



transport planning
traffic engineering
modelling

West Mundijong Industrial Area (Phase 1) Transport Impact Assessment

PREPARED FOR:
Shire of Serpentine Jarrahdale

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1 Introduction and Background

This Transport Impact Assessment (TIA) has been prepared by Transcore on behalf of Shire of Serpentine Jarrahdale (the Shire). The subject of this report is the proposed West Mundijong Industrial Area (WMIA) Local Structure Plan (LSP) to be located at the west of the Mundijong town site.

This TIA provides additional information and clarification to address the DPLH comments on TIA as outlined in DPLH email of 8 September 2022 to the Shire.

Figure 2 shows the location of the WMIA. Mundijong Road forms the southern boundary of the site, Kargotich Road, Bishop Road and Kwinana freight rail form the western and northern boundary of the subject site and future Tonkin Highway extension will be located at the east of the site.

Figure 2 also shows zones and reservations of the Metropolitan Region Scheme (MRS) including Tonkin Highway extension around the proposed WMIA. The land is already zoned 'Industry' under the MRS.

The LSP has been developed to guide future subdivision of the industrial area in a phased approach. The first phase would include 127 lots with minimum lot size of 1.5 - 2ha which is the subject of this TIA.

Key issues that will be addressed in this report include the traffic generation and distribution of the proposed LSP, operation of the LSP intersections on Kargotich Road, Bishop Road and Mundijong Road and the capacity of the intersections of Mundijong Road/ Kargotich Road and Bishop Road/ Kargotich Road for the existing, 2031 and 2041 scenarios.

Transcore undertook traffic counts traffic survey at the intersections of Mundijong Road/ Kargotich Road and Bishop Road/ Kargotich Road on Wednesday 11 August 2021 for the AM (7-8) and PM (4-5) peak hours. The projected future traffic volumes on surrounding regional roads were extracted from Main Roads WA ROM projection plots provided by Shire. The ROM projection plots were provided by Main Roads WA to Shire.

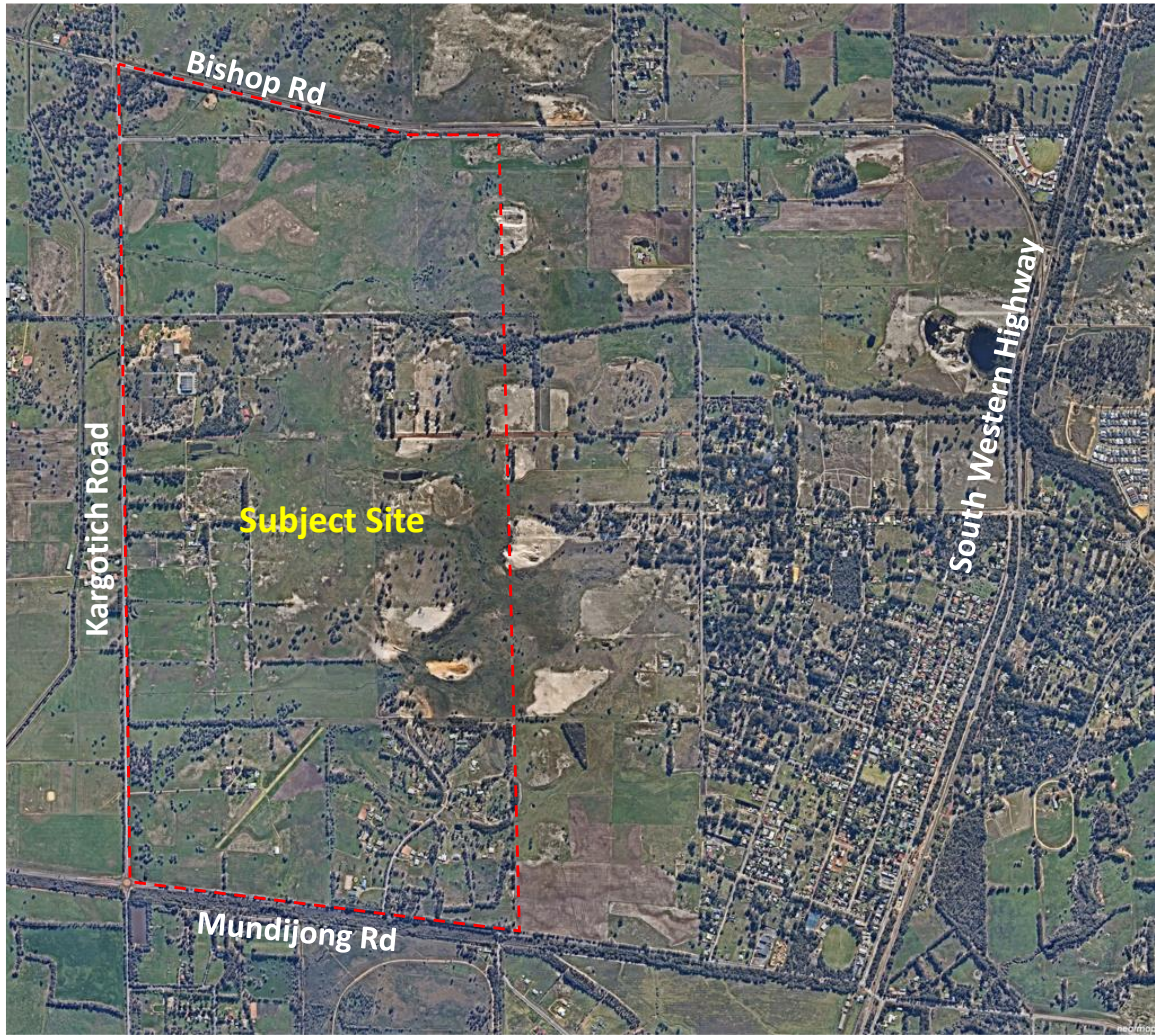


Figure 1: Location of the subject site (source: near map)

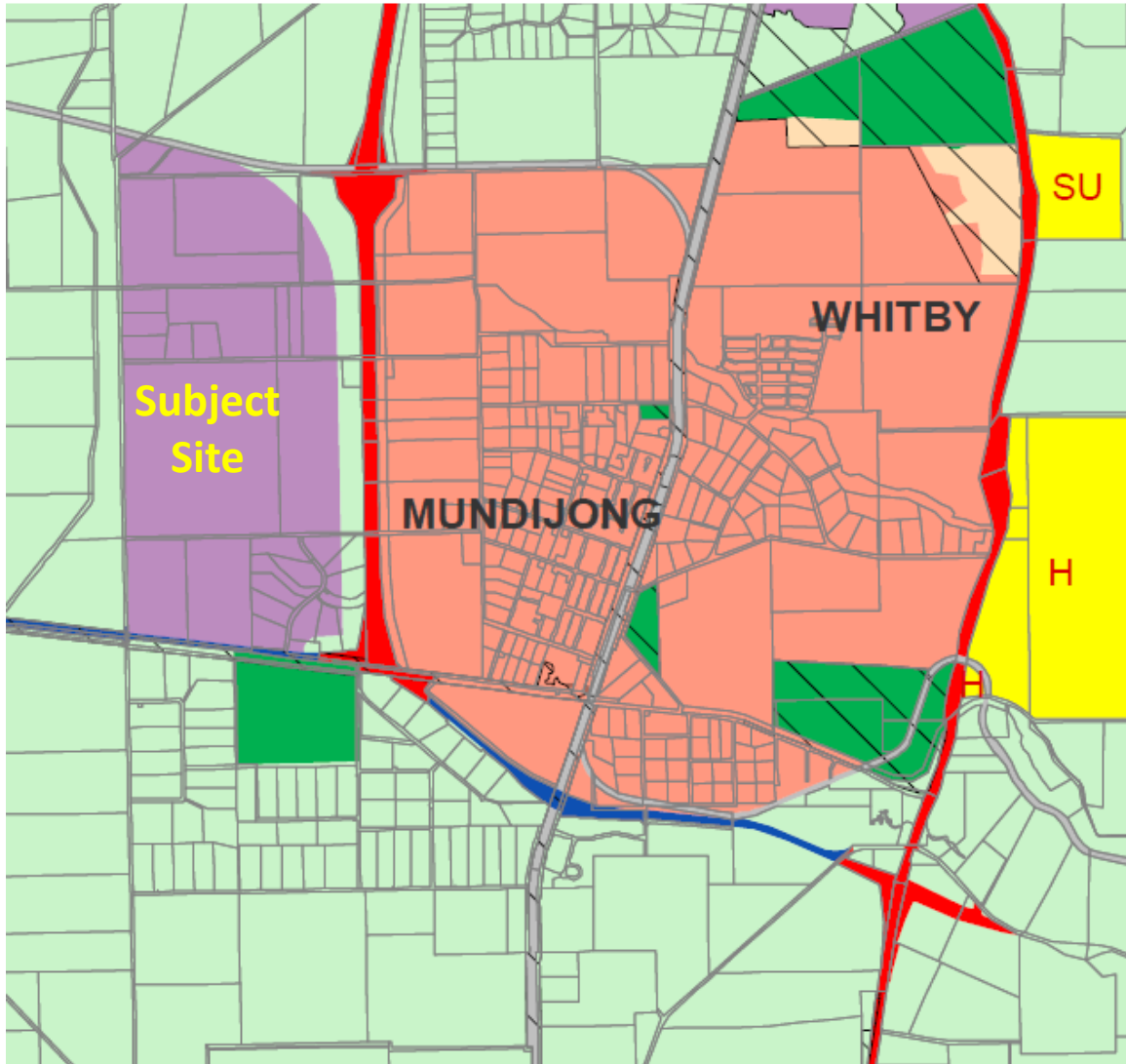


Figure 2: Location of the subject site with respect to MRS

2 Proposed Local Structure Plan

Appendix A of this report shows the proposed Local Structure Plan for West Mundijong Industrial Area. The phase 1 LSP is proposed to include a mixture of industrial uses with anticipated development yields as shown in **Table 1**. Accordingly, the first phase would include 127 lots with minimum lot size of 1.5 - 2ha.

Table 1: Estimated yields

Component	Area (ha)	Possible Lot Yield
General Industry (Core)	260ha	72
Light Industry (Precincts)	120ha	35
Service Commercial (Precincts)	30ha	20
Ecological (Corridors)	20ha	N/A
Drainage (Corridors)	15ha	N/A
Multiple Use (Corridor)	25ha	N/A
Total	470ha	127

The design objectives for Phase 1 LSP road network are to provide efficient movement network for commercial vehicles within the LSP, to serve the LSP via the existing and planned district and sub-regional road network and to utilise the potential of key transport initiatives, including extension of Tonkin Highway, possible re-alignment of the Kwinana freight rail and a possible intermodal facility.

Accordingly, a north-south spine road is planned within the LSP area to distribute the LSP traffic to Bishop Road and Mundijong Road. A number of intersections have also been planned along the existing Kargotich Road to improve connectivity of the LSP area.

The design of the internal road network of the LSP area will be in line with WAPC's D.C. 4.1. According to the advice received from the Shire the proposed Phase 1 LSP would accommodate RAV 4 vehicles. In longer term and in accordance with the South Metropolitan and Peel Sub-Regional Framework a potential intermodal facility at West Mundijong Industrial Area is identified. An intermodal facility would need to accommodate freight vehicles up to RAV 7 category. Therefore, all LSP roads and intersections will need to be designed to safely accommodate RAV7 vehicles and other road users in accordance with Main Roads WA and Austroads specifications.

It is noted that some of the surrounding road network (or some part of the roads) is not currently in the RAV network or not classified as RAV4 or RAV7 (refer **Figure 3**). The Shire will need to apply to Main Roads WA Heavy Vehicle Services for the relevant roads that will be used by RAV 7 vehicles to be classified and included in the RAV network to accommodate appropriate truck

movements to and from the proposed LSP. The RAV 7 Network permits a variety of prime mover and trailer combinations, up to a maximum length of 36.5m.

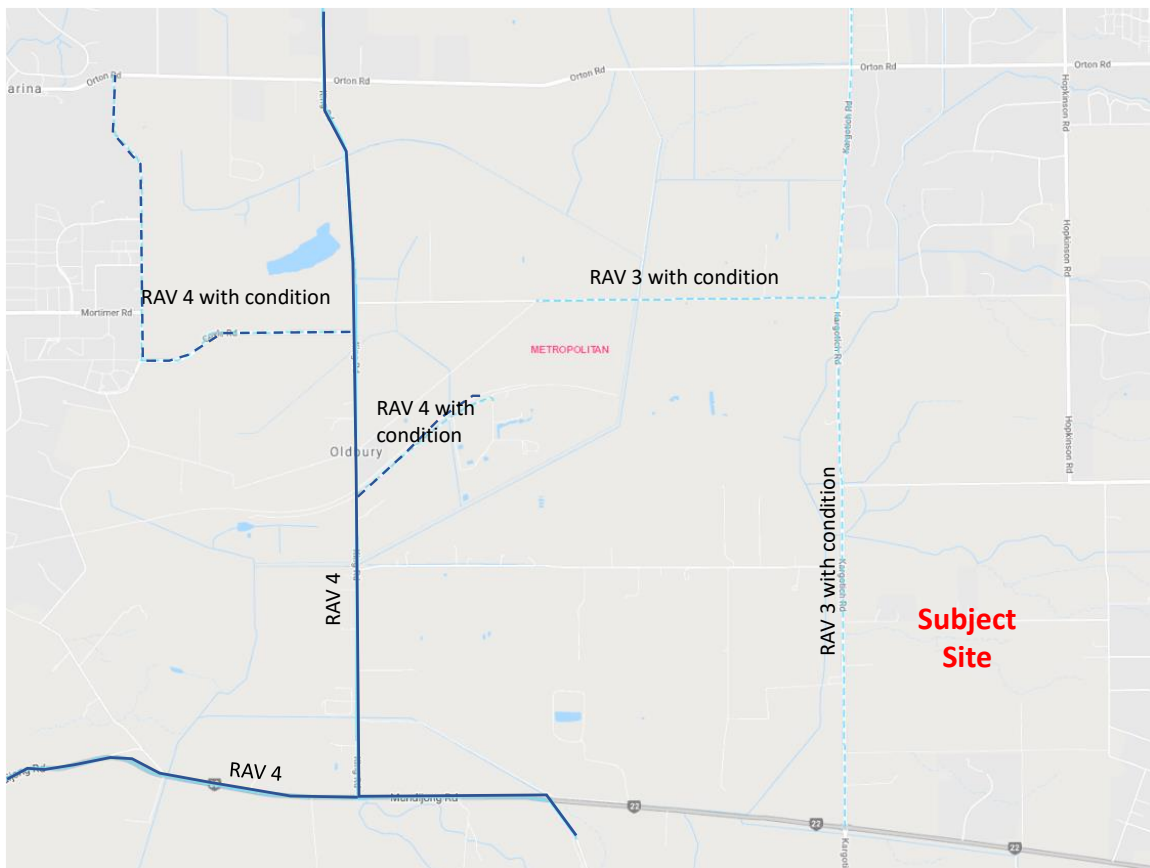


Figure 3: Existing RAV network on the surrounding roads

The RAV Network application process is summarised in **Figure 4**, which was adapted from “Main Roads Heavy Vehicle Services Framework - Adding a Local Government Road to a Restricted Access Vehicle Network”.

Works may need to be undertaken on the roads and intersections to accommodate RAV Network 4. The extent and scope of the works will be determined as part of the application process to Main Roads WA HVS for amendment of the RAV Network.

Some criteria which are assessed include, but may not be limited to:

- Required minimum road pavement widths based on traffic volumes;
- Overhead clearance to power lines;
- Overtaking opportunities;
- Road grades and impact on RAV acceleration and speed maintenance;
- Vehicle swept paths (and turning speed);
- Sight distances; and,
- Impact on other road users.

RAV Network Application Process

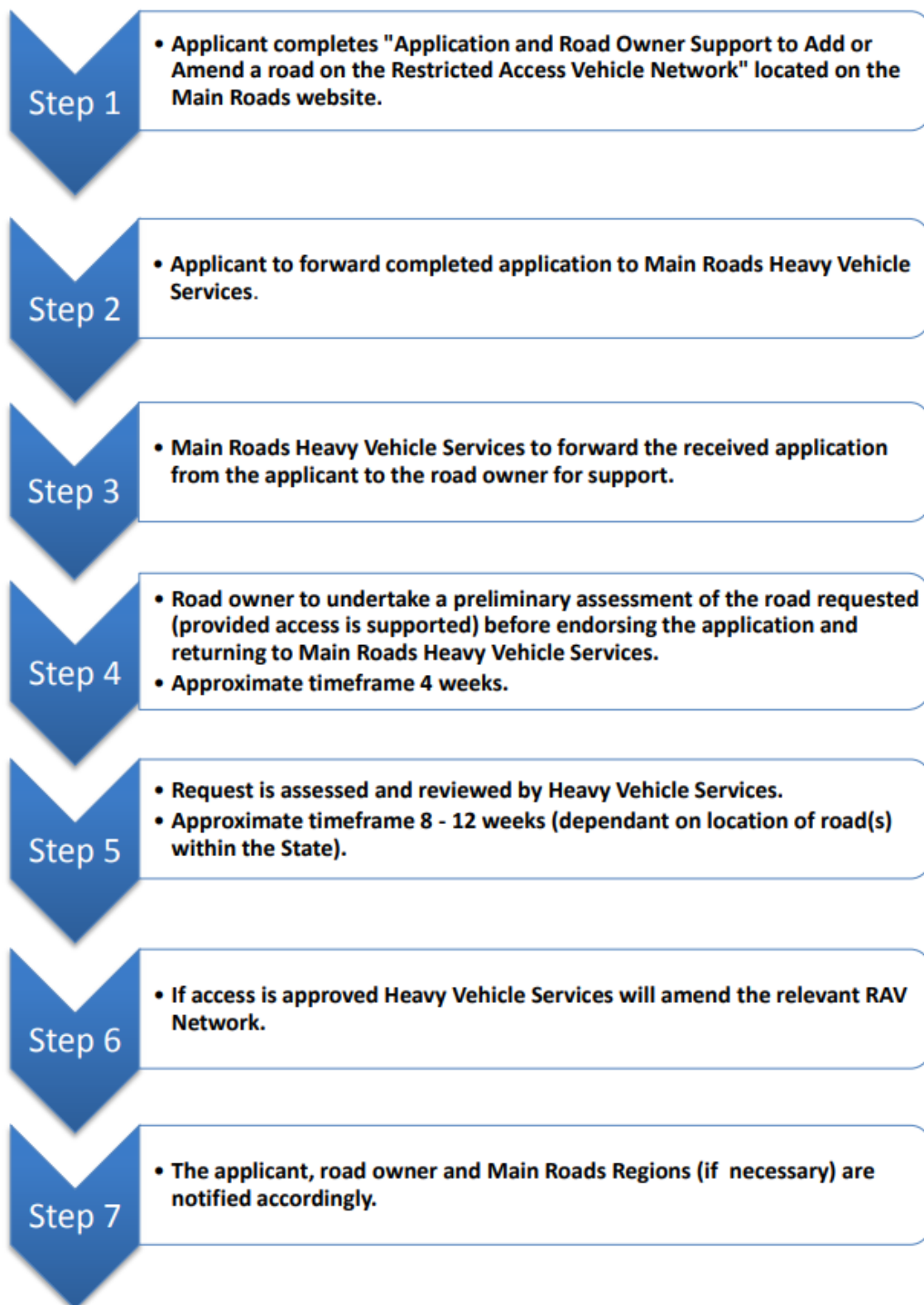


Figure 4: RAV Network application process

3 Existing Situation

3.1 Existing Land Use

Current land uses within the LSP area are predominantly rural. The area has been substantially cleared of remnant vegetation to enable cattle grazing. There is also a concentration of rural lifestyle land uses in the south eastern margins of the area around Pure Steel Lane.

The land is currently zoned 'Industrial' in the MRS and as 'Urban Development' in the Local Planning scheme.

3.2 Existing Road Network

The existing road network and their classification in the Main Roads WA Functional Road Hierarchy is illustrated in **Figure 5**.

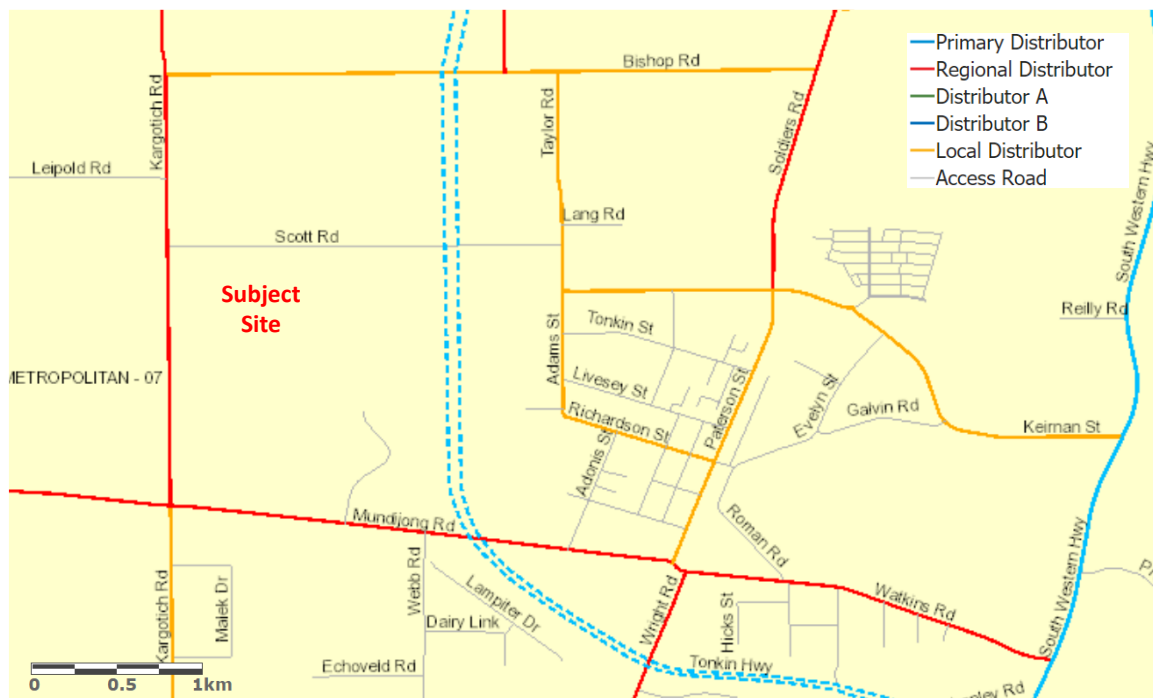


Figure 5: Existing road hierarchy

The details of the existing surrounding road network are provided in **Table 2** and the following paragraphs.

Table 2: Details of the existing surrounding road network

Street Names	Road Hierarchy	Jurisdiction	No. of Lanes	Posted Speed (km/h)
Bishop Road	Local Distributor	Local Govt.	2	50 (built-up areas) 110 (outside build-up areas)
Kargotich Road	Regional Distributor	Local Govt.	2	100 (south of Bishop Road) 90 (north of Bishop Road)
Mundijong Road	Regional Distributor	Local Govt.	2	100
Pure Steel Lane	Access Road	Local Govt.	2	50 (built-up areas) 110 (outside build-up areas)
Scott Road	Access Road	Local Govt.	2	50 (built-up areas) 110 (outside build-up areas)

Bishop Road in the vicinity of the subject site is a two-lane rural-standard road. As shown in **Figure 6**, Bishop Road currently features a relatively narrow pavement width with unsealed shoulders on both sides.



Figure 6: Existing standard of Bishop Road (source: near map June 2021)

Kargotich Road in the vicinity of the subject site is a two-lane rural-standard road. As shown in **Figure 7**, Kargotich Road currently features a 7.0m pavement width with unsealed shoulders on both sides. Intersection of Kargotich Road/ Mundijong Rod has recently been upgraded to a single lane roundabout intersection.



Figure 7: Existing standard of Kargotich Road (source: near map June 2021)

Mundijong Road in the vicinity of the subject site is a two-lane rural-standard road. As shown in **Figure 8**, Mundijong Road currently features a 7.0m pavement width with combination of sealed and unsealed shoulders on both sides.



Figure 8: Existing standard of Mundijong Road (source: near map June 2021)

3.3 Existing Traffic Volumes

Existing average weekday traffic (AWT) volumes on surrounding roads were sourced from Main Roads WA and is illustrated in **Figure 9**.

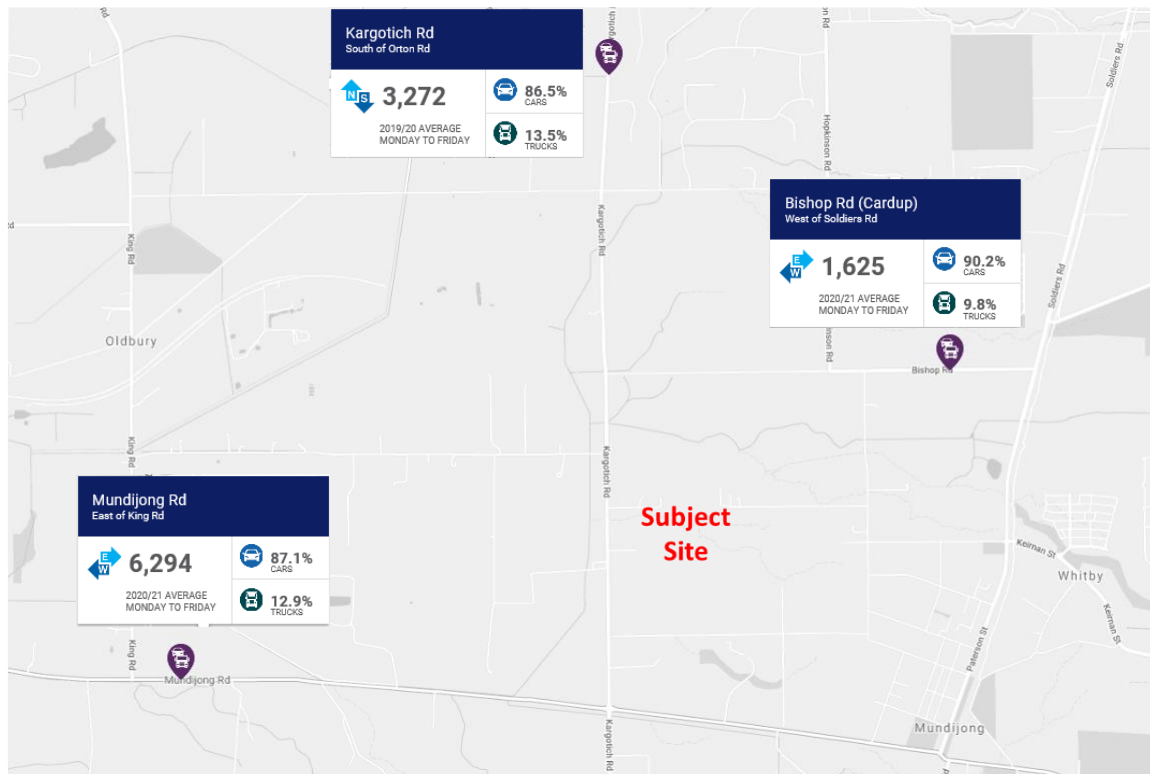


Figure 9: Existing traffic volumes

3.4 Public Transport Access

There are currently no public transport services in the vicinity of the site, with the nearest bus routes operating along Paterson Street and Watkins Road in the town centre of Mundijong. The nearest bus stops are located more than two kilometres from the site.

3.5 Pedestrian and Cyclist Facilities

The existing and proposed cycle network is sourced from the Shire of Serpentine-Jarrahdale Walking and Cycling Plan as shown in **Figure 10**. As evident currently there is lack of connectivity in terms of walking/cycling around the subject site.

It is anticipated that the proposed Primary Shared Path on the Tonkin Highway Extension corridor and secondary route on Mundijong Road (in line with Western Australian Bicycle Network Plan2017 update) will improve access for pedestrians and cyclists in the future, however, it is anticipated that demand for these modes of travel to and from the site will be low.



Figure 10: Bike map (source: Shire of Serpentine Jarrahdale)

3.6 Changes to Surrounding Transport Networks

Main Roads WA is planning to extend Tonkin Highway from Thomas Road in Oakford to South Western Highway in Mundijong. The extension of the Highway includes five connections at Thomas Road, Orton Road, Bishop Road, Mundijong Road and South Western Highway in the locality. The indicative alignment of the Tonkin Highway Extension in the vicinity of the subject site is illustrated in **Figure 11**.

The extension of Tonkin Highway south of Thomas Road is proposed to be implemented in two stages, an intermediate Project Case and a final Ultimate Case. The project case design would consist of 2 lanes in each direction from Thomas Road to South Western Highway with combination of at-grade and grade separated intersection treatments at Thomas Road, Orton Road, Bishop Road, Mundijong Road and South Western Highway. Ultimately, Tonkin Highway extension would be upgraded to 4 lanes with interchanges at the above-mentioned intersections. It is proposed that A grade separated interchange would be constructed at Bishop Road during the intermediate Project Case. According to the Connectivity and Accessibility Study undertaken by Arup in July 2021 for Tonkin Highway Extension Stage 3 – Thomas Road to South Western Highway, the Mundijong Road intersection is designed to be a dual lane roundabout at Project Case, and a diamond interchange at Ultimate Case.

With respect to the proposed realignment of Kwinana South Western freight rail line through Mundijong and Mardella as part of the Tonkin Highway Extension Project Main Roads WA states that” the *planning study identified two possible realignment options that were the subject of site investigation works and stakeholder consultation. Recognising the significance a future rail corridor will have for local landholders, it has been determined that future planning for a future freight rail realignment corridor should not be expedited*”.

“Therefore, we have resolved to separate the planning for the freight rail line corridor from the Tonkin Highway Extension project and undertake the planning for a future freight rail realignment corridor in 2021, in consultation with the community”.

“Following the conclusion of the planning study, further information about timing and delivery of the rail realignment will become available”.



Figure 11: Proposed Tonkin Highway Extension (Source: Main Roads WA)

It should be noted that there are a range of future uncertainties relating to the sub-regional traffic network which are subject to further planning and transport considerations including the outcomes of the Planning Investigation Areas identified in the South Metropolitan Peel Sub-Regional Framework and the Rail Realignment study being undertaken by Main Roads. Accordingly, it will be necessary to ensure that future subdivision, development, structure plan amendments and ultimately the 10-year structure plan review account for changes to the regional road network as these investigations and uncertainties are resolved.

4 Proposed Transport Network

4.1 Road Hierarchy

The design of the internal road network of the LSP area will be in line with WAPC's D.C. 4.1 Policy for industrial estates. The internal road network of the LSP area would exclude cul-de-sac or battle-axe lot access configurations.

According to WAPC's D.C. 4.1 Policy, *"In industrial areas, a minimum road reserve width of 20 metres is required to provide for safe and efficient traffic movement. For heavily trafficked/major through routes, a minimum road reserve width of 25 metres is required. Carriageway widths of 10 metres are favoured"*.

All roads and intersections accommodating RAV4 vehicles, will need to be designed to safely accommodate RAV7 vehicles and other road users in accordance with Main Roads WA specifications and relevant Austroads guidelines.

The internal roads are not expected to carry more than 5,000vpd and therefore the 20m road reserve with 10m traffic lanes should be sufficient for all internal roads except the north-south spine road which is estimated carry about 10,000vpd and would require a minimum road reserve width of 25 metres.

The projected traffic volumes on Mundijong Road are estimated to be more than 10,000vpd and Mundijong Road is likely to be upgraded to dual carriageway standard road by 2031. The existing and proposed roundabout intersections on Mundijong Road would also need to entail dual circulating lanes by 2031.

Bishop Road between north-south spine road and Tonkin Highway is estimated to carry more than 10,000vpd and therefore is likely to be upgraded to dual carriageway standard. The section of Bishop Road between north-south spine Road and Kargotich Road is estimated to carry less than 10,000vpd and is likely to remain as single carriageway standard.

4.2 Integration with Surrounding Area

The proposed land uses within the LSP area are in line with the planned land uses for the West Mundijong Industrial Area. Freight trips to and from the site are anticipated to be from other major industrial areas which may include Fremantle, Welshpool, Bunbury and the future Outer Harbour port at Kwinana. These trips would mainly use the proposed Tonkin Highway extension to connect to the other available freight routes.

5 Analysis of the Transport Network

5.1 Existing Development Trip Generation

The subject site is currently vacant and does not generate significant traffic.

5.2 Development Trip Generation and Distribution

The Road and Traffic Authority of NSW document “Guide to Traffic Generating Developments (October 2002)” and the information available to Transcore by the Shire have been sourced to estimate the trip generation for the proposed land uses for the LSP area.

The proposed land uses for the LSP area are predominantly general and light industry uses with some service commercial. Accordingly, a trip rate of 4 and 5 vehicles per day (VPD) per 100m² Gross Floor Area (GFA) was adopted for the general and light industry land uses respectively and it was assumed that the build-up area of the proposed Lots would be about 10% of the total Lot area. Higher trip rate of about 17vpd per 100m² Gross Floor Area (GFA) was assumed for the proposed service commercial area.

Table 3 summarises the assumptions, daily trip rates and daily trip generation for the proposed LSP area. Accordingly, the total trip generation of the anticipated land uses for the subject site is estimated to be about 14,360vpd.

Table 3: Daily trip generation of the proposed LSP area

Land use	Estimated lot yield	Lot area (ha)	Build up area factor	Daily Trip rate per 100m ² GFA	Trip Generation
General Industry (Core)	72	2	0.1	4	5760
Light Industry (Precincts)	35	2	0.1	5	3500
Service commercial (Precincts)	20	1.5	0.1	17	5100
Total					14,360

Table 4 summarises the peak hour trip generation of the proposed land uses within the LSP area.

Table 4: LSP area peak hour trips

Land use	Weekday-AM	Weekday-PM	Weekday-AM	Weekday-PM	AM		PM	
	trip rate	trip rate	Total trips	Total trips	In	Out	In	Out
General Industry (Core)	0.005	0.005	720	720	576	144	144	576
Light Industry (Precincts)	0.01	0.01	700	700	560	140	140	560
Service commercial (Precincts)	0.007	0.027	203	810	162	41	162	648
TOTAL TRAFFIC			1623	2230	1298	325	446	1784

Transcore has provided traffic-engineering services for a number of projects within the Shire including Whitby Local Structure Plan (LSP); Lot 33 Hopkinson Rd, Cardup – LSP and the Glades LSP and as a result has developed a EMME strategic transport model of the locality. This model includes the Stage 3 extension of Tonkin Highway. This traffic model was used to establish the trip distribution of the LSP area. However, for the purpose of SIDRA analysis the Main Roads WA ROM traffic projections were used as appropriate. More discussions around the projected traffic volumes are provided in section 5.3 Traffic Flow Forecasts.

The distribution of the proposed LSP traffic is determined by the EMME transport model developed by Transcore in proportion to the location of trip productions and attractors for work trips, and other trips among all the land uses in the traffic model. **Figure 12** illustrates the trip distribution of the LSP.

The peak hour trip distribution of the LSP area is shown in **Figure 13**. The small table in **Figure 13** reflects the AM and PM peak hours trips outlined in **Table 4** and is the summation of the total inbound and outbound trips at development crossovers shown in **Figure 13**.

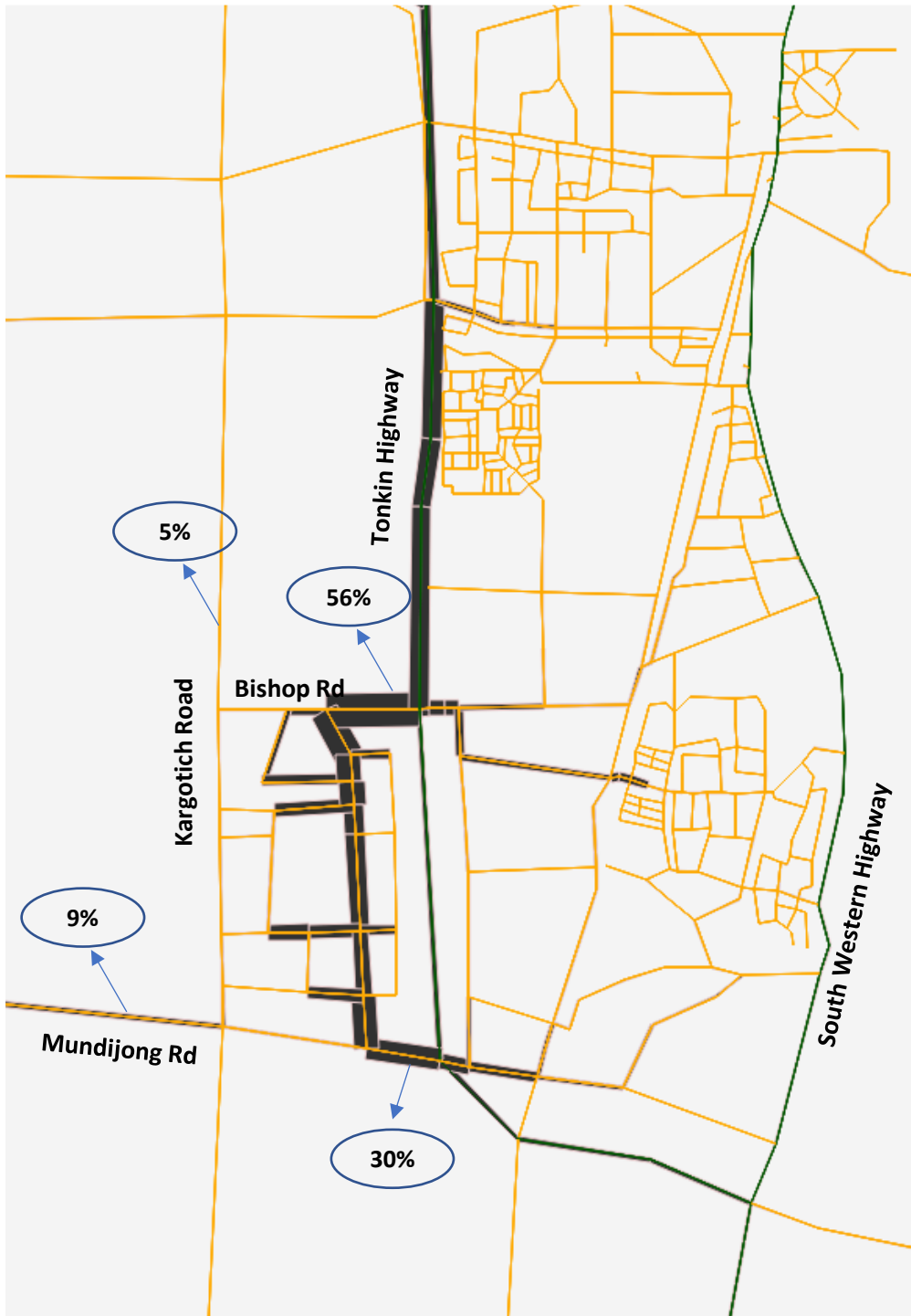


Figure 12: LSP Trip distribution

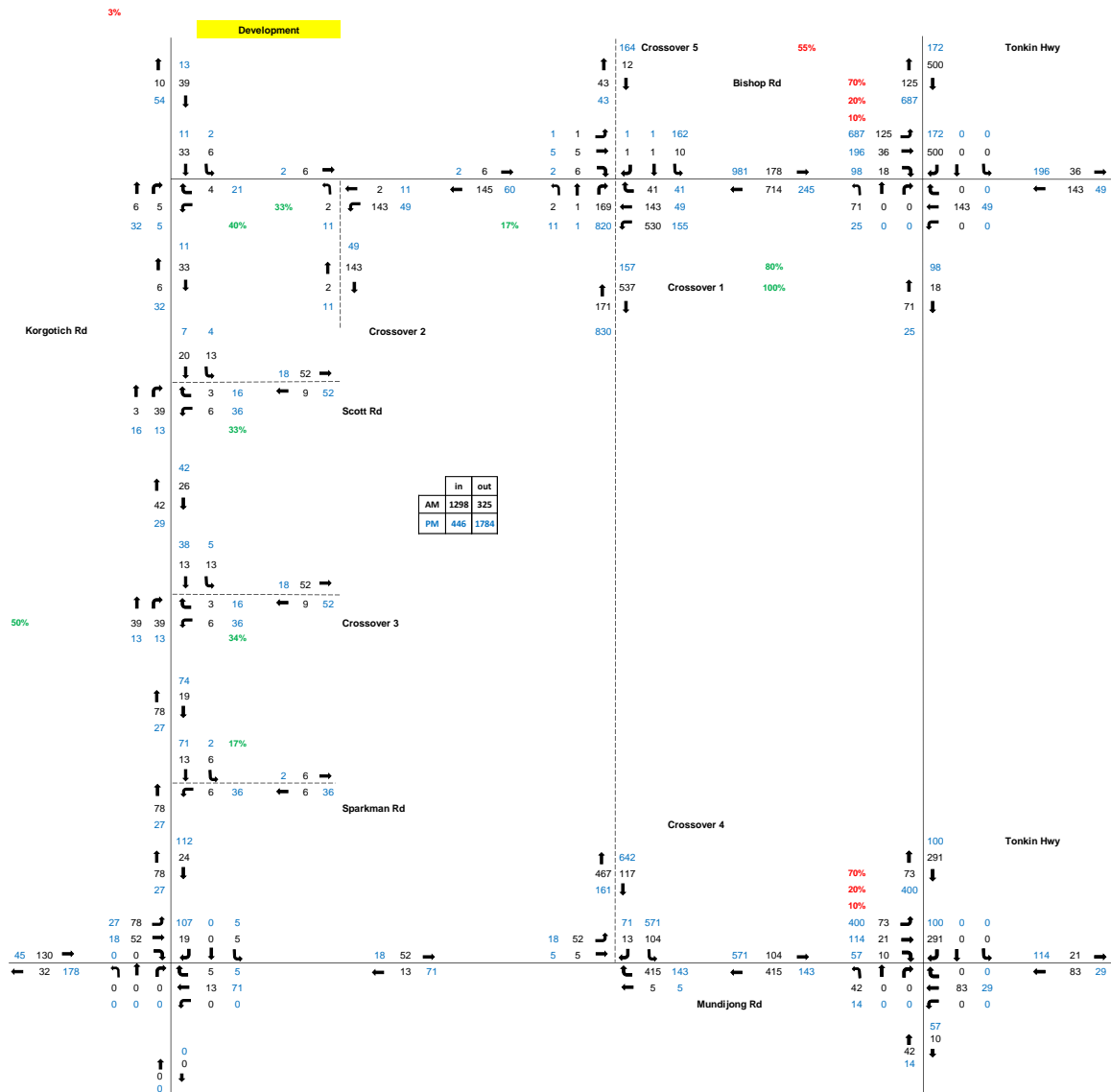


Figure 13: LSP peak hour trip distribution (AM, PM)

5.3 Traffic Flow Forecasts

In order to establish the background traffic on surrounding road network the ROM24 traffic projections provided by Main Roads WA were sourced. The ROM24 traffic projections were provided for 2031 and 2041 scenarios and for two different land use assumptions being MLUFS ver1.4 and Thomas Road Planning Study Modelling. The Main Roads WA projected 2031 and 2041 daily traffic volumes are shown in **Figure 14** and **Figure 15**. As evident, the Thomas Road Planning Study Modelling results show higher traffic projections on Mundijong Road (almost similar for Tonkin Highway) in this vicinity and therefore these figures were used for a robust SIDRA intersection analysis.

The traffic projections on Bishop Road and Korgotich Road fronting the LSP area would be mainly affected by the LSP area as there are no new developments identified in the South Metropolitan Peel Sub-Region Frame Work (May 2015) except the proposed LSP area to the west of Tonkin Highway in this vicinity. On this basis the LSP traffic has been added to the Bishop Road and

Kargotich Road fronting the LSP area with conservative background traffic growth of 2% for 2031 and 2041.

On this basis the 2031 and 2041 peak hour traffic projections on the surrounding roads and intersections were established and are shown in **Figure 16** and **Figure 17**

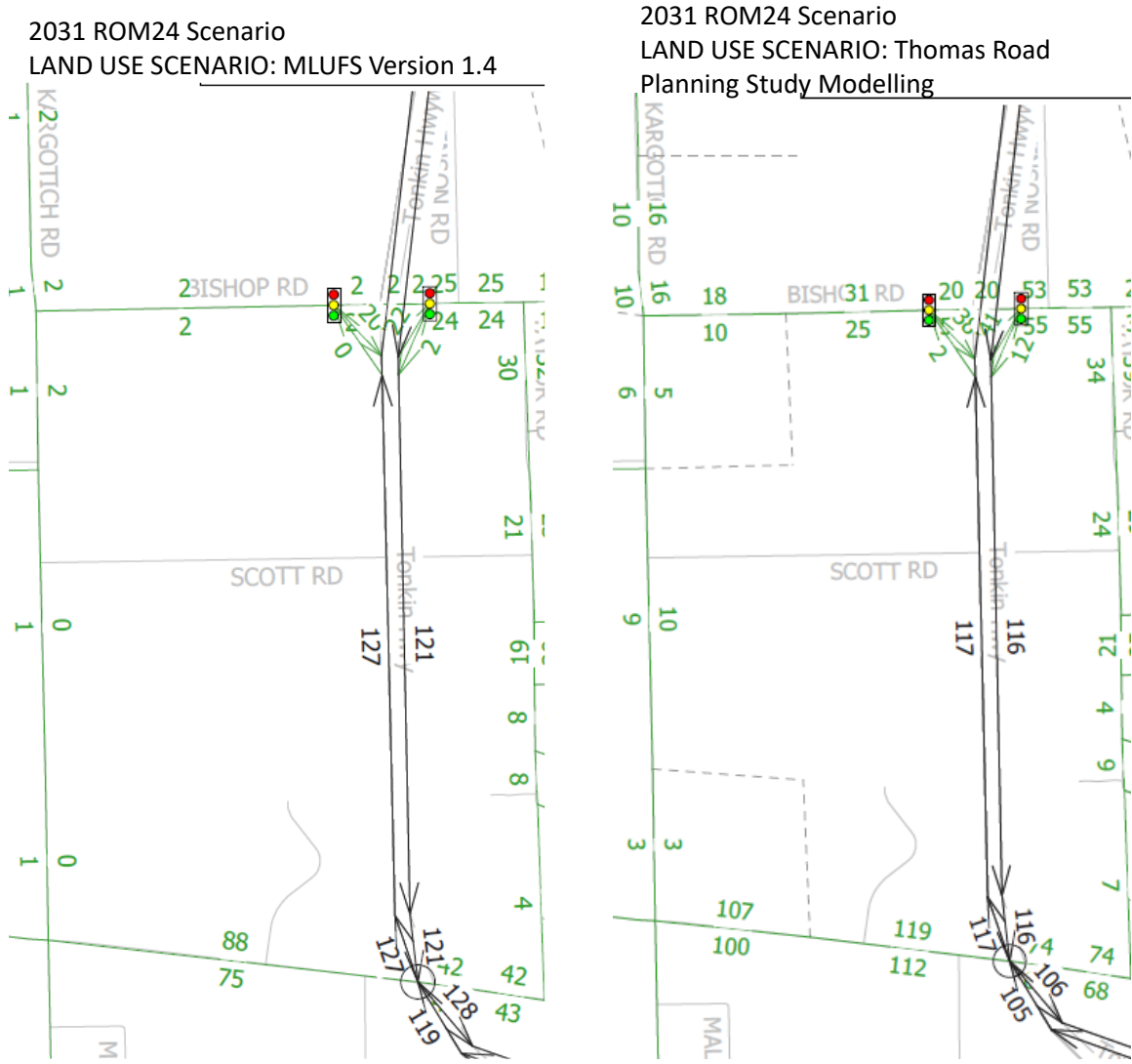
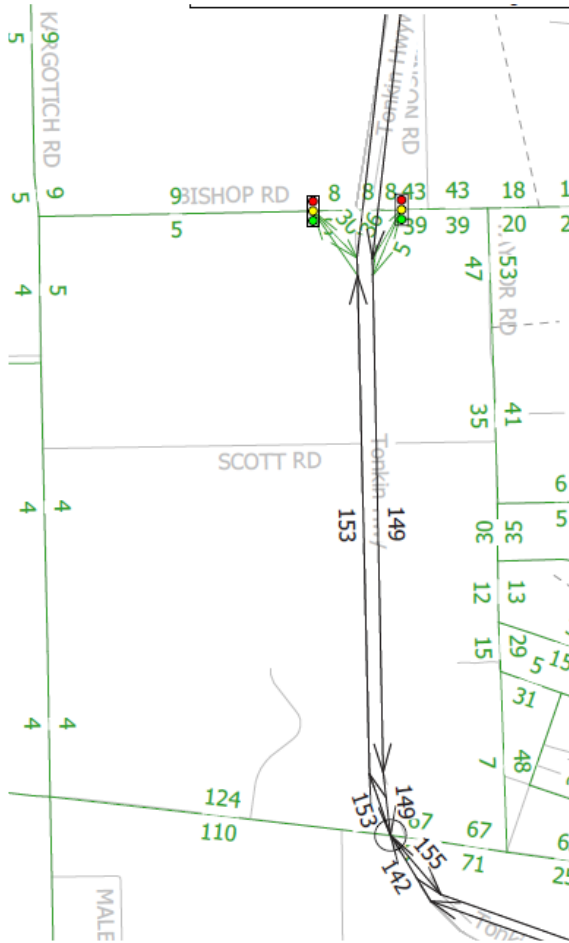


Figure 14: 2031 Main Roads WA traffic projections

2041 ROM24 Scenario
 LAND USE SCENARIO: MLUFS Version 1.4



2041 ROM24 Scenario
 LAND USE SCENARIO: Thomas Road
 Planning Study Modelling

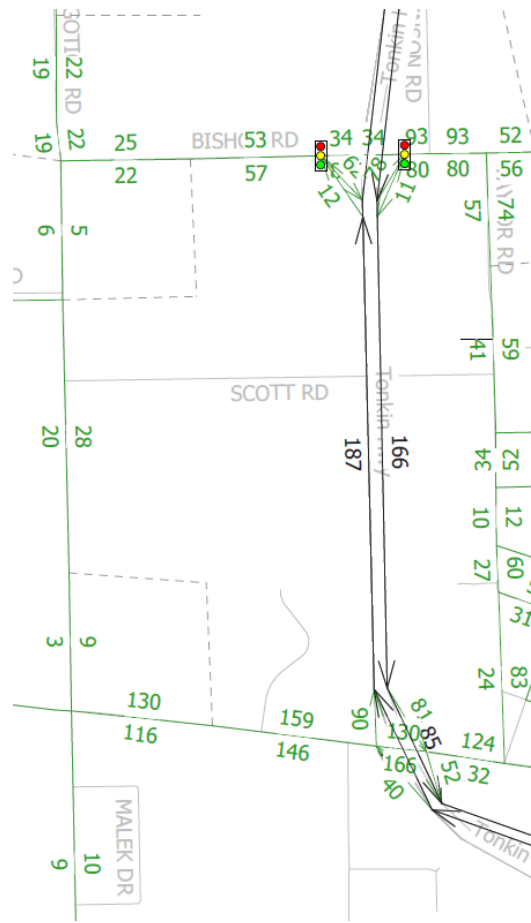


Figure 15: 2041 Main Roads WA traffic projections

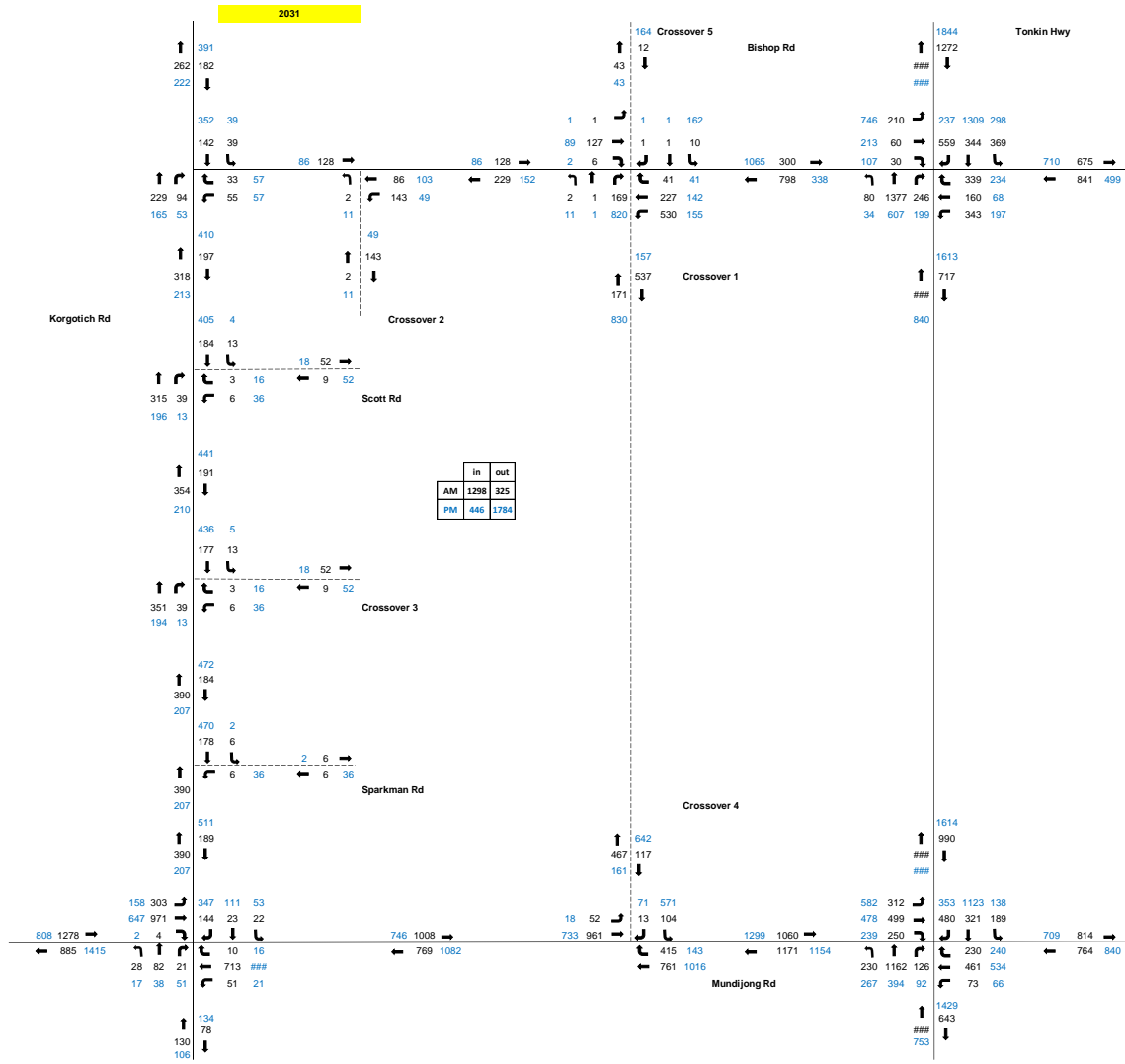


Figure 16: Traffic projections 2031

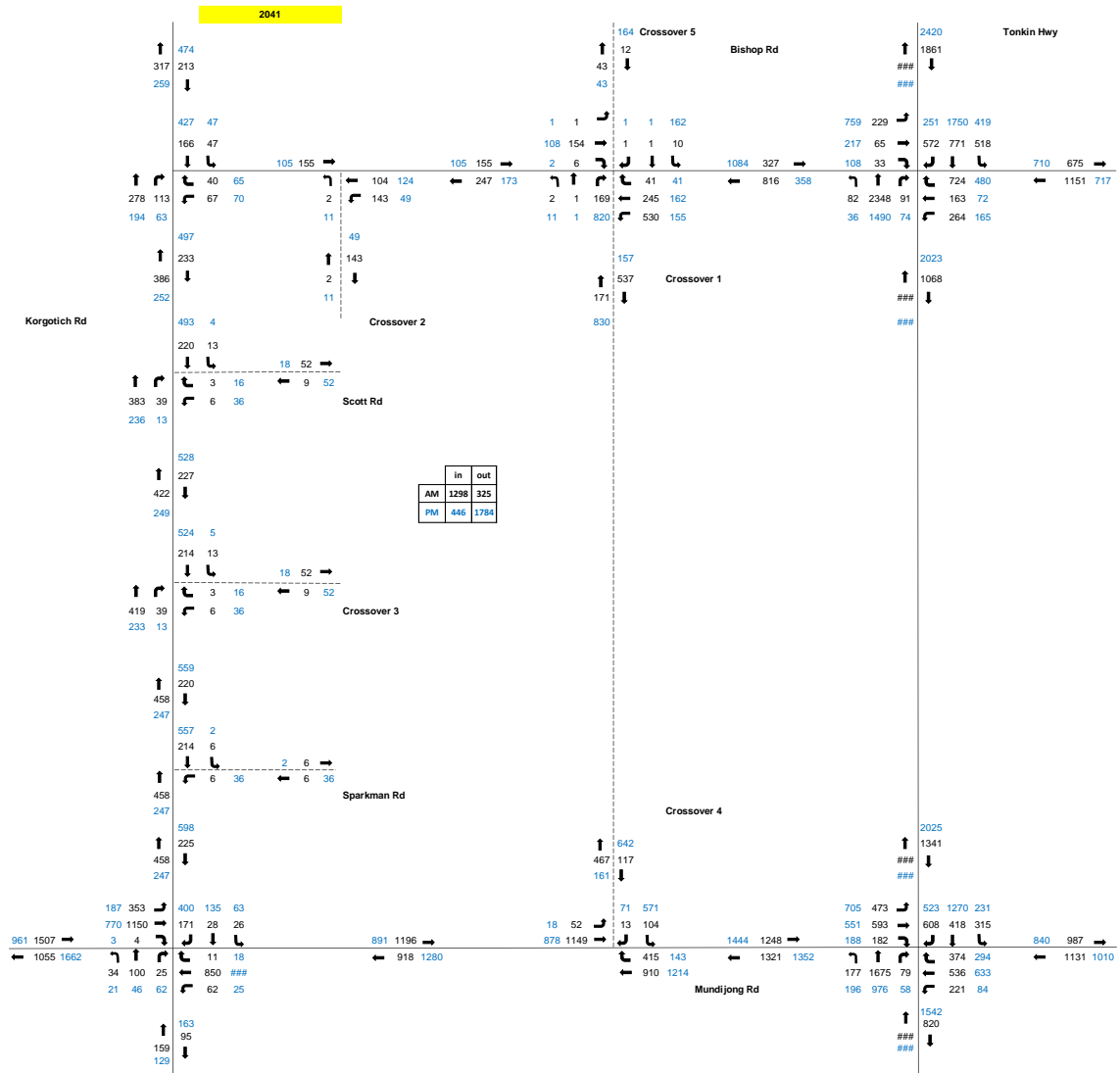


Figure 17: Traffic projections 2041

5.4 Roads and Intersections

The proposed road network to accommodate the future projected traffic volumes are discussed in section 4 of this report, including the details of the proposed road hierarchy in section 4.1.

Figure 18 details the proposed controls for intersections within and around the LSP area.

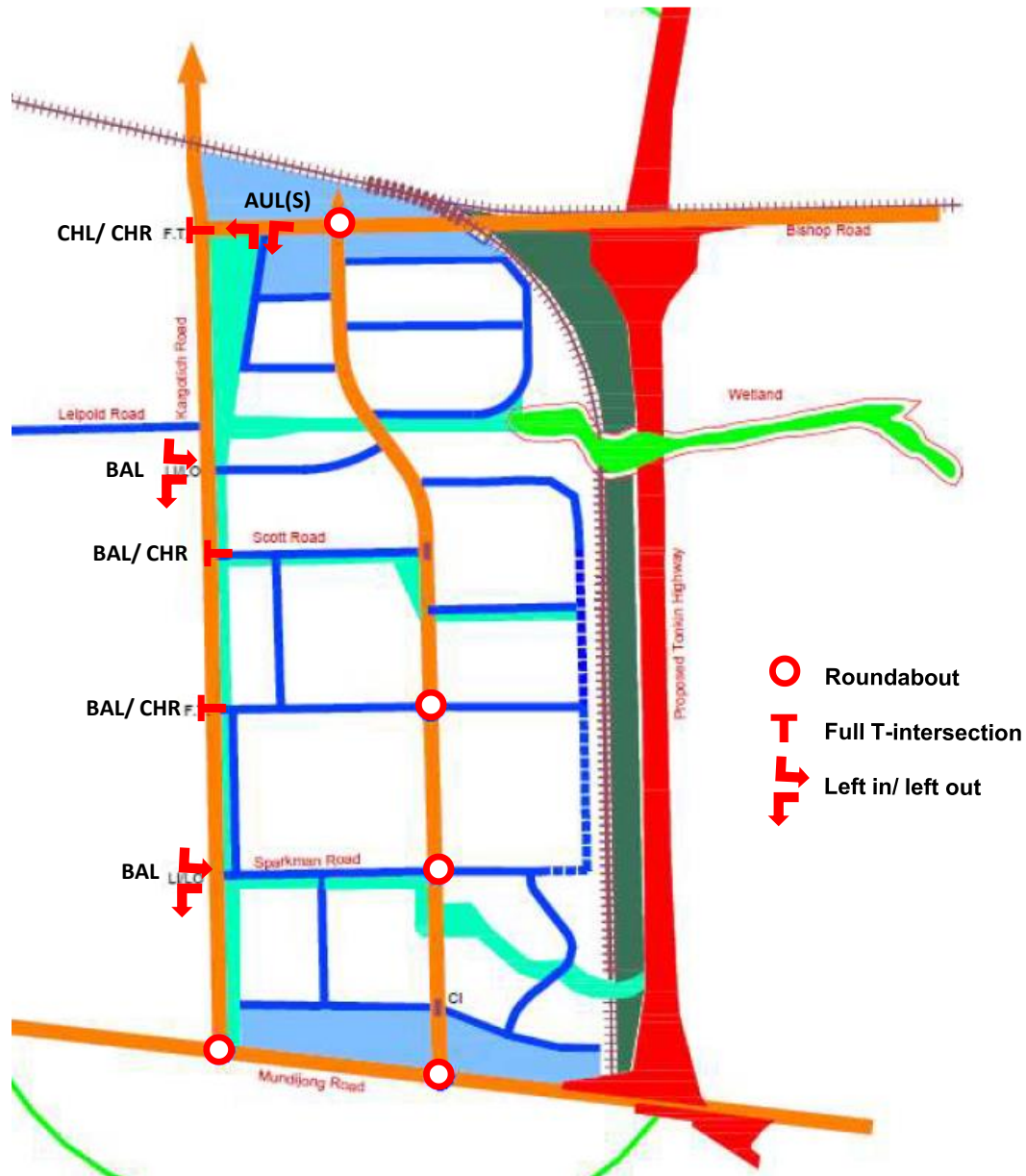


Figure 18: Proposed intersection treatments

Kargotich Road Intersections

Full movement intersections are proposed at:

- Bishop Road/ Kargotich Road;
- Scott Road/ Kargotich Road; and,
- The central intersection between Scott Road and Sparkman Road.

Left in/ left out intersections are proposed at:

- Sparkman Road/ Kargotich Road; and
- The proposed road immediately south of Leopold Road.

In order to establish the turn lane requirements for these intersections reference was made to Main Roads WA spreadsheet tool for turn lane assessments. The turn lane assessments were undertaken using the 2041 traffic projections. The results of the assessments are shown in **Figure 18** (above) for each individual intersection.

The details of the turn lanes (i.e. length of turn pockets at the intersections) will need to be investigated further during the detailed design stage of the project. Also, as part of these investigations intersection spacing between the existing intersection of Leipold Road/ Kargotich Road and the proposed LSP left in/ left out intersection on Kargotich Road immediately south of Leipold Road should be assessed further and depending on the result of the assessment the proposed left in/ left out intersection may need to be relocated or restricted to left in only or left out only or removed all together.

In order to provide conservative assessments at this stage no traffic was distributed at the proposed left in/ left out intersection immediately south of Leipold Road.

Bishop Road Intersections

A 4-way roundabout intersection is proposed for the Bishop Road/ north-south spine road. The proposed LSP also shows a second intersection on Bishop Road immediately east of Kargotich Road. The separation distance between these two intersections would need to be investigated during the detailed design stage of the project and depending on the result of the investigation the proposed intersection to the east of Kargotich Road may need to be downgraded to left in/ left out intersection. At this stage in order to provide a robust assessment the traffic analysis is undertaken assuming a left in/ left out intersection at this location.

According to the Connectivity and Accessibility Study undertaken by Arup in July 2021 for Tonkin Highway Extension Stage 3 – Thomas Road to South Western Highway, the proposed intersection of Bishop Road/ Tonkin Highway is proposed as an interchange at the outset of the project (Project Case). The proposed interchange concept is illustrated in **Figure 19**.

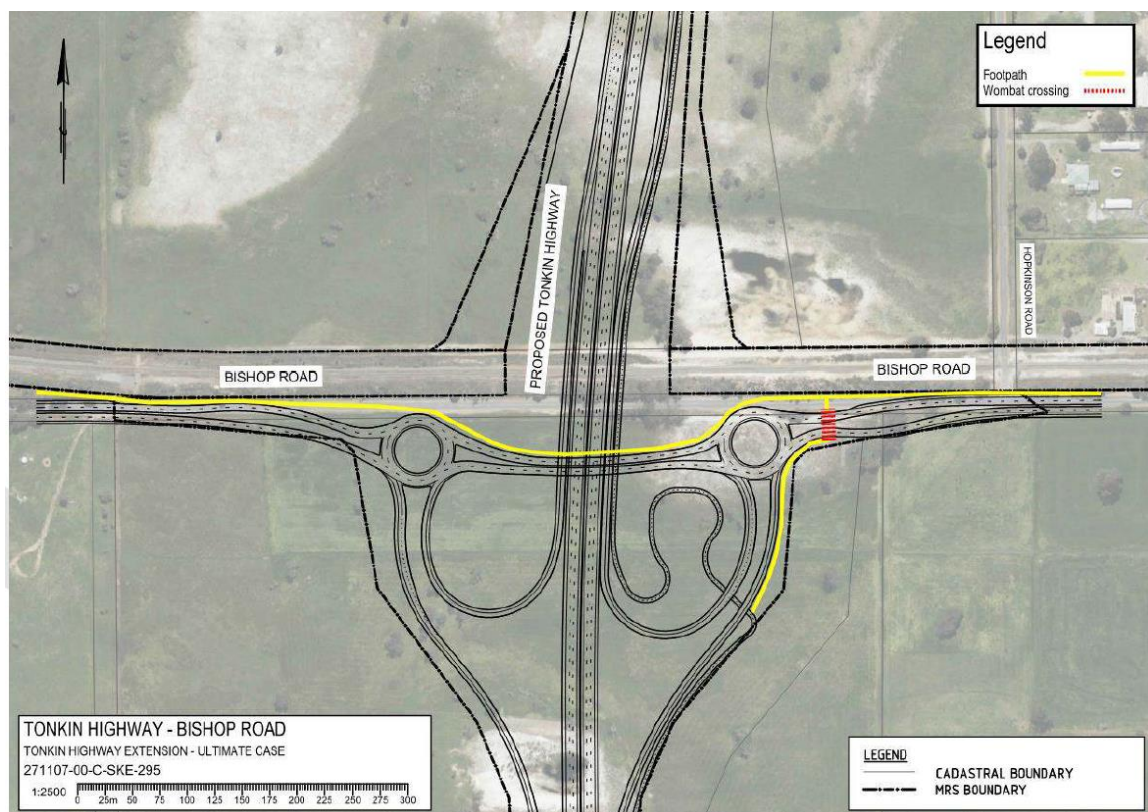


Figure 19: Proposed interchange concept at Bishop Road/ Tonkin Highway

Mundijong Road Intersections

The intersection of Mundijong Road/ Kargotich Road has been recently upgraded to a single lane roundabout intersection and is expected to be upgraded to dual lane roundabout once Mundijong Road is upgraded to dual lane in this vicinity in the future. The proposed north-south spine road is also proposed to connect to Mundijong Road as a 3-leg roundabout intersection.

According to the Connectivity and Accessibility Study undertaken by Arup in July 2021 for Tonkin Highway Extension Stage 3 – Thomas Road to South Western Highway, the Mundijong Road intersection is designed to be a dual lane roundabout at Project Case, and a diamond interchange at Ultimate Case (refer **Figure 20** for the concepts of the intersection for the interim and ultimate scenarios). It is suggested that the proposed LSP 3-leg roundabout intersection on Mundijong Road should provide sufficient separation distance from the proposed interchange on Tonkin Highway/ Mundijong Road at Ultimate Case (minimum 350m from Tonkin Highway on and off ramps) to reduce any potential traffic impact at the interchange. The exact location of the proposed LSP 3-leg roundabout intersection on Mundijong Road should be investigated further during the detailed design stage of the project.

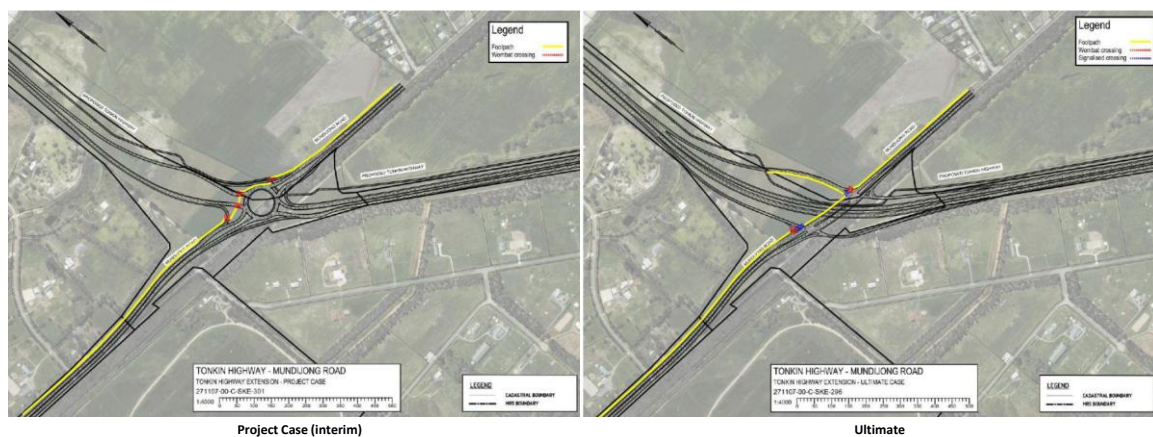


Figure 20: Proposed intersection concepts for the Mundijong Road/ Tonkin Highway

5.5 Impact on Surrounding Roads

The WAPC *Transport Impact Assessment Guidelines* (2016) provides the following guidance on the assessment of traffic impacts:

“As a general guide, an increase in traffic of less than 10 percent of capacity would not normally be likely to have a material impact on any particular section of road, but increases over 10 percent may. All sections of road with an increase greater than 10 percent of capacity should therefore be included in the analysis”. **Figure 21** illustrates the proportion of LSP traffic on surrounding roads. The numbers in brackets are 2041 daily traffic and the numbers outside the brackets are the LSP daily traffic. As evident, the impact of LSP traffic on the northern part of Kargotich Road and western part of Mundijong Road is less than 10%.

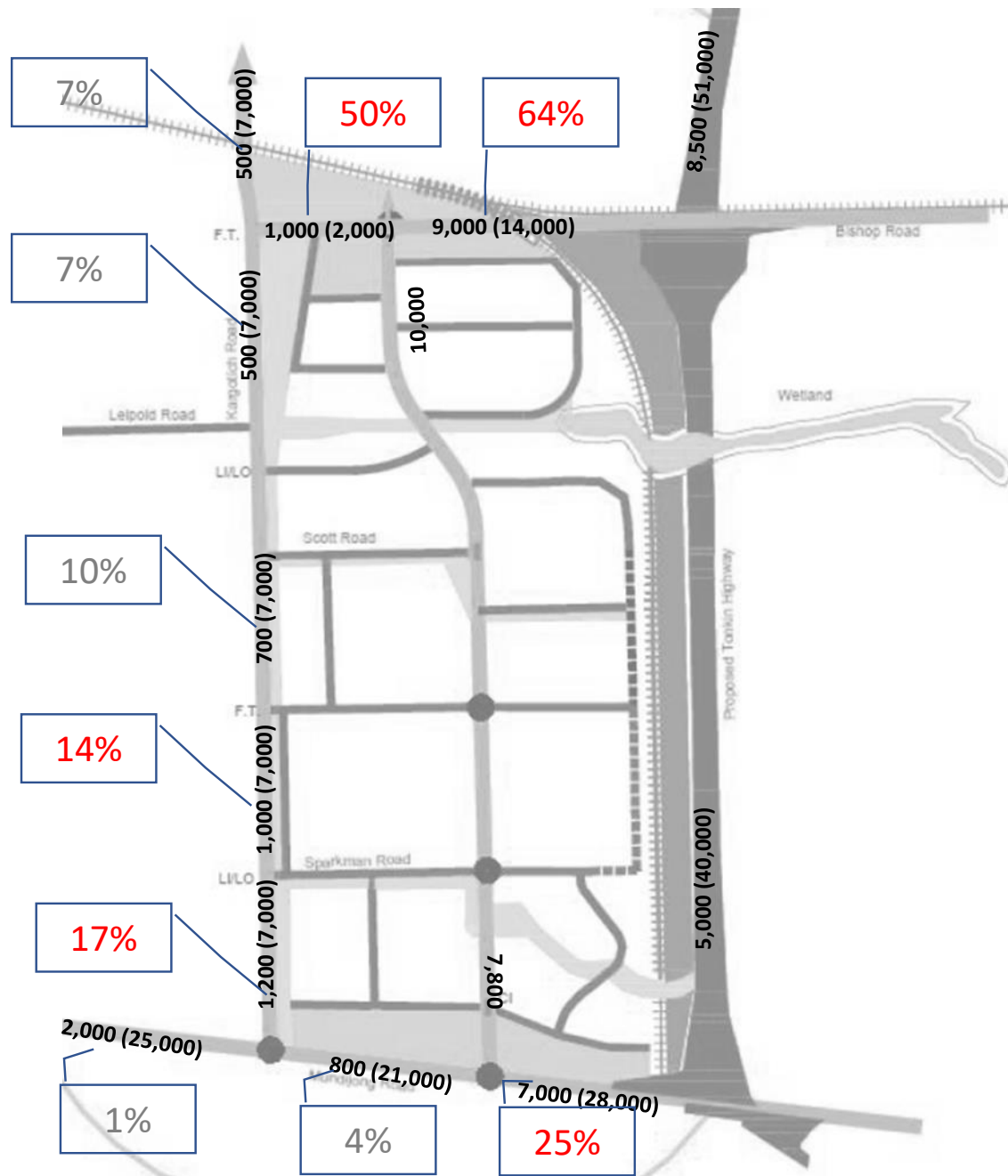


Figure 21: Projected daily traffic and LSP traffic (2041 total traffic)

According to Austroads “Guide to the Geometric Design of Rural Roads” document, the appropriate cross section for a rural road is defined in **Table 3**.

Table 5: Rural single carriageway road

Element	Design AADT				
	1-150	150-500	500-1,000	1,000-3,000	>3,000
Traffic Lanes	3.5 (1x3.5)	6.2 (2x3.1)	6.2-7.0 (2x3.1/3.5)	7.0 (2x3.5)	7.0 (2x3.5)
Total Shoulder	2	1.5	1.5	2	2.5
Shoulder Seal	0.5	0.5	0.5	1	1.5

The projected daily traffic volumes on Kargotich Road are estimated to be more than 3,000vpd and therefore the future standard of this road as a rural road should include 2x 3.5m traffic lanes plus 2.5m shoulders on both sides with 1.5m sealed shoulders.

The projected traffic volumes on Bishop Road between Kargotich Road and north-south spine road is estimated to be between 1,000vpd - 3,000vpd and therefore as a rural road this section of Bishop Road need to be upgraded to 2x 3.5m traffic lanes plus 2m shoulders on both sides with 1.0m sealed shoulders. The section of Bishop Road between north-south spine road and Tonkin Highway would need to be upgraded to dual carriageway standard. Similarly, Mundijong Rod would need to be upgraded to dual carriageway standard fronting the LSP area.

5.6 Analysis of Intersections

Intersection analysis was undertaken for the following intersections and timeframes as shown in **Table 6**. It is expected that the future standard of the proposed grade separated interchanges at Tonkin Highway/ Bishop Road and Tonkin Highway Mundijong Road will be able to accommodate the traffic projections in this locality and therefore no SIDRA analysis has been undertaken for interchanges.

Table 6: Intersections analysed in SIDRA

Intersections	2021	2031	2041
Mundijong Road/ Kargotich Road	Yes	Yes	Yes
Bishop Road/ Kargotich Road	Yes	Yes	Yes
north-south spine Road/ Mundijong Road	NA	Yes	Yes
north-south spine Road/ Bishop Road	NA	Yes	Yes
LSP central intersection on Kargotich Road	NA	Yes	Yes
Mundijong Road/Tonkin Highway	NA	Yes	Grade separated
Bishop Road/ Tonkin Highway	NA	Grade separated	Grade separated

Capacity analysis of these intersections were undertaken using the SIDRA computer software package for the AM and PM peak hours. SIDRA is an intersection modelling tool commonly used by traffic engineers for all types of intersections. SIDRA outputs are presented in the form of

Degree of Saturation, Level of Service, Average Delay and 95% Queue. These characteristics are defined as follows:

- ✚ **Degree of Saturation (DoS):** is the ratio of the arrival traffic flow to the capacity of the approach during the same period. The Degree of Saturation ranges from close to zero for varied traffic flow up to one for saturated flow or capacity.
- ✚ **Level of Service (LoS):** is the qualitative measure describing operational conditions within a traffic stream and the perception by motorists and/or passengers. In general, there are 6 levels of service, designated from A to F, with Level of Service A representing the best operating condition (i.e. free flow) and Level of Service F the worst (i.e. forced or breakdown flow).
- ✚ **Average Delay:** is the average of all travel time delays for vehicles through the intersection.
- ✚ **95% Queue:** is the queue length below which 95% of all observed queue lengths fall.

The results of the SIDRA analysis are summarised in **Appendix B**. The SIDRA intersection models were coded with reference to Main Roads WA Operation Modelling Guidelines. All relevant parameters such as heavy vehicle groups, PCU factors etc. were coded as per the Main Roads WA Guidelines. The heavy vehicle percentages for the proposed development are assumed to be about 25% in line with similar industrial areas such as Maddington-Kenwick Strategic Employment Area (MKSEA) as shown in logistics Blvd in **Figure 22**.

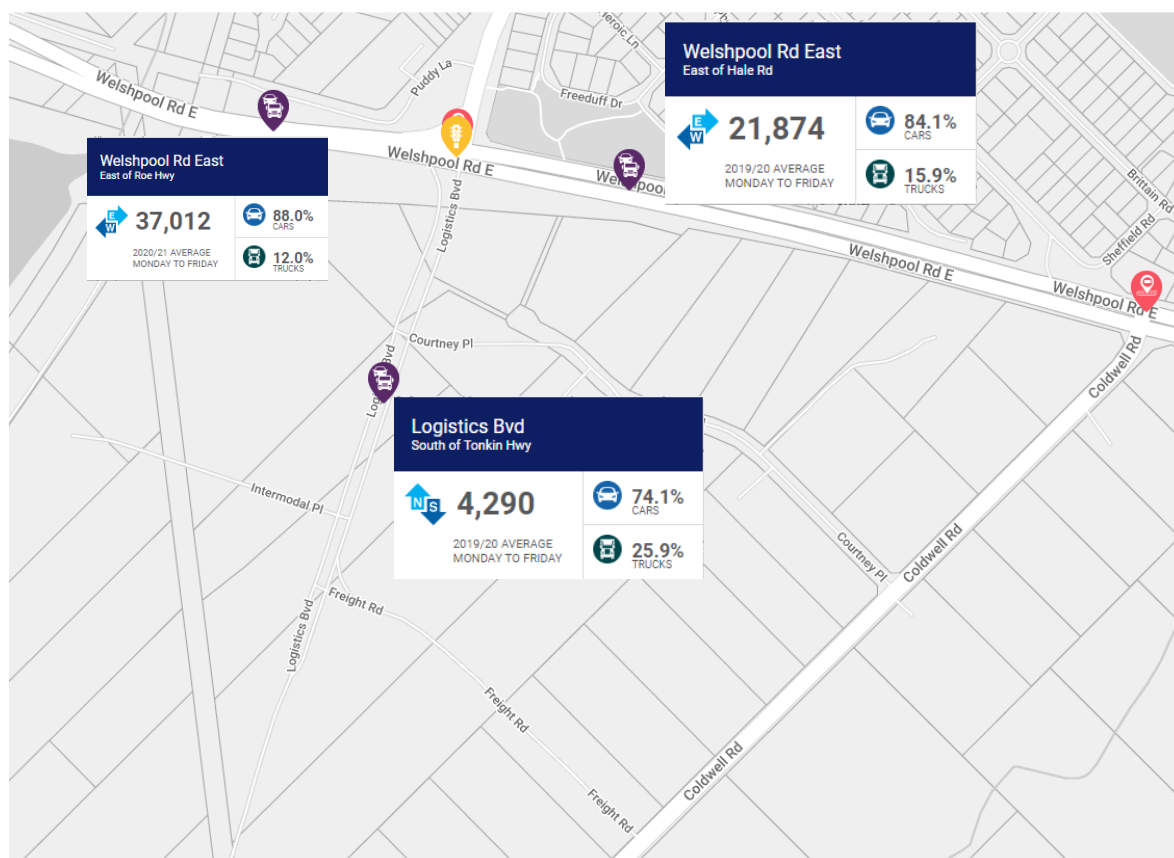


Figure 22: The heavy vehicle percentages in Logistic Blvd and surrounding roads

Mundijong Road/ Kargotich Road

The SIDRA analysis results and site observations indicate that the existing single lane roundabout intersection of Mundijong Road/ Kargotich Road presently operates satisfactorily and with good level of service and with moderate queues and delays during both weekday peak hours. In 2031 due to the sheer volume of traffic on Mundijong Rod this roundabout intersection would need to be upgraded to dual lane (as part of the duplication of Mundijong Road). The duplication of the Mundijong Road and the roundabout would provide significant capacity for the intersection and according to the SIDRA analysis undertaken the future standard of the roundabout intersection would accommodate the projected traffic volumes on Mundijong Road and the additional traffic generated by the LSP.

Appendix B of this report provides the existing and proposed intersection layouts and the results of the SIDRA analysis.

Bishop Road/ Kargotich Road

The SIDRA analysis results and site observations indicate that the existing intersection of Bishop Road/ Kargotich Road presently operates satisfactorily and with good level of service and with almost no queues and delays during both weekday peak hours. The current standard of the intersection includes a left turn slip lane and AUR treatment for the right turn from Kargotich Road to Bishop Road. In 2031 and with the additional traffic on Bishop Road and Kargotich Road the AUR treatment would need to be upgraded to an appropriate CHR treatment. SIDRA analysis for both 2031 and 2041 indicates that the upgraded intersection of Bishop Road/ Kargotich Road would operate satisfactorily and with good level of service and with moderate queues and delays during both weekday peak hours.

of this report provides the existing and proposed intersection layouts and the results of the SIDRA analysis.

North-South Spine Road/ Mundijong Road

The proposed layout of this 3-way roundabout intersection would entail a dual lane roundabout intersection with 4 lanes on Mundijong Road in 2031 and beyond. The north-south spine road would entail a 100m left turn slip lane (refer Appendix B for the proposed layout of this intersection). SIDRA analysis for both 2031 and 2041 indicates that this intersection would operate satisfactorily, with good level of service and with moderate queues and delays during both weekday peak hours.

north-south Spine Road/ Bishop Road

The proposed layout of this 4-way roundabout intersection for 2031 and beyond would entail a dual lane roundabout intersection with 4 lanes on Bishop Road to the east and short 100m dual lanes on Bishop Road to the west of the roundabout. The side roads (north and south of Bishop Road) are modelled as single lanes (refer Appendix B for the proposed layout of this intersection). SIDRA analysis for both 2031 and 2041 indicates that this intersection would operate satisfactorily, with good level of service and with moderate queues and delays during both weekday peak hours.

LSP central intersection on Kargotich Road

The proposed LSP central intersection on Kargotich Road is expected to be busier than the other full movement priority-controlled T-intersection along Kargotich Road (Scott Road intersection) and therefore the SIDRA analysis was undertaken for this intersection. However, the same intersection layout is also proposed for Scott Road/ Kargotich Road (refer to Appendix B for the proposed intersection layout). SIDRA analysis for both 2031 and 2041 indicates that the proposed

LSP central intersection on Kargotich Road would operate satisfactorily and with good level of service and with moderate queues and delays during both weekday peak hours.

Mundijong Road/Tonkin Highway

According to the Connectivity and Accessibility Study undertaken by Arup in July 2021 for Tonkin Highway Extension Stage 3, the Mundijong Road intersection is designed to be a dual lane roundabout at Project Case, and a diamond interchange at Ultimate Case (refer **Figure 20** for the concepts of the intersection for the interim and ultimate scenarios).

SIDRA analysis was therefore undertaken for the Project Case (interim or 2031). The results indicate that the proposed dual lane roundabout intersection at Mundijong Road/Tonkin Highway would not be able to accommodate the 2031 projected traffic volumes (sourced from Main Roads WA ROM projections) on Tonkin Highway and long queues and delays are reported on Tonkin Highway for both AM and PM peak hours. The reported LoS is F on Tonkin Highway northbound in AM and Tonkin Highway southbound in PM. This is because of the significant through traffic on Tonkin Highway and Mundijong Road in year 2031 regardless of the proposed LSP traffic distribution at this intersection.

Therefore, it is recommended that Main Roads WA review the proposed intersection layout of Mundijong Road/Tonkin Highway during the Project Case and consider bring forward the construction of the proposed interchange to ensure satisfactory traffic operations and safety at this intersection.

6 Conclusions

This Transport Impact Assessment (TIA) has been prepared by Transcore on behalf of Shire of Serpentine Jarrahdale (the Shire). The subject of this report is the proposed West Mundijong Industrial Area (WMIA) Local Structure Plan (LSP) to be located at the the west of the Mundijong town site.

The LSP has been developed to guide the future industrial subdivision in a phased approach. The first phase would include 127 lots with minimum lot size of 1.5 - 2ha which is the subject of this TIA.

The proposed land uses for the LSP area are predominantly general and light industry uses with some service commercial. The total trip generation of the proposed land uses for the LSP is estimated to be about 14,360vpd, about 1,623vph in AM and about 2,239vph in PM peak hours.

According to the transport modelling and analysis undertaken the internal roads are not estimated to carry more than 5,000vpd and therefore the 20m road reserve with 10m traffic lanes should be sufficient for all internal LSP roads except the north-south spine road which would carry about 10,000vpd and would require a minimum road reserve width of 25 metres.

The projected traffic volumes on Mundijong Road are estimated to be more than 10,000vpd and therefore Mundijong Road would need to be upgraded to dual carriageway standard by 2031. The existing and proposed roundabout intersections on Mundijong Road would also need to entail dual lanes in 2031.

Bishop Road between north-south spine road and Tonkin Highway is estimated to carry more than 10,000vpd and would need to be upgraded to dual carriageway standard. The section of Bishop Road between north-south spine road and Kargotich Road is estimated to carry less than 10,000vpd and may remain as single carriageway standard.

The design of the internal road network of the LSP area will be in line with WAPC's D.C. 4.1. According to the advice received from the Shire the proposed Phase 1 LSP would accommodate RAV 4 vehicles. In longer term and in accordance with the South Metropolitan and Peel Sub-Regional Framework a potential intermodal facility at West Mundijong Industrial Area is identified. An intermodal facility would need to accommodate freight vehicles up to RAV 7 category. Therefore, all LSP roads and intersections will need to be designed to safely accommodate RAV7 vehicles and other road users in accordance with Main Roads WA and Austroads specifications.

It is noted that some of the surrounding road network (or some part of the roads) is not currently in the RAV network or not classified as RAV7. The Shire will need to apply to Main Roads WA Heavy Vehicle Services for the relevant roads that will be used by RAV 7 vehicles to be classified and included in the RAV network.

The projected daily traffic volumes on Kargotich Road are estimated to be more than 3,000vpd and therefore the proposed standard of this road as a rural road should include 2x 3.5m traffic lanes plus 2.5m shoulders on both sides with 1.5m sealed shoulders.

The projected traffic volumes on Bishop Road between Kargotich Road and north-south spine road is estimated to be between 1,000vpd - 3,000vpd and therefore as a rural road this section

of Bishop Road need to be upgraded to 2x 3.5m traffic lanes plus 2m shoulders on both sides with 1.0m sealed shoulders. The section of Bishop Road between north-south spine road and Tonkin Highway would need to be upgraded to dual carriageway standard. Similarly, Mundijong Rod would need to be upgraded to dual carriageway standard fronting the LSP area.

According to the Connectivity and Accessibility Study undertaken by Arup in July 2021 for Tonkin Highway Extension Stage 3, the Mundijong Road intersection is designed to be a dual lane roundabout at Project Case, and a diamond interchange at Ultimate Case.

SIDRA analysis undertaken for the Project Case (interim or 2031 indicates that the proposed dual lane roundabout intersection at Mundijong Road/Tonkin Highway would not be able to accommodate the 2031 projected traffic volumes (sourced from Main Roads WA ROM projections) on Tonkin Highway. Therefore, it is recommended that Main Roads WA review the proposed intersection layout of Mundijong Road/Tonkin Highway during the Project Case and consider bring forward the construction of the proposed interchange to ensure satisfactory traffic operations and safety at this intersection.



Appendix A

PROPOSED LOCAL STRUCTURE PLAN



LEGEND

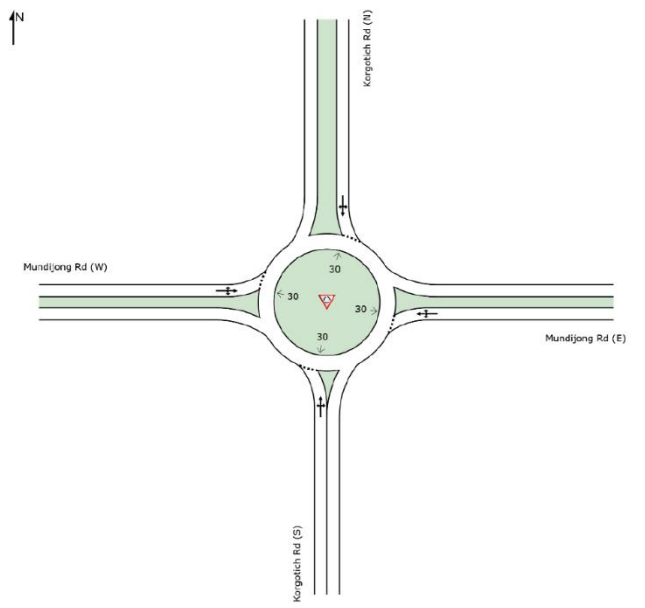
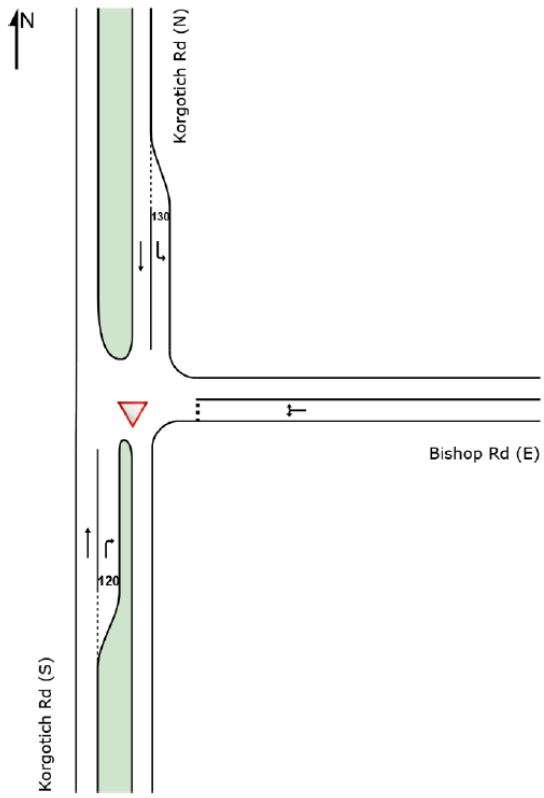
- - - SUBJECT LAND
- SPINE ROADS - 27.5m
- MULTIPLE USE CORRIDOR (INCORPORATED DRAINAGE FUNCTION)
- Roundabout intersections proposed
- PRIMARY REGIONAL ROAD
- MAINTENANCE TRAIL
- POTENTIAL DRAINAGE AND LANDSCAPE ENHANCEMENT
- EXISTING CADASTRE
- ROADS
- 330 V POWER LINES
- CONSERVATION CATEGORY WETLAND
- ROADS SUBJECT TO FUTURE INVESTIGATION BY THE DEPARTMENT OF TRANSPORT
- 50m CONSERVATION CATEGORY WETLAND BUFFER
- INDICATIVE ECOLOGICAL LINKAGES
- GENERAL INDUSTRY
- PROPOSED RAIL LINK (Subject to further investigation)
- EXISTING KWINANA FREIGHT RAIL
- LIGHT INDUSTRY
- 100m MULTIPLE USE CORRIDOR BUFFER FOR EFFLUENT DISPOSAL
- NOISE ATTENUATION
- AREA TO BE RETAINED IN THE 'RURAL' ZONE (METROPOLITAN REGION SCHEME) PENDING FURTHER INVESTIGATIONS BY THE DEPARTMENT OF TRANSPORT INTO FUTURE REGIONAL TRANSPORT REQUIREMENTS.
- HIGHWAY COMMERCIAL

NOTE:
 THE PROPOSED ROAD NETWORK MAY BE AMENDED IN RESPONSE TO ONGOING LIAISON WITH MAIN ROADS WESTERN AUSTRALIA. AT THIS STAGE THE ROAD NETWORK SHOWN IN THE DRAFT DISTRICT STRUCTURE PLAN IS A GUIDE ONLY.



Appendix B

SIDRA OUTPUTS



Existing Layouts

MOVEMENT SUMMARY

Site: [Bishop Rd & Korgotich Rd - 2021 - AM (Site Folder: 2021)]

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

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h]	[HV %]	[Total veh/h]	[HV %]				[Veh. veh]	[Dist] m				
South: Korgotich Rd (S)														
5	T1	183	16.9	193	16.9	0.118	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
6	R2	73	8.6	77	8.6	0.066	8.4	LOS A	0.3	2.2	0.28	0.64	0.28	79.1
Approach		256	14.5	269	14.5	0.118	2.4	NA	0.3	2.2	0.08	0.18	0.08	93.0
East: Bishop Rd (E)														
7	L2	45	14.2	47	14.2	0.090	7.9	LOS A	0.3	2.9	0.31	0.64	0.31	68.8
9	R2	24	14.2	25	14.2	0.090	11.5	LOS B	0.3	2.9	0.31	0.64	0.31	56.8
Approach		69	14.2	73	14.2	0.090	9.2	LOS A	0.3	2.9	0.31	0.64	0.31	66.2
North: Korgotich Rd (N)														
10	L2	27	8.6	28	8.6	0.017	8.1	LOS A	0.0	0.0	0.00	0.66	0.00	65.6
11	T1	117	16.4	123	16.4	0.077	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
Approach		144	14.9	152	14.9	0.077	1.5	NA	0.0	0.0	0.00	0.12	0.00	95.7
All Vehicles		469	14.6	494	14.6	0.118	3.1	NA	0.3	2.9	0.09	0.23	0.09	89.2

MOVEMENT SUMMARY

Site: [Bishop Rd & Korgotich Rd - 2021 - PM (Site Folder: 2021)]

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

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h]	[HV %]	[Total veh/h]	[HV %]				[Veh. veh]	[Dist] m				
South: Korgotich Rd (S)														
5	T1	109	16.9	115	16.9	0.070	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
6	R2	39	8.6	41	8.6	0.044	9.5	LOS A	0.2	1.4	0.42	0.69	0.42	78.4
Approach		148	14.7	156	14.7	0.070	2.5	NA	0.2	1.4	0.11	0.18	0.11	93.3
East: Bishop Rd (E)														
7	L2	47	14.2	49	14.2	0.120	9.0	LOS A	0.4	3.8	0.48	0.74	0.48	67.9
9	R2	29	14.2	31	14.2	0.120	12.7	LOS B	0.4	3.8	0.48	0.74	0.48	55.3
Approach		76	14.2	80	14.2	0.120	10.4	LOS B	0.4	3.8	0.48	0.74	0.48	64.9
North: Korgotich Rd (N)														
10	L2	30	8.6	32	8.6	0.019	8.1	LOS A	0.0	0.0	0.00	0.66	0.00	65.6
11	T1	280	16.4	295	16.4	0.183	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
Approach		310	15.6	326	15.6	0.183	0.8	NA	0.0	0.0	0.00	0.06	0.00	97.8
All Vehicles		534	15.2	562	15.2	0.183	2.6	NA	0.4	3.8	0.10	0.19	0.10	91.1

MOVEMENT SUMMARY

Site: [Mundijong Rd & Korgotich Rd - 2021 - AM (Site Folder: 2021)]

Site Category: (None)
Roundabout

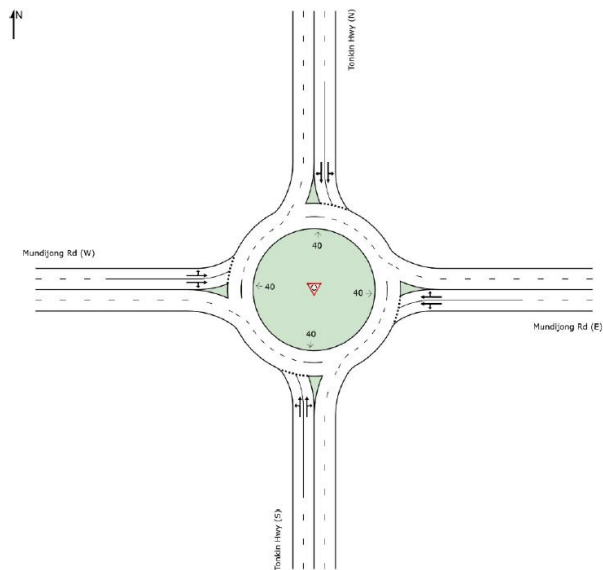
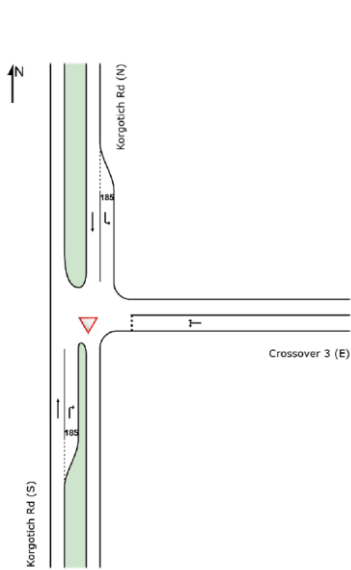
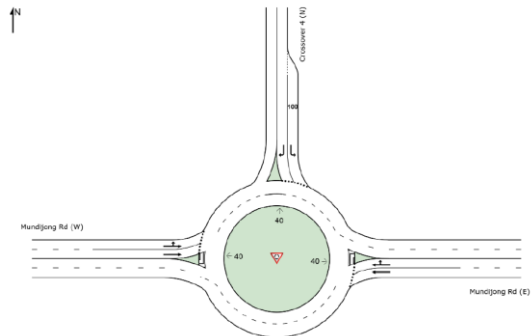
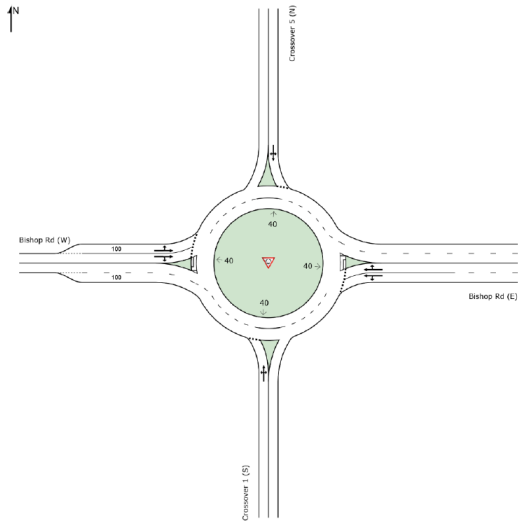
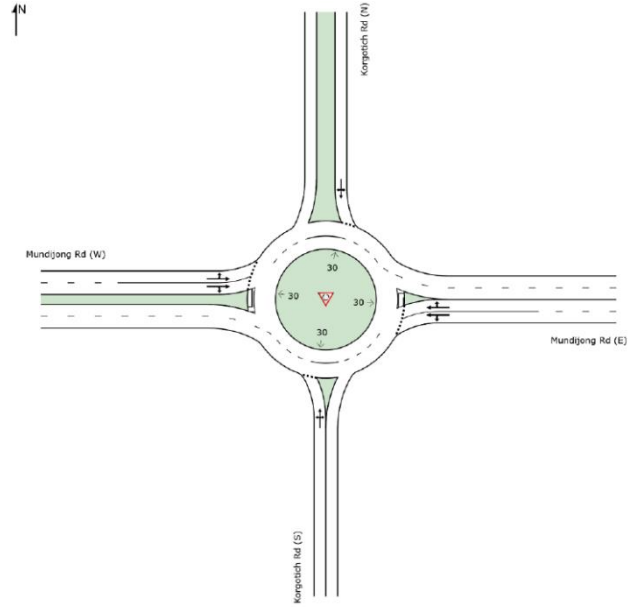
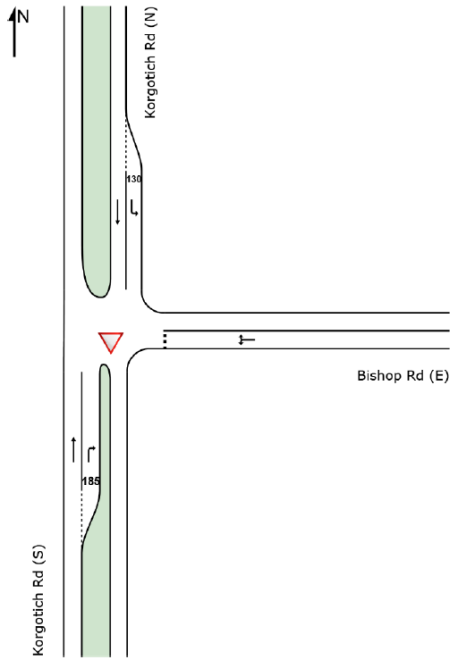
Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h]	[HV %]	[Total veh/h]	[HV %]				[Veh. veh]	[Dist. m]				
South: Korgotich Rd (S)														
10	L2	23	17.2	24	17.2	0.092	8.5	LOS A	0.5	4.5	0.43	0.58	0.43	35.1
11	T1	67	16.9	71	16.9	0.092	9.3	LOS A	0.5	4.5	0.43	0.58	0.43	73.1
12	R2	3	17.2	3	17.2	0.092	15.0	LOS B	0.5	4.5	0.43	0.58	0.43	66.5
Approach		93	17.0	98	17.0	0.092	9.3	LOS A	0.5	4.5	0.43	0.58	0.43	64.2
East: Mundijong Rd (E)														
1	L2	42	16.4	44	16.4	0.129	7.9	LOS A	0.7	6.6	0.36	0.56	0.36	65.7
2	T1	94	15.5	99	15.5	0.129	8.8	LOS A	0.7	6.6	0.36	0.56	0.36	34.7
3	R2	4	16.9	4	16.9	0.129	14.5	LOS B	0.7	6.6	0.36	0.56	0.36	71.3
Approach		140	15.8	147	15.8	0.129	8.7	LOS A	0.7	6.6	0.36	0.56	0.36	42.8
North: Korgotich Rd (N)														
4	L2	14	16.3	15	16.3	0.121	7.8	LOS A	0.7	6.0	0.34	0.63	0.34	76.2
5	T1	19	16.4	20	16.4	0.121	8.7	LOS A	0.7	6.0	0.34	0.63	0.34	77.9
6	R2	102	14.6	107	14.6	0.121	14.3	LOS B	0.7	6.0	0.34	0.63	0.34	70.6
Approach		135	15.0	142	15.0	0.121	12.8	LOS B	0.7	6.0	0.34	0.63	0.34	72.2
West: Mundijong Rd (W)														
7	L2	185	16.9	195	16.9	0.243	7.5	LOS A	1.6	14.4	0.31	0.55	0.31	70.0
8	T1	107	16.3	113	16.3	0.243	8.3	LOS A	1.6	14.4	0.31	0.55	0.31	65.0
9	R2	3	16.4	3	16.4	0.243	14.0	LOS B	1.6	14.4	0.31	0.55	0.31	63.7
Approach		295	16.7	311	16.7	0.243	7.8	LOS A	1.6	14.4	0.31	0.55	0.31	68.9
All Vehicles		663	16.2	698	16.2	0.243	9.2	LOS A	1.6	14.4	0.34	0.57	0.34	63.8

MOVEMENT SUMMARY

Site: [Mundijong Rd & Korgotich Rd - 2021 - PM (Site Folder: 2021)]

Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h]	[HV %]	[Total veh/h]	[HV %]				[Veh. veh]	[Dist. m]				
South: Korgotich Rd (S)														
10	L2	14	17.2	15	17.2	0.057	9.9	LOS A	0.3	2.9	0.59	0.65	0.59	34.7
11	T1	31	16.9	33	16.9	0.057	10.7	LOS B	0.3	2.9	0.59	0.65	0.59	72.4
12	R2	2	17.2	2	17.2	0.057	16.4	LOS B	0.3	2.9	0.59	0.65	0.59	65.3
Approach		47	17.0	49	17.0	0.057	10.7	LOS B	0.3	2.9	0.59	0.65	0.59	61.6
East: Mundijong Rd (E)														
1	L2	17	16.4	18	16.4	0.243	9.4	LOS A	1.5	13.8	0.59	0.67	0.59	63.7
2	T1	194	15.5	204	15.5	0.243	10.2	LOS B	1.5	13.8	0.59	0.67	0.59	34.1
3	R2	9	16.9	9	16.9	0.243	15.9	LOS B	1.5	13.8	0.59	0.67	0.59	70.0
Approach		220	15.6	232	15.6	0.243	10.4	LOS B	1.5	13.8	0.59	0.67	0.59	37.4
North: Korgotich Rd (N)														
4	L2	39	16.3	41	16.3	0.296	8.2	LOS A	1.9	17.0	0.43	0.65	0.43	76.5
5	T1	91	16.4	96	16.4	0.296	9.1	LOS A	1.9	17.0	0.43	0.65	0.43	78.2
6	R2	197	14.6	207	14.6	0.296	14.7	LOS B	1.9	17.0	0.43	0.65	0.43	70.8
Approach		327	15.3	344	15.3	0.296	12.3	LOS B	1.9	17.0	0.43	0.65	0.43	73.6
West: Mundijong Rd (W)														
7	L2	108	16.9	114	16.9	0.195	7.2	LOS A	1.3	11.3	0.22	0.52	0.22	70.2
8	T1	140	16.3	147	16.3	0.195	8.0	LOS A	1.3	11.3	0.22	0.52	0.22	65.5
9	R2	2	16.4	2	16.4	0.195	13.7	LOS B	1.3	11.3	0.22	0.52	0.22	64.1
Approach		250	16.6	263	16.6	0.195	7.7	LOS A	1.3	11.3	0.22	0.52	0.22	68.4
All Vehicles		844	15.9	888	15.9	0.296	10.4	LOS B	1.9	17.0	0.42	0.62	0.42	61.9



Futute intersection Layouts

MOVEMENT SUMMARY

Site: [Bishop Rd & Korgotich Rd - 2031 - AM (Site Folder: 2031 - AM)]

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

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h]	[HV %]	[Total veh/h]	[HV %]				[Veh. veh]	[Dist m]				
South: Korgotich Rd (S)														
5	T1	229	16.9	241	16.9	0.148	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
6	R2	94	8.6	99	8.6	0.089	8.7	LOS A	0.4	3.0	0.33	0.65	0.33	78.9
Approach		323	14.5	340	14.5	0.148	2.6	NA	0.4	3.0	0.09	0.19	0.09	92.8
East: Bishop Rd (E)														
7	L2	55	14.2	58	14.2	0.131	8.1	LOS A	0.5	4.2	0.37	0.68	0.37	68.1
9	R2	33	14.2	35	14.2	0.131	13.4	LOS B	0.5	4.2	0.37	0.68	0.37	55.8
Approach		88	14.2	93	14.2	0.131	10.1	LOS B	0.5	4.2	0.37	0.68	0.37	65.3
North: Korgotich Rd (N)														
10	L2	39	8.6	41	8.6	0.025	8.1	LOS A	0.0	0.0	0.00	0.66	0.00	65.6
11	T1	142	16.4	149	16.4	0.093	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
Approach		181	14.7	191	14.7	0.093	1.8	NA	0.0	0.0	0.00	0.14	0.00	95.0
All Vehicles		592	14.5	623	14.5	0.148	3.4	NA	0.5	4.2	0.11	0.25	0.11	88.7

MOVEMENT SUMMARY

Site: [Bishop Rd & Korgotich Rd - 2031 - PM (Site Folder: 2031 - PM)]

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

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h]	[HV %]	[Total veh/h]	[HV %]				[Veh. veh]	[Dist m]				
South: Korgotich Rd (S)														
5	T1	165	16.9	174	16.9	0.107	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
6	R2	53	8.6	56	8.6	0.068	10.2	LOS B	0.3	2.1	0.48	0.74	0.48	77.8
Approach		218	14.9	229	14.9	0.107	2.5	NA	0.3	2.1	0.12	0.18	0.12	93.5
East: Bishop Rd (E)														
7	L2	57	14.2	60	14.2	0.242	10.0	LOS A	0.9	8.1	0.60	0.84	0.63	66.1
9	R2	57	14.2	60	14.2	0.242	16.6	LOS C	0.9	8.1	0.60	0.84	0.63	52.4
Approach		114	14.2	120	14.2	0.242	13.3	LOS B	0.9	8.1	0.60	0.84	0.63	61.4
North: Korgotich Rd (N)														
10	L2	39	8.6	41	8.6	0.025	8.1	LOS A	0.0	0.0	0.00	0.66	0.00	65.6
11	T1	352	16.4	371	16.4	0.230	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
Approach		391	15.6	412	15.6	0.230	0.8	NA	0.0	0.0	0.00	0.07	0.00	97.7
All Vehicles		723	15.2	761	15.2	0.242	3.3	NA	0.9	8.1	0.13	0.22	0.13	90.0

MOVEMENT SUMMARY

Site: [Bishop Rd & Crossover 1 & Crossover 5 - 2031 - AM]
(Site Folder: 2031 - AM)]

Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h]	[HV %]	[Total veh/h]	[HV %]				[Veh. veh]	[Dist m]				
South: Crossover 1 (S)														
10	L2	2	25.0	2	25.0	0.207	2.5	LOSA	1.0	10.4	0.48	0.37	0.48	29.3
11	T1	1	25.0	1	25.0	0.207	2.1	LOSA	1.0	10.4	0.48	0.37	0.48	19.3
12	R2	169	25.0	178	25.0	0.207	2.1	LOSA	1.0	10.4	0.48	0.37	0.48	32.7
Approach		172	25.0	181	25.0	0.207	2.1	LOSA	1.0	10.4	0.48	0.37	0.48	32.6
East: Bishop Rd (E)														
1	L2	530	25.0	558	25.0	0.369	8.4	LOSA	2.7	27.7	0.09	0.60	0.09	38.5
2	T1	227	14.2	239	14.2	0.216	5.6	LOSA	1.3	11.8	0.09	0.51	0.09	65.2
3	R2	41	25.0	43	25.0	0.216	17.8	LOS B	1.3	11.8	0.09	0.51	0.09	52.7
Approach		798	21.9	840	21.9	0.369	8.1	LOSA	2.7	27.7	0.09	0.57	0.09	45.3
North: Crossover 5 (N)														
4	L2	10	25.0	11	25.0	0.015	1.7	LOSA	0.1	0.6	0.45	0.28	0.45	40.0
5	T1	1	25.0	1	25.0	0.015	1.7	LOSA	0.1	0.6	0.45	0.28	0.45	19.3
6	R2	1	25.0	1	25.0	0.015	1.7	LOSA	0.1	0.6	0.45	0.28	0.45	40.1
Approach		12	25.0	13	25.0	0.015	1.7	LOSA	0.1	0.6	0.45	0.28	0.45	38.3
West: Bishop Rd (W)														
7	L2	1	25.0	1	25.0	0.058	9.4	LOSA	0.3	2.7	0.42	0.48	0.42	47.3
8	T1	127	8.6	134	8.6	0.058	6.6	LOSA	0.3	2.7	0.44	0.51	0.44	64.2
9	R2	6	25.0	6	25.0	0.058	19.4	LOS B	0.3	2.6	0.45	0.54	0.45	35.3
Approach		134	9.5	141	9.5	0.058	7.2	LOSA	0.3	2.7	0.44	0.51	0.44	62.5
All Vehicles		1116	20.9	1175	20.9	0.369	7.0	LOSA	2.7	27.7	0.20	0.53	0.20	44.3

MOVEMENT SUMMARY

Site: [Bishop Rd & Crossover 1 & Crossover 5 - 2031 - PM]
(Site Folder: 2031 - PM)]

Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h]	[HV %]	[Total veh/h]	[HV %]				[Veh. veh]	[Dist m]				
South: Crossover 1 (S)														
10	L2	11	25.0	12	25.0	0.852	7.8	LOSA	15.2	154.2	0.92	0.94	1.15	27.5
11	T1	1	25.0	1	25.0	0.852	7.5	LOSA	15.2	154.2	0.92	0.94	1.15	17.8
12	R2	820	25.0	863	25.0	0.852	7.5	LOSA	15.2	154.2	0.92	0.94	1.15	30.7
Approach		832	25.0	876	25.0	0.852	7.5	LOSA	15.2	154.2	0.92	0.94	1.15	30.7
East: Bishop Rd (E)														
1	L2	155	25.0	163	25.0	0.130	8.4	LOSA	0.8	7.8	0.06	0.61	0.06	38.5
2	T1	142	14.2	149	14.2	0.119	5.6	LOSA	0.7	6.4	0.05	0.56	0.05	64.6
3	R2	41	25.0	43	25.0	0.119	17.8	LOS B	0.7	6.4	0.05	0.56	0.05	52.1
Approach		338	20.5	356	20.5	0.130	8.3	LOSA	0.8	7.8	0.05	0.58	0.05	49.6
North: Crossover 5 (N)														
4	L2	162	25.0	171	25.0	0.512	13.0	LOS B	3.7	37.2	0.95	1.17	1.17	33.3
5	T1	1	25.0	1	25.0	0.512	13.0	LOS B	3.7	37.2	0.95	1.17	1.17	15.8
6	R2	1	25.0	1	25.0	0.512	13.0	LOS B	3.7	37.2	0.95	1.17	1.17	31.9
Approach		164	25.0	173	25.0	0.512	13.0	LOS B	3.7	37.2	0.95	1.17	1.17	33.2
West: Bishop Rd (W)														
7	L2	1	25.0	1	25.0	0.108	17.2	LOS B	1.0	8.2	1.00	0.80	1.00	41.7
8	T1	89	8.6	94	8.6	0.108	14.2	LOS B	1.0	8.2	0.99	0.82	0.99	58.0
9	R2	2	25.0	2	25.0	0.108	29.3	LOS C	0.8	6.8	0.99	0.87	0.99	32.0
Approach		92	9.1	97	9.1	0.108	14.5	LOS B	1.0	8.2	0.99	0.82	0.99	57.2
All Vehicles		1426	22.9	1501	22.9	0.852	8.8	LOSA	15.2	154.2	0.73	0.87	0.88	35.5

MOVEMENT SUMMARY

Site: [Crossover 3 & Korgotich Rd - 2031 - AM (Site Folder: 2031 - AM)]

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

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h]	[HV %]	[Total veh/h]	[HV %]				[Veh. veh]	[Dist m]				
South: Korgotich Rd (S)														
5	T1	351	16.9	369	16.9	0.227	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
6	R2	39	25.0	41	25.0	0.047	9.9	LOS A	0.2	2.0	0.36	0.66	0.36	77.5
Approach		390	17.7	411	17.7	0.227	1.1	NA	0.2	2.0	0.04	0.07	0.04	98.4
East: Crossover 3 (E)														
7	L2	6	25.0	6	25.0	0.019	1.2	LOS A	0.1	0.7	0.44	0.30	0.44	54.6
9	R2	3	25.0	3	25.0	0.019	11.2	LOS B	0.1	0.7	0.44	0.30	0.44	55.8
Approach		9	25.0	9	25.0	0.019	4.6	LOS A	0.1	0.7	0.44	0.30	0.44	55.0
North: Korgotich Rd (N)														
10	L2	13	25.0	14	25.0	0.011	8.8	LOS A	0.0	0.0	0.00	0.66	0.00	82.2
11	T1	177	16.4	186	16.4	0.113	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
Approach		190	17.0	200	17.0	0.113	0.6	NA	0.0	0.0	0.00	0.05	0.00	99.1
All Vehicles		589	17.6	620	17.6	0.227	1.0	NA	0.2	2.0	0.03	0.06	0.03	98.0

MOVEMENT SUMMARY

Site: [Crossover 3 & Korgotich Rd - 2031 - PM (Site Folder: 2031 - PM)]

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

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h]	[HV %]	[Total veh/h]	[HV %]				[Veh. veh]	[Dist m]				
South: Korgotich Rd (S)														
5	T1	194	16.9	204	16.9	0.124	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
6	R2	13	25.0	14	25.0	0.024	12.7	LOS B	0.1	1.0	0.54	0.75	0.54	74.5
Approach		207	17.4	218	17.4	0.124	0.8	NA	0.1	1.0	0.03	0.05	0.03	98.8
East: Crossover 3 (E)														
7	L2	36	25.0	38	25.0	0.146	4.5	LOS A	0.5	5.7	0.64	0.64	0.64	52.8
9	R2	16	25.0	17	25.0	0.146	15.7	LOS C	0.5	5.7	0.64	0.64	0.64	54.1
Approach		52	25.0	55	25.0	0.146	8.0	LOS A	0.5	5.7	0.64	0.64	0.64	53.2
North: Korgotich Rd (N)														
10	L2	5	25.0	5	25.0	0.004	8.8	LOS A	0.0	0.0	0.00	0.66	0.00	82.2
11	T1	436	16.4	459	16.4	0.278	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	99.8
Approach		441	16.5	464	16.5	0.278	0.2	NA	0.0	0.0	0.00	0.01	0.00	99.7
All Vehicles		700	17.4	737	17.4	0.278	1.0	NA	0.5	5.7	0.06	0.07	0.06	96.1

MOVEMENT SUMMARY

Site: [Mundijong Rd & Korgotich Rd - 2031 - AM (Site Folder: 2031 - AM)]

Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[Total veh/h]	HV %	[Total veh/h]	HV %				[Veh. veh]	[Dist m]				
South: Korgotich Rd (S)														
10	L2	28	17.2	29	17.2	0.238	11.8	LOS B	1.1	9.7	0.70	0.88	0.70	34.2
11	T1	82	16.9	86	16.9	0.238	12.6	LOS B	1.1	9.7	0.70	0.88	0.70	71.0
12	R2	21	17.2	22	17.2	0.238	18.4	LOS B	1.1	9.7	0.70	0.88	0.70	63.3
Approach		131	17.0	138	17.0	0.238	13.4	LOS B	1.1	9.7	0.70	0.88	0.70	62.5
East: Mundijong Rd (E)														
1	L2	51	16.4	54	16.4	0.357	8.3	LOS A	2.7	23.7	0.51	0.58	0.51	64.1
2	T1	713	15.5	751	15.5	0.357	9.3	LOS A	2.7	23.7	0.52	0.59	0.52	34.2
3	R2	10	16.9	11	16.9	0.357	15.1	LOS B	2.6	22.7	0.54	0.61	0.54	70.1
Approach		774	15.6	815	15.6	0.357	9.3	LOS A	2.7	23.7	0.52	0.59	0.52	36.1
North: Korgotich Rd (N)														
4	L2	22	16.3	23	16.3	0.373	13.4	LOS B	2.0	17.0	0.78	0.95	0.86	72.5
5	T1	23	16.4	24	16.4	0.373	14.3	LOS B	2.0	17.0	0.78	0.95	0.86	74.0
6	R2	144	14.6	152	14.6	0.373	19.8	LOS B	2.0	17.0	0.78	0.95	0.86	67.1
Approach		189	15.0	199	15.0	0.373	18.4	LOS B	2.0	17.0	0.78	0.95	0.86	68.6
West: Mundijong Rd (W)														
7	L2	303	16.9	319	16.9	0.542	8.0	LOS A	4.9	43.8	0.50	0.56	0.50	68.7
8	T1	971	16.3	1022	16.3	0.542	9.0	LOS A	4.9	43.8	0.52	0.57	0.52	62.4
9	R2	4	16.4	4	16.4	0.542	14.7	LOS B	4.8	42.3	0.53	0.57	0.53	60.9
Approach		1278	16.4	1345	16.4	0.542	8.8	LOS A	4.9	43.8	0.52	0.57	0.52	64.8
All Vehicles		2372	16.1	2497	16.1	0.542	10.0	LOS A	4.9	43.8	0.55	0.62	0.56	54.1

MOVEMENT SUMMARY

Site: [Mundijong Rd & Korgotich Rd - 2031 - PM (Site Folder: 2031 - PM)]

Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[Total veh/h]	HV %	[Total veh/h]	HV %				[Veh. veh]	[Dist m]				
South: Korgotich Rd (S)														
10	L2	17	17.2	18	17.2	0.333	15.8	LOS B	1.7	15.5	0.86	0.97	0.93	32.4
11	T1	38	16.9	40	16.9	0.333	16.6	LOS B	1.7	15.5	0.86	0.97	0.93	67.2
12	R2	51	17.2	54	17.2	0.333	22.4	LOS C	1.7	15.5	0.86	0.97	0.93	57.7
Approach		106	17.1	112	17.1	0.333	19.3	LOS B	1.7	15.5	0.86	0.97	0.93	57.4
East: Mundijong Rd (E)														
1	L2	21	16.4	22	16.4	0.706	14.7	LOS B	9.2	81.3	0.98	0.96	1.26	59.4
2	T1	1051	15.5	1106	15.5	0.706	16.7	LOS B	9.2	81.3	0.98	1.00	1.29	32.2
3	R2	16	16.9	17	16.9	0.706	23.6	LOS C	8.4	74.9	0.98	1.04	1.32	65.7
Approach		1088	15.5	1145	15.5	0.706	16.7	LOS B	9.2	81.3	0.98	1.00	1.29	33.2
North: Korgotich Rd (N)														
4	L2	53	16.3	56	16.3	0.812	19.9	LOS B	8.5	73.7	0.91	1.15	1.59	68.2
5	T1	111	16.4	117	16.4	0.812	20.8	LOS C	8.5	73.7	0.91	1.15	1.59	69.6
6	R2	347	14.6	365	14.6	0.812	26.3	LOS C	8.5	73.7	0.91	1.15	1.59	63.1
Approach		511	15.2	538	15.2	0.812	24.4	LOS C	8.5	73.7	0.91	1.15	1.59	65.0
West: Mundijong Rd (W)														
7	L2	158	16.9	166	16.9	0.343	7.7	LOS A	2.6	22.8	0.40	0.55	0.40	69.1
8	T1	647	16.3	681	16.3	0.343	8.7	LOS A	2.6	22.8	0.42	0.55	0.42	63.3
9	R2	2	16.4	2	16.4	0.343	14.4	LOS B	2.5	21.9	0.43	0.55	0.43	61.8
Approach		807	16.4	849	16.4	0.343	8.5	LOS A	2.6	22.8	0.41	0.55	0.41	65.2
All Vehicles		2512	15.8	2644	15.8	0.812	15.8	LOS B	9.2	81.3	0.78	0.88	1.05	49.4

MOVEMENT SUMMARY

Site: [Mundijong Rd & Tonkin Hwy- 2031 - AM (Site Folder: 2031 - AM)]

Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: Tonkin Hwy (S)														
10	L2	230	14.6	242	14.6	1.524	490.2	LOS F	215.5	1936.9	1.00	6.25	21.18	11.3
11	T1	1162	17.1	1223	17.1	1.524	492.7	LOS F	215.5	1936.9	1.00	5.76	19.82	7.0
12	R2	126	16.3	133	16.3	1.524	501.3	LOS F	153.7	1390.4	1.00	5.11	18.02	7.0
Approach		1518	16.7	1598	16.7	1.524	493.0	LOS F	215.5	1936.9	1.00	5.78	19.88	7.7
East: Mundijong Rd (E)														
1	L2	73	24.6	77	24.6	0.740	18.8	LOS B	7.1	62.5	0.97	1.12	1.47	56.9
2	T1	461	14.6	485	14.6	0.740	19.6	LOS B	7.1	62.5	0.97	1.12	1.48	67.3
3	R2	230	17.1	242	17.1	0.740	29.4	LOS C	6.1	54.9	0.94	1.11	1.49	53.3
Approach		764	16.3	804	16.3	0.740	22.5	LOS C	7.1	62.5	0.96	1.12	1.48	63.0
North: Tonkin Hwy (N)														
4	L2	189	16.3	199	16.3	0.733	14.9	LOS B	6.9	64.8	0.93	1.08	1.32	61.7
5	T1	321	24.6	338	24.6	0.733	16.1	LOS B	6.9	64.8	0.93	1.08	1.32	62.6
6	R2	480	14.6	505	14.6	0.833	28.3	LOS C	9.1	78.8	0.98	1.17	1.67	61.7
Approach		990	18.2	1042	18.2	0.833	21.8	LOS C	9.1	78.8	0.95	1.12	1.49	61.9
West: Mundijong Rd (W)														
7	L2	312	17.1	328	17.1	1.090	112.7	LOS F	50.0	447.8	1.00	2.57	7.07	34.5
8	T1	499	16.3	525	16.3	1.090	116.0	LOS F	50.0	447.8	1.00	2.47	6.79	34.4
9	R2	250	24.6	263	24.6	1.090	128.2	LOS F	36.4	339.4	1.00	2.29	6.30	32.7
Approach		1061	18.5	1117	18.5	1.090	117.9	LOS F	50.0	447.8	1.00	2.46	6.75	34.0
All Vehicles		4333	17.4	4561	17.4	1.524	210.5	LOS F	215.5	1936.9	0.98	3.08	9.22	19.1

MOVEMENT SUMMARY

Site: [Mundijong Rd & Tonkin Hwy- 2031 - PM (Site Folder: 2031 - PM)]

Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: Tonkin Hwy (S)														
10	L2	267	14.6	281	14.6	0.684	14.8	LOS B	5.7	50.4	0.93	1.06	1.27	68.9
11	T1	394	17.1	415	17.1	0.684	17.4	LOS B	5.7	50.4	0.92	1.06	1.29	61.6
12	R2	92	16.3	97	16.3	0.684	25.3	LOS C	5.0	45.3	0.91	1.06	1.30	58.6
Approach		753	16.1	793	16.1	0.684	17.4	LOS B	5.7	50.4	0.92	1.06	1.28	64.6
East: Mundijong Rd (E)														
1	L2	66	24.6	69	24.6	1.013	68.4	LOS E	24.7	217.0	1.00	1.80	4.20	32.6
2	T1	534	14.6	562	14.6	1.013	70.1	LOS F	24.7	217.0	1.00	1.78	4.14	44.1
3	R2	240	17.1	253	17.1	1.013	85.1	LOS F	18.5	166.3	1.00	1.68	3.91	30.3
Approach		840	16.1	884	16.1	1.013	74.3	LOS F	24.7	217.0	1.00	1.75	4.08	39.7
North: Tonkin Hwy (N)														
4	L2	138	16.3	145	16.3	1.428	403.0	LOS F	193.4	1845.7	1.00	5.72	17.71	8.4
5	T1	1123	24.6	1182	24.6	1.428	405.0	LOS F	193.4	1845.7	1.00	5.48	17.19	8.4
6	R2	353	14.6	372	14.6	1.428	412.8	LOS F	153.9	1412.2	1.00	4.96	16.07	13.3
Approach		1614	21.7	1699	21.7	1.428	406.5	LOS F	193.4	1845.7	1.00	5.39	16.99	9.6
West: Mundijong Rd (W)														
7	L2	582	17.1	613	17.1	0.964	36.5	LOS D	23.4	211.7	1.00	1.56	2.98	58.9
8	T1	478	16.3	503	16.3	0.964	41.0	LOS D	23.4	211.7	1.00	1.56	3.04	57.4
9	R2	239	24.6	252	24.6	0.964	50.4	LOS E	20.3	186.0	1.00	1.55	3.07	54.3
Approach		1299	18.2	1367	18.2	0.964	40.7	LOS D	23.4	211.7	1.00	1.56	3.02	57.4
All Vehicles		4506	18.7	4743	18.7	1.428	174.1	LOS F	193.4	1845.7	0.99	2.88	7.93	22.3

MOVEMENT SUMMARY

Site: [Mundijong Rd & Crossover 4 - 2031 - AM (Site Folder: 2031 - AM)]

Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
East: Mundijong Rd (E)														
5	T1	761	14.6	801	14.6	0.413	7.6	LOS A	3.9	34.1	0.15	0.50	0.15	81.8
6	R2	415	25.0	437	25.0	0.413	19.6	LOS B	3.8	41.3	0.17	0.72	0.17	54.5
Approach		1176	18.3	1238	18.3	0.413	11.8	LOS B	3.9	41.3	0.16	0.58	0.16	70.4
North: Crossover 4 (N)														
7	L2	104	25.0	109	25.0	0.173	3.1	LOS A	0.8	9.2	0.71	0.71	0.71	46.1
9	R2	13	25.0	14	25.0	0.034	4.8	LOS A	0.1	1.5	0.68	0.64	0.68	31.7
Approach		117	25.0	123	25.0	0.173	3.3	LOS A	0.8	9.2	0.71	0.70	0.71	44.8
West: Mundijong Rd (W)														
10	L2	52	25.0	55	25.0	0.539	14.4	LOS B	4.9	44.0	0.79	0.80	0.86	37.7
11	T1	961	16.3	1012	16.3	0.539	12.8	LOS B	4.9	44.0	0.80	0.83	0.90	71.1
Approach		1013	16.7	1066	16.7	0.539	12.9	LOS B	4.9	44.0	0.80	0.83	0.90	69.8
All Vehicles		2306	17.9	2427	17.9	0.539	11.9	LOS B	4.9	44.0	0.47	0.70	0.51	68.5

MOVEMENT SUMMARY

Site: [Mundijong Rd & Crossover 4 - 2031 - PM (Site Folder: 2031 - PM)]

Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
East: Mundijong Rd (E)														
5	T1	1016	14.6	1069	14.6	0.434	8.1	LOS A	3.9	33.9	0.39	0.54	0.39	80.1
6	R2	143	25.0	151	25.0	0.434	20.4	LOS C	3.8	35.5	0.42	0.60	0.42	56.7
Approach		1159	15.9	1220	15.9	0.434	9.6	LOS A	3.9	35.5	0.40	0.54	0.40	76.7
North: Crossover 4 (N)														
7	L2	571	25.0	601	25.0	0.749	7.2	LOS A	6.5	72.6	0.84	1.24	1.24	44.5
9	R2	71	25.0	75	25.0	0.150	4.5	LOS A	0.6	6.4	0.62	0.62	0.62	31.7
Approach		642	25.0	676	25.0	0.749	6.9	LOS A	6.5	72.6	0.82	1.17	1.17	43.4
West: Mundijong Rd (W)														
10	L2	18	25.0	19	25.0	0.305	10.6	LOS B	2.2	19.6	0.45	0.55	0.45	39.2
11	T1	733	16.3	772	16.3	0.305	8.8	LOS A	2.2	19.6	0.46	0.56	0.46	73.2
Approach		751	16.5	791	16.5	0.305	8.9	LOS A	2.2	19.6	0.46	0.56	0.46	72.6
All Vehicles		2552	18.4	2686	18.4	0.749	8.7	LOS A	6.5	72.6	0.52	0.71	0.61	65.0

MOVEMENT SUMMARY

Site: [Bishop Rd & Korgotich Rd - 2041 - AM (Site Folder: 2041 - AM)]

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

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: Korgotich Rd (S)														
5	T1	278	16.9	293	16.9	0.179	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
6	R2	113	8.6	119	8.6	0.112	8.9	LOS A	0.5	3.8	0.36	0.67	0.36	78.8
Approach		391	14.5	412	14.5	0.179	2.6	NA	0.5	3.8	0.10	0.19	0.10	92.8
East: Bishop Rd (E)														
7	L2	67	14.2	71	14.2	0.180	8.3	LOS A	0.7	5.9	0.42	0.70	0.42	67.5
9	R2	40	14.2	42	14.2	0.180	15.7	LOS C	0.7	5.9	0.42	0.70	0.42	54.7
Approach		107	14.2	113	14.2	0.180	11.0	LOS B	0.7	5.9	0.42	0.70	0.42	64.5
North: Korgotich Rd (N)														
10	L2	47	8.6	49	8.6	0.030	8.1	LOS A	0.0	0.0	0.00	0.66	0.00	65.6
11	T1	166	16.4	175	16.4	0.109	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
Approach		213	14.7	224	14.7	0.109	1.8	NA	0.0	0.0	0.00	0.15	0.00	94.8
All Vehicles		711	14.5	748	14.5	0.180	3.6	NA	0.7	5.9	0.12	0.26	0.12	88.4

MOVEMENT SUMMARY

Site: [Bishop Rd & Korgotich Rd - 2041 - PM (Site Folder: 2041 - PM)]

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

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: Korgotich Rd (S)														
5	T1	194	16.9	204	16.9	0.125	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
6	R2	63	8.6	66	8.6	0.092	11.0	LOS B	0.3	2.8	0.54	0.79	0.54	77.1
Approach		257	14.9	271	14.9	0.125	2.7	NA	0.3	2.8	0.13	0.19	0.13	93.2
East: Bishop Rd (E)														
7	L2	70	14.2	74	14.2	0.351	12.1	LOS B	1.6	13.3	0.69	0.94	0.89	63.9
9	R2	65	14.2	68	14.2	0.351	22.0	LOS C	1.6	13.3	0.69	0.94	0.89	49.2
Approach		135	14.2	142	14.2	0.351	16.9	LOS C	1.6	13.3	0.69	0.94	0.89	59.1
North: Korgotich Rd (N)														
10	L2	47	8.6	49	8.6	0.030	8.1	LOS A	0.0	0.0	0.00	0.66	0.00	65.6
11	T1	427	16.4	449	16.4	0.280	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.8
Approach		474	15.6	499	15.6	0.280	0.8	NA	0.0	0.0	0.00	0.07	0.00	97.6
All Vehicles		866	15.2	912	15.2	0.351	3.9	NA	1.6	13.3	0.15	0.24	0.18	89.3

MOVEMENT SUMMARY

Site: [Bishop Rd & Crossover 1 & Crossover 5 - 2041 - AM
(Site Folder: 2041 - AM)]

Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h]	[HV %]	[Total veh/h]	[HV %]				[Veh. veh]	[Dist m]				
South: Crossover 1 (S)														
10	L2	2	25.0	2	25.0	0.210	2.7	LOSA	1.0	10.6	0.49	0.38	0.49	29.2
11	T1	1	25.0	1	25.0	0.210	2.2	LOSA	1.0	10.6	0.49	0.38	0.49	19.3
12	R2	169	25.0	178	25.0	0.210	2.2	LOSA	1.0	10.6	0.49	0.38	0.49	32.6
Approach		172	25.0	181	25.0	0.210	2.2	LOSA	1.0	10.6	0.49	0.38	0.49	32.5
East: Bishop Rd (E)														
1	L2	530	25.0	558	25.0	0.369	8.4	LOSA	2.7	27.8	0.09	0.60	0.09	38.5
2	T1	245	14.2	258	14.2	0.229	5.6	LOSA	1.4	12.6	0.09	0.50	0.09	65.3
3	R2	41	25.0	43	25.0	0.229	17.8	LOS B	1.4	12.6	0.09	0.50	0.09	52.8
Approach		816	21.8	859	21.8	0.369	8.0	LOSA	2.7	27.8	0.09	0.57	0.09	45.7
North: Crossover 5 (N)														
4	L2	10	25.0	11	25.0	0.015	1.9	LOSA	0.1	0.6	0.46	0.29	0.46	40.0
5	T1	1	25.0	1	25.0	0.015	1.9	LOSA	0.1	0.6	0.46	0.29	0.46	19.3
6	R2	1	25.0	1	25.0	0.015	1.9	LOSA	0.1	0.6	0.46	0.29	0.46	40.1
Approach		12	25.0	13	25.0	0.015	1.9	LOSA	0.1	0.6	0.46	0.29	0.46	38.2
West: Bishop Rd (W)														
7	L2	1	25.0	1	25.0	0.070	9.4	LOSA	0.4	3.3	0.43	0.49	0.43	47.2
8	T1	154	8.6	162	8.6	0.070	6.6	LOSA	0.4	3.3	0.44	0.51	0.44	64.2
9	R2	6	25.0	6	25.0	0.070	19.4	LOS B	0.4	3.2	0.46	0.54	0.46	35.3
Approach		161	9.3	169	9.3	0.070	7.1	LOSA	0.4	3.3	0.44	0.51	0.44	62.8
All Vehicles		1161	20.5	1222	20.5	0.369	7.0	LOSA	2.7	27.8	0.20	0.53	0.20	45.0

MOVEMENT SUMMARY

Site: [Bishop Rd & Crossover 1 & Crossover 5 - 2041 - PM
(Site Folder: 2041 - PM)]

Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h]	[HV %]	[Total veh/h]	[HV %]				[Veh. veh]	[Dist m]				
South: Crossover 1 (S)														
10	L2	11	25.0	12	25.0	0.873	9.8	LOSA	17.1	174.0	0.98	1.11	1.31	26.9
11	T1	1	25.0	1	25.0	0.873	9.5	LOSA	17.1	174.0	0.98	1.11	1.31	17.3
12	R2	820	25.0	863	25.0	0.873	9.5	LOSA	17.1	174.0	0.98	1.11	1.31	30.1
Approach		832	25.0	876	25.0	0.873	9.5	LOSA	17.1	174.0	0.98	1.11	1.31	30.1
East: Bishop Rd (E)														
1	L2	155	25.0	163	25.0	0.131	8.4	LOSA	0.8	7.9	0.06	0.61	0.06	38.5
2	T1	162	14.2	171	14.2	0.131	5.6	LOSA	0.8	7.2	0.05	0.54	0.05	64.9
3	R2	41	25.0	43	25.0	0.131	17.8	LOS B	0.8	7.2	0.05	0.54	0.05	52.3
Approach		358	20.1	377	20.1	0.131	8.2	LOSA	0.8	7.9	0.05	0.57	0.05	50.5
North: Crossover 5 (N)														
4	L2	162	25.0	171	25.0	0.531	13.8	LOS B	3.8	38.9	0.96	1.19	1.20	32.9
5	T1	1	25.0	1	25.0	0.531	13.8	LOS B	3.8	38.9	0.96	1.19	1.20	15.6
6	R2	1	25.0	1	25.0	0.531	13.8	LOS B	3.8	38.9	0.96	1.19	1.20	31.5
Approach		164	25.0	173	25.0	0.531	13.8	LOS B	3.8	38.9	0.96	1.19	1.20	32.8
West: Bishop Rd (W)														
7	L2	1	25.0	1	25.0	0.135	17.7	LOS B	1.3	10.4	1.00	0.81	1.00	41.2
8	T1	108	8.6	114	8.6	0.135	14.7	LOS B	1.3	10.4	1.00	0.84	1.00	57.5
9	R2	2	25.0	2	25.0	0.135	30.0	LOS C	1.0	8.6	1.00	0.89	1.00	31.8
Approach		111	9.0	117	9.0	0.135	15.0	LOS B	1.3	10.4	1.00	0.84	1.00	56.8
All Vehicles		1465	22.6	1542	22.6	0.873	10.1	LOS B	17.1	174.0	0.75	0.97	0.97	35.4

MOVEMENT SUMMARY

Site: [Crossover 3 & Korgotich Rd - 2041 - AM (Site Folder: 2041 - AM)]

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

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV %	[Total veh/h	HV %				[Veh. veh	Dist] m				
South: Korgotich Rd (S)														
5	T1	419	16.9	441	16.9	0.270	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	99.8
6	R2	39	25.0	41	25.0	0.049	10.2	LOS B	0.2	2.2	0.40	0.67	0.40	77.1
Approach		458	17.6	482	17.6	0.270	1.0	NA	0.2	2.2	0.03	0.06	0.03	98.5
East: Crossover 3 (E)														
7	L2	6	25.0	6	25.0	0.023	1.5	LOS A	0.1	0.9	0.50	0.38	0.50	53.7
9	R2	3	25.0	3	25.0	0.023	15.7	LOS C	0.1	0.9	0.50	0.38	0.50	54.9
Approach		9	25.0	9	25.0	0.023	6.3	LOS A	0.1	0.9	0.50	0.38	0.50	54.1
North: Korgotich Rd (N)														
10	L2	13	25.0	14	25.0	0.011	8.8	LOS A	0.0	0.0	0.00	0.66	0.00	82.2
11	T1	214	16.4	225	16.4	0.137	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
Approach		227	16.9	239	16.9	0.137	0.5	NA	0.0	0.0	0.00	0.04	0.00	99.2
All Vehicles		694	17.5	731	17.5	0.270	0.9	NA	0.2	2.2	0.03	0.06	0.03	98.2

MOVEMENT SUMMARY

Site: [Crossover 3 & Korgotich Rd - 2041 - PM (Site Folder: 2041 - PM)]

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

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV %	[Total veh/h	HV %				[Veh. veh	Dist] m				
South: Korgotich Rd (S)														
5	T1	233	16.9	245	16.9	0.149	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
6	R2	13	25.0	14	25.0	0.029	14.3	LOS B	0.1	1.2	0.60	0.80	0.60	72.9
Approach		246	17.3	259	17.3	0.149	0.8	NA	0.1	1.2	0.03	0.04	0.03	98.9
East: Crossover 3 (E)														
7	L2	36	25.0	38	25.0	0.193	6.4	LOS A	0.7	7.4	0.74	0.75	0.75	50.9
9	R2	16	25.0	17	25.0	0.193	23.7	LOS C	0.7	7.4	0.74	0.75	0.75	52.2
Approach		52	25.0	55	25.0	0.193	11.7	LOS B	0.7	7.4	0.74	0.75	0.75	51.3
North: Korgotich Rd (N)														
10	L2	5	25.0	5	25.0	0.004	8.8	LOS A	0.0	0.0	0.00	0.66	0.00	82.2
11	T1	524	16.4	552	16.4	0.334	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	99.8
Approach		529	16.5	557	16.5	0.334	0.2	NA	0.0	0.0	0.00	0.01	0.00	99.7
All Vehicles		827	17.3	871	17.3	0.334	1.1	NA	0.7	7.4	0.06	0.06	0.06	96.4

MOVEMENT SUMMARY

Site: [Mundijong Rd & Korgotich Rd - 2041 - AM (Site Folder: 2041 - AM)]

Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[Total veh/h]	[HV %]	[Total veh/h]	[HV %]				[Veh. veh]	[Dist m]				
South: Korgotich Rd (S)														
10	L2	34	17.2	36	17.2	0.331	13.1	LOS B	1.6	14.6	0.77	0.92	0.82	33.7
11	T1	100	16.9	105	16.9	0.331	13.9	LOS B	1.6	14.6	0.77	0.92	0.82	70.1
12	R2	25	17.2	26	17.2	0.331	19.7	LOS B	1.6	14.6	0.77	0.92	0.82	61.9
Approach		159	17.0	167	17.0	0.331	14.7	LOS B	1.6	14.6	0.77	0.92	0.82	61.6
East: Mundijong Rd (E)														
1	L2	62	16.4	65	16.4	0.444	8.6	LOS A	3.6	32.0	0.60	0.62	0.60	63.4
2	T1	850	15.5	895	15.5	0.444	9.7	LOS A	3.6	32.0	0.61	0.63	0.61	34.0
3	R2	11	16.9	12	16.9	0.444	15.6	LOS B	3.4	30.4	0.63	0.65	0.63	69.7
Approach		923	15.6	972	15.6	0.444	9.7	LOS A	3.6	32.0	0.61	0.63	0.61	35.9
North: Korgotich Rd (N)														
4	L2	26	16.3	27	16.3	0.537	17.0	LOS B	3.3	28.6	0.87	1.02	1.12	69.9
5	T1	28	16.4	29	16.4	0.537	18.0	LOS B	3.3	28.6	0.87	1.02	1.12	71.3
6	R2	171	14.6	180	14.6	0.537	23.4	LOS C	3.3	28.6	0.87	1.02	1.12	64.7
Approach		225	15.0	237	15.0	0.537	22.0	LOS C	3.3	28.6	0.87	1.02	1.12	66.1
West: Mundijong Rd (W)														
7	L2	353	16.9	372	16.9	0.659	8.4	LOS A	6.9	61.3	0.63	0.59	0.63	68.2
8	T1	1150	16.3	1211	16.3	0.659	9.5	LOS A	6.9	61.3	0.66	0.60	0.66	61.3
9	R2	4	16.4	4	16.4	0.659	15.3	LOS B	6.7	58.9	0.67	0.61	0.67	59.8
Approach		1507	16.4	1586	16.4	0.659	9.2	LOS A	6.9	61.3	0.65	0.60	0.65	63.9
All Vehicles		2814	16.1	2962	16.1	0.659	10.7	LOS B	6.9	61.3	0.66	0.66	0.69	53.3

MOVEMENT SUMMARY

Site: [Mundijong Rd & Korgotich Rd - 2041 - PM (Site Folder: 2041 - PM)]

Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[Total veh/h]	[HV %]	[Total veh/h]	[HV %]				[Veh. veh]	[Dist m]				
South: Korgotich Rd (S)														
10	L2	21	17.2	22	17.2	0.489	21.5	LOS C	2.8	25.0	0.91	1.02	1.14	30.5
11	T1	46	16.9	48	16.9	0.489	22.3	LOS C	2.8	25.0	0.91	1.02	1.14	63.7
12	R2	62	17.2	65	17.2	0.489	28.1	LOS C	2.8	25.0	0.91	1.02	1.14	52.8
Approach		129	17.1	136	17.1	0.489	25.0	LOS C	2.8	25.0	0.91	1.02	1.14	53.6
East: Mundijong Rd (E)														
1	L2	25	16.4	26	16.4	0.914	31.2	LOS C	22.7	201.7	1.00	1.31	2.18	46.7
2	T1	1242	15.5	1307	15.5	0.914	34.4	LOS C	22.7	201.7	1.00	1.34	2.23	26.9
3	R2	18	16.9	19	16.9	0.914	43.1	LOS D	19.9	176.5	1.00	1.38	2.29	55.4
Approach		1285	15.5	1353	15.5	0.914	34.5	LOS C	22.7	201.7	1.00	1.34	2.23	27.6
North: Korgotich Rd (N)														
4	L2	63	16.3	66	16.3	1.048	83.2	LOS F	37.1	323.4	1.00	2.18	5.75	41.9
5	T1	135	16.4	142	16.4	1.048	84.1	LOS F	37.1	323.4	1.00	2.18	5.75	42.9
6	R2	400	14.6	421	14.6	1.048	89.5	LOS F	37.1	323.4	1.00	2.18	5.75	38.7
Approach		598	15.2	629	15.2	1.048	87.6	LOS F	37.1	323.4	1.00	2.18	5.75	40.0
West: Mundijong Rd (W)														
7	L2	187	16.9	197	16.9	0.419	7.9	LOS A	3.4	30.0	0.48	0.56	0.48	68.7
8	T1	770	16.3	811	16.3	0.419	9.0	LOS A	3.4	30.0	0.49	0.57	0.49	62.6
9	R2	3	16.4	3	16.4	0.419	14.7	LOS B	3.3	28.7	0.50	0.57	0.50	61.2
Approach		960	16.4	1011	16.4	0.419	8.8	LOS A	3.4	30.0	0.49	0.57	0.49	64.6
All Vehicles		2972	15.8	3128	15.8	1.048	36.5	LOS D	37.1	323.4	0.83	1.25	2.33	39.2

MOVEMENT SUMMARY

Site: [Mundijong Rd & Crossover 4 - 2041 - AM (Site Folder: 2041 - AM)]

Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h]	[HV %]	[Total veh/h]	[HV %]				[Veh. veh]	[Dist m]				
East: Mundijong Rd (E)														
5	T1	910	14.6	958	14.6	0.462	7.6	LOS A	4.8	41.6	0.17	0.51	0.17	81.4
6	R2	415	25.0	437	25.0	0.462	19.6	LOS B	4.7	49.3	0.19	0.71	0.19	55.1
Approach		1325	17.9	1395	17.9	0.462	11.4	LOS B	4.8	49.3	0.17	0.57	0.17	71.7
North: Crossover 4 (N)														
7	L2	104	25.0	109	25.0	0.203	3.8	LOS A	1.0	11.4	0.78	0.78	0.78	45.8
9	R2	13	25.0	14	25.0	0.038	5.3	LOS A	0.2	1.8	0.73	0.70	0.73	31.5
Approach		117	25.0	123	25.0	0.203	4.0	LOS A	1.0	11.4	0.77	0.77	0.77	44.6
West: Mundijong Rd (W)														
10	L2	52	25.0	55	25.0	0.639	16.1	LOS B	7.3	65.7	0.86	0.88	1.05	37.4
11	T1	1149	16.3	1209	16.3	0.639	14.6	LOS B	7.3	65.7	0.87	0.91	1.09	70.1
Approach		1201	16.7	1264	16.7	0.639	14.6	LOS B	7.3	65.7	0.86	0.91	1.09	69.0
All Vehicles		2643	17.6	2782	17.6	0.639	12.5	LOS B	7.3	65.7	0.51	0.73	0.62	68.9

MOVEMENT SUMMARY

Site: [Mundijong Rd & Crossover 4 - 2041 - PM (Site Folder: 2041 - PM)]

Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h]	[HV %]	[Total veh/h]	[HV %]				[Veh. veh]	[Dist m]				
East: Mundijong Rd (E)														
5	T1	1214	14.6	1278	14.6	0.507	8.2	LOS A	5.1	43.8	0.43	0.53	0.43	79.9
6	R2	143	25.0	151	25.0	0.507	20.5	LOS C	4.9	45.5	0.46	0.59	0.46	56.8
Approach		1357	15.7	1428	15.7	0.507	9.5	LOS A	5.1	45.5	0.44	0.54	0.44	77.1
North: Crossover 4 (N)														
7	L2	571	25.0	601	25.0	0.812	9.9	LOS A	7.8	87.5	0.90	1.51	1.51	43.5
9	R2	71	25.0	75	25.0	0.160	5.0	LOS A	0.6	6.9	0.65	0.65	0.65	31.6
Approach		642	25.0	676	25.0	0.812	9.3	LOS A	7.8	87.5	0.87	1.41	1.41	42.5
West: Mundijong Rd (W)														
10	L2	18	25.0	19	25.0	0.365	10.7	LOS B	2.8	25.0	0.47	0.56	0.47	39.1
11	T1	878	16.3	924	16.3	0.365	8.9	LOS A	2.8	25.0	0.49	0.57	0.49	73.0
Approach		896	16.5	943	16.5	0.365	8.9	LOS A	2.8	25.0	0.49	0.57	0.49	72.5
All Vehicles		2895	18.0	3047	18.0	0.812	9.3	LOS A	7.8	87.5	0.55	0.74	0.67	65.8