# Arthurs Seat Road – Black Spot project
## Information summary
## September 2024

MORNINGTON PENINSULA Shire

## Introduction

This document provides an overview of the context, background, funding process and treatments for the Arthurs Seat Road Black Spot project.

The Black Spot project applies to the section of Arthurs Seat Road between Whitehill Road and Shoreham Road/ Red Hill Road.

**Mornington Peninsula Towards Zero 2020-2025 Road Safety Strategy**

The Mornington Peninsula has a long history of high rates of road trauma. Tragically, the Mornington Peninsula is among the worst in terms of road deaths and serious injuries of Victoria's 79 municipalities. We've had 75 deaths, and over 1500 people have been seriously injured in the past decade which have devastating and often lifelong impacts to victims and their families.

All road users expect a high level of road safety. Our community has consistently highlighted road safety as a significant concern.

Being a large geographic area with 1364 kilometres of sealed and 336 kilometres of unsealed Shire-managed roads, and 289 kilometres of State-managed roads within the Mornington Peninsula, addressing road trauma is challenging.

Nevertheless, we're determined to eliminate severe road trauma, as demonstrated by the Shire formally committing to becoming Victoria's first 'Towards Zero' municipality in 2016 and adoption of our Mornington Peninsula Towards Zero 2020-2025 Road Safety Strategy.

The strategy is founded on the principle that human error is inevitable, but no one should be killed or seriously injured on our roads, recognising that human life and health are paramount. The ultimate vision is for all journeys to be safe for all road users by 2050, achieving zero deaths and serious injuries.

**Safe System philosophy**

All road managers, including councils, have a responsibility to manage safety on their road network. The main purpose of roads is to provide a corridor for the safe movement of people and goods. Safety of road users must be the highest priority when managing roads.

Mornington Peninsula Shire's road safety strategy is underpinned by the international best-practice Safe System approach to road safety which consists of four pillars:

- Safer Roads – upgrade of roads, intersections and roadsides.
- Safer Speeds – management of vehicle speeds to be within safe limits.
- Safer Road Users – education and enforcement of drivers and other road users.
- Safer Vehicles – improvement of vehicle safety and motorists driving the safest vehicle they can afford.

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**Figure 1:** Safe System approach to road safety

The Safe System approach is based on reducing the likelihood of crashes occurring, but it also recognises that people make mistakes so that if/ when crashes occur, they should not result in death or serious injury which means that reducing severity is also important.

Minimising the probability that road users will be killed or seriously injured in a collision relies on understanding human tolerance to different crash types. When considering road safety and treatments, the below vehicle speed thresholds (refer to Figure 2 below) for different crash types are taken into account, with the aim being to limit collisions to these speeds so that death or serious injury are unlikely. The speeds in Figure 2 have a probability of death of around 10% for each collision, with the risk of death or serious injury increasing sharply above these speeds.

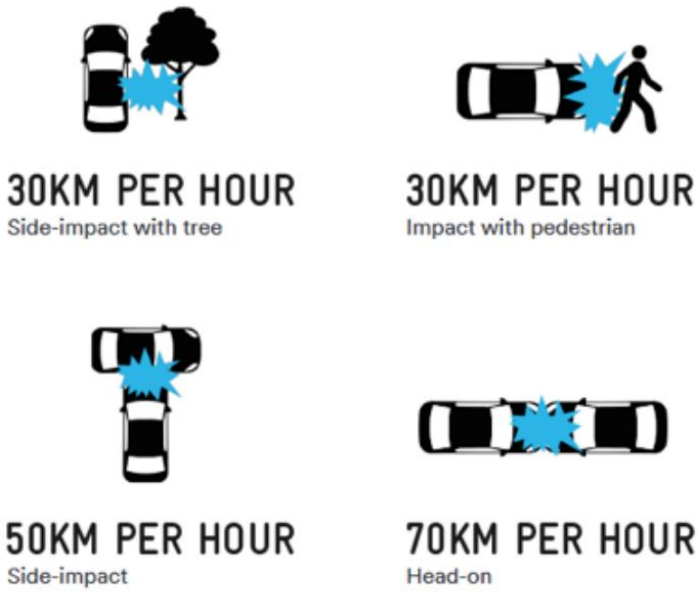


**Figure 2:** The speed at which the probability of survival is 90% for different collision types (source: Victorian Transport Accident Commission)

Of particular relevance to Arthurs Seat Road is the 30 km/h threshold for a vehicle side-impact with a tree or similar hazard. Given the high number of rigid hazards close to the road such as trees and power poles, and the 60 km/h speed limit, protecting errant vehicles from these hazards is important. This is further discussed in later sections of this document.

It is noted that the threshold speeds for collisions between two vehicles (ie. side-impact and head-on) are much less when one vehicle is significantly heavier than the other. This is due to the heavier vehicle having much greater momentum and kinetic energy due to its higher mass which is transferred to the occupants of the lighter vehicle in a collision, resulting in a higher likelihood of death or serious injury.

## Arthurs Seat Road – between Whitehill Road and Shoreham Road/ Red Hill Road

Mornington Peninsula Shire manages the section of Arthurs Seat Road between Whitehill Road and Shoreham Road/ Red Hill Road. The section between Whitehill Road and Boundary Road is a State road, managed by the Victorian Department of Transport & Planning (DTP).

The Shire-managed section is classified as a 'Local Arterial' and has a traffic volume of around 5,000 vehicles per day. The road provides an important link between State roads like Arthurs Seat Road to the west of Whitehill Road, Mornington-Flinders Road and Whitehill Road, with Shoreham Road (which links to Frankston-Flinders Road) and Red Hill Road (which links to Bittern-Dromana Road).

This section of Arthurs Seat Road also provides access to a range of facilities and amenities, such as Red Hill Recreation Reserve, Focus Disability Support, Red Hill Preschool, restaurants, wineries, shops, places of worship and private properties.

### Arthurs Seat Road road safety risks

Traditionally, road safety practitioners have focused on identifying Black Spots based on past crash history. While identifying and investigating crash patterns remains important, proactively identifying crash risks and implementing treatments to avoid crashes occurring in the future is a more progressive way to reduce road trauma over the long term. Our road safety strategy marks an important milestone for the Shire in moving to addressing systemic crash risk, rather than waiting for crashes to occur.

The *Austroads Guide to Road Safety Part 2 – Safe Roads*[1] specifies a proactive approach to managing road safety risks, using rural roads as an example (although the same risk-based concept applies to all types of roads): "*Reactive and proactive approaches are often used in combination. For example, on a rural network with many run-off-road crashes, it is desirable that all potential high-severity locations be treated, regardless of whether crashes have occurred. A proactive risk rating approach can be used to identify and prioritise equally risky locations (in terms of road and roadside features), irrespective of crash history*". The 2015 version of *Part 8 - Treatment of Crash Locations* goes on to say "*This is in contrast to a crash-based analysis that addresses just those points on the road where crashes have previously occurred. Equally risky locations (in terms of road and roadside features) should not be ignored*".

Arthurs Seat Road between Whitehill Road and Shoreham Road/ Red Hill Road has a number of road safety risk factors such as:

- Several curves, with radii ranging from approximately 150m to 350m.
- Lack of delineation to provide visual cues and assist drivers to navigate the curves.

[1] Austroads is regarded as the peak body in Australia and New Zealand undertaking research and providing comprehensive evidence-based guides on road safety, road design, traffic management, road pavements and transport asset management.

- Some sections of the road have a rural or peri-urban feel which contributes how drivers perceive the road, resulting in some drivers travelling above the 60 km/h posted speed limit. It also generally takes time for drivers to adjust to a new speed limit so not all vehicles are currently travelling at the 60 km/h speed limit that was implemented in December 2023.
- Rigid hazards close to the edge of the road such as trees and power poles. Collision with a rigid hazard has the possibility of resulting in death or serious injury. The probability of death or serious injury in a side-on collision with a rigid hazard has a 10% probability of death at only 30 km/h (refer to Figure 2 earlier in this document).
- Embankments and open drains close to the edge of the road.
- Unsealed shoulders.
- A concentration of pedestrians in a number of areas, including pedestrians crossing the road, such as adjacent to Red Hill Recreation Reserve and adjacent to the businesses in the vicinity of the Red Hill General Store.
- Recreational cyclists riding along the road.
- A higher concentration of motorcycles than other roads due to Arthurs Seat Road being a popular recreational motorcycle route.

Run-off road risk score

The *Austroads Guide to Road Design Part 6 – Roadside Design, Safety and Barriers*, explains a comprehensive methodology to calculate risk scores for run-off road crashes, taking into account factors such as vehicle speeds, horizontal alignment (eg if the road is straight or curved), traffic volume, and hazards adjacent to the road. DTP's supplement to the Austroads guide provides further information on applying the methodology in Victoria.

Calculated risk scores for a number of sections of Arthurs Seat Road are provided in Table 2 below, with the location of each risk score shown in Figure 3.

**Table 2:** Run-off road risk scores on sections of Arthurs Seat Road

| Ref no. | Location | Horizontal alignment | Risk score | Safety barrier installed? |
|---|---|---|---|---|
| 1 | Near 229 Arthurs Seat Road | Curved | 1.24 | Yes |
| 2 | Adjacent to Red Hill Recreation Reserve | Straight | 0.29 | No |
| 3 | Opposite Andrews Lane | Curved | 1.53 | Yes |
| 4 | Outside 120 Arthurs Seat Road | Curved | 0.74 | Yes |
| 5 | Outside 90 Arthurs Seat Road | Curved | 1.59 | Yes |

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**Figure 3:** Risk score locality plan

The DTP supplement provides guidance on recommended risk threshold scores for two locality contexts – urban and rural. These scores represent the maximum score that a project should adopt for roadside hazards.

It should be noted that the road context is considered 'urban' if it falls within the Greater Metropolitan Region of Melbourne, which includes the Mornington Peninsula. Therefore, the risk score threshold target for an urban context of 0.5 is relevant to Arthurs Seat Road.

Where the risk score exceeds the 0.5 threshold, risk mitigation measures such as road safety barriers should be considered.

As shown in Table 2, locations 1, 3, 4 and 5 warrant risk mitigation measures. Road safety barriers are the only practical treatment to substantially reduce the risk to vehicle occupants in a run-off road crash.

The risk score of a straight section of Arthurs Seat Road is included in Table 2 for the purpose of comparison of risk scores on curves compared to straight sections of road.

**Arthurs Seat Road crash history**

In addition to the road safety risks present on Arthurs Seat Road, there has been a history of crashes over a long period of time.

It is worth noting that perception by some members of the public is that all or most road crashes are due to irresponsible or poor driving. While irresponsible driving does contribute to road trauma, a significant proportion of road trauma occurs due to genuine mistakes, even when driving in a responsible and compliant manner. The Safe System philosophy recognises that people make mistakes, and no one deserves to die or be seriously injured on our roads. As such, road managers should provide road environments that minimise the likelihood of

crashes occurring, but also protect road users if a crash does occur so that death or serious injury is not the result. While we don't want there to be any irresponsible driving on our roads, road safety treatments can result in less crashes and lower severity from irresponsible driving.

Road crashes where at least one person is injured and Police attend the crash are known as 'casualty crashes'. Casualty crashes are recorded in the Victorian Department of Transport & Planning's crash database which councils are able to access.

Since 2012, there has been 15 recorded casualty crashes on Arthurs Seat Road, between Whitehill Road and Shoreham Road/ Red Hill Road (excluding crashes that have occurred at the intersection of Arthurs Seat Road and Whitehill Road), resulting in one person being killed, eight people being seriously injured and ten people receiving less severe injuries.

It's worth noting that not only fatal and serious injury collisions are concerning. The location of minor injury crashes are also concerning as they could be indicating a road safety risk that could result in a more severe collision in the future. The level of injury sustained in a crash can often be a matter of circumstance and chance.

For the 2023/2024 Australian Government's Black Spot Program, the Victorian Department of Transport & Planning specified a five year period of 1 July 2016 to 30 June 2021 to be used for identifying crash patterns. During this period, there was nine crashes on the Shire-managed section of Arthurs Seat Road. Analysis of these nine crashes identified a pattern of 'lane departure' crashes, consisting of 'run-off road' and 'head on' crashes, with six of these types of crashes within the five year period. The other three crashes were different crash types. Further information each crash and the crash pattern is provided in the following sections.

## Crash summary

A summary of the nine crashes on Arthurs Seat Road, from Whitehill Road and Shoreham Road/ Red Hill Road between 1 July 2016 to 30 June 2021 is provided in Table 1 below.

**Table 1:** Summary of crashes on Arthurs Seat Road from Whitehill Road to Shoreham Road/ Red Hill Road between 1 July 2016 to 30 June 2021

| Shire ref no. | Crash ref no. | Location | Date of crash | Type of crash | Severity | Crash included in 2023/2024 Black Spot application? |
|---|---|---|---|---|---|---|
| 1 | T20160018662 | Arthurs Seat Road, 132m west of Arthurs Seat Road service road (ie. 175m west of Arkwells Lane) | 26/8/2016 | Run-off road | 2no. serious injuries 1no. minor injury | Yes |
| 2 | T20160024506 | Arthurs Seat Road, 189m north-west of Andrews Lane | 13/11/2016 | Run-off road then head-on | 1no. minor injury | Yes |
| 3 | T20170011385 | Arthurs Seat Road, 29m east of Arthurs Seat Road service road (ie 65m east of Arkwells Lane) | 10/6/2017 | Through vehicle collide with U-turning vehicle | 1no. minor injury | No |
| 4 | T20180000556 | At intersection of Arthurs Seat Road and Prossors Lane | 10/1/2018 | Rear end | 1no. minor injury | No |
| 5 | T20180018204 | At intersection of Arthurs Seat Road and Andrews Lane | 27/9/2018 | Right-angle crash at intersection | 1no. minor injury | No |

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| Shire ref no. | Crash ref no. | Location | Date of crash | Type of crash | Severity | Crash included in 2023/2024 Black Spot application? |
|---|---|---|---|---|---|---|
| 6 | T20180023696 | Arthurs Seat Road, 222m south-east of Whitehill Road | 8/11/2018 | Run-off road | 1no. serious injury | Yes |
| 7 | T20190000255 | Arthurs Seat Road, close to Perry Lane | 3/1/2019 | Run-off road | 1no. minor injury | Yes |
| 8 | T20200014249 | Arthurs Seat Road, 68m south of Mechanics Road | 13/7/2020 | Run-off road | 1no. serious injury | Yes |
| 9 | T20210012305 | Arthurs Seat Road, close to Whitehill Road | 1/6/2021 | Head-on | 1no. serious injury<br>1no. minor injury | Yes |

The location of each of the nine crashes is shown in Figure 4 below.

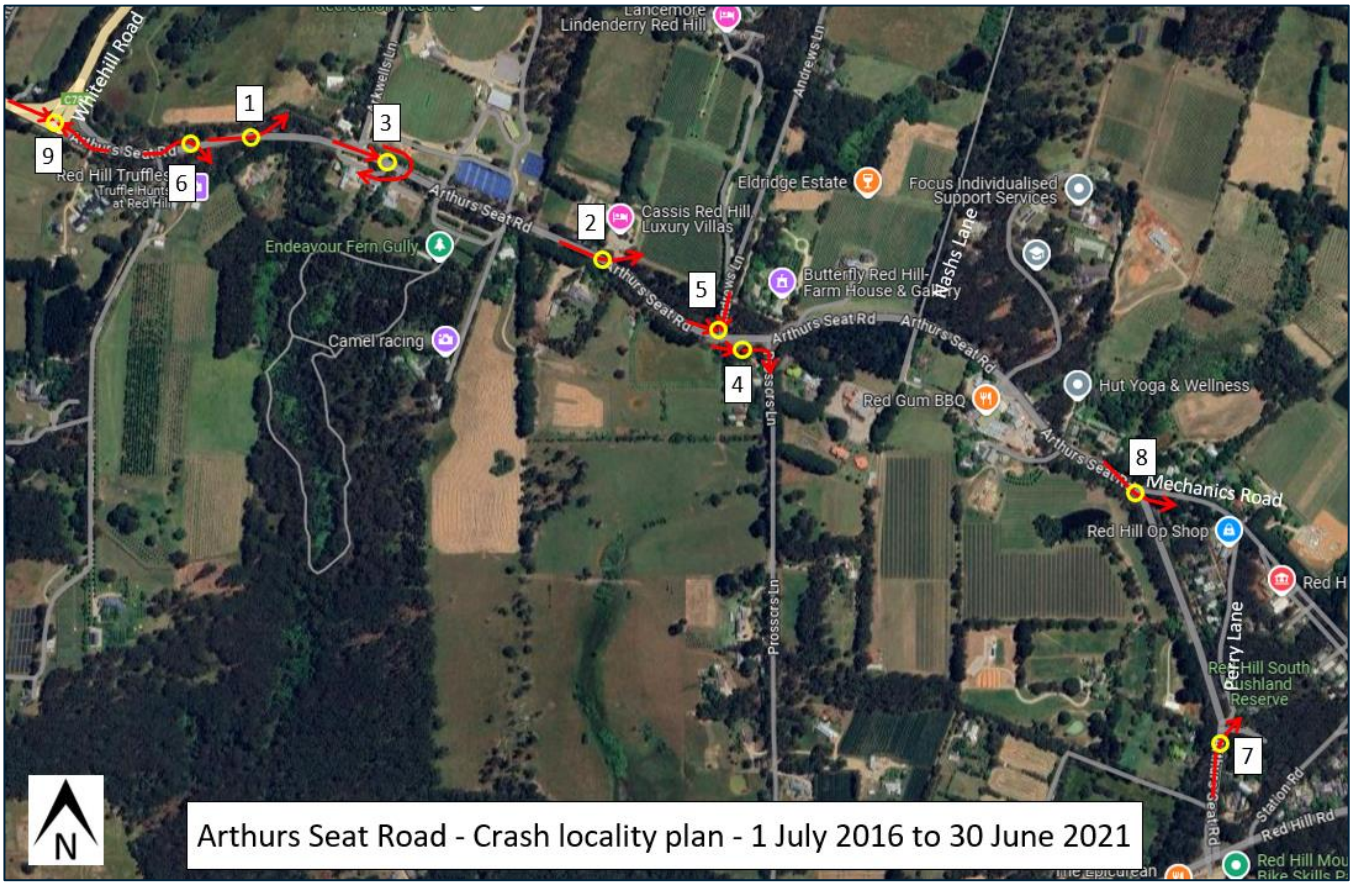


**Figure 4:** Arthurs Seat Road crash locality plan – 1 July 2016 to 30 June 2021

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Crash analysis

Details of each of the nine crashes are provided in chronological order below.

1. Arthurs Seat Road, 132m west of Arthurs Seat Road service road (ie. 175m west of Arkwells Lane)


Information from Police report: Vehicle travelling east on Arthurs Seat Road failed to take right-hand curve, resulting in the vehicle continuing straight at the curve, leaving the road on the north side of Arthurs Seat Road, and travelling through vegetation before colliding with trees. Both driver and passenger suffered serious injuries. Major damage to front and passenger side of the vehicle.

Mornington Peninsula Shire comment: Vehicle running off the road on the outside of the curve is in line with road safety risk factors in terms of vehicles being more likely to run-off a road on the outside of a curve. Likelihood of similar crashes could be reduced with improved delineation and/or lower speed limit. The severity of the crash could be reduced by installing road safety barrier on the outside of the curve.

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2. Arthurs Seat Road, 189m north-west of Andrews Lane


Information from Police report: Vehicle travelling east on Arthurs Seat Road failed to negotiate the right-hand curve and veered onto the unsealed shoulder on the left side (ie north side) of the road. The vehicle overcorrected by steering to the right, losing control and collided head-on with an oncoming vehicle. Both vehicles were extensively damaged.

Mornington Peninsula Shire comment: The vehicle failing to negotiate the right-hand curve is an example of the risk of the outside of curves. On this occasion, the vehicle leaving the carriageway on the outside of the curve resulting in overcorrection and a head-on crash, but could have just as likely resulted in a collision with rigid roadside hazards such as power poles and/or trees on the northern side of the road. Likelihood of similar crashes could be reduced with improved delineation and/or lower speed limit and/or sealing the unsealed shoulder. Severity of any future crashes on the outside of the curve into rigid hazards could be reduced by installing road safety barrier, however, the existing driveways at Cassis Red Hill prevents the possibility of installing barrier in this location.

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3. Arthurs Seat Road, 29m east of Arthurs Seat Road service road (ie 65m east of Arkwells Lane)


Information from Police report: Vehicle was stationary on the shoulder on the left (ie north) side of Arthurs Seat Road, facing east. The vehicle performed a U-turn into the path of a vehicle travelling east on Arthurs Seat Road.

Mornington Peninsula Shire comment: The driver of the vehicle that performed the U-turn either did not see the approaching vehicle, or misjudged its distance and/or speed. There is limited road improvements that could reduce the likelihood of this crash occurring, although a lower speed limit may assist due to shorter braking distances and more reaction time to avoid a collisions. A lower speed limit would also reduce the severity of this type of crash.

4. At intersection of Arthurs Seat Road and Prossors Lane


Information from Police report: Vehicle travelling east on Arthurs Seat Road slowed to turn right into Prossors Lane. A second vehicle travelling east, collided with the rear of the first vehicle. One vehicle occupant conveyed to hospital for observations. Both vehicles towed from the scene.

Mornington Peninsula Shire comment: Rear end collisions at intersections are more common at locations that do not have dedicated right turn lanes. A right turn lane could be constructed at Prossors Lane, however, it is not currently a high priority relative to other road safety risks on the Mornington Peninsula. Construction of a right turn lane in this location would also likely require significant vegetation removal and installation of road safety barrier to protect vehicles from adjacent trees. The 60 km/h speed limit implemented in December 2023 assists in reducing the likelihood and severity of any future rear end crashes in this location.

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5. At intersection of Arthurs Seat Road and Andrews Lane


Information from Police report: A truck has pulled out from Andrews Lane into the path of an eastbound vehicle. The approaching vehicle braked heavily and skidded into the side of the truck, causing substantial front end damage, requiring the vehicle to be towed.

Mornington Peninsula Shire comment: As Andrews Lane is a minor road relative to other roads within the Mornington Peninsula, a substantial intersection upgrade such as a roundabout is not warranted. The 60 km/h speed limit implemented in December 2023 assists in reducing the likelihood and severity of any future crashes in this location. Sight lines at the intersection will be reviewed in collaboration with the Shire's new vegetation management contractor to assess whether vegetation maintenance could improve sight lines.

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6. Arthurs Seat Road, 222m south-east of Whitehill Road


Information from Police report: Vehicle travelling east on Arthurs Seat Road. As the driver began turning on the right-hand curve, the vehicle skidded across the road, hitting a ditch on the right side (ie south side) of the road, rolling twice and coming to rest on its side. The vehicle occupant suffered serious injuries. The driver reported that they swerved to avoid a fox on the road.

Mornington Peninsula Shire comment: The curve in the road likely contributed to the vehicle losing control when swerving. Animals crossing roads in the Shire's hinterland area is quite common, particularly at dawn and dusk, and can't readily be prevented. On this occasion, the vehicle leaving the carriageway resulted in loss of control onto the right sight of the road, but could have just as likely resulted in a collision with rigid roadside hazards such as trees on the left side of the road (whether it is due to swerving for an animal, or loss of control for any other reason). Severity of any future crashes on the outside the curve into rigid hazards could be reduced by lowering the speed limit and/or installing road safety barrier. Running off the road on the inside of the curve as occurred on this occasion is less likely to reoccur so road safety barrier is less warranted, as vehicles are generally more likely to run-off the road on the outside of curves. The 60 km/h speed limit implemented in December 2023 assists in reducing the likelihood and severity of any future crashes in this location.

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7. Arthurs Seat Road, close to Perry Lane


Information from Police report: Motorcycle travelling north on Arthurs Seat Road at approximately 60 km/h, lost control on loose gravel and slid into the embankment on the northern side of the road. Rider received fractured right angle and dislocated/ fractured little finger.

Mornington Peninsula Shire comment: Managing debris on roads in hinterland areas is challenging. Gravel, mud, leaves and twigs sometimes accumulate on roads which can contribute to vehicle and motorcycle instability, particularly on curves. Motorcycle crashes often result in riders sliding on the road. When this occurs on curves (such as any of the curves on Arthurs Seat Road), the rider will tend to slide off the outside of the curve. If trees are present adjacent to the road, the rider may hit the trees, causing death or serious injury which is an example of risks associated with the outside of curves. A road safety barrier with motorcycle protection on the posts, may result in lesser severity than hitting a tree. However, several driveways and Perry Lane being on the outside of the curve prevents the possibility of installing barrier in this location.

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8. Arthurs Seat Road, 68m south of Mechanics Road


Information from Police report: Vehicle driving south on Arthurs Seat Road has lost control at a curve in the road and slid off the road into the bank beside the road, causing the vehicle to roll. Driver conveyed to hospital. Large amount of damage to vehicle. Road may have been slippery from debris caused by a recent storm and rain.

Mornington Peninsula Shire comment: Managing debris on roads in hinterland areas is challenging. Gravel, mud, leaves and twigs sometimes accumulate on roads which can contribute to vehicle instability, particularly on curves. The vehicle running off the road on the outside of the curve is in line with road safety risk factors in terms of vehicles being more likely to run-off a road on the outside of a curve. Likelihood of similar crashes could be reduced with improved delineation and/or lower speed limit. The severity of crashes could be reduced by installing road safety barrier on the outside of the curve, however, Mechanics Road, several driveways, the open drain and the bank on the outside of the curve prevents the possibility of installing barrier in this location.

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9. Arthurs Seat Road, close to Whitehill Road


Information from Police report: Vehicle travelling westbound on Arthurs Seat Road approaching Whitehill Road crossed double white lines at the right turn lane at Whitehill Road and collided with an oncoming eastbound vehicle.

Mornington Peninsula Shire comment: Head-on collisions appear to be one of the main risks on Arthurs Seat Road. The likelihood of head-on collisions in this location could be reduced with improved delineation and/or a lower speed limit. A lower speed limit would also assist to reduce the severity of similar crashes. A 60 km/h speed limit was installed in December 2023 on Arthurs Seat Road from west of Whitehill Road to the existing 60 km/h section near Shoreham Road/ Red Hill Road.

Crash summary

Through analysing the above crashes, a pattern of 'lane departure' crashes, consisting of 'run-off road' and 'head on' crashes was identified (six of these within the five year Black Spot analysis period). On this basis, Arthurs Seat Road was identified as a potential candidate for a Black Spot Program application.

Vehicles left the carriageway on the outside of curves in four of the crashes along Arthurs Seat Road. While crashes did not occur on all of the curves along the road in the five year analysis period, the crash trend is indicating a systemic risk where Arthurs Seat Road has increased risk of vehicles leaving the road on the outside of curves, resulting in crashes.

The severity of crashes along Arthurs Seat Road has the potential to be high, with trees, power poles, embankments and open drains close to the road, elevating the 'consequence' side of the 'likelihood plus consequence' risk equation. A collision with these hazards has high potential to result in death or serious injury, even at relatively low speeds with a side impact with a rigid hazard at 30 km/h still having a 10% probability of being fatal (refer to Figure 2). The probability of being killed in a side impact with a rigid object rises sharply above 30km/h.

Crashes tend to reoccur in a repeatable and predictable pattern when risk factors are not mitigated. Without treatment, the same type of crashes would likely continue to occur on Arthurs Seat Road. However, the exact locations where crashes occur on risky roads tends to vary, with crashes along a length of road rarely occurring in the exact same location. Therefore, it is important to improve safety at all locations on Arthurs Seat Road that have a similar risk, such as on the outside of curves in the road in order to maximise the reduction in road trauma. This approach aligns with information from *Austroads Guide to Road Safety Part 2 – Safe Roads* quoted in the 'Arthurs Seat Road road safety risks' section of this document.

## Road safety treatments

In general terms, risk is a product of two key elements: likelihood and severity. Risk can be reduced by reducing the likelihood and/or severity.

However, the Safe System approach to road safety recognises that likelihood of crashes can rarely be reduced to zero as humans will always make mistakes and therefore, for road safety treatments to be effective, they should address both the likelihood and severity of crashes wherever possible.

As discussed in the previous section, a pattern of 'lane departure' crashes and risk was identified on Arthurs Road, making it a potential 'Black Length' candidate, meaning that crashes have occurred along a length of road (refer to more details of the Black Spot Program in the next section of this document).

Treatment of Black Lengths generally involves improving safety along the whole length of road, where possible, and further mitigating risk at particularly high risk locations along the length. *Austroads Guide to Road Safety Part 2 – Safe Roads* provides guidance on developing solutions to crash problems and road safety risks.

Possible treatments to reduce the likelihood and/ or severity of run-off road crash risk:

- Road safety barries (severity)
- Remove roadside hazards such as trees and power poles (likelihood and severity)
- Linemarking improvements (likelihood)
- Raised Reflective Pavement Markers (likelihood)
- Guideposts (likelihood)
- Chevron Alignment Markers at curves and bends (likelihood)
- Advisory warning signage (likelihood)
- Lower speed limit (likelihood and severity)
- Shoulder sealing (likelihood)

Possible treatments to reduce the likelihood and/ or severity of head-on crash risk:

- Centre road barriers to physically separate opposing traffic (severity)
- Linemarking improvements (likelihood)
- Wide linemarked median (likelihood)
- Raised Reflective Pavement Markers (likelihood)
- Lower speed limit (likelihood and severity)

It should be noted that not all treatments are necessarily possible or practical on all roads due to factors such as existing road width, the need to retain access to side roads and property access (eg road safety barries cannot

block side roads or property accesses), and environmental considerations such as removal of native vegetation. Thus, there are site-specific considerations to take into account for each road safety improvement project. The cost of each type of treatment is also an important factor as project budgets are always limited. The cost of treatments relative to their benefit is also important for Black Spot applications, as the Benefit Cost Ratio of road safety improvements is one of the criteria when DTP are assessing Black Spot applications.

As discussed in later sections of this document, potential road safety treatments were proposed for Arthurs Seat Road to respond to the identified crash pattern and risk of 'lane departure' crashes, taking into account the site-specifics of Arthurs Seat Road.

## Australian Government Black Spot Program

The Australian Government's Black Spot Program is an annual program that provides funding to local governments for road safety improvements based on historic crashes and road safety risk.

The types of road safety issues that are funded under the Black Spot Program are in two broad categories – Black Spots where crashes and/or risk are present in a confined vicinity, and Black Lengths where crashes and/or risk are present along the length of a road.

In Victoria, the Federal funding is administered by the Victorian Department of Transport & Planning (DTP). DTP are responsible for devising the application process, assessing potential Black Spot projects, selecting which road safety improvement projects receive Black Spot funding, and overseeing the progress and outcomes of each funded project.

The Black Spot Program is a competitive grant program where councils across Victoria apply for funding. Councils wishing to apply for Black Spot funding review crashes and road safety risk across its road network to identify potential road safety improvement projects. For each project, crash patterns and risk factors are identified, then suitable treatments developed to reduce the road safety risk. A Benefit Cost Ratio is calculated for each project to enable comparison of the benefits relative to the costs between different projects when DTP is evaluating the applications. The applications are extensively assessed by DTP determine which applications receive grant funding.

For the 2023/2024 Program (the Program that the Arthurs Seat Road Black Spot project was funded), DTP's requirements for applications were as follows:

- At least three casualty crashes for Black Spots
- At least one crash per kilometre over a five year period for Black Lengths (ie. 0.2 crashes per kilometre per year)
- Benefit Cost Ratio more than 2.0
- Projects can also be submitted that are supported by a Road Safety Audit or Safe System Assessment

Each year, Mornington Peninsula Shire reviews crash patterns and risk at particular locations and along lengths of road, across our road network and applies for Black Spot funding for the highest priority projects as part of our commitment to reducing road trauma. The Shire has successfully delivered over $10 million of Black Spot Program funded road safety improvements in recent years.

### Arthurs Seat Road Black Spot application

As discussed earlier in this document, through analysing crashes along Arthurs Seat Road, a pattern of 'lane departure' crashes, consisting of 'run-off road' and 'head on' crashes was identified (six of these within the five year Black Spot analysis period). On this basis, Arthurs Seat Road was identified as a potential candidate for a Black Spot Program application.

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Our Mornington Peninsula Towards Zero 2020-2025 Road Safety Strategy 'Lane departure' crashes are one of the six systemic crash types that represent around 90% of all deaths and serious injuries that occur within the Mornington Peninsula. Therefore, 'Lane departure' crashes are one of the systemic crash risks that we are targeting with safety improvements.

Mornington Peninsula Shire engaged consultant HDS Australia to assist in preparing our 2023/2024 Black Spot applications. HDS have significant expertise in Black Spot investigations and treatments for a range of councils, as well as road safety, traffic engineering and road design.

HDS further investigated and analysed the site conditions on Arthurs Seat Road, the crash pattern and reviewed road safety risks along the road. The investigation determined that the 'lane departure' crash pattern and risk of future crashes is a concern for this section of road. Without treatment, the same type of crashes would likely continue to occur. The risk of run-off road crashes on the outside of curves is a particular concern, and there is the possibility of high severity crashes due to the proximity of rigid hazards close to the road.

Options for road safety improvements were developed to reduce the likelihood and severity of these types of crashes. As mentioned earlier in this document, while crashes did not occur on all of the curves along the road in the five year analysis period, the crash trend is indicating a systemic risk where Arthurs Seat Road has increased risk of vehicles leaving the road on the outside of curves, resulting in crashes. Therefore, the Black Spot application was based on being reactive to crashes, but also took into account the locations that have the highest risk of future crashes.

Two options were proposed:

- Option 1 (preferred option): Delineation improvements to reduce the likelihood of run-off road crashes and head-on crashes along the whole length of road, and road safety barriers in high risk locations. Crash Reduction Factor: 45%
- Option 2: Delineation improvements along the whole length of road only. Crash Reduction Factor: 30%

Option 1 was the preferred option as it proposed treatments to reduce both the likelihood and severity of crashes, in line with Safe System principles, and would be more effective in reducing crashes.

The Arthurs Seat Road Black Spot application was assessed by DTP as being among the most justified road safety improvements after considering all of the applications from around Victoria. Just under $500,000 of funding was received from the Black Spot Program to deliver the improvements identified in Option 1.

The road safety improvements in Option 1 included a combination of treatments such as improvements to linemarking, Raised Reflective Pavement Markers, guideposts and signage, and installation of road safety barriers. The improved delineation is intended to reduce the likelihood of crashes occurring, and the road safety barriers are designed to reduce the severity of crashes in the highest risk locations (ie. on the outside of curves) by redirecting errant vehicles, relative to striking a rigid object such as a tree or power pole.

<u>Road safety barrier locations</u>

The crash data analysis and risk assessment identified a particular systemic risk on the outside of curves on Arthurs Seat Road. On this basis, road safety barrier was proposed on the outside of curves as the highest risk locations along Arthurs Seat Road to reduce the severity of future crashes to minimise the risk of death or serious injury.

There are no other road safety treatments that are as effective in reducing the severity of vehicles leaving the carriageway as road safety barriers. Other options such as removing power poles and substantial clearing of roadside vegetation can reduce the probability that an errant vehicle will collide with a rigid hazard, but road safety research confirms that errant vehicles often travel a long way from the road, requiring an excessively large vegetation clearance envelope to replicate the effectiveness of road safety barrier (the DTP supplement to the

*Austroads Guide to Road Design Part 6* nominates 10-15m for a 60 km/h road). In addition, removal of roadside hazards does not fully mitigate risk of vehicle rollover due to embankments, and vehicle wheels 'snagging' on shrubs, bushes, divots, wet/ soft spots, or ruts in the cleared area. It is very difficult to adequately maintain a wide roadside area to the level that it is smooth enough to have a high probability of preventing an errant vehicle from rolling over.

Following assessment of each curve during the Black Spot application process, road safety barrier was proposed on three of the curves (five sections of barrier) on Arthurs Seat Road. Road safety barriers were not able to be installed on all curves due to driveways and side roads on some of the curves. Nevertheless, the delineation improvements on Arthurs Seat Road will assist to reduce the likelihood of crashes in these locations, as well as the whole length of this section of Arthurs Seat Road. The 60 km/h speed limit implemented in December 2023 assists in reducing the likelihood and severity of any future rear end crashes in this location.

In relation to the road safety barriers on the north side of Arthurs Seat Road adjacent to 120 Arthurs Seat Road, this section of barrier is necessary for a number of reasons:

- This section of road is curved which has been assessed to be a risk along Arthurs Seat Road.
- The curve in this location is somewhat deceiving. Some drivers perceive the road as quite straight but aerial photos show that the road is evidently curved. In addition, the curve significantly tightens to a smaller radius as vehicles drive eastbound.

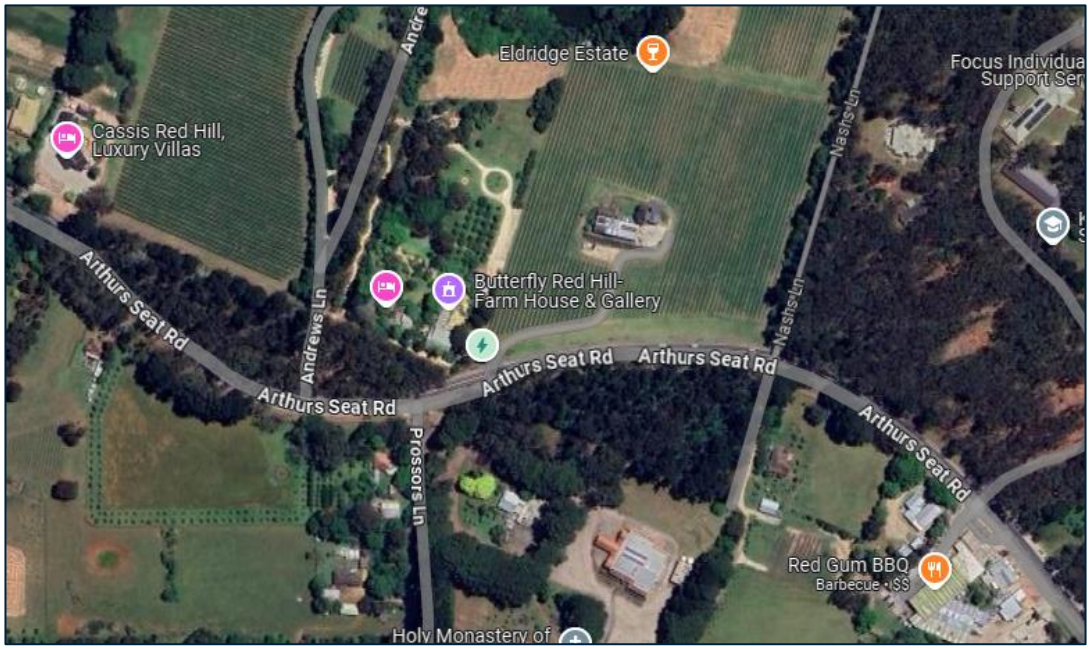


**Figure 4:** Ariel photo showing curves on Arthurs Seat Road in the vicinity of Andrews Lane, Prossors Lane and Nashs Lane (source: Google Maps)

- The run-off road risk score discussed earlier in this document exceeds the 0.5 target threshold where risk mitigation measures such as road safety barriers should be considered.
- There is a number of power poles adjacent to the road.
- The roadside has a downward slope down which increases the risk that a vehicle will lose control if they leave the road in this location, and may rollover or continue into the grape vines. The timber posts of the vineyard pose a risk to vehicle occupants as they present a rigid hazard due to their stiffness and strength.
- If a vehicle loses control on the curve, or as the curve tightens (it is more likely that drivers will misjudge a tightening curve relative to a curve with a consistent radius), the errant vehicle may continue to the

heavily vegetated area just to the east of 120 Arthurs Seat Road which is dangerous to vehicle occupants as these large trees are rigid hazards. To minimise the probability that an errant vehicle can travel 'behind' the barrier and continue to the vegetated area, the barrier must extend a sufficient distance to the west to protect vehicles from this hazard. This is referred to as the 'Length of Need' the barrier. The below diagram demonstrates this concept (source: *Austroads Guide to Road Design Part 6 – Roadside Design, Safety and Barriers*).

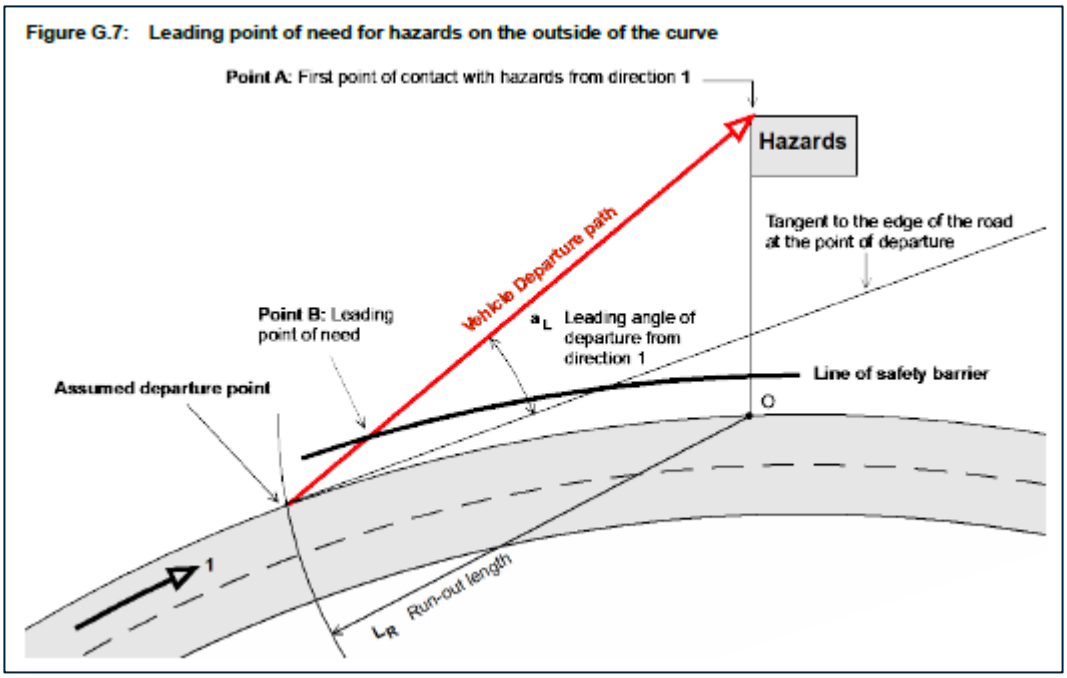


**Figure 5:** Diagram of the leading point of need for hazards on the outside of curves (source: Austroads Guide to Road Design Part 6 – Roadside Design, Safety and Barriers)

Community engagement

Community engagement on the road safety works was undertaken in early 2024, prior to implementation of the improvements.

The Shire sent letters to just over 100 of the nearby residents and businesses along Arthurs Seat Road and on roads adjoining Arthurs Seat Road. There was also a community meeting held in March of 2024 to discuss the project with residents, businesses and other stakeholders.

Timelines for submission of Black Spot applications are short. This generally prevents community engagement being able to be undertaken prior to submission of the Black Spot applications. In addition, where community engagement has been undertaken in the tight timelines prior to Black Spot submissions in the past, there has been community dissatisfaction in relation to the Shire explaining that it is a funding application and not a funded project, when proposed projects were not successful in receiving funding and the project won't proceed, or if the scope of the project changed based on DTP input during the application assessment phase.

60 km/h speed limit on Arthurs Seat Road

An investigation of the speed limit on Arthurs Seat Road between Whitehill Road and Shoreham Road/ Red Hill Road was underway prior to the Black Spot application.

The speed limit was assessed against the Victorian Department of Transport & Planning's Speed Zoning Technical Guidelines. It was determined that 60 km/h is the appropriate speed limit for the road environment, use

and users of this section of Arthurs Seat Road, particularly given the crash history and risk along the road. The speed limit change to 60 km/h was subsequently approved by DTP in late 2023 and implemented in December 2023.

Speed limit changes have the potential to reduce the likelihood and severity of crashes, but are not a 'silver bullet'. For example, while the average vehicle speed on Arthurs Seat Road appears to have reduced by several kilometres per hour since December 2023, it often takes several years for driver behaviour to adjust to a lower speed limit.

Despite the 60 km/h speed limit, there is still risk of crashes on Arthurs Seat Road, particularly on the curves, and the likelihood that run-off road crashes would be at high severity, given the prevalence of roadside hazards. The 60 km/h speed limit is part of a package of treatments to improve road safety, along with improvements to linemarking, Raised Reflective Pavement Markers, guideposts and signage, and installation of road safety barriers.

## Road safety barrier type

'Ezy Guard' steel W-beam guardrail was selected as the road safety barrier to be installed on Arthurs Seat Road.

Ezy Guard is suitable for protecting vehicle occupants from roadside hazards in most of the common scenarios along roads. This type of flexible barrier is designed and tested to absorb impact energy from errant vehicles by yielding of the ductile posts, providing a forgiving impact. This reduces force exerted on vehicle occupants, and dramatically reduces the risk of death or serious injury relative to striking a rigid hazard like a tree or power pole, or the vehicle rolling over on the roadside.

Motorcycle protection rails are included on road safety barriers on roads that have a higher prevalence of motorcycles, particularly on the outside of curves. These rails reduce the severity when a motorcycle hits the barrier relative to a motorcyclist hitting the posts of the barrier, or sliding underneath the barrier and potentially striking a rigid hazard behind the barrier.

Ezy Guard is rigorously crash tested against the MASH (Manual for Assessing Safety Hardware) crash testing standards as required by Austroads and the Victorian Department of Transport & Planning.

Other types of flexible road safety barriers such as Wire Rope Safety Barrier are not suitable for Arthurs Seat Road as wire rope barriers deflect further when struck so need additional space behind the barrier, the radii of some of the curves on Arthurs Seat Road are less than manufacturer's specifications for installation of Wire Rope Safety Barrier and they're more maintenance intensive than other types of barrier.

## Pedestrian safety

Road safety consultant Road Solutions undertook a Road Safety Assessment focussed on particular issues and concerns between Nashs Lane and Mechanics Road. The assessment was separate from the Black Spot application. Risks to pedestrians crossing Arthurs Seat Road were identified which could be made safer with construction of a pedestrian refuge near the Red Hill General Store and threshold linemarking in advance of the refuge to highlight the pedestrian activity. These works were undertaken at the same time as the Black Spot works.

# Arthurs Seat Road – Black Spot project
## Information summary
## September 2024

MORNINGTON PENINSULA Shire

### Conclusion

Mornington Peninsula Shire has a strong commitment to improving road safety and reducing road trauma.

Arthurs Seat Road between Whitehill Road and Shoreham Road/ Red Hill Road was identified as a potential Black Spot project based on its extensive crash history and road safety risk, with a particular crash pattern of 'lane departure' crashes, indicating a systemic risk of run-off road crashes, particularly on the outside of curves.

Road safety improvement works were subsequently funded by the Australian Government Black Spot Program, incorporating delineation improvements to reduce the likelihood of crashes and road safety barrier in the highest risk locations on the outside of curves to reduce the severity of crashes.

Without road safety treatments, crashes on this section on Arthurs Seat Road would likely continue to occur in the future.