



**ACT**  
Government

Transport Canberra and  
City Services

## FREEDOM OF INFORMATION COVERSHEET

The following information is provided pursuant to section 28 of the *Freedom of Information Act 2016*.

FOI reference: 22-066

Information to be published	Status
1. Access application	Published
2. Decision notice and schedule	Published
3. Documents	Published
4. Additional information identified	n/a
5. Fees	waived
6. Processing time (in working days)	28 days
7. Decision made by Ombudsman	n/a
8. Additional information identified by Ombudsman	n/a
9. Decision made by ACAT	n/a
10. Additional information identified by ACAT	n/a

**From:** [REDACTED]  
**To:** [TCCS\\_FreedomOfInformation](#)  
**Cc:** [REDACTED]  
**Subject:** FOI Request | Traffic Condition Study on a Watson Intersection  
**Date:** Thursday, 21 April 2022 11:51:52 AM  
**Attachments:** [image001.jpg](#)

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Good Afternoon,

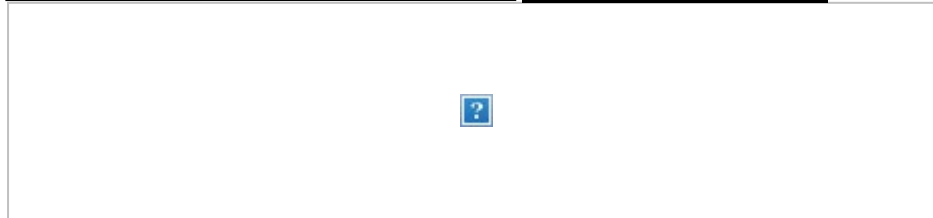
**RE: FOI REQUEST – TRAFFIC CONDITION STUDY OF PHILLIP AVENUE & WINDEYER STREET INTERSECTION, WATSON**

I write to request under the *Freedom of Information Act 2016* a copy of the Traffic Condition Study of Phillip Avenue and Windeyer Street Intersection, Watson.

Should you require any further information or clarification about my request, please contact my office on [REDACTED].

Best,

[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]





**ACT**  
Government

Transport Canberra and  
City Services



Dear 

### **Freedom of Information Request - Reference 22-066**

I refer to your application for access to government information received by Transport Canberra and City Services (TCCS) on 10 March 2022 under the *Freedom of Information Act 2016* (FOI Act) seeking:

*“A copy of the Traffic Condition Study of Phillip Avenue and Windeyer Street intersection, Watson.”*

I thank your office for providing further guidance around the context of the type of information you are requesting on 18 May 2022.

### **Authority**

I am an Information Officer appointed by the Director-General under section 18 of the Act to deal with access applications made under Part 5 of the FOI Act.

### **Timeframes**

A decision was due on your application by 20 May 2022. I thank you for agreeing to an extension until 2 June 2022.

### **Decision on access**

In accordance with the FOI Act, a search was conducted of records held by TCCS and the report you are seeking access to has been identified.

In reviewing the information within this record, I have found on balance, it is in the public interest to provide you with partial access. A copy of this record with deletions applied to information which is contrary to the public interest is enclosed at Attachment A. My decision is further detailed in the below statement of reasons.

### **Statement of Reasons**

In making my decision on disclosing government information, I must identify all relevant factors in schedule 2 of the FOI Act and determine, on balance, where the public interest lies. In reaching my access decision, I have taken the following into account:

#### ***Factors favouring disclosure in the public interest (Schedule 2, Section 2.1)***

- Schedule 2.1(a)(i) - promote open discussion of public affairs and enhance the government’s accountability;
- Schedule 2.1(a)(ii) - contribute to positive and informed debate on important issues or matters of public interest;

- Schedule 2.1(a)(iii) - inform the community of the government's operations, including the policies, guidelines and codes of conduct followed by the government in its dealings with members of the community;
- Schedule 2.1(a)(iv) - ensure effective oversight of expenditure of public funds; and
- Schedule 2.1(a)(viii) - reveal the reason for a government decision and any background or contextual information that informed the decision.

***Factors favouring non-disclosure (Schedule 2, Section 2.2)***

- Schedule 2.2(a)(ii) - prejudice the protection of an individual's right to privacy or any other right under the Human Rights Act 2004; and
- Schedule 2.2(a)(xiii) - prejudice the competitive commercial activities of an agency.

In reviewing the relevant record, personal information relating to third parties has been identified. I find that factor 2.2(a)(ii) is relevant to this information and I must consider if the disclosure is likely to prejudice the protection of an individual's right to privacy under the *Human Rights Act 2004*. In making this decision, I have considered that this information is not readily available to the public. I find that the protection of an individual's right to privacy under the *Human Rights Act 2004* carries significant weight. In this instance, I have found the disclosure of personal information to be, on balance, contrary to the public interest.

Further, information has been identified which relates financial figures that, if disclosed, are likely to prejudice the competitive commercial activities of an agency. Specifically, this information relates to the agencies willingness to pay, including potential future procurements. I have found that the disclosure of this information is, on balance, contrary to the public interest.

As I have found that the factors favouring disclosure can be met in the remaining information, I have decided to provide you with partial access to the record at [Attachment A](#).

**Charges**

Pursuant to section 107 of the FOI Act, no fee is applicable to this application.

**Online publishing – disclosure log**

Under section 28 of the Act, TCCS maintains an online record of access applications called a disclosure log. Your original access application, my decision and documents will be published in the TCCS disclosure between 3 – 10 business days from the date of this decision.

Your personal contact details will not be published. You may view the TCCS' disclosure log at <https://www.cityservices.act.gov.au/about-us/freedom-of-information/disclosure-log> .

**Ombudsman review**

My decision on your access request is a reviewable decision as identified in Schedule 3 of the Act. You have the right to seek an Ombudsman review of this outcome under section 73 of the Act within 20 working days from the day that my decision is published in TCCS' disclosure log or a longer period allowed by the Ombudsman.

If you wish to request a review of my decision, you may write to the Ombudsman at:

The ACT Ombudsman  
GPO Box 442  
CANBERRA ACT 2601  
Via email: [actfoi@ombudsman.gov.au](mailto:actfoi@ombudsman.gov.au)

**ACT Civil and Administrative Tribunal (ACAT) review**

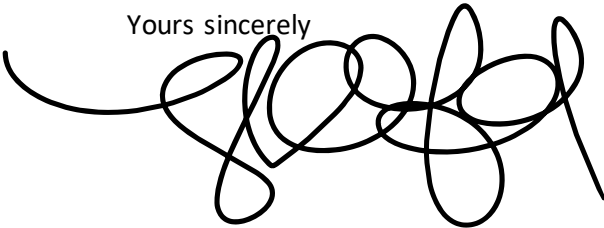
Under section 84 of the Act, if a decision is made under section 82 on an Ombudsman review, you may apply to the ACAT for review of the Ombudsman decision.

Further information may be obtained from ACAT at:

ACT Civil and Administrative Tribunal  
Level 4, 1 Moore Street  
GPO Box 370  
CANBERRA CITY ACT 2601  
Telephone: (02) 6207 1740  
[www.acat.act.gov.au](http://www.acat.act.gov.au)

If you have any queries concerning the directorate's processing of your request, or would like further information, please contact the TCCS FOI team on (02) 6207 2987 or email to [tccs.foi@act.gov.au](mailto:tccs.foi@act.gov.au).

Yours sincerely



Meghan Oldfield  
Information Officer

2 June 2022



**ACT**  
Government

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Transport Canberra and City Services

**PHILLIP AVENUE/ WINDEYER STREET, WATSON**

**BLACK SPOT FEASIBILITY STUDY**

**ROADS ACT**

**FINAL**

**RG 20060-2/ 0**

**03 SEPTEMBER 2020**



**Consulting Engineers**

# PHILLIP AVENUE/ WINDEYER STREET, WATSON

## BLACK SPOT FEASIBILITY STUDY

Prepared for Roads ACT

### Document Register

Revision	Date	Details	Author	Verifier	Approver
Draft	01/09/20	Draft report	■	■	■
0	03/09/20	Final report	■	■	■

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## 1. INTRODUCTION

### 1.1 Objective

R D Gossip (RDG) was commissioned by Roads ACT to undertake a Black Spot Feasibility study of the intersection of Phillip Avenue and Windeyer Street Watson, to assist in the assessment process for improvements under the Federal Black Spot Program.

### 1.2 The Brief

Specifically, the scope of the brief is to undertake the following:

- Produce a collision diagram of the crash data for the last five (5) years, with consideration of individual traffic lanes.
- Assess the traffic conditions and the extent that road conditions may be contributing to crashes.
- Day and night road safety audit checks of the surrounding environment.
- Document any deficiencies with current layouts for the volume of traffic passing through the site. Undertake an assessment in the short and medium term of traffic growth at each location, or other planning issues which may have a traffic impact.
- Develop practical options to address the deficiencies identified. While no detailed survey is required, service requirements or pavement defects should be identified and assessed. Options are to consider safe systems philosophy and specific needs of all road users including public transport, commercial vehicles, emergency vehicles, pedestrians, on-road cyclists and motorcyclists.
- Undertake a Safe System Infrastructure Assessment for all proposed options.
- Prepare a cost estimate for each option including preliminaries and contingencies (at least [REDACTED] Treatments that have no chance of being implemented under the Black Spot budget (due to likely financial limitations) should be still be considered and recommended for implementation under future Capital Works programs.
- Prepare the economic analysis (Benefit to Cost Ratio) for the agreed option using the base case as the "do nothing" situation. The analysis should consider the benefits and dis-benefits over the life of the improvement works, which can be assumed to be 10 years and Nett Present Value (NPV) @ 7% as per Roads ACT ratio matrix. The average costs of crashes by accident type are to be used in estimating the benefits which result from crash reductions.
- Works are to be undertaken in accordance with the latest versions of the following:
  - ACT Design Standards and specifications.
  - Relevant Austroads Guidelines.
  - Relevant current Australian Standards.

### 1.3 The Project Team

The client is Roads ACT. The Project Officer is Jayanthi Vikneson.

The RDG project team is:

[REDACTED]	Project Manager and Senior Traffic Engineer, Lead Level 3 Road Safety Auditor
[REDACTED]	Senior Designer and Level 2 Road Safety Auditor
[REDACTED]	Senior Draftsperson

### 1.4 Locality Plan



Figure 1-1 Locality Plan

Note that ACTMAPi has been used for all aerial photography used in this report.

## 2. EXISTING SITE CONDITIONS

### 2.1 Road Hierarchy

Phillip Avenue is classified as a Major Collector road in the ACT road network providing a link from North Canberra to the Federal Highway. There are property accesses on both sides of the road and parking is permitted on this section of Phillip Avenue. The road speed is signed at 60 km/h.



Photo 2-1 Phillip Avenue (northwest view south of the intersection with Windeyer Street)



Photo 2-2 Phillip Avenue (southeast view north of the intersection with Windeyer Street)

Windeyer Street is classified as a Major Collector road in the ACT road network. It provides access from Phillip Avenue to Watson. There are driveways on Windeyer Street near the intersection, however, on street parking is not permitted. The road speed is signed at 60 km/h.



**Photo 2-3 Windeyer Street (northeast view west of the intersection with Phillip Avenue)**

Phillip Avenue is classified as a Principal Cycle Training route by the Active Travel Infrastructure Practitioner Tool. There are no on-road cycle lanes near the intersection.

## **2.2 Geometric Layout**

### **2.2.1 Road Layout**

Phillip Avenue is a divided four-lane two-way road at the intersection with Windeyer Street. The median is kerbed and vegetated and circa 5 m wide (as shown in Photos 2-1 and 2-2).

Windeyer Street at the intersection is a divided three-lane two-way road. The median is kerbed and gravelled and circa 2.5 m wide (as shown in Photo 2-3).

### **2.2.2 Intersection Layout**

The intersection of Phillip Avenue with Windeyer Street is a signalised T-intersection. Below are the following properties of the intersection:

- The traffic signals have two signal phases, with delayed greens when the pedestrian crossing signals are activated.
- Pedestrian crossing phases are provided on each leg of the intersection;
- There is a driveway at the head of the T-intersection, with driveways located close to the intersection;
- A bus stop is located on the western side of Phillip Avenue circa 17 m north of the pedestrian cross walk lines;
- U-turns are permitted on Phillip Avenue at the traffic signals;
- There are no turn lanes on Phillip Avenue or separated turn signals; and

- The kerb side lane on Windeyer Street is a shared left and right turn lane.

The intersection layout is shown in Figure 2-1.



Figure 2-1 Intersection layout

### 2.3 Traffic Volumes

Traffic data was provided for the approaches to the intersection for the week starting 11 August 2019. The provided traffic data is provided in Table 2-1.

Table 2-1 Traffic Volumes and Speed Data

Towards	Weekday Average (vpd)	Weekday Average Speed (km/h)	Weekday 85 %ile Speed (km/h)
<b>Phillip Avenue (between Bradfield Street and May Street)</b>			
May Street (NWB)	2,975	58.7	65.6
Bradfield Street (SEB)	2,696	58.6	64.3
<b>Total Volume</b>	<b>5,671</b>		
<b>Windeyer Street (between Dobson Street and Burton Street)</b>			
Dobson Street (SWB)	1,858	52.5	59.8
Burton Street (NEB)	1,845	51.6	58.3
<b>Total Volume</b>	<b>3,893</b>		

The data indicates under 6,000 vehicles per day use Phillip Avenue and Windeyer Street. The traffic volumes are typical to a Major Collector road classification (between 3,001 and 6,000 daily vehicles).

Traffic volumes collected from the traffic signals indicate that the average weekday volume of vehicles per day travelling through the intersection is circa 9,100.

The following can be derived from the provided traffic data:

- The weekday peak periods were between 8:00 am and 9:00 am during the morning and 5:00 pm and 6:00 pm during the afternoon/ evening;
- The AM peak period indicated that the volumes in the southeast direction on Phillip Avenue are nearly triple the volume in the northwest direction. The PM peak period indicated that the volume in the northwest direction on Phillip Avenue was nearly double the volume in the southeast direction, and
- The speed data indicates that road users comply with the speed limit through the intersection.

## 2.4 Collision Statistics

A total of 13 collisions occurred in the five year period from 1 January 2015 to 31 December 2019 inclusive. These included five injury collisions requiring medical treatment.

An indicative guide to the performance of this intersection compared to the average for the ACT in 2017 can be obtained from the following approximate percentages for the ACT as a whole:

- approximately 10.14% of collisions occur in wet weather;
- approximately 23.51% occur in the peak hours, taken as 8.00-9.00 and 17.00-18.00.
- approximately 20.75% occur in the hours of darkness.

The collision history identified that:

- 2 collisions (15%) occurred in wet weather, above the average.
- 6 collisions (46%) occurred in the peak periods, above the average.
- No collisions occurred in hours of darkness.

Observations made during the inspections during peak periods indicate that some road users are accepting insufficient gaps in the traffic when turning right from Phillip Avenue into Windeyer Street (near-miss observed in the morning peak).

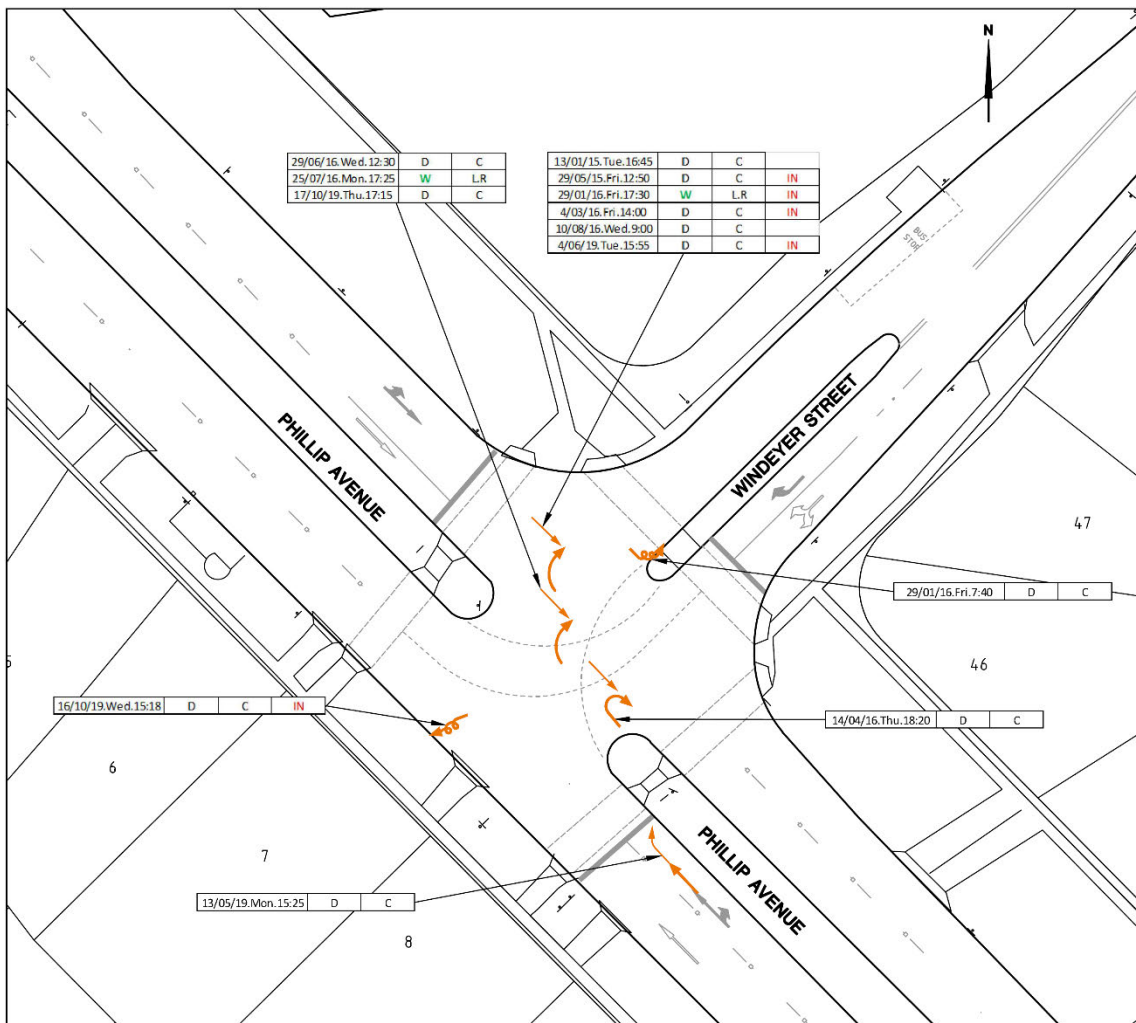
The highest collision statistic at the intersection over the five year period was 9 through southbound vehicles colliding with Phillip Avenue northbound right turning vehicles (RUM Code 202). The 4 of the 5 injuries that occurred at the intersection occurred between a Phillip Avenue southbound through vehicle and a Phillip Avenue northbound turning vehicle. The other injury occurred from a single vehicle losing control at the intersection.

There were no collisions involving pedestrians or cyclists.

Table 2-2 provides a collision factor matrix used to highlight particular recurring features of the collision history with a collision diagram provided in Figure 2-2.

Table 2-2 Crash Factor Matrix

DCA CODE Accident-type (Dominant ones first)	KEY DIRECTION (To)	NUMBER OF ACCIDENTS EACH YEAR					TOTAL for this combination of DCA Code & Key Direction	DIRECTION OF OTHER VEHICLE				SURFACE		Day			PERIOD			SEVERITY					
		2015	2016	2017	2018	2019		To North	To East	To South	To West	Dry	Wet	Weekday	Saturday	Sunday	Nigh time	AM Peak	Daytime	PM Peak	Fatality	Major Injury (admitted to hospital)	Minor Injury (received medical treatment)	Property Damage	
202	NB	2	5			2	9			9		7	2	9				1	4	4				4	5
207	NB		1				1			1		1		1				1							1
303	NB					1	1	2				1		1				1							1
70	WB					1	1					1		1				1					1		
706	SB		1				1					1		1				1							1
<b>TOTALS</b>		<b>2</b>	<b>7</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>13</b>	<b>2</b>	<b>0</b>	<b>10</b>	<b>0</b>	<b>11</b>	<b>2</b>	<b>13</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>7</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>5</b>	<b>8</b>	



ACCIDENT DATA PERIOD - 01/01/15 TO 31/12/19  
ABBREVIATION AND SYMBOL SCHEDULE

DAY	ROAD SURFACE	WEATHER	SEVERITY
MO : Monday	D : Dry	C : Clear	IN : Injury
TU : Tuesday	W ; Wet	O.C : Cloudy or Overcast	F : Fatal
WE : Wednesday	S : Snow or Ice	H.R : Heavy Rain	
TH : Thursday		L.R : Light Rain	
FR : Friday		FOG : FOG	
SA : Saturday			
SU : Sunday			

Figure 2-2 Collision diagram



## 2.5 Pedestrians

There are paths on all sides of the intersection, with pedestrian phases provided on each approach. The existing kerb ramps do not align correctly across the intersection and do not comply with current standards. The path desire line on the north eastern side of Phillip Avenue does not align with the signalised pedestrian crossing.

A mixed use business park is located on the northwest corner of the intersection, with the Watson local shops and the Majura Primary School located to the east of the intersection that would generate pedestrians through the intersection.



**Photo 2-4 Existing pedestrian crossing facilities**

There were no collisions involving pedestrians, however, it has been advised that there have been several near misses associated with pedestrians crossing Phillip Avenue on the northern side of the intersection and the dual right turn from Windeyer Street.

## 2.6 Cyclists

There are no on-road cycle lanes in the proximity to the intersection. Phillip Avenue is classified as a Principal Cycle Training route.

Multiple cyclists, including school children, were observed riding on the paths at the intersection and using the traffic signals to cross the road. There was some cyclist activity on the road.

There were no collisions involving cyclists.

## 2.7 Motorcyclists

There were no collisions involving motorcycles at this intersection.

## 2.8 Public Transport

Transport Canberra have two bus services that turn at the intersection. One service travels on Phillip Avenue (north) turning at Windeyer Street with circa 20 minutes bus intervals, and the other service travels on Phillip Avenue (south) turning at Windeyer Street with circa 15 minute bus intervals.

It was advised by Transport Canberra that no difficulties have been reported using the intersection.

## 2.9 Lateral Clearance Issues

The clear zone for a 60 km/h speed limit or less with traffic between 1,501 and 6,000 vehicles per day is 4.5 m for a flat verge. The following items are located in the clear zone:

- Several established trees in the verge on both sides of the road and the median on Phillip Avenue;
- Several established trees in the verge on the eastern side of the road on Windeyer Street;
- Overhead power poles (4.2 m from face of kerb) in the verge on the south side of Phillip Avenue;
- Frangible light columns in the median of Phillip Avenue and the eastern verge of Windeyer Street, and
- A concrete bus shelter on the north side of Phillip Avenue north of the intersection.

An onsite assessment of the Minimum Crossing Sight Distance (MGSD) (81 m for 60 km/h speed limit) identified that:

- The MGSD is achieved for vehicles turning right from Phillip Avenue into Windeyer Street, however, the trees in the median do create some visual obstruction, and
- The MGSD for vehicles performing U-turns at the intersection is also impacted by the trees in the verge.

## 2.10 Pavement

The pavement on the approaches to the intersection is cracked with some sections rutted. There are sections of the pavement that have been replaced.

The pavement on the approaches to the intersection require maintenance (likely replacement) to reduce the further damage (i.e. repair the pavement before it requires substantial remediation).



Photo 2-5 Existing pavement conditions

## 2.11 Traffic Control Devices

Pavement markings on the approach to and through the intersection are worn and require replacement. These should be undertaken as part of the pavement repair.



**Photo 2-6 Existing pavement markings condition**

## 2.12 Future Traffic Volumes

It is difficult to predict changes to traffic volumes through the intersection. There is a high potential that the volumes would exceed 6,000 vehicles per day in the near future with urban infill becoming more prevalent throughout established suburbs and as Gungahlin expands.

An increase of peak traffic volume at the intersection would increase the queue length and delay associated with turning movements at this intersections and possibly lead to future collisions. No known substantial increase is expected

### 3. DISCUSSION AND POSSIBLE IMPROVEMENTS

#### 3.1 General Overview

The collisions being experienced at this location meet the criteria set by the Commonwealth Department of Infrastructure for consideration within the Black Spot Program of a minimum of three injury collisions within a 5 year period.

The collision frequency at this intersection is around 0.78 Collisions per Million Entering Vehicles (C/MEV). This rate is considered high for a signalised T-intersection.

#### 3.2 Predominant Conflicts and Collisions

The collision data identifies that the most common class of collision involved vehicles colliding within the intersection (RUM Codes 20) at 77% (10 of 13), with 9 right turning - through collisions (RUM code 202) between northbound and southbound vehicles.

Several issues could have contributed to a number of these cross traffic collisions. These could be as follows;

- No separate right turn phase and dedicated right turn lane.
- Vehicles proceeding through the lights after they turn yellow/ red.
- Delays experienced by road users (including the queuing of vehicles) contributing to some road users accepting insufficient gaps in the traffic.
- Right turning vehicles are crossing two lanes of unopposed traffic travelling in one direction.
- Right turning vehicles accepting insufficient minimum gap sight distance when turning.
- Obscured visibility for turning vehicles due to the trees in the median.

Some drivers were observed taking risks during peak periods, whether associated with opposing traffic movements or driver hesitation and would turn at the intersection when there was an insufficient gap in the traffic, resulting in the approaching vehicles to having slow.

#### 3.3 Opportunities for Reduction of Historical Collisions

The focus of the proposed improvements are aimed at reducing the common collisions that occur at this intersection.

The four identified options that would assist in the reduction of these collisions are listed below. All these options include the signalisation of the right turn movement from Phillip Avenue into Windeyer Street. Minor changes to the opposing direction (i.e. provisions of a cycle lane/ wide shoulder) would be consistent for all options. It is also recommended to improve the existing signalised pedestrian facilities (e.g. compliant kerb ramps, correct path alignment, etc.).

Provide a right turn lane with signalised right turn arrow, through lane and marked shoulder

##### **Option 1 – Provide a right turn lane with a signal controlled right turn, a through lane and a marked shoulder in the existing pavement**

This option involves using the existing pavement to provide a right turn lane with a signal controlled right turn, a through lane and a marked shoulder.

A signal controlled right turn lane would reduce the number of collisions associated with the vehicles turning right from Phillip Avenue into Windeyer Street. The use of the existing pavement for this option would result in the removal of a through lane, reducing the hold line capacity of the intersection.

However, the provision of a wide shoulder would provide a facility for existing cyclists and some protection for residents using the driveways near the intersection.

This options would remove some of the on-street car parking near the intersection.

The provided traffic signal data for the intersection was used to undertake a preliminary SIDRA analysis of the operation of the intersection for this option. The signal data did not provide turn volumes, however, an assumption of 20% was applied for turning vehicles. Based on this assumption the intersection would operate satisfactorily during the peak periods with one through lane and one turning lane in the north west direction. This would require verification through the analysis based on intersection counts.

### **Option 2 – Provide a right turn lane with a signal controlled right turn and two through lanes in the existing pavement**

This option involves using the existing pavement to provide a right turn lane with a signal controlled right turn and two through lanes in the existing pavement. There is adequate width to provide a 3.7 m lane shared kerb side lane and two 3.2 m lanes.

This option would not impact the hold lane capacity.

This options would remove some of the on-street car parking near the intersection.

### **Option 3 – Provide a right turn lane (widening the existing pavement into the median) with a signal controlled right turn, two through lanes and a cycle lane**

This option requires civil works to widen the existing pavement into the median to provide the width for a cycle lane, two through lanes and a right turn lane.

This option is similar to option 2, however, provides an on-road cycle lane through the intersection and separation between driveways and the through traffic lane.

This option would likely require the removal of trees in the median (currently in the clear zone).

### **Option 4 – Split the phasing of the intersection, provide a cycle lane/ wide shoulder and two lanes in each direction on Phillip Avenue**

This option involves using the existing infrastructure with changes to the traffic signal operation and pavement markings. It would change the existing 2 phase signal operation to 3 phases, providing a green signal on only one approach at any one time.

The provided traffic signal data for the intersection was used to undertake a preliminary SIDRA analysis of the operation of the intersection for this option. Based on the spilt phasing the intersection would operate satisfactorily during the peak periods, however, would experience greater delays than the other options.

The Traffic Signal Unit of Roads ACT have advised that this option would not be supported. Therefore this option is not considered appropriate and has not been further assessed within this report.

## 4. SAFE SYSTEM INFRASTRUCTURE ASSESSMENT OF PROPOSED OPTIONS

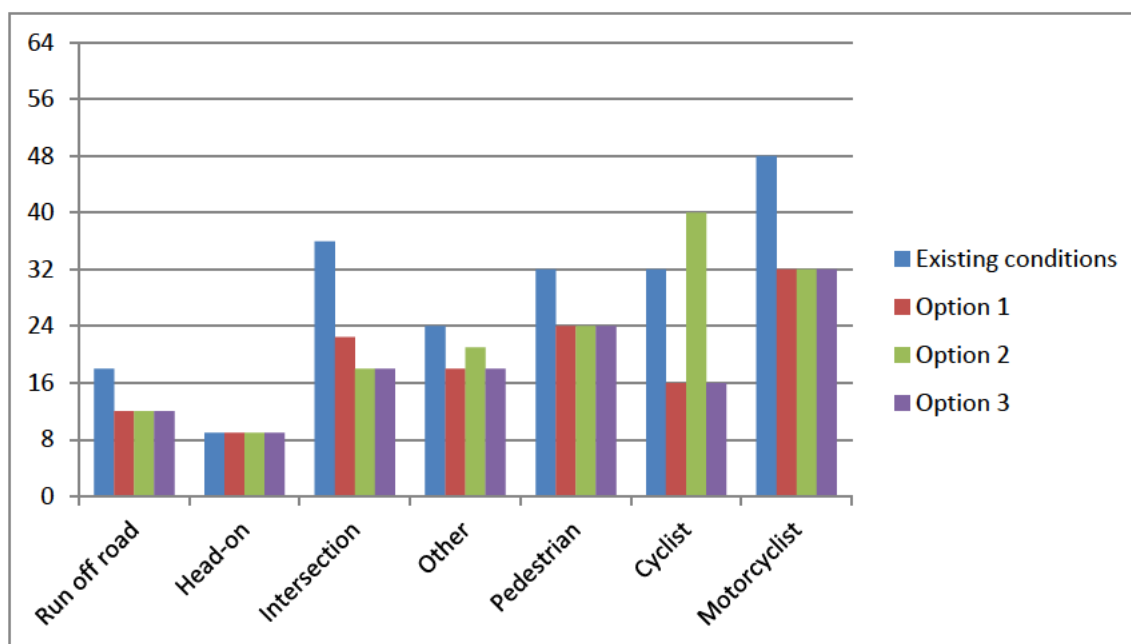
### 4.1 Assessment Summary

The Safe System Assessment (SSA) Matrix scoring was based on the Austroads Safe System Assessment Framework Table 4.4 Safe System matrix scoring system (refer Appendix 1).

The Safe System Assessment Matrix scores for the existing conditions and the proposed design options are shown in **Table 4-1**. The scores for each crash type are shown in **Figure 4-1**. The detailed assessments are presented in **Section 4.2**.

**Table 4-1 SSA Matrix Scores**

Option	Score
Existing conditions	199/448
Option 1 – Provide a right turn lane with a signal controlled right turn, a through lane and a marked shoulder in the existing pavement	133.5/448
Option 2 – Provide a right turn lane with a signal controlled right turn and two through lanes in the existing pavement	159/448
Option 3 – Provide a right turn lane (widening the existing pavement into the median) with a signal controlled right turn, two through lanes and a cycle lane	129/448



**Figure 4-1 Phillip Avenue/ Windeyer Street SSA Scores for Crash Types**

### 4.2 Safe System Assessment Matrices

The columns of the Safe System matrix show the crash types that represent the main crash and road user types that contribute to death and serious injury.

As scores vary along routes and between intersections, an average score is taken for the project as a whole. Detailed matrix assessments were undertaken to determine the overall scores.

Reference is made to *AP-R509-16 Table 4.2* which is used to quantify the risk rating scores, with *AP-R509-16 Table 4.4* used as a scoring index.

**Table 4-2 Phillip Avenue/ Windeyer Street Safe System Assessment Matrix – Existing Conditions**

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
<b>Exposure Comments:</b>	AADT between 5,000 and 10,000 veh/day	AADT between 5,000 and 10,000 veh/day	AADT between 5,000 and 10,000 veh/day	AADT between 5,000 and 10,000 veh/day	Pedestrian volumes are expected to be very high based on visual observations (> 100 units/ day).	Cyclists volumes are expected to be very high based on visual observations (> 100 units/ day).	For motorcyclist crash types, AADT is estimated to be greater than 100 vehicles per day
<b>Score:</b>	3/4	3/4	3/4	3/4	4/4	4/4	4/4
<b>Likelihood Comments:</b>	<p>Factors that <b>increase</b> the likelihood include:</p> <ul style="list-style-type: none"> <li>Run-off road associated with turning movements at the intersection.</li> <li>Current pavement conditions.</li> </ul> <p>Factors that <b>decrease</b> the likelihood include:</p> <ul style="list-style-type: none"> <li>Delineation by existing pavement markings.</li> <li>Straight approaches.</li> </ul>	<p>Factors that <b>increase</b> the likelihood include:</p> <ul style="list-style-type: none"> <li>Opportunity for a road user to turn into opposing traffic due to dual lanes in each direction.</li> </ul> <p>Factors that <b>decrease</b> the likelihood include:</p> <ul style="list-style-type: none"> <li>The road is divided at the intersection.</li> <li>Delineation by existing pavement markings.</li> </ul>	<p>Factors that <b>increase</b> the likelihood include:</p> <ul style="list-style-type: none"> <li>Vehicles crossing two lanes of traffic for right turn movements.</li> <li>No separate turn phase at the traffic signals.</li> <li>U-turns permitted on Phillip Avenue.</li> <li>Vegetation in median impedes sight distance.</li> </ul> <p>Factors that <b>decrease</b> the likelihood include:</p> <ul style="list-style-type: none"> <li>Signalised intersection assists in separating some movements.</li> </ul>	<p>Factors that <b>increase</b> the likelihood include:</p> <ul style="list-style-type: none"> <li>Driveways in the intersection.</li> <li>Visibility of driveways due to roadside vegetation.</li> <li>Dual right turn lane from Windeyer Street increases the opportunity for lane swiipe.</li> <li>Wide kerb side lane.</li> <li>On-street parking permitted close to intersection.</li> <li>Vehicles tailgating.</li> </ul> <p>Factors that <b>decrease</b> the likelihood include:</p> <ul style="list-style-type: none"> <li>Straight approaches.</li> <li>Delineation by existing pavement markings.</li> </ul>	<p>Factors that <b>increase</b> the likelihood include:</p> <ul style="list-style-type: none"> <li>Near a primary school.</li> <li>Route to shops</li> <li>60 km/h speed limit.</li> <li>Width of road.</li> <li>Condition of crossing facilities and path alignment.</li> <li>Driveways in the intersection.</li> </ul> <p>Factors that <b>decrease</b> the likelihood include:</p> <ul style="list-style-type: none"> <li>Signalised crossing with leading pedestrian phase when activated.</li> </ul>	<p>Factors that <b>increase</b> the likelihood include:</p> <ul style="list-style-type: none"> <li>No on-road cycle lane.</li> <li>On-street parking permitted close to intersection.</li> <li>Higher number of younger/ inexperienced cyclists due to proximity to a school.</li> </ul> <p>Factors that <b>decrease</b> the likelihood include:</p> <ul style="list-style-type: none"> <li>Wide kerb side lane.</li> <li>Signalised crossing with leading pedestrian phase when activated.</li> </ul>	<p>Factors that <b>increase</b> the likelihood include:</p> <ul style="list-style-type: none"> <li>Exposure of motorcycle crossing two lanes of traffic when turning right.</li> <li>Size of a motorcycle in contrast to passenger vehicles and thus more likely obscured by another vehicle, particularly in the turn lanes.</li> </ul> <p>Factors that <b>decrease</b> the likelihood include:</p> <ul style="list-style-type: none"> <li>Delineation by existing pavement markings.</li> </ul>
<b>Score:</b>	3/4	1/4	4/4	4/4	2/4	2/4	3/4
<b>Severity Comments:</b>	<p>Factors that <b>increase</b> the severity include:</p> <ul style="list-style-type: none"> <li>60 km/h speed limit.</li> <li>Non frangible obstructions in the clear zone.</li> </ul> <p>Factors that <b>decrease</b> the severity include:</p> <ul style="list-style-type: none"> <li>None.</li> </ul>	<p>Factors that <b>increase</b> the severity include:</p> <ul style="list-style-type: none"> <li>60 km/h speed limit.</li> </ul> <p>Factors that <b>decrease</b> the severity include:</p> <ul style="list-style-type: none"> <li>None.</li> </ul>	<p>Factors that <b>increase</b> the severity include:</p> <ul style="list-style-type: none"> <li>60 km/h speed limit.</li> <li>Right angle crashes</li> </ul> <p>Factors that <b>decrease</b> the severity include:</p> <ul style="list-style-type: none"> <li>None.</li> </ul>	<p>Factors that <b>increase</b> the severity include:</p> <ul style="list-style-type: none"> <li>60 km/h speed limit.</li> </ul> <p>Factors that <b>decrease</b> the severity include:</p> <ul style="list-style-type: none"> <li>None.</li> </ul>	<p>Factors that <b>increase</b> the severity include:</p> <ul style="list-style-type: none"> <li>60 km/h speed limit.</li> </ul> <p>Factors that <b>decrease</b> the severity include:</p> <ul style="list-style-type: none"> <li>None.</li> </ul>	<p>Factors that <b>increase</b> the severity include:</p> <ul style="list-style-type: none"> <li>60 km/h speed limit.</li> </ul> <p>Factors that <b>decrease</b> the severity include:</p> <ul style="list-style-type: none"> <li>None.</li> </ul>	<p>Factors that <b>increase</b> the severity include:</p> <ul style="list-style-type: none"> <li>60 km/h speed limit.</li> </ul> <p>Factors that <b>decrease</b> the severity include:</p> <ul style="list-style-type: none"> <li>None.</li> </ul>
<b>Score:</b>	2/4	3/4	3/4	2/4	4/4	4/4	4/4
<b>Product</b>	18/64	9/64	36/64	24/64	32/64	32/64	48/64
						<b>TOTAL</b>	<b>199/448</b>

Below is the legend for the following tables:

- Black text Common factor between this plan and the existing conditions
- ~~Strikethrough~~ Factor that is removed or significantly diminished between the existing conditions and this option
- *Blue italic text* New or significantly altered in this option compared to the existing conditions



**Table 4-3 Phillip Avenue/ Windeyer Street Safe System Assessment Matrix – Option 1 – Provide a right turn lane with a signal controlled right turn, a through lane and a marked shoulder in the existing pavement**

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
<b>Exposure Comments:</b>	AADT between 5,000 and 10,000 veh/day	AADT between 5,000 and 10,000 veh/day	AADT between 5,000 and 10,000 veh/day	AADT between 5,000 and 10,000 veh/day	Pedestrian volumes are expected to be very high based on visual observations (> 100 units/ day).	Cyclists volumes are expected to be very high based on visual observations (> 100 units/ day).	For motorcyclist crash types, AADT is estimated to be greater than 100 vehicles per day
<b>Score:</b>	3/4	3/4	3/4	3/4	4/4	4/4	4/4
<b>Likelihood Comments:</b>	<p>Factors that increase the likelihood include:</p> <ul style="list-style-type: none"> <li>Run-off road associated with turning movements at the intersection.</li> <li>Current pavement conditions.</li> </ul> <p>Factors that decrease the likelihood include:</p> <ul style="list-style-type: none"> <li>Delineation by existing pavement markings.</li> <li>Straight approaches.</li> <li><i>Narrow kerb side traffic lanes on the Phillip Avenue approach and through the intersection.</i></li> <li><i>Phillip Avenue traffic lanes moved further from the verge.</i></li> </ul>	<p>Factors that increase the likelihood include:</p> <ul style="list-style-type: none"> <li>Opportunity for a road user to turn into opposing traffic due to dual lanes in each direction.</li> </ul> <p>Factors that decrease the likelihood include:</p> <ul style="list-style-type: none"> <li>The road is divided at the intersection.</li> <li>Delineation by existing pavement markings.</li> </ul>	<p>Factors that increase the likelihood include:</p> <ul style="list-style-type: none"> <li>Vehicles crossing two lanes of traffic for right turn movements.</li> <li><del>No separate turn phase at the traffic signals.</del></li> <li>U-turns permitted on Phillip Avenue.</li> <li>Vegetation in median impedes sight distance.</li> <li><i>Potential for increased intersection delay due to reduced hold line capacity.</i></li> </ul> <p>Factors that decrease the likelihood include:</p> <ul style="list-style-type: none"> <li>Signalised intersection assists in separating some movements.</li> <li><i>Narrow kerb side traffic lanes on the approach and through the intersection.</i></li> <li><i>Provision of a right turn lane and right turn signal phase.</i></li> </ul>	<p>Factors that increase the likelihood include:</p> <ul style="list-style-type: none"> <li>Driveways in the intersection.</li> <li>Visibility of driveways due to roadside vegetation.</li> <li>Dual right turn lane from Windeyer Street increases the opportunity for lane swiipe.</li> <li><del>Wide kerb side lane.</del></li> <li>On-street parking permitted close to intersection.</li> <li>Vehicles tailgating.</li> </ul> <p>Factors that decrease the likelihood include:</p> <ul style="list-style-type: none"> <li>Straight approaches.</li> <li>Delineation by existing pavement markings.</li> <li><i>Wide shoulder on the approach and through the intersection that can be used for driveway access/ egress.</i></li> <li><i>Reduction of conflict with the removal of the dual right turn from Windeyer Street.</i></li> </ul>	<p>Factors that increase the likelihood include:</p> <ul style="list-style-type: none"> <li>Near a primary school.</li> <li>Route to shops</li> <li>60 km/h speed limit.</li> <li>Width of road.</li> <li><del>Condition of crossing facilities and path alignment.</del></li> <li>Driveways in the intersection.</li> </ul> <p>Factors that decrease the likelihood include:</p> <ul style="list-style-type: none"> <li>Signalised crossing with leading pedestrian phase when activated.</li> <li><i>Improved crossing facilities.</i></li> <li><i>Reduction of conflict with the removal of the dual right turn from Windeyer Street.</i></li> </ul>	<p>Factors that increase the likelihood include:</p> <ul style="list-style-type: none"> <li><del>No on road cycle lane.</del></li> <li>On-street parking permitted close to intersection.</li> <li>Higher number of younger/ inexperienced cyclists due to proximity to a school.</li> </ul> <p>Factors that decrease the likelihood include:</p> <ul style="list-style-type: none"> <li><del>Wide kerb side lane.</del></li> <li>Signalised crossing with leading pedestrian phase when activated.</li> <li><i>On-road cycle lane.</i></li> <li><i>Improved crossing facilities.</i></li> <li><i>Reduction of conflict with the removal of the dual right turn from Windeyer Street.</i></li> </ul>	<p>Factors that increase the likelihood include:</p> <ul style="list-style-type: none"> <li>Exposure of motorcycle crossing two lanes of traffic when turning right.</li> <li>Size of a motorcycle in contrast to passenger vehicles and thus more likely obscured by another vehicle, particularly in the turn lanes.</li> </ul> <p>Factors that decrease the likelihood include:</p> <ul style="list-style-type: none"> <li>Delineation by existing pavement markings.</li> <li><i>Narrow kerb side traffic lanes on the approach and through the intersection.</i></li> <li><i>Provision of a right turn lane and right turn signal phase.</i></li> </ul>
<b>Score:</b>	2/4	1/4	2.5/4	3/4	1.5/4	1/4	2/4
<b>Severity Comments:</b>	<p>Factors that increase the severity include:</p> <ul style="list-style-type: none"> <li>60 km/h speed limit.</li> <li>Non frangible obstructions in the clear zone.</li> </ul> <p>Factors that decrease the severity include:</p> <ul style="list-style-type: none"> <li>None.</li> </ul>	<p>Factors that increase the severity include:</p> <ul style="list-style-type: none"> <li>60 km/h speed limit.</li> </ul> <p>Factors that decrease the severity include:</p> <ul style="list-style-type: none"> <li>None.</li> </ul>	<p>Factors that increase the severity include:</p> <ul style="list-style-type: none"> <li>60 km/h speed limit.</li> <li>Right angle crashes</li> </ul> <p>Factors that decrease the severity include:</p> <ul style="list-style-type: none"> <li>None.</li> </ul>	<p>Factors that increase the severity include:</p> <ul style="list-style-type: none"> <li>60 km/h speed limit.</li> </ul> <p>Factors that decrease the severity include:</p> <ul style="list-style-type: none"> <li>None.</li> </ul>	<p>Factors that increase the severity include:</p> <ul style="list-style-type: none"> <li>60 km/h speed limit.</li> </ul> <p>Factors that decrease the severity include:</p> <ul style="list-style-type: none"> <li>None.</li> </ul>	<p>Factors that increase the severity include:</p> <ul style="list-style-type: none"> <li>60 km/h speed limit.</li> </ul> <p>Factors that decrease the severity include:</p> <ul style="list-style-type: none"> <li>None.</li> </ul>	<p>Factors that increase the severity include:</p> <ul style="list-style-type: none"> <li>60 km/h speed limit.</li> </ul> <p>Factors that decrease the severity include:</p> <ul style="list-style-type: none"> <li>None.</li> </ul>
<b>Score:</b>	2/4	3/4	3/4	2/4	4/4	4/4	4/4
<b>Product</b>	12/64	9/64	22.5/64	18/64	24/64	16/64	32/64
	<b>TOTAL</b>						<b>133.5/448</b>

**Table 4-4 Phillip Avenue/ Windeyer Street Safe System Assessment Matrix – Option 2 – Provide a right turn lane with a signal controlled right turn and two through lanes in the existing pavement**

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
<b>Exposure Comments:</b>	AADT between 5,000 and 10,000 veh/day	AADT between 5,000 and 10,000 veh/day	AADT between 5,000 and 10,000 veh/day	AADT between 5,000 and 10,000 veh/day	Pedestrian volumes are expected to be very high based on visual observations (> 100 units/ day).	Cyclists volumes are expected to be very high based on visual observations (> 100 units/ day).	For motorcyclist crash types, AADT is estimated to be greater than 100 vehicles per day
<b>Score:</b>	3/4	3/4	3/4	3/4	4/4	4/4	4/4
<b>Likelihood Comments:</b>	<p>Factors that <b>increase</b> the likelihood include:</p> <ul style="list-style-type: none"> <li>Run-off road associated with turning movements at the intersection.</li> <li>Current pavement conditions.</li> </ul> <p>Factors that <b>decrease</b> the likelihood include:</p> <ul style="list-style-type: none"> <li>Delineation by existing pavement markings.</li> <li>Straight approaches.</li> <li><i>Narrow kerb side traffic lanes on the Phillip Avenue approach and through the intersection.</i></li> <li><i>Eastbound Phillip Avenue traffic lanes moved further from the verge.</i></li> </ul>	<p>Factors that <b>increase</b> the likelihood include:</p> <ul style="list-style-type: none"> <li>Opportunity for a road user to turn into opposing traffic due to dual lanes in each direction.</li> </ul> <p>Factors that <b>decrease</b> the likelihood include:</p> <ul style="list-style-type: none"> <li>The road is divided at the intersection.</li> <li>Delineation by existing pavement markings.</li> </ul>	<p>Factors that <b>increase</b> the likelihood include:</p> <ul style="list-style-type: none"> <li>Vehicles crossing two lanes of traffic for right turn movements.</li> <li><del>No separate turn phase at the traffic signals.</del></li> <li>U-turns permitted on Phillip Avenue.</li> <li>Vegetation in median impedes sight distance.</li> </ul> <p>Factors that <b>decrease</b> the likelihood include:</p> <ul style="list-style-type: none"> <li>Signalised intersection assists in separating some movements.</li> <li><i>Narrow kerb side traffic lanes on the approach and through the intersection.</i></li> <li><i>Provision of a right turn lane and right turn signal phase.</i></li> </ul>	<p>Factors that <b>increase</b> the likelihood include:</p> <ul style="list-style-type: none"> <li>Driveways in the intersection.</li> <li>Visibility of driveways due to roadside vegetation.</li> <li>Dual right turn lane from Windeyer Street increases the opportunity for lane swipe.</li> <li><del>Wide kerb side lane.</del></li> <li>On-street parking permitted close to intersection.</li> <li>Vehicles tailgating.</li> <li><i>Decreased width of westbound kerbside lane increases the likelihood of collision between through vehicle and driveway vehicle movement and increases the risk of collision with objects in the clear zone.</i></li> </ul> <p>Factors that <b>decrease</b> the likelihood include:</p> <ul style="list-style-type: none"> <li>Straight approaches.</li> <li>Delineation by existing pavement markings.</li> <li><i>Reduction of conflict with the removal of the dual right turn from Windeyer Street.</i></li> </ul>	<p>Factors that <b>increase</b> the likelihood include:</p> <ul style="list-style-type: none"> <li>Near a primary school.</li> <li>Route to shops</li> <li>60 km/h speed limit.</li> <li>Width of road.</li> <li><del>Condition of crossing facilities and path alignment.</del></li> <li>Driveways in the intersection.</li> </ul> <p>Factors that <b>decrease</b> the likelihood include:</p> <ul style="list-style-type: none"> <li>Signalised crossing with leading pedestrian phase when activated.</li> <li><i>Improved crossing facilities.</i></li> <li><i>Reduction of conflict with the removal of the dual right turn from Windeyer Street.</i></li> </ul>	<p>Factors that <b>increase</b> the likelihood include:</p> <ul style="list-style-type: none"> <li>No on-road cycle lane.</li> <li>On-street parking permitted close to intersection.</li> <li>Higher number of younger/ inexperienced cyclists due to proximity to a school.</li> <li><i>Shared cycle lane</i></li> </ul> <p>Factors that <b>decrease</b> the likelihood include:</p> <ul style="list-style-type: none"> <li><del>Wide kerb side lane.</del></li> <li>Signalised crossing with leading pedestrian phase when activated.</li> <li><i>Improved crossing facilities.</i></li> <li><i>Reduction of conflict with the removal of the dual right turn from Windeyer Street.</i></li> </ul>	<p>Factors that <b>increase</b> the likelihood include:</p> <ul style="list-style-type: none"> <li>Exposure of motorcycle crossing two lanes of traffic when turning right.</li> <li>Size of a motorcycle in contrast to passenger vehicles and thus more likely obscured by another vehicle, particularly in the turn lanes.</li> </ul> <p>Factors that <b>decrease</b> the likelihood include:</p> <ul style="list-style-type: none"> <li>Delineation by existing pavement markings.</li> <li><i>Narrow kerb side traffic lanes on the approach and through the intersection.</i></li> <li><i>Decreased width of westbound kerbside lane increases the likelihood of collision between through vehicle and driveway vehicle movement and increases the risk of collision with objects in the clear zone.</i></li> <li><i>Provision of a right turn lane and right turn signal phase.</i></li> </ul>
<b>Score:</b>	2/4	1/4	2/4	3.5/4	1.5/4	2.5/4	2/4
<b>Severity Comments:</b>	<p>Factors that <b>increase</b> the severity include:</p> <ul style="list-style-type: none"> <li>60 km/h speed limit.</li> <li>Non frangible obstructions in the clear zone.</li> </ul> <p>Factors that <b>decrease</b> the severity include:</p> <ul style="list-style-type: none"> <li>None.</li> </ul>	<p>Factors that <b>increase</b> the severity include:</p> <ul style="list-style-type: none"> <li>60 km/h speed limit.</li> </ul> <p>Factors that <b>decrease</b> the severity include:</p> <ul style="list-style-type: none"> <li>None.</li> </ul>	<p>Factors that <b>increase</b> the severity include:</p> <ul style="list-style-type: none"> <li>60 km/h speed limit.</li> <li>Right angle crashes</li> </ul> <p>Factors that <b>decrease</b> the severity include:</p> <ul style="list-style-type: none"> <li>None.</li> </ul>	<p>Factors that <b>increase</b> the severity include:</p> <ul style="list-style-type: none"> <li>60 km/h speed limit.</li> </ul> <p>Factors that <b>decrease</b> the severity include:</p> <ul style="list-style-type: none"> <li>None.</li> </ul>	<p>Factors that <b>increase</b> the severity include:</p> <ul style="list-style-type: none"> <li>60 km/h speed limit.</li> </ul> <p>Factors that <b>decrease</b> the severity include:</p> <ul style="list-style-type: none"> <li>None.</li> </ul>	<p>Factors that <b>increase</b> the severity include:</p> <ul style="list-style-type: none"> <li>60 km/h speed limit.</li> </ul> <p>Factors that <b>decrease</b> the severity include:</p> <ul style="list-style-type: none"> <li>None.</li> </ul>	<p>Factors that <b>increase</b> the severity include:</p> <ul style="list-style-type: none"> <li>60 km/h speed limit.</li> </ul> <p>Factors that <b>decrease</b> the severity include:</p> <ul style="list-style-type: none"> <li>None.</li> </ul>
<b>Score:</b>	2/4	3/4	3/4	2/4	4/4	4/4	4/4
<b>Product</b>	12/64	9/64	18/64	21/64	24/64	40/64	32/64
						<b>TOTAL</b>	<b>156/448</b>

**Table 4-5 Phillip Avenue/ Windeyer Street Safe System Assessment Matrix – Option 3 – Provide a right turn lane (widening the existing pavement into the median) with a signal controlled right turn, two through lanes and a cycle lane**

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
<b>Exposure Comments:</b>	AADT between 5,000 and 10,000 veh/day	AADT between 5,000 and 10,000 veh/day	AADT between 5,000 and 10,000 veh/day	AADT between 5,000 and 10,000 veh/day	Pedestrian volumes are expected to be very high based on visual observations (> 100 units/ day).	Cyclists volumes are expected to be very high based on visual observations (> 100 units/ day).	For motorcyclist crash types, AADT is estimated to be greater than 100 vehicles per day
<b>Score:</b>	3/4	3/4	3/4	3/4	4/4	4/4	4/4
<b>Likelihood Comments:</b>	<p>Factors that increase the likelihood include:</p> <ul style="list-style-type: none"> <li>Run-off road associated with turning movements at the intersection.</li> <li>Current pavement conditions.</li> </ul> <p>Factors that decrease the likelihood include:</p> <ul style="list-style-type: none"> <li>Delineation by existing pavement markings.</li> <li>Straight approaches.</li> <li><i>Narrow kerb side traffic lanes on the Phillip Avenue approach and through the intersection.</i></li> <li><i>Removal of trees in the median</i></li> <li><i>Eastbound Phillip Avenue traffic lanes moved further from the verge</i></li> </ul>	<p>Factors that increase the likelihood include:</p> <ul style="list-style-type: none"> <li>Opportunity for a road user to turn into opposing traffic due to dual lanes in each direction.</li> </ul> <p>Factors that decrease the likelihood include:</p> <ul style="list-style-type: none"> <li>The road is divided at the intersection.</li> <li>Delineation by existing pavement markings.</li> </ul>	<p>Factors that increase the likelihood include:</p> <ul style="list-style-type: none"> <li>Vehicles crossing two lanes of traffic for right turn movements.</li> <li><del>No separate turn phase at the traffic signals.</del></li> <li>U-turns permitted on Phillip Avenue.</li> <li>Vegetation in median impedes sight distance.</li> </ul> <p>Factors that decrease the likelihood include:</p> <ul style="list-style-type: none"> <li>Signalised intersection assists in separating some movements.</li> <li><i>Narrow kerb side traffic lanes on the approach and through the intersection.</i></li> <li><i>Provision of a right turn lane and right turn signal phase.</i></li> </ul>	<p>Factors that increase the likelihood include:</p> <ul style="list-style-type: none"> <li>Driveways in the intersection.</li> <li>Visibility of driveways due to roadside vegetation.</li> <li>Dual right turn lane from Windeyer Street increases the opportunity for lane swipe.</li> <li><del>Wide kerb side lane.</del></li> <li>On-street parking permitted close to intersection.</li> <li>Vehicles tailgating.</li> </ul> <p>Factors that decrease the likelihood include:</p> <ul style="list-style-type: none"> <li>Straight approaches.</li> <li>Delineation by existing pavement markings.</li> <li><i>Wide shoulder on the approach and through the intersection that can be used for driveway access/ egress.</i></li> <li><i>Reduction of conflict with the removal of the dual right turn from Windeyer Street.</i></li> </ul>	<p>Factors that increase the likelihood include:</p> <ul style="list-style-type: none"> <li>Near a primary school.</li> <li>Route to shops</li> <li>60 km/h speed limit.</li> <li>Width of road.</li> <li><del>Condition of crossing facilities and path alignment.</del></li> <li>Driveways in the intersection.</li> </ul> <p>Factors that decrease the likelihood include:</p> <ul style="list-style-type: none"> <li>Signalised crossing with leading pedestrian phase when activated.</li> <li><i>Improved crossing facilities.</i></li> <li><i>Reduction of conflict with the removal of the dual right turn from Windeyer Street.</i></li> </ul>	<p>Factors that increase the likelihood include:</p> <ul style="list-style-type: none"> <li><del>No on road cycle lane.</del></li> <li>On-street parking permitted close to intersection.</li> <li>Higher number of younger/ inexperienced cyclists due to proximity to a school.</li> </ul> <p>Factors that decrease the likelihood include:</p> <ul style="list-style-type: none"> <li><del>Wide kerb side lane.</del></li> <li>Signalised crossing with leading pedestrian phase when activated.</li> <li><i>On-road cycle lane.</i></li> <li><i>Improved crossing facilities.</i></li> <li><i>Reduction of conflict with the removal of the dual right turn from Windeyer Street.</i></li> </ul>	<p>Factors that increase the likelihood include:</p> <ul style="list-style-type: none"> <li>Exposure of motorcycle crossing two lanes of traffic when turning right.</li> <li>Size of a motorcycle in contrast to passenger vehicles and thus more likely obscured by another vehicle, particularly in the turn lanes.</li> </ul> <p>Factors that decrease the likelihood include:</p> <ul style="list-style-type: none"> <li>Delineation by existing pavement markings.</li> <li><i>Narrow kerb side traffic lanes on the approach and through the intersection.</i></li> <li><i>Provision of a right turn lane and right turn signal phase.</i></li> </ul>
<b>Score:</b>	2/4	1/4	2/4	3/4	1.5/4	1/4	2/4
<b>Severity Comments:</b>	<p>Factors that increase the severity include:</p> <ul style="list-style-type: none"> <li>60 km/h speed limit.</li> <li>Non frangible obstructions in the clear zone.</li> </ul> <p>Factors that decrease the severity include:</p> <ul style="list-style-type: none"> <li>None.</li> </ul>	<p>Factors that increase the severity include:</p> <ul style="list-style-type: none"> <li>60 km/h speed limit.</li> </ul> <p>Factors that decrease the severity include:</p> <ul style="list-style-type: none"> <li>None.</li> </ul>	<p>Factors that increase the severity include:</p> <ul style="list-style-type: none"> <li>60 km/h speed limit.</li> <li>Right angle crashes</li> </ul> <p>Factors that decrease the severity include:</p> <ul style="list-style-type: none"> <li>None.</li> </ul>	<p>Factors that increase the severity include:</p> <ul style="list-style-type: none"> <li>60 km/h speed limit.</li> </ul> <p>Factors that decrease the severity include:</p> <ul style="list-style-type: none"> <li>None.</li> </ul>	<p>Factors that increase the severity include:</p> <ul style="list-style-type: none"> <li>60 km/h speed limit.</li> </ul> <p>Factors that decrease the severity include:</p> <ul style="list-style-type: none"> <li>None.</li> </ul>	<p>Factors that increase the severity include:</p> <ul style="list-style-type: none"> <li>60 km/h speed limit.</li> </ul> <p>Factors that decrease the severity include:</p> <ul style="list-style-type: none"> <li>None.</li> </ul>	<p>Factors that increase the severity include:</p> <ul style="list-style-type: none"> <li>60 km/h speed limit.</li> </ul> <p>Factors that decrease the severity include:</p> <ul style="list-style-type: none"> <li>None.</li> </ul>
<b>Score:</b>	2/4	3/4	3/4	2/4	4/4	4/4	4/4
<b>Product</b>	12/64	9/64	18/64	18/64	24/64	16/64	32/64
<b>TOTAL</b>							<b>129/448</b>

### 4.3 Safer Vehicles, People and Post-Crash Care

Table 4-6 provides a general high level overview of additional safe systems components associated with the assessed roads.

**Table 4-6 Additional Safe System Component**

Pillar	Prompt	Comment
Road User	Are road users likely to be alert and compliant, or are there factors that might influence this?	<ul style="list-style-type: none"> <li>The intersection is clearly signed on approach</li> <li>The straight dual lane approaches to the intersection could result in drivers exceeding the speed limit.</li> </ul>
	What are the expected compliance and enforcement levels (alcohol/drugs, speed, road rules, and driving hours) and what is the likelihood of driver fatigue? Can enforcement of these issues be conducted safely?	<ul style="list-style-type: none"> <li>There is potential for road users to use this road when travelling from an event/ club, etc. home and may be under the influence. However, this would occur network wide and should be addressed correspondingly.</li> <li>The straight dual lane approaches to the intersection can result in higher speeds. Suitable verge and median width for a mobile speed camera.</li> </ul>
	Are there special road uses (e.g. entertainment precincts, elderly, children, on-road activities), distraction by environmental factors (e.g. commerce, tourism), or risk-taking behaviours?	<ul style="list-style-type: none"> <li>Used got access into Watson, including access to Majura Primary School and the Watson shops.</li> <li>Right turn movements are a higher level of risk due to no separate signalised movement and dual lane crossing.</li> </ul>
Vehicle	What level of alignment is there with the ideal of safer vehicles?	<ul style="list-style-type: none"> <li>There is nothing to indicate this project contravenes the ideals of safer vehicles.</li> </ul>
	Are there factors which might attract large numbers of unsafe vehicles? Is the percentage of heavy vehicles too high for the proposed/existing road design?	<ul style="list-style-type: none"> <li>The distribution of vehicle types will likely remain.</li> <li>Intersection used for public transport with multiple services turning at the intersection.</li> </ul>
	Are there enforcement resources in the area to detect non-roadworthy, overloaded or unregistered vehicles and thus remove them from the network? Can enforcement of these issues be conducted safely?	<ul style="list-style-type: none"> <li>Inspections of vehicle roadworthy are undertaken network wide. Potential to undertake additional reviews network wide at locations where compliance could be an issue.</li> <li>Nothing constrains enforcement.</li> </ul>
	Has vehicle breakdown been catered for?	<ul style="list-style-type: none"> <li>The trafficable width of the road provides sufficient width for a stopped vehicle and two way movements.</li> </ul>
Post-crash care	Are there issues that might influence safe and efficient post-crash care in the event of a severe injury?	<ul style="list-style-type: none"> <li>No identified issues.</li> </ul>
	Do emergency and medical services operate as efficiently and rapidly as possible?	<ul style="list-style-type: none"> <li>It is assumed that there would be an efficient post-crash response and care.</li> </ul>
	Are other road users and emergency response teams protected during a crash event? Are drivers provided the correct information to address travelling speeds on the approach and adjacent to the incident? Is there reliable information available via radio, VMS etc.?	<ul style="list-style-type: none"> <li>Opportunity to close the road where the event occurred with minimal impact to road users.</li> <li>A detour of road users could be implemented.</li> </ul>
	Is there provision for e-safety (i.e. safety systems based on modern information and communication technologies, C-ITS)?	<ul style="list-style-type: none"> <li>Not applicable for this location due to the road side environment.</li> </ul>

## 5. PROPOSED IMPROVEMENTS

### 5.1 Option 1, 2 and 3 – Signalise the right turn with additional improvements

These options have the potential to reduce the number of collisions from opposing turns that are occurring. A signalised right turn can be expected to reduce collisions from opposing turns by 45% (based on Austroads Guide to Road Safety Part 8 Treatment of Crash Locations, Appendix F). The expected reduction will provide the same benefit for Options 1, 2 and 3.

A preliminary assessment of the economic worth of these options has been undertaken using assumptions detailed in the following section.

Preliminary estimates of the cost (excluding GST, including site works, ■■■■ consultancy fees and ■■■■ contingency) for each option are:

Option 1 – Provide a right turn lane with a signal controlled right turn, a through lane and a marked shoulder in the existing pavement	\$417,443
Option 2 – Provide a right turn lane with a signal controlled right turn and two through lanes in the existing pavement	\$410,813
Option 3 – Provide a right turn lane (widening the existing pavement into the median) with a signal controlled right turn, two through lanes and a cycle lane	\$524,580

The cost estimates of the above options are provided in Appendix 1 and include the repair of the pavement through the intersection due to the current poor pavement condition. If the pavement is repaired as part of road maintenance the above costs would significantly reduce.

Preliminary estimates of the cost (excluding GST, including site works, ■■■■ consultancy fees and ■■■■ contingency) that exclude pavement rehabilitation for each option are:

Option 1 – Provide a right turn lane with a signal controlled right turn, a through lane and a marked shoulder in the existing pavement	\$116,813
Option 2 – Provide a right turn lane with a signal controlled right turn and two through lanes in the existing pavement	\$110,183
Option 3 – Provide a right turn lane (widening the existing pavement into the median) with a signal controlled right turn, two through lanes and a cycle lane	\$199,915

The cost estimates of the above options are provided in Appendix 1 and sketch plans provided in Appendix 2.

The cost estimates excluding pavement works have been used in the BCR assessment.

### 5.2 BCR Assessment

The following details the financial assessment of the costs and benefits of undertaking these modifications based on the projected extent of the reduction in accidents due to the modifications. Assumptions used in our assessments and in particular for the potential benefits for the Phillip Avenue/ Windeyer Street intersection are detailed below.

Roads ACT has provided the following summary data in relation to the cost of various types of collisions in the ACT.

**Table 5-1 2018 Crash Cost Estimates for Different Crash Type Codes**

Crash Type Code	ACT Equivalent Crash Types	Description	Costs (\$)	
			HC <sup>1</sup>	WTP <sup>2</sup>
001-009	10,16	Vehicle Hits Pedestrian	196,736	232,760
101-109	2	Adjacent Approaches	33,442	38,310
201	4,5	Head On	196,953	344,339
202	1	Right Turn into Oncoming Vehicle	50,940	54,677
203-207	9	Opposing Turns	21,510	20,186
301-304	6	Rear End	13,046	14,371
305-309	3,9	Lane Change/ Side Swipe	15,974	17,155
401-403	9	Hit Parked / Parking Vehicle	11,734	14,297
404	8	Reversing into Traffic	11,354	11,206
405	12,19	Reversing into Fixed Object	10,079	10,079
406-408	9	Leaving Driveway/Footway	16,950	19,876
501-506	9,15,19,20,21	Overtaking	48,234	93,069
601,602,604	7	Hit Parked Vehicle	13,663	13,569
603	9	Collision with Broken Down Vehicle	36,750	35,238
605-607	12	On Path, Hit Object	35,518	32,864
609	11	Struck Animal	13,623	13,406
610	15	Loads Hit Vehicle	10,658	11,027
701-708	13,15,19,20,21	Loss of Control on Straight- L or R turns	56,481	83,587
801-805,808	13,15,19,20,21	Loss of Control on Curve - L or R turns	69,533	102,776
901	14	Fell from Moving Vehicle	1,019,477	2,356,764
902-907	01 to 22	Miscellaneous	58,108	121,375
Other e.g. 07, 08	01 to 22	Other	34,356	32,279

**Table 5-2 2015 Average crash costs by crash severity**

Costs by crash type	Costs (\$)	
	HC <sup>1</sup>	WTP <sup>2</sup>
Fatal crashes	2,960,016	8,607,544
Serious injury crashes	765,311	643,416
Minor injury crashes	29,556	40,799
Property Damage Only crashes	10,079	10,079

Note: 1 – Human Capital (HC), 2 – Willingness-to-pay (WTP)

The above costs are calculated using accident records for the period of 2014-2018. In the calculation of BCR the Willingness-to-pay costs are used, with the Human Capital cost provided for comparison.

Assumptions of the effectiveness of countermeasures in reducing recorded accidents were taken from the Austroads publication Guide to Road Safety Part 8 Treatment of Crash Locations, Appendix F.

The assessment of the value of collision reductions due to improvement treatments at the intersection is summarised in the table below:

Accident Type	Number Recorded in 5 years	Annual Accident Cost		Proportion Reduction	Annual Benefit	
		HC	WTP		HC	WTP
<b>Option 1, 2 and 3 – Signalise the right turn with additional improvements</b>						
202 Opposing Turns - thru-right	9	\$91,692	\$98,419	0.45	\$41,261	\$44,288
207 Opposing Turns – U-turn	1	\$4,302	\$4,037	0.45	\$1,936	\$1,817
<b>TOTAL</b>					<b>\$43,197</b>	<b>\$46,105</b>

The analysis indicated the following BCR and net present value (at 7% over 10 years) for the treatments with both Human Capital costs and Willingness-to-Pay. The analysis is based on the pavement rehabilitation being undertaken by Road Maintenance. This is due to the analysis inclusive of the pavement rehabilitation costs indicated that there would not be benefit gained from any option.

Treatment	Approach	Estimated Costs	NPV	NPV/Capital Cost	BCR
Option 1 – Provide a right turn lane with a signal controlled right turn, a through lane and a marked shoulder in the existing pavement	HC	\$116,813	\$193,876	1.66	2.77
	WTP		\$214,300	1.83	2.96
Option 2 – Provide a right turn lane with a signal controlled right turn and two through lanes in the existing pavement	HC	\$110,183	\$200,072	1.82	2.94
	WTP		\$220,497	2.00	3.13
Option 3 – Provide a right turn lane (widening the existing pavement into the median) with a signal controlled right turn, two through lanes and a cycle lane	HC	\$198,915	\$117,145	0.59	1.63
	WTP		\$137,569	0.69	1.74

The analysis indicates that there would be benefit gained from each of the proposed options. Note that BCR values have been provided for both HC and WTP approaches for comparison. However, as the WTP approach is adopted for the Black Spot Program these values are further commented in Section 6.

The BCR calculations are provided in Appendix 3.

### 5.3 Audit related modifications

The pavement condition has been identified as need of repair and has been assumed that Road Maintenance will repair the pavement prior to the implementation of the selected option.

The provided options include the realignment of the kerb ramps crossing Windeyer Street and the approach on the eastern side of Phillip Avenue.

The consolidation of the blocks that have driveways in or near the intersection, or an easement away from the intersection, would improve safety for all users.



## **6. RECOMMENDATIONS**

### **6.1 Modifications Addressing Historical collisions.**

The analysis indicates that each of the proposed options would result in adequate benefit gained, with the results indicating that providing a signal controlled right turn with a short right turn lane and two through lanes (Option 2) has the highest BCR.

However, this option would remove on street parking and push the through lane closer to the verge and driveways. It also removes the ability for on-road cyclists to use a marked shoulder. Based on the SSA results, Option 1 is considered the preferred option. Due to the difference between the costs and BCR, it is considered that Option 1 is considered the most suitable treatment for this intersection.

### **6.2 Modifications Addressing Potential Collisions**

The options provided in this feasibility study have addressed the identified audit findings at the intersection.

**APPENDIX 1 ESTIMATED COSTS**

**Option 1 – Provide a right turn lane with a signal controlled right turn, a through lane and a marked shoulder in the existing pavement**

	Inclusive of pavement repair	Exclusive of pavement repair
0 General	[REDACTED]	[REDACTED]
1 Provision for Traffic		
2 Earthworks		
3 Underground Services		
4 Flexible Pavement Construction		
6 Concrete Kerbs, Footpaths and Minor Works		
8 Incidental Works		
9 Landscape		
10 Road Signs		
11 Pavement Marking		
13 Traffic Signals		
14 Street Lighting		
Total (Excluding GST)		
Add Design & Superintendence Fees (██████)		
Add Contingency (██████)		
<b>TOTAL (Excluding GST)</b>	<b>\$417,443</b>	<b>\$116,813</b>

**Option 2 – Provide a right turn lane with a signal controlled right turn and two through lanes in the existing pavement**

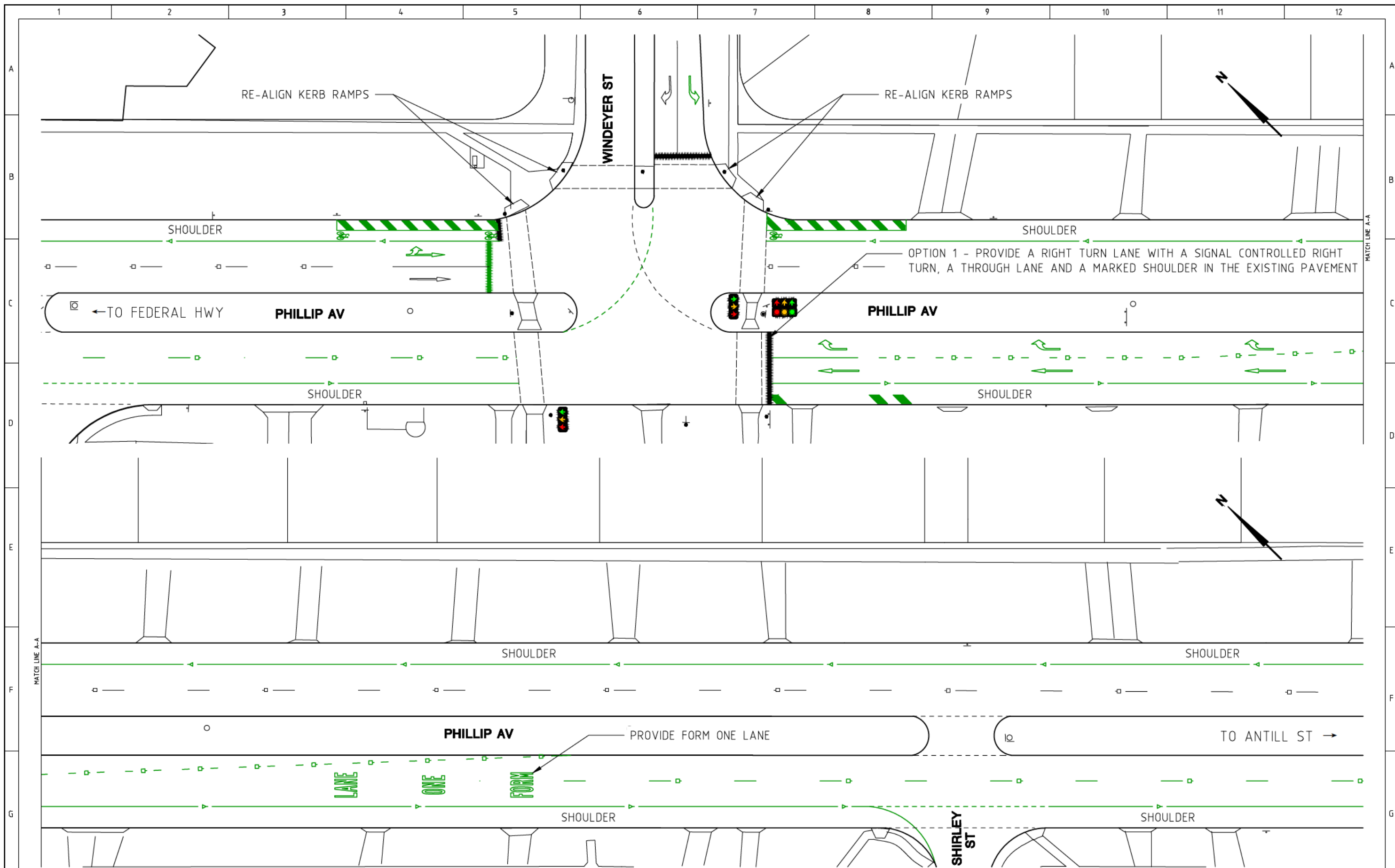
	Inclusive of pavement repair Excl. GST	Exclusive of pavement repair Excl. GST
0 General	[REDACTED]	[REDACTED]
1 Provision for Traffic		
2 Earthworks		
3 Underground Services		
4 Flexible Pavement Construction		
6 Concrete Kerbs, Footpaths and Minor Works		
8 Incidental Works		
9 Landscape		
10 Road Signs		
11 Pavement Marking		
13 Traffic Signals		
14 Street Lighting		
Total (Excluding GST)		
Add Design & Superintendence Fees (██████)		
Add Contingency (██████)		
<b>TOTAL (Excluding GST)</b>	<b>\$410,813</b>	<b>\$110,183</b>

**Option 3 – Provide a right turn lane (widening the existing pavement into the median) with a signal controlled right turn, two through lanes and a cycle lane**

	Inclusive of pavement repair Excl. GST	Exclusive of pavement repair Excl. GST
0 General		
1 Provision for Traffic		
2 Earthworks		
3 Underground Services		
4 Flexible Pavement Construction		
6 Concrete Kerbs, Footpaths and Minor Works		
8 Incidental Works		
9 Landscape		
10 Road Signs		
11 Pavement Marking		
13 Traffic Signals		
14 Street Lighting		
Total (Excluding GST)		
Add Design & Superintendence Fees (+)		
Add Contingency (+)		
<b>TOTAL (Excluding GST)</b>	<b>\$524,580</b>	<b>\$198,915</b>

Note: Costings are based on the sketch design. Service providers have not been contacted in relation to the type and location of services in the area. Potholing has not been undertaken to identify specific location and depth of services. Design and construction costs may vary depending on the Service provider requirements to relocate or protect the service where required.

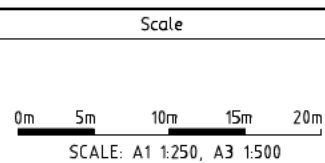
## APPENDIX 2 CONCEPT SKETCHES



**LEGEND**

- ERADICATE LINEMARKING
- EXISTING LINEMARKING
- APPLY NEW LINEMARKING

AMENDMENTS		
AMENDMENT	APPROVAL	DATE
DRAWING STAGE - LATEST DATE INDICATES DRAWING STATUS		
Black Spot Report: 03/09/20	Final Sketch Plan: --/--/--	Final Design: --/--/--
For tendering purposes only: --/--/--	Issued for construction: --/--/--	W.A.E.: --/--/--



**Design Agent**

R.D. Gossip Pty Ltd  
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Unit 108, 12 Provan Street  
Campbell ACT 2602  
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**Client**

Project Officer: Jayanth Vikneson  
Project Number: TBA

**ACT**  
Government

**Project**

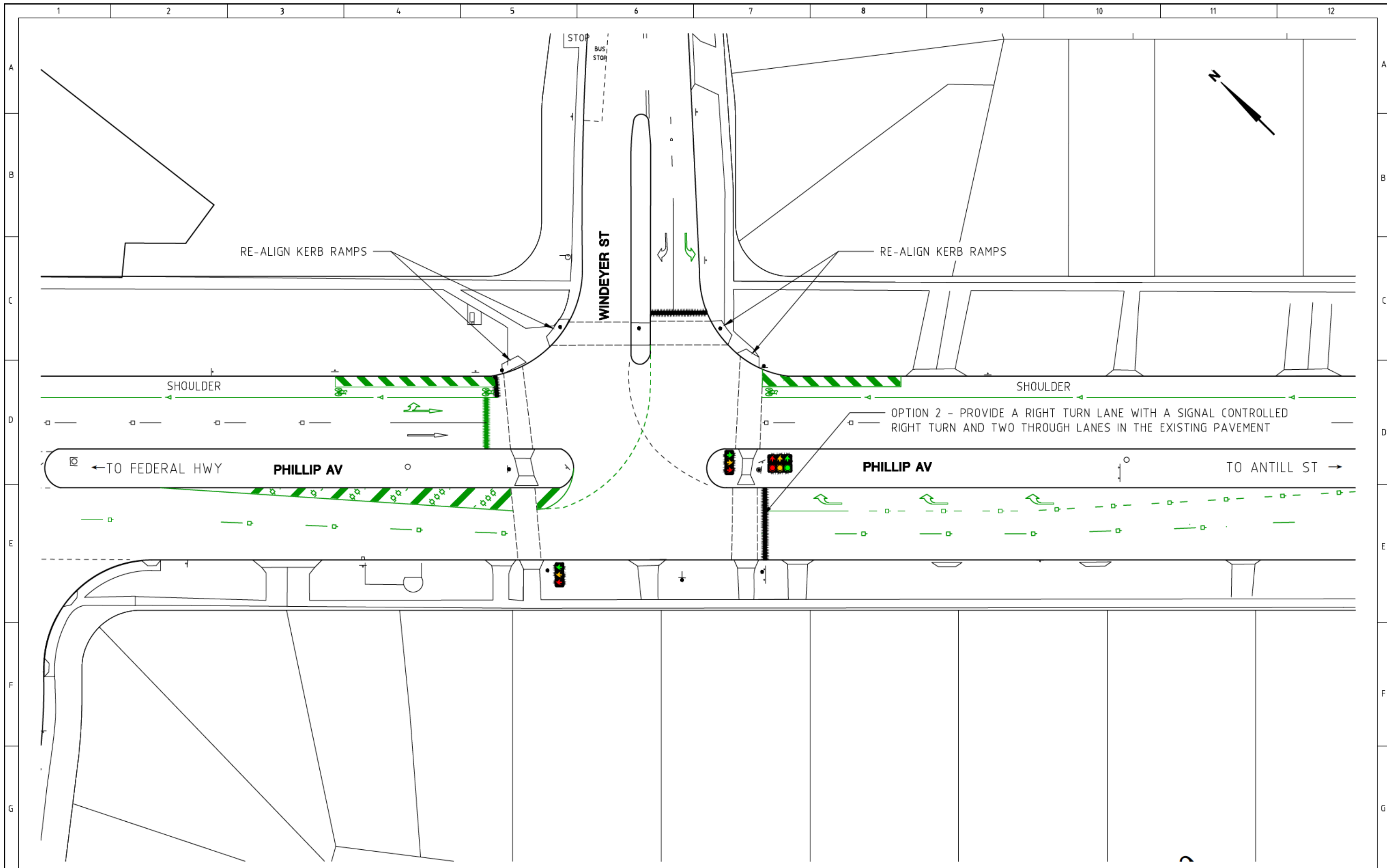
PHILLIP AV/ WINDEYER ST,  
WATSON  
BLACK SPOT FEASIBILITY  
STUDY

Date: 03/09/20

**Drawing Title**

OPTION 1 - PROVIDE A RIGHT  
TURN LANE WITH A SIGNAL  
CONTROLLED RIGHT TURN, A  
THROUGH LANE AND A MARKED  
SHOULDER IN THE EXISTING  
PAVEMENT

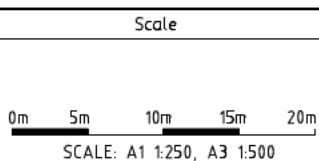
Drig. No.	Sheet	Revision
RG 20060	1	0



**LEGEND**

- ERADICATE LINEMARKING
- EXISTING LINEMARKING
- APPLY NEW LINEMARKING

AMENDMENTS		
AMENDMENT	APPROVAL	DATE
DRAWING STAGE - LATEST DATE INDICATES DRAWING STATUS		
Black Spot Report: 03/09/20	Final Sketch Plan: --/--/--	Final Design: --/--/--
For tendering purposes only: --/--/--	Issued for construction: --/--/--	W.A.E.: --/--/--



**Design Agent**

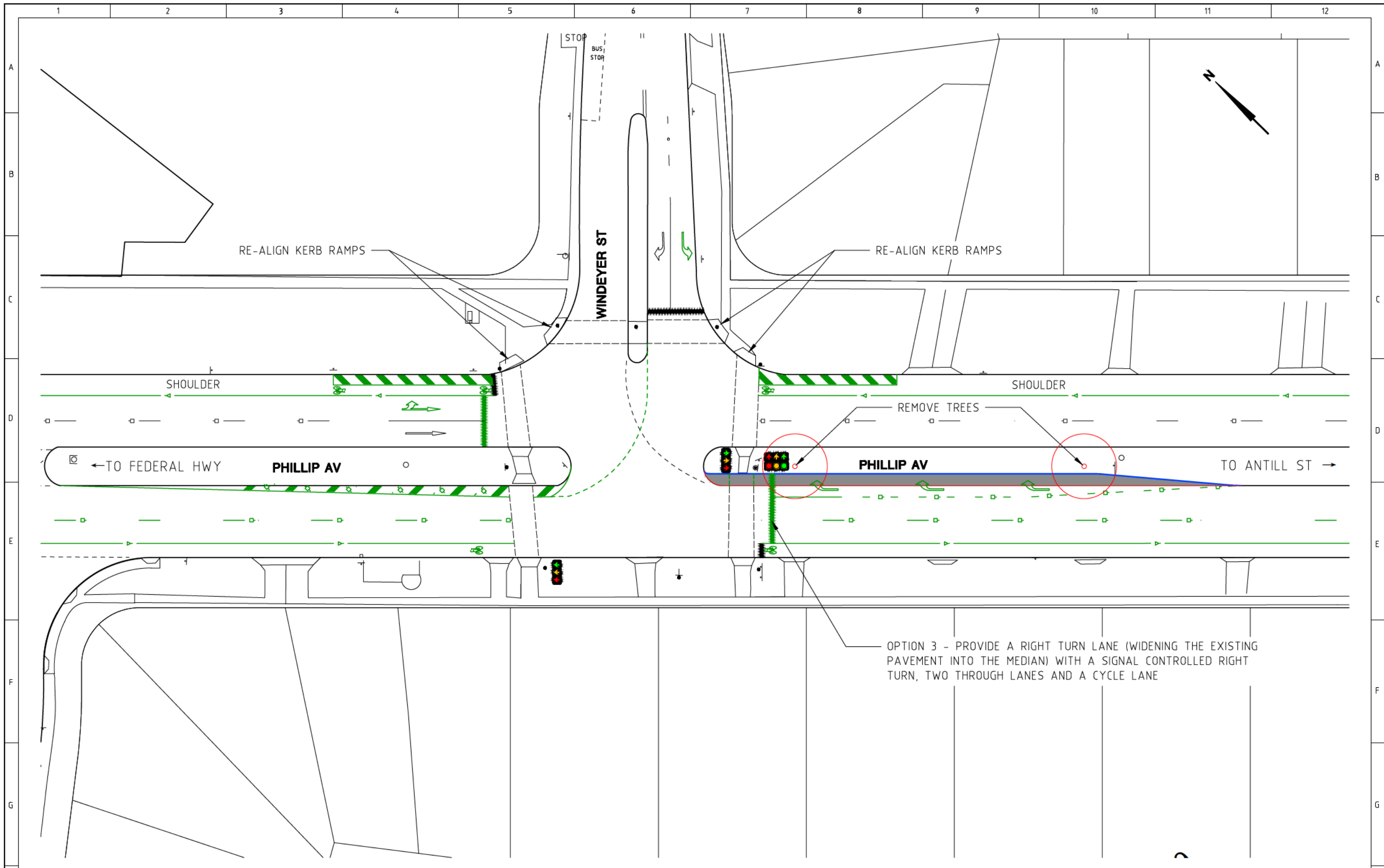
R.D. Gossip Pty Ltd  
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**Client**

Project Officer: Jayanth Vikneson  
Project Number: TBA

**ACT**  
Government

Project	Drawing Title			
PHILIP AV/ WINDEYER ST, WATSON BLACK SPOT FEASIBILITY STUDY	OPTION 2 - PROVIDE A RIGHT TURN LANE WITH A SIGNAL CONTROLLED RIGHT TURN AND TWO THROUGH LANES IN THE EXISTING PAVEMENT			
Date: 03/09/20	<table border="1"> <tr> <td>Drw. No. RG 20060</td> <td>Sheet 2</td> <td>Revision 0</td> </tr> </table>	Drw. No. RG 20060	Sheet 2	Revision 0
Drw. No. RG 20060	Sheet 2	Revision 0		



OPTION 3 - PROVIDE A RIGHT TURN LANE (WIDENING THE EXISTING PAVEMENT INTO THE MEDIAN) WITH A SIGNAL CONTROLLED RIGHT TURN, TWO THROUGH LANES AND A CYCLE LANE

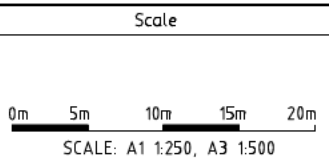
**LEGEND**

- ERADICATE LINEMARKING
- EXISTING LINEMARKING
- APPLY NEW LINEMARKING

AMENDMENTS		
AMENDMENT	APPROVAL	DATE

DRAWING STAGE - LATEST DATE INDICATES DRAWING STATUS		
Black Spot Report: 03/09/20	Final Sketch Plan: --/--/--	Final Design: --/--/--
For tendering purposes only: --/--/--	Issued for construction: --/--/--	W.A.E.: --/--/--



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Ph: 62 4291 4918

Designed by:

Drawn by:

Checked by:

Approved by:

**Client**

Project Officer: Jayanth Vikneson  
Project Number: TBA

ACT Government

**Project**

PHILLIP AV/ WINDEYER ST,  
WATSON  
BLACK SPOT FEASIBILITY  
STUDY

Date: 03/09/20

**Drawing Title**

OPTION 3 - PROVIDE A RIGHT  
TURN LANE (WIDENING THE  
EXISTING PAVEMENT) WITH A  
SIGNAL CONTROLLED RIGHT  
TURN, TWO THROUGH LANES  
AND A CYCLE LANE

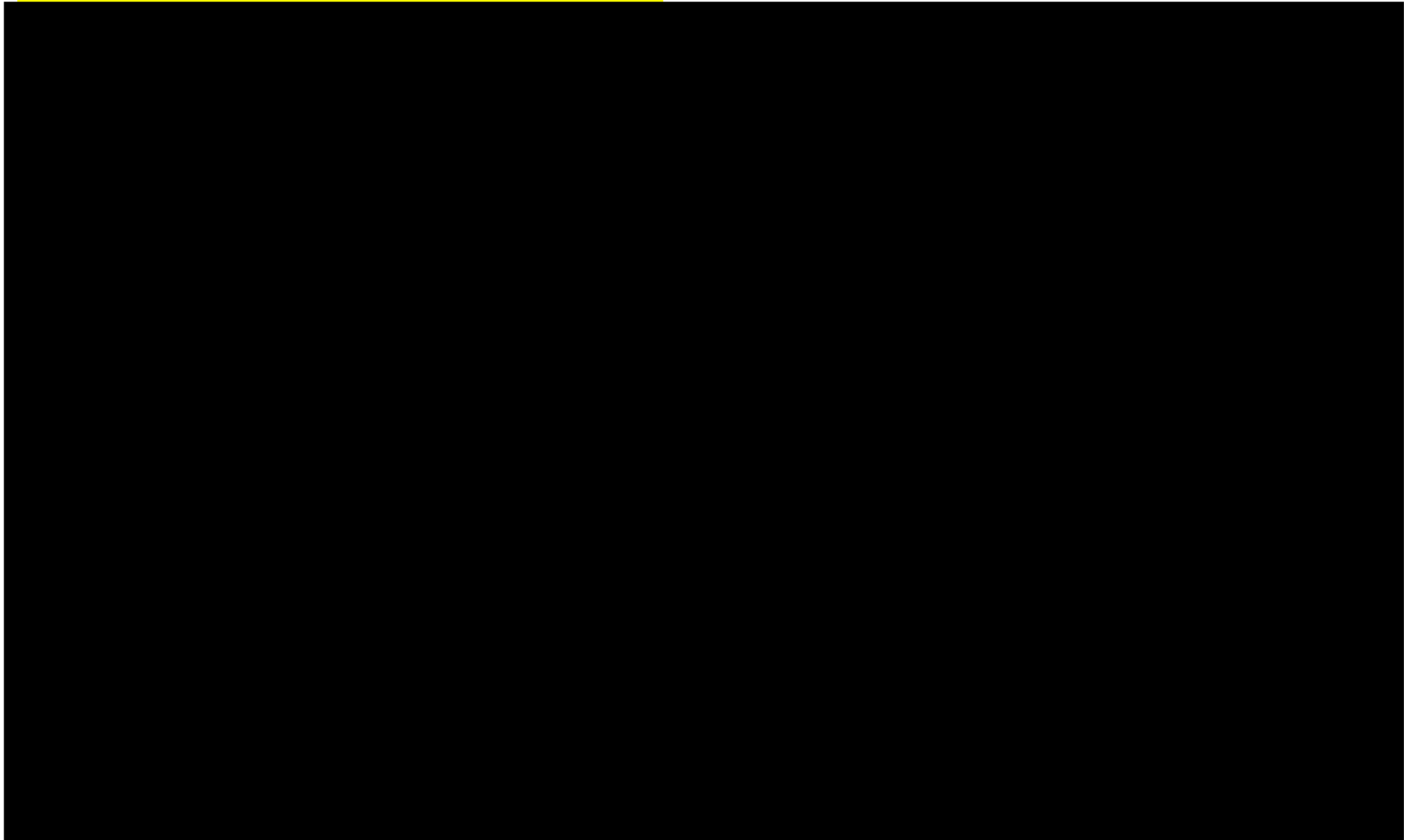
Dwg. No.	Sheet	Revision
RG 20060	3	0

### **APPENDIX 3 FINANCIAL ANALYSES**

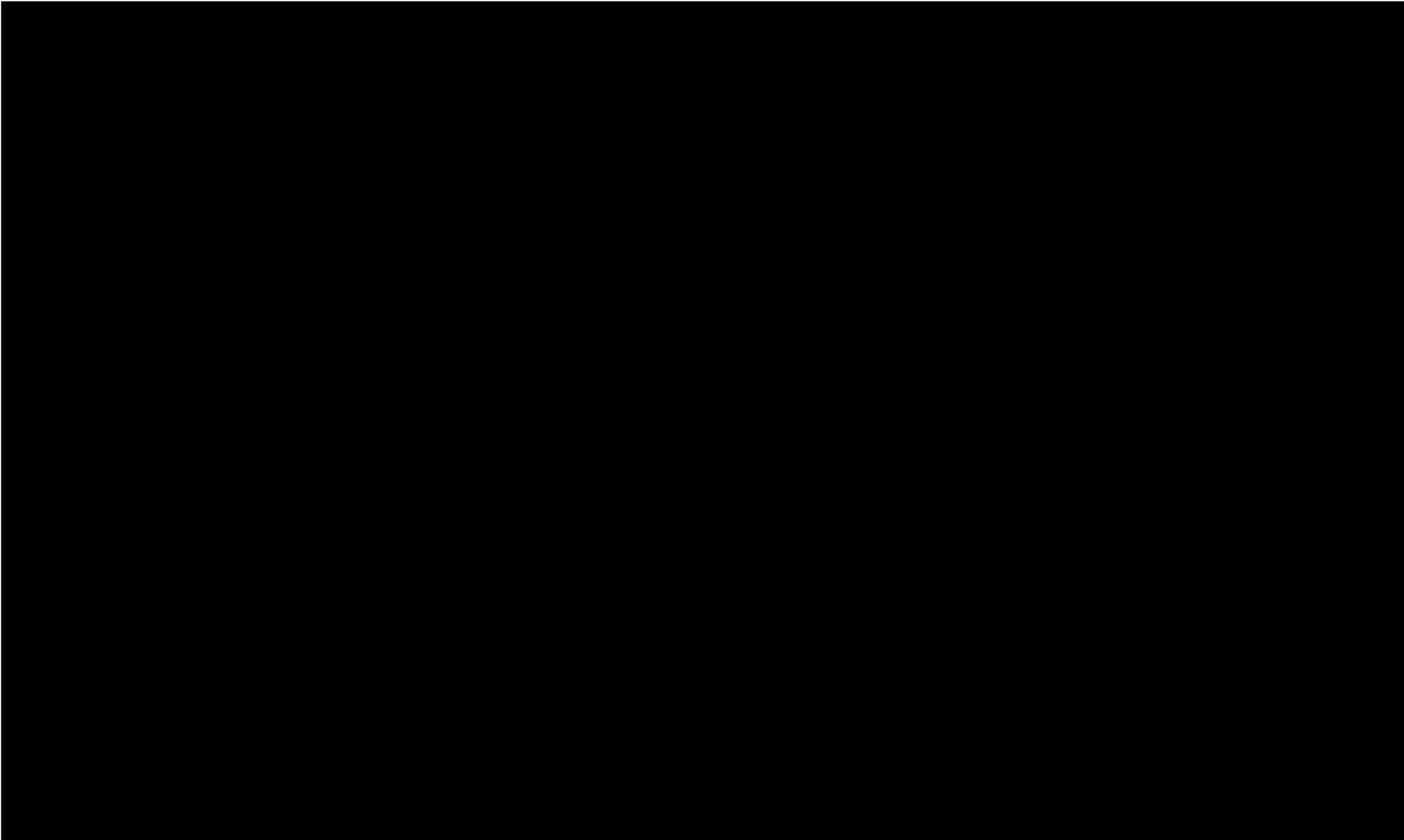
Note: Benefit Cost Analysis has only been provided for the WTP approach excluding the pavement rehabilitation costs.



**BENEFIT COST ANALYSIS USING DISCOUNTED CASH FLOWS**



**BENEFIT COST ANALYSIS USING DISCOUNTED CASH FLOWS**



**BENEFIT COST ANALYSIS USING DISCOUNTED CASH FLOWS**

