Private Plan Change Request – Hughes Developments Limited
Appendix B – Transportation Assessments
(Carriageway Consulting & Novo Group)

HUGHES DEVELOPMENTS

Faringdon Residential Development Rolleston

Transportation Assessment

CARRIAGEWAY CONSULTING

traffic engineering | transport planning

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1. Introduction

1.1. Hughes Developments Limited is seeking land use consent for residential development within Rolleston at two locations, towards the southeast and southwest of the existing Faringdon subdivision.

1.2. This Transportation Assessment sets out a detailed analysis of the transportation issues associated with the proposed residential activity including changes in travel patterns that are likely to arise. Where potential adverse effects are identified, ways in which these can be addressed are set out.

1.3. This report is cognisant of the guidance specified in the New Zealand Transport Agency's 'Integrated Transport Assessment Guidelines' and although travel by private motor vehicle is addressed within this report, in accordance with best practice the importance of other transport modes is also recognised. Consequently, travel by walking, cycling and public transport is also considered.

2. Site Overview

2.1. Location

2.1.1. The ODP areas lie to the immediate southeast and southwest of the existing (and largely constructed) Faringdon subdivision, towards the north of Selwyn Road and approximately 2.5km south of Rolleston town centre. The locations of the ODP areas in the context of the local area are shown in Figure 1 and in more detail in Figure 2. The ODP areas are presently zoned as Inner Plains within the Selwyn District Plan ("*District Plan*").

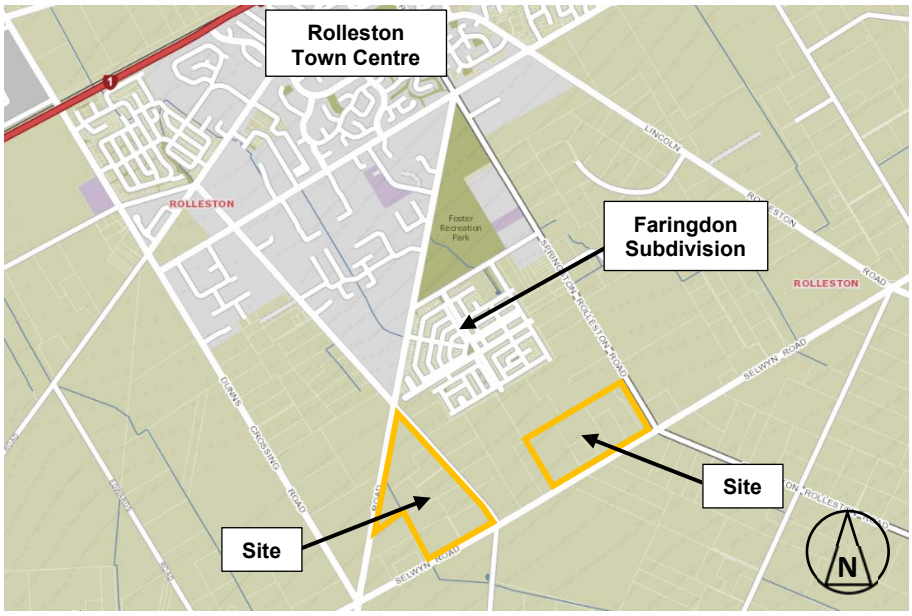

Figure 1: General Location of Proposed ODP Areas

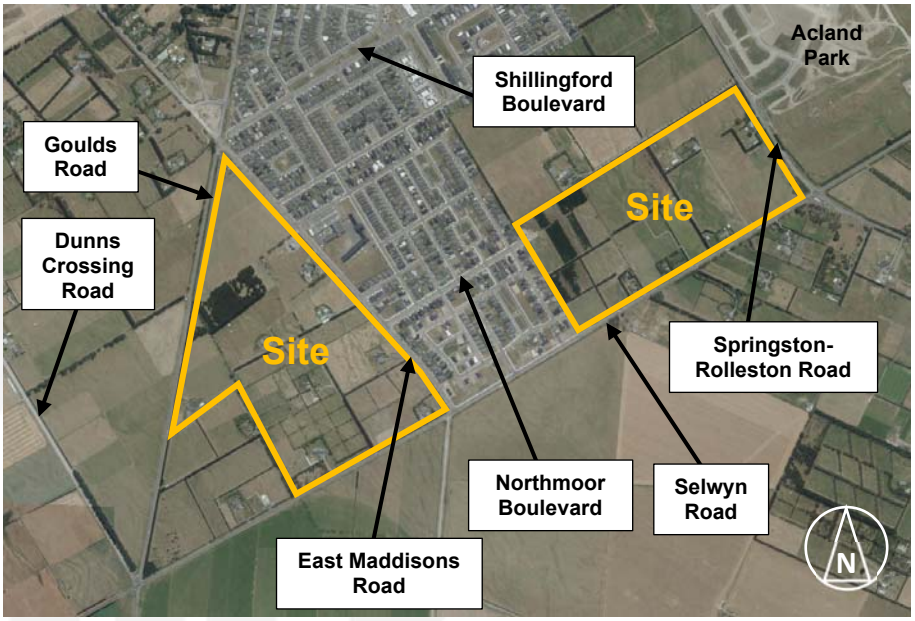

Figure 2: Aerial Photograph of Proposed ODP Areas and Environs

2.2. Road Hierarchy

2.2.1. The Selwyn District Plan classifies Selwyn Road and Springston-Rolleston Road as Arterial Roads, indicating a role of connecting areas of district importance including the district's townships and other key places and activities, including across district boundaries. As such, roads of this type primarily provide for through traffic.

2.2.2. Under the hierarchy, Goulds Road and East Maddisons Road are Collector Roads towards the north of Oak Tree Lane (approximately 1km north of the Goulds Road / East Maddisons Road intersection), described in the District Plan as having a role which distributes and collects local traffic within and between neighbourhood areas. They have a balance of a traffic movement function against a property access function that they also need to provide.

2.2.3. Towards the south of Oak Tree Lane and adjacent to the ODP area, Goulds Road and East Maddisons Road are Local Roads as are all other roads within Faringdon. These have a primary function of providing for property access.

3. Current Transportation Networks

3.1. Road Network (Southwestern ODP Area)

3.1.1. Towards the eastern side of the ODP area, East Maddisons Road has a sealed carriageway width of 11m with parking permitted on both sides, and a flat and straight alignment. The road is subject to a 60km/h speed limit. The eastern side of the road is characterised by multiple private driveways associated with the current extent of the Faringdon subdivision but the western (site) side is undeveloped.

Photograph 1: East Maddisons Road (Looking South)

3.1.2. At the northern extremity of the ODP area, East Maddisons Road meets Goulds Road at priority ('stop') intersection with Goulds Road retaining priority. On the immediate approach to the intersection, East Maddisons Road deviates towards the west such that it meets Goulds Road at 90-degrees. This scheme has recently been put in place as part of the Faringdon subdivision as previously East Maddisons Road met an acute angle. There are no auxiliary turning lanes at the intersection.

Photograph 2: East Maddisons Road / Goulds Road Intersection (Looking North)

3.1.3. Lemonwood School lies on the eastern side of East Maddisons Road. Based on information previously received, the school role is expected to be a maximum of 750 students, and there will also be a pre-school for up to 50 children. The school does not have direct vehicular access onto East Maddisons Road.

3.1.4. To the southeast, East Maddisons Road meets Selwyn Road at a priority ('give way') crossroads, where traffic on Selwyn Road retains the right of way. Sight distances for vehicles emerging from East Maddisons Road are excellent in both directions. There are no auxiliary lanes provided for vehicles turning into East Maddisons Road from Selwyn Road.

Photographs 3 and 4: Sight Distances to the Left and Right at the Selwyn Road / East Maddisons Road Intersection

Photograph 5: Selwyn Road / East Maddisons Road Intersection, Looking North from East Maddisons Road (South)

3.1.5. Along the southern edge of the ODP area, Selwyn Road has a 6.4m carriageway width, with grassed verges of 7-8m on either side. It has a flat and straight alignment, with a marked centreline but no edgeline markings. To the west of East Maddisons Road, Selwyn Road has an 80km/h speed limit.

Photograph 6: Selwyn Road (Looking West)

3.1.6. Approximately 1.1km southwest of East Maddisons Road, Selwyn Road meets Goulds Road at a priority ('stop') controlled intersection, with Selwyn Road retaining priority. Goulds Road meets at an acute angle of around 60 degrees but sightlines in each direction remain good. There are no auxiliary turning lanes at the intersection.

Photograph 7: Selwyn Road / Goulds Road Intersection (Looking South)

3.1.7. As shown on Photograph 7, there is a fifth leg at the intersection of Dunns Crossing Road. This joins Goulds Road just 15m north of Selwyn Road, and traffic must give-way at the intersection.

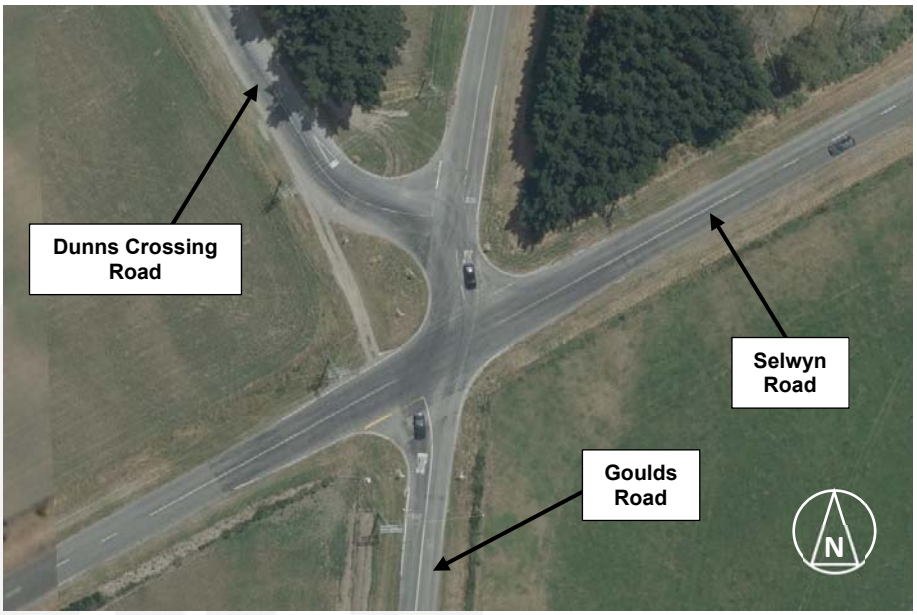

Figure 3: Aerial Photograph of Selwyn Road / Goulds Road / Dunns Crossing Road Intersection

3.1.8. West of this intersection, the speed limit on Selwyn Road increases to 100km/h and the road provides a connection to rural areas before terminating at the Selwyn River.

3.1.9. North of Selwyn Road, Goulds Road has a flat and straight alignment with a 6.5m carriageway width and wide grassed verges of 7-8m on either side. It is subject to an 80km/h speed limit and has a centreline but no edgeline markings.

Photograph 8: Goulds Road (Looking North)

3.1.10. Some 1.4km northeast of this intersection, Goulds Road meets East Maddison Road (discussed previously) before then connecting to other district roads that provide a connection into Rolleston town centre.

3.2. Road Network (Southeastern ODP Area)

3.2.1. Selwyn Road runs along the southern side of the ODP area. Immediately adjacent to the ODP area, the road has a 6.4m carriageway width, with grassed verges of 7-8m on either side. It has a flat and straight alignment, with a marked centreline but no edgeline markings, and has a speed limit of 80km/h.

Photograph 9: Selwyn Road Adjacent to ODP Area (Looking West)

3.2.2. However, immediately west of the ODP area lies an existing developed area of Faringdon. Along this section, Selwyn Road is subject to a 60km/h speed limit and has a number of driveways and a carriageway that has been widened to 9m, although at present this is divided as 6m for the eastbound traffic lane and 3m for the westbound lane.

Photograph 10: Selwyn Road Adjacent to Faringdon (Looking East)

3.2.3. The location where the two carriageway widths meet represents the southwestern corner of the ODP area. The layout is evidently temporary as there are no road markings or signage to indicate the reduced carriageway width.

Photograph 11: Selwyn Road Change of Carriageway Width and Speed Limit (Looking East)

3.2.4. Approximately 1850m from the existing edge of Faringdon, Selwyn Road meets Springston-Rolleston Road at a priority ('stop') controlled intersection, where traffic on Springston-Rolleston Road retain priority. The alignment of Springston-Rolleston Road curves slightly in this location, which increases sight distances for eastbound vehicles on Selwyn Road, but decreases them for westbound vehicles. The intersection does not have any auxiliary turning lanes, but there is a small amount of flaring which can be used by turning traffic.

Photograph 12: Springston-Rolleston Road / Selwyn Road Intersection (Looking South)

3.2.5. Springston-Rolleston Road forms the eastern edge to the ODP area. This presently has a variable carriageway width, notionally around 9m (two traffic lanes of 3.5m width each, with a 1m shoulder on both sides) but there is widening provided for the main entrance into the Acland Park subdivision, currently under construction, and which has auxiliary turning lanes.

Photograph 13: Springston-Rolleston Road (Looking North)

Photograph 14: Springston-Rolleston Showing Auxiliary Lanes into Acland Park (Looking South)

3.2.6. Further south, Springston-Rolleston Road turns towards the southeast and connects to the township of Lincoln. North of the ODP area, Springston-Rolleston Road meets Lowes Road at a four-arm roundabout. The northern continuation of Springston-Rolleston Road is known as Tennyson Street, and this provides a roading linkage to Rolleston town centre and to Main South Road (State Highway 1).

3.3. Non-car Modes of Transport

3.3.1. As the ODP areas represent the edge of the current urban development of Rolleston, footpath provision is intermittent and largely aligned with the extent of development. As such, there are footpaths along the eastern side of East Maddison Road, the northern side of Selwyn Road (adjacent to the current extent of Faringdon) and on the eastern side of Springston-Rolleston Road adjacent to Acland Park. Certain of these are sufficiently wide to accommodate a shared walking and cycling path, although there is presently no signage to indicate shared use.

Photograph 15: Footpaths on East Maddisons Road and Selwyn Road

4. Future Changes to Land Use and Infrastructure

4.1. Rolleston Structure Plan

4.1.1. The Rolleston Structure Plan has now been implemented through Plan Change 7 to the District Plan. Nevertheless, the Structure Plan is helpful in setting out the high-level principles guiding growth within the town, and of particular importance are the proposed amendments to the transportation network both for motorised vehicles and non-car users which affect both ODP areas.

Figure 4: Extract from Figure 8.2 of Rolleston Structure Plan ("Main Roads – Primary Network")

4.1.2. The form of development shown on the Structure Plan highlights that in due course, there will be two east-west routes in the area, one of which passes through the southwestern ODP area (Northmoor Boulevard).

4.1.3. The roading network towards the north of the southeastern ODP area will be extended as far as Selwyn Road, with extensions of Hungerford Drive and Faringdon Boulevard. It should be noted however that the location of all of these roads is slightly different to what has subsequently been implemented through Outline Development Plan Area 6 (Faringdon).

4.1.4. Faringdon Boulevard (and its southern extension) and Springston-Rolleston Road will be cycle routes.

Figure 5: Extract from Figure 8.3 of Rolleston Structure Plan ("Cycleway Routes")

4.1.5. Public transport is to be improved within Rolleston. Although the roading patterns have changed slightly, the Structure Plan suggests that Northmoor Boulevard will have a "*potential service*" which will also run along part of East Maddisons Road.

Figure 6: Extract from Figure 8.4 of Rolleston Structure Plan ("Public Transport Route Patterns")

4.2. *Land Use Changes*

4.2.1. The District Plan sets out that there are a number of residential areas in the immediate vicinity of the proposed ODP areas.

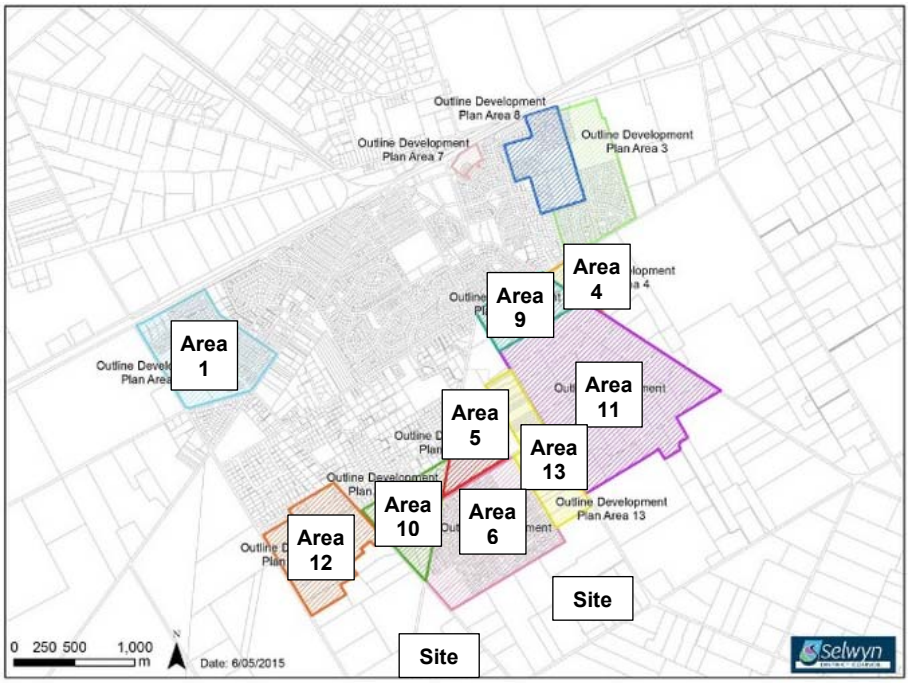

Figure 7: Confirmed Residential Areas Set Out in the Selwyn District Plan in the Vicinity of the ODP Areas

4.2.2. Development of Rolleston is continuing and therefore for the purposes of assessing the proposed ODP areas, it has been assumed that each of these areas noted above is fully developed. This is discussed further below.

5. Current and Future Transportation Patterns

5.1. Traffic Flows

5.1.1. Selwyn District Council carries out regular traffic counts on the key vehicle routes throughout the district. However, as noted above, there is ongoing development in the vicinity of the two ODP areas and therefore current traffic flows do not indicate future traffic flows particularly once the identified ODP areas discussed previously in this report are developed.

5.1.2. As a result of this, the Council has made available its microsimulation model for the Rolleston area. In brief, this transportation model includes the future land uses in the area, and assigns the likely traffic generation of these onto the surrounding road network. It is understood that the Council considers that the model reflects the most likely scenario for development in the Rolleston area, as described previously in this report. All modelling work included in this report was undertaken by the Council's preferred transport modelling consultants.

5.1.3. For this assessment, the model used allows for full development of the ODP areas plus known other developments in the area (such as Lemonwood School). A manual assignment has been used to recalculate the traffic flows at the East Maddisons Road / Goulds Road intersection as the model allow for a roundabout to be constructed in this location, which is unlikely to happen for some considerable time (if at all).

5.1.4. The forecast traffic flows at the intersections closest to the ODP areas are set out below.

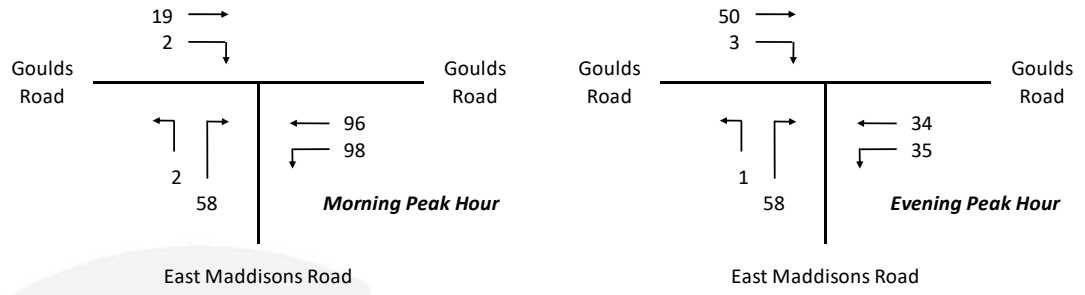

Figure 8: Anticipated Traffic Flows at the Goulds Road / East Maddisons Road Intersection with Confirmed Development (Without Proposed ODP areas)

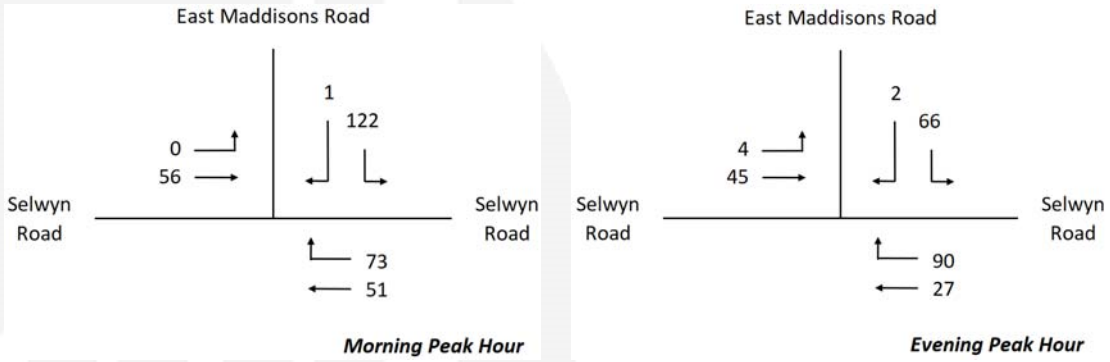

Figure 9: Anticipated Traffic Flows at the Selwyn Road / East Maddisons Road Intersection, with Confirmed Development (Without Proposed ODP areas)

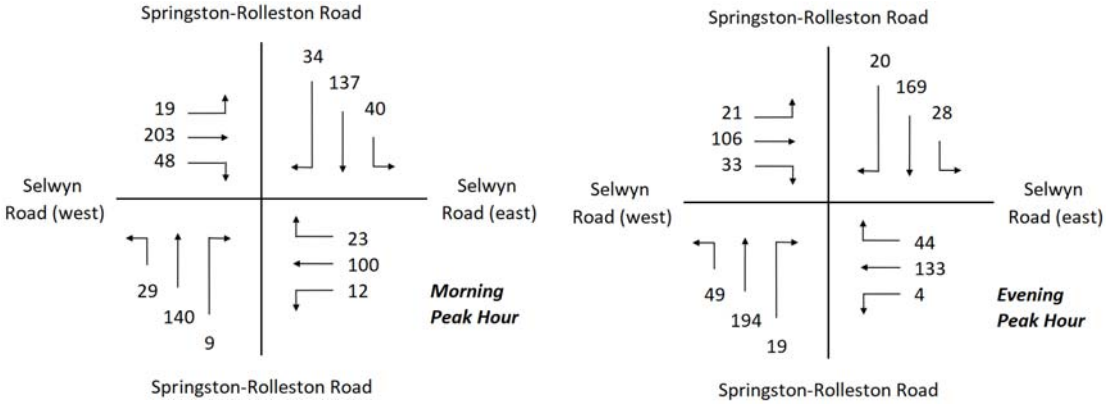

Figure 10: Anticipated Traffic Flows at the Selwyn Road / Springston-Rolleston Road Intersection, with Confirmed Development (Without Proposed ODP areas)

5.1.5. The data shows that even with development of existing ODP areas, traffic flows remain relatively modest.

5.1.6. The microsimulation software provides an expected level of service for the intersections, but a more detailed evaluation has been carried out using the computer software program Sidra Intersection and the results are summarised below.

Road and Movement		Morning Peak Hour			Evening Peak Hour		
		Avg Delay (secs)	95 %ile Queue (veh)	Level of Service	Avg Delay (secs)	95 %ile Queue (veh)	Level of Service
East Maddisons Road (southeast)	L	5.8	0.0	A	7.1	0.0	A
	R	6.5	0.2	A	6.1	0.2	A
Goulds Road (northeast)	L	6.4	0.0	A	6.4	0.0	A
Goulds Road (southwest)	R	7.5	0.0	A	7.1	0.0	A

Table 1: Anticipated Levels of Service at the Goulds Road / East Maddisons Road Intersection, with Confirmed Development (Without Proposed ODP areas)

Road and Movement		Morning Peak Hour			Evening Peak Hour		
		Avg Delay (secs)	95 %ile Queue (veh)	Level of Service	Avg Delay (secs)	95 %ile Queue (veh)	Level of Service
Selwyn Road (northeast)	R	5.8	0.3	A	5.7	0.3	A
East Maddisons Road (northwest)	L	5.7	0.3	A	5.7	0.2	A
	R	6.1	0.0	A	6.0	0.0	A
Goulds Road (southwest)	L	5.6	0.0	A	5.6	0.0	A

Table 2: Anticipated Levels of Service at the Selwyn Road / East Maddisons Road Intersection, with Confirmed Development (Without Proposed ODP areas)

Road and Movement		Morning Peak Hour			Evening Peak Hour		
		Avg Delay (secs)	95 %ile Queue (veh)	Level of Service	Avg Delay (secs)	95 %ile Queue (veh)	Level of Service
Springston - Rolleston Rd (south)	L	7.2	0.1	A	8.2	0.2	A
	R	7.6	0.1	A	8.6	0.2	A
Selwyn Road (east)	L	9.6	0.0	A	10.5	0.0	B
	T	11.3	0.7	B	13.7	1.3	B
	R	14.1	0.7	B	15.3	1.3	C
Springston - Rolleston Rd (north)	L	7.4	0.3	A	8.5	0.2	A
	R	7.6	0.3	A	8.8	0.2	A
Selwyn Road (west)	L	9.7	0.1	A	10.6	0.1	B
	T	12.4	1.9	B	13.0	0.9	B
	R	13.8	1.9	B	15.0	0.9	C

Table 3: Anticipated Levels of Service at the Selwyn Road / Springston-Rolleston Road Intersection, with Confirmed Development (Without Proposed ODP areas)

5.1.7. It can be seen that queues and delays are low, with good levels of service provided for each turning movement.

5.2. Non-Car Modes of Transport

5.2.1. The volumes of pedestrians and cyclists in the area are presently relatively low due to the limit extent of residential development. However it is anticipated that they will increase in due course on those parts of Selwyn Road and Springston-Rollestion Road as houses are constructed and occupied.

5.2.2. Similarly, the extent of public transport services is largely dependent upon the number of potential passengers in an area, which in this case is currently minimal. As the extent of residential development increases then the number of potential passengers will also increase, and this means that it is likely that bus services could be extended. At present though there are no scheduled bus services in the immediate area.

5.3. Road Safety

5.3.1. The NZTA Crash Analysis System has been used to identify the location and nature of the recorded traffic crashes in the vicinity of the ODP areas. All reported crashes between 2015 and 2019, plus the partial record for 2016, were identified on Goulds Road (East Maddisons Road to Selwyn Road), Selwyn Road (Goulds Road to Springston-Rolleston Road), Springston-Rolleston Road (across the ODP area frontage and to the immediate south of Selwyn Road), and East Maddisons Road (Goulds Road to Selwyn Road).

5.3.2. This showed that 16 crashes had been recorded, of which 7 occurred at the Selwyn Road / Springston-Rolleston Road intersection, 7 occurred at the Selwyn Road / Goulds Road intersection, and one each occurred at the East Maddisons Road / Goulds Road and East Maddisons Road / Selwyn Road intersections.

5.3.3. At the East Maddisons Road / Goulds Road intersection, the crash occurred when a driver turned right from Goulds Road (north) into East Maddisons Road (west) and lost control. The

crash did not result in any injuries. Since that time, the speed limit on the roads has been reduced from the then-prevailing 100km/h, which will assist in mitigating this type of crash.

5.3.4. At the East Maddisons Road / Selwyn Road intersection, the crash occurred when a driver turned right from Selwyn Road (east) into East Maddisons Road and lost control. The crash did not result in any injuries. A temporary speed limit of 30km/h was in place at the time, potentially due to construction works at Faringdon, but it appears that the driver was travelling more quickly than this.

5.3.5. Of the 7 crashes that occurred at the Selwyn Road / Springston-Rolleston Road intersection:

- One crash occurred when a vehicle travelling from Goulds Road (south) to Goulds Road (north) failed to give-way and struck an eastbound vehicle on Selwyn Road. The crash did not result in any injuries;
- One crash occurred when a southbound vehicle on Goulds Road failed to give-way and struck a vehicle turning from Selwyn Road (east) into Goulds Road. The crash resulted in minor injuries;
- Two crashes occurred when a vehicle travelling from Goulds Road (south) to Goulds Road (north) failed to give-way and struck a westbound vehicle on Selwyn Road. One crash resulted in minor injuries and the other resulted in no injuries;
- Three crashes occurred when a vehicle travelling from Goulds Road (north) to Goulds Road (south) failed to give-way and struck a westbound vehicle on Selwyn Road. One crash resulted in serious injuries, one crash resulted in minor injuries and one resulted in no injuries;

5.3.6. The crashes all involve a failure to give-way to another vehicle, with three involving northbound vehicles on Goulds Road. This is not uncommon within a high-speed rural area, but as set out below, the proposed development will result in measures that will address the issue at least in part.

5.3.7. Of the 7 crashes that occurred at the Selwyn Road / Springston-Rolleston Road intersection:

- Two crashes occurred when a vehicle travelling from Selwyn Road (west) failed to give-way and struck a northbound vehicle on Springston-Rolleston Road. One crash resulted in serious injuries and the other resulted in minor injuries;
- Two crashes occurred when a vehicle travelling from Selwyn Road (west) failed to give-way and struck a southbound vehicle on Springston-Rolleston Road. The crashes both resulted in minor injuries;
- One crash occurred when a vehicle travelling from Selwyn Road (east) failed to give-way and struck a southbound vehicle on Springston-Rolleston Road. The crash did not result in any injuries;
- One crash occurred when a vehicle travelling from Selwyn Road (west) and turning right onto Springston-Rolleston Road lost control and left the road. The crash resulted in minor injuries;
- One crash occurred when a vehicle turning right from Springston-Rolleston Road (north) onto Selwyn Road (west) was struck by another southbound vehicle that attempted to overtake it. The crash resulted in minor injuries;

5.3.8. Most of the crashes all involve a failure to give-way to another vehicle, although the direction of travel does not show any strong bias in either direction of travel. The lower speed limit in this area is likely to have resulted in changes to the crash patterns, but this may not yet be reflected in the data.

5.3.9. Overall, there are clusters of crashes at the Selwyn Road / Springston-Rolleston Road and Selwyn Road / Goulds Road intersections, and these are discussed further below.

5.3.10. It should be reiterated that traffic flows will increase in future as a result of increased development within the immediate area, and thus the crash numbers are likely to change due to road users having greater potential for conflict with one another. However, it can reasonably be anticipated that all new and improved roads will be constructed to meet current standards and accordingly, that no inherent significant safety risks will be introduced.

6. Proposal

6.1. The proposal is for two residential areas, with the southeastern area providing a total of 405 lots and the southwestern area providing 564 lots.

Figure 11: Outline Development Plan for Southwestern ODP Area

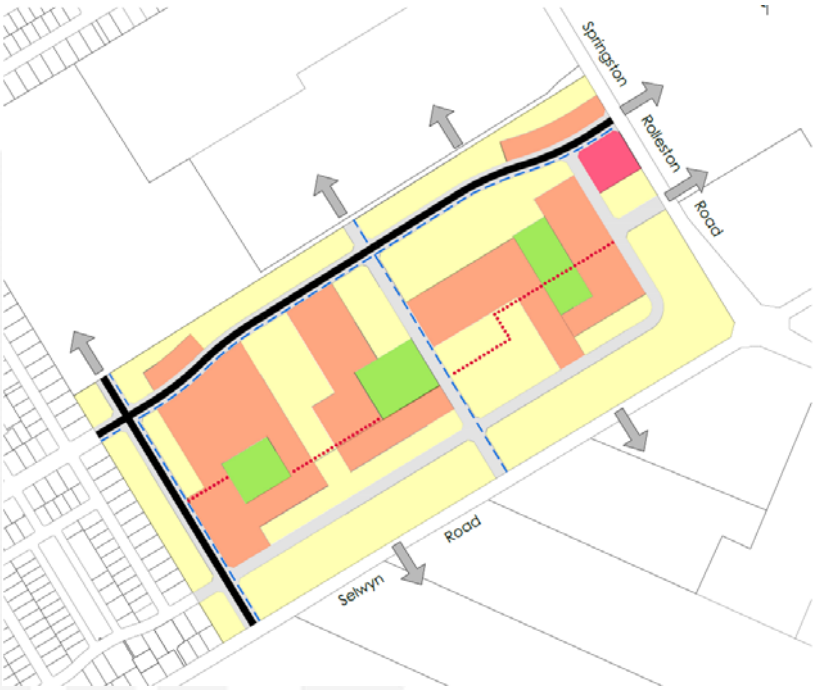

Figure 12: Outline Development Plan for Southeastern ODP Area

6.2. From a transportation perspective, each ODP area will have a number of linkages onto the adjacent roading network. The southwestern ODP area provides a main roading link between East Maddisons Road and Goulds Road, as an extension of Northmoor Boulevard. There are also two connections onto Selwyn Road. The southeastern ODP area provides an east-west

connection to Springston-Rolleston Road, also as an extension of Northmoor Boulevard, plus a north-south link that aligns with Faringdon Boulevard.

6.3. It is anticipated that each of the intersections at the ODP area boundaries and within the ODP areas will operate as priority intersections (rather than roundabouts).

7. Traffic Generation and Distribution

7.1. Traffic Generation

7.1.1. Traffic generated by residential developments is known to vary for a variety of reasons, with one such reason being the proximity (or otherwise) to employment and community facilities. Where a dwelling is some distance from these types of facilities, the traffic generation rates tend to be lower than for residences that are closer due to 'trip chaining', that is, the tendency of a resident to carry out multiple visits to different destinations during the same trip away from the dwelling.

7.1.2. In this instance, the locations of the ODP areas represents an extension to the urban area of Rolleston, and as a result, it is considered that a rate of 8 vehicle movements per day per residence is appropriate.

7.1.3. An allowance has been made for each dwelling to generate 1 vehicle movement in the peak hours. In the morning peak hour, 90% of these are likely to be exiting the development, with 65% of the generated vehicle movements entering the development in the evening peak hour.

7.1.4. This suggests the following traffic generation:

Scenario	Traffic Volumes		
	In	Out	Total
Morning Peak Hour	56	508	564
Evening Peak Hour	367	197	564
Daily	1,128	1,128	4,512

Table 4: Traffic Generation of Southwestern Area

Scenario	Traffic Volumes		
	In	Out	Total
Morning Peak Hour	41	364	405
Evening Peak Hour	263	142	405
Daily	1,620	1,620	3,240

Table 5: Traffic Generation of Southeastern Area

7.2. Trip Distribution

7.2.1. The microsimulation model has been used to determine the trip distribution. This has different distributions for each direction of travel and for the morning and evening peak hours, but on average shows the following:

- Towards State Highway 1 east: 14%
- Selwyn Road east: 16%
- Springston-Rolleston Road: 4%
- State Highway 1 west: 0%
- North of State Highway 1: 6%
- Rolleston town centre: 15%
- Other locations outside Rolleston (unspecified): 6%
- Internal movements: 39%

7.2.2. The data shows a high degree of trip-making that remains internal to the ODP areas.

7.2.3. The roading network towards the south of Rolleston generally comprises higher speed, rural roads, where drivers do not have to give-way to other vehicles. Conversely, the roading network within Rolleston has an urban speed limit and numerous locations where drivers must slow down or stop for other vehicles. It is therefore considered more likely that where drivers have a choice, they will use Selwyn Road rather than using the Rolleston urban road network. The vehicles have been assigned onto the network on this basis.

Direction	Routes	Traffic Volumes			
		Morning Peak Hour		Evening Peak Hour	
		In	Out	In	Out
Towards State Highway 1 east (14%)	50% on East Maddisons Road (north) 50% on Goulds Road (north)	4 4	36 36	26 26	14 14
Selwyn Road east (16%)	50% on East Maddisons Road (south) to Selwyn Road 50% direct to Selwyn Road	4 4	41 41	29 29	16 16
Springston-Rolleston Road (4%)	50% on East Maddisons Road (south) to Selwyn Road 50% direct to Selwyn Road	1 1	10 10	7 7	4 4
North of State Highway 1 (6%)	50% on East Maddisons Road (north) 50% on Goulds Road (north)	2 2	15 15	11 11	6 6
Rolleston town centre (15%)	50% on East Maddisons Road (north) 50% on Goulds Road (north)	4 4	38 38	28 28	15 15
Other locns outside Rolleston (6%)	Not assigned	3	30	22	12
Internal movements (39%)	Not assigned	22	198	143	77
Total	-	56	508	367	197

Table 6: Traffic Distribution of Southwestern Area

Direction	Routes	Traffic Volumes			
		Morning Peak Hour		Evening Peak Hour	
		In	Out	In	Out
Towards State Highway 1 east (14%)	All on Springston-Rolleston Road (north)	6	51	37	20
Selwyn Road east (16%)	50% on Springston-Rolleston Road to Selwyn Road 50% direct to Selwyn Road	3 3	29 29	21 21	11 11
Springston-Rolleston Road (4%)	50% on Springston-Rolleston Road to Selwyn Road 50% direct to Selwyn Road	1 1	7 7	5 5	3 3
North of State Highway 1 (6%)	All on Springston-Rolleston Road (north)	2	22	16	9
Rolleston town centre (15%)	All on Springston-Rolleston Road (north)	6	55	39	21
Other locns outside Rolleston (6%)	Not assigned	2	22	16	9
Internal movements (39%)	Not assigned	16	142	103	55
Total	-	41	364	263	142

Table 7: Traffic Distribution of Southeastern Area

8. Effects on the Transportation Networks

8.1. Roading Network Capacity

8.1.1. The computer software program Sidra Intersection has again been used to assess the effects of the increased traffic volumes at the nearby intersections, and the results are summarised below.

Road and Movement		Morning Peak Hour			Evening Peak Hour		
		Avg Delay (secs)	95 %ile Queue (veh)	Level of Service	Avg Delay (secs)	95 %ile Queue (veh)	Level of Service
East Maddisons Road (southeast)	L	5.9	0.0	A	7.3	0.0	A
	R	7.4	0.8	A	7.0	0.4	A
Goulds Road (northeast)	L	6.4	0.0	A	6.4	0.0	A
Goulds Road (southwest)	R	7.6	0.0	A	7.5	0.0	A

Table 8: Anticipated Levels of Service at the Goulds Road / East Maddisons Road Intersection, with Confirmed Development (With Proposed ODP Areas)

Road and Movement		Morning Peak Hour			Evening Peak Hour		
		Avg Delay (secs)	95 %ile Queue (veh)	Level of Service	Avg Delay (secs)	95 %ile Queue (veh)	Level of Service
Selwyn Road (northeast)	R	5.9	0.4	A	5.8	0.6	A
East Maddisons Road (northwest)	L	5.9	0.5	A	5.8	0.2	A
	R	6.3	0.0	A	6.4	0.0	A
Goulds Road (southwest)	L	5.6	0.0	A	5.6	0.0	A

Table 9: Anticipated Levels of Service at the Selwyn Road / East Maddisons Road Intersection, with Confirmed Development (With Proposed ODP Areas)

Road and Movement		Morning Peak Hour			Evening Peak Hour		
		Avg Delay (secs)	95 %ile Queue (veh)	Level of Service	Avg Delay (secs)	95 %ile Queue (veh)	Level of Service
Springston - Rolleston Rd (south)	L	7.2	0.1	A	8.2	0.2	A
	R	7.7	0.1	A	8.7	0.2	A
Selwyn Road (east)	L	9.7	0.0	A	10.5	0.0	B
	T	11.6	0.9	B	16.0	3.0	C
	R	16.7	0.9	C	18.6	3.0	C
Springston - Rolleston Rd (north)	L	7.3	0.3	A	8.4	0.3	A
	R	7.6	0.3	A	8.9	0.3	A
Selwyn Road (west)	L	9.7	0.1	A	10.7	0.1	B
	T	15.6	4.8	C	14.3	1.7	B
	R	17.1	4.8	C	17.9	1.7	C

Table 10: Anticipated Levels of Service at the Selwyn Road / Springston-Rolleston Road Intersection, with Confirmed Development (With Proposed ODP Areas)

8.1.2. It can be seen that although the queues and delays increase slightly from those without the ODP areas in place, they remain relatively low. In this regard, delays of 19 seconds (the greatest forecast) are not unreasonable for the weekday peak hours. Good levels of service are provided for each turning movement. On this basis, no revisions are proposed to the intersection geometries.

8.1.3. One outcome of the expected traffic distribution is that the extent of increase through the Selwyn Road / Goulds Road intersection will be very low. This intersection has therefore not been considered in further detail.

8.1.4. It is understood that the existing roading environment will be revised as a result of the development of the ODP areas. In response to the frontage changing from rural to urban, it can be expected that the carriageways will be widened (in a similar fashion to the way in which that section of Selwyn Road adjacent to Faringdon has been widened) and will be reconstructed with an urban formation that includes kerbs and footpaths. Although details of this will only be provided at the time of subdivision, there are no reasons why such improvement schemes could not be implemented on view of the wide road reserves.

8.1.5. It is also expected that the opportunity will be taken to reduce the speed limits of Goulds Road and Selwyn Road, and potentially also Springston-Rolleston Road. In each case, it would be appropriate for the 80km/h speed limit to be lowered to 60km/h, to be consistent with East Maddisons Road and the existing section of Selwyn Road adjacent to Faringdon.

8.2. Non-Car Modes of Transport

8.2.1. As a result of the proposed development areas, it can be expected that pedestrian volumes in the immediate area will increase. However the inclusion of a footpath along one side of Goulds Road, Selwyn Road and the affected part of Springston-Rolleston Road, plus a second footpath along the western side of East Maddisons Road will accommodate likely volumes. Such provision will be particularly important for those walking to and from school.

8.2.2. It is anticipated that the roads within the ODP areas will meet the Council's standards for new roads, including the provisions of footpaths and cycling infrastructure where necessary, and therefore no further comment has been made on the internal road network.

8.2.3. Although the provision of a bus service is beyond the scope of a resource consent application, the internal roading network creates the ability to form carriageway widths that are suitable for a service to pass through the site in future, should such a service operate.

8.3. Road Safety

8.3.1. The crash history in the vicinity of the ODP areas does not indicate that there are any particular features or factors that would affect, or be affected by, their development. Although there is a cluster of crashes at the Selwyn Road / Goulds Road and Selwyn Road / Springston – Rolleston Road intersections, the ODP areas will enable a reduction in the speed limit on both roads, which will therefore support a safer environment. Further, there is not expected to be any significant increase in traffic flows at the Selwyn Road / Goulds Road intersection.

8.3.2. The new roads which are being provided due to development in the area will meet current standards, including for non-motorised travel. and therefore it is unlikely that any new road safety issues will be introduced. Further, the flat and straight alignment of the frontage roads means that sight distances at the proposed new intersections will be excellent.

9. Statutory Planning Matters

9.1. Structure Plan

9.1.1. The Rolleston Structure Plan provides the overarching framework within which development of the ODP areas is expected to take place. A comparison has therefore been made in detail with these.

9.1.2. For the southwestern area, a road link is shown on the Structure Plan from East Maddisons Road to Goulds Road, being the continuation of an east-west route that lies further to the east. Within the ODP, the link is provided. It is not straight but curvilinear, and connects to East Maddisons Road further south in order to align with Northmoor Boulevard (which forms the east-west route).

9.1.3. For the southwestern area, the only cycling link is along Selwyn Road and this can be provided as part of the necessary upgrading of the road. A possible bus route is also shown on the northern part of East Maddisons Road but again, the upgrading of the road to provide this is not precluded.

9.1.4. For the southeastern area, two north-south links are shown as the extensions of Faringdon Boulevard and Hungerford Drive. These are shown on the ODP. The ODP also shows an east-west link to Springston-Rolleston Road but this is further north in the Structure Plan. It is understood however that the resource consents that have been granted for Faringdon resulted in the relocation of this link to the south meaning that it is now within the ODP area.

9.1.5. For the southwestern area, one cycling link is along Selwyn Road and this can be provided as part of the necessary upgrading of the road. A second link is along the extension of Faringdon Boulevard and this can be provided. A possible bus route is also shown on east-west route (Northmoor Boulevard) and this can be provided subject to a suitable design for the road.

9.1.6. Accordingly, it is considered that the ODPs are in accordance with the Structure Plan for the area.

9.2. District Plan

9.2.1. The District Plan sets out a number of transportation-related policies and rules with which any new development is expected to comply. Since the proposal at present is at a high level, it is not possible to undertake a detailed evaluation of the extent of compliance with these but an initial assessment has been carried out.

9.2.2. It is considered likely that there will be non-compliances with the separation of vehicle crossings and driveways, and sightlines from driveways, as these issues commonly occur within residential subdivisions due to the greater frequency of intersections and the lot density meaning that inevitable, some driveways are closer to intersections than anticipated. A full assessment will be required of these in due course but it is likely that the lower speed environment and road user familiarity will provided mitigation for any shortfalls.

9.2.3. The extent of any non-compliances can also be minimised by specifying the locations of driveways at the more sensitive lots.

9.2.4. For completeness, if direct driveways are proposed onto higher speed roads, then the speed limits will need to be reduced in order to ensure that vehicles can manoeuvre safely.

9.2.5. On this basis, at this stage we do not consider that the ODPs have any elements which preclude justified non-compliances with the District Plan, but acknowledge that this will need to be assessed in more detail when the relevant consents are applied for.

9.2.6. Consequently, subject to these caveats, the ODPs can be supported from a transportation perspective.

10. Conclusions

10.1. This report has identified, evaluated and assessed the various transport and access elements of two proposed ODPs which will facilitate residential subdivisions. Overall it is considered that the traffic generated by the development of the ODP areas can be accommodated on the adjacent roading network without capacity or efficiency issues arising, even allowing for development of surrounding residential areas. Intersection modelling using data extracted from the Council's microsimulation transport model shows that levels of service at all intersections remain good, with low queues and delays, and accordingly no improvement measures are required at any locations.

10.2. The crash history in the vicinity of the site does not indicate that there would be any adverse safety effects from the proposal. However the future increase in urbanisation of the area creates the opportunity for the Council to review (and lower) the current speed limits on Goulds Road, Selwyn Road and Springston-Rolleston Road which will provide an overall safer roading environment.

10.3. In view of the increased traffic flows on Goulds Road, Selwyn Road and Springston-Rolleston Road, these roads will need upgrading from their current rural formation. There are no constraints to this occurring.

10.4. The proposal is likely to be in accordance with the requirements of the District Plan, other than in respect of the separation distances at intersections and sight distances at vehicle crossings close to intersections. However, the majority of the shortfalls in the separation distances are likely to be small, and as the vast majority of drivers in the area will be familiar with the roading layout, it is likely that non-compliances could be supported.

10.5. The proposed ODPs are also in accordance with the Structure Plan for the area.

10.6. Overall, and subject to the preceding comments, the ODPs can be supported from a traffic and transportation perspective and it is considered that there are no traffic and transportation reasons why they could not be approved.

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December 2019

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Planning. Traffic. Development.

Integrated Transport Assessment

Prepared for

HUGHES DEVELOPMENTS LIMITED

Dunns Crossing Road Plan Change
Rolleston

November 2020

Integrated Transport Assessment
Prepared for

Hughes Developments Limited

Dunns Crossing Road Plan Change
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Appendices

Appendix 1 Proposed Outline Development Plan (ODP)
Appendix 2 Turning Count Model Data
Appendix 3 SIDRA Reports

Introduction

1. Hughes Developments Limited has commissioned Novo Group to prepare an Integrated Transport Assessment (ITA) for a Plan Change in Rolleston. More specifically this includes land at 108 Dunns Crossing Road south to the intersection with Dunns Crossing Road, Goulds Road and Selwyn Road, north to 597 East Maddisons Road and includes 3/144 Dunns Crossing Road.

2. This report provides an assessment of the transport aspects of the proposed development. It describes the transport environment in the vicinity of the site, the transport related components of the proposal and identifies any transportation issues associated with the proposed development. This includes any likely changes in travel patterns. The assessment also examines any potential adverse effects and whether these can be mitigated. The report has been prepared broadly in accordance with the Integrated Transportation Assessment Guidelines specified in New Zealand Transport Agency Research report 422, November 2010 and other relevant best practice guides.

3. The site location is illustrated in Figure 1. The proposed ODP for the site is contained in **Appendix 1**.

Figure 1: Site location (source: Canterbury maps)

Transport Environment

Road Network

4. The site is located approximately 3.0 km south of Rolleston's town centre. Dunns Crossing Road runs along the western side of the site with Goulds Road to the east. North of the site there are some large rural properties as well as a suburban subdivision. To the east, there is some frontage with East Maddisons Road. These roads are shown below in **Figure 2**.

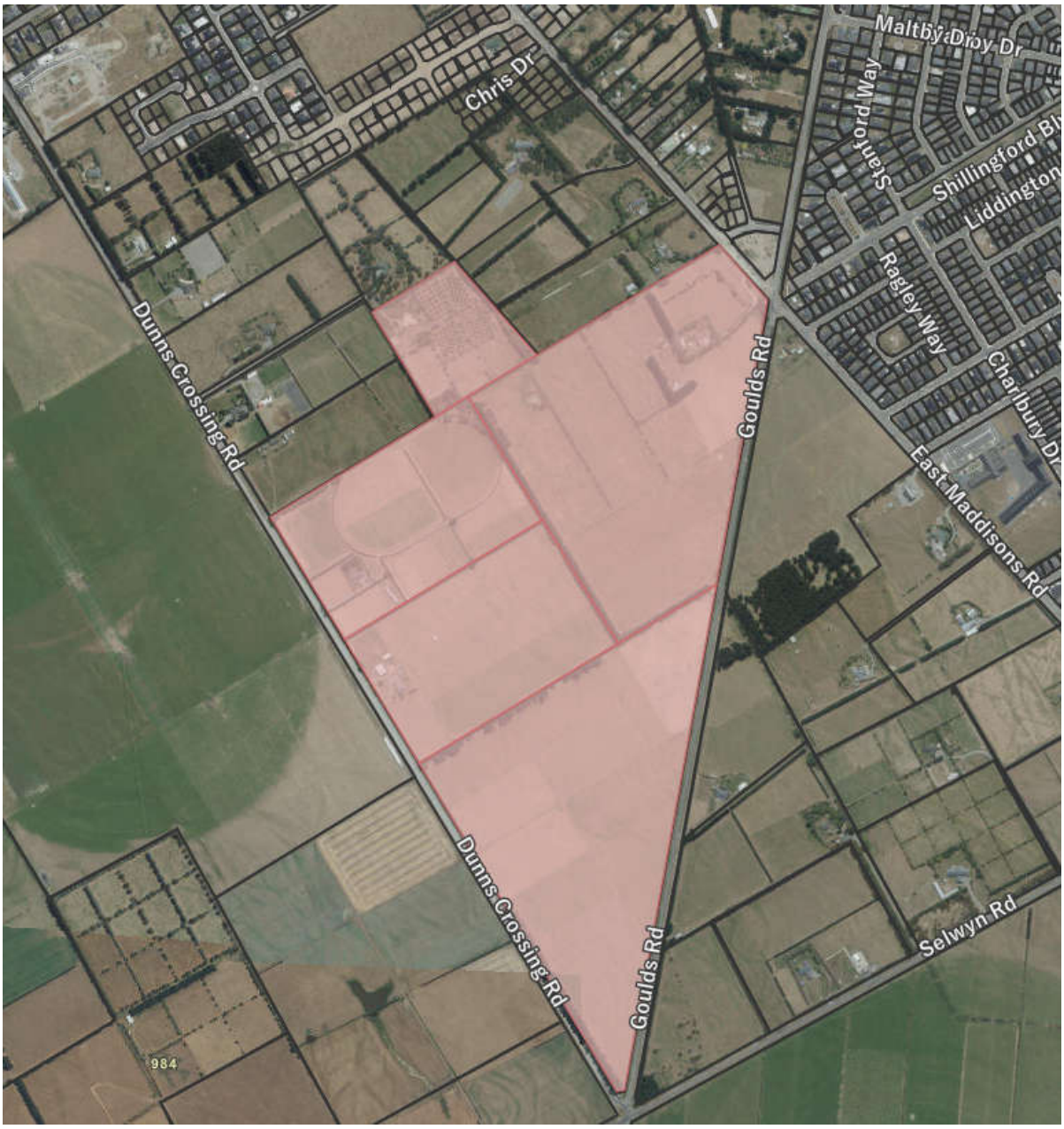

Figure 2: Adjacent Roads to the Site (source: Canterbury maps)

5. The key characteristics of adjacent roads are summarised below.

Dunns Crossing Road and Selwyn Road

Table 1: Road characteristics – Dunns Crossing Road and Selwyn Road

Key Feature or Characteristic	Dunns Crossing Road	Selwyn Road
Road Classification	Operative District Plan: Local Road (south of Lowes Road). Proposed District Plan: Local Road (south of Lowes Road) on the Planning Map; however, it is classified as an Arterial Road in Road Hierarchy Table APP2.	Arterial
Cross section Description	20 m road reserve. Grass verge. 7.0m (approx.) sealed carriageway, 3.5m lane in each direction separated by a painted centreline. 1.0m approximately either side unsealed. No edge line markings.	20 m road reserve. Grass verge. 6.5 m (approx.) sealed carriageway, 3.25 m lane in each direction separated by a painted centreline. No edge line markings.
Road features	Straight alignment with grass verges/scrub either side (range from 1-3 m) with power poles on the west side.	Straight alignment with grass verges either side (range from 6-8 m) with power poles on the north side.
Traffic Volumes	1,602 vehicles per day (vpd) (Sept 2019).	638 vpd (2019).
Posted Speed Limit	The speed limit is 80 km/h north from Selwyn Road but then reduces to 60km/h from 130 Dunns Crossing Road.	80 km/h between Dunns Crossing Road and East Maddisons Road but then reduces to 60 km/h.
Cycling Infrastructure	None	None
Pedestrian Infrastructure	None	None
Public Transport	There are currently no public transport routes passing the site.	There are currently no public transport routes passing the site.
Other Notes	At the southern end, Dunns Crossing Road joins as a T-intersection to Goulds Road.	Selwyn Road has priority over East Maddisons Road and Goulds Road.

Notes:
All traffic volumes are from RAMM and provided by SDC (Selwyn District Council).
In the Proposed District Plan, Dunns Crossing Road is classed as a local road on the digital map, however it is tabled as an arterial road within Part 4 - APP2.[1]

[1] https://eplan.selwyn.govt.nz/review/#Rules/0/492/1/0/0

Goulds Road and East Maddisons Road

Table 2: Road characteristics – Goulds Road and East Maddisons Road (north and south of Goulds Road)

	Goulds Road	East Maddisons Road (north)	East Maddisons Road (south)
Road Classification	Collector	Collector	Collector
Cross section Description	20 m road reserve Grass verge 7 m (approx.) sealed carriageway, 3.5 m lane in each direction separated by a painted centreline.	20 m road reserve. 10 m (approx.) carriageway (kerb to kerb), 5.0 m lane in each direction separated by a painted centreline. Unrestricted (unmarked) kerbside parking on both sides, north of 600 East Maddisons Road. The road width reduces to 9 m on the approach to Goulds Road after Rangatira Street. Footpaths on both sides of East Maddisons Road up to 600 East Maddisons Road. Footpaths range in width from 1.5 m – 2.5 m. The footpath then extends further on the east side up to 610 East Maddisons Road. Verge between the footpath and the kerb.	20 m road reserve. 11 m (approx.) carriageway (kerb to kerb), 5.5m lane in each direction separated by a painted centreline. Unrestricted (unmarked) kerbside parking on both sides. 1.5 m footpath along the east side of the road with a verge between the footpath and the kerb. Verge approximately 4 m in width on the west side of the road.
Traffic Volumes	984 vpd (July 2020)	2,026 vpd (July 2020)	2,026 vpd (July 2020)
Posted Speed Limit	80 km/h north from Selwyn Road but then changes to 60 km/h just south of the intersection with East Maddisons Road.	60 km/h north of Goulds Road but then changes to 50km/h just north of Fairbairn Road.	60 km/h between Selwyn Road and Goulds Road.
Cycling Infrastructure	None	None	None
Pedestrian Infrastructure	None	Sealed footpaths provided on both sides of the road. Several uncontrolled pedestrian crossing points along and across East Maddisons Road that includes at the intersection with Goulds Road. These all have tactile paving.	Sealed footpath provided on east side of road. Several uncontrolled crossings along the east side of Maddisons Road. No tactile paving. No uncontrolled crossings over East Maddisons Road.
Public Transport	There are currently no public transport routes passing the site.	There are currently no public transport routes passing the site.	There are currently no public transport routes passing the site.
Other Notes	Goulds Road has priority over East Maddisons Road and Dunns Crossing Road.	Give-way controlled priority intersection with Goulds Road. Goulds Road has priority.	Stop controlled priority intersection with East Maddisons Road. Goulds Road has priority.

	No stopping lines on both sides of the road south from 600 East Maddisons Road. There is a short access road on the bend (Rangatira Street) to some on street parking bays. This section was formerly East Maddisons Road before the realignment.	The east side of the road is characterised by multiple driveways, but the western side is undeveloped. However, there is a private plan change in progress for this undeveloped site to convert to Living Z zone.

Note: All traffic volumes are from RAMM and provided by SDC.

6. The southern end of Dunns Crossing Road joins Goulds Road approximately 15m north of Selwyn Road. This is controlled by a give-way control with priority afforded to traffic on Goulds Road as shown in **Figure 3**. To the west of this intersection the speed limit increases to 100 km/h along Selwyn Road.

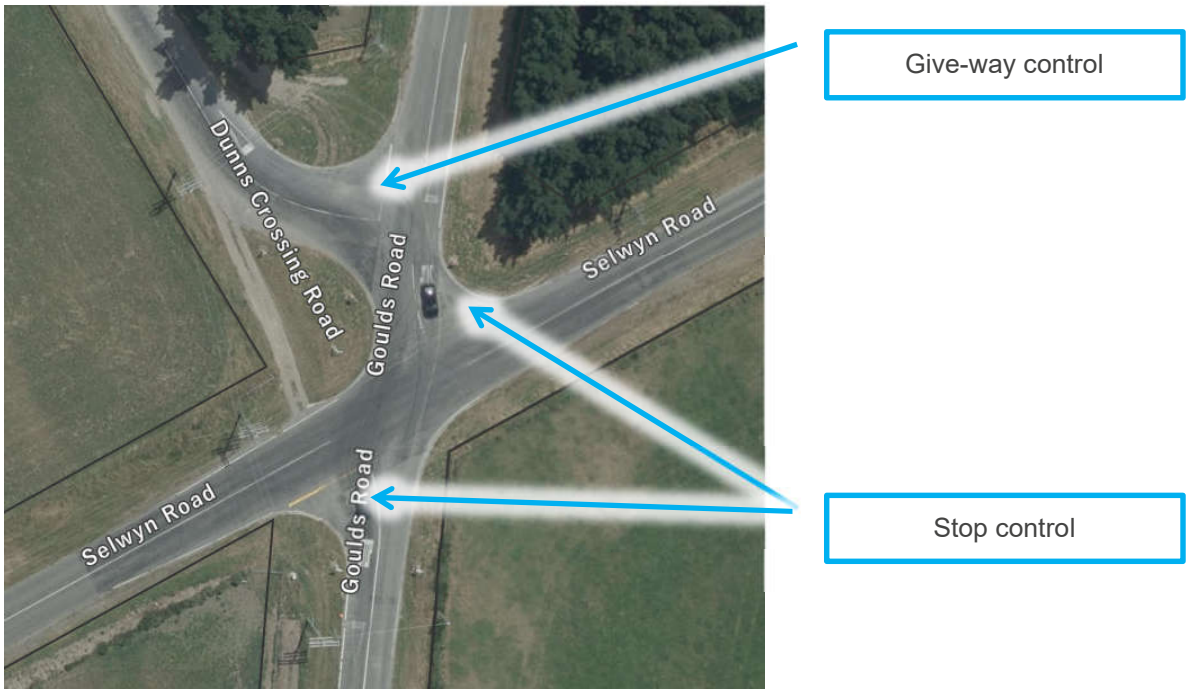

Figure 3: Dunns Crossing Road/Goulds Road and Selwyn Road intersection (source: Canterbury Maps)

7. The Goulds Road (north and south) approaches connect with Selwyn Road on an approximate 60-degree angle.

8. To the east of the proposed site, East Madisons Road has been re-orientated to provide a set of two staggered-T-intersections as shown in **Figure 4**. Note that Rangatira Street has been created in place of the previous East Maddisons Road, however, this does not connect with Goulds Road.

Figure 4: Goulds Road/ East Maddisons Road T-intersections (source: Canterbury Maps)

Crash History

9. The NZ Transport Agency Crash Analysis System (CAS) has been reviewed to identify crashes that have been reported within 50m of the site's road frontages for the five-year period ending 9 November 2020. In total, 11 crashes were identified, as shown in **Figure 5**.

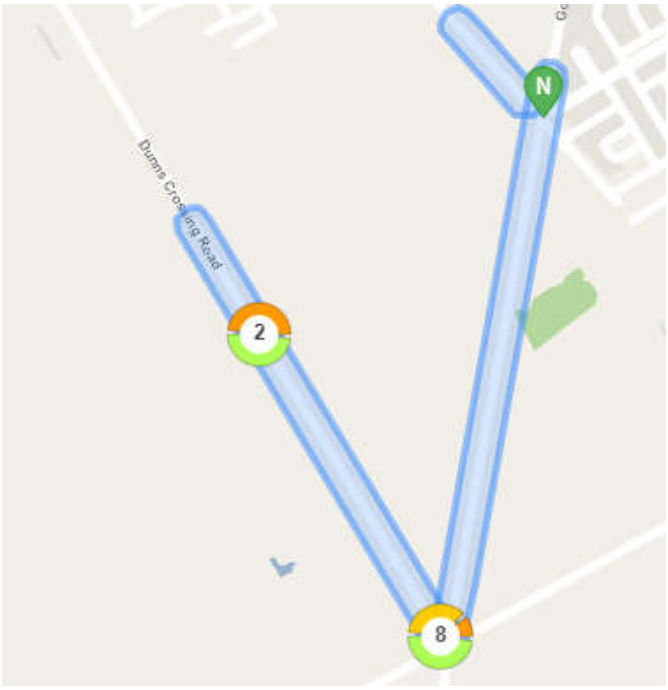

Figure 5: CAS database study area and results

10. **Figure 6** illustrates the collision diagram for the study area.

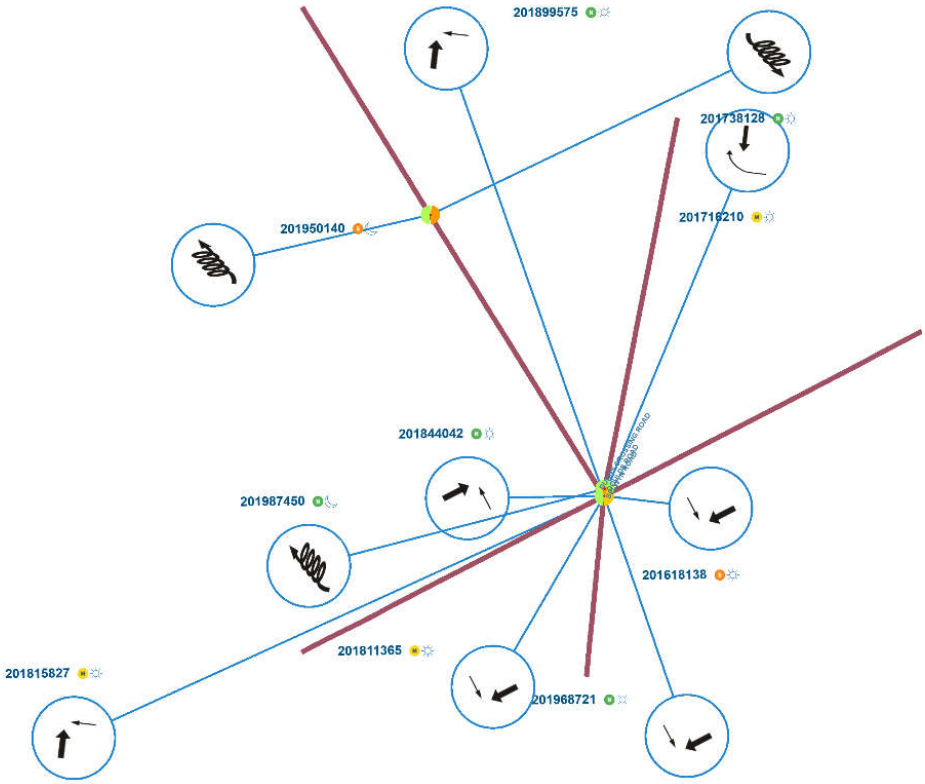

Figure 6: Collision diagram of crashes at Selwyn Road/Goulds Road and along Dunns Crossing Road.

11. The different road frontages have been assessed individually for any trends in the types of crashes:

Dunns Crossing Road

Three crashes reported with only one resulting in an injury, which was serious. However, this is suspected of being alcohol related. Among the other two crashes, one was related to speeding and inexperience. All three were related to losing control.

Key trend(s) observed:

Losing control was a key factor in all the crashes, which may be related to speed.

East Maddisons Road

Only one crash reported, which was non-injury. This involved losing control on a bend as driving too fast when turning right from Goulds Road into East Maddisons Road (North), however, the East Maddisons Road intersection has since changed to a new realignment.

Key trend(s) observed:

None.

Selwyn Road

Seven crashes were reported at the intersection of Selwyn Road and Goulds Road. The general details of the crashes are listed below in **Table 3**.

Table 3: Crashes at the intersection of Selwyn Road and Goulds Road in the last 5 years

Direction travelling	Factor	Type of Injury
Vehicle from Goulds Road North	Failure to see vehicle from Selwyn Road East	Minor
Vehicle from Goulds Road North	Failure to see vehicle from Selwyn Road East due to sunstrike	Non-injury
Vehicle from Goulds Road North	Failure to see vehicle from Selwyn Road East	Non-injury
Vehicle from Goulds Road North	Failure to stop at intersection. Tourist not familiar with conditions	Serious
Vehicle from Goulds Road North	Failure to see vehicle from Selwyn Road East	Minor
Vehicle from Goulds Road South	Failure to give-way to vehicle from Selwyn Road West	Non-injury
Vehicle from Goulds Road South	Failure to see vehicle from Selwyn Road East due to sunstrike	Minor

Key trend(s) observed:

(1) Failure to see vehicles driving westbound along Selwyn Road (North).

(2) Failure to see vehicles driving westbound along Selwyn Road due to sunstrike.

(3) Failure to stop at the stop controlled intersection from Goulds Road (North and South).

Note that all crashes only resulted in minor injuries with the one serious injury related to a tourist failing to stop, likely due to being unfamiliar with the conditions.

Non-Car Modes of Transport

12. The site is located on the edge of the current urban development of Rolleston, on a greenfield site. Footpaths are typically aligned with the extent of development. Accordingly, there is limited infrastructure in the area for non-car modes. There is a small section of footpath (approximately 30m in length) adjacent to the site along East Maddisons Road, north of Goulds Road. This was presumably built following the realignment of East Maddisons Road on the north side of Goulds Road.

13. The nearest subdivision is Faringdon (located on the eastern side of Goulds Road and East Maddisons Road), which has a footpath along the eastern side of East Maddisons Road.

14. We are aware of a new subdivision proposed to the east of the site on the south-eastern side of Goulds Road and to the south-west of East Maddisons Road as shown in **Figure 7**. It is understood that this has already been lodged with Council.

Figure 7: ODP Submitted for the Land to the South East of the Proposed Site.

Future Changes to Land Use Infrastructure

Rolleston Structure Plan

15. A Structure Plan for Rolleston was set out in 2009 aiming that demonstrated how existing and future development could be integrated to maximise sustainable development outcomes. The Structure Plan was intended to provide some high-level principles to guide growth.

16. **Figure 8** illustrates the future road network outlined in the Structure Plan, in relation to the site. It clearly indicates a primary east-west route through the site that links Dunns Crossing Road with Goulds Road and East Maddisons Road. The middle/eastern portion of this road has already been constructed within the adjoining Faringdon subdivision and is known as Shillingford Boulevard. It is understood that a roundabout is ultimately proposed at the intersection of this road and Goulds Road.

Figure 8: Rolleston Structure Plan – Main Roads – Primary Network (source: Rolleston Structure Plan 2009[2])

17. The Structure Plan also proposes 'local secondary roads' across the site that extend between Dunns Crossing Road and Goulds Road.

18. The nearest cycle routes proposed are along Dunns Crossing Road (north to south) and Selwyn Road (east to west) as indicated in **Figure 9**. There is another east to west link proposed further north of the site that connects Dunns Crossing Road and Goulds Road.

[2] https://www.selwyn.govt.nz/__data/assets/pdf_file/0015/14361/Final-Rolleston-Structure-Plan-230909.pdf

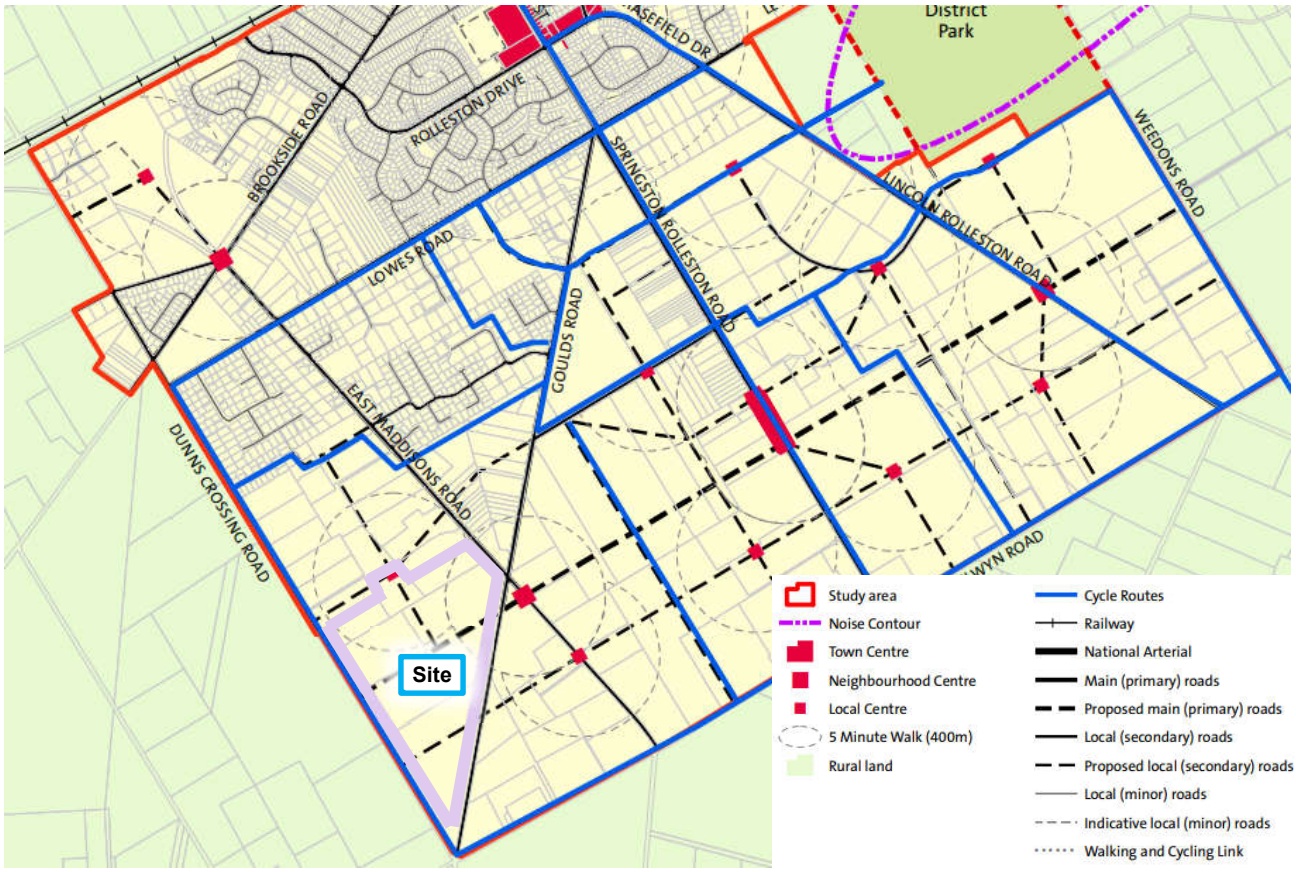

Figure 9: Rolleston Structure Plan – Cycleway Routes (source: Rolleston Structure Plan 2009)

19. For public transport provision, the expected development of bus service routes is indicated in **Figure 10**. This is only indicative and dependent on development; however, it suggests that the primary east to west link i.e. could have a 'potential service' with it operating through the site. In addition, an 'orbital service' may operate adjacent to the site. Accordingly, the site is likely to be well served by public transport.

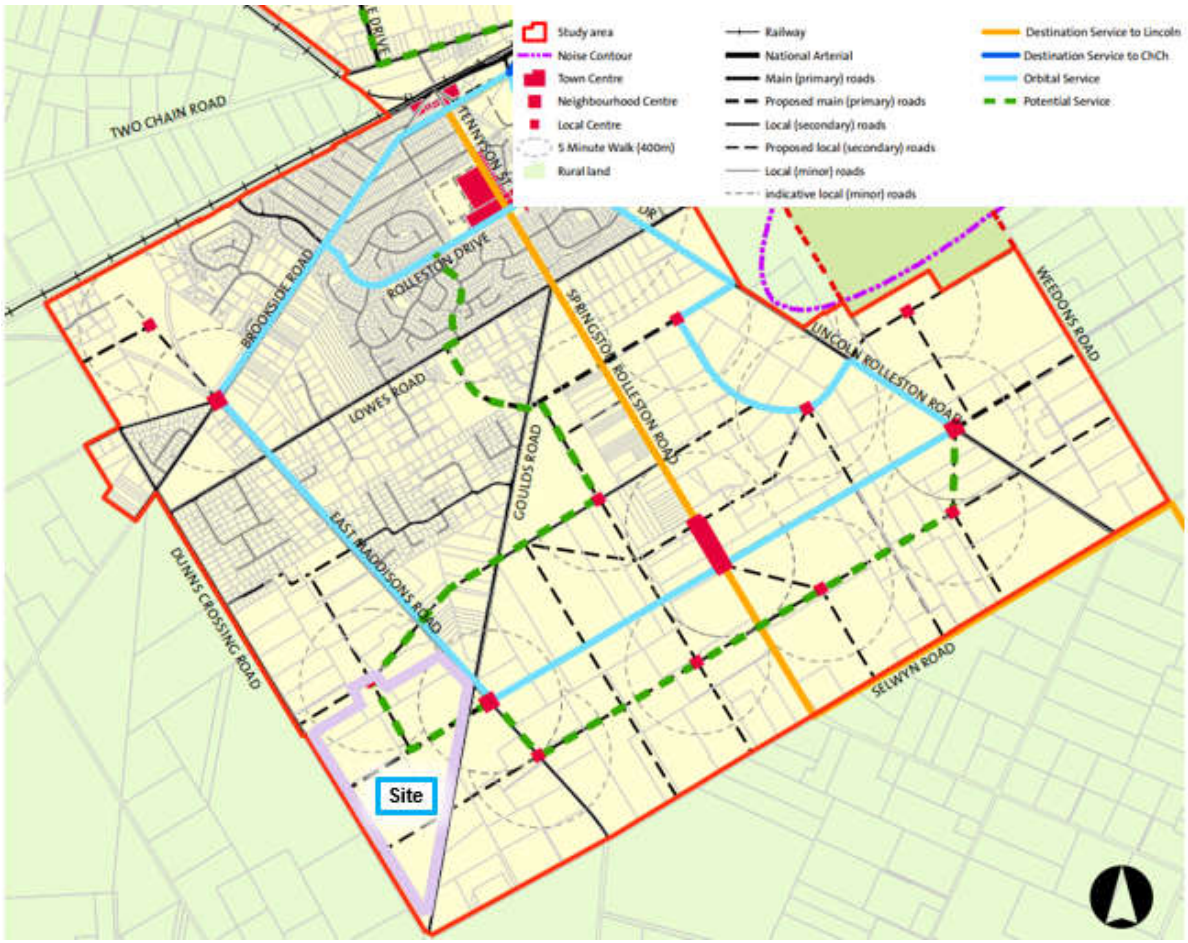

Figure 10: Rolleston Structure Plan – Public Transport Route Patterns (source: Rolleston Structure Plan 2009)

Land Use Changes

20. We are also aware that other Plan Changes are being lodged in the vicinity of this site that will lead to additional traffic on the surrounding road network. That said, the status of those Plan Changes is not certain (i.e. they have not been approved) and the adoption of the 2028 model forecasts is considered to be a reasonable basis for the future environment until such time as the status of other Plan Changes applications has been determined.

Current and Future Transportation Patterns

21. There is significant ongoing development in Rolleston and in the vicinity of the proposed ODP area. Conducting traffic counts along the relevant roads will not accurately assess the appropriate impact. SDC has therefore appointed a consultant to manage and maintain a Paramics model for Rolleston. The full model network is shown below in **Figure 11** from which volumes were extracted from. AM and PM peak traffic volumes were provided for the future forecast year of 2028.

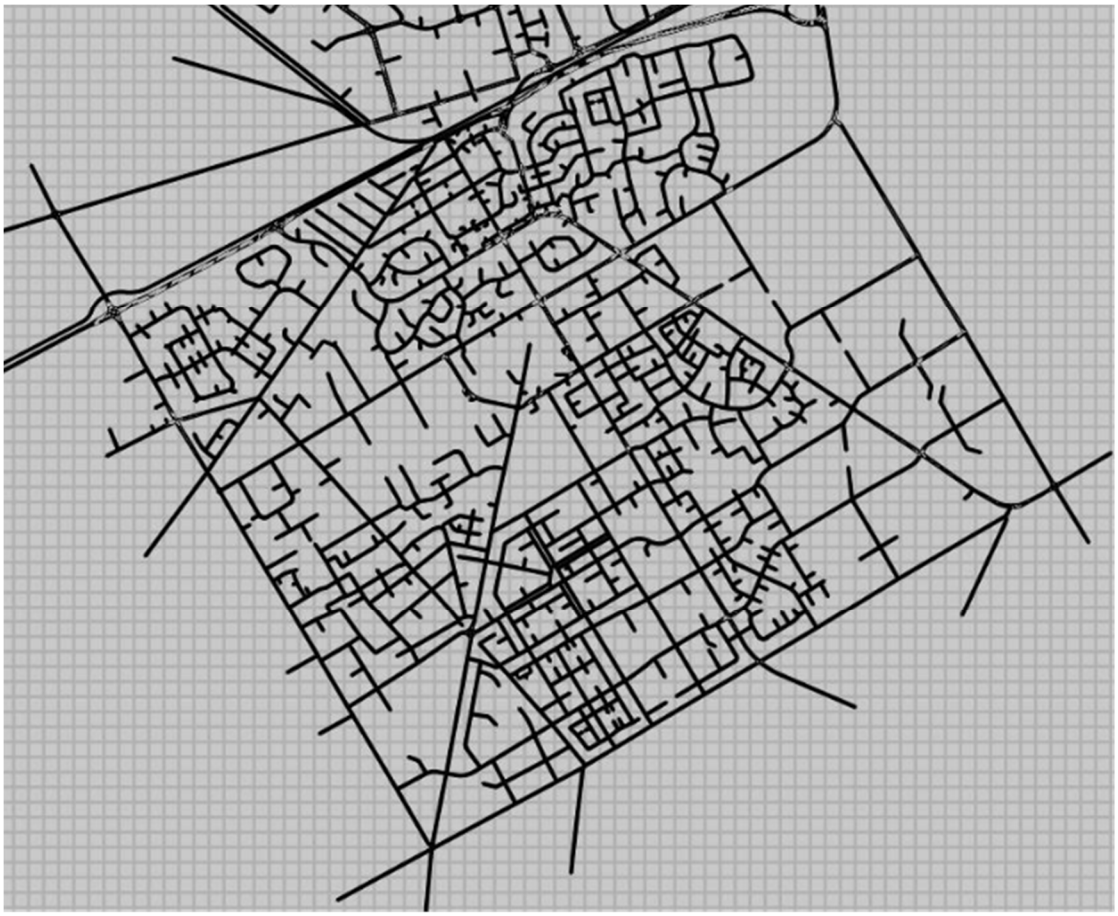

Figure 11: 2028 Paramics Network Model for Rolleston

22. The latest version of the Paramics model used was released in the week commencing 2/11/2020.

Model Volumes and Assumptions

23. The turning volumes from the Paramics model are included within **Appendix 2**. The model includes the following assumptions:

- A proposed roundabout at Goulds Road and East Maddisons Road has been added into the 2028 model.
- The modelling assumes all primary and secondary connectors illustrated in the Farringdon Far West plan provided are complete by 2028.
- The 2028 model assumes that 25% of development in the Future Urban Development Areas (which includes Farringdon Far West) will be complete. This development is assumed to be evenly spread across each Future Urban Development Area.
- Household trip rates are not specifically calibrated in the model – instead they are passed down from matrices from the CAST model.

Proposal

24. The proposal is for a residential zone providing 780 lots, based on 12 households per hectare across the 65-hectare block. The proposed ODP is illustrated in **Appendix 1**.

25. Unless otherwise stated, it is proposed to adopt the transport provisions of the Operative District Plan or Proposed District Plan, whichever is relevant at the time.

26. The area will have several linkages to adjoining sites and that are in line with the Structure Plan for Rolleston. These include:

    - A primary east-west link through the site. This broadly aligns with that identified in the Structure Plan and will tie in with a proposed roundabout at the intersection of Shillingford Boulevard and Goulds Road.

    - A further primary north-south road (slightly curving) through the site linking with the other primary road (to the north) and ultimately Northmoor Boulevard within the Faringdon subdivision (further to the east).

    - Two local secondary roads connecting with Dunns Crossing Road.

    - Three local secondary roads connecting with Goulds Road.

    - Four local secondary roads connecting with land further to the north.

27. The road cross-sections and intersection spacings within the Plan Change area are proposed to comply with the requirements of the District Plan. It is proposed that the roads identified on the ODP would be constructed as either Local Major or Local Intermediate roads.

28. A series of shared paths (off road and on road) are also proposed through the site for pedestrians and cyclists.

Traffic Generation and Distribution

29. Based on the NZ Transport Agency Research Report 453 (Trips and Parking Related to Land Use), and using the 85th percentile traffic generation rate, the traffic generation of the proposed activity (residential) is 0.9 vehicle movements per unit per peak hour and 8.2 vehicle movements per unit per day for outer suburban residential dwellings.

30. Applying those rates to the proposed 780 lots planned on the ODP will lead to a traffic generation of 702 vehicle movements per hour at peak times and 6,396 vehicle movements per day.

31. In the morning peak, 80% of trips will be departing the development, with 65% arriving in the evening peak hour. These are typical splits for residential housing in the peak hours. The anticipated traffic generation is shown in **Table 4**.

Table 4: Traffic Generation (780 Lots)

Scenario	In	Out	Total
Morning Peak Hour	140	562	702
Evening Peak Hour	456	246	702
Daily	3198	3198	6396

32. When the Total "Ins" and Total "Outs" from the model are compared to the projected development traffic for the site based on trip generation rates from the NZ Transport Agency Research Report 453, the volumes used in the modelling are significantly higher, indicating, that we have modelled a much worse case. The comparison is shown in **Table 5**. Note that the Total Ins and Outs did not include traffic associated with the Goulds Road access so the development trips modelled in SIDRA are higher than anticipated.

Table 5: Comparison of Model vs NZTA 453 Trip Generation Rates

	Source	Total Ins	Total Outs	Total
Development trips based on NZ Transport Agency Research Report 453	AM Peak	140	562	702
	PM Peak	456	246	702
Development trips modelled	AM Peak	344*	508*	854*
	PM Peak	556*	528*	1,084*

Note: * The Total Ins and Outs did not include traffic using the Goulds Road access.

33. As the 2028 model assumes that development is only 25% complete for Future Urban Development Areas, the turning volumes related to site traffic have been multiplied by a factor of 4 for use in the SIDRA modelling. This ensures that full development traffic for the site has been included. The forecasted total traffic volumes at the three intersections to the ODP area are illustrated in **Figure 12**.

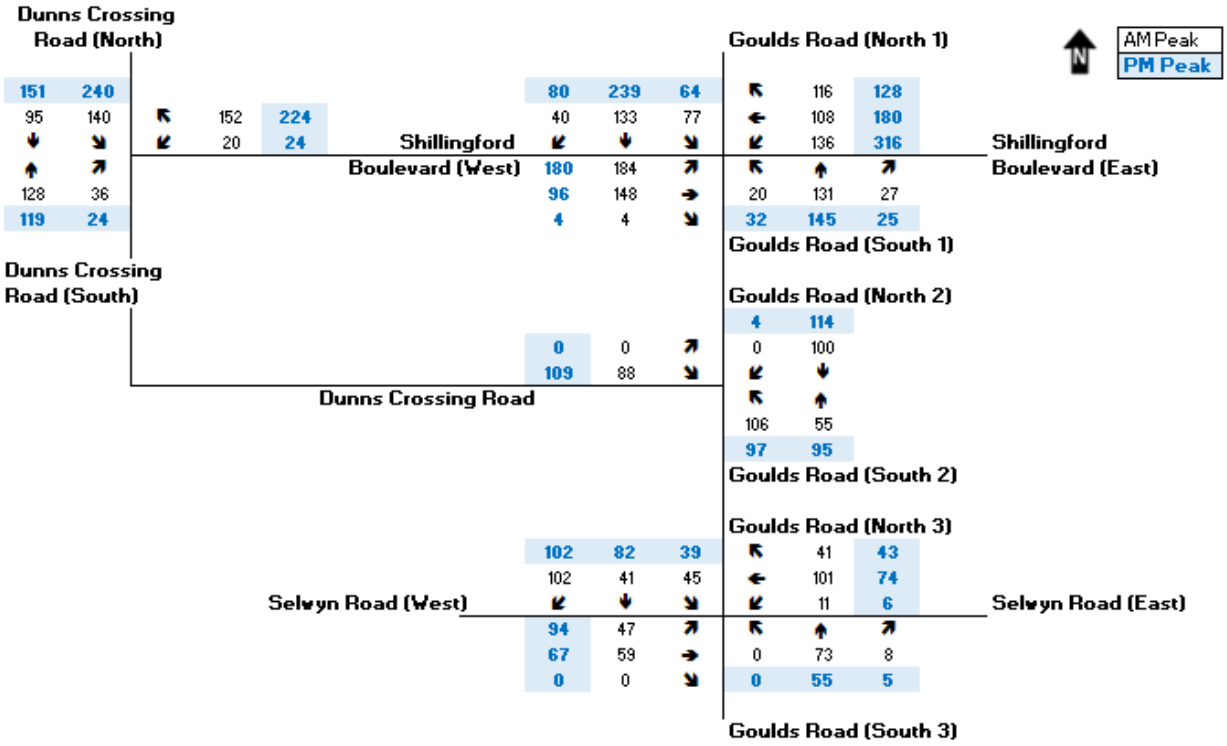

Figure 12: Projected Turning Volumes for 2028

34. Trip distribution for the site is based on that shown in the Paramics model. Without turning volumes for the Goulds Road access, only indicative assumptions can be drawn. These include:

- The new roundabout at the intersection of Goulds Road and Shillingford Boulevard will accommodate a significant proportion of traffic related to the site with a high proportion expected to use Goulds Road North and Shillingford Boulevard East.

- A significant proportion of traffic accessing Dunns Crossing Road is expected to use Dunns Crossing Road North.

- A significant proportion of traffic at the intersection of Gould Road/Selwyn Road is expected to use Selwyn Road West.

Effects on the Transportation Networks

Roading Network Capacity

35. The traffic effects of the proposed ODP have been modelled using SIDRA 9.0 – an industry standard computer-based analysis tool for assessing the performance characteristics of an intersection.

36. The results presented in this report include the Level of Service ('LOS') provided by the intersection. LOS is a generalised function of delay where LOS A and B are very good and indicative of free-flow conditions; C is good; D is acceptable; and E and F are typically indicative of congestion and unstable conditions, although the former is sometimes accepted in the peak hour.

37. As there were no volumes provided for the baseline, we have only been able to model the future year 2028 scenario with 100% development traffic for the site.

38. Due to the proximity of Dunns Crossing Road/Goulds Road intersection with Goulds Road/Selwyn Road intersection, these were modelled as being linked as shown in **Figure 13**. Given the likely re-classification of Dunns Crossing Road as an arterial route, logic suggests that intersection rationalisation and improvements would have some merit in this location.

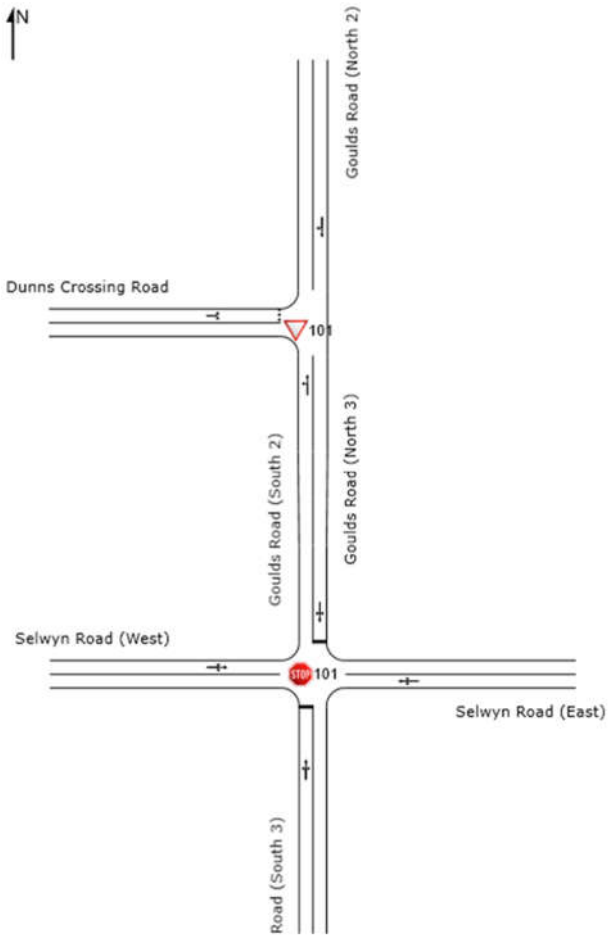

Figure 13: Layout Modelled for the Dunns Crossing Road/Goulds Road/Selwyn Road T-intersections

39. The SIDRA results are summarised below.

Table 6: SIDRA Results at the Dunns Crossing Road/Shillingford Boulevard T-intersection

Road and Movement	Turn	AM			PM		
		Avg Delay (s)	95 %tile Queue (veh)	Level of Service	Avg Delay (s)	95 %tile Queue (veh)	Level of Service
Dunns Crossing Rd South	R	1.4	1	A	6.2	1	A
Shillingford Blvd	L	4.9	1	A	5.3	1	A
	R	6.1	1	A	7.0	1	A
Dunns Crossing Rd North	L	4.6	0	A	4.6	0	A

Table 7: SIDRA Results at the Shillingford Boulevard/Goulds Road Roundabout

Road and Movement	AM			PM		
	Average Delay (s)	95 %tile Queue (vehicle)	Level of Service	Average Delay (s)	95 %tile Queue (vehicle)	Level of Service
Goulds Road (South 1)	4.7	1	A	5.4	1	A
Shillingford Boulevard (East)	5.2	2	A	7.1	6	A
Goulds Road (North 1)	4.4	1	A	4.3	2	A
Shillingford Boulevard (West)	4.4	2	A	4.5	2	A

Table 8: SIDRA results at the Dunns Crossing Road/Goulds Road/Selwyn Road T-intersections

Road and Movement	AM			PM		
	Average Delay (s)	95 %tile Queue (vehicle)	Level of Service	Average Delay (s)	95 %tile Queue (vehicle)	Level of Service
Goulds Road (South 2)	1.4	0	A	1.1	0	A
Goulds Road (North 2)	0.1	0	A	0.2	0	A
Dunns Crossing Road	5.4	1	A	5.7	1	A
Goulds Road (South 3)	10.0	1	A	10.1	1	B
Selwyn Road (East)	2.5	1	A	3.1	1	A
Goulds Road (North 3)	5.8	1	A	5.8	1	A
Selwyn Road (West)	3.1	0	A	5.2	0	A

40. The results indicate that the existing intersections at Goulds Road/Selwyn Road and Dunns Crossing Road/Goulds Road can support the level of development traffic proposed. In addition, a new single circulating lane roundabout can support traffic volumes at the intersection of Goulds Road and Shillingford Boulevard. LOS A are shown for the AM and PM peak periods.

41. All SIDRA modelling is included in **Appendix 3**.

Access Arrangements and Roading Network

42. The engineering details of the proposed access arrangements are yet to be determined, although it is considered there will be sufficient space to accommodate satisfactory intersections. The intersections will be designed to comply with relevant design standards, including sight line requirements. These will also be subject to road safety audit requirements to confirm they are anticipated to operate safely.

43. Access to individual properties is also proposed to comply with the District Plan requirements. Any non-compliances will either be sought at subdivision stage or addressed on an individual basis and the effects of this on safety and efficiency considered at that stage.

44. It is understood that the existing roading environment will be revised as a result of the development of the ODP area. The area will change from being rural to urban, so carriageways are expected to be widened alongside the implementation of kerbs and footpaths along all site frontages.

45. As the area urbanises, speed limits are envisioned to reduce along Goulds Road, East Maddisons Road and Dunns Crossing Road. It would be appropriate for the 80km/h speed limit to be lowered to at least 60km/h, to be consistent with East Maddisons Road and Dunns Crossing Road at the northern end.

46. Accordingly, the internal transport network is considered to be safe and efficient.

47. The District Plan rules regarding parking and loading will be adopted for this Plan Change. This is sufficient to confirm that parking and loading will be satisfactorily provided for in a functional and practical manner.

Non-Car Modes of Transport

48. The proposed site includes a number of pedestrian and cycle links within the Plan Change area. These are proposed to connect with adjacent ODPs and detailed design can be tailored to the satisfaction of Council at subdivision stage. This includes the Faringdon South West subdivision, the Faringdon subdivision on the east side of East Maddisons Road and the OPD proposed on the west side of Dunns Crossing Road.

49. At subdivision stage, the plan will ensue that there are sufficient pedestrian and cycle links for access to the neighbourhood centre proposed to the east of the ODP as well as linkages for those attending the new school along East Maddisons Road, south of Goulds Road. It is anticipated that many children will choose to walk to this school from the ODP development area.

50. Any cycle routes across the site are expected to tie in with the cycle route proposed along Dunns Crossing Road. Other on-road and off-road cycle infrastructure is also proposed within the Plan Change area.

51. The above is considered to be sufficient to confirm that the site has sufficient accessibility to a range of everyday facilities without the need to drive.

52. It is anticipated that the roads/footpaths/cycle infrastructure within the ODP areas will meet the Council's standards in terms of geometric design and cross section detail.

53. As the site is located on a 'possible bus service' route, the internal roading network will be able to cater for any bus services through the site in the future. This includes the consideration of bus stops through the site.

Off-Site Improvements

54. There were some safety issues identified at the intersection of Selwyn Road and Goulds Road. These typically involved drivers travelling along Goulds Road (north and south) failing to see traffic travelling westbound along Selwyn Road. It is anticipated that the urbanisation of this area (as the adjacent residential zoned land is developed) would better highlight the intersection and reduce the speed limit on Selwyn Road. This may address the crash record at this location. If crashes continue after this area is urbanised, there would be value in Council rationalising the layout. The Proposed District Plan identifies that Dunns Crossing Road (south of Lowes Road through to Selwyn Road) could be reclassified as an arterial road in which case an intersection improvement would have some practical and logical merit.

Summary and Conclusions

Summary

55. This Plan Change would enable the development of up to 780 residential lots within the Plan Change Area.

56. An ODP has been prepared which provides multiple access points from surrounding roads and connections with adjoining land. A primary road east-west is provided through the site which will ultimately connect with Shillingford Boulevard in the adjoining Faringdon subdivision. A further primary road will provide alternative access to a further east-west road link located to the south. A series of other local roads will provide connections for all modes such that a high level of accessibility is provided.

57. The traffic capacity of intersections in the immediate vicinity of the site have been assessed and found to be acceptable. This includes the intersection of Dunns Crossing Road, Goulds Road/Selwyn Road and Goulds Road/Shillingford Boulevard. There will also be sufficient sight distance for these intersections to operate safely.

58. The crash history at the intersection of Goulds Road/Selwyn Road suggests that improvements should be investigated. The re-classification of Dunns Crossing Road as an arterial route suggests this would be considered as a matter of course.

59. The rezoning of this land aligns well with the Rolleston Structure Plan.

60. The transport provisions of the Operative District Plan (or Proposed District Plan) can be adopted at the subdivision and/or resource consent stages. No specific rules are required for any other transport purpose.

Conclusion

61. For the reasons discussed above, the proposed rezoning of this site for residential purposes can be supported from a transport perspective.

Appendix 1

Proposed Outline Development Plan (ODP)

East Maddisons Road

Gould's Road

Dunns Crossing Road

NORTH

LEGEND

- Medium Density
- Low Density
- Neighbourhood Centre
- Reserves
- Primary Road
- Secondary Road
- Possible Future Road Connection
- Shared Pedestrian / Cycle Lane (off road)
- Shared Pedestrian / Cycle Lane (on road)

ODP - Faringdon Far West

Not to Scale

Appendix 2

Turning Count Model Data

Dunns Crossing Rd / Faringdon East-West Link:

From	To	2028 AM		2028 PM	
		07:00 to 08:00	08:00 to 09:00	16:00 to 17:00	17:00 to 18:00
Dunns Crossing Rd N	Faringdon East-West Link	24	35	38	60
Dunns Crossing Rd N	Dunns Crossing Rd S	89	95	130	151
Faringdon East-West Link	Dunns Crossing Rd S	6	5	8	6
Faringdon East-West Link	Dunns Crossing Rd N	40	38	46	56
Dunns Crossing Rd S	Dunns Crossing Rd N	118	128	105	119
Dunns Crossing Rd S	Faringdon East-West Link	6	9	5	6

Goulds Rd roundabout:

From	To	2028 AM		2028 PM	
		07:00 to 08:00	08:00 to 09:00	16:00 to 17:00	17:00 to 18:00
Goulds Rd N	Faringdon East-West Link E	56	77	62	64
Goulds Rd N	Goulds Rd S	102	133	198	239
Goulds Rd N	Faringdon East-West Link W	10	10	19	20
Goulds Rd N	Goulds Rd N	0	0	1	1
Faringdon East-West Link E	Goulds Rd S	27	34	62	79
Faringdon East-West Link E	Faringdon East-West Link W	20	27	37	45
Faringdon East-West Link E	Goulds Rd N	20	29	32	32
Faringdon East-West Link E	Faringdon East-West Link E	0	1	0	1
Goulds Rd S	Faringdon East-West Link W	3	5	7	8
Goulds Rd S	Goulds Rd N	99	131	135	145
Goulds Rd S	Faringdon East-West Link E	19	27	21	25
Goulds Rd S	Goulds Rd S	0	0	0	0
Faringdon East-West Link W	Goulds Rd N	43	46	40	45
Faringdon East-West Link W	Faringdon East-West Link E	16	37	18	24
Faringdon East-West Link W	Goulds Rd S	1	1	1	1
Faringdon East-West Link W	Faringdon East-West Link W	0	0	1	1

Goulds Rd / Selwyn Rd / Dunns Crossing Rd intersections:

From	To	2028 AM		2028 PM	
		07:00 to 08:00	08:00 to 09:00	16:00 to 17:00	17:00 to 18:00
Goulds Rd N	Selwyn Rd E	24	24	18	20
Goulds Rd N	Goulds Rd S	18	22	35	42
Goulds Rd N	Selwyn Rd W	46	54	40	52
Goulds Rd N	Dunns Crossing Rd	1	0	2	4
Selwyn Rd E	Goulds Rd S	10	11	6	6
Selwyn Rd E	Selwyn Rd W	90	101	69	74
Selwyn Rd E	Dunns Crossing Rd	22	27	19	22
Selwyn Rd E	Goulds Rd N	10	14	20	21
Goulds Rd S	Selwyn Rd W	0	0	0	0
Goulds Rd S	Dunns Crossing Rd	48	48	23	28
Goulds Rd S	Goulds Rd N	23	25	23	27
Goulds Rd S	Selwyn Rd E	8	8	7	5
Selwyn Rd W	Dunns Crossing Rd	25	31	42	47
Selwyn Rd W	Goulds Rd N	12	16	43	47
Selwyn Rd W	Selwyn Rd E	60	59	73	67
Selwyn Rd W	Goulds Rd S	0	0	0	0
Dunns Crossing Rd	Goulds Rd N	0	0	0	0
Dunns Crossing Rd	Selwyn Rd E	23	21	20	19
Dunns Crossing Rd	Goulds Rd S	17	19	39	40
Dunns Crossing Rd	Selwyn Rd W	44	48	44	50

Appendix 3

SIDRA Reports

MOVEMENT SUMMARY

Site: 101 [DC Rd & G Rd - 2028 - PM (Site Folder: General)]

Network: N101 [Network1 (Network Folder: General)]

New Access
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Goulds Road (South 2)														
1	L2	102	1.0	102	1.0	0.106	2.1	LOS A	0.0	0.0	0.00	0.25	0.00	47.7
2	T1	100	1.0	100	1.0	0.106	0.0	LOS A	0.0	0.0	0.00	0.25	0.00	48.6
Approach		202	1.0	202	1.0	0.106	1.1	NA	0.0	0.0	0.00	0.25	0.00	48.1
North: Goulds Road (North 2)														
8	T1	120	1.0	120	1.0	0.064	0.0	LOS A	0.0	0.1	0.03	0.02	0.03	49.6
9	R2	4	1.0	4	1.0	0.064	5.2	LOS A	0.0	0.1	0.03	0.02	0.03	48.9
Approach		124	1.0	124	1.0	0.064	0.2	NA	0.0	0.1	0.03	0.02	0.03	49.6
West: Dunns Crossing Road														
10	L2	1	1.0	1	1.0	0.115	4.9	LOS A	0.2	1.1	0.33	0.60	0.33	45.9
12	R2	115	1.0	115	1.0	0.115	5.7	LOS A	0.2	1.1	0.33	0.60	0.33	43.2
Approach		116	1.0	116	1.0	0.115	5.7	LOS A	0.2	1.1	0.33	0.60	0.33	43.3
All Vehicles		442	1.0	442	1.0	0.115	2.0	NA	0.2	1.1	0.09	0.28	0.09	47.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [S Rd & G Rd - 2028 - PM (short) (Site Folder: General)]

Network: N101 [Network1 (Network Folder: General)]

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Goulds Road (South 3)														
1	L2	1	1.0	1	1.0	0.075	9.2	LOS A	0.1	0.8	0.37	0.94	0.37	62.5
2	T1	58	1.0	58	1.0	0.075	10.1	LOS B	0.1	0.8	0.37	0.94	0.37	57.2
3	R2	5	1.0	5	1.0	0.075	10.4	LOS B	0.1	0.8	0.37	0.94	0.37	62.1
Approach		64	1.0	64	1.0	0.075	10.1	LOS B	0.1	0.8	0.37	0.94	0.37	58.0
East: Selwyn Road (East)														
4	L2	6	1.0	6	1.0	0.074	7.5	LOS A	0.1	0.8	0.21	0.24	0.21	69.2
5	T1	78	1.0	78	1.0	0.074	0.3	LOS A	0.1	0.8	0.21	0.24	0.21	74.2
6	R2	45	1.0	45	1.0	0.074	7.2	LOS A	0.1	0.8	0.21	0.24	0.21	69.3
Approach		129	1.0	129	1.0	0.074	3.1	NA	0.1	0.8	0.21	0.24	0.21	72.8
North: Goulds Road (North 3)														
7	L2	41	1.0	41	1.0	0.273	4.8	LOS A	0.5	3.2	0.33	0.97	0.33	58.4
8	T1	86	1.0	86	1.0	0.273	5.7	LOS A	0.5	3.2	0.33	0.97	0.33	57.9
9	R2	107	1.0	107	1.0	0.273	6.3	LOS A	0.5	3.2	0.33	0.97	0.33	57.6
Approach		235	1.0	235	1.0	0.273	5.8	LOS A	0.5	3.2	0.33	0.97	0.33	57.9
West: Selwyn Road (West)														
10	L2	99	1.0	99	1.0	0.091	7.0	LOS A	0.0	0.0	0.00	0.38	0.00	68.0
11	T1	71	1.0	71	1.0	0.091	0.0	LOS A	0.0	0.0	0.00	0.38	0.00	73.4
12	R2	1	1.0	1	1.0	0.091	6.9	LOS A	0.0	0.0	0.00	0.38	0.00	68.0
Approach		171	1.0	171	1.0	0.091	4.1	NA	0.0	0.0	0.00	0.38	0.00	71.0
All Vehicles		599	1.0	599	1.0	0.273	5.2	NA	0.5	3.2	0.21	0.64	0.21	65.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [DC Rd & G Rd - 2028 - AM (short) (Site Folder: General)]

Network: N102 [Network2 (Network Folder: General)]

New Access
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Goulds Road (South 2)														
1	L2	112	1.0	112	1.0	0.089	2.1	LOS A	0.0	0.0	0.00	0.32	0.00	47.3
2	T1	58	1.0	58	1.0	0.089	0.0	LOS A	0.0	0.0	0.00	0.32	0.00	48.2
Approach		169	1.0	169	1.0	0.089	1.4	NA	0.0	0.0	0.00	0.32	0.00	47.6
North: Goulds Road (North 2)														
8	T1	105	1.0	105	1.0	0.054	0.0	LOS A	0.0	0.0	0.01	0.01	0.01	49.9
9	R2	1	1.0	1	1.0	0.054	5.1	LOS A	0.0	0.0	0.01	0.01	0.01	49.0
Approach		106	1.0	106	1.0	0.054	0.1	NA	0.0	0.0	0.01	0.01	0.01	49.9
West: Dunns Crossing Road														
10	L2	1	1.0	1	1.0	0.088	4.7	LOS A	0.1	0.8	0.28	0.58	0.28	46.0
12	R2	93	1.0	93	1.0	0.088	5.4	LOS A	0.1	0.8	0.28	0.58	0.28	43.4
Approach		94	1.0	94	1.0	0.088	5.4	LOS A	0.1	0.8	0.28	0.58	0.28	43.5
All Vehicles		369	1.0	369	1.0	0.089	2.0	NA	0.1	0.8	0.07	0.29	0.07	47.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [S Rd & G Rd - 2028 - AM (short) (Site Folder: General)]

Network: N102 [Network2 (Network Folder: General)]

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Goulds Road (South 3)														
1	L2	1	1.0	1	1.0	0.098	9.3	LOS A	0.1	1.0	0.37	0.94	0.37	62.6
2	T1	77	1.0	77	1.0	0.098	9.9	LOS A	0.1	1.0	0.37	0.94	0.37	57.4
3	R2	8	1.0	8	1.0	0.098	10.3	LOS B	0.1	1.0	0.37	0.94	0.37	62.2
Approach		86	1.0	86	1.0	0.098	10.0	LOS A	0.1	1.0	0.37	0.94	0.37	58.3
East: Selwyn Road (East)														
4	L2	12	1.0	12	1.0	0.088	7.3	LOS A	0.1	0.8	0.14	0.21	0.14	70.1
5	T1	106	1.0	106	1.0	0.088	0.1	LOS A	0.1	0.8	0.14	0.21	0.14	75.2
6	R2	43	1.0	43	1.0	0.088	7.0	LOS A	0.1	0.8	0.14	0.21	0.14	71.1
Approach		161	1.0	161	1.0	0.088	2.5	NA	0.1	0.8	0.14	0.21	0.14	74.1
North: Goulds Road (North 3)														
7	L2	47	1.0	47	1.0	0.232	4.8	LOS A	0.4	2.6	0.28	0.96	0.28	58.2
8	T1	43	1.0	43	1.0	0.232	5.6	LOS A	0.4	2.6	0.28	0.96	0.28	57.8
9	R2	107	1.0	107	1.0	0.232	6.3	LOS A	0.4	2.6	0.28	0.96	0.28	57.5
Approach		198	1.0	198	1.0	0.232	5.8	LOS A	0.4	2.6	0.28	0.96	0.28	57.7
West: Selwyn Road (West)														
10	L2	49	1.0	49	1.0	0.060	7.0	LOS A	0.0	0.0	0.01	0.29	0.01	70.4
11	T1	62	1.0	62	1.0	0.060	0.0	LOS A	0.0	0.0	0.01	0.29	0.01	74.8
12	R2	1	1.0	1	1.0	0.060	7.0	LOS A	0.0	0.0	0.01	0.29	0.01	69.2
Approach		113	1.0	113	1.0	0.060	3.1	NA	0.0	0.0	0.01	0.29	0.01	73.5
All Vehicles		558	1.0	558	1.0	0.232	4.9	NA	0.4	2.6	0.20	0.60	0.20	66.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [DC Rd & S Blvd - 2028 - PM (Site Folder: General)]

New Access
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Dunns Crossing Road South														
2	T1	119	1.0	125	1.0	0.086	0.5	LOS A	0.2	1.6	0.19	0.10	0.19	49.0
3	R2	24	1.0	25	1.0	0.086	6.2	LOS A	0.2	1.6	0.19	0.10	0.19	48.0
Approach		143	1.0	151	1.0	0.086	1.4	NA	0.2	1.6	0.19	0.10	0.19	48.8
East: Shillingford Blvd														
4	L2	24	1.0	25	1.0	0.295	5.3	LOS A	1.2	8.4	0.44	0.71	0.46	45.3
6	R2	224	1.0	236	1.0	0.295	7.0	LOS A	1.2	8.4	0.44	0.71	0.46	44.9
Approach		248	1.0	261	1.0	0.295	6.8	LOS A	1.2	8.4	0.44	0.71	0.46	45.0
North: Dunns Crossing Road North														
7	L2	240	1.0	253	1.0	0.217	4.6	LOS A	0.0	0.0	0.00	0.33	0.00	47.6
8	T1	151	1.0	159	1.0	0.217	0.1	LOS A	0.0	0.0	0.00	0.33	0.00	48.1
Approach		391	1.0	412	1.0	0.217	2.9	NA	0.0	0.0	0.00	0.33	0.00	47.8
All Vehicles		782	1.0	823	1.0	0.295	3.9	NA	1.2	8.4	0.17	0.41	0.18	47.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [DC Rd & S Blvd - 2028 - AM (Site Folder: General)]

New Access
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Dunns Crossing Road South														
2	T1	128	1.0	135	1.0	0.096	0.3	LOS A	0.3	1.9	0.18	0.13	0.18	48.8
3	R2	36	1.0	38	1.0	0.096	5.4	LOS A	0.3	1.9	0.18	0.13	0.18	47.9
Approach		164	1.0	173	1.0	0.096	1.4	NA	0.3	1.9	0.18	0.13	0.18	48.6
East: Shillingford Blvd														
4	L2	20	1.0	21	1.0	0.185	4.9	LOS A	0.7	4.7	0.34	0.62	0.34	45.8
6	R2	152	1.0	160	1.0	0.185	6.1	LOS A	0.7	4.7	0.34	0.62	0.34	45.4
Approach		172	1.0	181	1.0	0.185	6.0	LOS A	0.7	4.7	0.34	0.62	0.34	45.4
North: Dunns Crossing Road North														
7	L2	140	1.0	147	1.0	0.130	4.6	LOS A	0.0	0.0	0.00	0.32	0.00	47.7
8	T1	95	1.0	100	1.0	0.130	0.0	LOS A	0.0	0.0	0.00	0.32	0.00	48.2
Approach		235	1.0	247	1.0	0.130	2.8	NA	0.0	0.0	0.00	0.32	0.00	47.9
All Vehicles		571	1.0	601	1.0	0.185	3.3	NA	0.7	4.7	0.15	0.36	0.15	47.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [S Blvd & G Rd - 2028 - AM (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Goulds Road (South 1)														
1	L2	20	1.0	21	1.0	0.169	4.1	LOS A	1.0	6.8	0.47	0.51	0.47	46.4
2	T1	131	1.0	138	1.0	0.169	4.0	LOS A	1.0	6.8	0.47	0.51	0.47	47.5
3	R2	27	1.0	28	1.0	0.169	8.7	LOS A	1.0	6.8	0.47	0.51	0.47	47.8
Approach		178	1.0	187	1.0	0.169	4.7	LOS A	1.0	6.8	0.47	0.51	0.47	47.4
East: Shillingford Boulevard (East)														
4	L2	136	1.0	143	1.0	0.310	3.8	LOS A	2.0	14.2	0.44	0.53	0.44	46.3
5	T1	108	1.0	114	1.0	0.310	3.7	LOS A	2.0	14.2	0.44	0.53	0.44	47.4
6	R2	116	1.0	122	1.0	0.310	8.4	LOS A	2.0	14.2	0.44	0.53	0.44	47.6
Approach		360	1.0	379	1.0	0.310	5.2	LOS A	2.0	14.2	0.44	0.53	0.44	47.0
North: Goulds Road (North 1)														
7	L2	77	1.0	81	1.0	0.220	3.7	LOS A	1.3	9.3	0.41	0.48	0.41	46.7
8	T1	133	1.0	140	1.0	0.220	3.6	LOS A	1.3	9.3	0.41	0.48	0.41	47.8
9	R2	40	1.0	42	1.0	0.220	8.3	LOS A	1.3	9.3	0.41	0.48	0.41	48.0
Approach		250	1.0	263	1.0	0.220	4.4	LOS A	1.3	9.3	0.41	0.48	0.41	47.5
West: Shillingford Boulevard (West)														
10	L2	184	1.0	194	1.0	0.319	4.4	LOS A	2.0	14.1	0.52	0.54	0.52	46.7
11	T1	148	1.0	156	1.0	0.319	4.3	LOS A	2.0	14.1	0.52	0.54	0.52	47.8
12	R2	4	1.0	4	1.0	0.319	9.1	LOS A	2.0	14.1	0.52	0.54	0.52	48.1
Approach		336	1.0	354	1.0	0.319	4.4	LOS A	2.0	14.1	0.52	0.54	0.52	47.2
All Vehicles		1124	1.0	1183	1.0	0.319	4.7	LOS A	2.0	14.2	0.46	0.52	0.46	47.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [S Blvd & G Rd - 2028 - PM (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Goulds Road (South 1)														
1	L2	32	1.0	34	1.0	0.218	4.9	LOS A	1.4	9.6	0.60	0.59	0.60	46.0
2	T1	145	1.0	153	1.0	0.218	4.8	LOS A	1.4	9.6	0.60	0.59	0.60	47.1
3	R2	25	1.0	26	1.0	0.218	9.6	LOS A	1.4	9.6	0.60	0.59	0.60	47.4
Approach		202	1.0	213	1.0	0.218	5.4	LOS A	1.4	9.6	0.60	0.59	0.60	47.0
East: Shillingford Boulevard (East)														
4	L2	316	1.0	333	1.0	0.609	6.2	LOS A	5.7	40.6	0.74	0.74	0.80	45.5
5	T1	180	1.0	189	1.0	0.609	6.1	LOS A	5.7	40.6	0.74	0.74	0.80	46.6
6	R2	128	1.0	135	1.0	0.609	10.8	LOS B	5.7	40.6	0.74	0.74	0.80	46.9
Approach		624	1.0	657	1.0	0.609	7.1	LOS A	5.7	40.6	0.74	0.74	0.80	46.1
North: Goulds Road (North 1)														
7	L2	64	1.0	67	1.0	0.309	3.4	LOS A	2.0	14.4	0.37	0.45	0.37	46.6
8	T1	239	1.0	252	1.0	0.309	3.3	LOS A	2.0	14.4	0.37	0.45	0.37	47.8
9	R2	80	1.0	84	1.0	0.309	8.1	LOS A	2.0	14.4	0.37	0.45	0.37	48.0
Approach		383	1.0	403	1.0	0.309	4.3	LOS A	2.0	14.4	0.37	0.45	0.37	47.6
West: Shillingford Boulevard (West)														
10	L2	180	1.0	189	1.0	0.274	4.5	LOS A	1.7	11.8	0.53	0.55	0.53	46.7
11	T1	96	1.0	101	1.0	0.274	4.4	LOS A	1.7	11.8	0.53	0.55	0.53	47.8
12	R2	4	1.0	4	1.0	0.274	9.1	LOS A	1.7	11.8	0.53	0.55	0.53	48.1
Approach		280	1.0	295	1.0	0.274	4.5	LOS A	1.7	11.8	0.53	0.55	0.53	47.1
All Vehicles		1489	1.0	1567	1.0	0.609	5.7	LOS A	5.7	40.6	0.59	0.61	0.61	46.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.