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Red Hill Reserve Surrounds Update

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Executive Summary

Introduction

SMEC was commissioned by EPSDD to update earlier analysis using the Canberra Strategic Transport Model (CSTM) to evaluate the likely road network impacts of residential developments in Section 66 Deakin and Section 56 Red Hill on the surrounding road network.

The CSTM has recently been recalibrated to 2016 conditions and new road connection options for the proposed development in Section 56 Red Hill have also been developed. EPSDD has therefore requested an update to the earlier assessment.

Figure ES-1 shows the context area for this study, including intersections selected for assessment, Red Hill development areas and access roads for Scenarios 6 and 7.

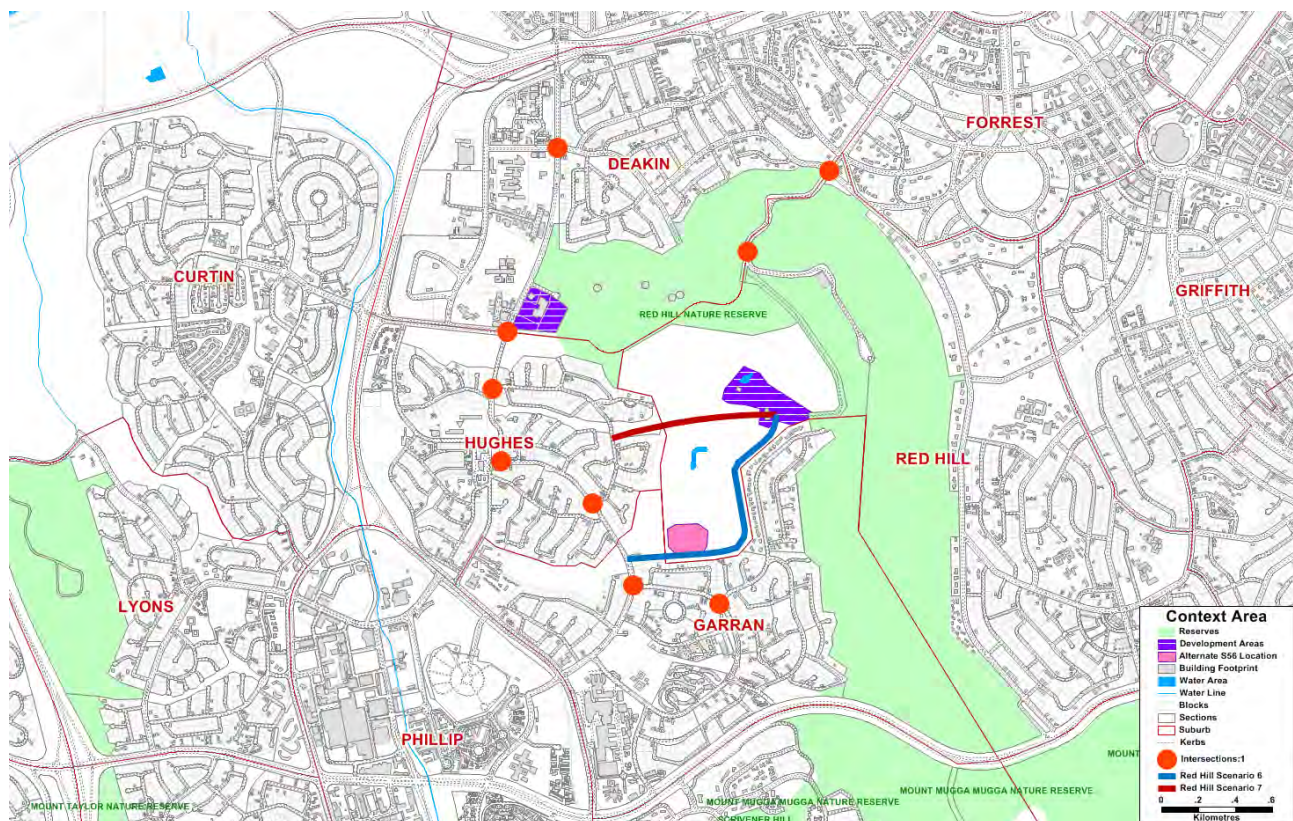


Figure ES-1: Context Area

Strategic Transport Modelling

The Red Hill Reserve Surrounds Traffic Study aims to determine the impact of various road network options alongside additional land use in both development areas. In addition to an updated base case using the recalibrated CSTM, two combinations of land use and road network changes were evaluated, using strategic transport modelling methods:

- **Base Case (CSTM 2011):** Land use and transport network assumptions for 2031 without the proposed developments using the previous CSTM calibrated to 2011 conditions
- **Base Case (CSTM 2016):** Current land use and transport network assumptions for 2031 using the CSTM calibrated to 2016 conditions. This scenario also assumes no developments in the Section 66 Deakin and Federal Golf Club sites
- **Scenario 6:** Base Case plus Mbark-Federal Golf Club Development and Section 66 Deakin Development, with access via a new road connecting to Birdwood Street, Hughes. Existing access to the Federal Golf Club via Gowrie Drive is removed.

- **Scenario 7:** Base Case plus Mbark-Federal Golf Club Development and Section 66 Deakin Development, with access via a new road connecting to Kitchener Street, Hughes. Existing access to the Federal Golf Club via Gowrie Drive is removed.

The strategic transport modelling analysis found the following:

- Section 56 Red Hill generates a minimal amount of additional traffic and thus its impact on the network is minor. Connecting to either Birdwood Street or Kitchener Street is unlikely to have any substantial impact on congestion.
- The CSTM suggests that Kent Street will already be close to its nominal capacity in 2031. The additional traffic generated by Section 66 Deakin results in some minor traffic diversions, particularly along Denison Street in the PM peak, as existing Kent Street traffic is displaced by the new development traffic. Some form of traffic calming and upgrades to intersections along Kent Street will likely be required in future.

Crash Analysis

A preliminary crash analysis was conducted using crash data records obtained from the dataACT Open Data Portal. Crashes around the key intersections in the study area were assessed and compared to the counted traffic volumes. For the nine intersections surveyed, crash rates range from 0.22 to 1.31 crashes per million vehicle movements. The analysis indicated that the intersection of Gowrie Drive with Red Hill Drive has the highest crash rate. For both scenarios tested in this report, Gowrie Drive is assumed to be closed, which would remove traffic from this dangerous intersection. The location with the next highest crash rate is the intersection of Carruthers Street and Kent Street with 0.55 crashes per million vehicle movements. This intersection has high traffic volumes and requires turning vehicles to cross multiple lanes of traffic. Interventions at this location should be considered.

A brief assessment of crashes over time by road condition, time of day and severity was also carried out. No intersection showed a clear trend of increases in the occurrence of crashes. The intersection of Kitchener Street and Birdwood Street appeared to show a decrease since 2012, with no crashes recorded since 2015. None of the intersections showed a clear increase in the occurrence of crashes during wet weather. The intersection of Kent Street and Kitchener Street showed an abnormally high proportion of crashes at night, which might indicate need for better lighting at this location. While all other intersections had less than 10% of crashes resulting in injury or fatality, the intersection of Gowrie Drive with Red Hill Drive had 100% of crashes resulting in injury. This is an extremely small sample size, however the risks at this intersection are clearly demonstrated.

Public Transport and Active Travel Assessment

Proximity to public transport stops was assessed qualitatively for the proposed development and surrounding areas was assessed using the new Network 19, which came into effect on 29 April, 2019. A bus stop is adjacent to the Section 66, Deakin development, providing access to Civic and Woden. Section 56, Red Hill has no access to public transport. The areas surrounding the development generally have reasonable access but the northern part of Brereton Street does not have any access. Note that Network 19 is not yet incorporated in the CSTM.

The active travel network around the proposed developments is well connected. However, the footpath on Brereton Street providing access to Section 56, Red Hill is narrow and has many interruptions. It is recommended that good walking and cycling access be provided on either of the new roads proposed in Scenario 6 or 7.

Intersection Assessment

As part of this project, intersection turning movement counts were collected at nine intersections within the study area in 2018 and 2019:

1. Mugga Way/Stonehaven Crescent – Gowrie Drive/Melbourne Avenue
2. Gilmore Crescent – Brereton Street
3. Kitchener Street – Gilmore Crescent
4. Kent Street – Carruthers Street
5. Kent Street – Strickland Crescent

6. Gowrie Drive – Red Hill Drive
7. Kitchener Street – Birdwood Street
8. Kent Street – Birdwood Street
9. Kent Street – Kitchener Street

The surveys covered the weekday AM and PM peak periods and a qualitative analysis of the intersections and connected roads was conducted based on these traffic counts.

Intersection Analysis

- The Mugga Way/Stonehaven Crescent – Gowrie Drive/Melbourne Avenue intersection performance is unlikely to be affected by the proposed development and access in the scenarios tested in this report. Unbalanced flows at this intersection could lead to high delays for some approaches and further monitoring or assessment of this intersection might be required.
- The Gilmore Crescent – Brereton Street intersection currently has a low level of traffic and would experience no change in the scenarios tested in this report.
- The Kitchener Street – Gilmore Crescent intersection currently carries moderate levels of traffic and its volumes would increase only slightly in the scenarios tested in this report. No issues are expected at this location.
- The Kent Street – Carruthers Street intersection currently experiences a significant amount of traffic, with performance for low priority movements likely to be poor during the peak periods, potentially leading to increased risky behaviour. Austroads standards suggest that an intersection of this type should not be priority controlled and signalisation should be considered to better control the performance and safety at this intersection.
- The Kent Street – Strickland Crescent intersection also currently experiences a significant amount of traffic, especially considering its current roundabout configuration. It is likely operating close to its capacity during the peak periods and the additional traffic generated by Section 66, Deakin could be enough to push it to an unacceptable level of performance. Signalisation might be necessary to manage performance and improve access for pedestrians and cyclists in the area.
- The Gowrie Drive – Red Hill Drive intersection carries very little traffic. The busiest period is the Wednesday midday golf course peak of 81 vehicles per hour, of which only half are travelling to or from the golf course. This very low level of traffic likely contributes to the low number of accidents, although the accident rate is very much higher than other intersections in the area. For the scenarios tested in this report, it is assumed that Gowrie Drive is closed. If this does not occur, interventions to improve safety at this location should be investigated.
- The intersection of Kitchener Street and Birdwood Street is generally low and only increases slightly for both scenarios tested. It is unlikely that any interventions would be required at this intersection.
- Traffic volumes at the intersection of Kent Street with Birdwood Street are moderate, and there could be some delays for traffic turning out of Birdwood Street, particularly in the PM peak. If Scenario 6 is adopted, some upgrades at this intersection might be necessary.
- Traffic at the intersection of Kent Street and Kitchener Street is moderate and a small amount of additional traffic would use this intersection in both scenarios. However, it is likely that the existing intersection has sufficient capacity.

Road Analysis

- Brereton Street carries very little traffic, currently fewer than 2,000 vehicles per day. No additional traffic would use this road in either scenario tested in this report.
- Gilmore Crescent between Brereton and Kitchener Streets currently carries just over 4,000 vpd, by which classification it operates as a major collector. No additional traffic would use this road in either scenario tested in this report.
- Kent Street carries a lot of traffic, with demand greatest between Carruthers Street and Strickland Crescent, due to the concentration of trip generators within this section. The additional land use at Section 66, Deakin accesses the network between these two points, adding traffic to a section of road that is likely already congested.

- Birdwood Street, while narrow, does not currently carry substantial traffic and the development scenarios would not significantly increase traffic. The volumes on this road do not suggest any capacity issues, except for the possible congestion at the intersection of Birdwood Street and Kent Street.
- Kitchener Street carries a moderate amount of traffic, with some traffic calming measures already implemented. In the scenarios tested in this report, there is a small increase in traffic but this is not expected to lead to any serious performance issues.

Comparison of Access Options

The access options considered for SMEC's previous study (*Red Hill Reserve Surrounds Traffic Study*, SMEC 2018) and this study have been compared using basic ratings against several criteria, including:

- Carriageway width
- Safety
- Road capacity
- Proportional increase over existing traffic
- Intersection operation/feasibility
- Pedestrian access (could be along a separate route)
- Impact on residents (number of affected residents and proximity to proposed access route)
- Planning constraints related to access, including fire and emergency access
- Ease of design/construction

It was found that access via Brereton Street offered the highest score against these criteria, closely followed by Kitchener Street and Birdwood Street. Access via Gowrie Drive scored very poorly.

Alternative Section 56 Development Location

Many of the challenges related to the proposed development of Section 56 (Federal Golf Course), including vehicular access, PT access and active travel, are due to the location of the development near the club house or near the centre of the golf course site. Locating the proposed development requires the retention or upgrade of Gowrie Drive or provision of alternative access via lengthy routes. These routes include existing roads (Brereton Street) or new connections to Birdwood Street or Kitchener Street, which require new roads through the golf course. Based on the assessment carried out in this study, the preferred access scenario is Scenario 2 (access via Brereton Street).

During the course of this study, the EPSDD project team proposed responding to the identified challenges, including environmental values, emergency access, pedestrian and cycle access, traffic and vehicular access issues, by suggesting that the proposed development be located at the southern end of the golf course, near Kitchener Street.

This alternative location has the major advantage of a much shorter access route via Kitchener Street, as well as other planning and environmental advantages. Although the additional traffic generated by the development still affects existing streets, the impact of the additional traffic is limited to Kitchener Street, a collector street, rather than lower order access streets.

The shorter access road to Kitchener Street is considered preferable to the long access road considered in Scenario 7. Detailed consideration of this new option is not in the scope of this study but the traffic impacts would be substantially the same as Scenario 7. It is expected that this shorter Kitchener Street access option would rank highest in the options comparison based on improved scores for impact on residents and ease of design and construction criteria, compared to the long access Kitchener Street option that ranked third.

Summary and Conclusions

The findings of this report include:

- Additional traffic generated by the proposed developments at Section 66, Deakin and Section 56, Red Hill do not significantly increase traffic volumes in the future, for either of the scenarios tested in this report, but traffic capacity issues are evident on existing streets.

- The intersection of Gowrie Drive with Red Hill Drive shows an accident rate and severity much higher than all other intersections in the area. Alternative access to the golf course should be provided (as in both Scenarios 6 and 7) or the intersection should be upgraded. It is noted that a previous study in 2014 investigated four possible upgrade options, but none of these options met the minimum sight lines required by Austroads.
- The intersection of Kent Street and Kitchener Street showed a higher than expected proportion of night time crashes. Further assessment of lighting at this location should be undertaken.
- Kent Street operates close to capacity and upgrades will be required with increased traffic volumes in the future, particularly at its intersections with Birdwood Street, Carruthers Street and Strickland Crescent.
- Birdwood Street or Kitchener Street each have sufficient capacity to carry the increased traffic from Section 56, Red Hill. However, the intersection of Birdwood Street and Kent Street is likely to perform worse than the intersection of Kitchener Street and Kent Street so Scenario 7 might be slightly preferable to Scenario 6.

The traffic analysis for these two proposed developments indicates that they have distinct impacts on the road network, and therefore further detailed traffic assessments for each development can be assessed independently.

Challenges

- Kent Street traffic is heavy, which is likely to cause problems at some intersections, particularly Carruthers Street and Strickland Crescent.
- The Section 66, Deakin development would increase delay on Kent Street and lead to a small diversion in traffic onto Denison Street.

Recommendations

Based on the outcomes of the transport modelling and analysis, SMEC recommends the following:

- Consider the benefits to access and traffic impacts of relocating development to the southern edge of the site, with access from Kitchener Street. This option appears to have benefits and further assessment is warranted.
- Scenario 2 (access via Brereton Street) is the highest ranked option and preferred option if the location of the proposed development remains near the existing clubhouse. The alternate scenario (short access via Kitchener Street) should also be included for further assessment, as it is expected that this option would score higher than Brereton Street in the comparison.
- Investigation of upgrade options for intersections on Kent Street, to address both performance and safety concerns, including:
 - Assess lighting at the intersection of Kent Street and Kitchener Street
 - Assess capacity improvements at Birdwood Street, Carruthers Street, Strickland Crescent
- Investigation of options to improve the performance and/or reduce the attractiveness of the Kent Street corridor, to encourage traffic to use Yarra Glen and Adelaide Avenue for north/south travel. Possible options include speed reduction or construction of one or more additional roundabouts to reduce the priority for north-south traffic along the corridor and wombat crossings to improve pedestrian permeability. Any changes to the corridor should also consider Light Rail Stage 2, which is expected to run along the Adelaide Avenue/Yarra Glen corridor.
- Closure or upgrade of the intersection of Gowrie Drive and Red Hill Drive (dependant on whether Scenario 6, 7 or another option is selected)
- Any new road(s) provided for the preferred option should include good active travel facilities and meet relevant emergency services design standards
- Cost estimates for road and intersection upgrades
- Ensure good pedestrian access to the Kent Street bus stops from Section 66, Deakin.

1 Introduction

SMEC was commissioned by the Environment, Planning and Sustainable Development Directorate (EPSDD) to extend modelling and assessment work for two land use developments adjacent the Red Hill Nature Reserve undertaken in 2018. These developments are in Section 66, Deakin and part Section 56, Red Hill. These developments have already been the subject of traffic impact studies, by Opus in 2017 and Graeme Shoobridge Advisory Services (GSAS) in 2018, respectively. In addition, an options analysis for critical safety upgrades to the intersection of Red Hill Drive and Gowrie Drive, which provides access to the Red Hill site, was conducted by AECOM in 2014.

The Section 66, Deakin adds a medium density residential development including 256 dwellings, preserving the existing office buildings.

The Section 56, Red Hill development is a redevelopment of the land currently occupied by the Federal Golf Club's existing clubhouse and will include a new clubhouse and facilities, along with an active seniors and retirement village containing 125 dwellings.

The previous studies undertaken by other consultants looked at largely localised traffic issues. SMEC then undertook an analysis of the wider area network implications and consequences of a number of road network options supporting the developments using the Canberra Strategic Transport Model (CSTM).

This study summarises the findings of SMEC's earlier report and assesses two additional road network options using the most recent version of the CSTM. Also included is a qualitative assessment of selected intersections, a crash analysis and a brief assessment of active travel and public transport coverage in the area.

The context area covered by this study are shown in Figure 1.

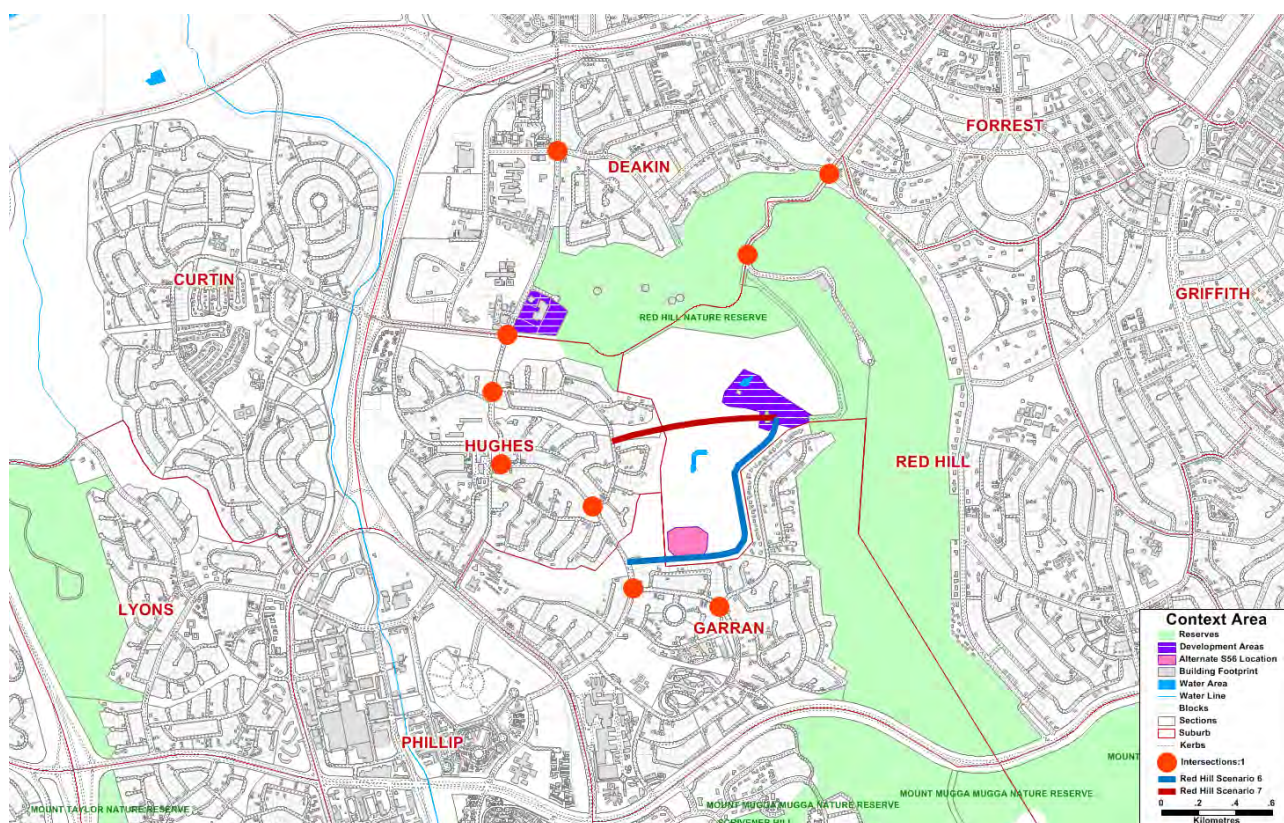


Figure 1: Context Area

2 Strategic Transport Modelling

The analysis has been conducted using the Canberra Strategic Transport Model (CSTM), updated in 2018-19 using the 2016 Census and 2017 ACT Household Travel Survey. This model contains a complete representation of the urban road networks of Canberra, Queanbeyan, Murrumbateman and Yass.

The model is an equilibrium model, in which travel decisions (origin/destination, mode, route etc.) are related to cost, where the cost of travel is minimised for every road user. As such, any changes to the model inputs and assumptions can have impacts far from where the change was made, the severity decreasing with distance, as the traffic adjusts and redistributes to minimise the individual user costs.

The modelling was conducted for the 2031 AM and PM peak periods and included modelling of the traffic impacts of both Section 56, Red Hill and Section 66, Deakin, assessing two new access options developed following the modelling works undertaken by SMEC in 2018.

2.1 Summary of Previous Modelling

The Red Hill Reserve Surrounds Traffic Study conducted by SMEC in 2018 aimed to determine the impact of various road network options alongside additional land use in both development areas. In addition to a base case, five combinations of land use and road network changes were evaluated, using the CSTM calibrated to 2011 conditions:

- **Base Case:** The current land use and transport network assumptions for 2031. This scenario assumes no developments in the Section 66, Deakin and Section 56, Red Hill sites
- **Scenario 1:** Base Case plus Section 56, Red Hill with access from Gowrie Drive only
- **Scenario 2:** Base Case plus Section 56, Red Hill with access from Brereton Street only
- **Scenario 3:** Base Case plus Section 56, Red Hill with access from both Gowrie Drive and Brereton Street
- **Scenario 4:** Base Case plus Section 66 Deakin
- **Scenario 5:** Base Case plus both developments, with the preferred access option selected from Scenarios 1-3 (access from Gowrie Drive only was selected)

The previous strategic transport modelling analysis found the following:

- Section 56 Red Hill generates a minimal amount of additional traffic and thus its impact on the network is insignificant. However, the major issue with this route option is the existing safety issues surrounding the geometry of Gowrie Drive and its intersection with Red Hill Drive.
- Connecting to Brereton Street instead of Gowrie Drive (Scenario 2) would result in a modest increase in traffic on Brereton Street (~1,400 vpd), with the possibility of exceeding the traffic limit for Brereton Street's existing classification. This option has already met opposition from the community.
- Connecting both Gowrie Drive and Brereton Street (Scenario 3) opens a very attractive alternative north-south route between Woden Valley and South Canberra. This results in approximately 8,000 vpd additional traffic on both roads, which greatly exceeds the traffic limits for their respective classifications. This would also cause major safety issues and would meet strong resistance from the community.
- The CSTM suggests that Kent Street will already be close to its nominal capacity in 2031. The additional traffic generated by Section 56 Deakin pushes it to capacity and results in noticeable traffic diversions as existing Kent Street traffic is displaced by the new development traffic. Some form of traffic calming and upgrades to intersections along Kent Street will likely be required in future.

2.2 Model Scenarios

The modelling considered land use developments in two locations:

1. **Mbark-Federal Golf Club Development in Block 1 Section 56, Red Hill**
Redevelopment of the club facilities and inclusion of an active seniors and retirement village
2. **Blocks 7 & 8 Section 66, Deakin**
Redevelopment of the existing site for mixed residential and commercial use (existing offices will be retained)

The following scenarios were modelled and are presented in this report:

- **Base Case (CSTM 2011):** Land use and transport network assumptions for 2031 using the CSTM calibrated to 2011 conditions (as used in SMEC's 2018 study). This scenario assumes no developments in the Section 66 Deakin and Federal Golf Club sites.
- **Base Case (CSTM 2016):** Current land use and transport network assumptions for 2031 using the CSTM calibrated to 2016 conditions. This scenario also assumes no developments in the Section 66 Deakin and Federal Golf Club sites.
- **Scenario 6:** Base Case plus Mbark-Federal Golf Club Development and Section 66 Deakin Development, with access via a new road connecting to Birdwood Street, Hughes. Existing access to the Federal Golf Club via Gowrie Drive is removed.
- **Scenario 7:** Base Case plus Mbark-Federal Golf Club Development and Section 66 Deakin Development, with access via a new road connecting to Kitchener Street, Hughes. Existing access to the Federal Golf Club via Gowrie Drive is removed.

For the modelling task, eight scenarios were tested using different versions of the CSTM, as shown in Table 1.

Table 1: Modelled Scenarios

SCENARIO	2031 AM	2031 PM
Base Case (CSTM 2011)	✓	✓
Base Case (CSTM 2016)	✓	✓
Scenario 6 (CSTM 2016)	✓	✓
Scenario 7 (CSTM 2016)	✓	✓

2.3 Model Assumptions

2.3.1 Zone Structure

The development areas within Section 66 Deakin and Section 56 Red Hill respectively fall within the existing CSTM Zones 050304 and 051001, as shown in Figure 2. The location of the development areas and proposed access routes are also shown.

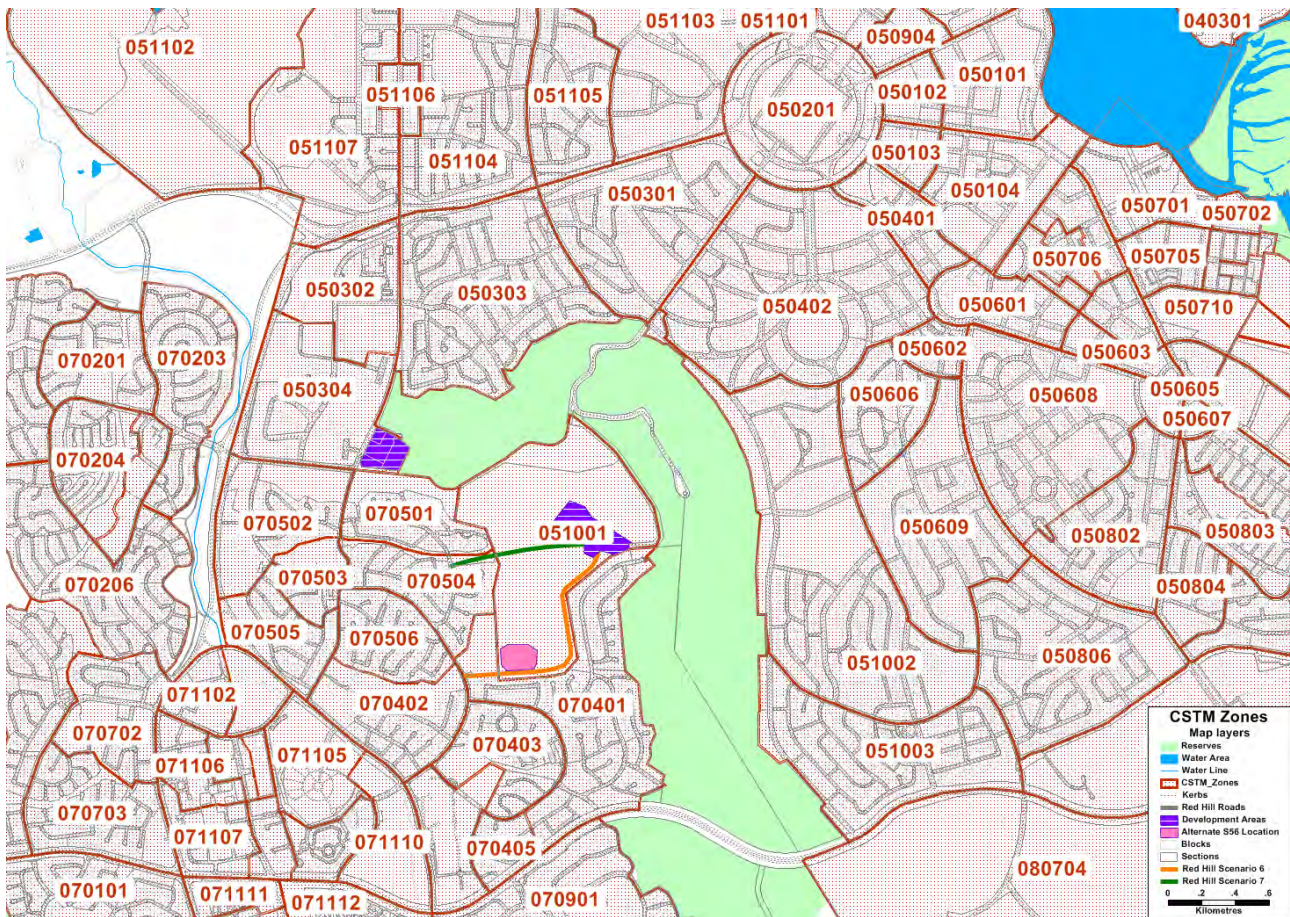


Figure 2: CSTM Zones in Development Areas

2.3.2 Road Network

The road network infrastructure improvements assumed to be present in each year from 2016 to 2041 have been confirmed with TCCS in 2018, when the current version of the CSTM was completed. Diagrams showing the upgrades in 2021 and 2031 are included in Appendix A.

Intersections are represented in the CSTM at a high level, with those that require vehicles to stop or give way being modelled through a reduction in capacity on the approaching roads. No discrimination is made by intersection control method.

A diagram showing the basic CSTM link attributes is included in Figure 3. The lane count is shown as line thicknesses, the signposted speed limit as shown as line colours and the hourly capacity is shown numerically.

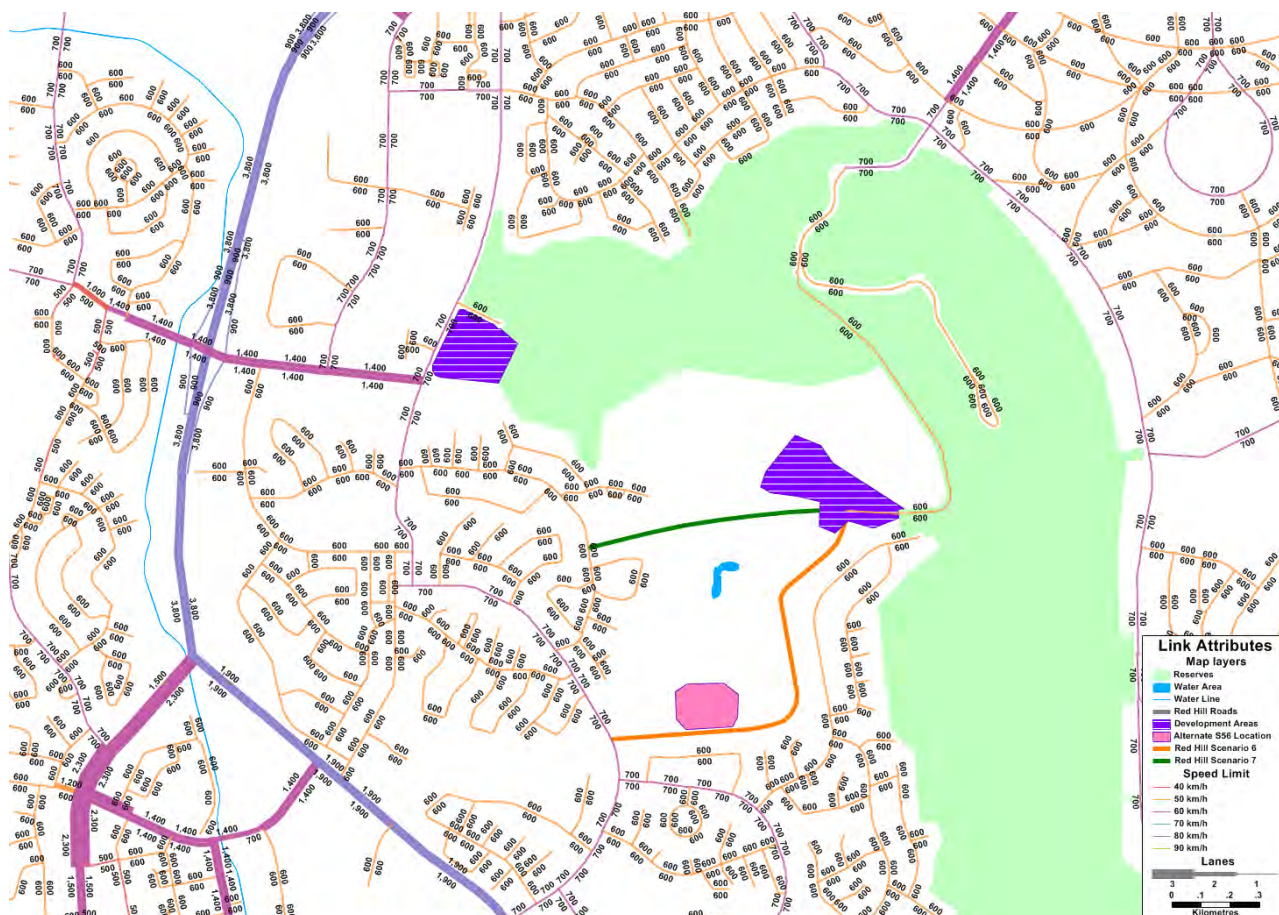


Figure 3: CSTM Basic Link Attributes

2.3.3 Public Transport

The public transport network in 2021 onwards is based on Transport Canberra's proposed Network 2018 provided to SMEC in March 2017, with the addition of Light Rail Stage 1 (LRS1) and the removal of bus routes operating along the LRS1 corridor. Light Rail Stage 2 (LRS2), assumed to be between Civic and Woden, is added in 2031.

2.3.4 Land Use

The base land use data was provided by TCCS and is dated 8 October 2018. The planned land use for 2031 (without the proposed developments) is shown in Table 2.

Table 2: CSTM 2031 Base Case Land Use

ZONE	DESCRIPTION	POPULATION	EMPLOYMENT	RETAIL SPACE	SCHOOL ENROLMENTS	TERTIARY ENROLMENTS
050304	Deakin	0	1,811	4,318	96	0
051001	Red Hill	0	42	0	0	0

The land use assumptions include the current understanding of the Yarralumla Brickworks development, as per the agreed land use in the CSTM.

2.4 Model Updates

2.4.1 Zone Structure

The developments within Section 56, Red Hill and Section 66, Deakin required the addition of Zones 050305 and 051004 to the CSTM, respectively. The updated zones are shown in Figure 4.

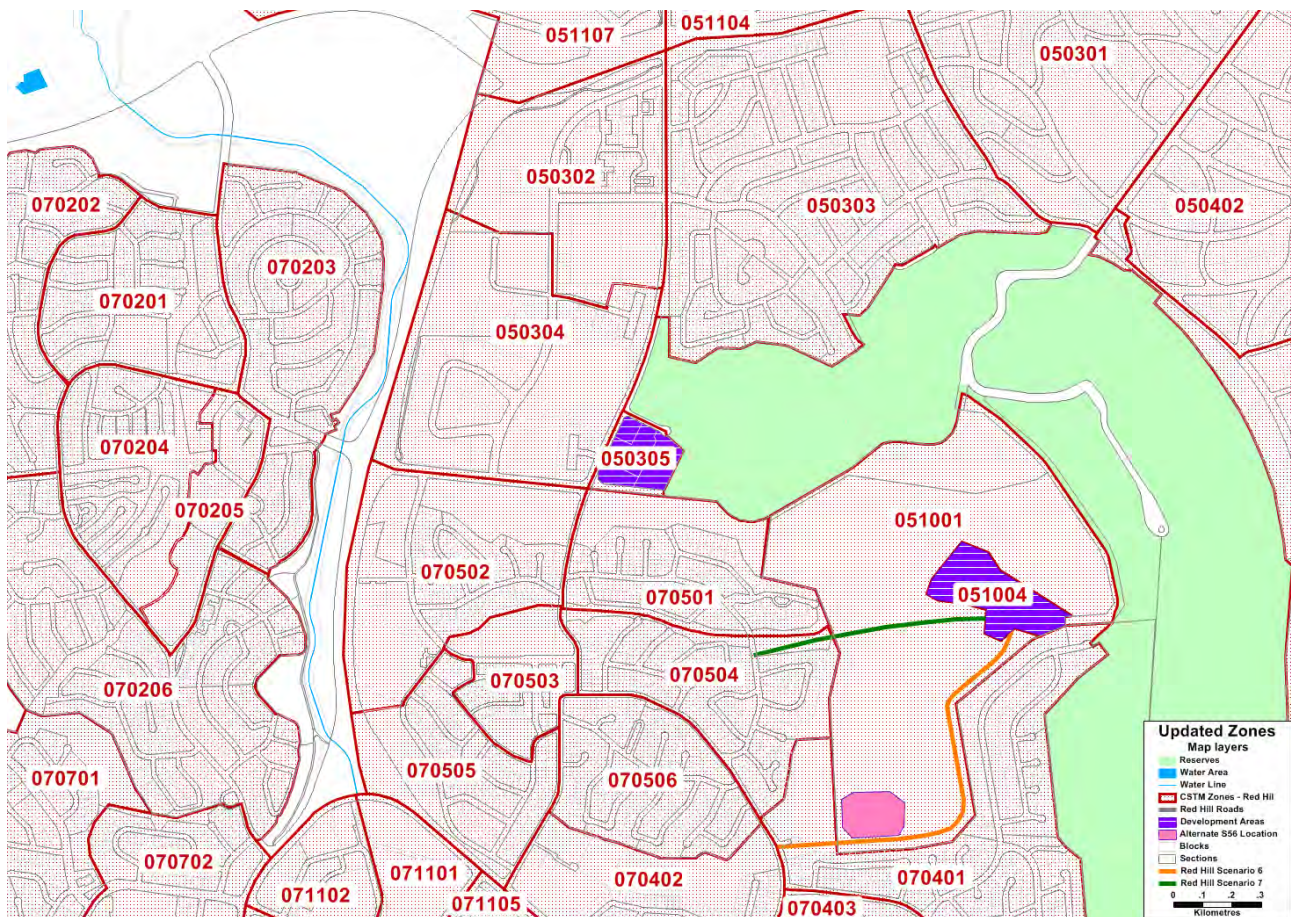


Figure 4: Updated Zone Layout

2.5 Land Use

The additional population in the new two zones was determined by calculating the average occupancy of each combination of dwelling type and size (number in bedrooms) for each suburb, using the 2016 Census records. The results of this process are shown in Tables 3 and 4. These values have been added to the CSTM, which has been allowed to conduct its standard trip generation and distribution procedures. In reality, the nature of the Section 56, Red Hill development (active seniors and retirees) is expected to generate less traffic than the average residential development. For this type of development, the RMS *Guide to Traffic Generating Developments* specifies 2 vehicle trips per day (250 total), 0.1 trips per AM peak (12.5 total) and 0.2 trips per PM peak (25 total). While this is a development for active seniors rather than an assisted care facility, the trip generation modelled by the CSTM should be treated as an upper limit to the expected traffic.

At the advice of EPSDD, the Section 66, Deakin development assumption shown in Table 3 has been reduced from 574 dwellings, as used by Opus, to 256 dwellings. The proportional distribution of dwelling types and sizes assumed by Opus has been retained.

Table 3: Section 66 Deakin Population Calculations

TYPE	BEDROOMS	COUNT	OCCUPANCY	POPULATION
Apartment	1	63	1.24	78
Apartment	2	175	1.90	332
Apartment	3	13	2.00	26
Townhouse	3	5	1.98	11
Total		256	1.74	447

Table 4: Section 56 Red Hill (Mbark) Population Calculations

TYPE	BEDROOMS	COUNT	OCCUPANCY	POPULATION
House	3	62	2.33	144
Apartment	1	9	1.18	11
Apartment	2	12	1.60	19
Apartment	3	18	2.89	52
Townhouse	2	12	1.47	18
Townhouse	3	12	2.83	34
Total		125	2.22	278

The population in Zones 050305 and 051004 in each scenario is given in Table 5. No changes have been made to the land use of any existing zones. This means that the trips generated by the proposed developments are added to the trips generated by the base land use forecasts for 2031.

Table 5: Zone Population by Scenario

ZONE	SCENARIO 6	SCENARIO 7
050305	278	278
051004	447	447

2.6 Strategic Transport Modelling Results

2.6.1 Aggregated Outputs

Tables 6 and 7 show bulk summary results for the Base case using the 2011 CSTM and the 2016 CSTM. After the recalibration to 2016 conditions and the updates to the 2031 scenario, there is a reduction in person trips of approximately 8%. However, there is a much larger reduction in HBW PT usage, and the forecast HBW PT mode share reduces to 12.8% from 16.8% in the AM peak. In the PM peak, HBW public transport usage increase from 7.7% to 13.4% in the recalibrated model. Recent changes to the bus network (implemented in April 2019) are not yet included in the CSTM and it is not yet known what impact these fundamental changes to PT travel in Canberra will have in the future. In both peak periods, the average car trip length increases from approximately 9.5 km to 12.5 km in the recalibrated model.

Table 6: 2031 AM Base Bulk Scenario Results

OUTPUT	BASE (CSTM 2011)	BASE (CSTM 2016)
Person Trips	200,612	183,461
PT Trips	22,476	19,104
Bicycle Trips	9,555	10,856
Car Trips	150,226	125,239
HBW PT Trips	8,266	9,416
HBW PT %	16.8%	12.8%
Car VKT	1,409,038	1,577,806
ΔVKT	-	+168,768
Car VHT	44,835	43,106
ΔVHT	-	-1,729

Table 7: 2031 PM Base Bulk Scenario Results

OUTPUT	BASE (CSTM 2011)	BASE (CSTM 2016)
Person Trips	174,833	166,815
PT Trips	9,155	14,961
Bicycle Trips	2,651	8,754
Car Trips	139,143	122,330
HBW PT Trips	3,345	11,359
HBW PT %	7.7%	13.4%
Car VKT	1,324,868	1,513,781
ΔVKT	-	+188,913
Car VHT	33,453	33,958
ΔVHT	-	+505

A summary of the bulk outputs of the models is included in Tables 8 and 9. The Red Hill and Deakin developments generate 216 additional person trips in the AM peak and 197 in the PM peak.

The change in Vehicle Kilometres Travelled (VKT) and Vehicle Hours Travelled (VHT) in each scenario is largely a reflection of the increased population. Of the 216 additional person trips in the AM peak, 8-9 use public transport and 16-17 use bicycle. The remainder travel by car. In the PM peak, of the 197 additional trips, 15-17 use public transport and 5-6 use bicycle.

In Scenario 6, there is an additional 1,210 car VKT and 62 car VHT in the AM peak with an additional 1,154 car VKT and 40 car VHT in the PM peak.

In Scenario 7, there is an additional 1,245 car VKT and 58 car VHT in the AM peak with an additional 1,221 car VKT and 40 car VHT in the PM peak.

Table 8: 2031 AM Bulk Scenario Results

OUTPUT	BASE (CSTM 2016)	SCENARIO 6	SCENARIO 7
Person Trips	183,461	183,677	183,677
PT Trips	19,104	19,112	19,113
Bicycle Trips	10,856	10,873	10,872
Car Trips	125,239	125,369	125,369
HBW PT Trips	9,416	9,415	9,416
HBW PT %	12.8%	12.8%	12.8%
Car VKT	1,577,806	1,579,016	1,579,051
ΔVKT	-	+1,210	+1,245
Car VHT	43,106	43,168	43,164
ΔVHT	-	+62	+58

Table 9: 2031 PM Bulk Scenario Results

OUTPUT	BASE (CSTM 2016)	SCENARIO 6	SCENARIO 7
Person Trips	166,815	167,012	167,012
PT Trips	14,961	14,978	14,976
Bicycle Trips	8,754	8,759	8,760
Car Trips	122,330	122,450	122,452
HBW PT Trips	11,359	11,371	11,370
HBW PT %	13.4%	13.4%	13.4%
Car VKT	1,513,781	1,514,936	1,515,002
ΔVKT	-	1,154	1,221
Car VHT	33,958	33,998	33,998
ΔVHT	-	40	40

2.6.2 Detailed Individual Scenario Results

Diagrams extracted from the CSTM showing hourly peak volumes and volume/capacity for each scenario, as well as peak volume differences for the scenarios, are shown below. Except for the Base Case, both the peak traffic and peak traffic difference (compared to the Base Case) are included for each scenario.

2.6.2.1 Base Case (CSTM 2011)

The Base Case hourly flow diagrams for 2031 AM and 2031 PM are shown below. Of the roads surrounding the development sites, significant traffic volumes can be seen on Adelaide Avenue, Kent Street and Stonehaven Crescent in both peak periods. The performance on Kent Street in particular suggests that intervention will be required at some of the intersections along its length. Currently, all are priority controlled, with two low-speed roundabouts. The traffic on Kent Street will cause performance and safety issues at the intersections and upgrades will likely need to be investigated.

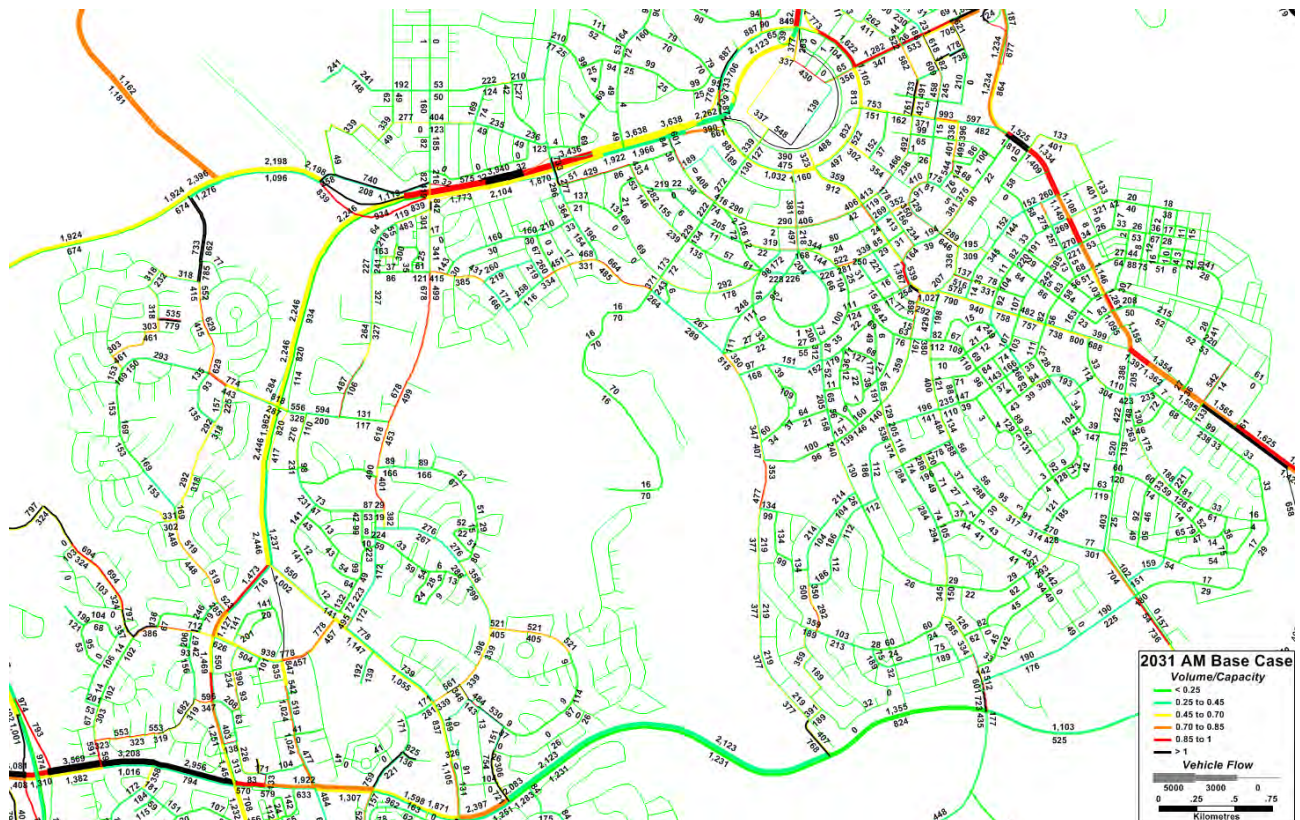


Figure 5: Base Case (CSTM 2011) 2031 AM Hourly Flow and V/C

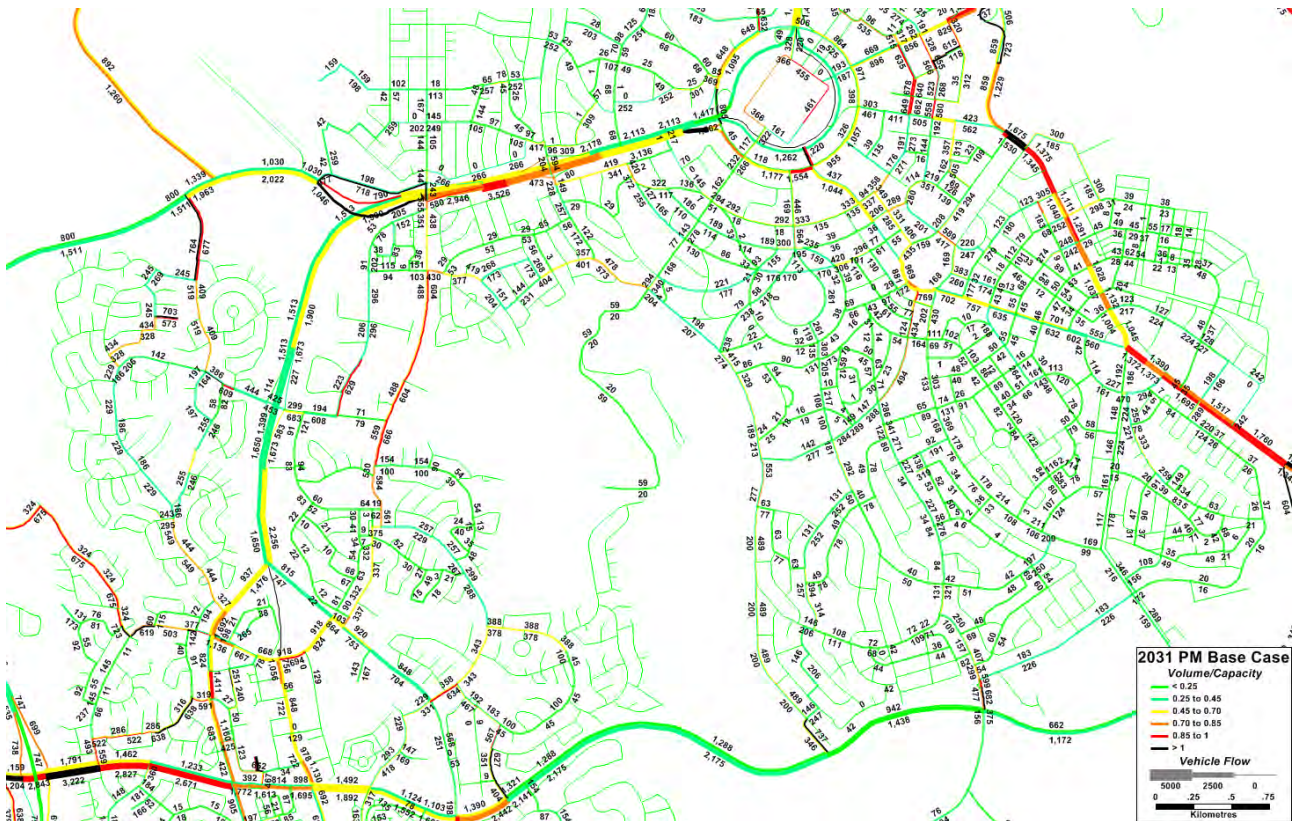


Figure 6: Base Case (CSTM 2011) 2031 PM Hourly Flow and V/C

2.6.2.2 Base Case (CSTM 2016)

The Base Case (CSTM 2016) hourly flow diagrams for 2031 AM and 2031 PM are shown in Figure 7 and Figure 8, respectively. Of the roads surrounding the development sites, significant traffic volumes can be seen on Adelaide Avenue, Yarra Glen, Stonehaven Crescent and Kent Street in both peak periods. The traffic on Kent Street will likely cause performance and safety issues at the intersections and upgrades will need to be investigated before 2031. Similarly, volumes on Stonehaven Crescent, west of Melbourne Avenue, are close to capacity and some interventions might be required before 2031.

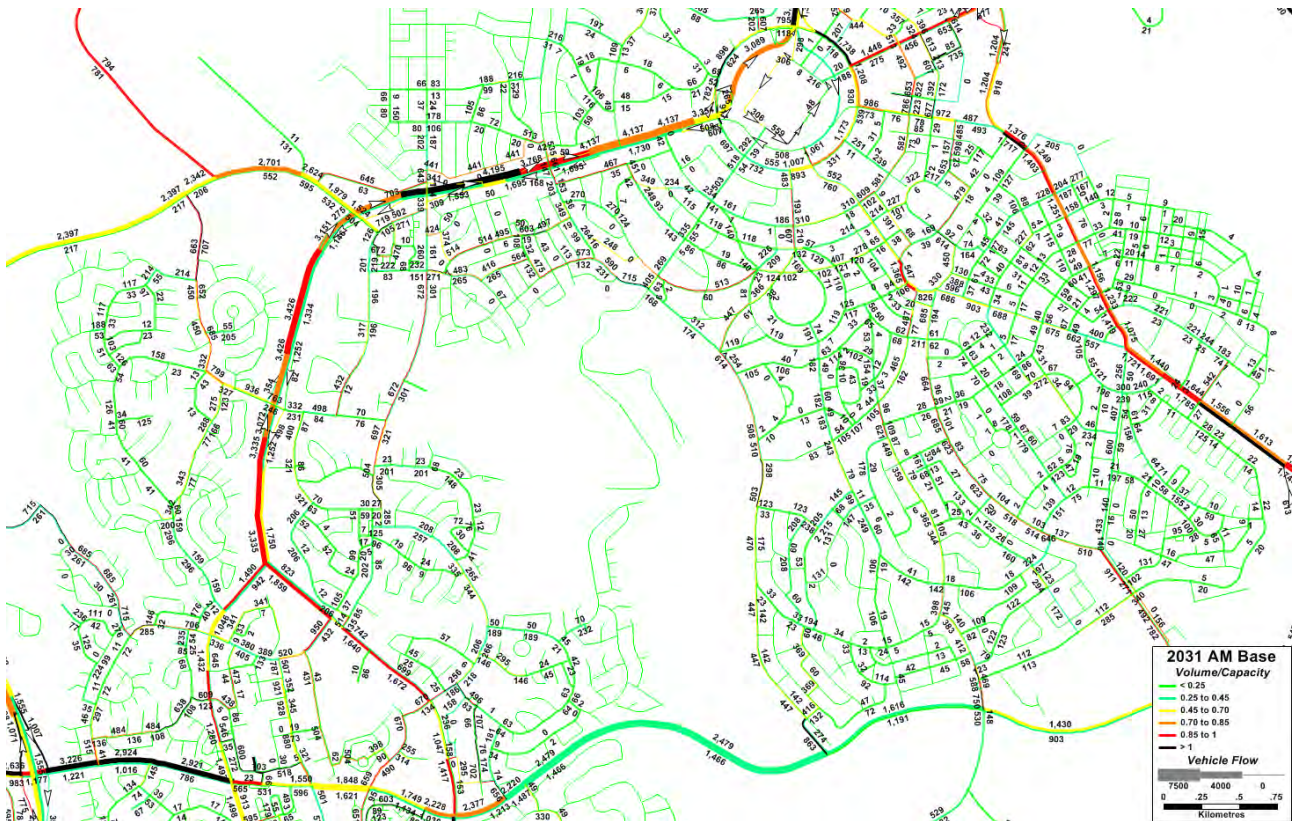


Figure 7: Base Case (CSTM 2016) 2031 AM Hourly Flow and V/C

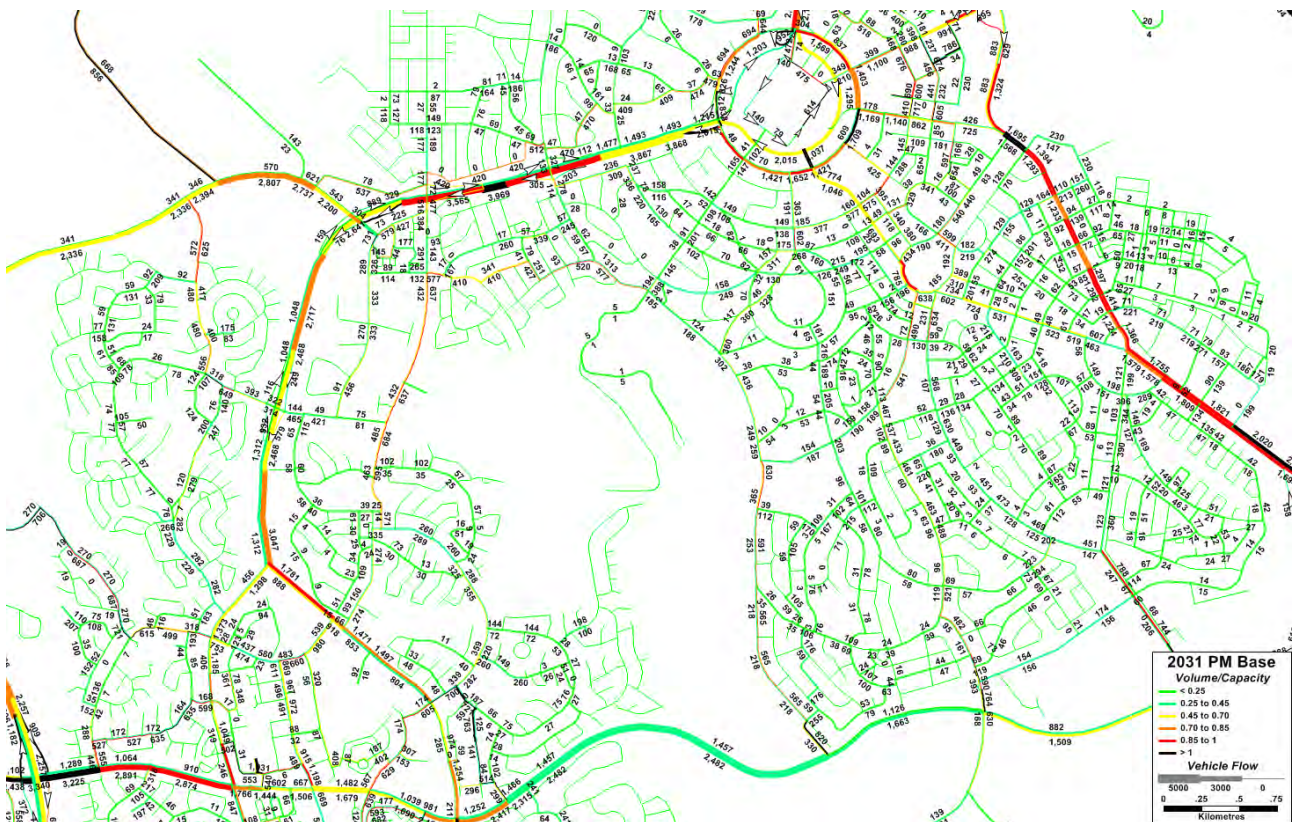


Figure 8: Base Case (CSTM 2016) 2031 PM Hourly Flow and V/C

A comparison of the traffic volumes for the 2031 AM and PM peak periods between the CSTM (2011) and CSTM (2016) are shown in Figure 9 and Figure 10, respectively. For most of the local roads around the study area, the differences between the models are relatively small. Larger differences are apparent on major roads, including Yarra Glen, Adelaide

Avenue, Cotter Road and Hindmarsh Drive. The 2016 CSTM also includes upgrades to the Cotter Road – Adelaide Avenue interchange, allowing all movements and direct access from Cotter Road to Denison Street. Given the small differences in modelled volumes on local roads around the developments, which is where most impact would be felt, it is considered that the findings from the earlier modelling are still current and can be compared to the findings from this current modelling activity.

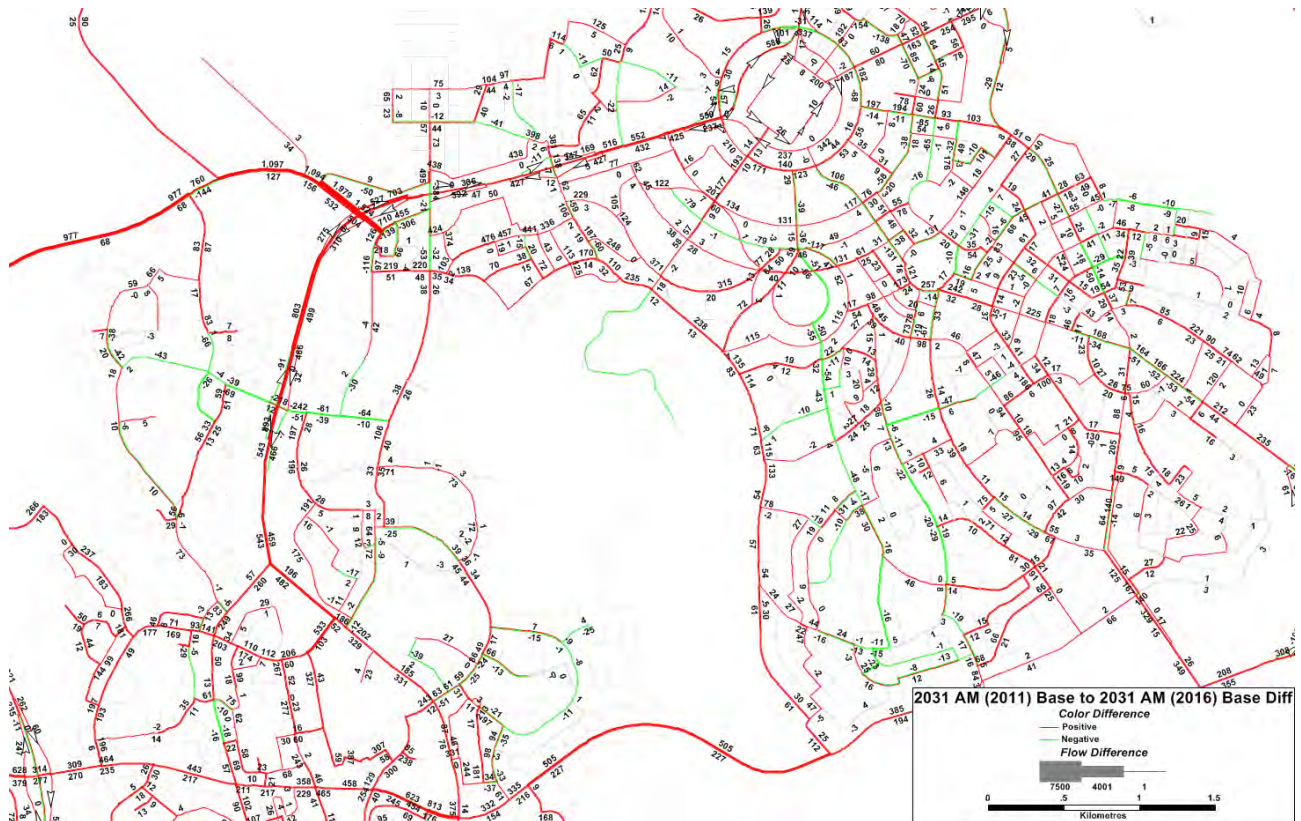


Figure 9: Base Case 2031 AM Difference between CSTM 2011 and CSTM 2016

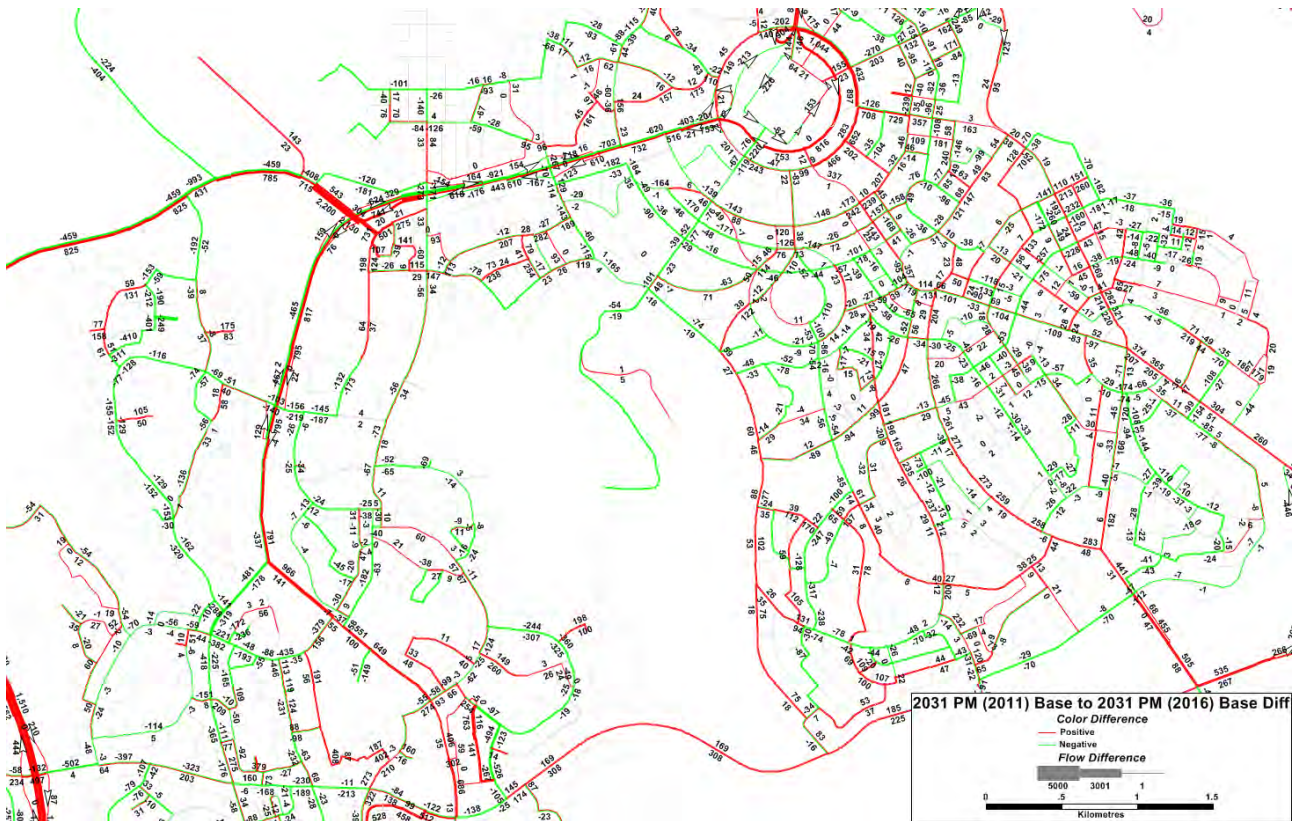


Figure 10: Base Case 2031 PM Difference between CSTM 2011 and CSTM 2016

2.6.2.3 Scenario 6

Scenario 6 includes the closure of Gowrie Drive and a new connection from Federal Golf Club to Birdwood Street. Figures 11 and 12 show the traffic volumes and Volume/Capacity for the network around the study area in the 2031 AM and PM peaks, respectively. As in the Base Case, traffic is largely concentrated on major arterials in the area. However, Kent Street and Stonehaven Crescent operate close to capacity in both peaks.

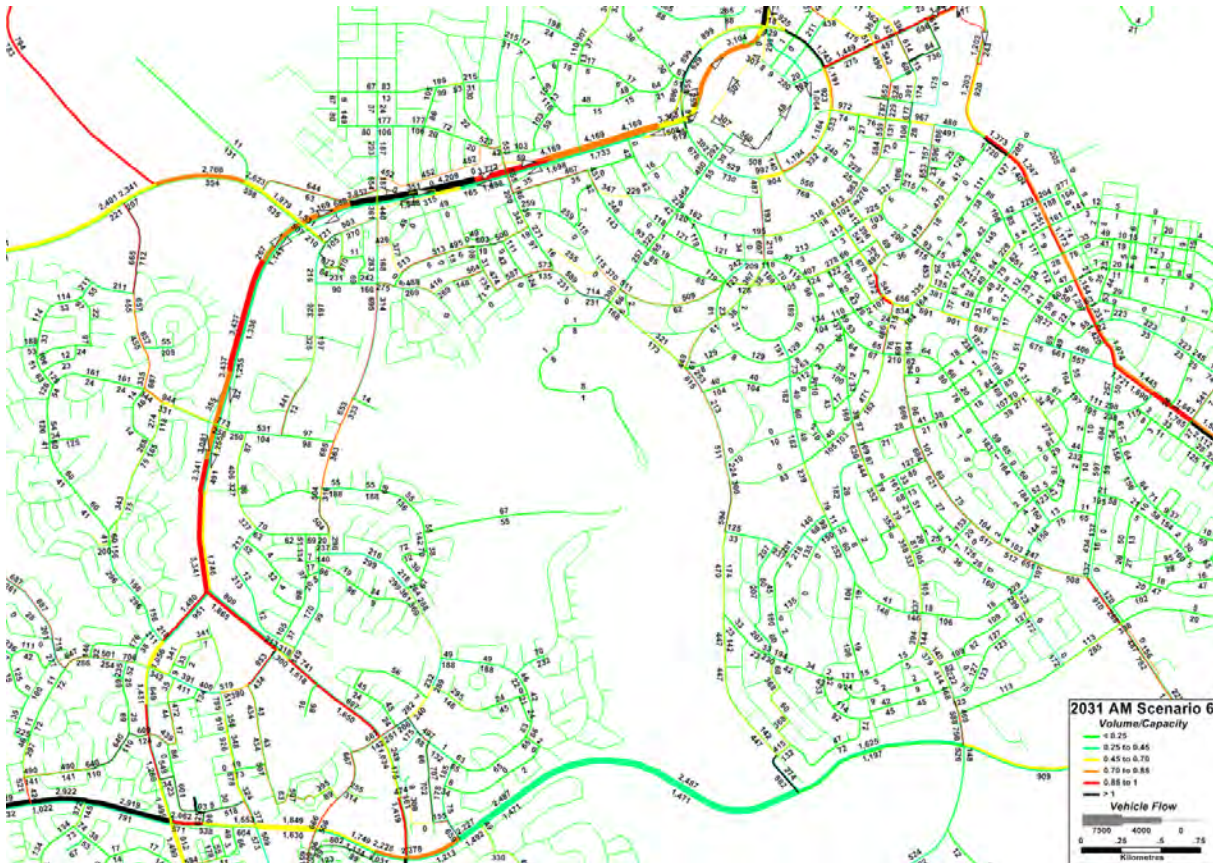


Figure 11: Scenario 6 2031 AM Hourly Flow and V/C

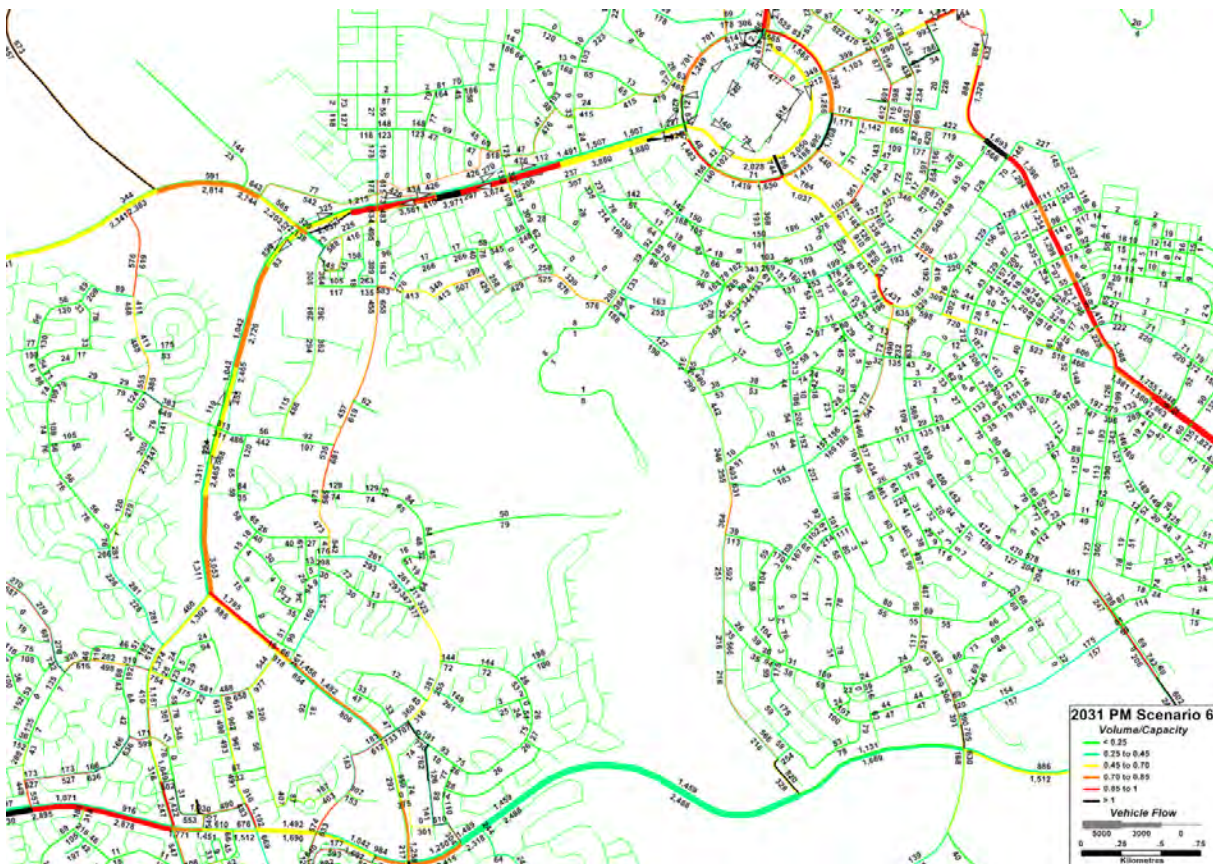


Figure 12: Scenario 6 2031 PM Hourly Flow and V/C

Figures 13 and 14 show the flow difference between Base (CSTM 2016) and Scenario 6 in the 2031 AM and PM peaks, respectively. There is a small amount of additional traffic on Birdwood Street, Kitchener Street and Carruthers Street, generated by the proposed developments. There is a small increase in traffic on Denison Street due to increased congestion on Kent Street. Overall, the impact on the surrounding road network is negligible with traffic volumes increases generally fewer than 30 vehicles per hour. These increases would not be expected to have any significant adverse impacts on network performance.

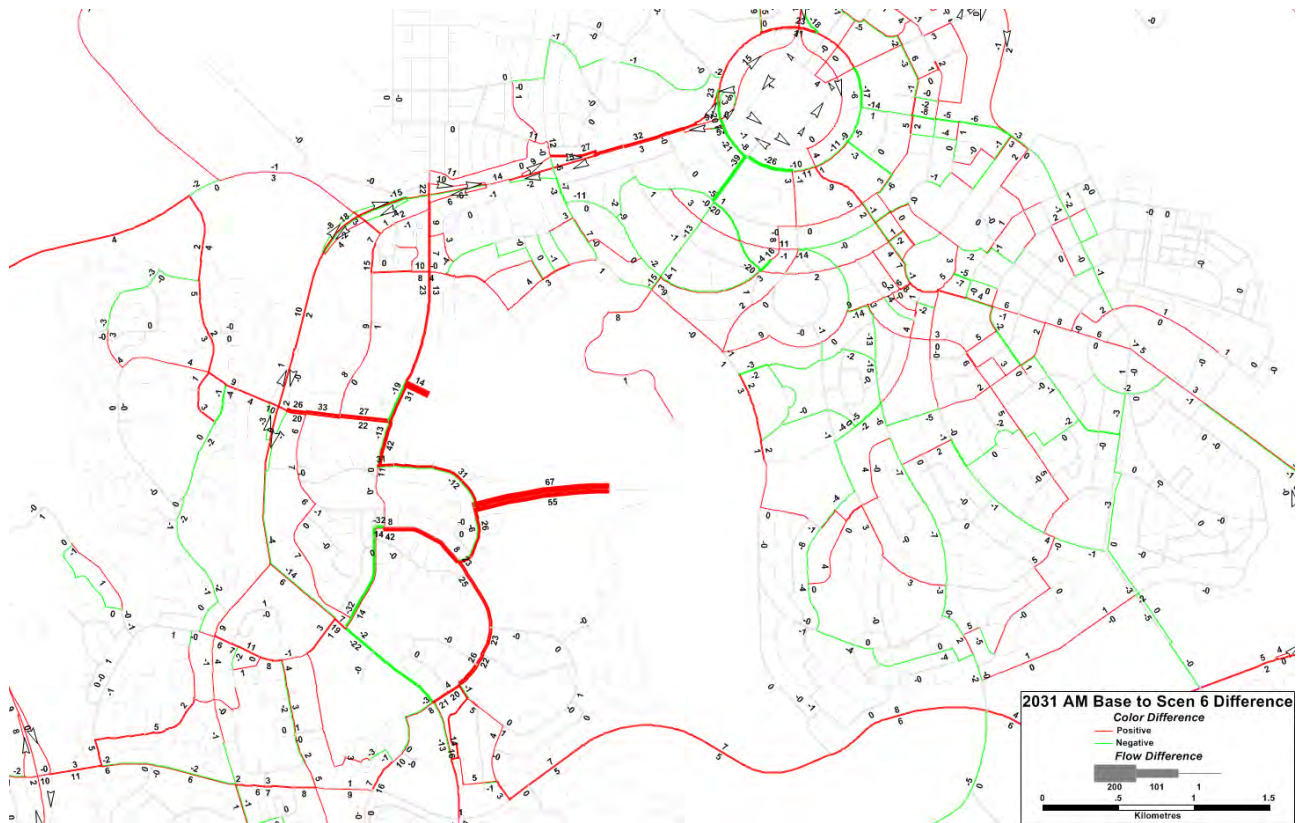


Figure 13: Scenario 6 2031 AM Hourly Flow Difference

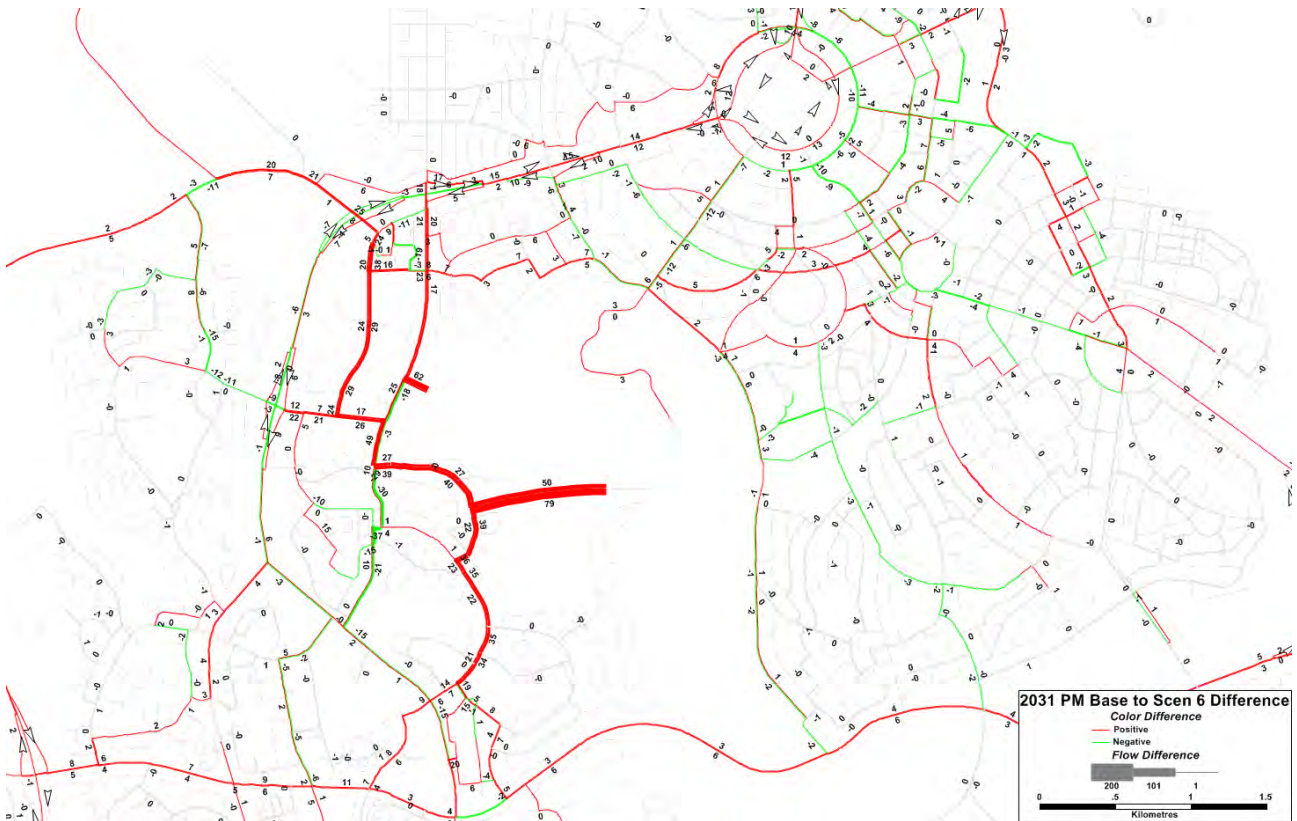


Figure 14: Scenario 6 2031 PM Hourly Flow Difference

2.6.2.4 Scenario 7

Scenario 7 moves the Section 56 Red Hill access from Gowrie Drive to Kitchener Street, which forces the redistribution of ~120 trips in both the 2031 AM and PM peak periods. Figures 15 and 16 show the hourly flow and Volume/Capacity for the 2031 AM and PM peak periods, respectively. As in the Base Case, traffic is largely concentrated on major arterials in the area. However, Kent Street and Stonehaven Crescent operate close to capacity in both peaks.

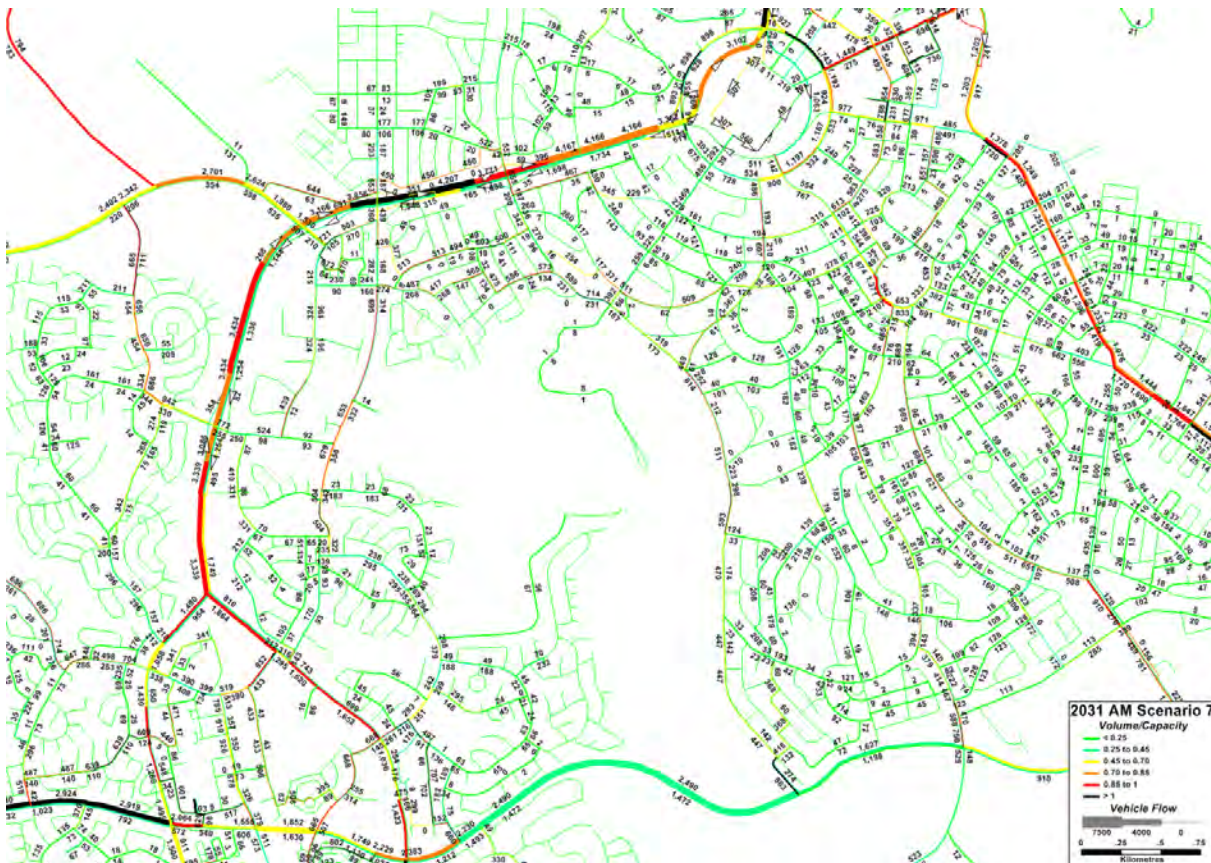


Figure 15: Scenario 7 2031 AM Hourly Flow and V/C

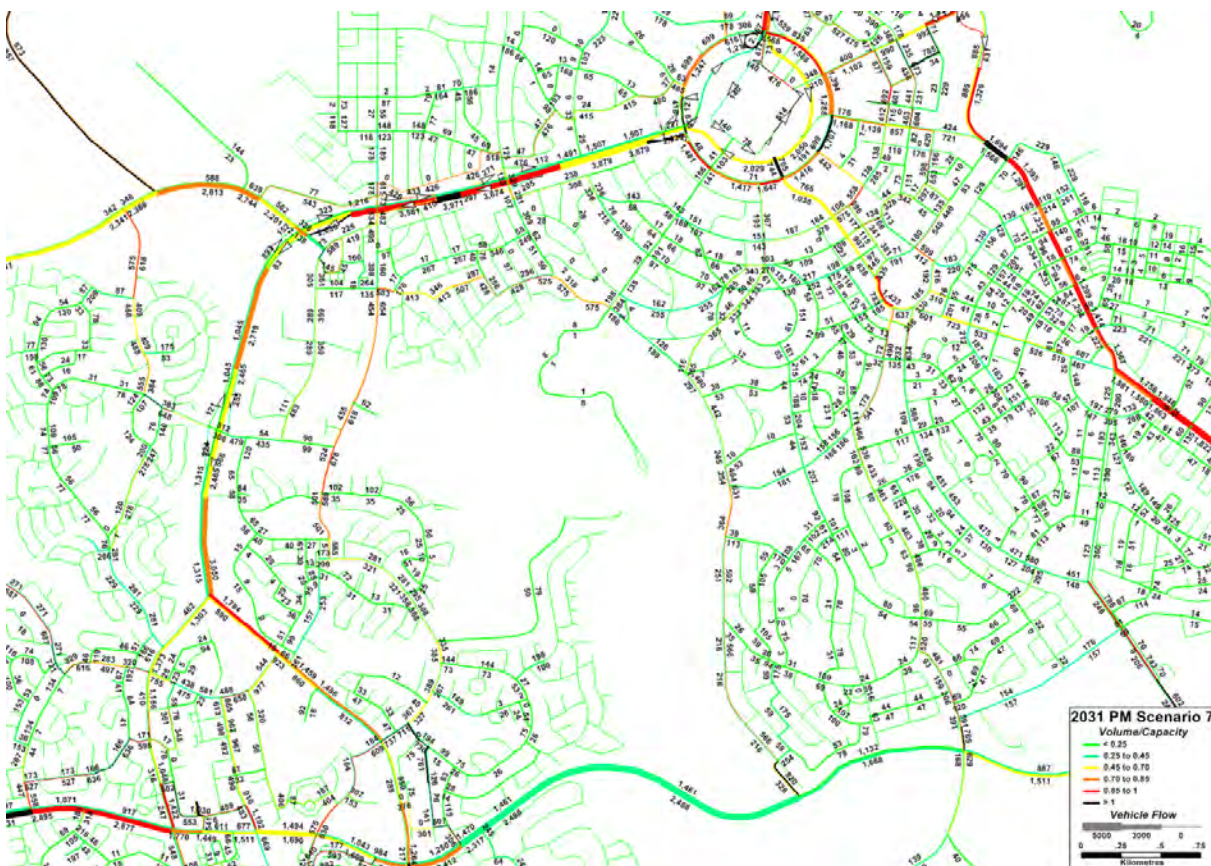


Figure 16: Scenario 7 2031 PM Hourly Flow and V/C

Figures 17 and 18 show the flow difference between Base and Scenario 7 in the 2031 AM and PM peaks, respectively. There is a small amount of additional traffic on Kitchener Street, Kent Street and Carruthers Street, generated by the proposed developments. There is a small increase in traffic on Denison Street due to increased congestion on Kent Street. Overall, the impact on the surrounding road network is negligible with traffic volumes increases generally fewer than 30 vehicles per hour. These increases would not be expected to have any significant adverse impacts on network performance.

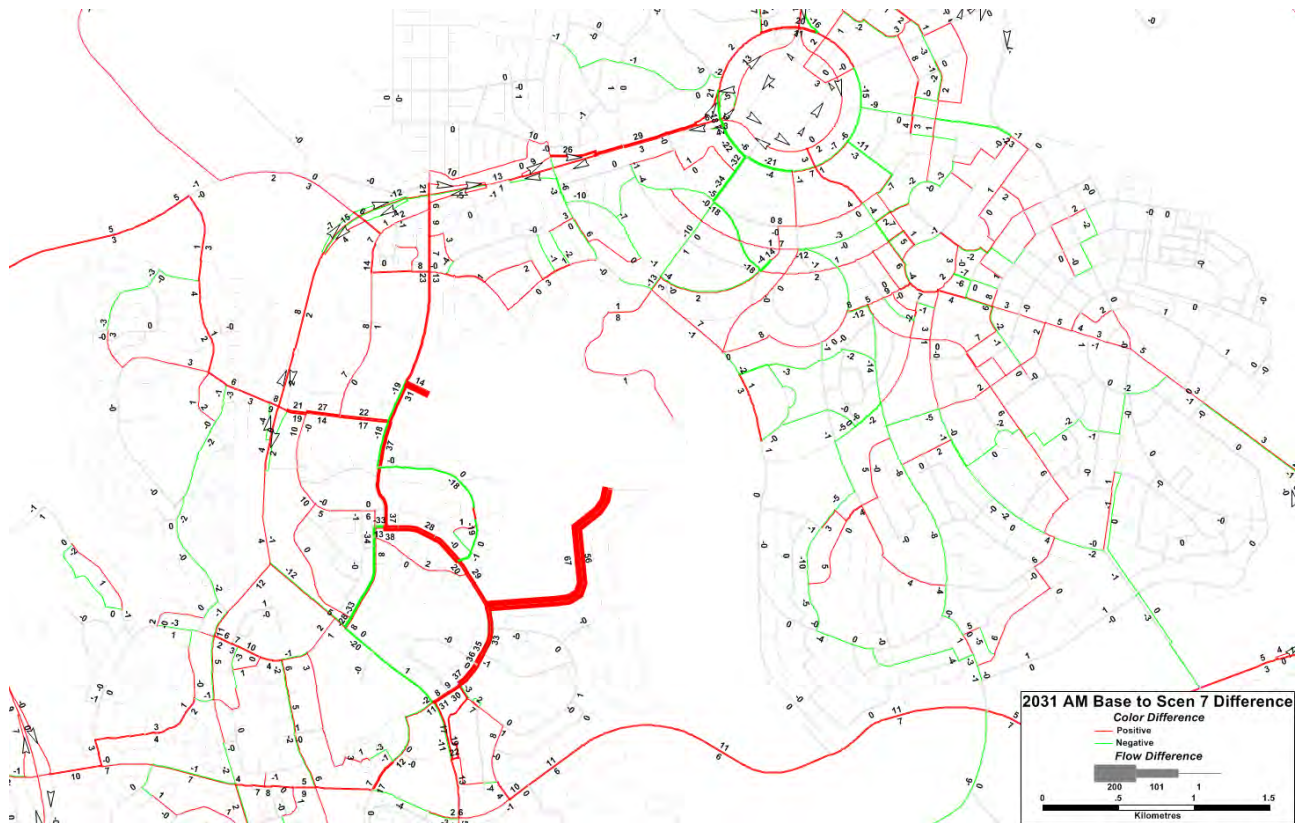


Figure 17: Scenario 7 2031 AM Hourly Flow Difference

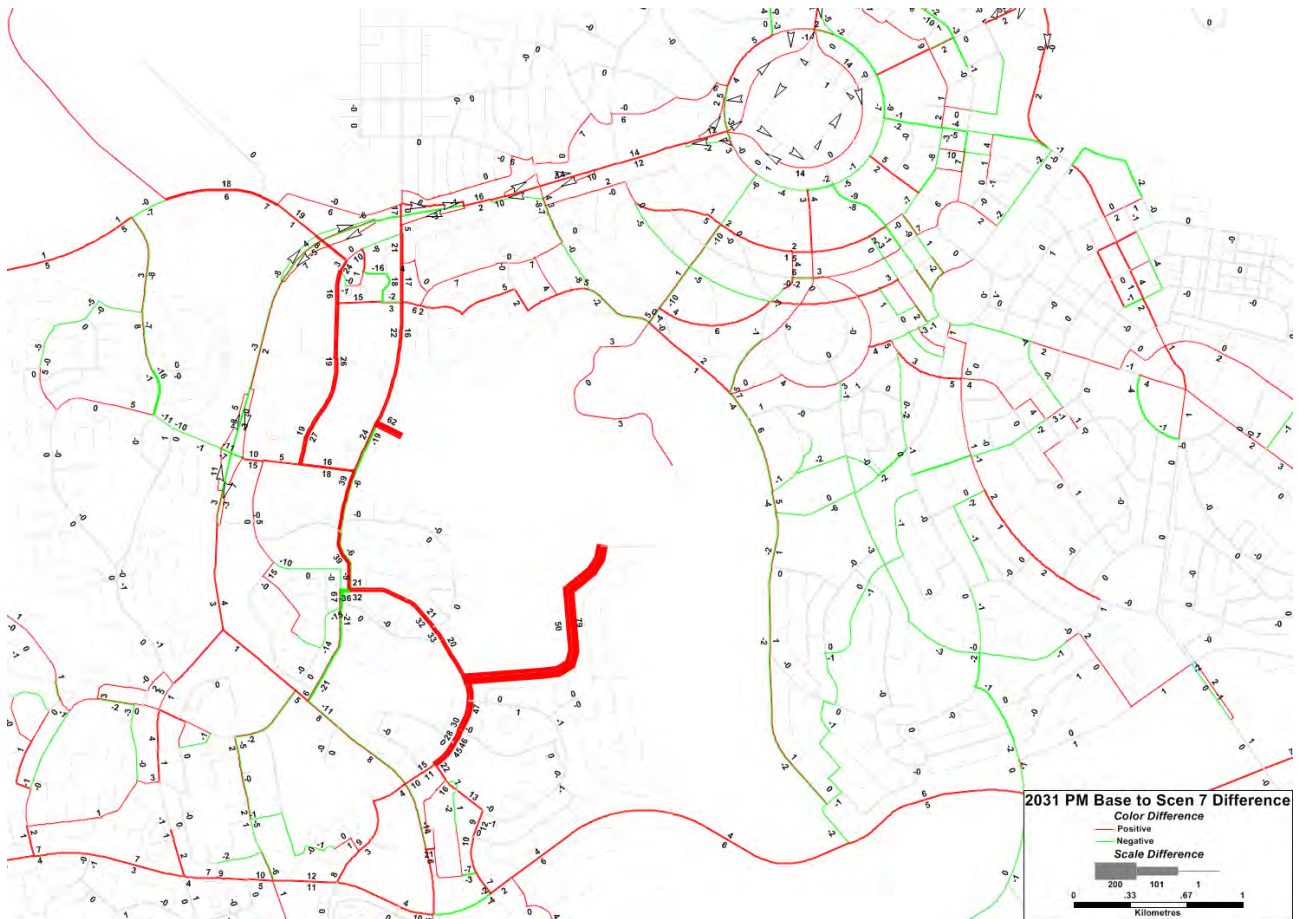


Figure 18: Scenario 7 2031 PM Hourly Flow Difference

2.6.3 Strategic Modelling Summary

A comparison of the traffic volumes for the 2031 AM and PM peak periods between the CSTM (2011) and CSTM (2016) was carried out. For most of the local roads around the study area, the differences between the models are relatively small. Larger differences are apparent on major roads, including Yarra Glen, Adelaide Avenue, Cotter Road and Hindmarsh Drive. Given the small differences in modelled volumes on local roads around the developments, which is where most impact would be felt, it is considered that the findings from the earlier modelling, particularly Scenario 5, which includes both proposed developments, are still current and can be compared to the findings from this current modelling activity.

In Scenarios 5, 6 and 7, given the small amount of additional traffic, the impact on the surrounding network is generally considered to be insignificant. However, Kent Street is already close to its capacity in the 2031 Base Case and the additional traffic generated by the development results in Kent Street coming very close to its capacity in 2031 AM. Given the pre-existing heavy traffic flows on Kent Street, the additional traffic may cause additional delay at the intersections of Carruthers Street, Strickland Crescent and Equinox. Options to address this could be a combination of traffic calming measures (to reduce peak traffic volumes) and signal control at some intersections (to provide better pedestrian access, balance performance at all approaches and induce gaps in the traffic flow along Kent Street).

Comparisons of scenarios for the rest of this report will be limited to Scenarios 5, 6 and 7 as these represent full development of both sites, which will have the greatest impact on the network.

3 Crash Analysis

SMEC obtained crash data for the suburbs surrounding the developments (Deakin, Forrest, Garran, Hughes and Red Hill) for the period 2012 to present (approximately 7.3 years) from the dataACT Open Data Portal¹. The crash statistics for the area around the proposed developments have been extracted from these records and are shown in Figure 19.

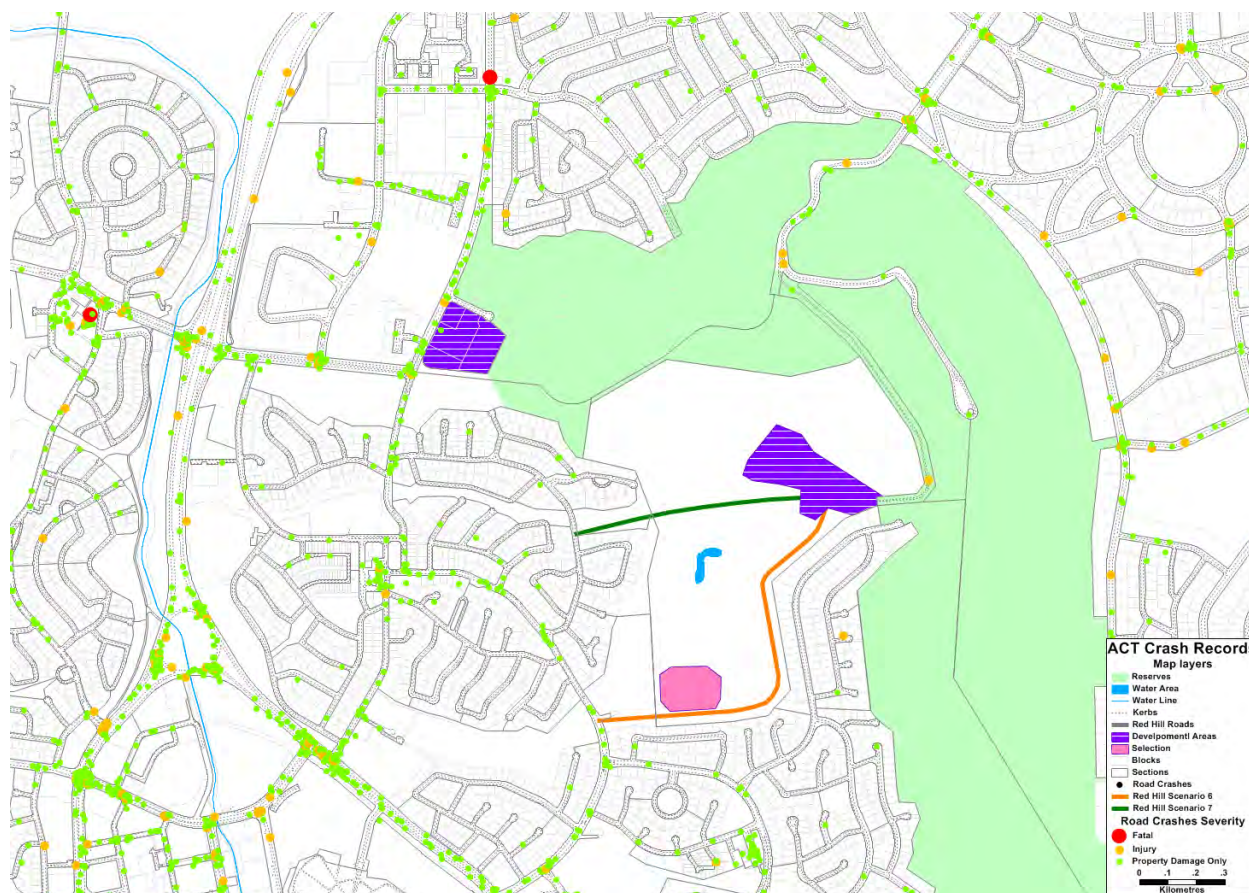


Figure 19: ACT Crash Records 2012-2019

Surveyed traffic counts were used for crash analysis for the following intersections:

- Kitchener Street – Birdwood Street
- Kent Street – Birdwood Street
- Kent Street – Kitchener Street
- Kitchener Street – Gilmore Crescent
- Carruthers Street – Kent Street
- Stonehaven Crescent – Gowrie Drive – Melbourne Avenue
- Gowrie Drive – Red Hill Drive
- Kent Street – Strickland Crescent
- Gilmore Crescent – Brereton Street

To estimate annual traffic from the AM and PM peak period counts, an annualisation factor was developed based on research conducted by Orthongthed, Wang & Legaspi, which provides daily and annual conversion factors for local roads in urban Sydney and four rural regions of NSW, based on a two-hour peak period. In this instance, the average of AM and PM counts has been used. Canberra does not resemble either urban Sydney or rural NSW, instead lying somewhere

¹ <https://www.data.act.gov.au/Transport/ACT-Road-Crash-Data/6jn4-m8rx>

in between in terms of traffic intensity and behaviour, so average factors have been calculated from the rural and urban factors.

Table 10: Traffic Uplift Factors

REGION	DAILY	ANNUAL
Hunter	5.91	1,995
Northern	5.86	1,965
South-west	5.58	1,960
Southern	5.99	2,032
(Rural)	5.84	1,988
Sydney (urban)	7.22	2,469
Average	6.53	2,229

Source: Orthongthed, Wang & Legaspi 2013

The crash records for each intersection have been compiled and are shown in Table 11 and Figure 20. The records cover approximately 7.3 years for the records obtained from dataACT. It was assumed that a crash that occurred within 50 metres of the intersection was associated with the intersection in some way. The annual crash rate was averaged over the recorded period and is expressed in crashes per million vehicle movements (C/MVM), calculated as:

$$\text{CrashRate} = \frac{\text{Crashes}}{\text{AnnualTraffic} \times \text{Years} / 1,000,000}$$

Table 11: Crash Rates by Intersection (2012-2019)

INTERSECTION	MOVEMENTS				CRASHES	PERIOD [YEARS]	RATE [C/MVM]
	2019 AM	2019 PM	Daily	Annual			
Kitchener Street – Birdwood Street	1,490	1,409	9,465	3,230,936	7	7.3	0.30
Kent Street – Birdwood Street	1,411	1,963	11,016	3,760,323	10	7.3	0.36
Kent Street – Kitchener Street	1,375	1,898	10,686	3,647,759	9	7.3	0.34
Kitchener Street – Gilmore Crescent	1,590	1,423	9,837	3,357,989	9	7.3	0.37
Carruthers Street – Kent Street	2,768	2,418	16,932	5,779,797	23	7.3	0.55
Stonehaven Crescent – Gowrie Drive – Melbourne Avenue	2,413	2,176	14,983	5,114,441	17	7.3	0.46
Gowrie Drive – Red Hill Drive	67	121	614	209,526	2	7.3	1.31
Kent Street – Strickland Crescent	3,275	2,959	20,354	6,947,793	19	7.3	0.37
Gilmore Crescent – Brereton Street	908	786	5,531	1,887,963	3	7.3	0.22

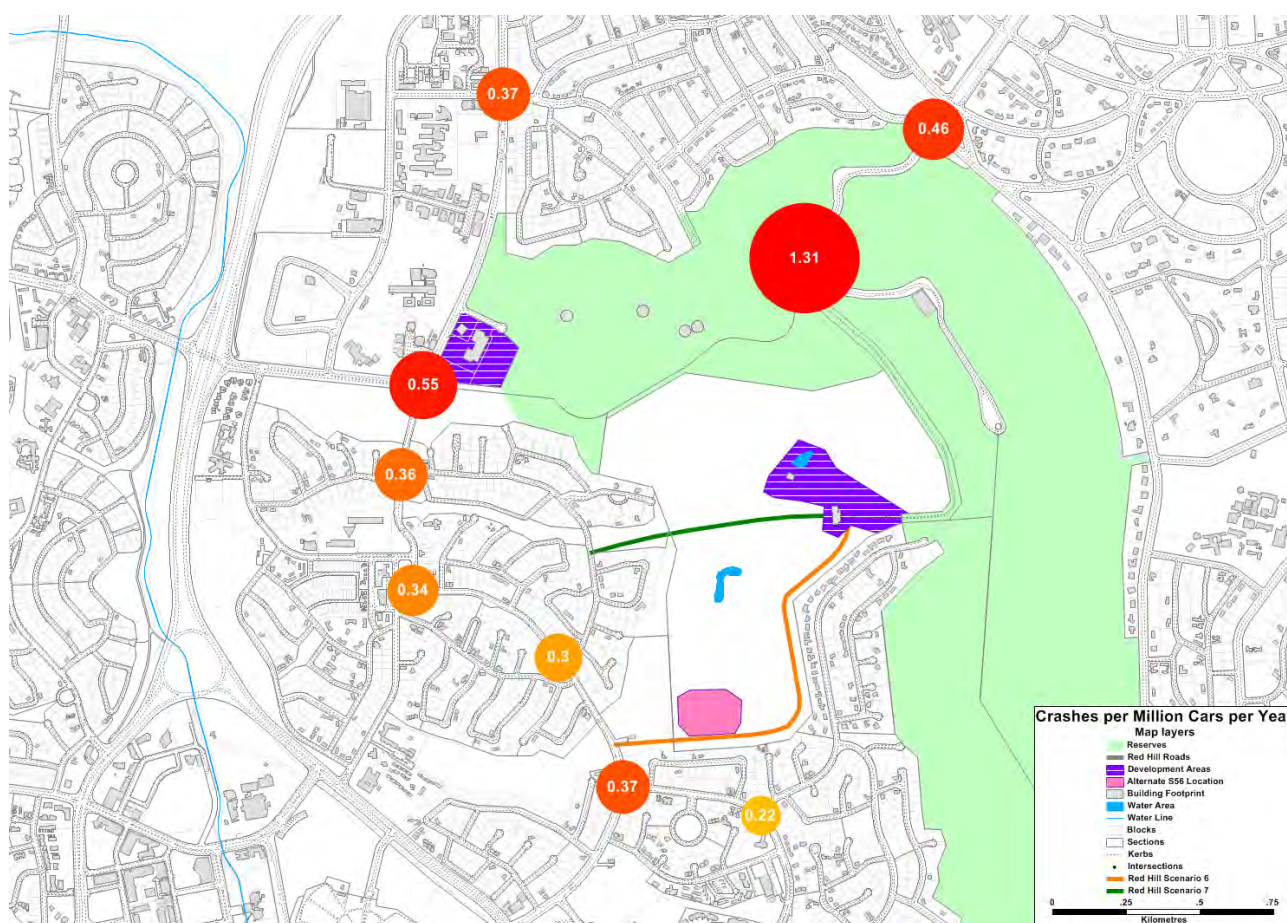


Figure 20: Crashes per Million Vehicle Movements (2012-2019)

The crash records in Table 11 show that there is a range of risk for the intersections around the study area. The intersection of Gilmore Crescent and Brereton Street is the safest, with 0.22 crashes per million vehicle movements. The intersection of Gowrie Drive with Red Hill Drive is the least safe intersection with 1.31 crashes per million vehicle movements. The intersection of Carruthers Street and Kent street has the most crashes over the analysis period and has the second highest number of crashes per million vehicle movements, at 0.55.

A brief analysis of crash factors was also conducted, with the following factors assessed:

- Trend over time
- Wet/dry comparison
- Day/night comparison
- Severity comparison

Figure 21 shows the number of crashes per year for the years 2012 to 2019. From this figure, there does not appear to be a clear trend at any intersection, except the intersection of Kitchener Street and Birdwood Street, where crashes were highest in 2012 and there have not been any recorded crashes since 2015. All other intersections show apparently random variation each year.

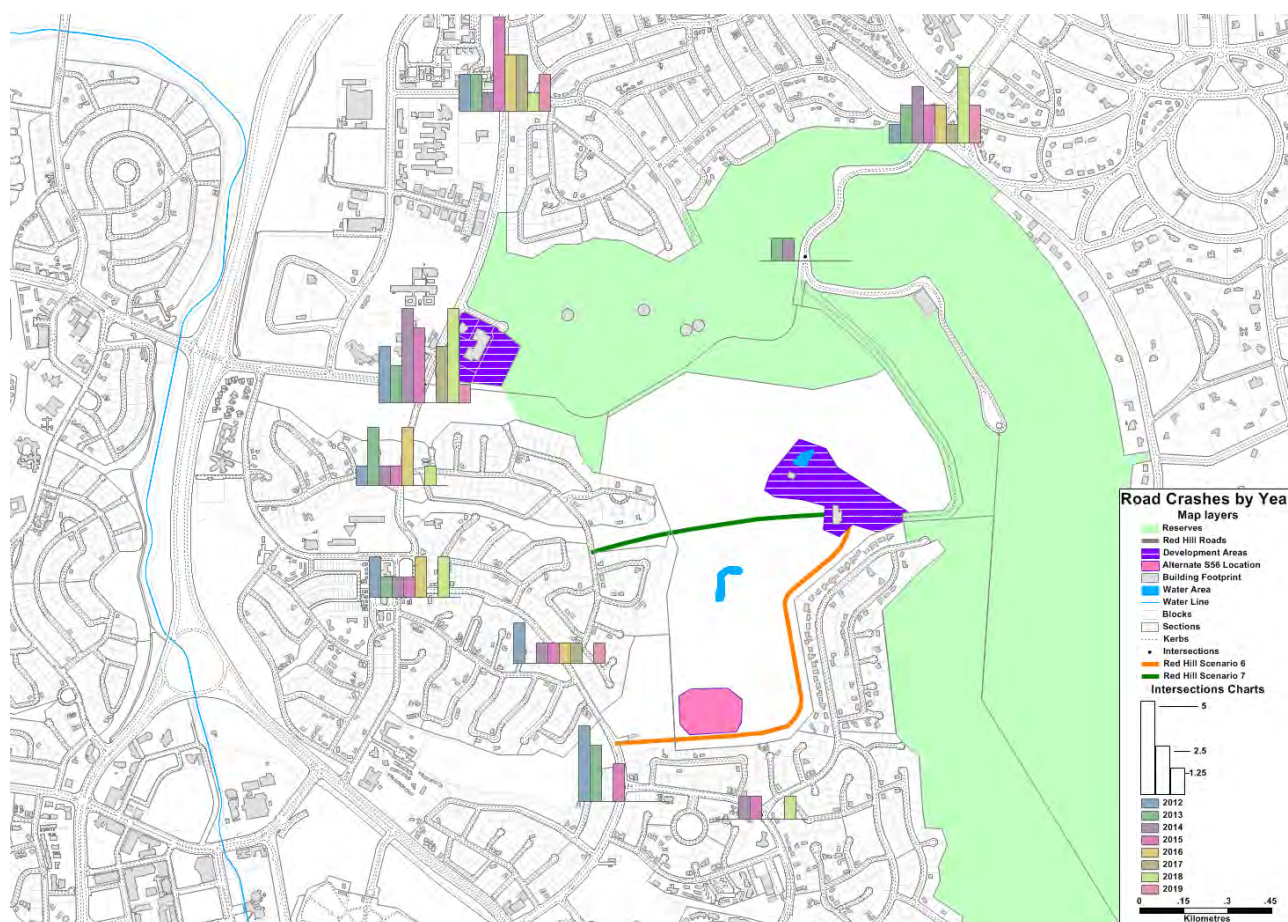


Figure 21: Road Crashes per Year (2012-2019)

Figure 22 shows the proportion of crashes that happen on wet or dry road surface. Most intersection show approximately one quarter of the crashes occurring on a wet road surface. Notable exceptions are the intersections of Brereton Street with Gilmore Crescent and Gowrie Drive with Red Hill Drive, where all crashes occurred on a dry surface. However, the number of crashes at these sites is very low.

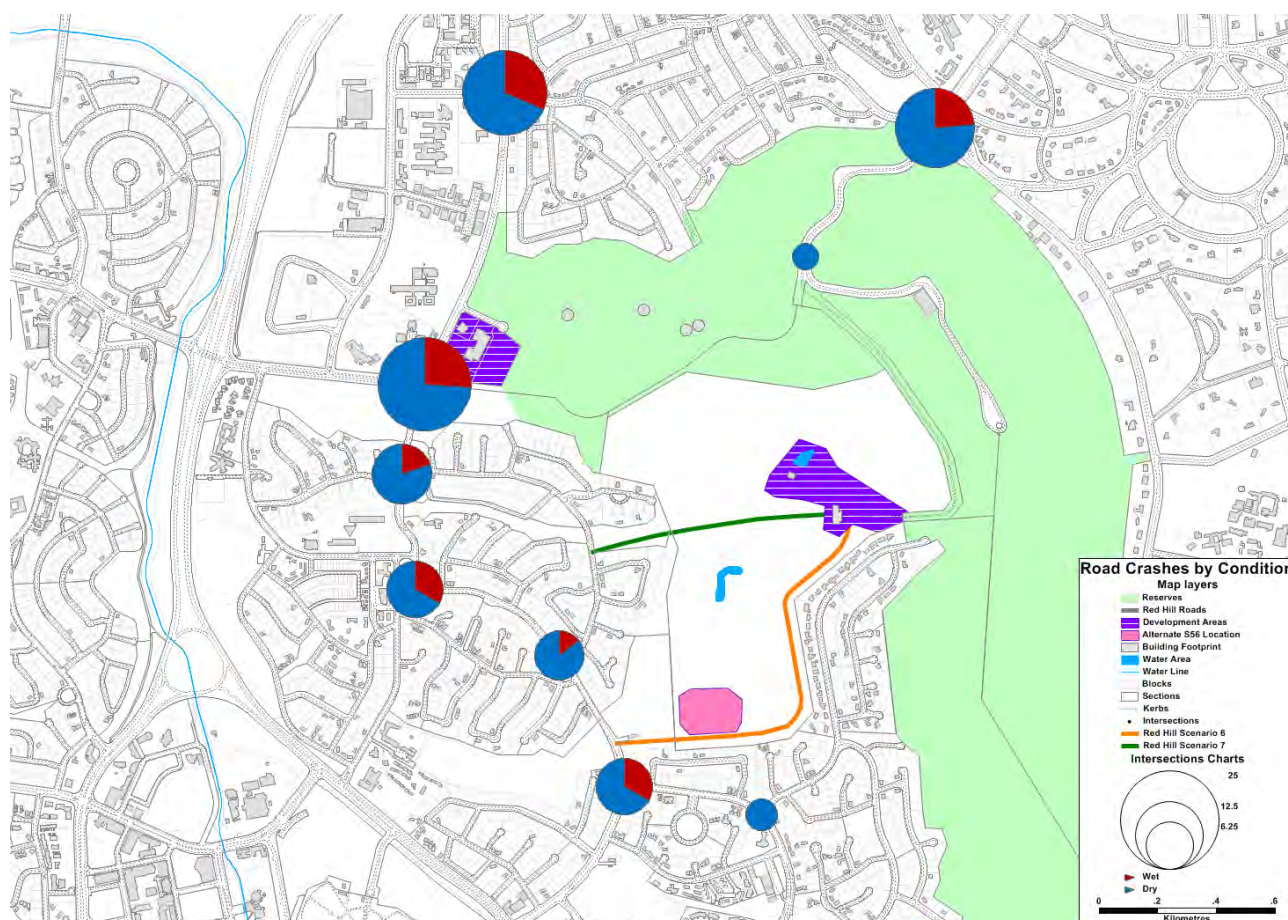


Figure 22: Road Crashes by Wet/Dry Condition (2012-2019)

Figure 23 shows the proportion of crashes that occur during the day and night. Most intersections have a small proportion of crashes at night. However, the intersection of Kitchener Street and Kent Street has more than half of its crashes occurring at night. It is recommended that further investigation be carried out at this location to determine if there is an issue with street lighting or some other factor that increases risk at night time.

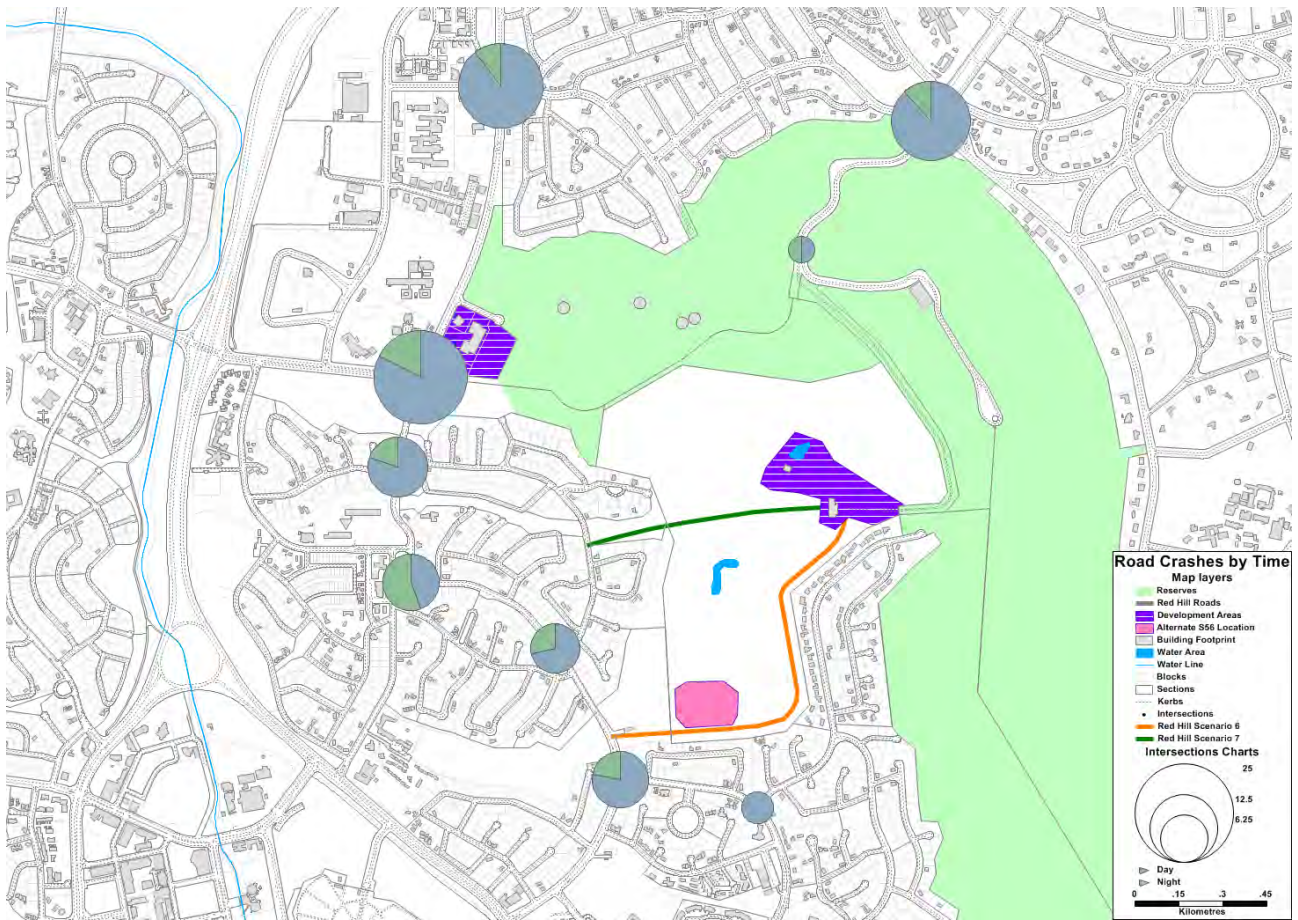


Figure 23: Road Crashes by Time of Day (2012-2019)

Figure 24 shows the proportion of crashes by severity. Most crashes result in property damage only. Larger intersections, with a higher number of vehicles and crashes, have a small number of crashes causing injury or fatality. The notable exception is the intersection of Gowrie Drive and Red Hill Drive. Only two crashes were recorded around this intersection between 2012 and 2019, but both resulted in injury.

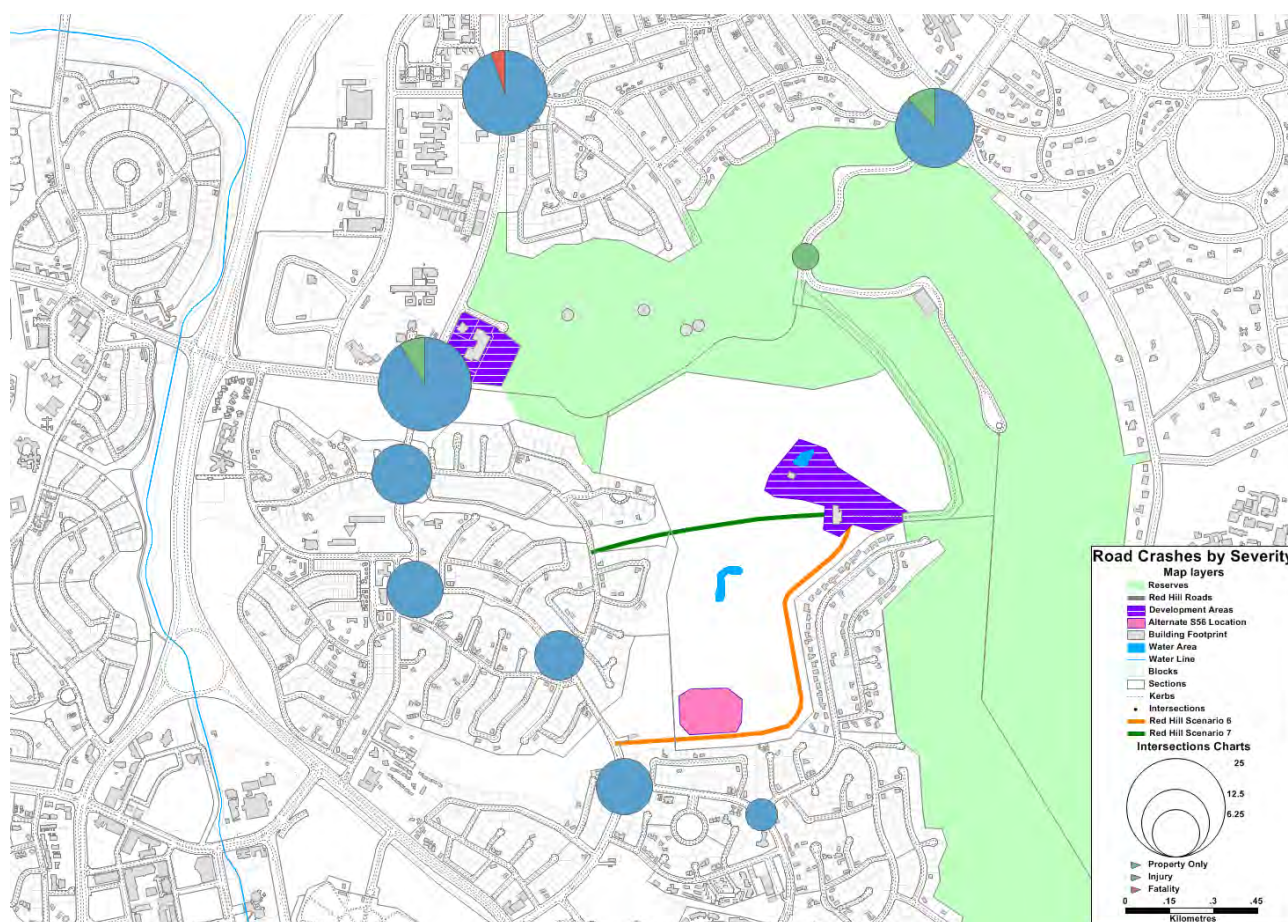


Figure 24: Road Crashes by Severity (2012-2019)

3.1 Summary

The brief crash analysis carried out in this study identified a number of issues that should be investigated further. The identified issues include:

- The intersection of Gowrie Drive with Red Hill Drive is the least safe intersection with 1.31 crashes per million vehicle movements. All the crashes recorded at this intersection resulted in injury, compared to the other intersections which had injury rates of less than 10%. If Gowrie Drive remains connected in the future, investigations should be carried out to identify changes to be made at this intersection to improve its safety. It is noted that the sample size at this intersection is very small.
- The intersection of Carruthers Street and Kent street has the most crashes over the analysis period and has the second highest number of crashes per million vehicle movements, at 0.52. The combination of high crash rate and high traffic volume suggest that further investigation is required.
- The intersection of Kitchener Street and Kent Street has an unusually high proportion of its crashes occurring at night. Further investigation should be undertaken to determine the cause and possible solutions.

4 Public Transport and Active Travel Assessment

4.1 Public Transport Coverage

Figure 25 shows the coverage of bus stops in the current Network 19. For this assessment, it is assumed that local stops have a coverage radius of 500 m and rapid stops have a coverage radius of 800 m, as per the distances in the Estate Development Code. Most of the area around the proposed development has good public transport coverage. Residents in Deakin, Hughes and Garran largely have access to local routes while some residents in the southern areas of Hughes and Garran have access to the rapid route, R6 – City to Woden via Barton. Routes 57 and 58 also run between City and Woden but do so via slower routes than R6.

The proposed development at Section 56, Red Hill does not have access to public transport, nor does the northern part of Brereton Street.

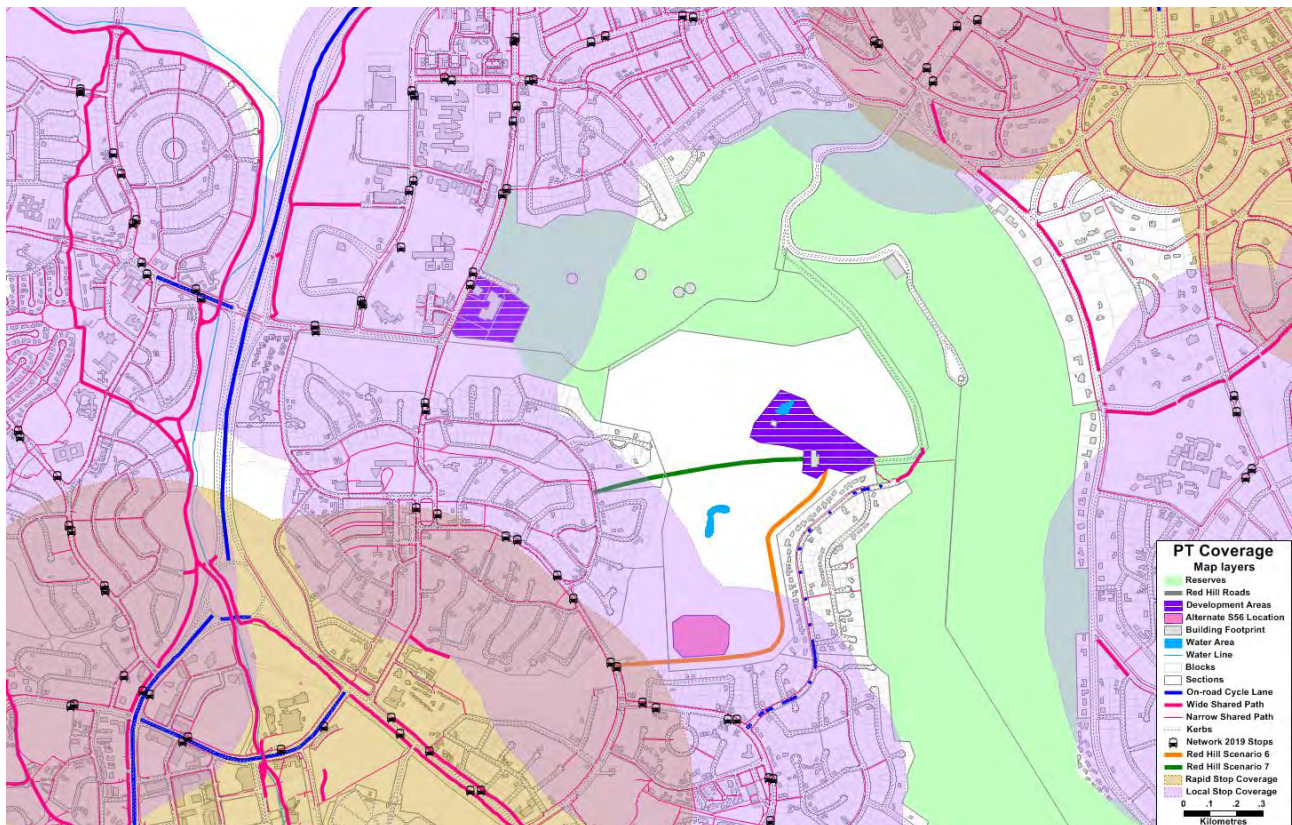


Figure 25: Network 19 Bus Stop Coverage

4.2 Active Travel Network

Figure 25 shows the active travel network around the proposed development area. Most higher order (collector or above) roads in the hierarchy appear to have a footpath/narrow shared path on at least one side of the road. However, many local streets have no footpath at all. Pedestrian access, particularly for people with limited mobility can be very difficult without a footpath. On local streets, verges are often not traversable due to soft surfaces or overgrown gardens and the can be cars parked on the road. Brereton Street has a footpath on only one side and it is often interrupted by driveway ramps, kerb ramps, hedges and garbage bins. It is recommended that the new road accessing the Federal Golf Club development area would have appropriate pedestrian facilities to allow easy walking.

The main off-road shared path network and on-road cycle lane network are connected to most areas via footpaths or rideable local streets.

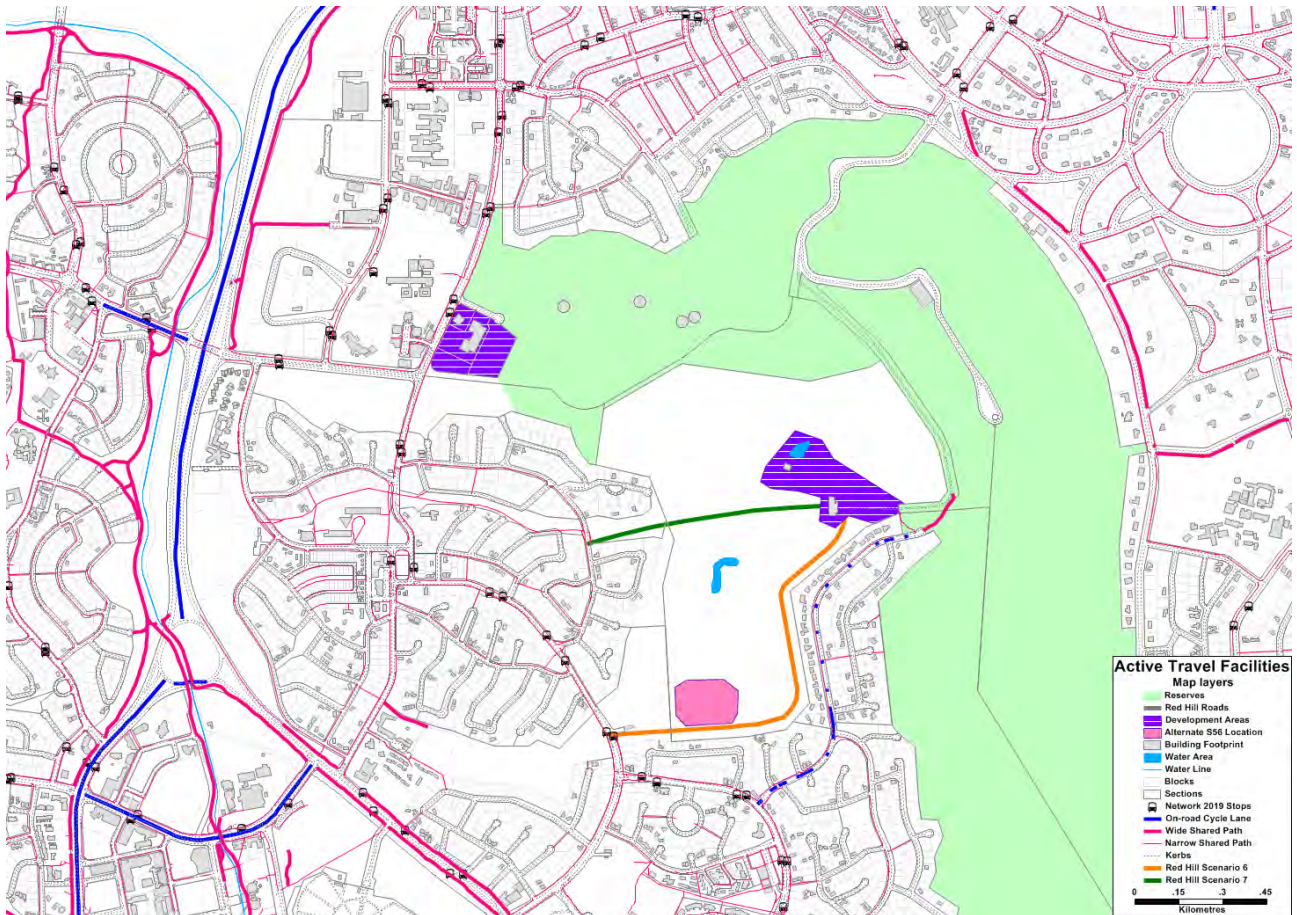


Figure 26: PT and Active Travel Facilities

The two nearest local centres to the Section 56, Red Hill development are Hughes and Garran, both of which are approximately 2 km away. This is about a 30 minute walk for many users and it is unlikely that many people will walk that far. Nevertheless, good pedestrian accessibility should be provided, whichever access option is chosen.

5 Road Network Assessment

Turning movement counts were obtained for the following six intersections on Wednesday 27 June 2018 and 4 July 2018:

1. Mugga Way/Stonehaven Crescent – Gowrie Drive/Melbourne Avenue
2. Gilmore Crescent – Brereton Street
3. Kitchener Street – Gilmore Crescent
4. Kent Street – Carruthers Street
5. Kent Street – Strickland Crescent
6. Gowrie Drive – Red Hill Drive

Further surveys were carried out on 10 April 2019 for the following three intersections:

7. Kitchener Street – Birdwood Street
8. Kent Street – Birdwood Street
9. Kent Street – Kitchener Street

At all nine locations, the surveys were conducted for the AM (07:30 to 09:30) and PM (16:30 to 18:30) peak periods. The turn count reports are included in Appendix B.

Summary flow diagrams provided by Matrix (the traffic survey contractor) for the 2018 and 2019 AM and PM peak periods are shown in Figure 27 through Figure 30. A qualitative assessment of current intersection performance and intersection type, based on the count data, is included below.

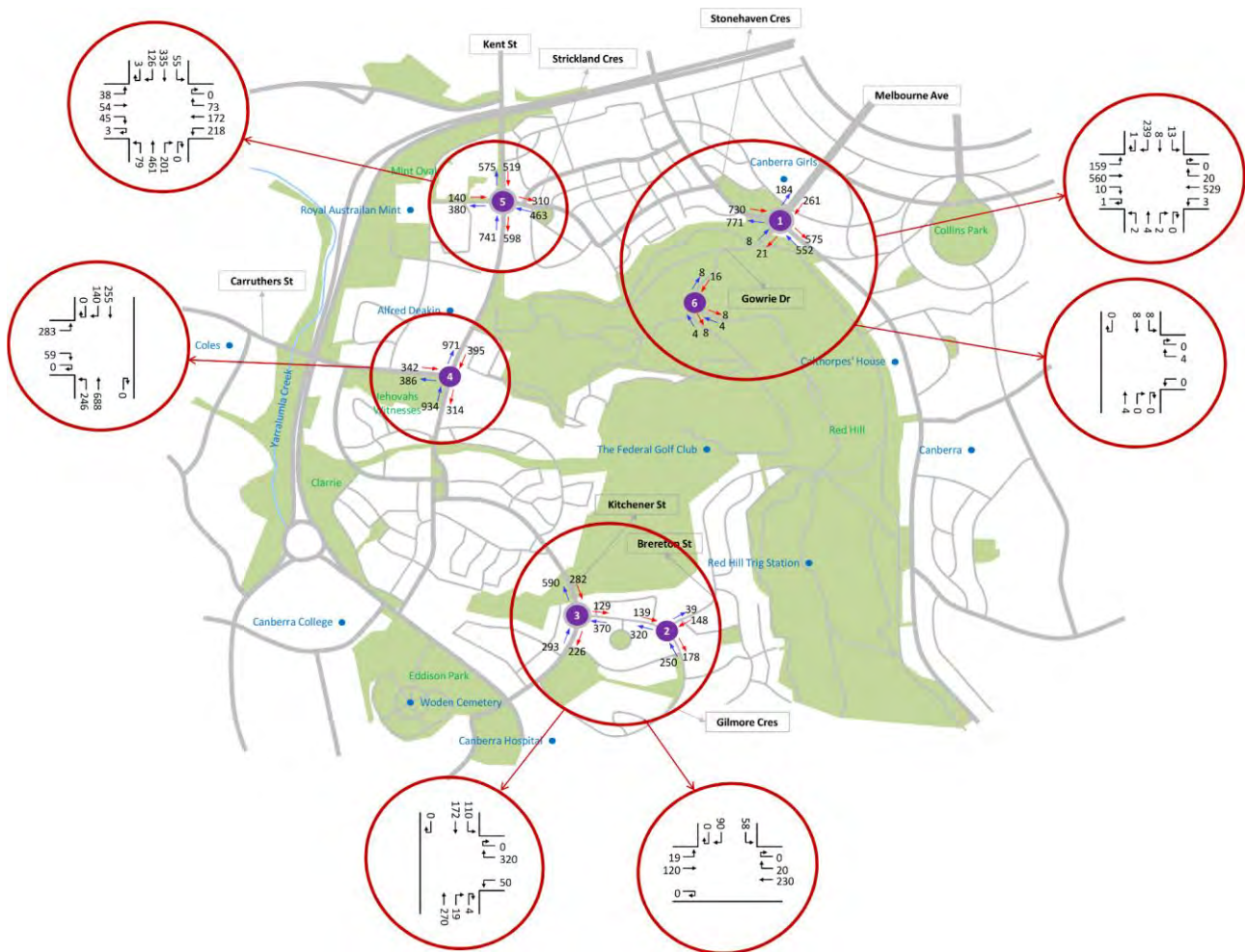


Figure 27: 2018 AM One-hour Peak Intersection Flows

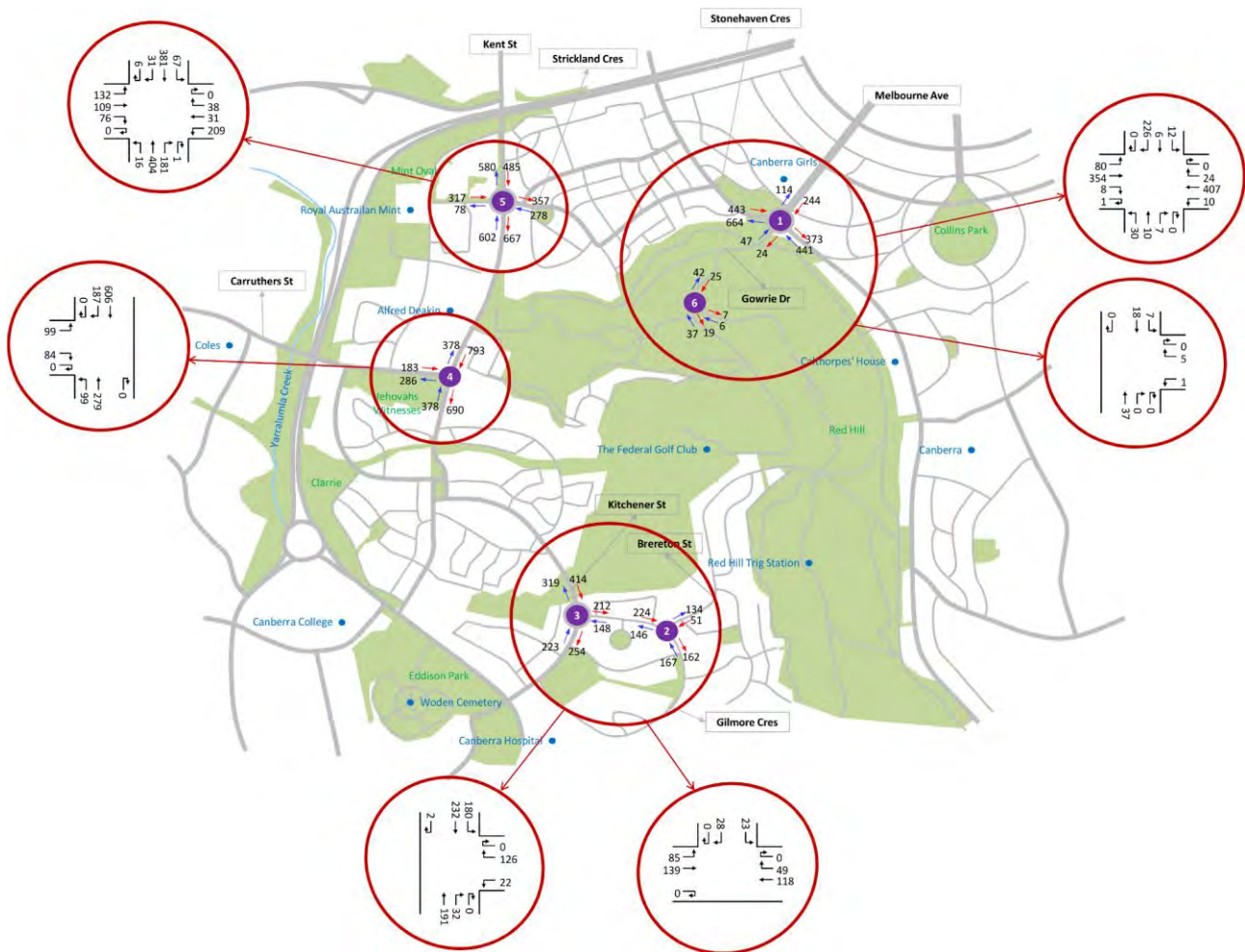


Figure 28: 2018 PM One-hour Peak Intersection Flows

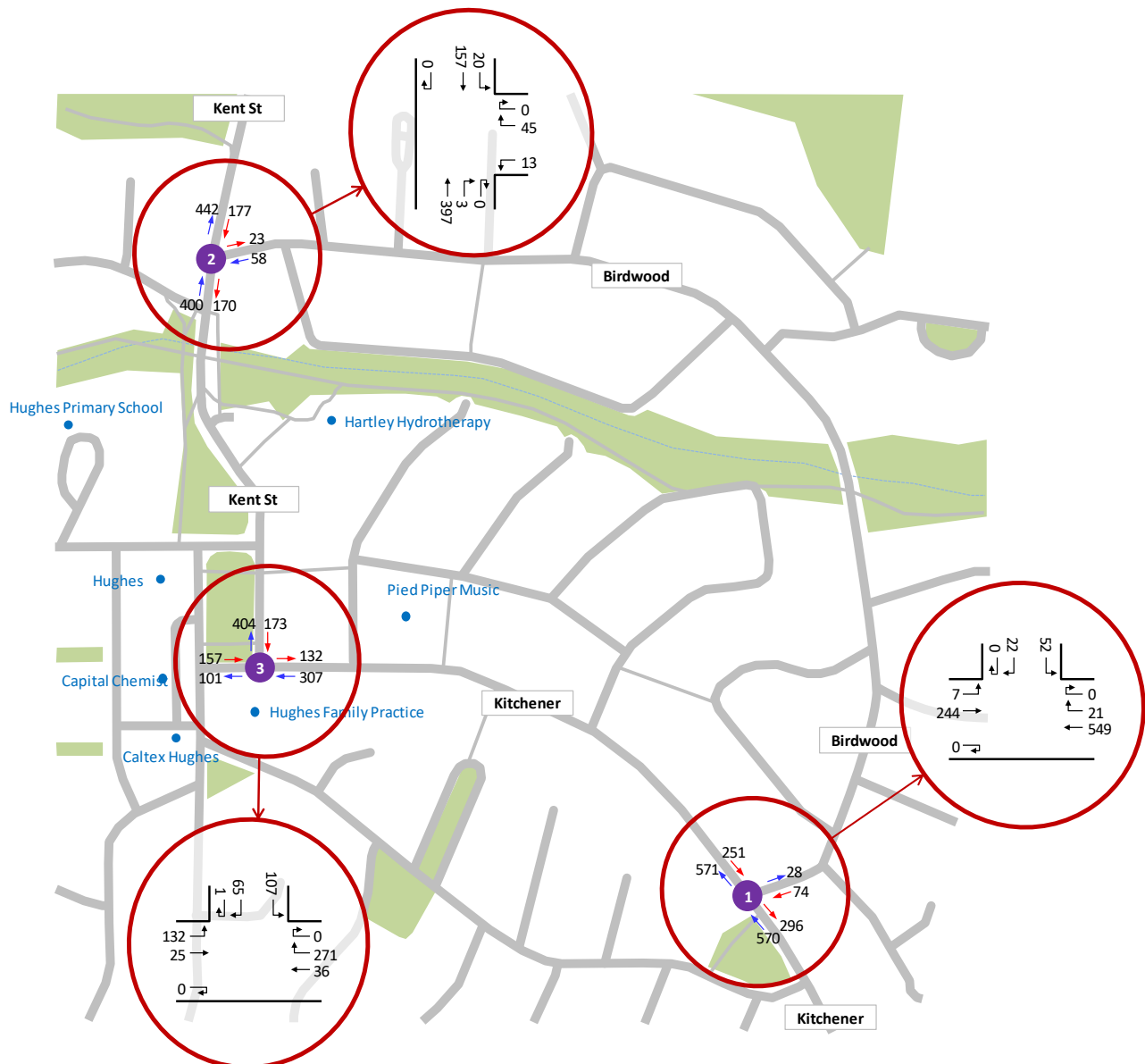


Figure 29: 2019 AM One-hour Peak Intersection Flows

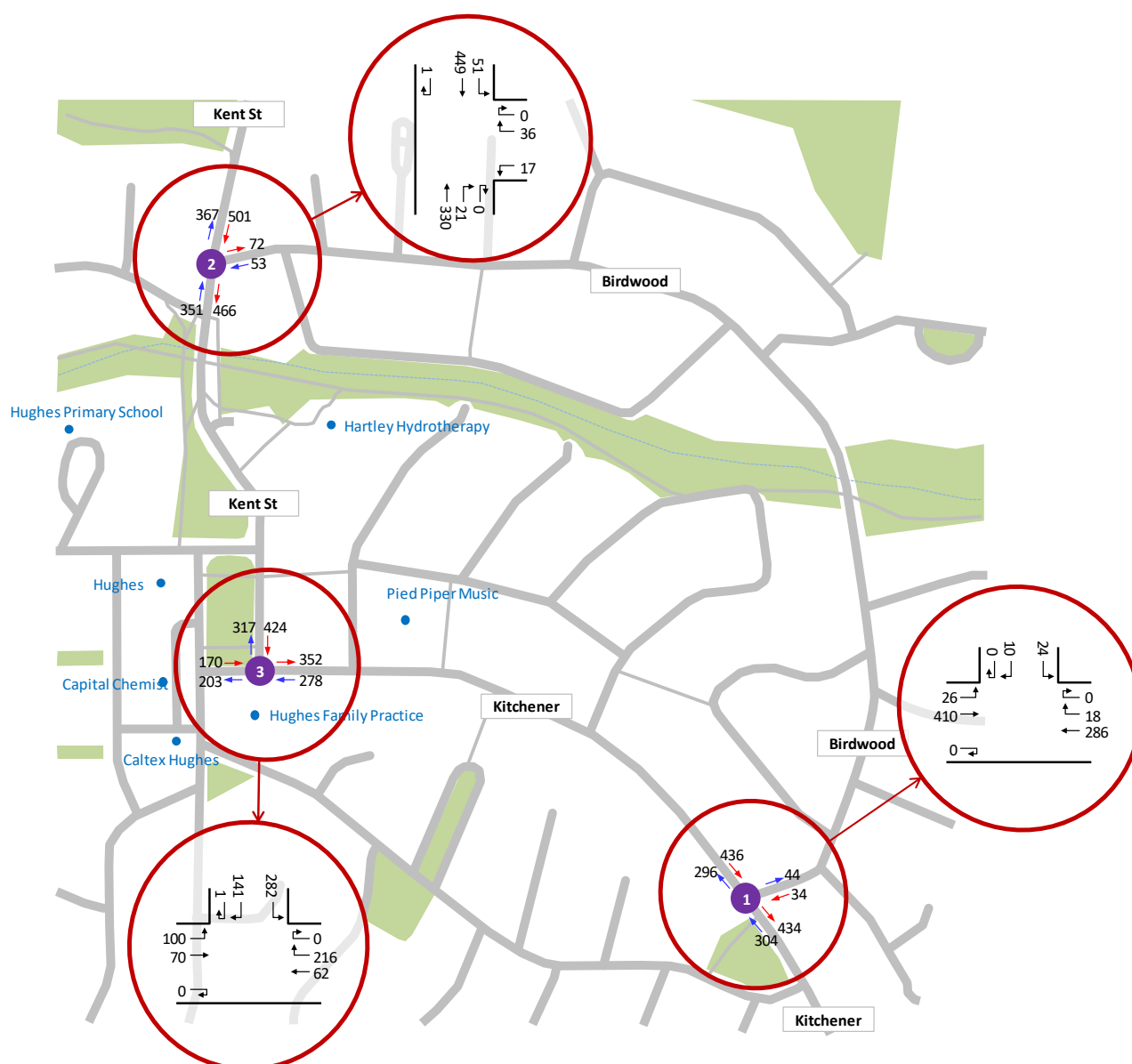


Figure 30: 2019 PM One-hour Peak Intersection Flows

Outside of the town centres, the CSTM is very general in its treatment of individual roads, with capacity dictated by lane count, speed and intersection density. The type of intersections and operating environment are too detailed for a strategic transport model. As such, in some cases the capacity defined in the CSTM will differ from the observed capacity of a road. A particular case that is present in this study is Kent Street, which carries close to 700 vehicles/hour in the 2031 scenario models (its defined capacity in the CSTM), while it is observed to carry almost 1,000 vph in the 2018 AM peak. This might suggest that the road is close to or at capacity in 2018, however the CSTM is best used to determine differences in traffic flow between two scenarios rather than absolute traffic volumes.

5.1 Intersections

5.1.1 Mugga Way/Stonehaven Crescent – Gowrie Drive/Melbourne Avenue

The primary traffic flow at this intersection is east-west along Mugga Way and Stonehaven Crescent. Very little traffic uses Gowrie Drive. The CSTM modelling shows a small increase in traffic in Scenario 5 and an insignificant amount of additional traffic in Scenarios 6 and 7, which would have no impact at this intersection. Austroads *Guide to Traffic Management* suggests that a roundabout at this location is likely to be an appropriate solution, offering low delays and some traffic calming. However, the very heavy flows along Stonehaven Crescent in both AM and PM peak periods could

lead to increased delay on the Gowrie Drive and Melbourne Avenue approaches. Further monitoring and assessment of this intersection might be required.

5.1.2 Gilmore Crescent – Brereton Street

The traffic at this intersection is reasonably low, with 2018 AM and PM peak volumes of 537 and 442 vehicles respectively. The proposed development causes no significant increase in traffic in any of Scenarios 5, 6 or 7. Austroads suggests that a give way control at this location is appropriate. Traffic volumes at this intersection are quite low in both peaks and there are not expected to be any significant delays.

5.1.3 Kitchener Street – Gilmore Crescent

The traffic at this intersection is moderate, with 2018 AM and PM peak volumes of 945 and 785 vehicles respectively. No additional traffic uses this intersection in Scenario 5. Some additional traffic uses this intersection in Scenarios 6 and 7, but the increase is modest and should not have a significant impact. Austroads suggests that a roundabout is appropriate at this location. The relatively balanced traffic volumes on each approach will reduce the likelihood that a single approach would dominate the intersection and increase delays on other approaches.

5.1.4 Kent Street – Carruthers Street

There is currently a large amount of traffic using this intersection. The total 2018 AM and PM peak volumes are 1671 and 1354 respectively and there is a small increase in traffic at this intersection for all of Scenarios 5, 6 and 7. The right turn out of Carruthers Street is quite small which might reflect the difficulty of executing this movement during peak periods. Signalisation of this intersection would therefore likely change the pattern of turning movements by improving performance of those that currently have low priority. Austroads suggests that priority control of this intersection is not appropriate and it would be better managed with signals or a roundabout. The crash analysis also suggested that this intersection is not operating safely and some intervention is required, both for performance and safety reasons.

5.1.5 Kent Street – Strickland Crescent

Considering its design, there is currently a large amount of traffic using this intersection. The total 2018 AM and PM peak volumes are 1,863 and 1,682 respectively. It is likely operating at or close to its capacity during the peak periods, and the additional traffic generated by the Section 66 development could potentially impact the performance, although the forecast additional traffic volumes are low in the three full developments scenarios. While the current intersection control type is appropriate according to Austroads, signalisation of this intersection could improve capacity and performance. Signalisation would also improve pedestrian and bicycle access through the area, which is important so close to the Deakin employment area.

5.1.6 Gowrie Drive – Red Hill Drive

There is very little traffic at this intersection – 24 vehicles in 2018 AM and 68 in 2018 PM. The Wednesday midday period saw 81 vehicles using the intersection, of which half are travelling to or from the lookout at the end of Red Hill Drive. This very low level of traffic contributes to the low number of crashes. However, the crash rate per vehicle and crash severity is much higher than other intersections in the area and interventions at the intersection should be investigated. Previous concepts developed by AECOM in 2014 did not meet Austroads sight line requirements due to challenging grades and had high costs. Since that assessment, there have been two injury-causing crashes at the intersection. In both Scenario 6 and 7, Gowrie Drive is closed, which would remove any risks at this intersection. In Scenario 5, this intersection is the primary access to Section 56, Red Hill, which approximately doubles the traffic volumes on Gowrie Drive. Austroads suggests that the intersection is best controlled by a stop or give-way sign.

5.1.7 Kitchener Street – Birdwood Street

The traffic surveys showed little traffic at this intersection in 2019. It is unlikely that any vehicle at the intersection would experience significant delay now or in the future. Austroads suggests that priority control of this intersection is appropriate. There is no additional traffic at this intersection in Scenario 5. There is only a small amount of additional traffic on Kitchener Street in Scenarios 6 and 7, but this is unlikely to cause any significant issues.

5.1.8 Kent Street – Birdwood Street

The traffic at this intersection is moderate, with 2019 AM and PM peak volumes of 635 and 904 vehicles respectively. Vehicles turning out of Birdwood Street, particularly in the PM peak period, could experience some delays. The developments in Scenarios 5, 6 and 7 would lead to a small increase in traffic along Kent Street, which could further increase delays. Austroads suggests that priority or roundabout control at this location would be appropriate. Further monitoring and assessment might be required to confirm that delays are acceptable.

5.1.9 Kent Street – Kitchener Street

The traffic at this intersection is moderate, with 2019 AM and PM peak volumes of 637 and 872 vehicles respectively. The CSTM modelling showed that a small amount of additional traffic would use this intersection in Scenarios 5, 6 and 7. However, the small roundabout should have sufficient capacity. Austroads suggests that roundabout control is appropriate at this location.

5.2 Roads

5.2.1 Brereton Street

The intersection counts indicate 2018 AM and PM peak volumes of 187 and 185 vehicles respectively, or approximately 1,860 vehicles per day. There would be no additional traffic on this road in Scenarios 5, 6 or 7. Brereton Street has sporadic cycle lane markings and a footpath on one side. However, the footpath is narrow and often interrupted by driveway ramps and pram ramps. Close hedges along one side of the footpath mean that it can also be blocked by wheelie bins on rubbish collection day. There are no significant capacity concerns on this road.

5.2.2 Gilmore Crescent

Gilmore Crescent between Brereton and Kitchener Streets carries approximately 480 vehicles in 2018 AM and 365 in 2018 PM, or an approximate daily volume of 4,220 vpd. No additional traffic uses Gilmore Crescent in Scenarios 6 or 7, while there is an insignificant increase in Scenario 5. There are no capacity concerns in this location.

5.2.3 Kent Street

In both peak periods, traffic demand is greatest between Carruthers Street and Strickland Crescent, coinciding with the concentration of land uses along this section of the road. The additional land use at Section 66 Deakin accesses the network between these two points, adding a small load to a section of road that is likely already congested.

The counted traffic volumes on this section of Kent Street exceed the nominal capacity of Kent Street in the CSTM by up to 270 veh/hr northbound and 90 veh/hr southbound, indicating that it operates somewhat more efficiently in reality than the basic assumption for this category of road in the CSTM, which would be due to a number of factors, not least being the level of conflict with driveways and intersecting streets. It is likely that increasing the capacity to reflect this would continue to show it operating at capacity, however this would have to be tested to be sure.

5.2.4 Birdwood Street

In 2019, Birdwood Street carried between 81-102 veh/hr in the AM peak and 78-125 veh/hr in the PM peak. In the future scenarios, Birdwood Street would carry slightly more traffic in Scenario 6, slightly less traffic in Scenario 7 and would experience no change in Scenario 5. The volumes in this location do not suggest any capacity issues, except for the possible congestion at the intersection of Birdwood Street and Kent Street, as discussed earlier.

5.2.5 Kitchener Street

Kitchener Street, between Kent Street and Birdwood Street, carried 439-822 veh/hr in the 2019 AM peak and 630-732 veh/hr in the 2019 PM peak. It appears that some local traffic management has been implemented by line-marking narrow lanes, presumably to manage speed. The volumes along Kitchener Street do not suggest serious capacity concerns, although there could be minor delays to side streets. The small traffic increases modelled in the future scenarios do not suggest any serious capacity or performance issues.

6 Suitability of Proposed Access Locations

The three full development scenarios assessed in this report require varying amounts of road construction through different locations around the study area. A brief assessment has been carried out to identify major constraints that may impact the feasibility of constructing these roads. Note that this is not intended to be a detailed or comprehensive feasibility study, but is a brief desktop assessment.

6.1 Scenario 2 (Access via Brereton Street)

Brereton Street is a minor collector that extends from Gilmore Crescent to just south of the Federal Golf Club. This street serves the residential area but does not currently provide access to the golf club. The crash analysis conducted as part of this study did not identify any evidence of extraordinary safety issues at the intersection of Brereton Street and Gilmore Crescent. Access to the proposed development would be located at the end of Brereton Street. Vehicular traffic, as well as pedestrians and cyclists, from the proposed development would travel the whole length of Brereton Street.

The area between the end of Brereton Street and the proposed development contains many trees of varying sizes and species. Care would need to be taken to minimise impact on any restricted or protected trees, if they are present.

6.2 Scenario 5 (Access via Gowrie Drive)

Gowrie Drive is currently a narrow and low grade road that serves the Federal Golf Club adequately, though not without posing safety issues. The midblock experiences a rate of traffic crashes no greater than the average for the area, however it is possible that its current users are familiar with the road and drive more carefully when using it. However, the intersection with Red Hill Drive has a very high crash rate and would need to be upgraded. A previous study by AECOM (*Red Hill Drive / Gowrie Drive Intersection – Analysis of options*, May 2014) identified four upgrade options for this intersection but none were able to meet Austroads sight distance requirements and some did not adequately accommodate large emergency vehicles or trucks.

There are a number of significant trees around the intersection of Gowrie Drive and Red Hill Drive that would further complicate upgrades of this road. A brief review of Significant Species, Vegetation Communities and Registered Trees using ACTmapi indicates that Gowrie Drive is surrounded by the following ecological constraints:

- Button Wrinklewort
- Drooping Sheoak
- ACT Listed Box Gum Woodland
- EPBC Listed Box Gum Woodland

6.3 Scenario 6 (Access via Birdwood Street)

Scenario 6 includes a relatively short road running west from Section 56, Red Hill, through the golf course and connecting to Birdwood Street. Possible issues for this access option include:

- Loss of potentially significant trees, particularly around the proposed intersection with Birdwood Street
- Construction of a new road in an overland flow path
- Proposed intersection is at the location of an existing grade separated pedestrian crossing, with the overland flow path under Birdwood Street
- Loss of open space and possible impact on green corridor
- Possible impact on trunk water mains associated with reservoirs on Red Hill
- Community resistance to a new road in open space directly behind current residences

6.4 Scenario 7 (Access via Kitchener Street)

Scenario 7 includes a relatively long access road running along the eastern side of the Federal Golf Course and connecting to Kitchener Street. Possible issues for this alignment include:

- Impact on Spotted-tailed Quoll (ACTMapi: Significant Species, Vegetation Communities and Registered Trees)
- Loss of potentially significant trees
- Possible impact on sewer/electricity services behind residences on Brereton Street and Ingamells Street
- Community resistance to a new road in open space directly behind current residences
- Possible impact on the Scout hall or its driveway and car park

7 Comparison of Access Options

This report and SMEC's 2018 assessment considered five potential road access options for Section 56, Red Hill and assessed them in a number of ways. These options have been rated against the following criteria:

- Carriageway width
- Safety
- Road capacity
- Proportional increase on existing traffic
- Intersection operation/feasibility
- Pedestrian access (could be along a separate route)
- Impact on residents (number of affected residents and proximity to access route)
- Planning constraints related to access including fire and emergency access
- Ease of design/construction

The outcomes of the assessment against these criteria included:

- **Kitchener Street:**
 - Width: Kitchener Street is approximately 10.2 metres between kerbs north of Gilmore Crescent (north) and 12.5 metres between kerbs south of Gilmore Crescent (north). Kitchener Street has on-road bus stops, marked cycle lanes and parking areas.
 - Safety: The intersections where traffic increases are expected have better than average safety records, for the area.
 - Road capacity: Kitchener Street operates at approximately 45% of capacity in the 2031 Base Case so there is plenty of spare capacity
 - Proportional increase on existing traffic: Traffic volumes increase by approximately 14% in Scenario 7.
 - Intersection operation/feasibility: No issues identified
 - Pedestrian access (could be along a separate route): Route is slightly circuitous
 - Impact on residents (number and proximity): New road would be constructed directly behind approximately 50 residences on Brereton Street and Ingamells Street
 - Planning Constraints (fire and emergency): Kitchener Street and the proposed access route are not located in the bushfire prone area.
 - Ease of design/construction: Some minor issues identified with services and access to scout hall
- **Birdwood Street:**
 - Width: Birdwood Street is approximately 7.3 metres between kerbs. There are no bus stops, cycle lanes or marked car parking spaces along its length.
 - Safety: The intersections where traffic increases are expected have better than average safety records, for the area.
 - Road capacity: Birdwood Street operates at approximately 11% of capacity in the 2031 Base Case, so there is plenty of spare capacity.
 - Proportional increase on existing traffic: Traffic increases by 21% in Scenario 6.
 - Intersection operation/feasibility: Scenario 6 has an increase in traffic at the intersection of Birdwood Street and Kent Street, where some capacity issues were noted.
 - Pedestrian access (could be along a separate route): Relatively direct access from Section 56, Red Hill to Hughes Shops.
 - Impact on residents (number and proximity): New road would be constructed behind approximately 20 residences.
 - Planning Constraints (fire and emergency): Parts of Birdwood Street are located in the bushfire prone area but the access route is not.
 - Ease of design/construction: Issues with levels and grade at the proposed connection to Birdwood Street (pedestrian and overland flow underpass).

- **Brereton Street:**
 - Width: Brereton Street is approximately 10.2 metres between kerbs for its length. There are intermittent marked cycle lanes around intersections and in some midblock sections.
 - Safety: The intersections where traffic increases are expected have better than average safety records, for the area.
 - Road capacity: Brereton Street operates at approximately 16% of capacity in the Base Case
 - Proportional increase on existing traffic: traffic on Brereton Street increases by 76% in Scenario 2.
 - Intersection operation/feasibility: No issues noted
 - Pedestrian access (could be along a separate route): Brereton Street currently has some pedestrian access issues. These would need to be addressed or a new pedestrian route constructed.
 - Impact on residents (number and proximity): All residents (approximately 90 residences) on Brereton Street would have an increase in traffic along an existing road
 - Planning Constraints (fire and emergency): Parts of Brereton Street are located in the bushfire prone area but the access route is not. The access route would pass through designated land and require NCA works approval.
 - Ease of design/construction: Scenario 2 uses existing roadways, except for a short link to the golf course.
- **Gowrie Drive:**
 - Width: Gowrie Drive is approximately 5 metres wide. There are no formed shoulders or kerbs.
 - Safety: Traffic increases are expected at a very dangerous intersection
 - Road capacity: Gowrie Drive operates at 7% of its capacity in the 2031 Base Case.
 - Proportional increase on existing traffic: Traffic is expected to increase by 72% in Scenario 1.
 - Intersection operation/feasibility: The intersection of Gowrie Drive and Red Hill Road is a poor design with serious sightline and safety issues. Higher volumes through the intersection may not operate well and would certainly be unsafe.
 - Pedestrian access (could be along a separate route): Poor access from the proposed development to local shops and centres.
 - Impact on residents (number and proximity): There are no local residents along this route.
 - Planning Constraints (fire and emergency): Gowrie Drive is wholly located within the bushfire prone area. Advice received from ESA is that Gowrie Drive would need to be upgraded (widened to 7 metres wide) if it to be used for access.
 - Ease of design/construction: Gowrie Drive may require widening to operate safely. The intersection of Gowrie Drive and Red Hill Drive would need to be upgraded. An earlier study of this intersection by AECOM was not able to find a design that met Austroads sightline requirements due to level and grade issues.
- **Gowrie Drive/Brereton Street:**
 - Width: Brereton Street is approximately 10.2 metres between kerbs for its length. There are intermittent marked cycle lanes around intersections and in some midblock sections. Gowrie Drive is approximately 5 metres wide. There are no formed shoulders or kerbs.
 - Safety: Very large traffic increases are expected at a very dangerous intersection
 - Road capacity: Gowrie Drive operates at 7% of capacity and Brereton Drive operates at 16% of capacity in the Base Case.
 - Proportional increase on existing traffic: In Scenario 3, traffic increases by 931% on Gowrie Drive and 446% on Brereton Street.
 - Intersection operation/feasibility: Existing intersections would need to be upgraded.
 - Pedestrian access (could be along a separate route): Poor access from the proposed development to local shops and centres.
 - Impact on residents (number and proximity): Major increase in traffic for all residents (approximately 90 residences) on existing Brereton Street
 - Planning Constraints (fire and emergency): Gowrie Drive is wholly located within the bushfire prone area. Advice received from ESA is that Gowrie Drive would need to be upgraded (widened to 7 metres wide) if it to be used for access. Parts of Brereton Street are located in the bushfire prone area. The access route would pass through designated land and require NCA works approval.

- Ease of design/construction: It would be extremely difficult or impossible to upgrade Gowrie Drive and Brereton Street to Major Collector standard. The intersection of Gowrie Drive and Red Hill Drive would need to be upgraded. An earlier study of this intersection by AECOM was not able to find a design that met Austroads sightline requirements due to level and grade issues.

Each option has been given a rating of good (3), neutral (2) or poor (1) for each of these criteria as shown in Table 12.

Table 12: Relative Rating of Access Options

CRITERIA	KITCHENER STREET LONG ACCESS	BIRDWOOD STREET	BRERETON STREET	GOWRIE DRIVE	GOWRIE DRIVE/ BRERETON STREET
Width	3	2	2	1	1
Safety	3	2	2	1	1
Capacity	2	2	2	1	1
Proportional traffic increase	3	2	2	2	1
Intersection operation	3	1	3	1	1
Pedestrian access	1	2	2	1	1
Impact on residents	1	1	2	3	2
Planning Constraints (fire and emergency access)	2	2	2	1	2
Ease of design/construction	1	1	3	1	1
Total Score	19	15	20	12	11
Final Rank	2	3	1	4	5

Of the five possible access points considered, using the criteria discussed above, access via Brereton Street is marginally preferred over Birdwood Street and Kitchener Street. Access via Gowrie Drive, or a combination of Gowrie Drive and Brereton Street, is not preferred, primarily due to safety issues at the intersection of Gowrie Drive and Red Hill Drive, and impact on residents if Brereton Street is connected via Gowrie Drive to the wider road network in Forrest and Deakin.

The assessment carried out here used a limited set of criteria to compare the identified options. The assessment has shown that the Gowrie Drive options should not be considered further. However, the other three options have similar scores and should all be considered in more detail. In particular, the cost and environmental impact of construction of new roadways through green spaces has not been considered here but applies to the Birdwood Street and Kitchener Street options. While the Brereton Street option increases traffic on existing roads, the increased traffic does not exceed the capacity of the roads or require reclassification of the roads in the network hierarchy.

The three areas where Kitchener Street (long access) scored poorly are pedestrian access, impact on residents and ease of design/construction. If the proposed development location was to be shifted to the southern area of the golf course, each of these three criteria would score highly. This would rank Kitchener Street (short access) above Brereton Street. Therefore, Kitchener Street (short access) should also be considered for further assessment.

8 Conclusion

8.1 Summary

Each proposed development results in a modest increase in traffic at a local level, with no major impacts coming from proposed access points to the road network. Section 56, Red Hill generates a minimal amount of additional traffic and thus its impact on the network is minor. Connecting to either Birdwood Street or Kitchener Street is unlikely to have any substantial impact on congestion, apart from adding trips to already identified local area streets with volume constraints.

The CSTM suggests that Kent Street will already be close to its nominal capacity in 2031. The modest additional traffic generated by Section 66, Deakin results in some minor traffic diversions, particularly along Denison Street in the PM peak, as existing Kent Street traffic is displaced by the new development traffic and the volume increase on Kent Street reflects this redistribution. This will have implications for many of the intersections on Kent Street, particularly the low speed roundabouts at Strickland Crescent and Equinox and the give-way intersection with Carruthers Street. If there is significant through traffic on Kent Street heading towards the Adelaide Avenue eastbound on-ramp, traffic calming measures could encourage these vehicles to shift to Yarra Glen, probably via Carruthers Street.

It is likely that the Kent Street – Carruthers Street intersection would require signal control, however the Kent Street – Strickland Crescent intersection is situated amongst residences and this might cause some complications. The road reserve appears capable of supporting the necessary infrastructure, but the light from the signals themselves and the constant sound of the audio-tactile pedestrian pushbuttons would cause problems for the surrounding residents. However, this might be acceptable due to the improvement to pedestrian safety it would provide. Traffic calming could be achieved through the use of rubber speed cushions, which could be designed to reduce the attractiveness of the route for general traffic while minimally impacting buses or emergency vehicles.

A preliminary crash analysis was conducted using crash data records obtained from the dataACT Open Data Portal. The analysis indicated that the intersection of Gowrie Drive with Red Hill Drive has the highest crash rate. For both scenarios tested in this report, Gowrie Drive is assumed to be closed, which would remove traffic from this dangerous intersection. The location with the next highest crash rate is the intersection of Carruthers Street and Kent Street with 0.55 crashes per million vehicle movements. This intersection has high traffic volumes and requires turning vehicles to cross multiple lanes of traffic. Interventions at this location should be considered.

A brief assessment of crashes over time, by road condition, by time of day and by severity was also carried out. No intersection showed a clear trend of increases in crashes but the intersection of Kitchener Street and Birdwood Street appeared to show a decrease since 2012 and no crashes were recorded since 2015. No intersection showed a clear increase in crashes during wet weather. The intersection of Kent Street and Kitchener Street showed an abnormally high proportion of crashes at night, which might indicate need for better lighting at this location. While all other intersection had less than 10% of crashes resulting in injury or fatality, the intersection of Gowrie Drive with Red Hill Drive had 100% of crashes resulting in injury. While this is an extremely small sample size, the risks at this intersection are clearly demonstrated.

Access to public transport for the proposed development and surrounding areas was assessed using the new Network 19, which came into effect on 29 April, 2019. Section 66, Deakin has a bus stop adjacent to the development, providing access to Civic and Woden. Section 56, Red Hill has no access to public transport. The areas surrounding the development generally have reasonable access but the northern part of Brereton Street does not have any access.

The active travel network around the proposed developments is well connected. However, the footpath on Brereton Street providing access to Section 56, Red Hill is narrow and has many interruptions. It is recommended that good walking and cycling access be provided on either of the new roads proposed in Scenario 6 or 7.

For the intersections assessed in this report, the following comments were made:

- The Mugga Way/Stonehaven Crescent – Gowrie Drive/Melbourne Avenue intersection performance is unlikely to be affected by the proposed development and access in the scenarios tested in this report. Unbalanced flows at this intersection could lead to high delays for some approaches and further monitoring or assessment of this intersection might be required.
- The Gilmore Crescent – Brereton Street intersection currently has a low level of traffic and would experience no change in the scenarios tested in this report.
- The Kitchener Street – Gilmore Crescent intersection currently carries moderate levels of traffic and its volumes would only increase slightly in the scenarios tested in this report. There are not expected to be any issues at this location.
- The Kent Street – Carruthers Street intersection currently experiences a significant amount of traffic, with performance for low priority movements likely to be poor during the peak periods and risky behaviour might be increased. Austroads standards suggest that an intersection of this type should not be priority controlled and signalisation should be considered to better control the performance and safety at this intersection.
- The Kent Street – Strickland Crescent intersection also currently experiences a significant amount of traffic, especially considering its current roundabout configuration. It is likely operating close to its capacity during the peak periods and the additional traffic generated by Deakin Section 66 could be enough to push it to an unacceptable level of performance. Signalisation might be necessary to manage performance and improve access for pedestrians and cyclists in the area.
- The Gowrie Drive – Red Hill Drive intersection carries very little traffic. The busiest period is the Wednesday midday golf course peak of 81 vehicles per hour, of which only half are travelling to or from the golf course. This very low level of traffic likely contributes to the low number of accidents, although the accident rate is very much higher than other intersections in the area. For the scenarios tested in this report, it is assumed that Gowrie Drive is closed. If this does not occur, interventions should be undertaken to improve safety at this location.
- The intersection of Kitchener Street and Birdwood Street is generally low and only increases slightly for both scenarios tested. It is unlikely that any interventions would be required at this intersection.
- Traffic volumes at the intersection of Kent Street with Birdwood Street are moderate, and there could be some delays for traffic turning out of Birdwood Street, particularly in the PM peak. If Scenario 6 is adopted, some upgrades at this intersection might be necessary.
- Traffic at the intersection of Kent Street and Kitchener Street is moderate and a small amount of additional traffic would use this intersection in both scenarios. However, it is likely that the existing intersection would have sufficient capacity.

For the road sections assessed in this report, the following comments were made:

- Brereton Street carries very little traffic, currently fewer than 2,000 vehicles per day. No additional traffic would use this road in either scenario tested in this report.
- Gilmore Crescent between Brereton and Kitchener Streets currently carries just over 4,000 vpd, by which classification it operates as a major collector. No additional traffic would use this road in either scenario tested in this report.
- Kent Street carries a lot of traffic, with demand greatest between Carruthers Street and Strickland Crescent, due to the concentration of trip generators within this section. The additional land use at Section 66 Deakin accesses the network between these two points, adding additional load to a section of road that is likely already congested.
- Birdwood Street, while narrow, does not currently carry substantial traffic and the development scenarios would not significantly increase traffic. The volumes on this road do not suggest any capacity issues, except for the possible congestion at the intersection of Birdwood Street and Kent Street.
- Kitchener Street carries a moderate amount of traffic, and some traffic calming has already been implemented. In the scenarios tested in this report, there is a small increase in traffic but this is not expected to lead to any serious performance issues.

8.2 Challenges

The following challenges are noted:

- Kent Street traffic is heavy, which is likely to cause problems at some intersections, particularly Carruthers Street and Strickland Crescent
- The Section 66 Deakin development would increase delay on Kent Street and lead to a small diversion in traffic onto Denison Street

A map of the challenges is included in Figure 31.

8.3 Recommendations

Based on the outcomes of the transport modelling and analysis, SMEC recommends the following:

- Adopt Scenario 2 (access via Brereton Street) as the preferred option for further analysis, noting that the Kitchener Street and Birdwood Street options should not be discounted at this stage. A new option, based on the Kitchener Street access, was identified by EPSDD during the study and should also be considered further. All four options should undergo further assessment of considerations outside the scope of this report, including environmental impact, impact on adjacent residents, construction cost and constructability.
- Investigation of upgrade options for intersections on Kent Street, to address both performance and safety concerns, including:
 - Assess lighting at the intersection of Kent Street and Kitchener Street
 - Assess capacity improvements at Birdwood Street, Carruthers Street, Strickland Crescent
- Investigation of options to improve the performance and/or reduce the attractiveness of the Kent Street corridor to encourage traffic to use Yarra Glen and Adelaide Avenue for north/south travel. Possible options include speed reduction or construction of one or more roundabouts to reduce the priority for north-south traffic along the corridor and wombat crossings to improve pedestrian permeability. Any changes to the corridor should also consider Light Rail Stage 2, which is expected to run along the Adelaide Avenue/Yarra Glen corridor.
- Closure or upgrade of the intersection of Gowrie Drive and Red Hill Drive (dependant on whether Scenario 6, 7 or another option is selected)
- Any new road(s) provided for the preferred option should include good active travel facilities and meet relevant emergency services design standards
- Cost estimates for road and intersection upgrades
- Ensure good pedestrian access to the Kent Street bus stops from Section 66, Deakin

A map of the recommendations is included in Figure 32.

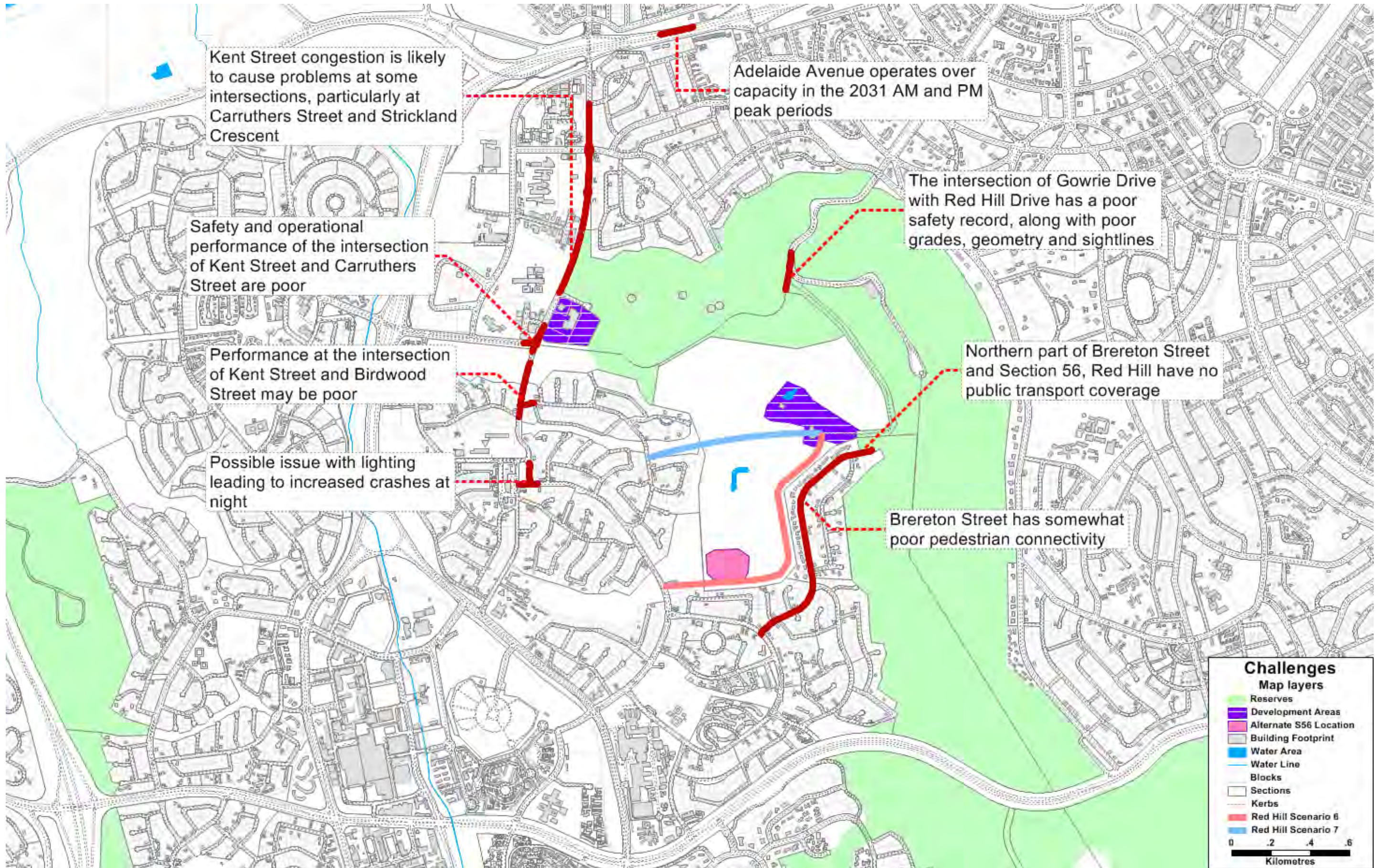


Figure 31: Red Hill Reserve Surrounds Challenges

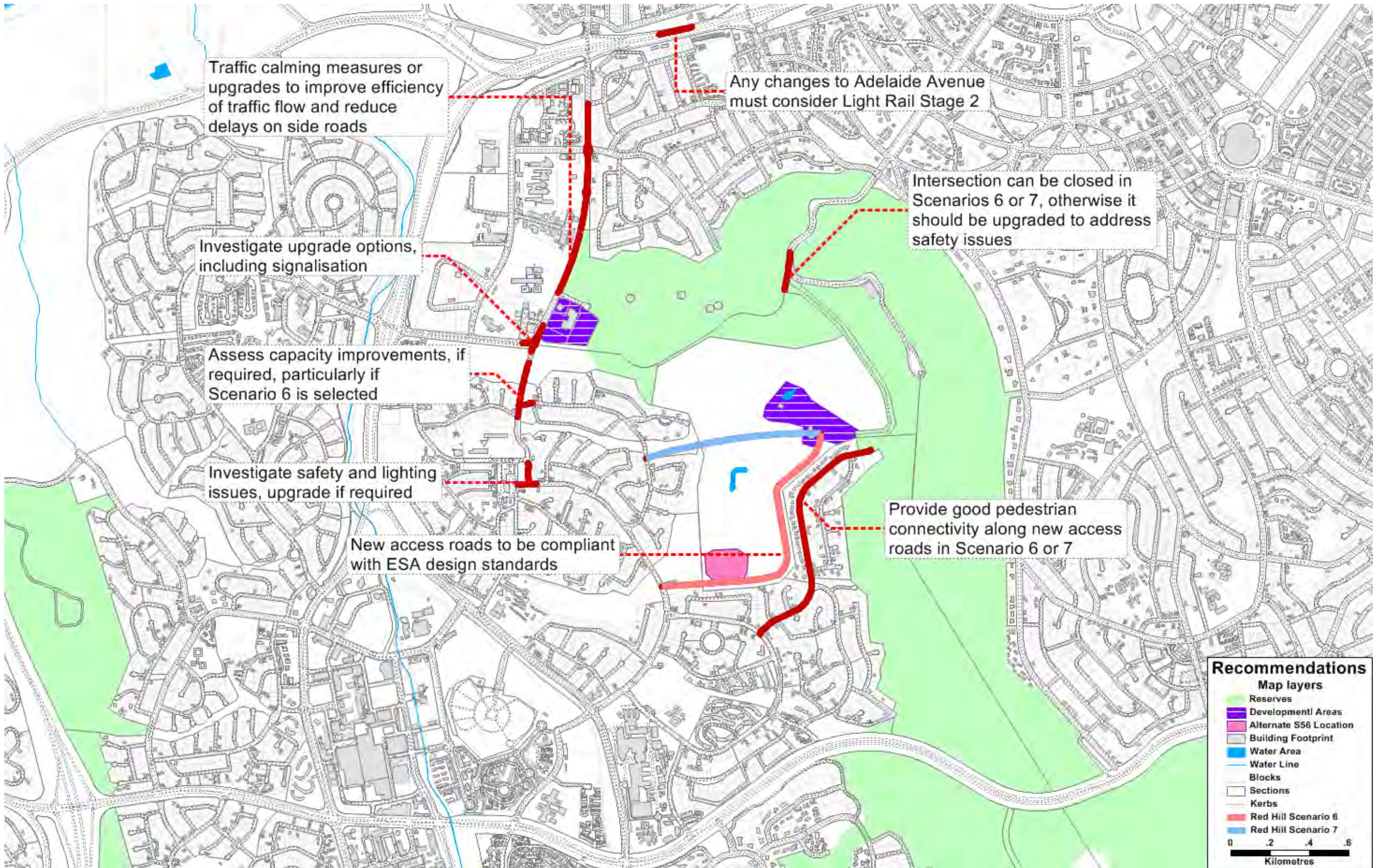


Figure 32: Red Hill Reserve Surrounds Recommendations

9 References

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Appendix A Future Road Network Assumptions

2021 Assumed Road Network Improvements

Network Item	Description
Taylor Local Roads	Added
Horse Park Drive Duplication	Duplication of Horse Park Drive between Federal Highway and Roden Cutler Drive- for 2018 completion. Anthony Rolfe Avenue to Well Station Drive
Hibberson Street pedestrian and light rail zone	Pedestrian and light rail only zone between Kate Crace Street and Gungahlin Place
Hibberson Street one-way shared zone	Shared zone between pedestrians and vehicles on Hibberson Street between Gungahlin Place and Gozzard Street
Manning Clark Crescent Extension	New road connecting Flemington Road to Anthony Rolfe Avenue
Ernest Cavanagh Street Extension	Extension of Ernest Cavanagh Street from Hinder Street to Manning Clark Crescent
The Valley Avenue Extension and Manning Clark Crescent Extension	Extension of The Valley Avenue from Kate Crace Street to Manning Clark Crescent and the extension of Manning Clark Cres from Flemington Rd to Anthony Rolfe Avenue
New road to the south of The Valley Avenue	Following up SLA (Darren Benson) for details where it connects to including extension of Gungahlin Place and 4 th leg of Valley Avenue/Kate Crace St intersection (both intersections now signalised)
Light Rail Stage 1	Light rail from Gungahlin to City
Flemington Road changes due to Light Rail Stage 1	Lane configuration changes between Well Station Drive and Federal Highway
Throsby Local Roads	Added (Copied from speed zones shapefile)
Gundaroo Drive Duplication Stage 1	Duplication between Gungahlin Drive and Mirrabai Drive/Anthony Rolfe Avenue
Gundaroo Drive Duplication Stage 2	Duplication between Gungahlin Drive and Barton Highway Roundabout.
Kuringa Drive/Owen Dixon Drive Signalisation	Intersection signalisation
Lawson Local Roads	Added (Copied from speed zones shapefile)
University of Canberra Hospital Access Road off Aikman Drive	A new road and associated intersection works to provide access to the hospital
Aikman Drive Duplication	Duplication between Ginninderra Drive and Emu Bank
Southern Cross Drive/Starke Street Signalisation	Intersection signalisation
Dickson Group Centre intersection upgrade	Antill Street/Cowper Street and Cowper Street/Dickson shops access road works, plus signalisation of Antill St/Badham St

Network Item	Description
Cape Street Extension	Extension of Cape Street from Challis Street to Northbourne Avenue – (Bus Access Only)
Northbourne Avenue/ London Circuit Intersection	Intersection upgrade
Parkes Way to Allara Street Exit	Added
West Belconnen Stage 1	New arterial road (Road 100) northwest of Stockdill Drive including multiple intersections located along the new arterial road. Also include other works proposed along Drake Brockmann Drive and Stockdill Drive
John Gorton Drive Stage 3	New roadworks providing access to Whitlam including signalisation of John Gorton Drive/William Hovell Drive/Coulter Drive intersection. (John Gorton Drive-William Hovell Drive Intersection Layout awaiting)
Molonglo Roads Stage 2	New roadways providing access to residential development
Weston Creek Group Centre	Brierly Street and Trenerry Square upgrade
Launceston Street / Irving Street Signalisation	Intersection signalisation
Cotter Road Duplication	Duplication from Tuggeranong Parkway to Yarralumla Creek
Dudley Street upgrade	Dudley St upgrade and Canberra Brickworks precinct access road from Dudley Street via a roundabout to boundary of new estate development
IKEA Northern Access Road	Mustang Avenue extension to north of IKEA called 'Dharaban Road'
Majura link road (Spitfire Avenue)	Link road between Majura Road and Majura Parkway Construction called 'Meddhung Road'
Tomsitt Drive Extension	Connect Tomsitt Drive to Yass Road (Ellerton Drive) in Queanbeyan
Monaro Highway – additional northbound lane	From Isabella Drive to Lanyon Drive
Hindmarsh Drive intersection upgrades	Signalisation at intersection with Launceston Street and Eggleston Crescent
Ashley Drive Duplication	Duplication of Ashley Drive from Erindale Drive to Johnson Drive
Anketell Street Upgrade	
Googong/Tralelee Link	Connect Googong/Tralelee area to Lanyon Drive West of Tomsitt Street Agreed

2026 Assumed Road Network Improvements

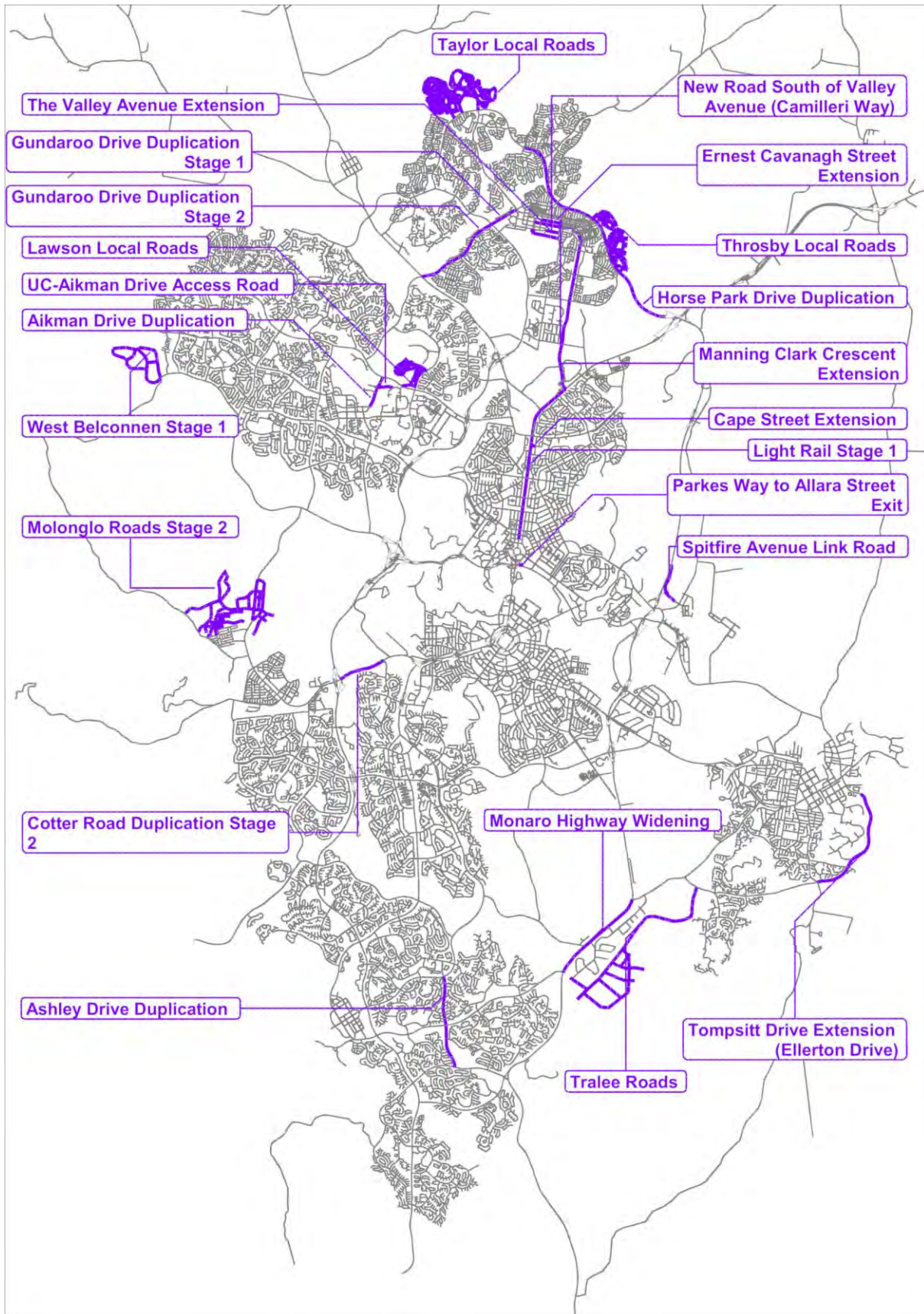
Network Item	Description
Horse Park Drive Duplication	From Mulligans Flat Road to Roden Cutler Drive
Mirrabei Drive Duplication (parts)	From Paul Coe Crescent to Yama Way (Mirrabei Drive corridor upgrade (including Shoalhaven intersection signalisation))
Old Well Station Road Upgrade	Old Well Station Road Upgrade between Federal Highway and Morisset Road
Sandford/Morisset Street Extension	Extension of Morisset Road to Federal Highway (Watson roundabout)
Nudurr Drive Extension	Connect Nudurr Drive from Grampians Street to Gungahlin Drive
Mouat Street, Lyneham	Additional lane for public transport including queue jump lane. (Mouat Street duplication (between Challis Street & Ginninderra Drive))
William Slim Drive Upgrade	Duplication from Barton Highway to Ginninderra Drive
Belconnen Way/ Springvale Drive Signalisation	Intersection signalisation
William Hovell Drive augmentation	New roadworks duplicating William Hovell Drive from John Gorton Drive to Drake Brockman Drive (William Hovell Drive northbound widening (Drake-Brockman Dr to Coppins Crossing Road))
John Gorton Drive Extension and Molonglo River Bridge	John Gorton Drive Arterial Road Approaches and Bridge Crossing of the Molonglo River
Fairbairn Avenue – additional westbound lane	From Majura Road to Majura Parkway
Fairbairn Avenue Augmentation	Additional Lane on Fairbairn Avenue Between Majura Parkway and Nomad Drive (Fairbairn Avenue additional lane (Majura Parkway to Majura Road))
Fairbairn Avenue Duplication	Duplication from Treloar Crescent to Majura Parkway (Fairbairn Avenue Duplication (between Majura Parkway and Northcott Drive))
Pialligo Avenue Duplication	Duplication between Airport (Brindabella Circuit) and NSW Border (including Sutton Road Drivers Training Centre entry) (East- West Corridor Study/Pialligo Avenue Duplication (Airport to NSW Border))
Monaro Highway – additional lanes	From Canberra Avenue to Johnson Drive (both directions) (Monaro Highway Duplication from Canberra Ave to Johnson Dr as part of North-South Corridor study)
Cotter Road – Stage 3	From Dunrossil Dr to Adelaide Avenue (including the Mint Interchange) – by 2031 to link with Light Rail

Network Item	Description
Tuggeranong Parkway – additional northbound lane	From Cotter Road to the Glenloch Interchange
Athllon Drive Duplication	Athllon Drive Duplication between Sulwood Drive and Drakeford Drive –
Erindale Drive Duplication	From Ashley Drive to Drakeford Drive
Tharwa Drive Duplication	Tharwa Drive Duplication between Woodcock Drive and Pocket Avenue

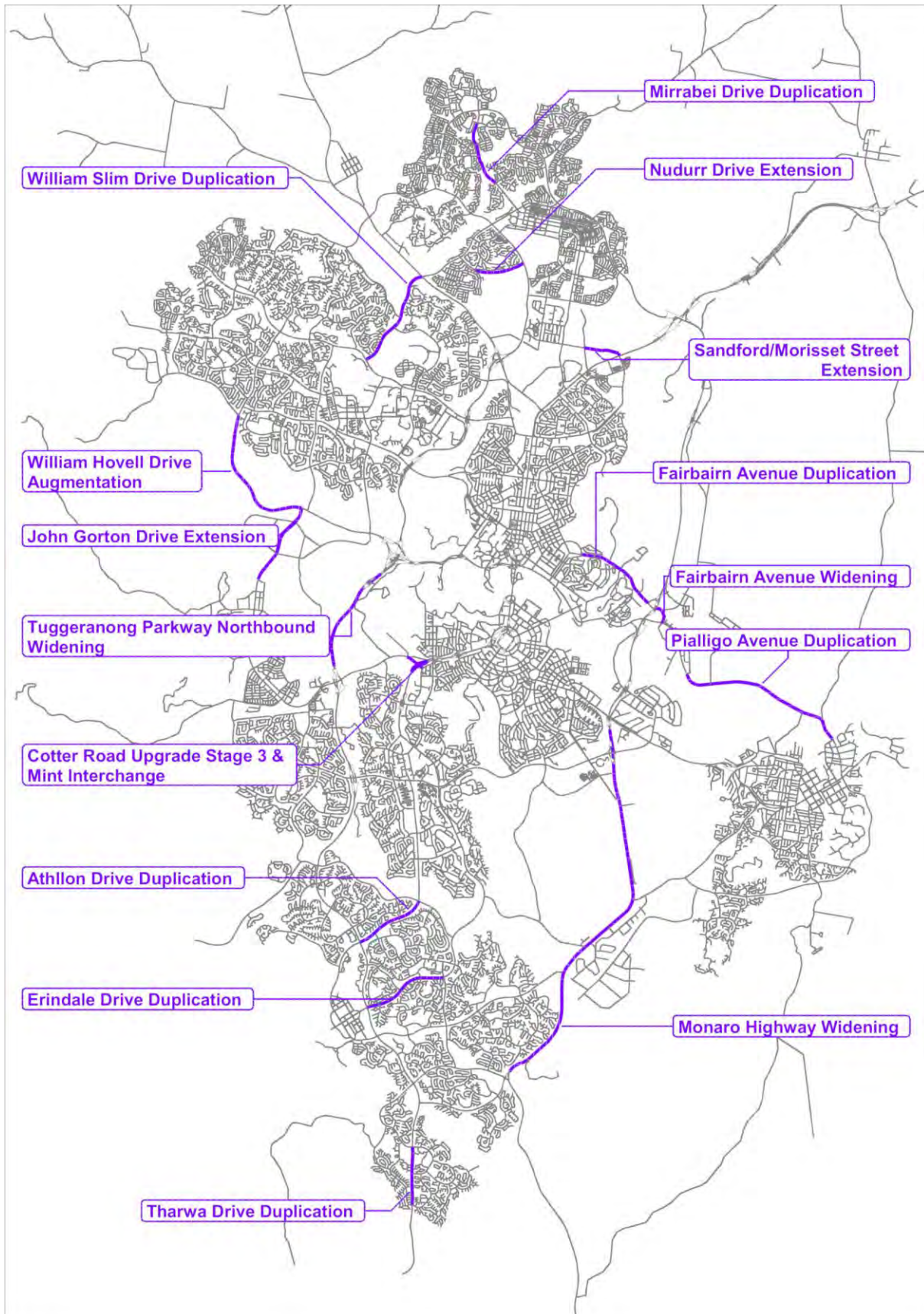
2031 Assumed Road Network Improvements

Network Item	Description
Horse Park Drive Duplication	From Roden Cutler Drive to Clarrie Hermes Drive
CSIRO Access Roads	Access roads to CSIRO development; no access via Barton Highway
Gungahlin Drive Duplication	From Gundaroo Drive to Horse Park drive (Gungahlin Drive augmentation (Horse Pak Drive to The Valley Avenue))
Clarrie Hermes Drive Duplication	From Horse Park Drive to the Barton Highway (Clarrie Hermes Drive Duplication (Gungahlin Drive to Barton Highway))
Barton Highway Interchange	Grade separation of Barton Highway and Gundaroo Drive
Lawson West Road Network	Road network in Lawson West, linking Lawson to the Ginninderra Drive – Aikman Drive intersection
Bindubi Street Extension	New roadworks linking John Gorton Drive and Bindubi Street
Kuringa Drive Duplication	Kuringa Drive Duplication between Kingsford Smith and Barton Highway
West Belconnen Stage 2	Roads to service West Belconnen Stage 2; link to Parkwood Drive (Duplication of part of Parkwood Road and Southern Cross Drive up to Florey Drive)
Drake Brockman Drive Upgrade	Duplication of Drake Brockman Drive
Southern Cross Drive Duplication	From Moyes Crescent to Spofforth Street
Molonglo Stage 3 Collector Roads	New roads providing access to the suburbs of Molonglo Stage 3
Light Rail Stage 2	Light rail from City to Woden Agreed
Commonwealth Avenue / Albert Street Signalisation	Staggered T arrangement with northbound to eastbound right turns at Albert Street. (Turn penalties to allow and ban the mentioned movements) Part of City to the Lake, Parkes Way upgrade and associated new roads.
Commonwealth Avenue / Corkhill Street Signalisation	Staggered T arrangement with south to west right turns at Corkhill Street. (Turn penalties to allow and ban the mentioned movements) Part of City to the Lake, Parkes Way upgrade and associated new roads

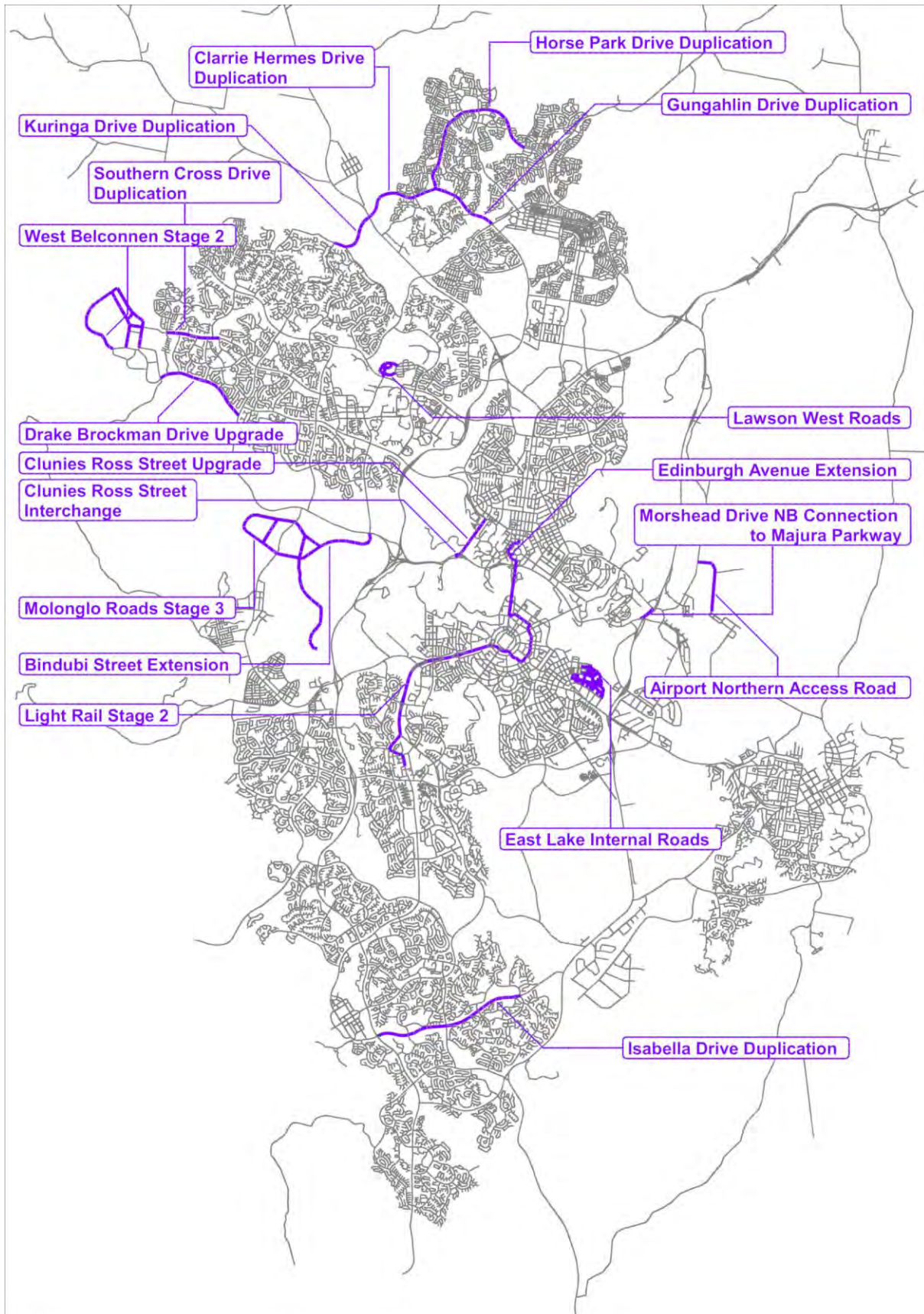
Network Item	Description
Edinburgh Avenue extensions to Vernon Circle	Part of City to the Lake, Parkes Way upgrade and associated new roads
New at-grade intersection between Commonwealth Avenue and London Circuit	Part of City to the Lake, Parkes Way upgrade and associated new roads
Removal of the Commonwealth Avenue to London Circuit loop ramp	Part of City to the Lake, Parkes Way upgrade and associated new roads
New west facing ramps at the Parkes Way/Clunies Ross Street interchange	Part of City to the Lake, Parkes Way upgrade and associated new roads
Clunies Ross Street Upgrade	Duplication of Clunies Ross Street between Barry Drive and Parkes Way
Sturt Avenue/MacMillan Crescent Signalisation	Intersection signalisation
East Lake Internal Roads	Primary transport access connections from Wentworth Avenue and Canberra Avenue Access/egress: extension of Dawes Street/Sandalwood Street, Cunningham Street, Burke Crescent and extension of the Causeway to a connection at Mildura Street
Morshead Drive	Northbound connection to the Majura Parkway
Airport Northern Access Road	Connect Glenora Drive to Majura Road (Northern Access to RAAF Fairbairn (Canberra Airport as part of Canberra Airport Master Plan 2014-2034 p181))
Isabella Drive Duplication	From Hambidge Crescent to Drakeford Drive (Isabella Drive Duplication (from Drakeford Drive to Chisholm Shops))



2021 Road Network Upgrades



2026 Road Network Upgrades



2031 Road Network Upgrades

Appendix B Intersection Turning Movement Counts

**local people
global experience**

SMEC is recognised for providing technical excellence and consultancy expertise in urban, infrastructure and management advisory. From concept to completion, our core service offering covers the life-cycle of a project and maximises value to our clients and communities. We align global expertise with local knowledge and state-of-the-art processes and systems to deliver innovative solutions to a range of industry sectors.