

# Midlands Highway Safety Improvements Programme 2014-2024

## Perth to Breadalbane Duplication

### Midlands Highway - Devon Hills Intersection – Treatment selection and justification

**Objective:** To provide safe and cost effective treatment of the Midlands Highway / Devon Hills Road intersection.

**Strategy:** Use the Safe Systems approach, traffic safety principles and risk assessment principles to determine the best option to provide for safe operation.

**Background:** This junction needs to be treated to work in with the highway duplication and make it safe for projected traffic volumes in twenty years.

- The existing T junction has 13,000 vpd on the major road (with one lane in each direction within a 100kph speed limit) and 1,100 vpd on the minor road based on 2013 survey data.
- For conservative design purposes the design traffic on the major road is expected to increase to 17,000 vpd by 2034 assuming annual growth rate of 1.5%.
- The Devon Hills enclave is not expected to grow and generate much beyond the current 1,100 vpd at this point in time.
- The proposed major road duplication will provide two lanes in each direction at 110kph.
- Midlands Highway is a National Highway and a Category 1 road in the Tasmanian Road Hierarchy.

#### Traffic Safety Principles and Objectives:

- Safe Systems framework for a safe road environment:

(Austroads Guide to Road Safety – Part 1 – Safety Overview)

- Avoid intersections between highways and local collector roads. This is subject to traffic volumes, travel speeds and crash risk.

(Austroads Guide to Road Safety – Part 4- Intersections and Crossings – General)

- Should be forgiving of human error and not penalise road users with death or serious injury when they inevitably make mistakes.
- The road design should not provide surprises to road users
- Manage the interrelationship of travel speed, infrastructure design and vehicle safety
- Freeways and highways should have higher design standards to enhance protection of road users and minimise conflict risk
- Design for vulnerable road users including buses, cyclists, elderly drivers, horse floats etc
- Avoid layouts that hide following vehicles

(Austroads Guide to Road Safety – Part 6 – Road Safety Audit)

- Assess crash risk.

(Austroads Guide to Road Safety – Part 7 – Road Network Safety Audit)

- Safety at junctions can be enhanced on high speed dual carriageways by the prevention of right turn crossing manoeuvres and prevention of U-turns at the junction, with use of a roundabout or a grade separation.

(Department for Transport – Geometric Design of Major/Minor Priority Junctions – TD 42/95)

- Compact grade separated junctions appear to be suitable for use where major flows are between 12,500 and 30,000 vpd and normally associated with very low flows (generally below 10% of major road flow) on the minor road.

(Department for Transport – Geometric Design of Major/Minor Priority Junctions – TD 40/94)

- Other local factors to consider:
  - Buses turning right onto the highway
  - Horse floats turning right onto the highway
  - Fog prone
  - Population centroid (Launceston) is north of the junction and the predominant turning manoeuvres are turning right onto the highway and left off the highway which account for 74% of the movements at this junction .i.e high right turn demand
  - Proximity of next closest major access - Perth

### **Crash Risk:**

- major flow of 17,000 vpd
- minor flow of 1,100 with high right turn out and left turn in demand
- two high speed (110kph) oncoming lanes
- Risk of Right turn / through crashes is high (i.e likely with major consequences)
- Risk of U turn / through crashes is high
- Risk of hidden following vehicles is high

See Appendix A-6

## **Intersection Treatment Options**

### **Option A – Compact grade separated junction**

Provides a ramp for two way flow over the highway with a trumpet layout with off and on ramps on the west side of the highway. Also includes an offset left turn deceleration lane on the east side. This is to solve hidden following vehicle issues – see Appendix A.7 #4, this needs to be common to all options.

### **Option B – Flyover**

Provides a single lane ramp across the highway with an on ramp for north bound traffic on the west side. Also includes an offset left turn deceleration lane on the east side.

### **Option C1 – Seagull and ITS**

Provides for all movements at grade and mitigate crash risk with ITS. ITS includes a circuit that detects right turners entering and activates Watch for Entering Traffic Wig Wag lights on the highway approaches to the junction. Also includes a weather station that activates a variable speed limit in foggy conditions. See Site drawing 9260 attached of similar provision made at East Tamar Highway / Dilston northern junction. Note this case involved 5,600 vpd on the major road and very low flow on the minor junction ~200 vpd. . Includes an offset left turn deceleration lane on the east side.

### **Option C2 – Seagull with 80 kph speed limit**

Provides for all movements at grade. Includes an offset left turn deceleration lane on the east side. The 80kph speed limit improves traffic safety but clashes with the purpose of the highway duplication effort and creates credibility issues for the Government.

### **Option C3 – Seagull intersection**

Provides for all movements at grade. Includes an offset left turn deceleration lane on the east side.

Right turners onto the major road must pick a gap between two oncoming lanes in each direction

### **Option D – Service Road to highway node north of Perth**

Devon Hills traffic accesses the highway at the northern end of Perth. Still requires an appropriate intersection north of Perth.

## **Discussion**

The Midlands Highway Safety Improvement projects between Perth and Mangalore involves a combination of “2+1” treatments reducing to “1+1” at the main junctions. This has been done to make best use of junctions for U turning, property access, emergency services and to switch between “2+1” and “1+2” along the highway. This has the added benefit of avoiding traffic safety issues with turning right across two oncoming traffic lanes where there may be hidden vehicles. See sketch in Appendix A.7 . “1+1” sections have been used this way to build in traffic safety improvements.

Between Perth and Breadalbane there is much more through traffic and a strong demand for the right turn out of Devon Hills.

The following decision analysis places in context whether at grade or grade separation is necessary for the right turn out of Devon Hills.

It should be noted that grade separation can take a range of forms:

- “rat holes” i.e single lane tunnel
- “flyovers” i.e single lane ramps
- Compact grade separated junctions providing for various movements
- Part and full Interchanges

Guidelines for deciding between at grade or grade separation at intersections are available e.g. the British Department for Transport, which include consideration of the traffic volume, speed environment, road standard or category, the kind of manoeuvres and crash history.

There is a range of ways of providing grade separation depending on the situation.

### **Decision Analysis**

**Table 1** summarises comparison of the options

The analysis supports the case for Option B – Flyover.

### **Recommendation:**

- A flyover be provided to cater for the movement from Devon Hills onto the Midlands Highway to head north
- An offset left turn deceleration lane be provided for the movement off the Midlands Highway to Devon Hills
- The low volume left turn onto the highway and right turn off the highway can be catered for with at grade facilities

## **Plans**

- DRG T3/2/60 – ITS Site 9260 – East Tamar Highway – Dilston – like Option C1
- A0087-025-0235 – Devon Hills Road ( Flyover Alternative) – like Option B
- A0087-025-0135 – Devon Hills Road Seagull – like Option C3
- A0087-025-xxxx – Devon Hills Road existing junction layout

## **Appendices**

Appendix A.1 – Guide to Road Design Part 4 – Intersections and Crossings - Page 133

Appendix A.2 - Guide to Road Safety Part 1 – Road Safety Overview – Page 3

Appendix A.3 – Guide to Road Safety Part 6 – Road safety Audit – Page 104

Appendix A.4 – Guide to Road Safety Part 6 – Road safety Audit – Page 105

Appendix A.5 – Guide to Road Safety Part 7 – Road Network Crash Risk Assess. – Page i

Appendix A.6 – Guide to Road Safety Part 7 – Road Network Crash Risk Assess. – Page39

Appendix A.7 – Guide to Road Safety Part 6 – Road Safety Audit – Page 114

Appendix B.1 – Midlands Highway Traffic Count Data

Appendix B.2 – Devon Hills Traffic Count Data

Appendix B.3 – Junction Turn Counts

Appendix B.4 – Crash History

Appendix C – Depart. for Transport – Geometric Design of Major / Minor Priority Junctions

Appendix D – Depart. for Transport – Layout of Compact Grade Separated Junctions

## **References**

- Austroads Guidelines
- British Department for Transport design standards

