of Tourist Crashes by Road User Type – Strathbogie

Figure 62: Number of tourist crashes by road user type – Strathbogie

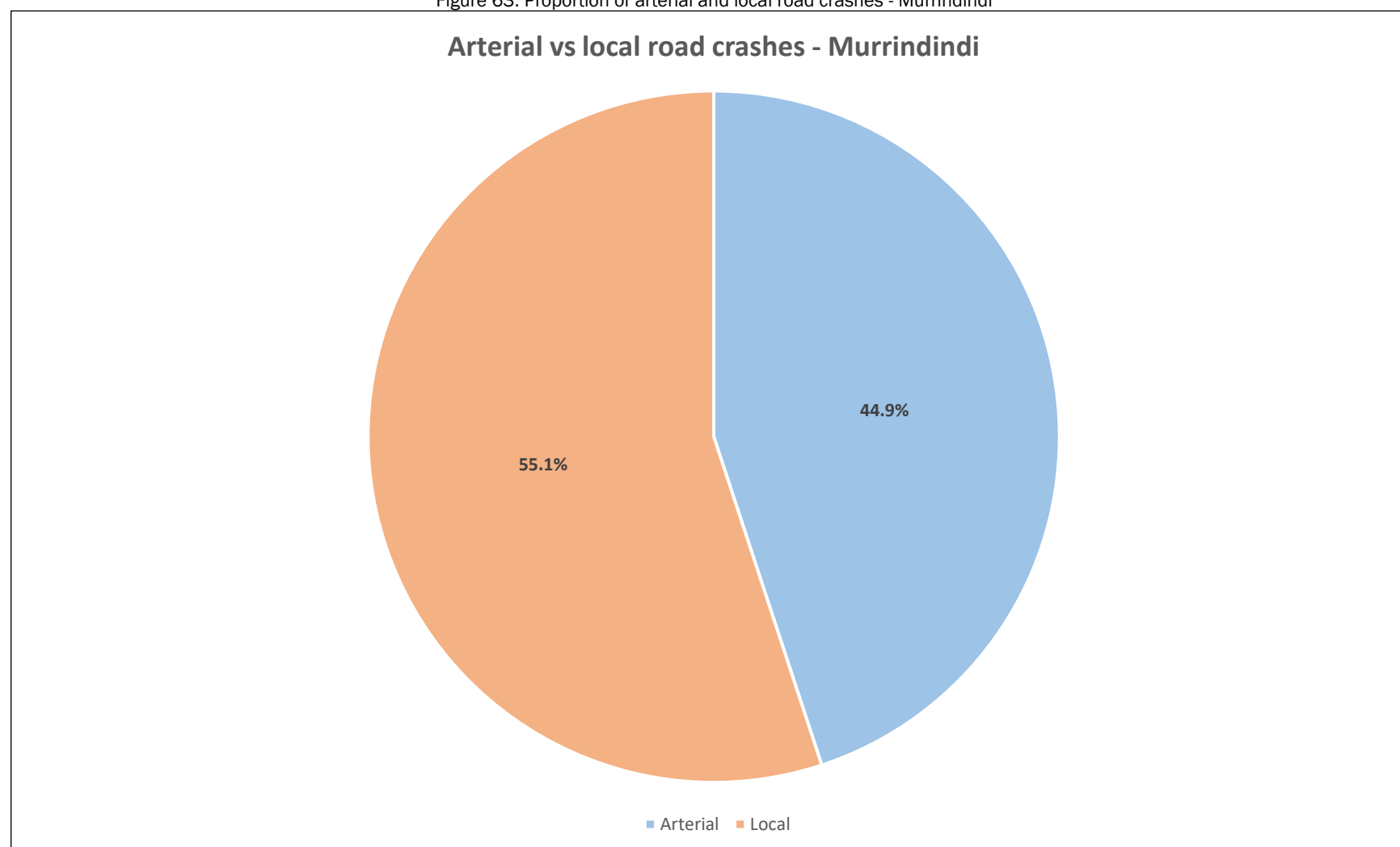


- In contrast to Murrindindi, most tourist crashes for Strathbogie are from driver and passenger road users, with an average number of 30.0 and 17.8 crashes per year, respectively.
- There is only an average of 6.0 tourist crashes per year involving motorcyclist road users within Strathbogie.

7 CRASHES BY LOCATION

7.1 Proportion of arterial vs local road crashes - Murrindindi

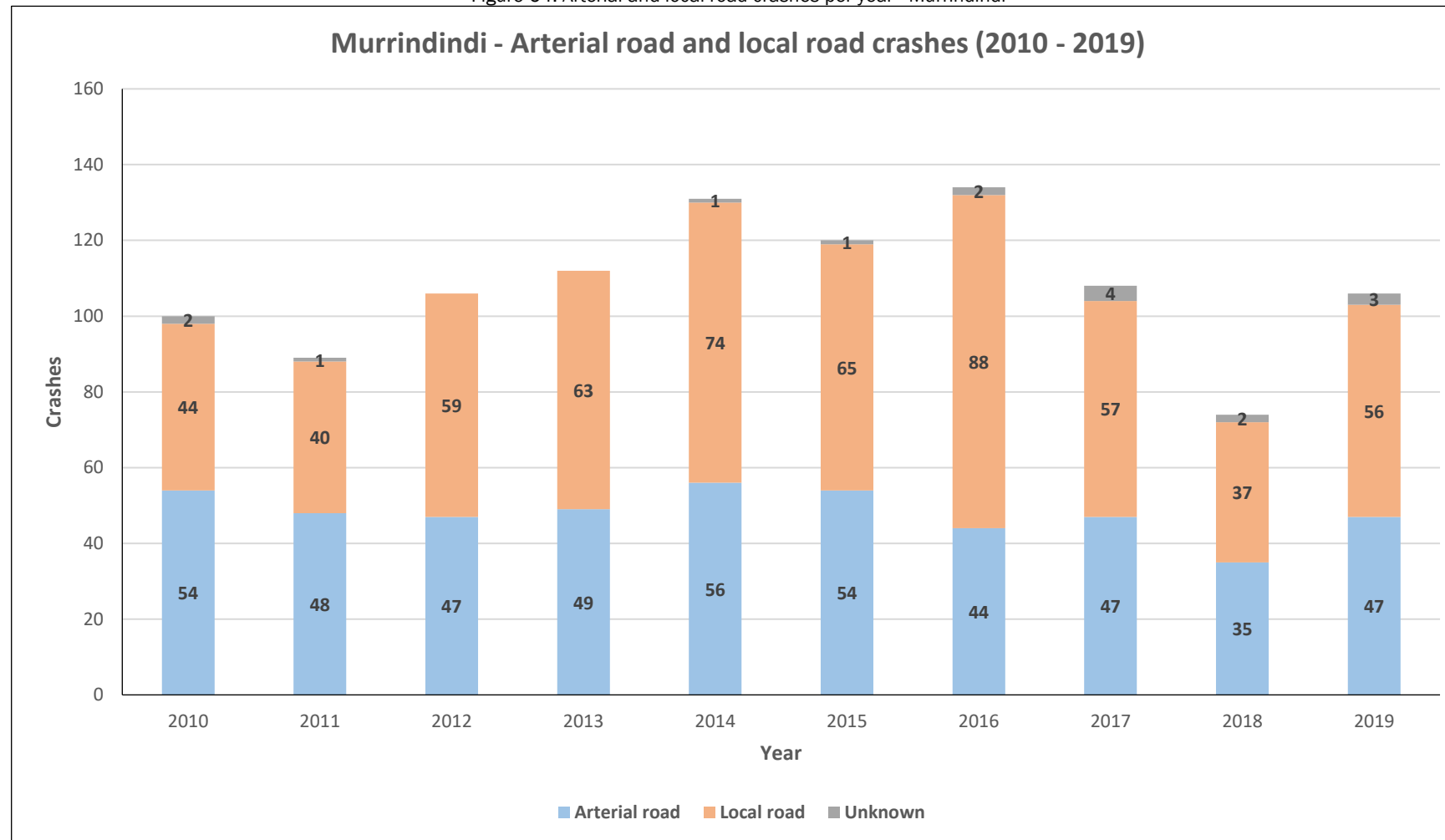
Figure 63: Proportion of arterial and local road crashes - Murrindindi



- There is a higher number of crashes on local roads than arterial roads in Murrindindi. This indicates that crashes in Murrindindi may be prevalent in various road environments and town areas.
- As local roads in the shire appear to traverse over various altitudes, the varying terrain and road geometry may have contributed to this higher number of crashes on local roads.

7.2 Arterial vs local road crashes per year - Murrindindi

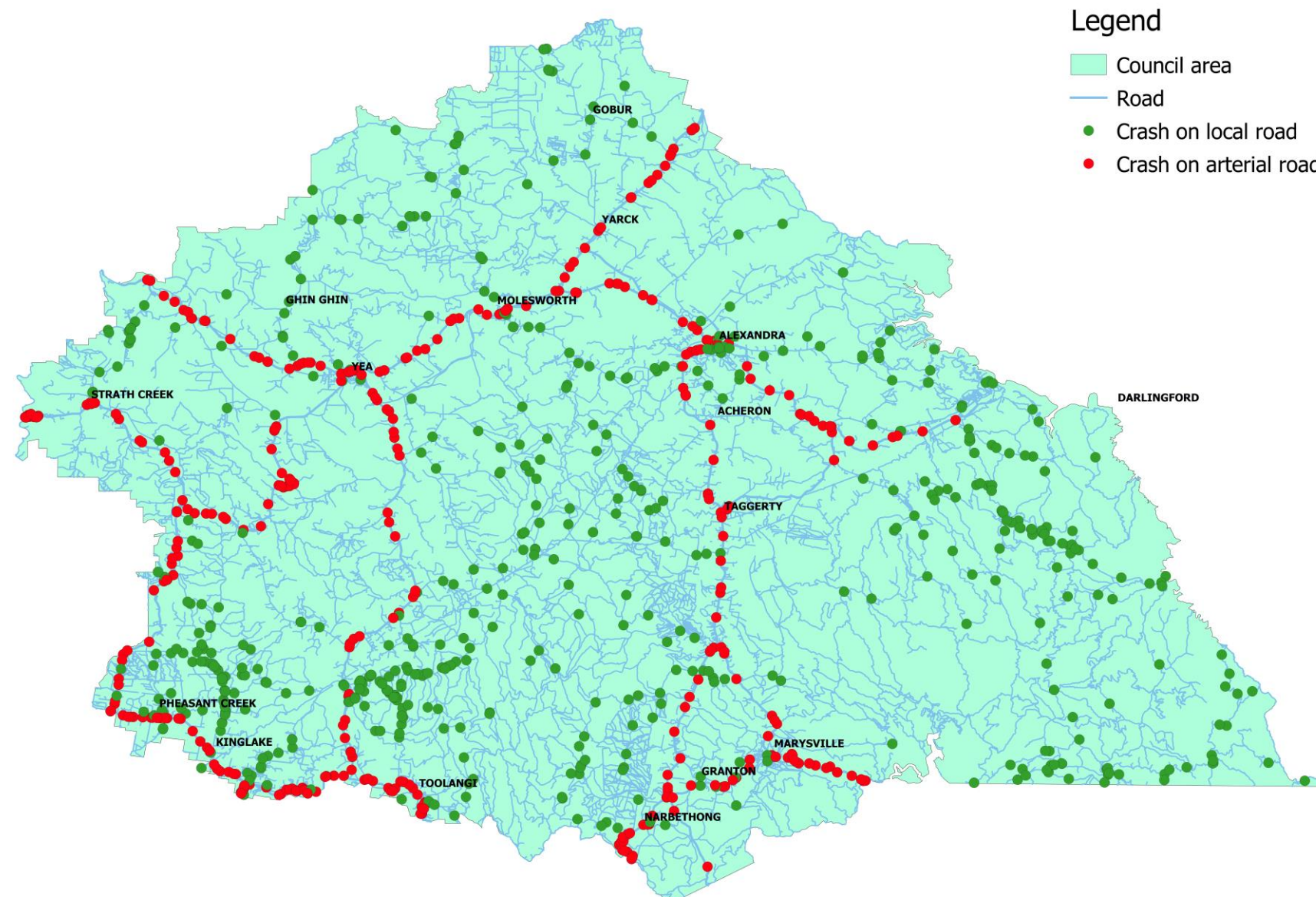
Figure 64: Arterial and local road crashes per year - Murrindindi



- There was a higher number of crashes on arterial roads in 2010 and 2011 compared to local roads, but not for other years.
- The number of crashes on local roads increased every year from 2011 to 2014.
- There are 33 % fewer local road crashes in the three-year period of 2017 to 2019 as compared to 2014 to 2016 (150 vs 227).

7.3 Location of arterial and local road crashes - Murrindindi

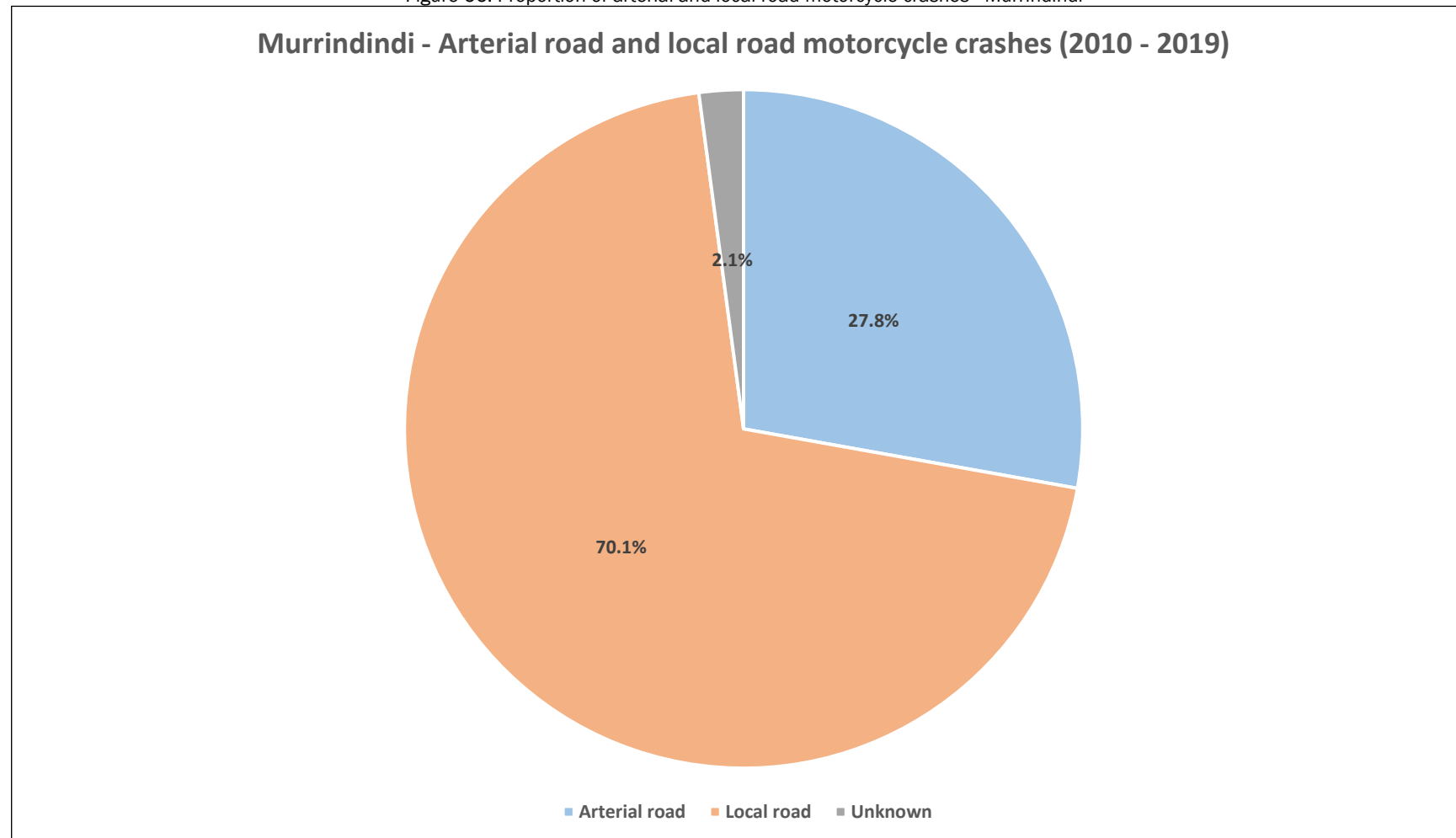
Figure 65: Crashes on arterials vs local roads – Murrindindi



- 588 (55.06 %) crashes in Murrindindi were on local roads while 480 (44.94 %) were on arterial roads.

7.4 Proportion of arterial vs local road motorcycle crashes – Murrindindi

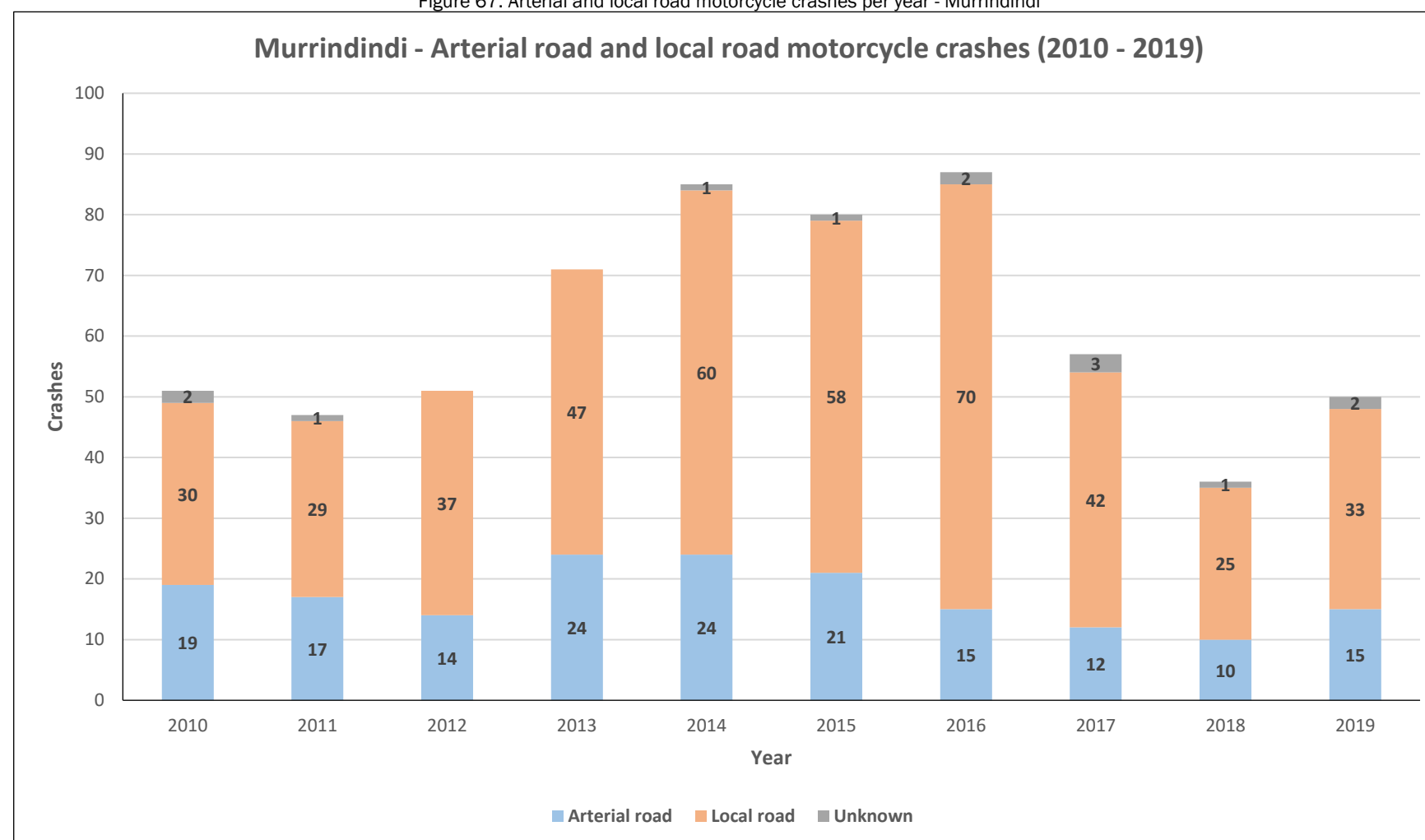
Figure 66: Proportion of arterial and local road motorcycle crashes - Murrindindi



- Most motorcycle crashes in Murrindindi are on local roads. This is a contributor to the larger proportion of local road crashes in the shire.
- Crashes of this road user type on popular local motorcycle routes may have contributed to this.
- The windy and hilly terrain along the local roads may have also contributed to this.

7.5 Arterial vs local road motorcycle crashes per year – Murrindindi

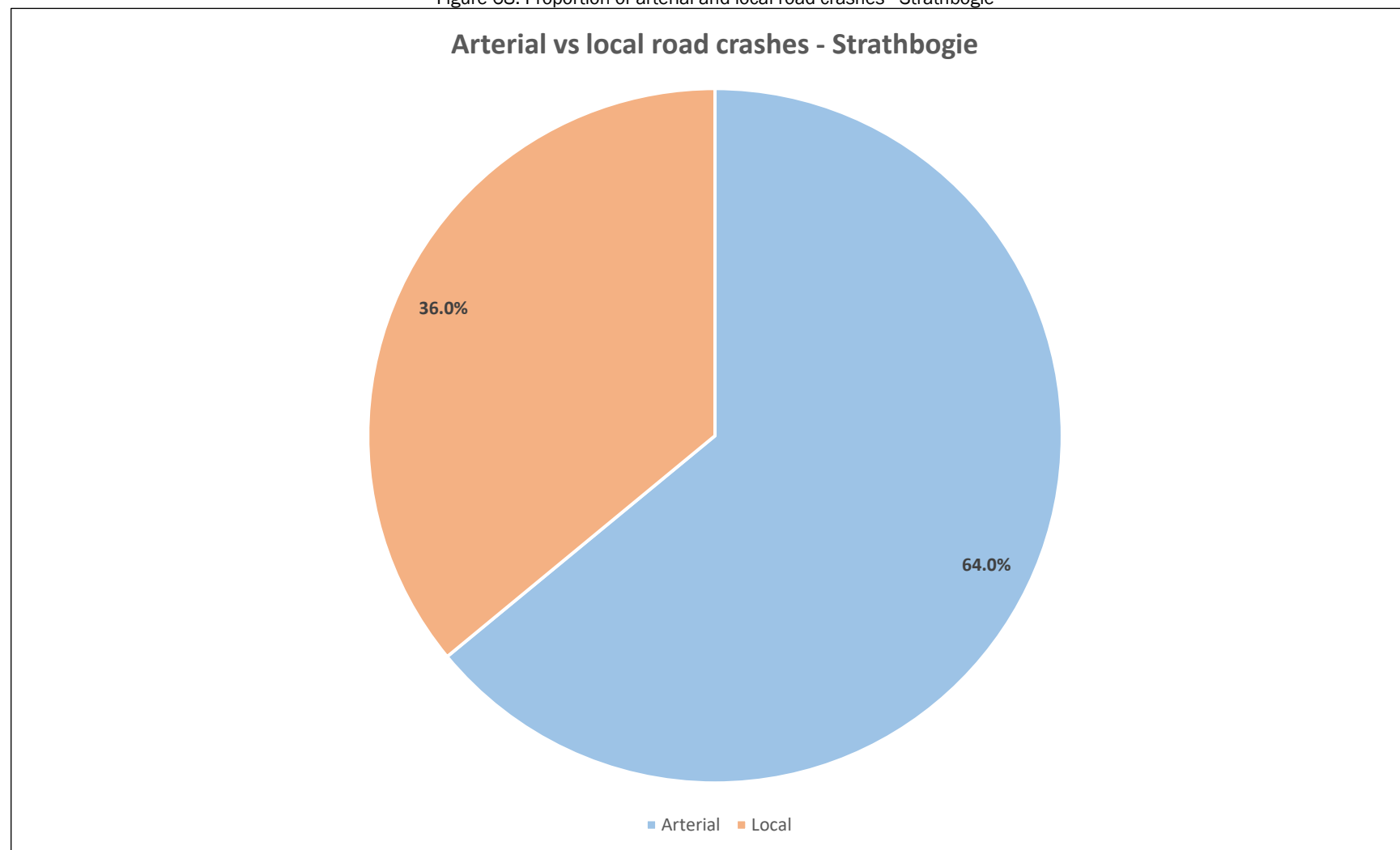
Figure 67: Arterial and local road motorcycle crashes per year - Murrindindi



- Motorcycle crashes in Murrindindi predominantly occur on local roads.
- There were much fewer motorcycle crashes each year in 2017 to 2019 as compared to the years of 2013 to 2016. Local road crashes decreased significantly by 64 % from 2016 to 2018.

7.6 Proportion of arterial vs local road crashes - Strathbogie

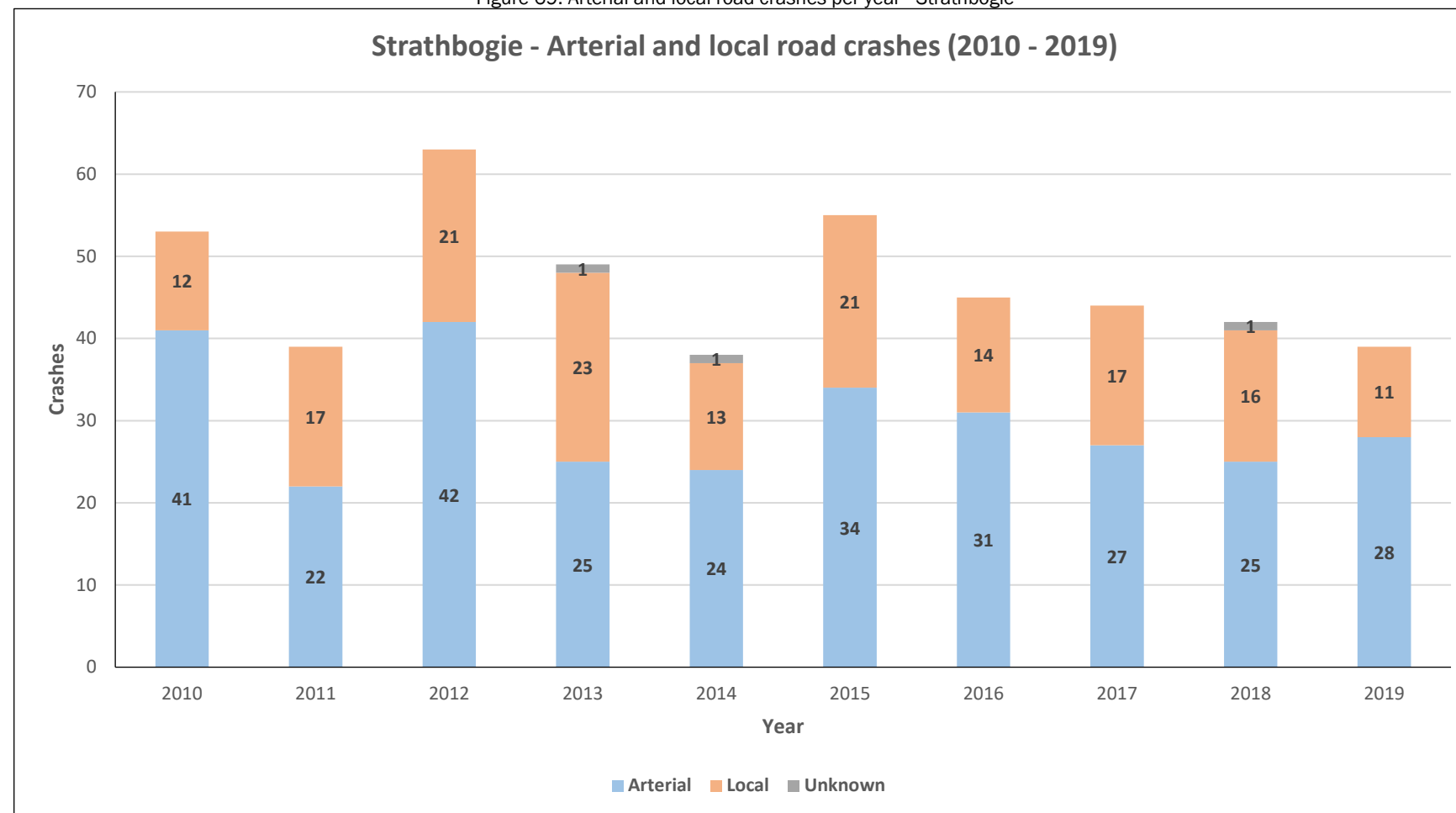
Figure 68: Proportion of arterial and local road crashes - Strathbogie



- There are more crashes on arterial roads in Strathbogie compared to local roads.
- Crashes on arterial roads may generally be more severe in nature due to higher speeds. This may have resulted in a greater proportion of FSI crashes in Strathbogie as compared to other shires.

7.7 Arterial vs local road crashes per year - Strathbogie

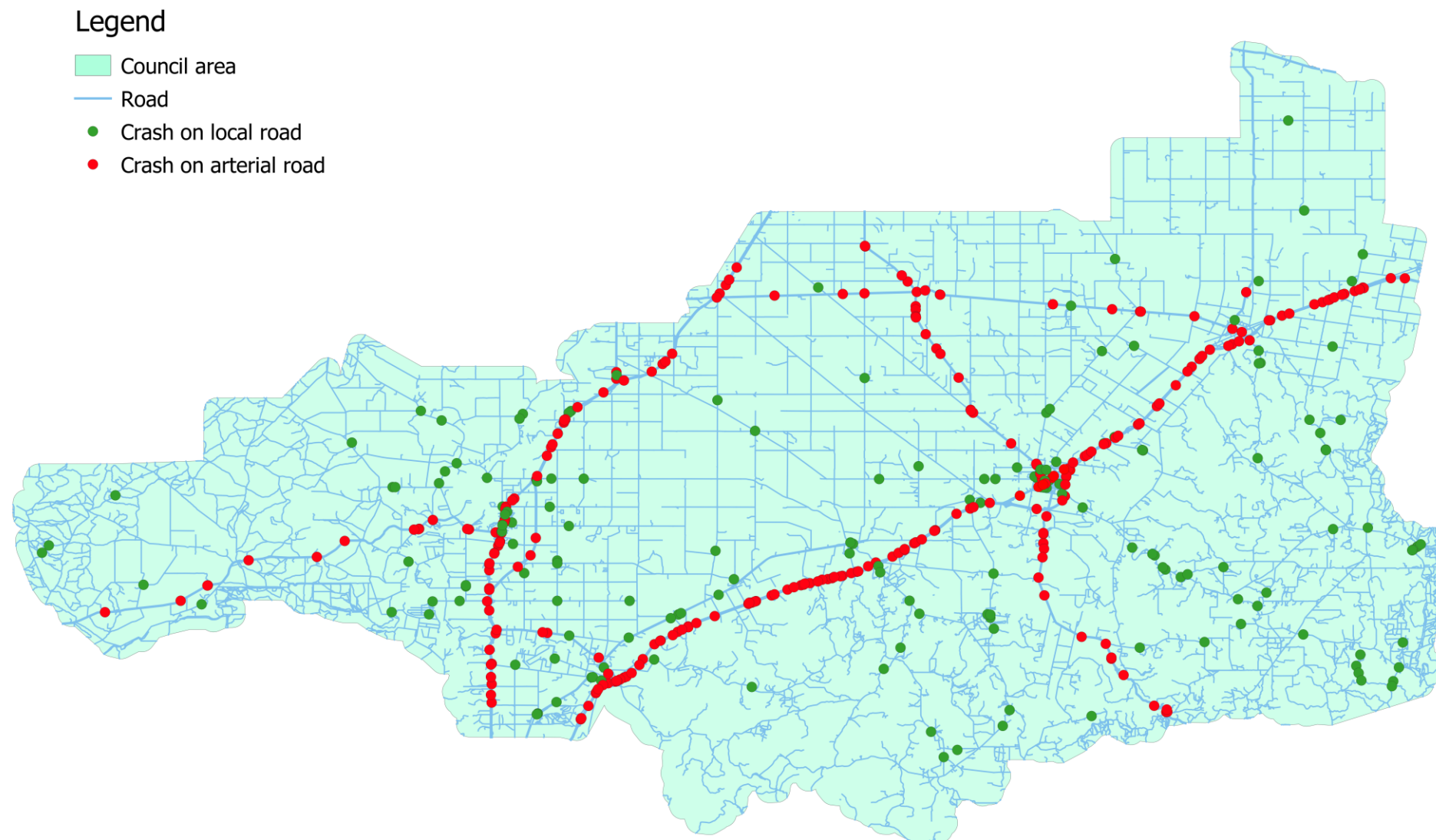
Figure 69: Arterial and local road crashes per year - Strathbogie



- There are more crashes on arterial roads as compared to local roads for all 10 years analysed.
- There was a spike in crashes in 2012, and the increase is largely attributed to arterial road crashes.
- Both arterial road and local road crashes were generally decreasing from 2015 to 2019. This indicates that any improvements to road safety in this period appear to benefit both types of roads in the shire.

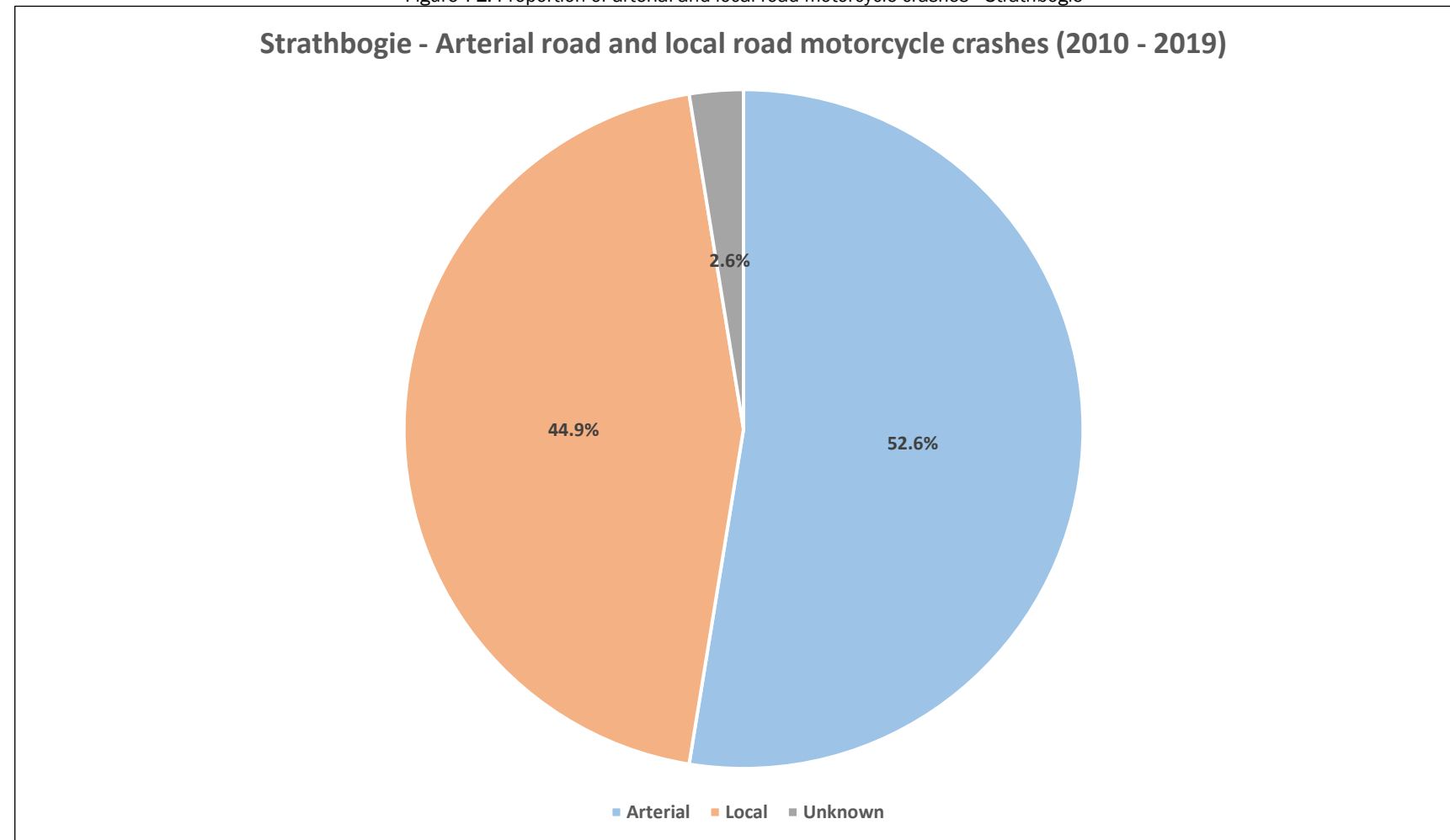
7.8 Location of arterial and local road crashes - Strathbogie

Figure 70: Crashes on arterial vs local roads – Strathbogie



7.9 Proportion of arterial vs local road motorcycle crashes – Strathbogie

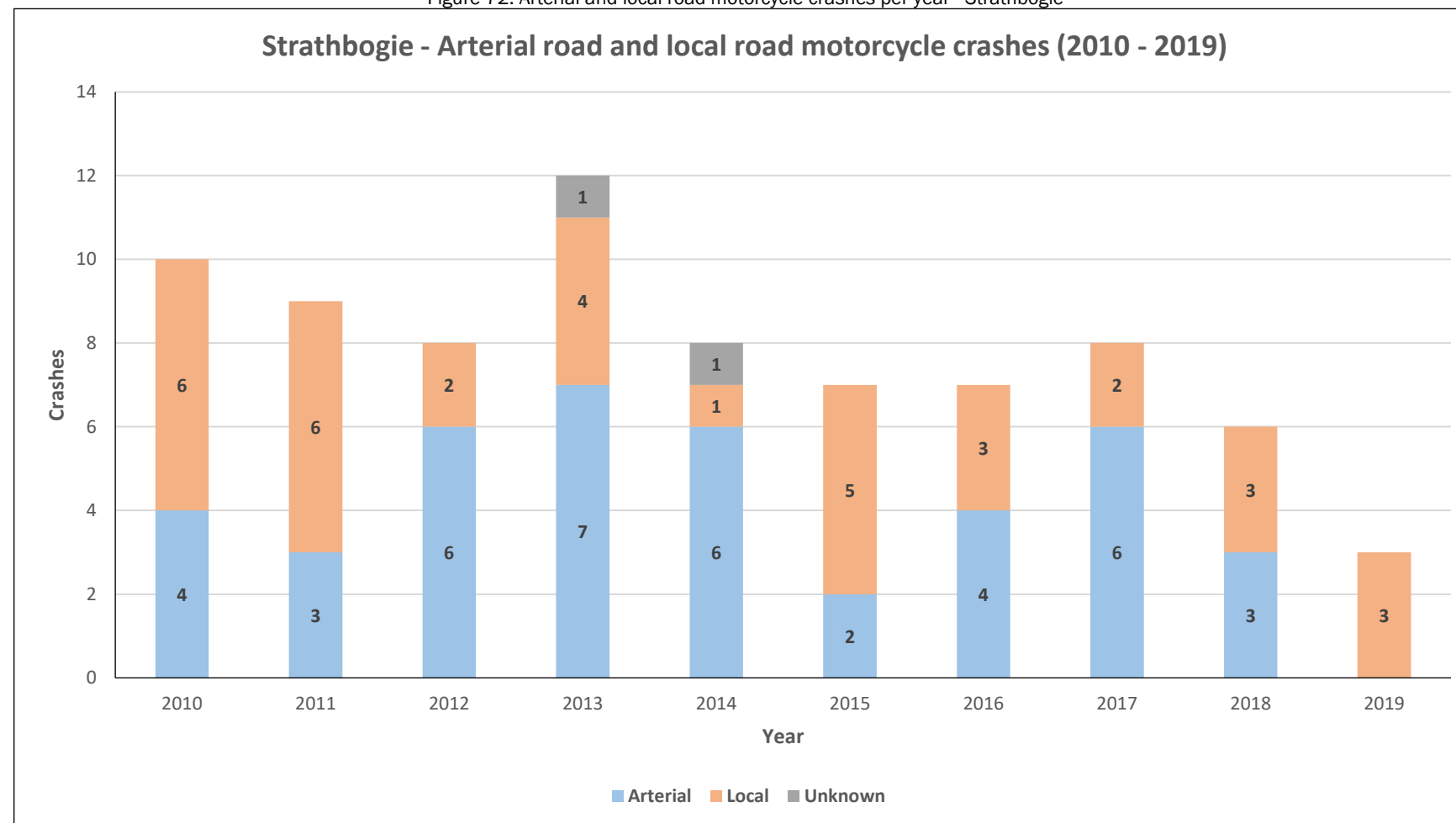
Figure 71: Proportion of arterial and local road motorcycle crashes - Strathbogie



- There are more motorcycle crashes on arterial roads than local roads in Strathbogie. This trend differs greatly from Murrindindi, where most motorcycle crashes are on local roads.
- This result may indicate that the distribution of motorcycle volumes among road types and the nature of their crashes may vary greatly between the two shires.

7.10 Arterial vs local road motorcycle crashes per year – Strathbogie

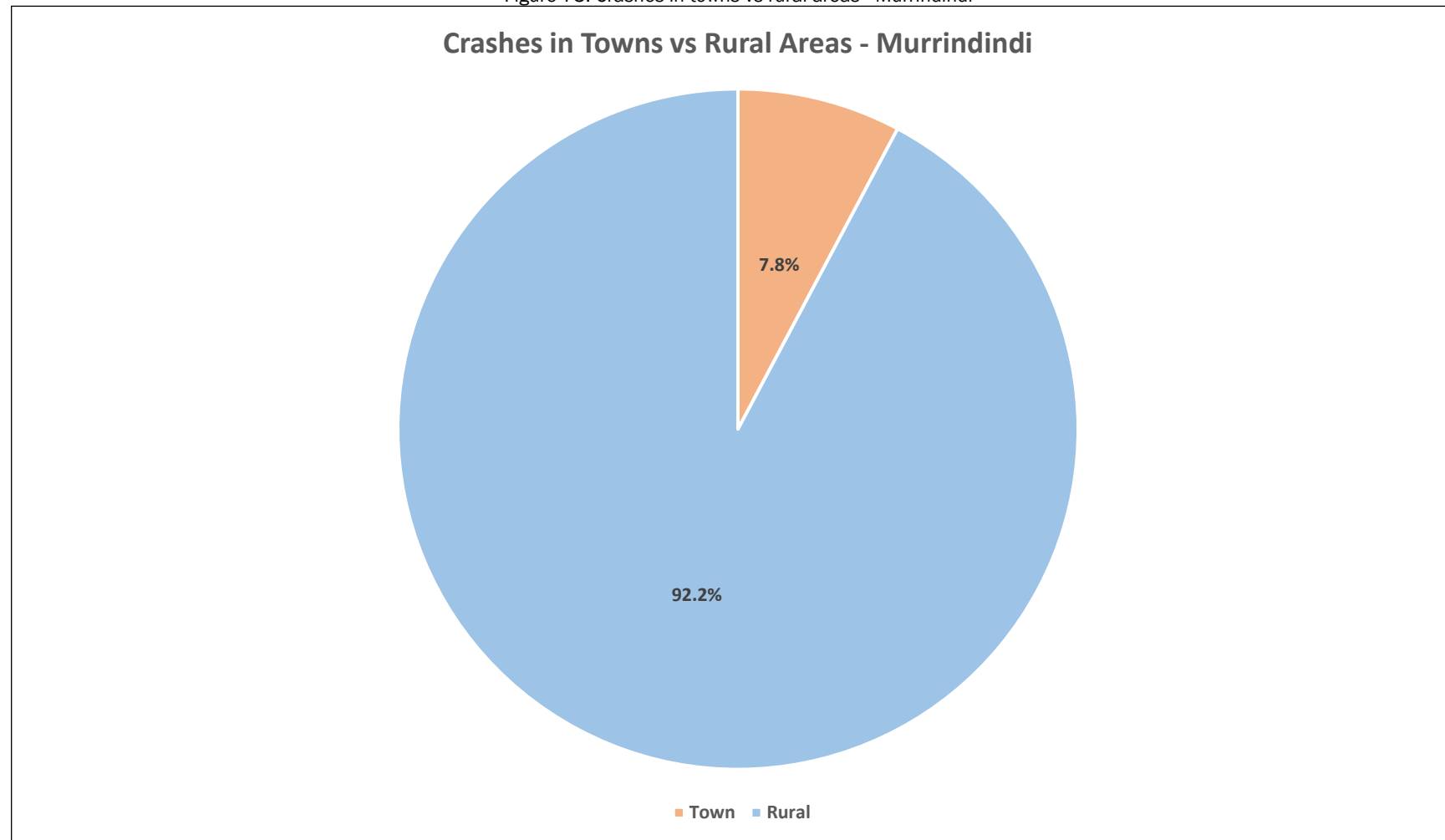
Figure 72: Arterial and local road motorcycle crashes per year - Strathbogie



- There is a large variation in the number of motorcycle crashes each year on local and arterial roads. This indicates that there may be a wide range of locations where motorcycle crashes have occurred over the years.
- 2019 is the only year where there are no motorcycle crashes on arterial roads.

7.11 Crashes in towns vs rural areas – Murrindindi

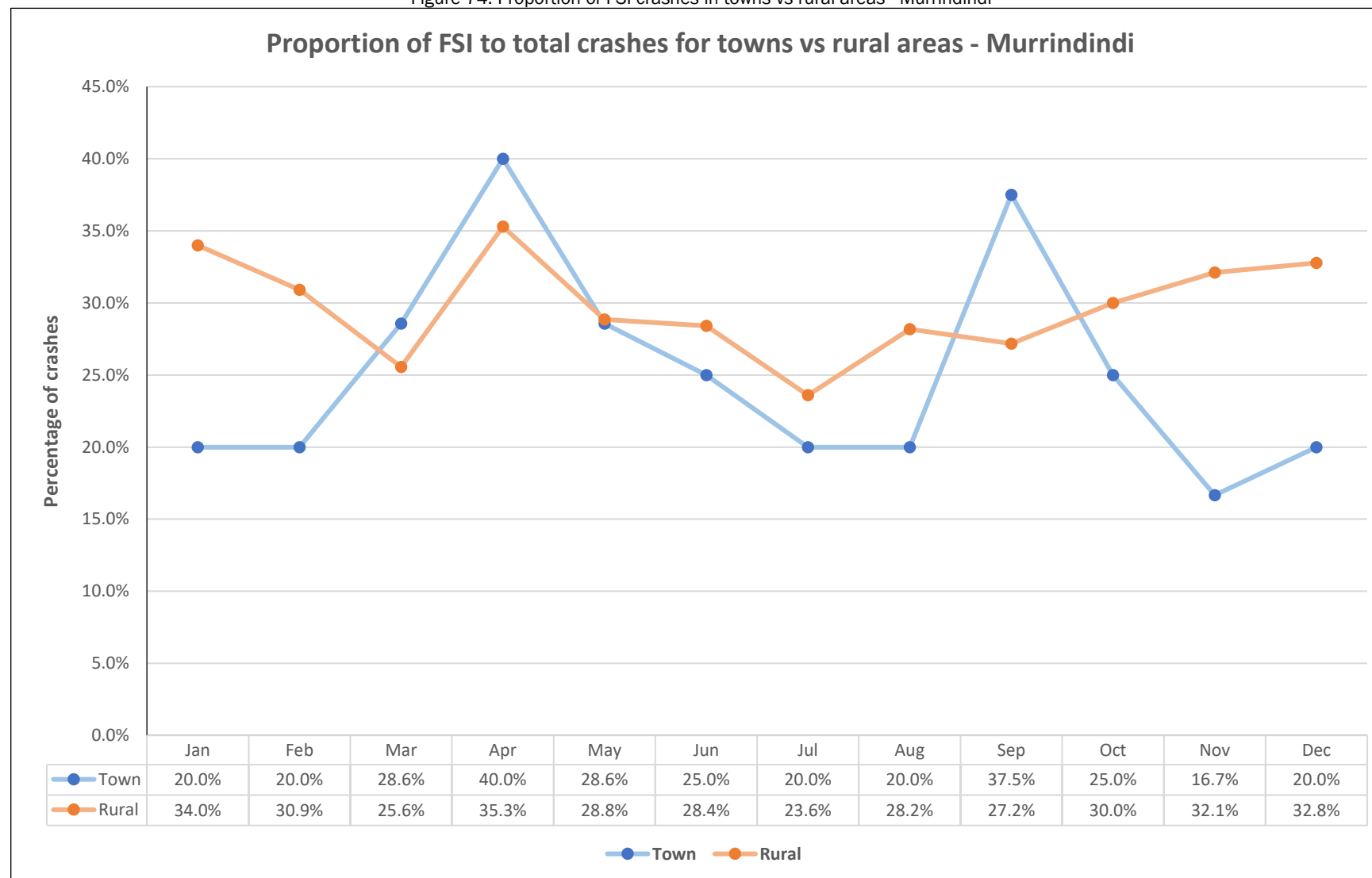
Figure 73: Crashes in towns vs rural areas - Murrindindi



- Almost all crashes in Murrindindi occurred outside of town areas. This may be attributed to the risk of crashes being increased in higher speed environments.
- Rural areas also tend to have more windy sections of road and roadside hazards than town areas, increasing the likelihood of run off-road crashes.

7.12 Proportion of FSI crashes in towns vs rural areas – Murrindindi

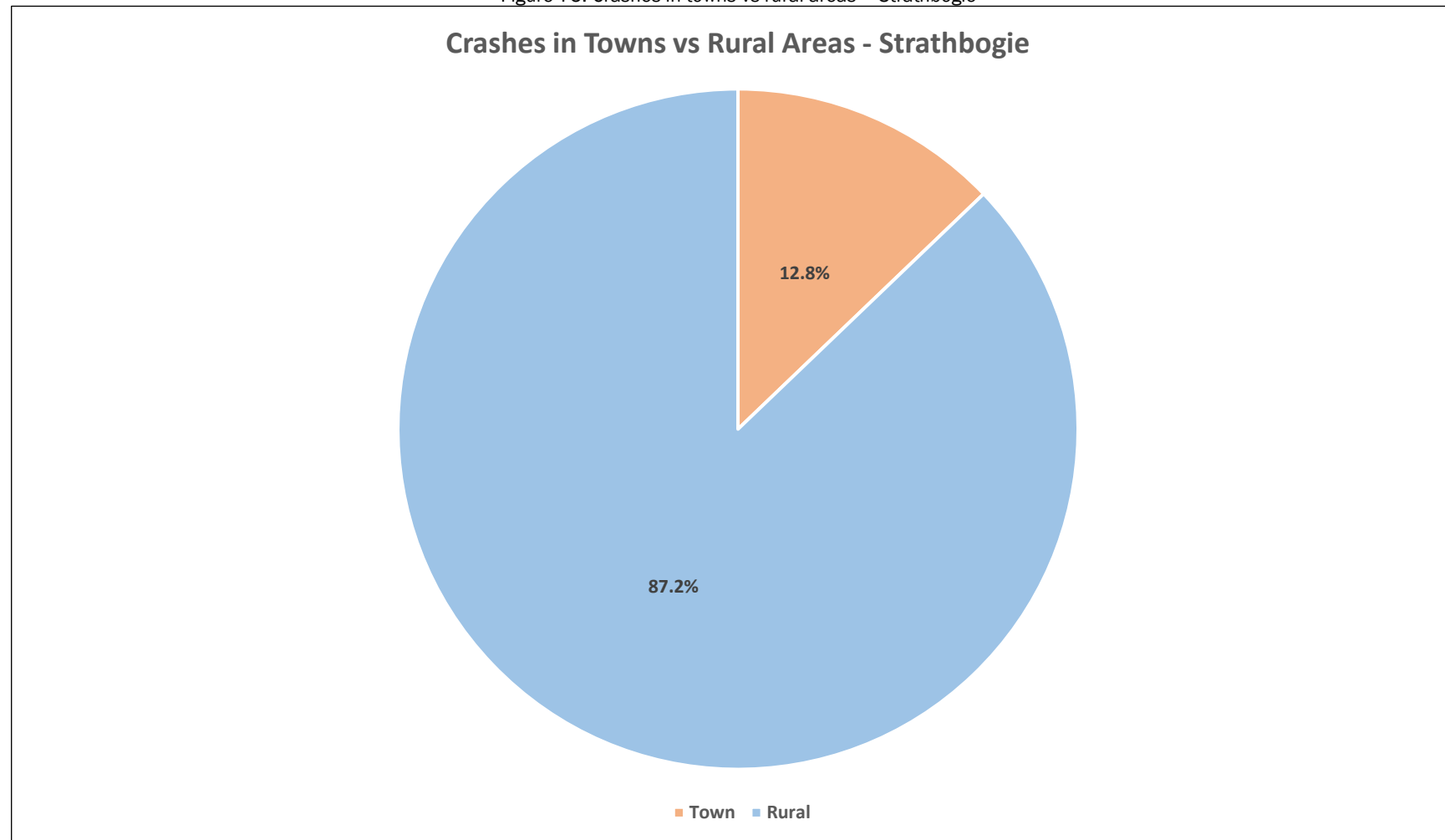
Figure 74: Proportion of FSI crashes in towns vs rural areas - Murrindindi



- Crashes in rural areas are more likely to result in fatalities or serious injury. This may be due to more hazardous road environments.

7.13 Crashes in towns vs rural areas – Strathbogie

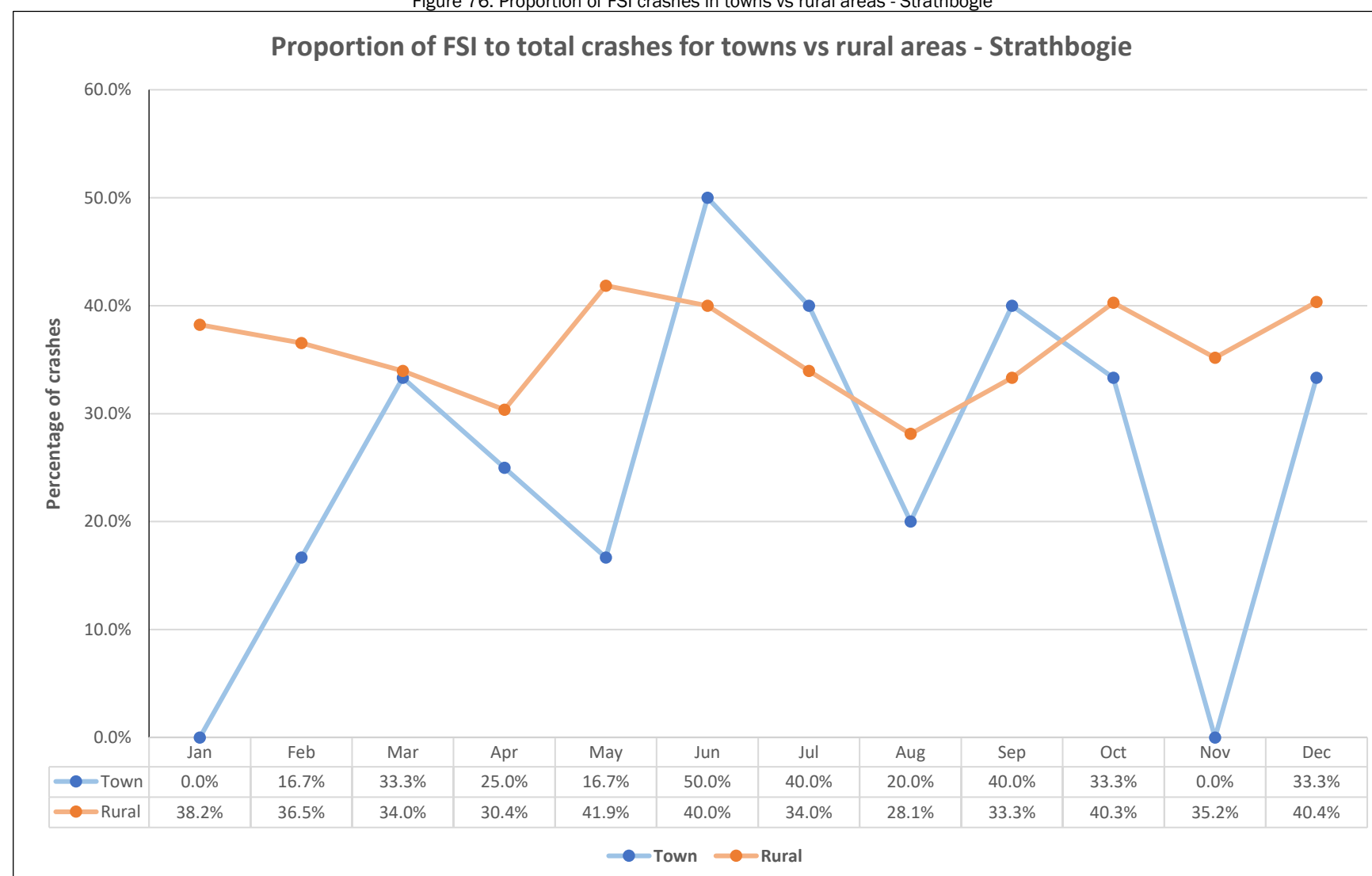
Figure 75: Crashes in towns vs rural areas – Strathbogie



- As per Murrindindi, most crashes in Strathbogie occurred in rural areas. However, there is a higher representation of crashes in town areas in Strathbogie as compared to Murrindindi (12.8 % vs 7.8 %).
- This may be attributed to the more uniform elevation over Strathbogie. In the shire of Murrindindi, towns tend to be in flatter, low-ground areas while rural regions cover large areas of hilly terrain. This variation in road environment may have led to a higher representation of rural crashes in Murrindindi as compared to Strathbogie.

7.14 Proportion of FSI crashes in towns vs rural areas – Strathbogie

Figure 76: Proportion of FSI crashes in towns vs rural areas - Strathbogie

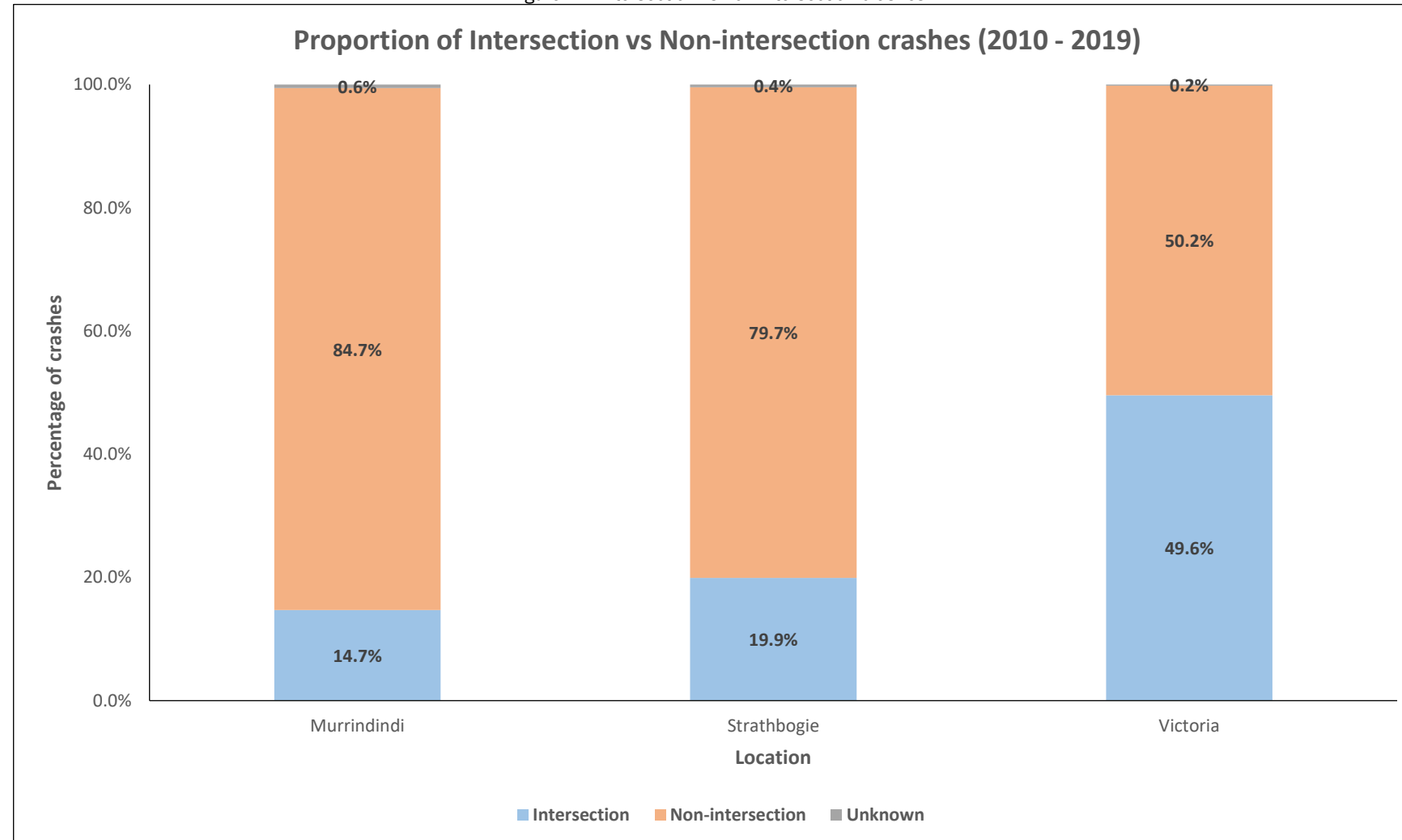


- The proportion of FSI crashes based on location in Strathbogie follows the same trend as Murrindindi where rural crashes tend to be more severe.
- There is a higher percentage of FSI crashes for both town and rural areas in Strathbogie compared to Murrindindi (56.8 % vs 43.2 % for rural and 43.4 % vs 36.1 % for towns). This indicates that crashes in both towns and rural areas in Strathbogie tend to be more severe when compared to similar location types in other shires.

8 CRASHES BY TYPE

8.1 Intersection vs non-intersection crashes

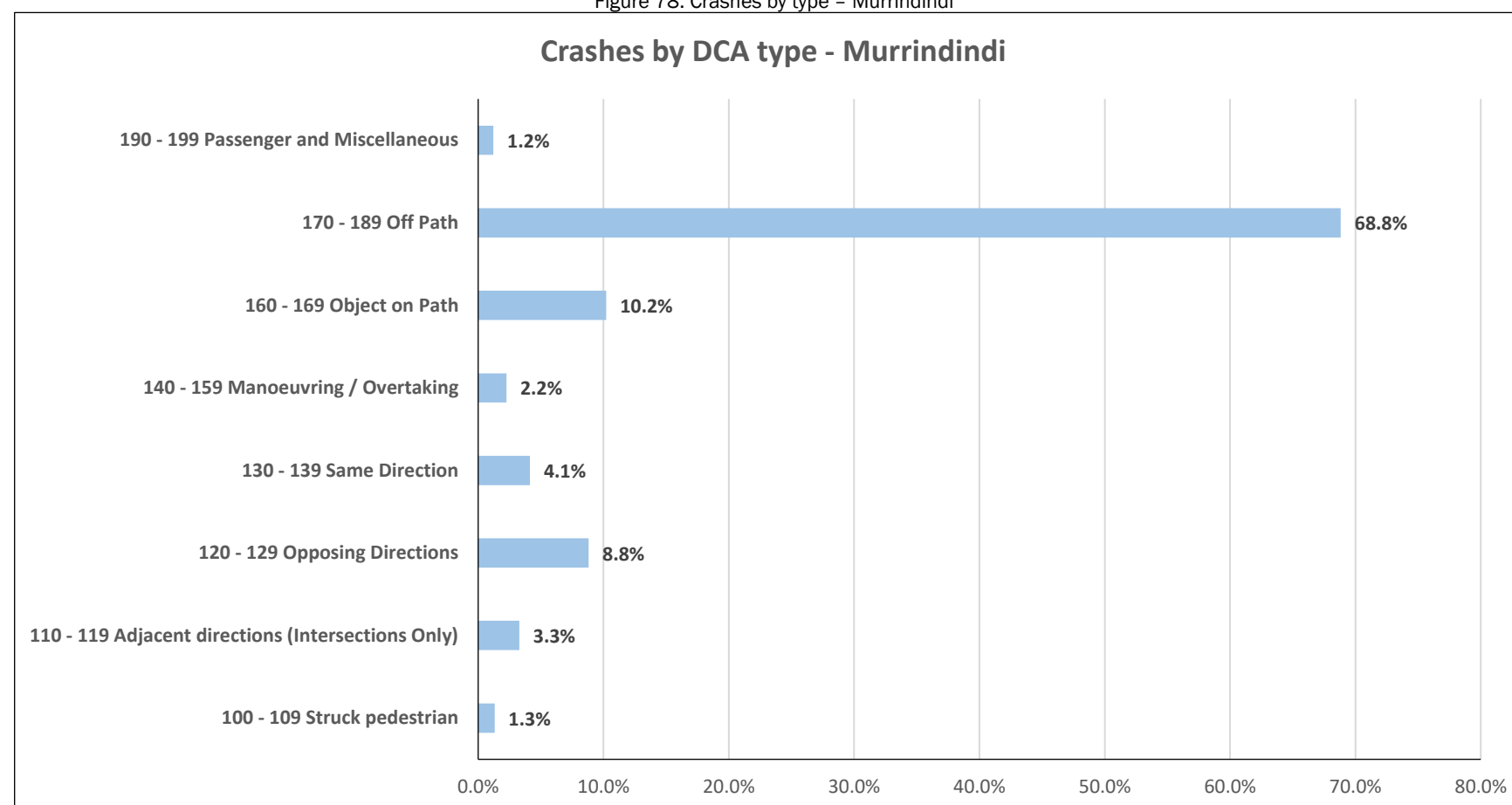
Figure 77: Intersection vs non-intersection crashes



- Non-intersection crashes in Murrindindi and Strathbogie are much more highly represented compared to the rest of Victoria. This indicates a higher prevalence of run-off-road crashes
- High speed limits, uneven surfaces and uneven terrain in rural areas such as the two shires may have contributed to this.

8.2 Crashes by DCA type – Murrindindi

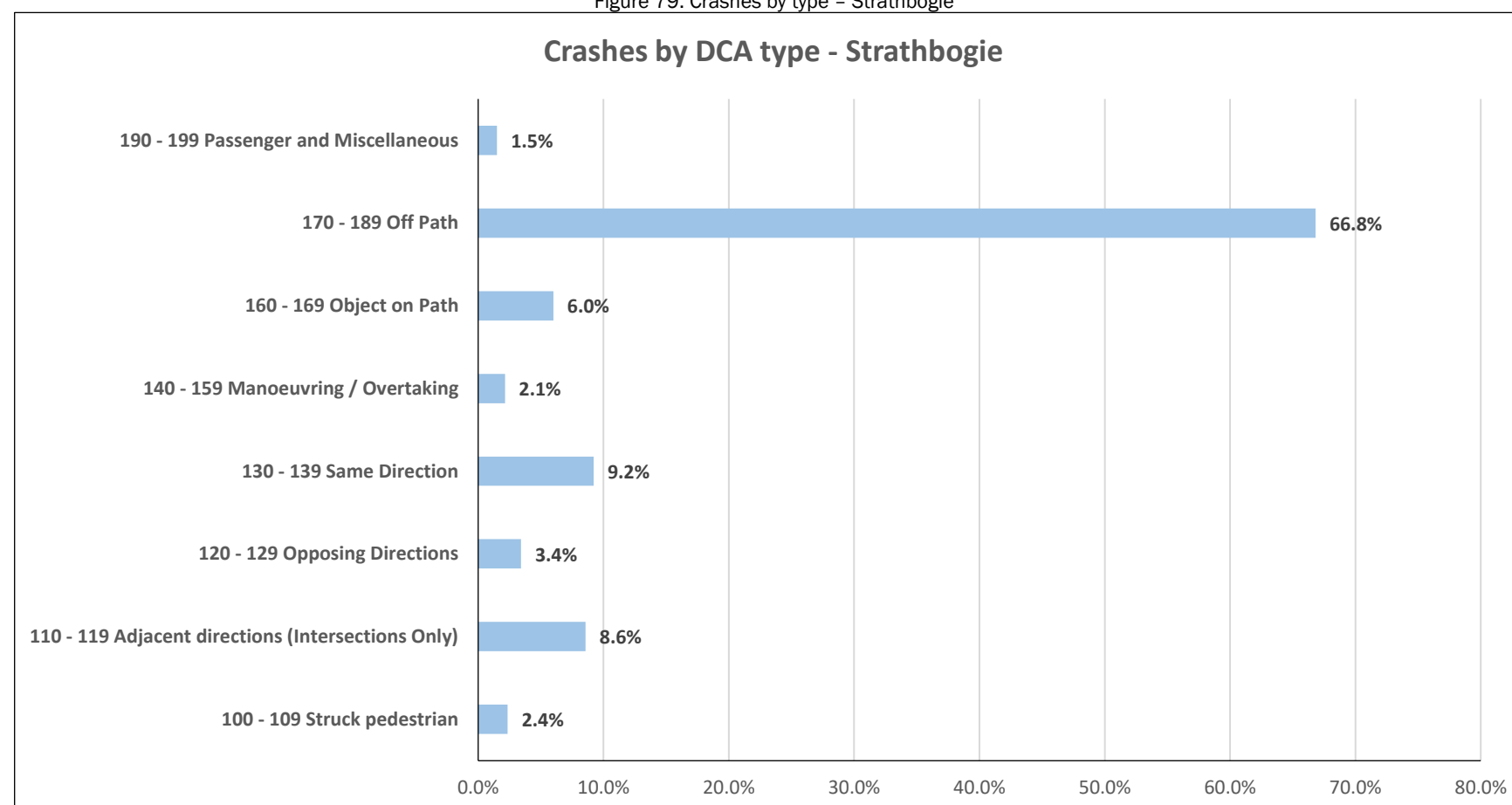
Figure 78: Crashes by type – Murrindindi



- Most crashes in Murrindindi result from vehicles running off the road / losing control in both curved and straight sections of road.
- Slippery or uneven conditions due to the number of unsealed and gravel roads within the shire may have contributed to these crashes. Windy sections of road in mountainous regions may also have attributed to off path crashes on curves.
- Striking an object or animal on the road is the second most common type of crash.

8.3 Crashes by DCA type – Strathbogie

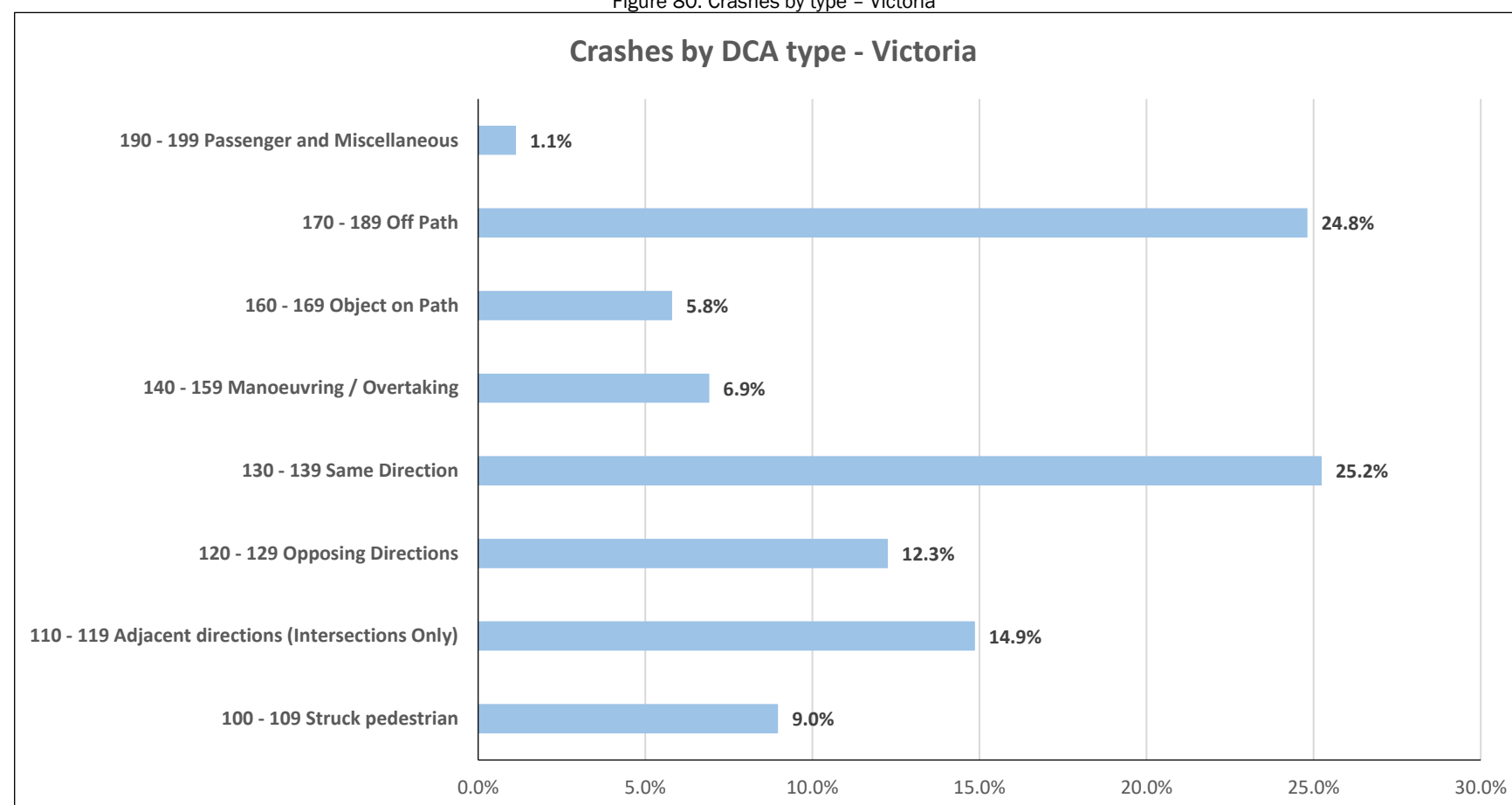
Figure 79: Crashes by type – Strathbogie



- Most crashes in Strathbogie appears to follow a similar trend to Murrindindi, with 66.8 % resulting from off path crashes (68.8 % for Murrindindi).
- Crashes in the same direction represent almost one out of ten crashes in the shire. Approximately half of these are rear end crashes.
- There is a higher representation of adjacent direction crashes in Strathbogie out of the two shires analysed (8.6 % vs 3.3 %). This may be a result of a higher representation of intersection crashes in Strathbogie.

8.4 Crashes by DCA type – Victoria

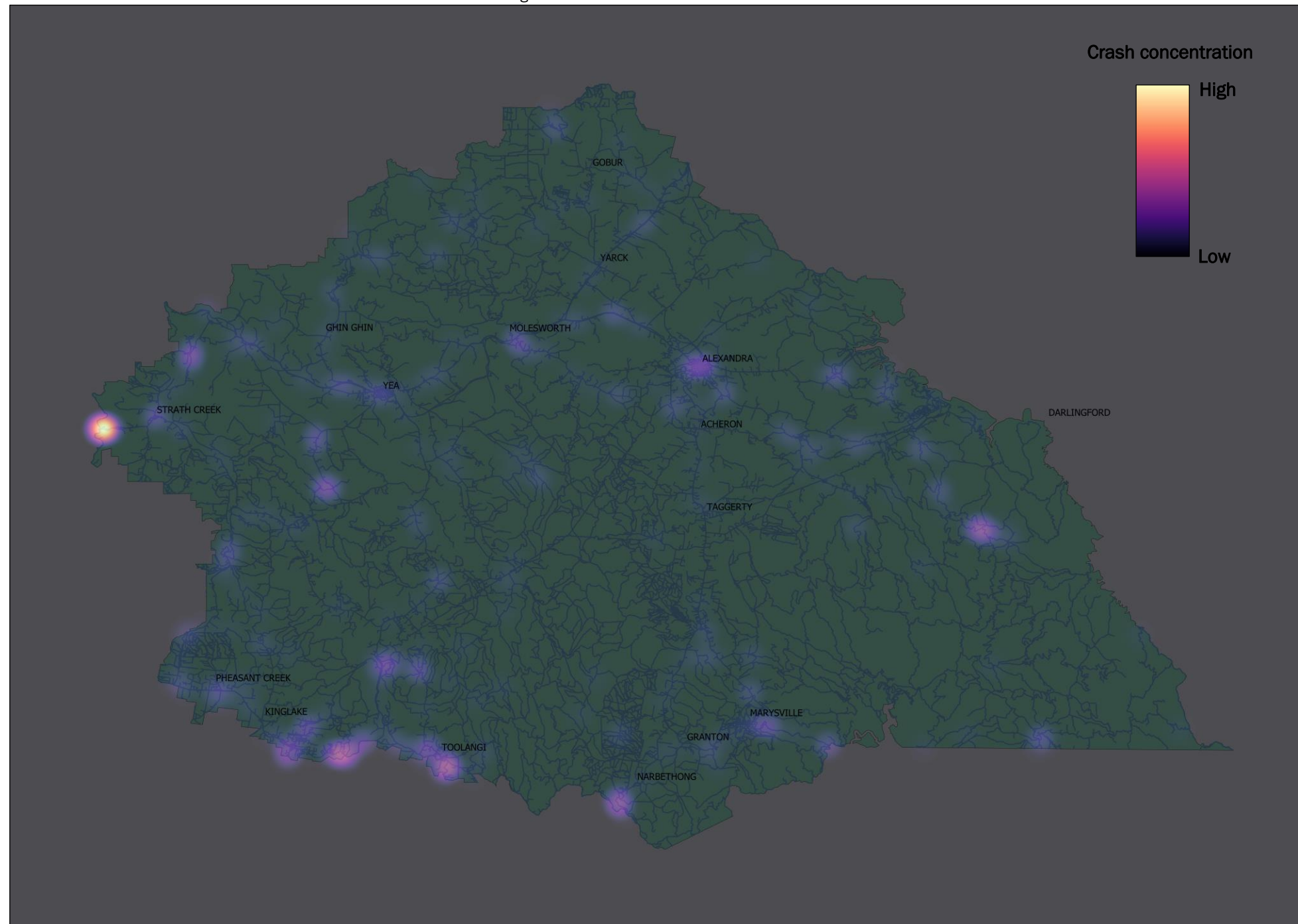
Figure 80: Crashes by type – Victoria



- Crashes tend to be more evenly distributed over different crash categories in the State of Victoria as compared to Strathbogie and Murrindindi. This suggests that road conditions where the bulk of vehicles are travelling in the two shires may be conducive for run-off road crashes as compared to the rest of the state.
- The percentage of object on path crashes are similar in Victoria (5.8 %) and Strathbogie (6.0 %) but is relatively high in Murrindindi (10.2 %).
- Manoeuvring and overtaking type crashes seem to be less of an issue in the two shires (approximately 2 %) as compared to the rest of the state (6.9 %).
- While the representation of crash types for several categories for Murrindindi and Strathbogie appear much lower than the rest of Victoria, this result may be skewed by the high number of off-path crashes for the two shires. Given the large number of total crashes for both locations, crash types other than off-road crashes may still be a result of considerable road safety deficiencies for Murrindindi and Strathbogie.

8.5 Location of run-off road crashes - Murrindindi

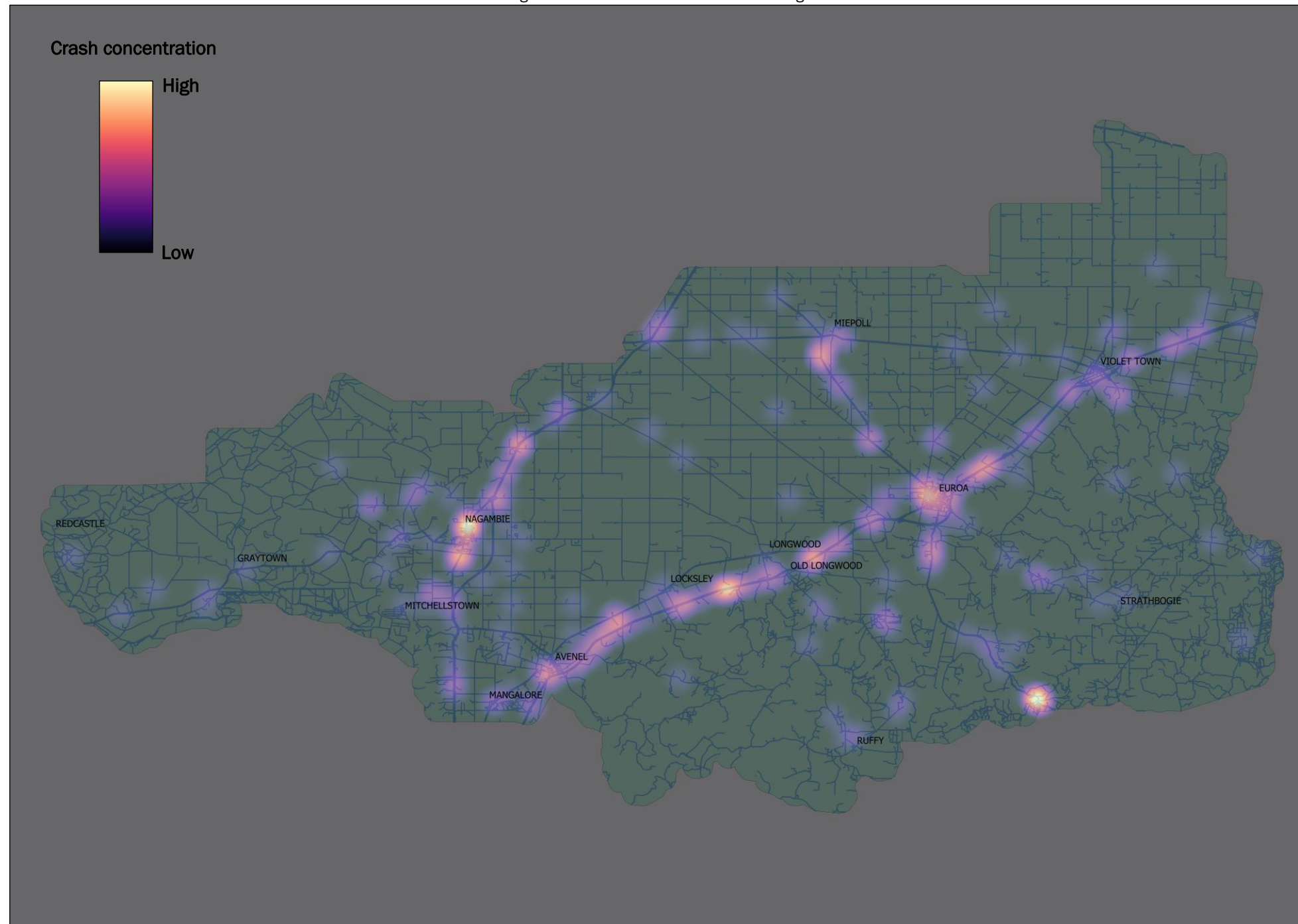
Figure 81: Run-off road crashes – Murrindindi



- 40.9 % (437 out of 1068) of crashes in Murrindindi resulted from a run-off road incident (not including out of control on carriageway (DCA 174 and 184) or other off path (DCA 179 and 189) crashes).
- There are clusters of these types of crashes on several arterial roads such as Melba Highway, Whittlesea-Kinglake Road, Healesville-Kinglake Road and Heidelberg-Kinglake Road.
- 202 (46.22 %) run-off road crashes occurred on local roads. Notable local road clusters include Whanregarwen Road (east of Molesworth), Highlands Road (northeast of Molesworth), Eildon-Jaimeson Road (southwest of Darlingford), Whittlesea-Yea Road (southwest of Yea) and Kinglake-Glenburn Road (east of Kinglake).

8.6 Location of run-off road crashes - Strathbogie

Figure 82: Run-off road crashes – Strathbogie

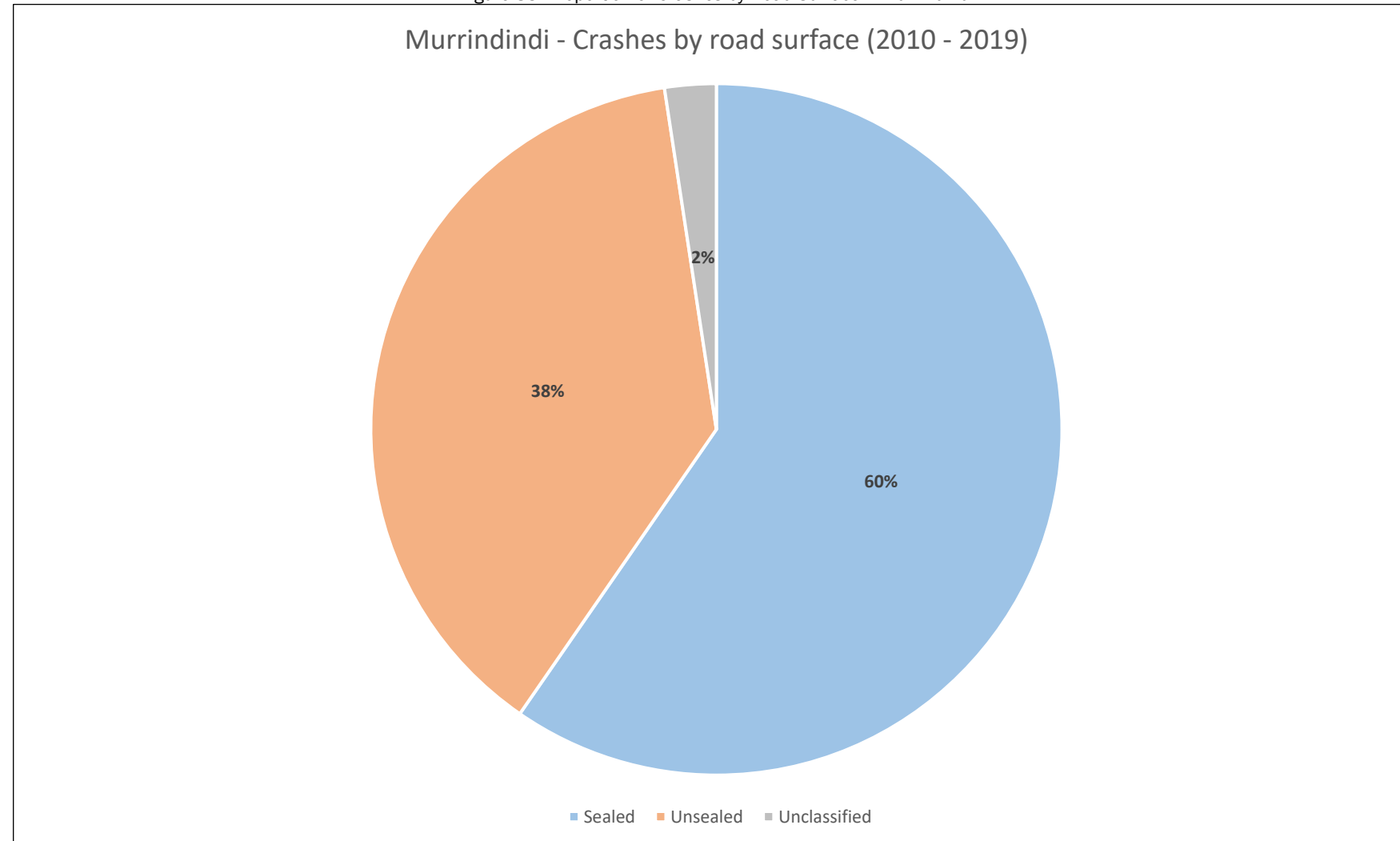


- 57.1 % (267 out of 467) of crashes in Strathbogie were a result of running off the road.
- Out of these crashes, 101 (37.8 %) occurred on local roads and 166 (62.2 %) were on arterials.
- Clusters have occurred on most major arterial roads. There are no notable clusters on specific local roads but appear widespread across the shire.

9 CRASHES BY ENVIRONMENTAL FACTORS

9.1 Proportion of Crashes by Road Surface – Murrindindi

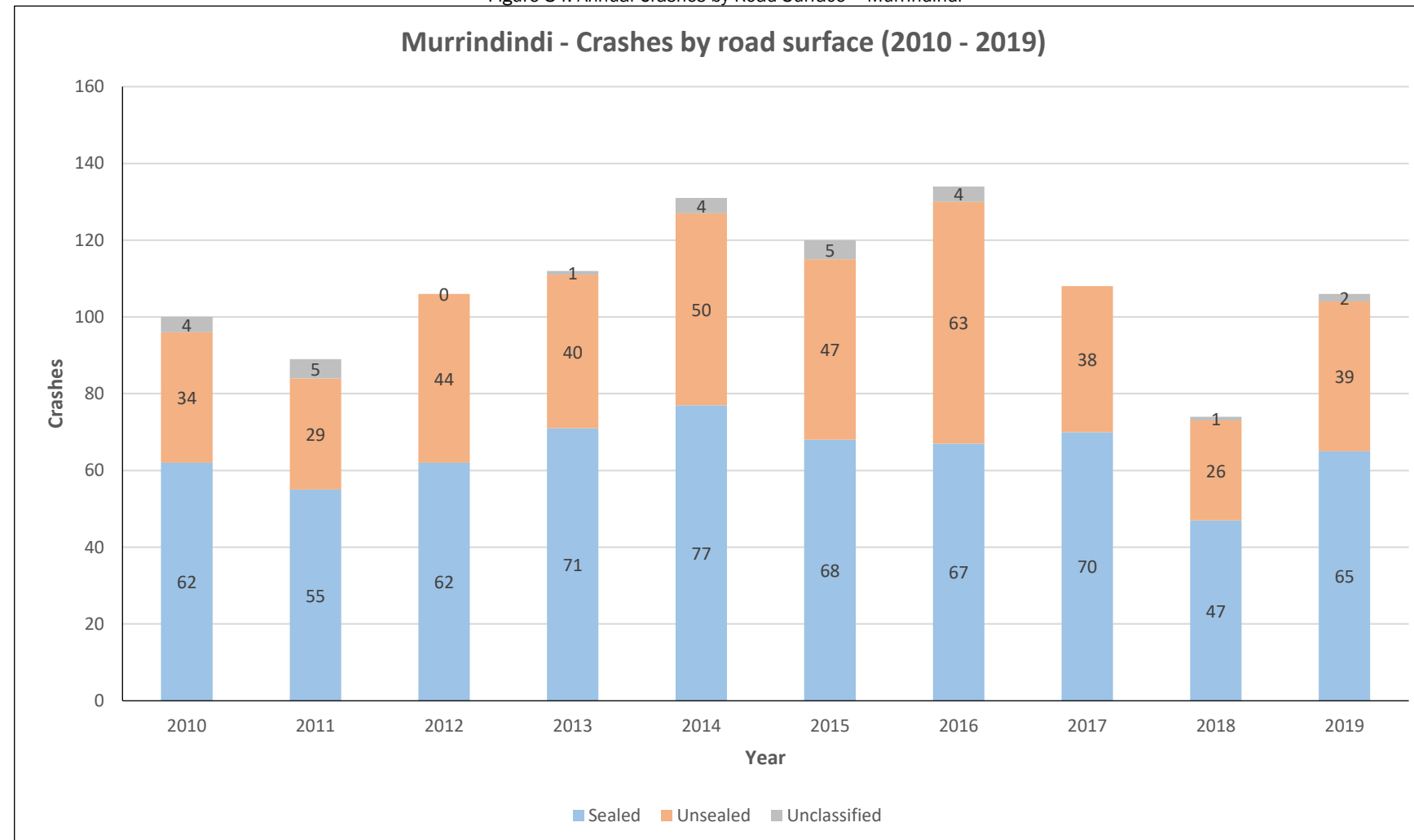
Figure 83: Proportion of Crashes by Road Surface – Murrindindi



- About two in five crashes in Murrindindi are on unsealed road surfaces and the proportion is much greater compared to Strathbogie.

9.2 Annual Crashes by Road Surface – Murrindindi

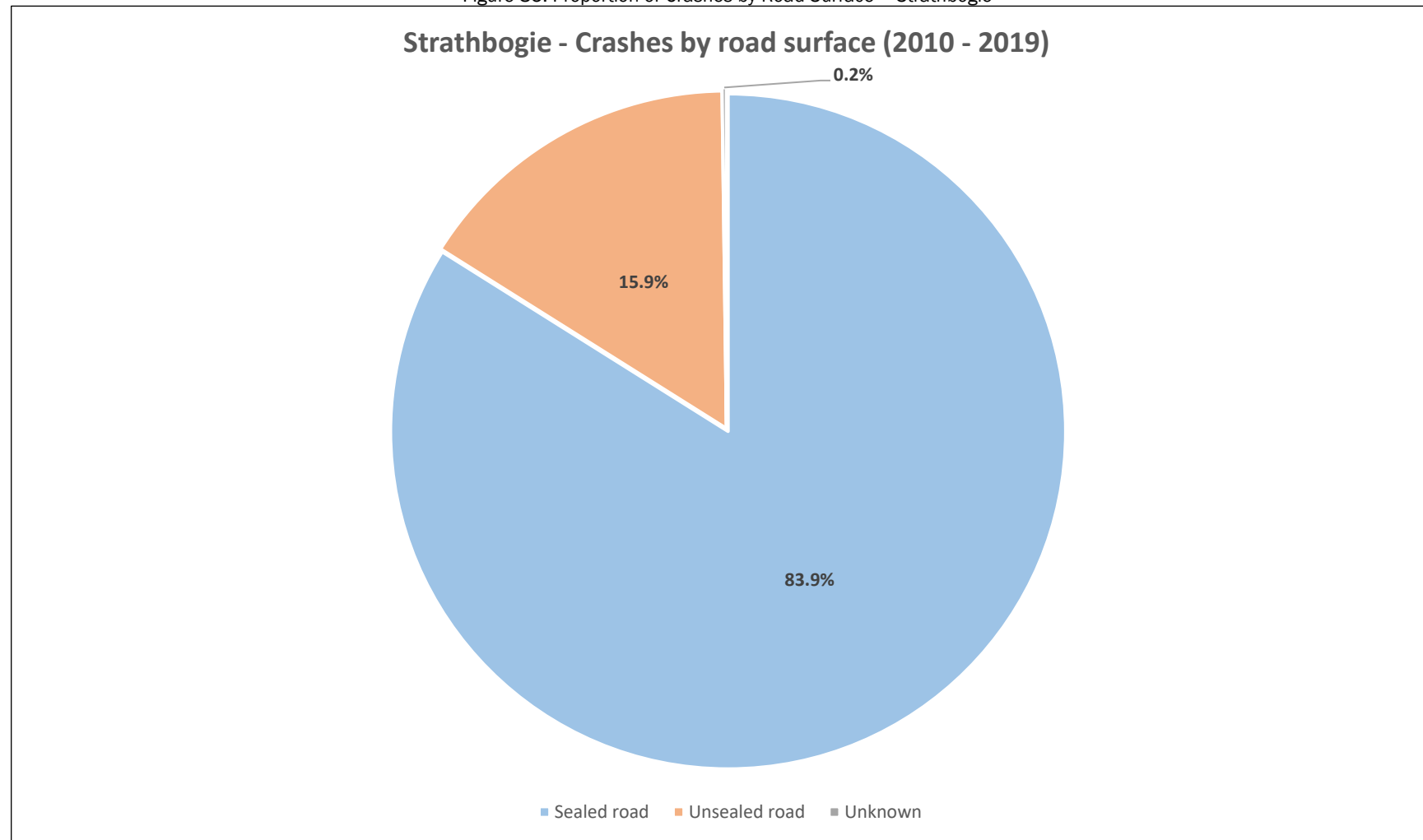
Figure 84: Annual Crashes by Road Surface – Murrindindi



- There are higher number of crashes on sealed roads than unsealed roads in Murrindindi for all 10 years analysed.
- The number of crashes on sealed roads increased every year from 2011 to 2014.
- In 2016, the number of crashes peaked on unsealed roads with 63 crashes.
- There was a significant decrease in number of crashes in 2018 for both sealed and unsealed roads.

9.3 Proportion of Crashes by Road Surface – Strathbogie

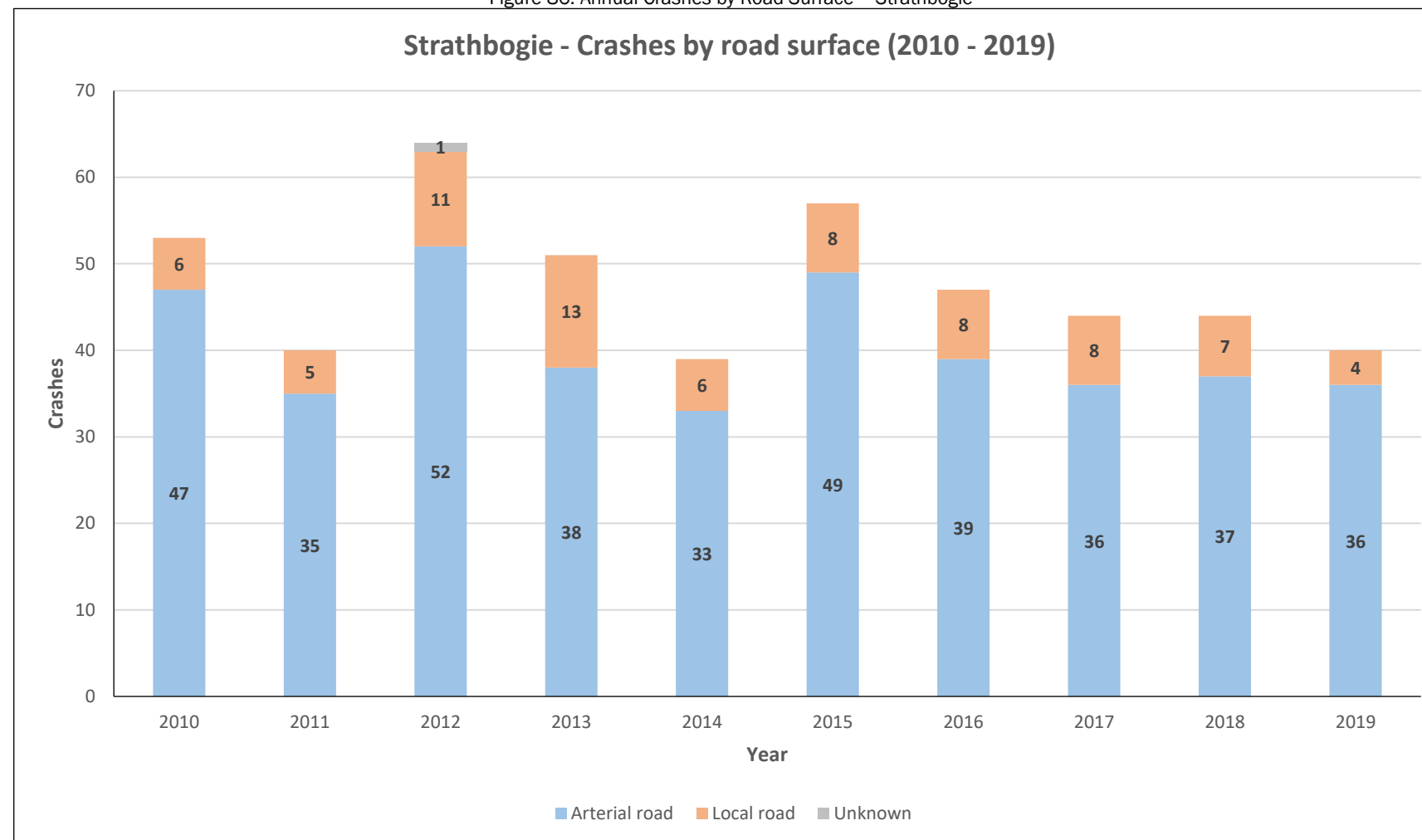
Figure 85: Proportion of Crashes by Road Surface – Strathbogie



- Approximately 16 % of crashes in Strathbogie are on unsealed road surfaces, with the remaining crashes generally on sealed roads.
- The proportion of crashes occurring on unsealed roads in Strathbogie is significantly lower than Murrindindi.

9.4 Annual Crashes by Road Surface – Strathbogie

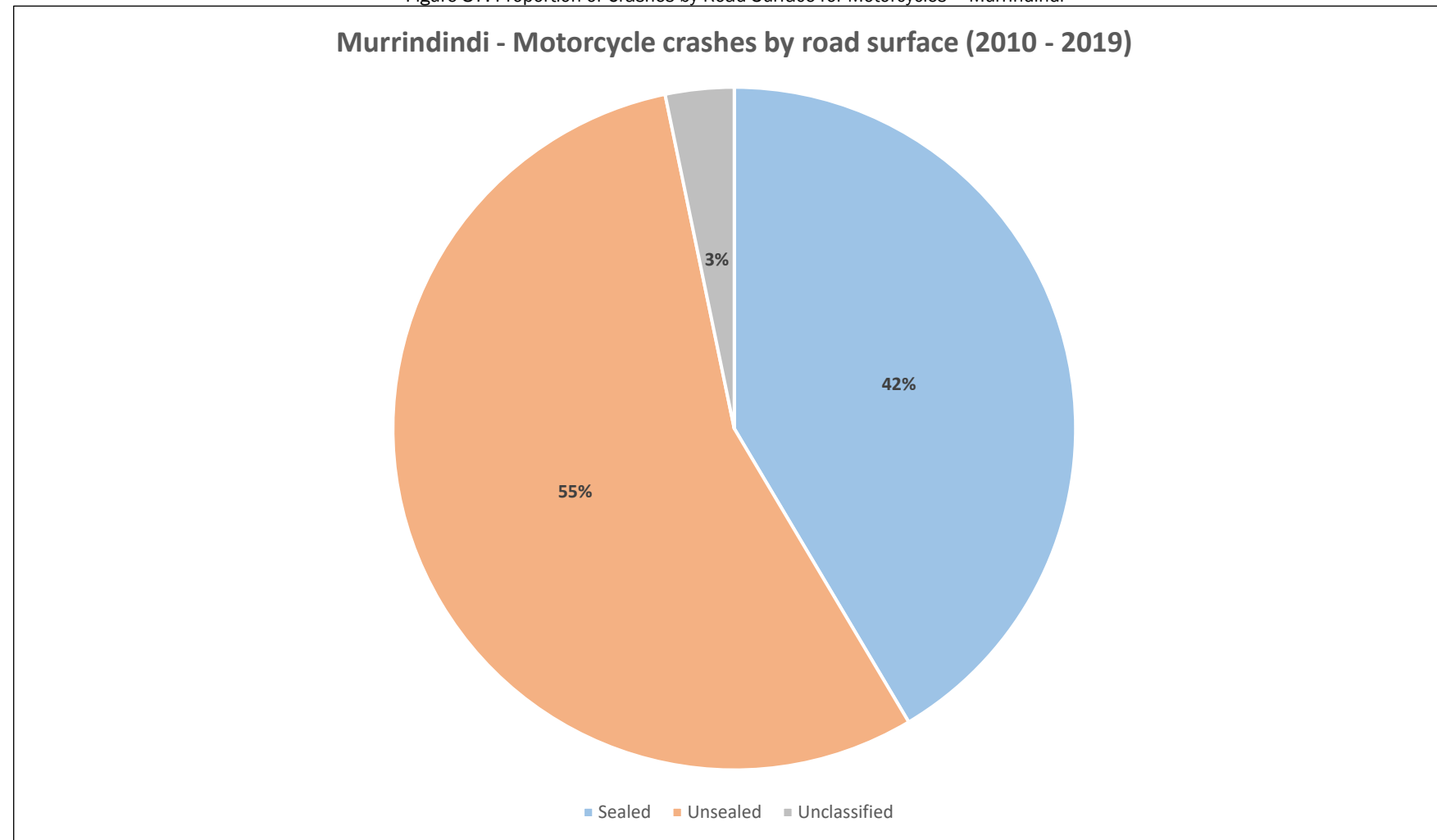
Figure 86: Annual Crashes by Road Surface – Strathbogie



- There are more crashes on sealed roads as compared to unsealed roads for all 10 years analysed.
- There was a spike in crashes in 2012, and the increase is largely attributed to sealed road crashes.
- Both sealed road and unsealed road crashes were generally decreasing from 2015 to 2019. This indicates that any improvements to road safety in this period appear to benefit both types of roads in the shire.

9.5 Proportion of Crashes by Road Surface for Motorcycles – Murrindindi

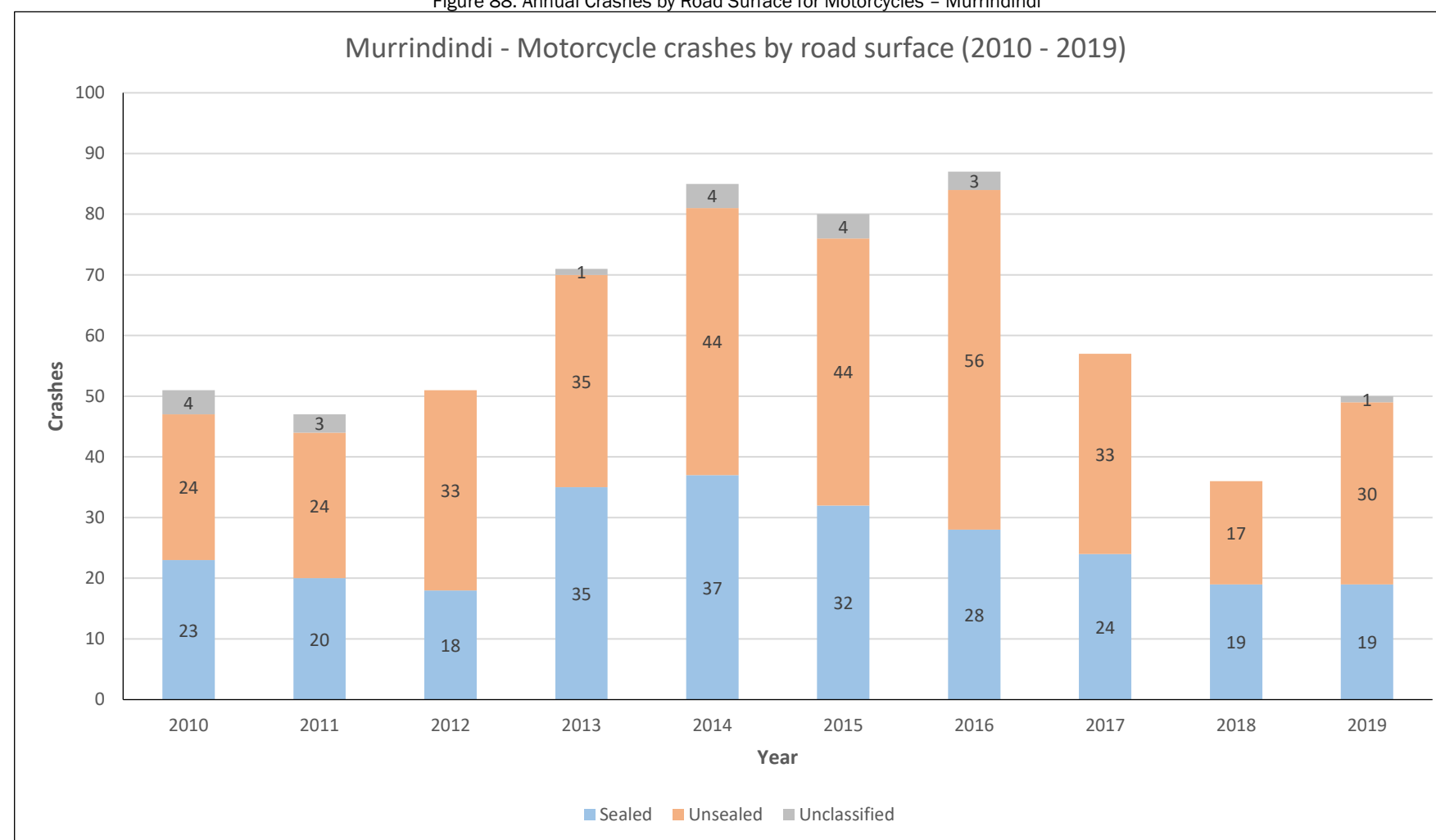
Figure 87: Proportion of Crashes by Road Surface for Motorcycles – Murrindindi



- Over half of motorcycle crashes in Murrindindi occurred on unsealed roads. This indicates that there is a crash trend on motorcycle routes for unsealed roads and is a significant reason as to why the proportion of crashes on unsealed roads within Murrindindi is significantly higher than other shires.

9.6 Annual Crashes by Road Surface for Motorcycles – Murrindindi

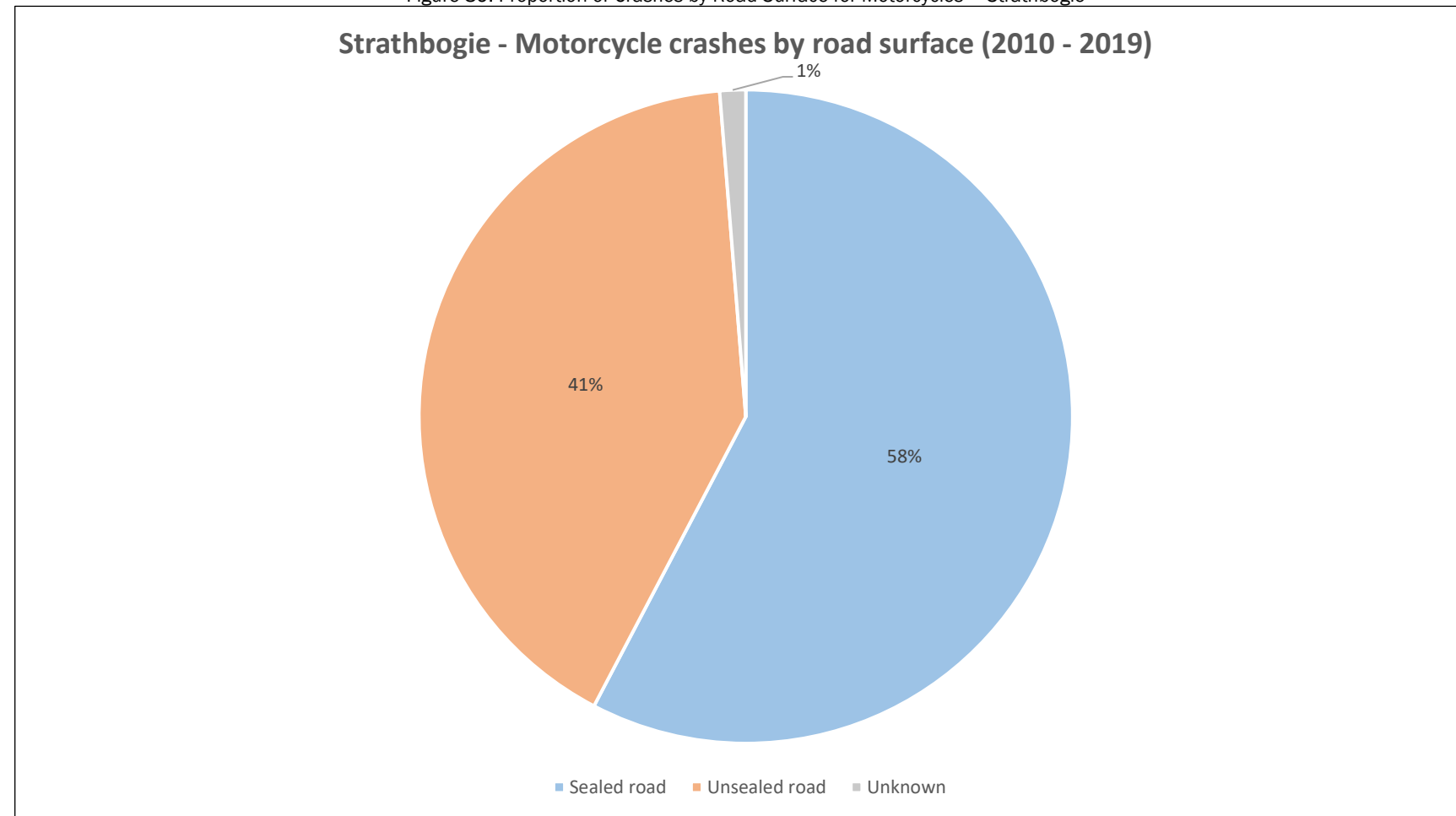
Figure 88: Annual Crashes by Road Surface for Motorcycles – Murrindindi



- For motorcycle crashes, there are higher number of crashes on unsealed roads than sealed roads in Murrindindi for all 10 years analysed.
- The number of motorcycle crashes on both sealed and unsealed roads generally increased every year from 2011 to 2014.
- In 2016, the number of crashes peaked on unsealed roads with 56 motorcycle crashes.
- There was a significant decrease in number of motorcycle crashes in 2018 for both sealed and unsealed roads.

9.7 Proportion of Crashes by Road Surface for Motorcycles – Strathbogie

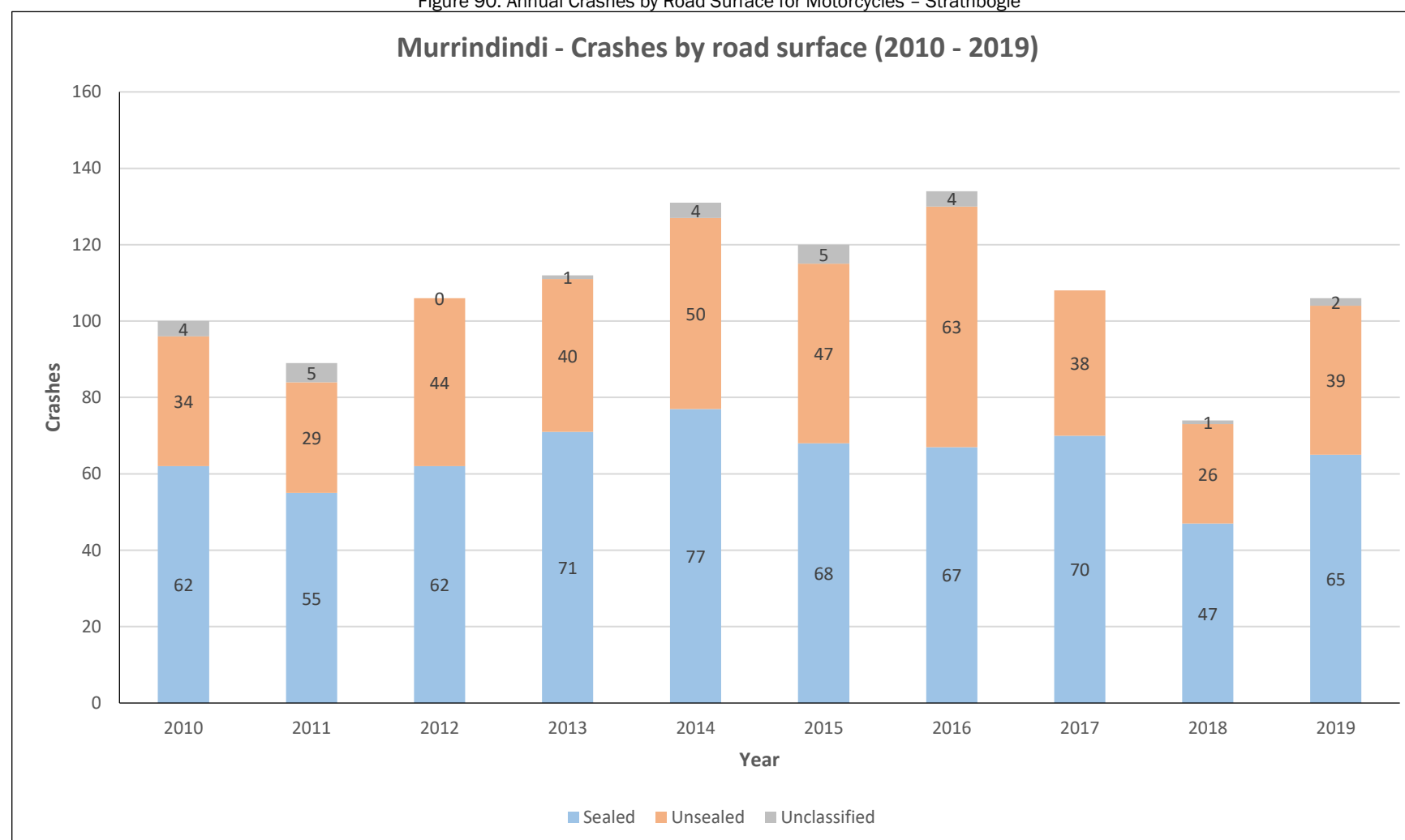
Figure 89: Proportion of Crashes by Road Surface for Motorcycles – Strathbogie



- About two in five motorcycle crashes in Strathbogie occurred on unsealed road surfaces, with a higher proportion of motorcycle crashes in Strathbogie occurring on sealed roads.
- This is in contrast with Murrindindi, where the majority of motorcycle crashes occurred on unsealed roads.

9.8 Yearly Crashes by Road Surface for Motorcycles – Strathbogie

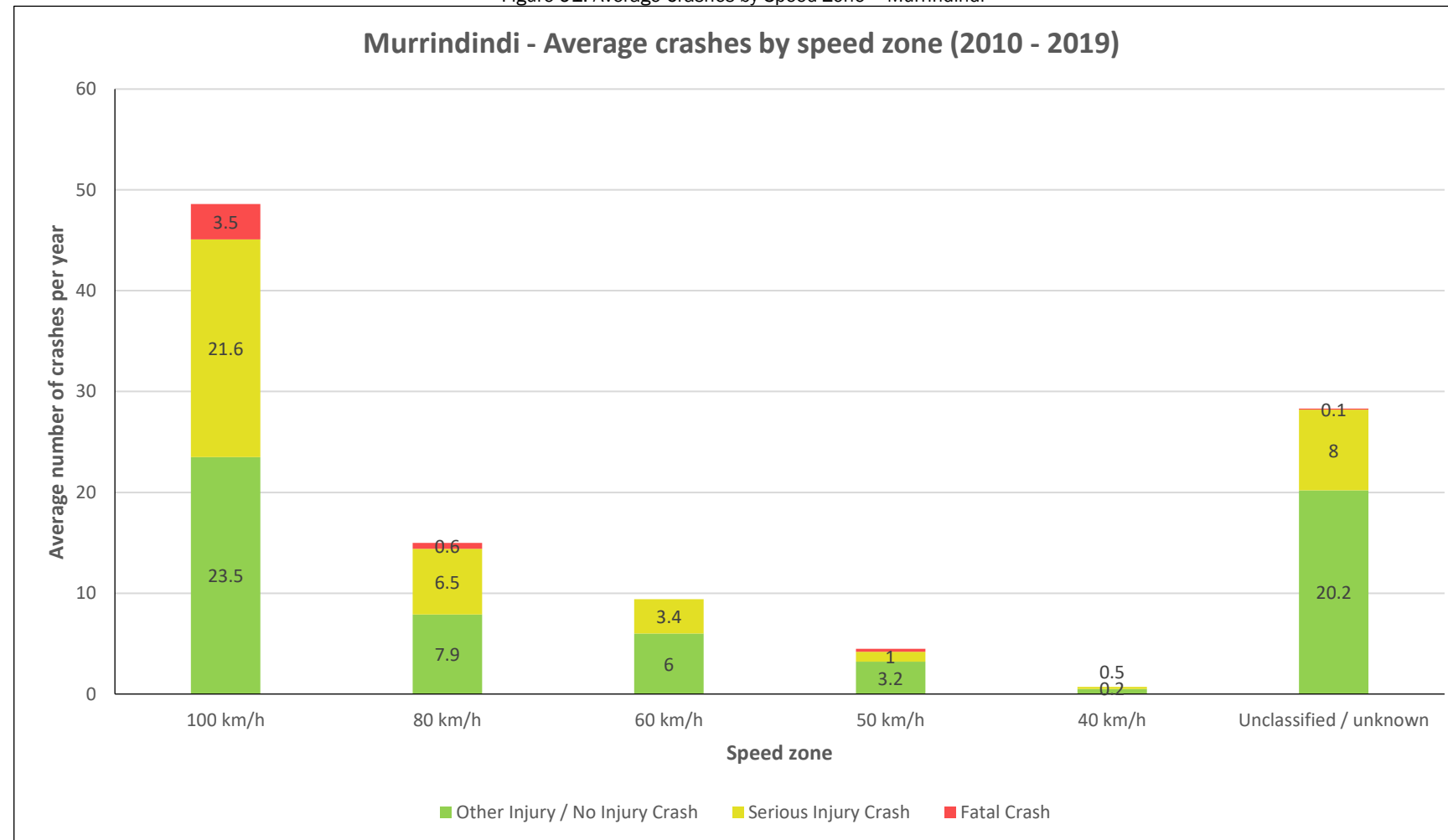
Figure 90: Annual Crashes by Road Surface for Motorcycles – Strathbogie



- For motorcycle crashes, there are higher number of crashes on sealed roads than unsealed roads in Strathbogie for all 10 years analysed.
- The number of motorcycle crashes on both sealed and unsealed roads generally increased every year from 2011 to 2014.
- In 2016, the number of crashes peaked on unsealed roads with 63 motorcycle crashes.
- There was a significant decrease in number of motorcycle crashes in 2018 for both sealed and unsealed roads.

9.9 Average Crashes by Speed Zone – Murrindindi

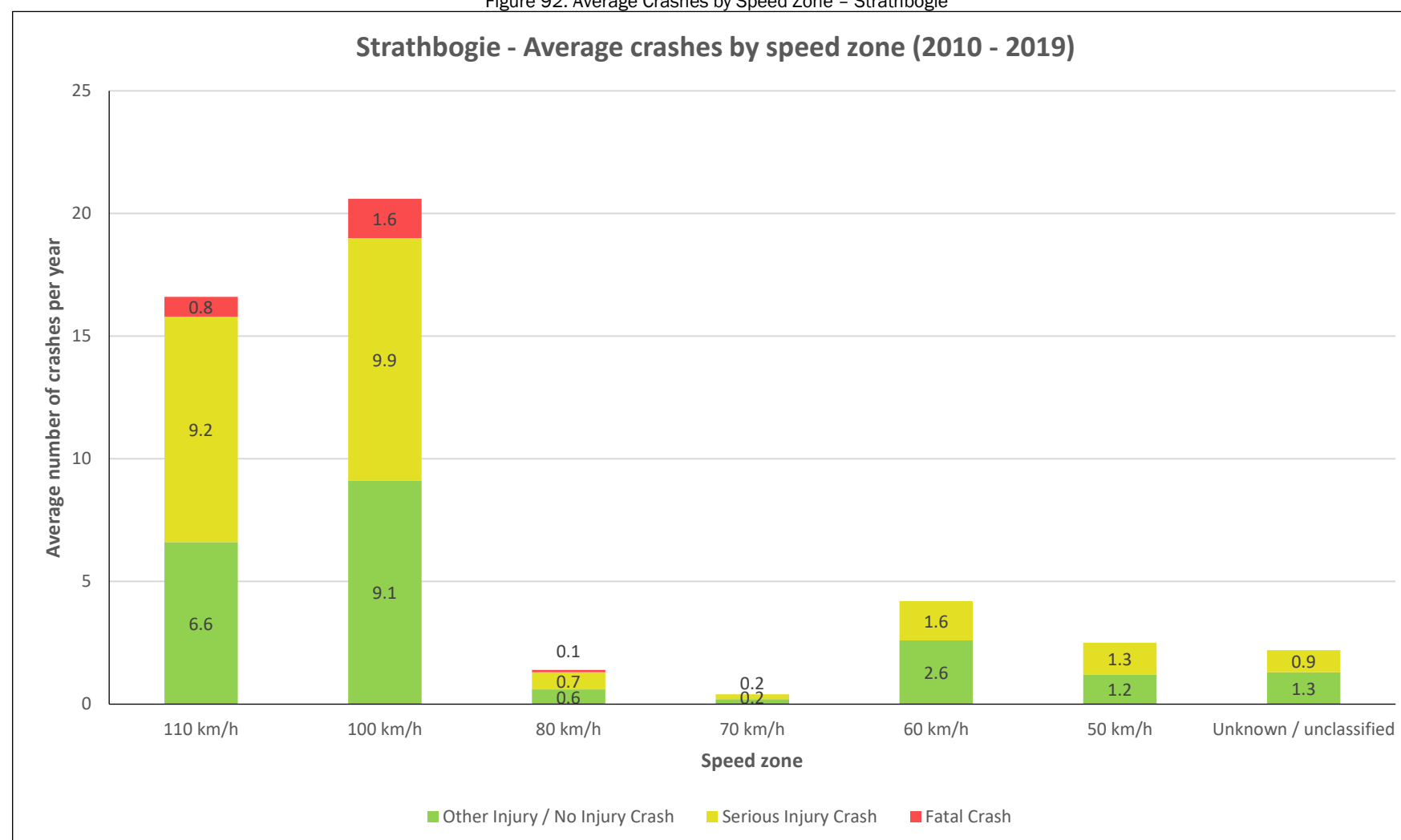
Figure 91: Average Crashes by Speed Zone – Murrindindi



- Majority of crashes in Murrindindi occurred on roads with speed limits of 100 km/h.
- In addition, majority of fatalities and serious injury crashes also occurred on roads with speed limits of 100 km/h in Murrindindi.
- The number and severity of crashes reduce at lower speed roads.

9.10 Average Crashes by Speed Zone – Strathbogie

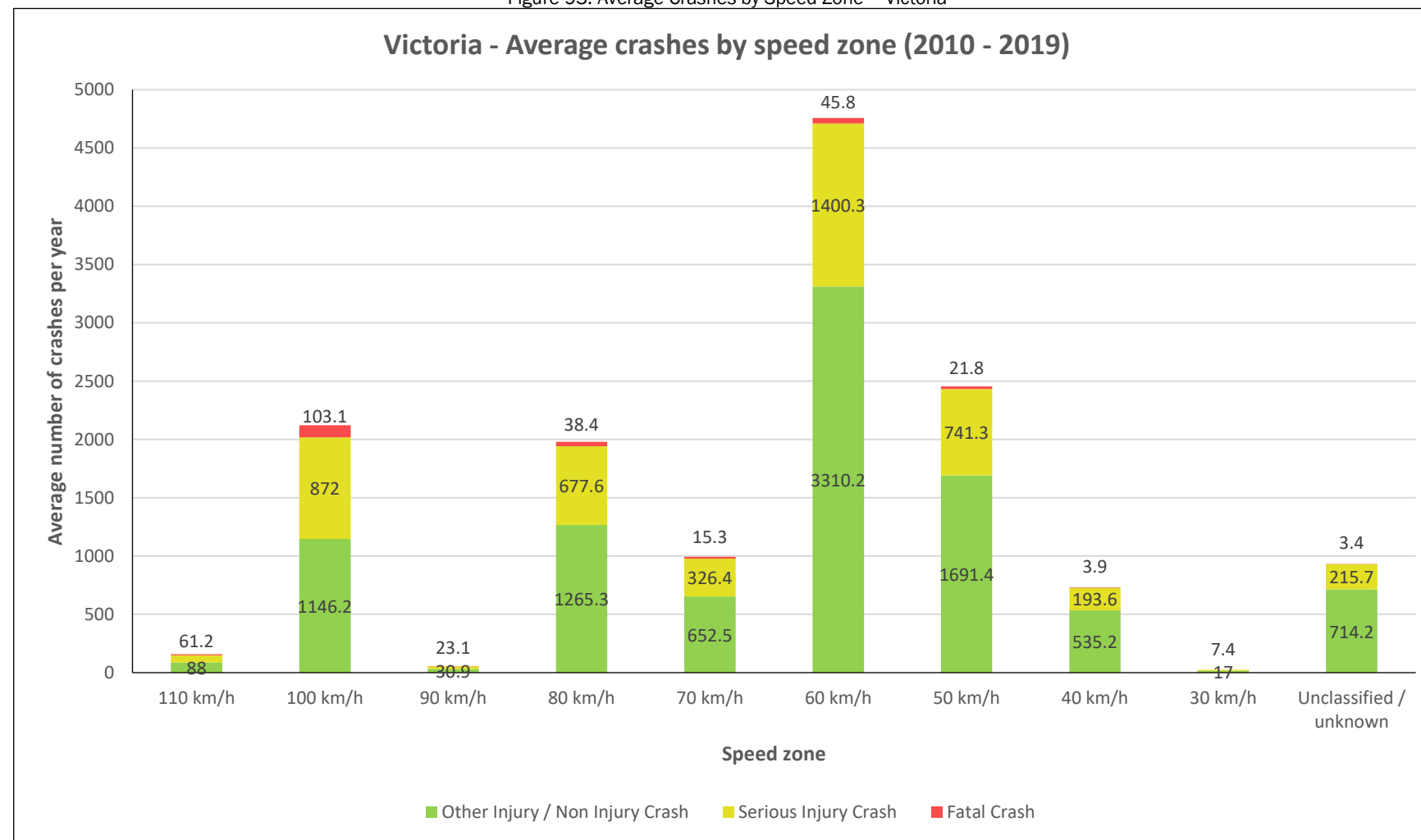
Figure 92: Average Crashes by Speed Zone – Strathbogie



- As per Murrindindi, most crashes in Strathbogie occurred on roads with speed limits of 100 km/h and 110 km/h.
- In addition, majority of fatalities and serious injury crashes also occurred on roads with speed limits of 100 km/h and 110 km/h in Strathbogie.

9.11 Average Crashes by Speed Zone – Victoria

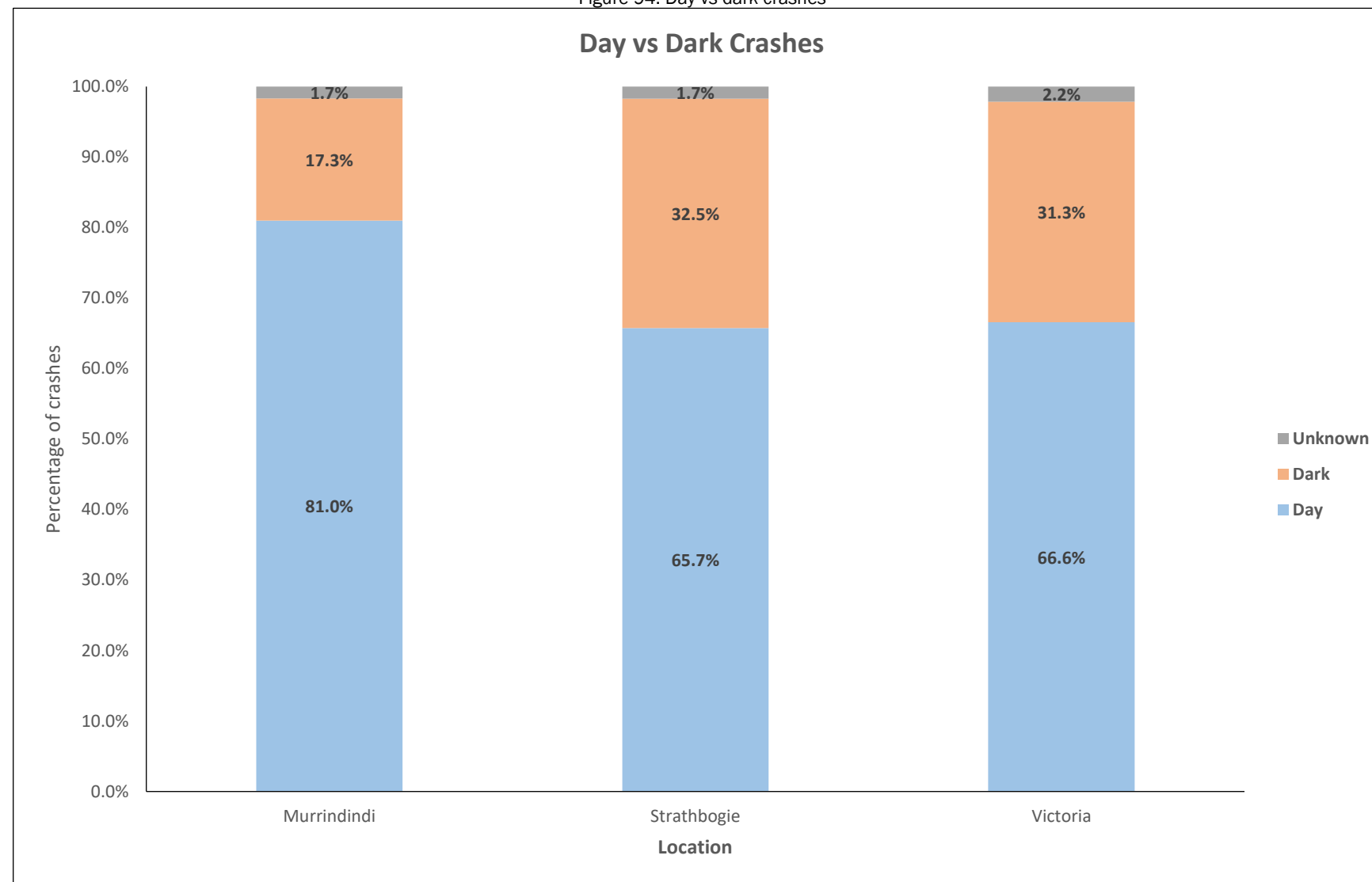
Figure 93: Average Crashes by Speed Zone – Victoria



- Unlike Murrindindi and Strathbogie, majority of crashes within Victoria occurred on speed zones of 50 km/h and 60 km/h, particularly in Metropolitan Melbourne.
- However, majority of fatality crashes within Victoria occurred on speed zones of 100 km/h and 110 km/h, which is also seen within Murrindindi and Strathbogie.

9.12 Day vs dark crashes

Figure 94: Day vs dark crashes

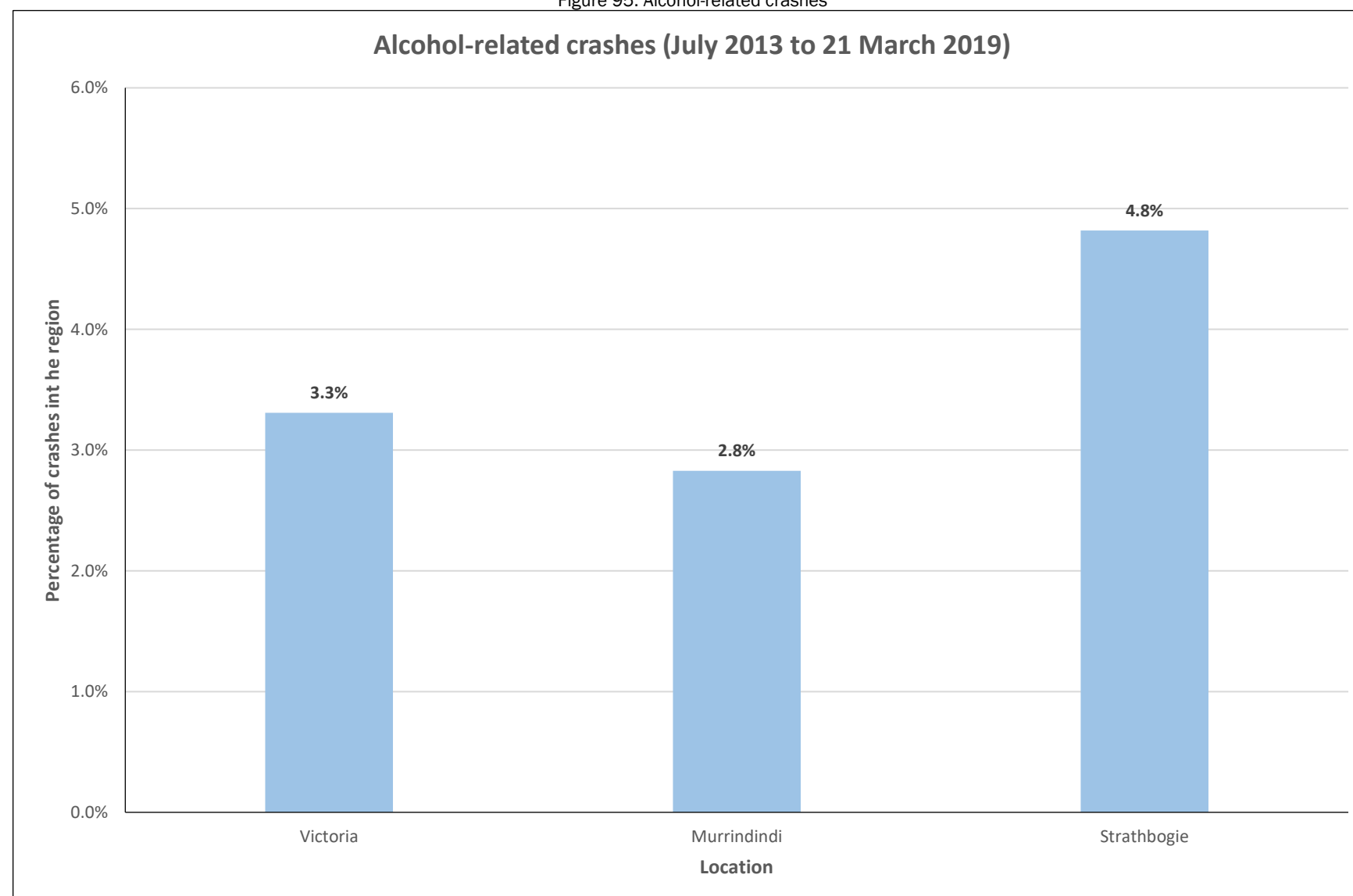


- The distribution of day vs dark crashes is similar within Strathbogie and Victoria. However, there is a much smaller percentage of dark crashes in Murrindindi. This may be skewed by the large number of crashes during daytime hours.

10 CRASHES BY CAUSE

10.1 Alcohol related crashes

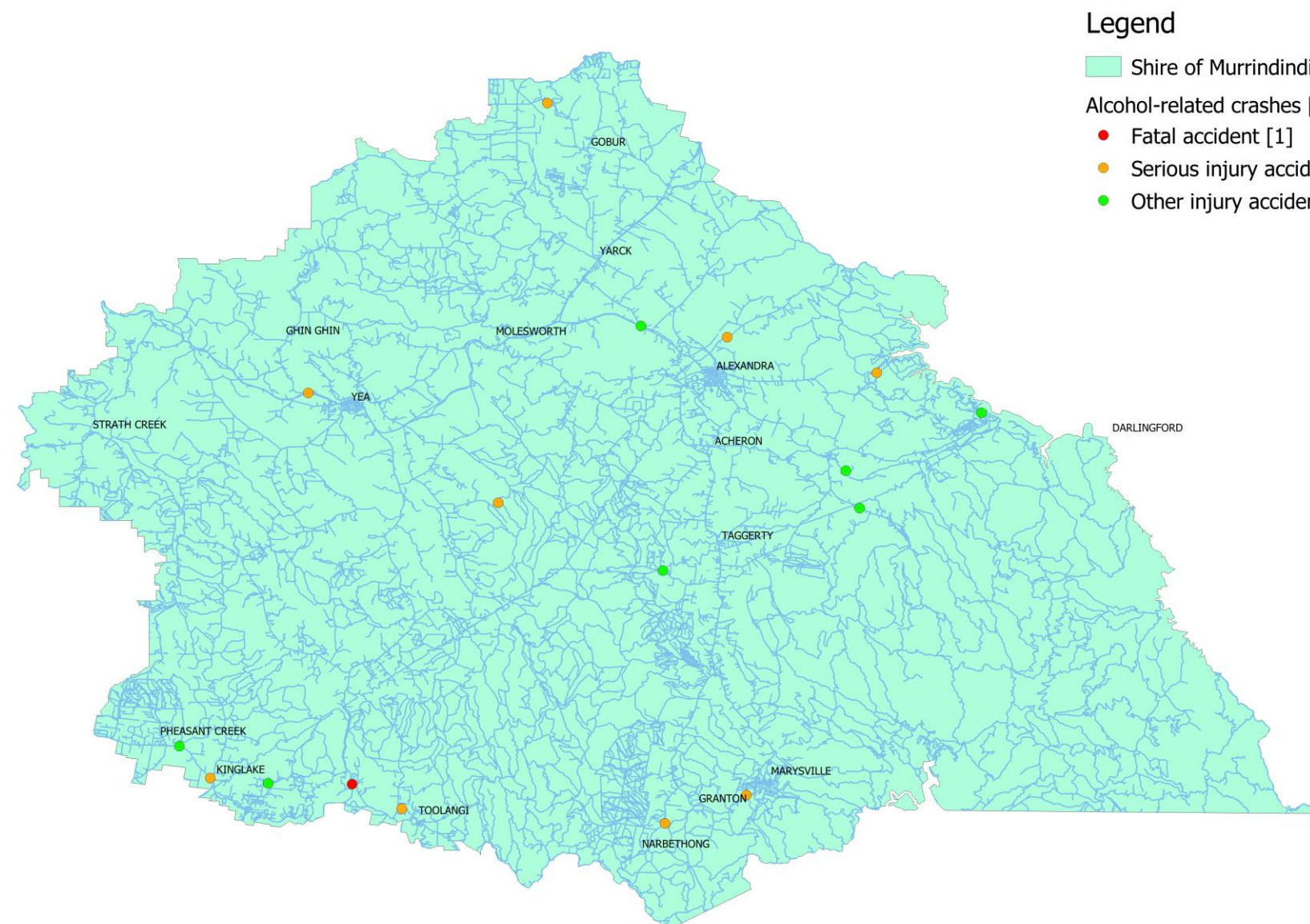
Figure 95: Alcohol-related crashes



- Approximately one in thirty crashes in Victoria is attributed to alcohol consumption. This figure is lower within Murrindindi but accounts for about one in twenty crashes in Strathbogie.

10.2 Map of alcohol related crashes - Murrindindi

Figure 96: Alcohol-related crashes - Murrindindi

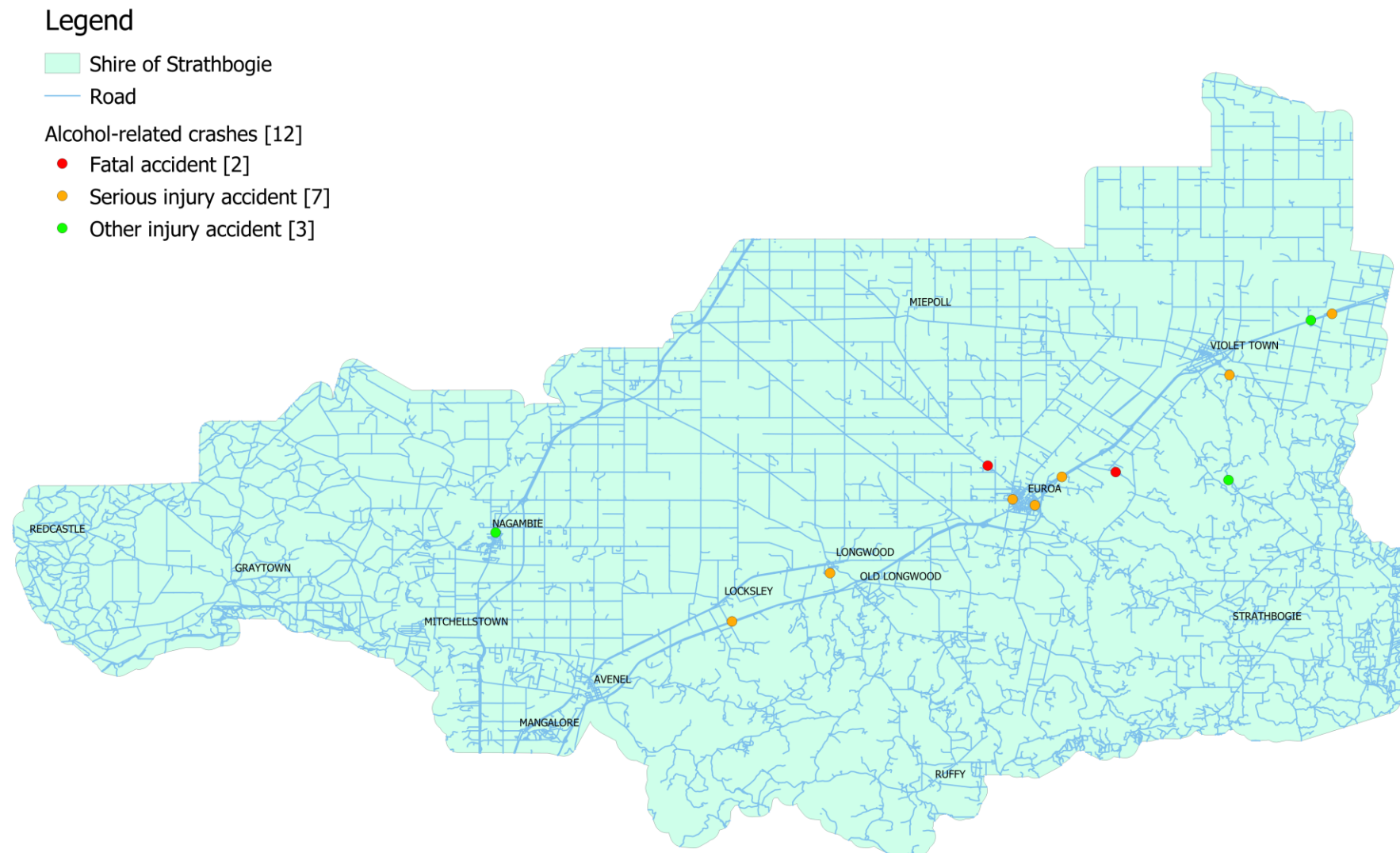


- The location of most crashes that were attributed from alcohol consumption appear to have occurred within a few kilometers of townships. All crashes occurred in separate locations.
- Nine crashes occurred on arterial roads while the remaining eight were on local roads. 14 out of the 17 crashes were on roads with an 80 – 100 km/h speed limit (remaining crashes were two on 60 km/h roads and one unknown).
- The high-speed zones suggests that alcohol-related crashes are more common in high-speed environments within the shire. However, many roads in the locality already have a high speed limit. The result may be an indicator of the proportion of speed zones within roads rather than a direct contributor to it.
- Almost all crashes appear to occur at or near curves. Detailed analysis of the crashes indicates that there were four head on crashes (including the fatal crash). The remainder resulted from running off road and colliding into roadside hazards.

Note: Data for alcohol related crashes are only provided within the dates of 1 July 2013 and 21 March 2019 (approximately five years and 10 months).

10.3 Map of alcohol related crashes – Strathbogie

Figure 97: Alcohol-related crashes – Strathbogie

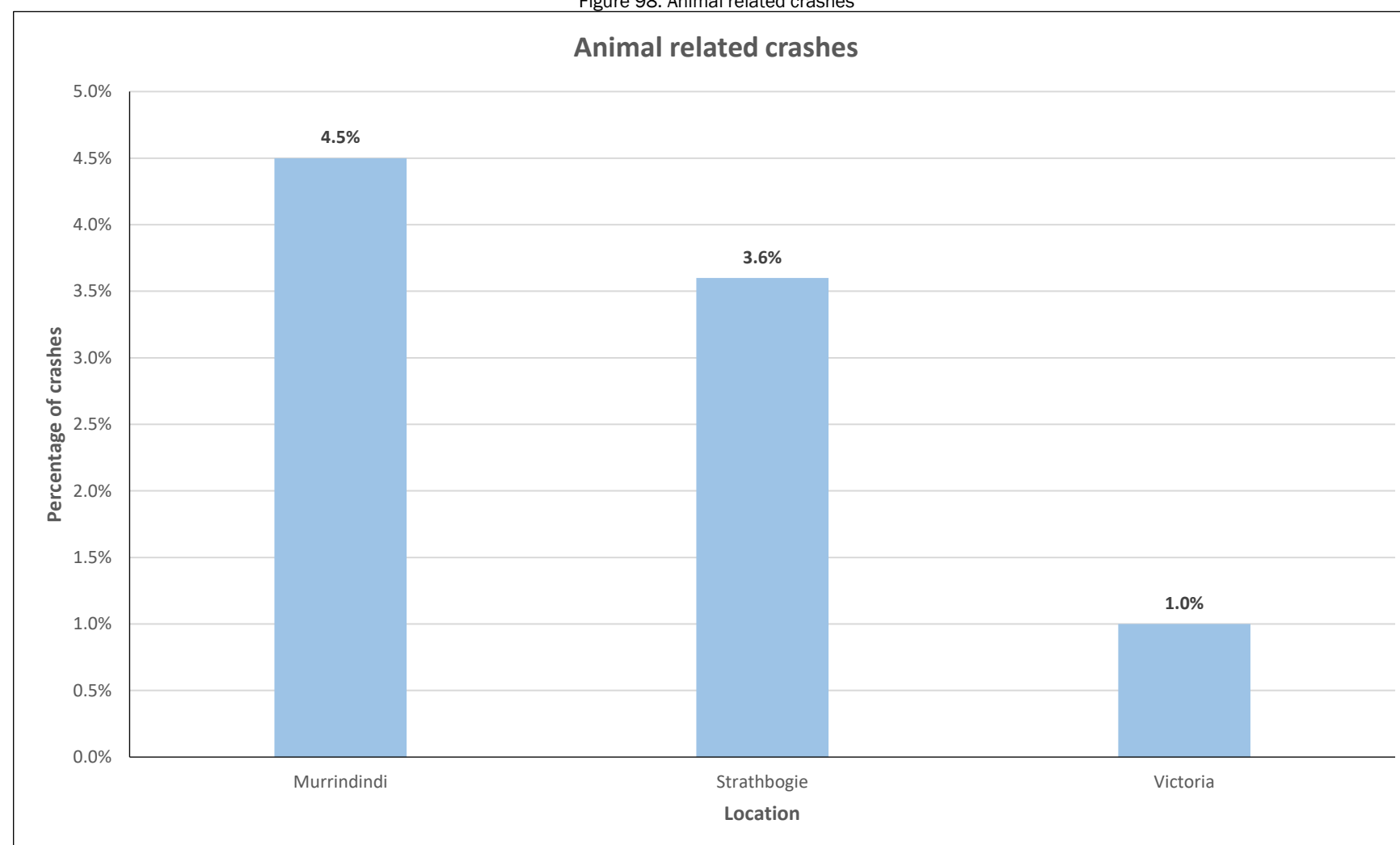


- As per Murrindindi, many alcohol-related crashes occurred in high-speed environments (nine out of the 12 crashes occurred where the speed zone was 80 km/h or higher). This includes both local and arterial roads.
- Eight crashes occurred within several kilometres of townships.
- There appears to be a cluster of alcohol related crashes near the town of Euroa. Two serious injury crashes occurred within the town. In addition, another serious injury as well one fatal crash occurred within three kilometres from Euroa.
- Detailed analysis of the crashes indicates eight crashes where vehicles collided into a fixed object (including one fatal), two others where the driver lost control resulting in the vehicle overturning (including one fatal), another where a pedestrian was struck and the one where the vehicle collided into an animal.

Note: Data for alcohol related crashes are only provided within the dates of 1 July 2013 and 21 March 2019 (approximately five years and 10 months).

10.4 Proportion of animal related crashes

Figure 98: Animal related crashes

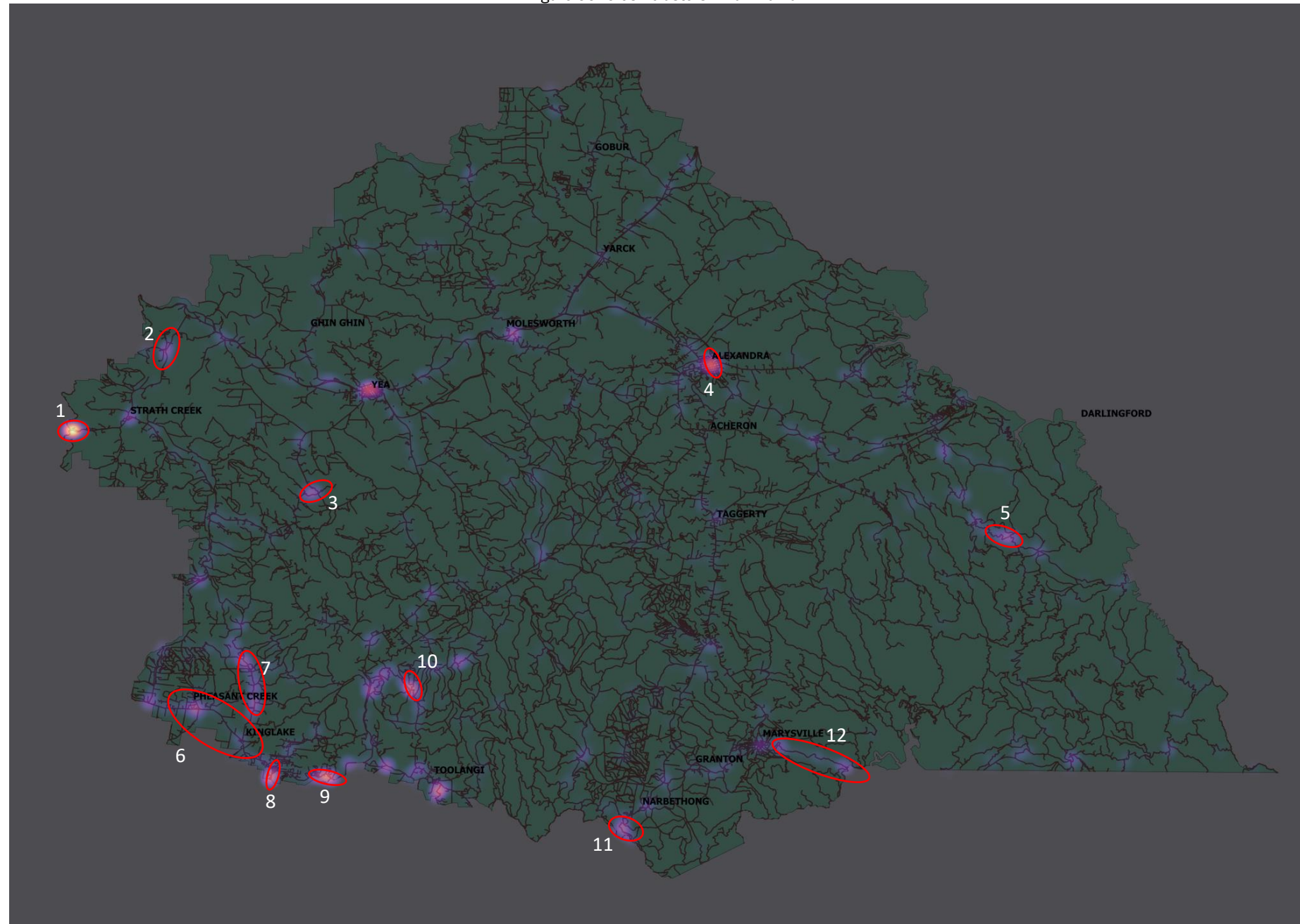


- Crashes in the two shires observed are about four times more likely to be a result of striking an animal compared to the average in Victoria.
- Roads located in mountainous or high-altitude regions in Murrindindi may bring road users close to areas where fauna is prevalent. Hilly or windy sections of road with vegetation may present sight distance issues. Drivers may not be noticing animals on the road.
- Animal-related crashes represent a smaller percentage of crashes in Strathbogie compared to Murrindindi. However, it is still much higher than the Victorian average. This may be typical of rural shires due to the increased likelihood of roads situated in the proximity of areas with wildlife.

11 CRASH CLUSTERS

11.1 Crash clusters in Murrindindi

Figure 99: Crash clusters - Murrindindi

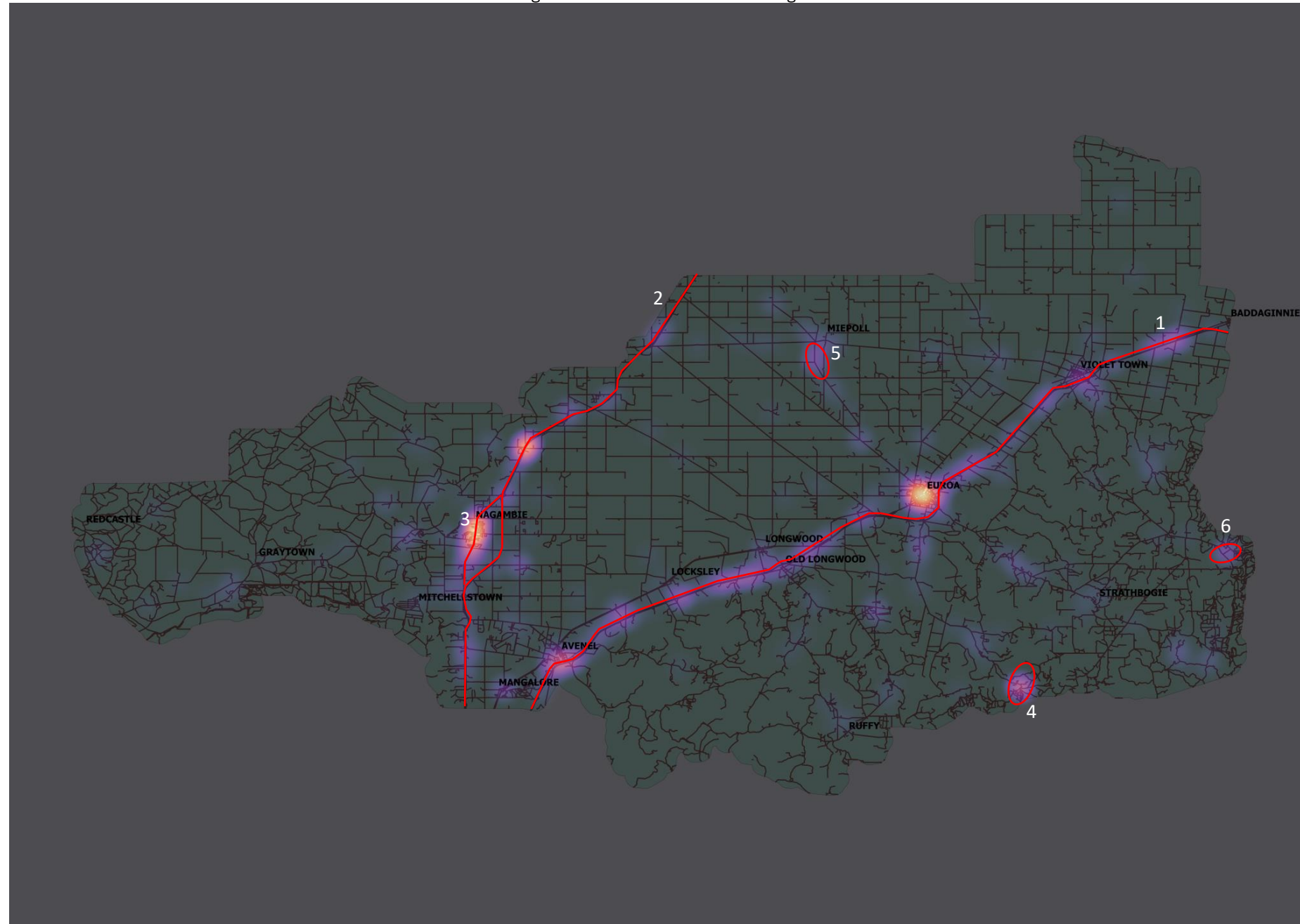


There are numerous locations within the shire of Murrindindi with a high density of crashes. The following identified locations are notable crash clusters with a generally high number of crashes per kilometre relative to the shire:

- (1) 30 crashes on a length of Broadford-Flowerdale Road from the intersection with Horans Track to 1.8 km west of the location.
- (2) 11 crashes on a 2.1 km length of King Parrot Creek Road from 40 m north of the intersection with Fairview Road to 2.0 km south of Fairview Road.
- (3) 11 crashes on a 1.8 km length of Whittlesea-Yea Road from 0.5 km northeast of the intersection with Barina Heights to 2.3 km northeast of the intersection.
- (4) 11 crashes on a 1.2 km length of Aitken Street / Grant Street between Green Street and Thom Street.
- (5) 26 crashes on a 9.6 km length of Eildon-Jaimeson Road between Fifteen Mile Road and 400 m northwest of Barnewall Plains Road.
- (6) 28 crashes on a 10.5 km section of Whittlesea-Kinglake Road between Macs Road and Parkside Road.
- (7) 28 crashes over a 6.1 km length on Extons Road / Mt Robertson Road between Arthurs Road and Powers Road.
- (8) 14 crashes within a span of 900 m on Heidelberg-Kinglake Road between Mt Jerusalem Road and Healesville-Kinglake Road.
- (9) 25 crashes on Healesville-Kinglake Road a 2.6 km length of road between Edward Staff Drive and east of Gordons Bridge Road.
- (10) 14 crashes on a 1.4 km section of Marginal Road / Spraggs Road from 500 m north of Gutter Creek Road to 600 m southeast of Eagle Nest Road.
- (11) 17 crashes over a 3.4 km length of Maroondah Highway from 250 m west of Manby Road to the municipality border.
- (12) 25 crashes over an 8.9 km section of Marysville-Woods Point Road from Tommys Bend Road to Kerami Crescent.

11.2 Crash clusters in Strathbogie

Figure 100: Crash clusters – Strathbogie



Many crashes in Strathbogie appear to be distributed along several major arterial roads. The location of crashes on local roads are more scattered in nature with few notable clusters. The following locations feature a high crash density relative to the shire:

- (1, 2, 3) There were 124 crashes on the Hume Freeway (1), 46 along Goulburn Valley Freeway (2) and 34 on Odwyer Road / High Street / Grimwade Road (3). 44 % of crashes in Strathbogie from 2010 – 2019 occurred on these roads.
- (4) Eight crashes spaced along 100 m of a windy section of Euroa-Mansfield Road just west of Ridge Road in Gooram.
- (5) Eight crashes within a 4.5 km length of Euroa-Shepparton Road between Murchison-Violet Town Road and 1.8 km southeast of Carters Road.
- (6) Five crashes on Gardiners Road in Boho South. This road is only approximately 0.8 km in length.

11.3 Survey results

Survey conducted with Victoria Police resulted in one response with the following inputs:

- Hot spot areas or road lengths for crashes for the following road users:
 - Motorcycle crashes:
 - Eildon-Jamieson Road
 - Merton-Euroa Road
 - Marysville-Woods Point Road
 - Pedestrian crashes:
 - Alexandra shopping precinct
 - Heavy vehicle crashes:
 - Maroondah Highway, between Yarck to Maindample
 - Bicycle crashes
 - Maroondah Highway, between Yarck to Maindample
- Top three road safety issues that contributes to majority of crashes:
 - Drug driving
 - Speeding
 - Tourists that are unfamiliar with the area or the road rules
- Attributes to the high fatality rates within the two shires compared to other regional areas:
 - High speed rural roads
 - Location and winding roads attract recreational on-road and off-road motorcycling.

12 KEY FINDINGS

The key findings determined from the crash statistics analysis of Murrindindi and Strathbogie Shires are given below.

Both Shires

- Fatality rate per 10,000 residents is 3.5 for Murrindindi and 2.6 for Strathbogie compared to 0.4 in Victoria. However, this does not take tourists into account
- Most crashes occur in rural areas rather than townships
- About 80 % of crashes in the two shires occurred midblock while this figure is about 50 % on average for Victoria
- Out of all days of the week, Sunday recorded the greatest number of crashes for the two shires as opposed to Victoria which recorded the least number of crashes on that day
- There is a high proportion of DCA 170 - 189 off path crashes for both shires (68.8 % for Murrindindi and 66.8 % for Strathbogie compared to 24.8 % for Victoria)
- Most crashes in the two shires occurred in 100 km/h speed zones or above. This trend is different to Victoria where the most common speed zone where a crash occurred is 60 km/h.

Murrindindi Shire

- Despite being classified as a small shire, Murrindindi has more crashes than 15 out of the 19 large rural shires. It also has the second highest number of fatalities for all rural shires, behind East Gippsland
- Proportion of FSI crashes is average when compared to other rural shires
- Number of crashes in Murrindindi decreased by 44 % from 2016 to 2018. However, there was a 42 % increase in crashes in 2019 compared to 2018
- 54 % of crashes occurred on local roads. 38 % of crashes occurred on unsealed roads
- 62 % of crashes occurred between 10 AM to 4 PM. This differs from Victoria where crashes are distributed more evenly in the early morning and late afternoon periods. This indicates that crashes as a result of recreational travel is more prevalent in Murrindindi
- 56 % of crashes in Murrindindi occurred on the weekend (with 32 % on Sunday). In Victoria, only 26 % of crashes occurred on the weekend. This is another indicator of a high proportion of crashes resulting from recreational travel within Murrindindi
- 56 % of crashes in Murrindindi involved motorcyclists. Out of all motorcyclist crashes, 70 % occurred on local roads. 55 % of motorcycle crashes were on unsealed roads
- There were 43 % fewer motorcycle crashes in the three-year period from 2017 to 2019 as compared to 2014 to 2016. However, there were 50 motorcycle crashes in 2019 as opposed to 36 in 2018
- The majority (72 %) of persons involved in crashes reside outside the shire. They appear to be largely from Metropolitan Melbourne. This indicates a large proportion of crashes involved tourists in the region
- 46 % of road users involved in crashes that lived outside the shire were motorcyclists. Overall, the above results indicates that recreational motorcyclists may be a major contributor to the high crash numbers in Murrindindi.

Strathbogie Shire

- Crashes in Strathbogie tend to be more severe in nature, with 55 % of crashes being Fatal or Serious Injury (FSI) crashes. This is the second highest figure for all rural shires and interface councils behind West Wimmera. Speed may be a contributing factor to this high figure given the large number of crashes in high-speed zones
- 64 % of crashes occurred on arterial roads. It appears to be largely contributed by crashes along Goulburn Valley Freeway, Hume Freeway and High Street in Nagambie
- The number of crashes in Strathbogie decreased every year from 2015 (55) to 2019 (39)
- 17 % of crashes in Strathbogie involve motorcyclists while 79 % of crashes involved light vehicles (e.g. cars, vans) or heavy vehicles
- There appears to be more motorcycle crashes on local roads, notably Gardiners Road (northeast of Strathbogie township), Gerars Track and Dry Creek Road (both southeast of Strathbogie township)
- 16 % of crashes occurred on unsealed roads in Strathbogie as opposed to 38 % in Murrindindi
- Out of all motorcycle crashes, 41 % were on unsealed roads
- 65 % of persons involved in crashes resided outside the shire, including Metropolitan Melbourne, Greater Shepparton and surrounding rural shires
- 11 % of road users involved in crashes that resided outside the shire were motorcyclists while 55 % were drivers
- The above result indicates that light vehicle run-off road crashes on major arterial roads are a major contributing factor to crash numbers in Strathbogie, with many drivers being tourists. Contributing factors may include speed, driver fatigue and unprotected roadside hazards.

13 RECOMMENDATIONS

The following recommendations to address road safety issues for both shires are listed below.

Murrindindi Shire

- Sealing of road surfaces on high-speed unsealed roads may be investigated, particularly on popular motorcyclist routes
- Consider providing information packages and educating tourists / road users who are unfamiliar with the roads with locations of high-risk areas and road lengths within Murrindindi. Particularly to motorcyclists as the winding roads attract recreational on-road and off-road motorcycling
- Consultation with motorcyclist groups is recommended to determine popular on-road and off-road motorcyclist routes and inform motorists of high-risk areas. Treatments should be investigated to address any road safety gaps while being supported by motorcycle groups
- Additional warning signs and safety treatments on high-risk areas identified in the crash cluster maps may be implemented
- Increased police presence and speed enforcement on peak times and on the weekends. Focus areas may include identified crash clusters
- Additional rest areas or facilities may be provided to reduce driver fatigue
- Safety treatments may be considered for windy road lengths within Murrindindi. This may include increased delineation, shielding or removing roadside hazards where practicable
- While the data indicates distinct crash trends for the shire, overall crash numbers are extremely high (more than double of most other small rural shires). Thus, figures that appear to be more insignificant (e.g. 15 % of crashes in Murrindindi are at intersections vs 50 % on average in Victoria) should also be investigated further and addressed. The local terrain in the shire (e.g. varied elevation and many windy roads) may have contributed to many crashes. Additionally, Murrindindi may carry more traffic volumes than other small rural shires than average, contributing to more crashes.

Strathbogie Shire

- Treatments should be considered along Goulburn Valley Freeway, Hume Freeway, Odwyer Road, Grimwade Road, Euroa-Shepparton Road and High Street in Nagambie to reduce the risk of run off-road crashes. This may include continuous audio-tactile linemarking, shielding roadside hazards and increased guideposts where they have not been installed.
- Treating run-off road crashes and re-evaluation of speed limits and speed limit signs for High Street in Nagambie township may be considered to reduce the risk and severity of crashes. Crashes are scattered along this section of road in the township and are generally not specific to one location
- Consider investigating if adequate rest areas are provided along major arterial roads to mitigate driver fatigue
- Increased police presence and speed enforcement on the abovementioned arterial roads may help to reduce dangerous driving behaviour, particularly on weekends
- Safety treatments may be considered for the windy section of Euroa-Mansfield Road just west of Ridge Road in Gooram to treat run-off road crashes. This may include increased delineation, shielding or removing roadside hazards where practicable

- A general re-evaluation of speed limits on arterial roads for both shires may be considered to reduce speeds where practicable. The proportion of FSI crashes in Strathbogie are especially high with 78 % of crashes having occurred in 100 – 110 km/h speed zones.

