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# Caloundra South Town Centre VISUM Modelling Report

Prepared for Stockland  
April 2016



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# Stockland

## Caloundra South Town Centre

### VISUM Modelling Report

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# 1 Introduction

The Caloundra South project is one of the largest mixed use projects in Australia with a predicted population of 50,000 persons and a development horizon of 25 to 35 years.

The site, which is located on the southern edge of the Sunshine Coast is the largest greenfield site in a single ownership in South East Queensland. This provides a unique opportunity to undertake appropriate and managed long-term planning.

The proposed development has 19 precincts and includes a broad range of land uses including detached and attached residential dwellings, small to large scale retail developments, commercial and showroom precincts, an industrial precinct, integrated sports uses, a suite of public and private schools and an array of cycle ways and pedestrian pathways.

To assess the traffic demand from this development, the Ultimate Caloundra South Transport Model version 5.06 (UCSTM) was developed by MWH on behalf of Stockland.

The UCSTM was developed based on the following requirements:

- Be suitably calibrated for the intended use;
- Be developed utilising data from the strategic Sunshine Coast Travel Forecasting Model (SCFTM) and later modified to incorporate the Sunshine Coast Multi-Modal Model (SCIMMS);
- Be able to validate the Caloundra South road hierarchy utilising the approved Master Plan as the base reference document;
- Be able to validate the Bruce Highway mid-block 'south facing ramp' interchange;
- Be able to accurately provide the intersection forms and associated land requirements for road network infrastructure from 'collector' status or above; and
- Be able to determine an efficient road network by optimising capacity with development staging.

The UCSTM has been updated as part of this project to account for proposed Town Centre and the modified model is called Town Centre Model (TCM). The purpose of this model is to determine the suitability of proposed land use and infrastructure changes and understand future travel pattern associated with gazetted road network. The model was reviewed by Department of Transport and Main Roads (TMR) and Sunshine Coast Regional Council (SCRC) and approved for further assessment in micro-simulation software VISSIM. The detailed comments and emails have been incorporated in Appendix D. Although the Town Centre model includes circulation within the retail centre, the traffic model approval only applies to gazetted road network.

## 1.1 Model History

This report represents the latest in the evolution of the UCSTM and TCM models. The history of how the model has evolved is described below.

### 1.1.1 Model History

An initial model was developed late 2012 with a report released for comment in February 2013. This model was based on data from SCTFM v3.5.

### 1.1.2 June 2013

Following the release of SCTFMv5, the model was refined and released to DTMR and SCRC for comment in June 2013. No documentation accompanied the model at this time. The following summarises the changes.

- A re-validated base year on new supplied counts
- New future year matrix was developed with cordon matrix, trip generation, distribution and time period splits based on SCTFM v5.
- Modified Caloundra Rd / Kawana Arterial interchange. The existing roundabout was retained on Caloundra Rd with Kawana Arterial as discussed with SCRC
- Minor intersection modifications
- Ultimate Caloundra South Transport Model Revised Model Development Report

### 1.1.3 October 2013

A report released in October (rev 7) which was based on the June 2013 release of the model. There were some minor network changes to the model to remove some route choice issues. The modifications included removing u-turns.

The first October report (rev 7) was update to produce the October report (rev 7.01). It includes a number of changes to fix some reporting errors and clarify some addition point. There were no changes to the model. Changes included:

- Updating the report with the SCTFM v5 trip generation factors;
- Clarification of mode share targets;
- Defining the process for producing the future year matrix; and
- Minor typographical changes.

### 1.1.4 November 2013

A further modification to the model was made and represents the results in this version of the report. A summary of the changes include:

- Removal of the industrial link road between Racecourse Rd and Precinct 13;
- Increased the number of connectors around the Town Centre from 3 to 7 and provided a more realistic spread of traffic on each connector;
- Minor intersection and signal timing modifications to accommodate changed route choice and removed some midblock u-turns to fix route choice issues;
- Changed the Caloundra Rd / Kawana Arterial interchange back to the plans provided by TMR;
- Modified the Bruce Highway / Bells Ck Rd interchange to provide more direct access from Bruce Highway to Kawana Arterial;
- Modified the road hierarchy and number of lanes in the model to reflect what is being proposed; and
- Included local road network details and added new connectors in the industrial precinct off Racecourse Rd, north of the Caloundra South development area.

The report November (rev7.11) supersedes the November (rev7.1). Changes include correct reference to previous SCTFM models, update road hierarchy plan to show intended preserved corridors, and points of clarification.

### 1.1.5 January 2016

Additional modifications were made to the model as part of the Caloundra South Town Centre project based on the discussions with TMR, SCRC, DILGP and Stockland. A summary of changes include:

- Disaggregation of zones within the proposed Town Centre based on the Town Centre Master Plan,
- Inclusion of additional zone connectors and stubs to reflect the proposed site access strategy proposed in the Town Centre Master plan, and
- Updates to the proposed transportation network to accurately reflect roads within the Town Centre

The TCM was submitted in October 2015 for approval to all stakeholders. Based on the comments received in December 2015 and January 2016 by SCRC and TMR, the model was revised and re-submitted in March 2016. The final model was approved for micro-simulation modelling by SCRC on 8<sup>th</sup> April 2016 and TMR on 7<sup>th</sup> April 2016. The detailed comments and emails have been incorporated in Appendix D.

## 2 Study Area

This project utilises the UCSTM developed in 2013. However, the study area is limited to the proposed Town Centre. The study area forms a small part of the overall UCSTM and consists of 27 Zones, 14 signalised Intersections, and 37 unsignalised intersections. The regional map and study area location are shown in Figure 2-1.

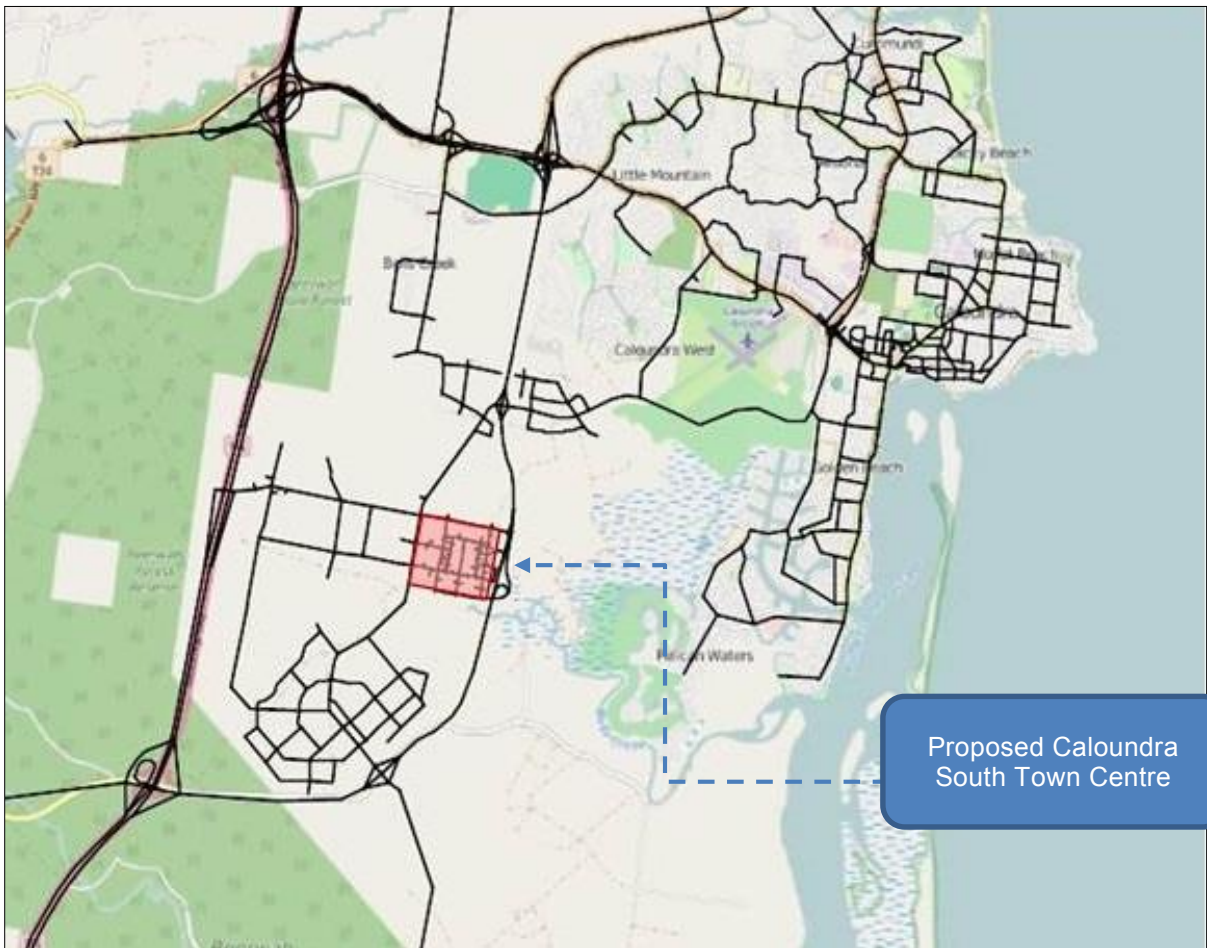


Figure 2-1 Study Area

### 3 Objectives

The objectives of this study include:

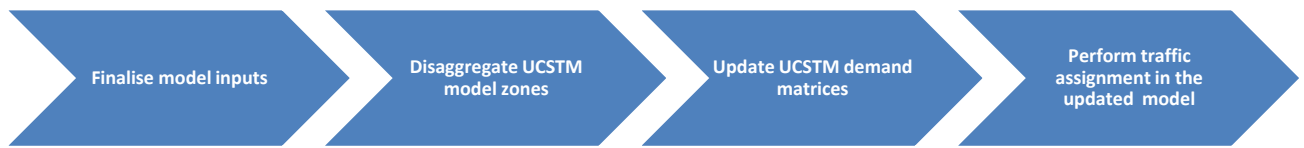
1. Revise the 2013 UCSTM to incorporate land use and infrastructure changes proposed as part of the Town Centre project, and
2. Develop traffic forecasts for the proposed Town Centre in order to use them as part of a micro-simulation exercise to evaluate the proposed transportation network.

### 4 Data Collection

As stated above, this project utilises the calibrated and validated UCSTM approved by the SCRC in November 2013. As a result, fresh primary data such as traffic counts were not collected for this project. Secondary data collected as part of this project included proposed Master Plan, land use data, and demographics data.

### 5 Modelling Approach

Figure 5-1 shows the modelling process which is explained in the following section:



**Figure 5-1 Modelling Approach**

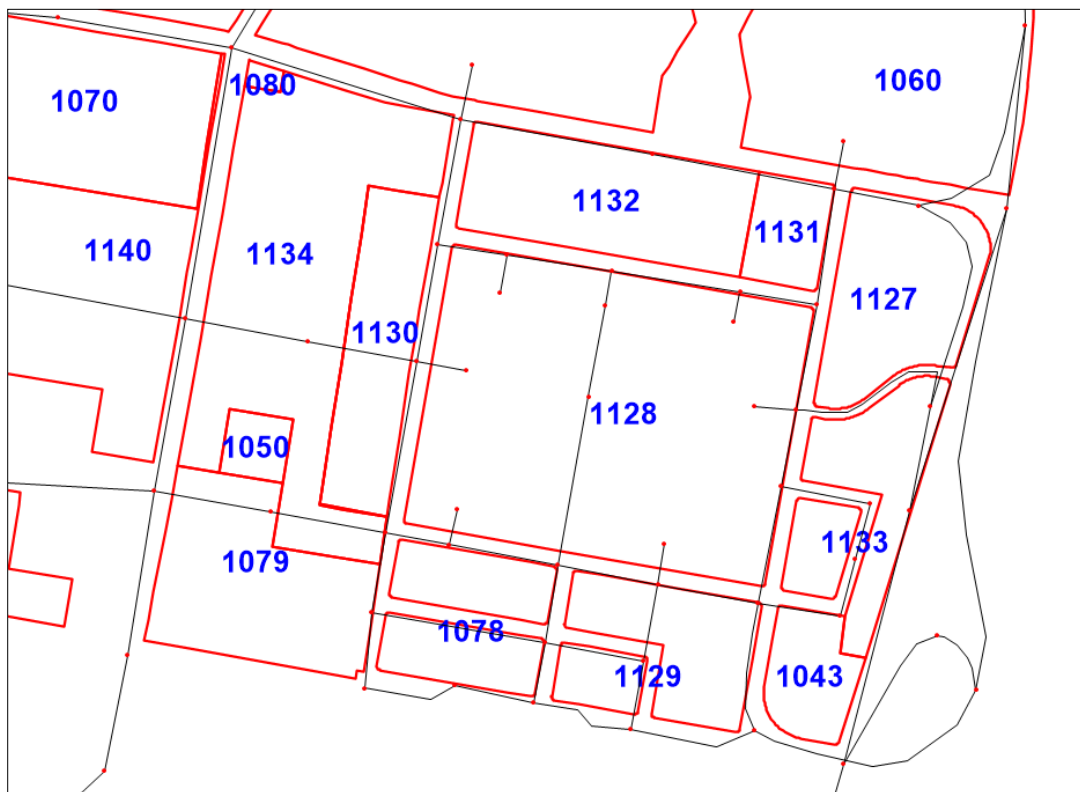
## 5.1 Model Inputs

The major inputs for this modelling exercise include:

- **Proposed road network:** The TCM road network is based on the proposed Town Centre Master Plan. The geometric configurations for the roads were provided by Stockland, and intersection geometries were determined based on an iterative process taking into account traffic flows.
- **Proposed land use/demographics:** Zone level land use sizes for the Town Centre were calculated by MWH based on the Town Centre Master Plan prepared by Urbis.

## 5.2 Disaggregation of Zones

Traffic Analysis Zones 1043, 1050, 1078, 1079, 1080, 1127, 1128, 1129, 1130, 1131, 1132, 1133, and 1134 represent the proposed Town Centre in the 2031+ Ultimate Caloundra South Transport Model (UCSTM). Figure 5-2 shows the zone numbers as modelled in the 2031+ UCSTM.



**Figure 5-2 Existing Zone Numbering Sequence**

The Town Centre zones were disaggregated into multiple smaller zones to account for the presence of diverse land uses such as residential, commercial and retail within the proposed Town Centre.

Table 5-1 and Figure 5-3 show the disaggregated Town Centre zones based on proposed land uses. The disaggregation of zones for the 2031 scenarios will not impact the UCSTM's stability and hence will not require recalibration and revalidation of the base model.

**Table 5-1: Zone Disaggregation Strategy**

Zones	No of Disaggregated Zones	Disaggregated Zone Numbers
1043		Unchanged
1050		Unchanged
1078	2	107801-107802
1079		Unchanged
1080		Deleted
1127	2	112701-112702
1128	12	112801-112812
1129	2	112901-112902
1130		Deleted
1131		Unchanged
1132	2	113201-113202
1133	2	113301-113302
1134		Unchanged

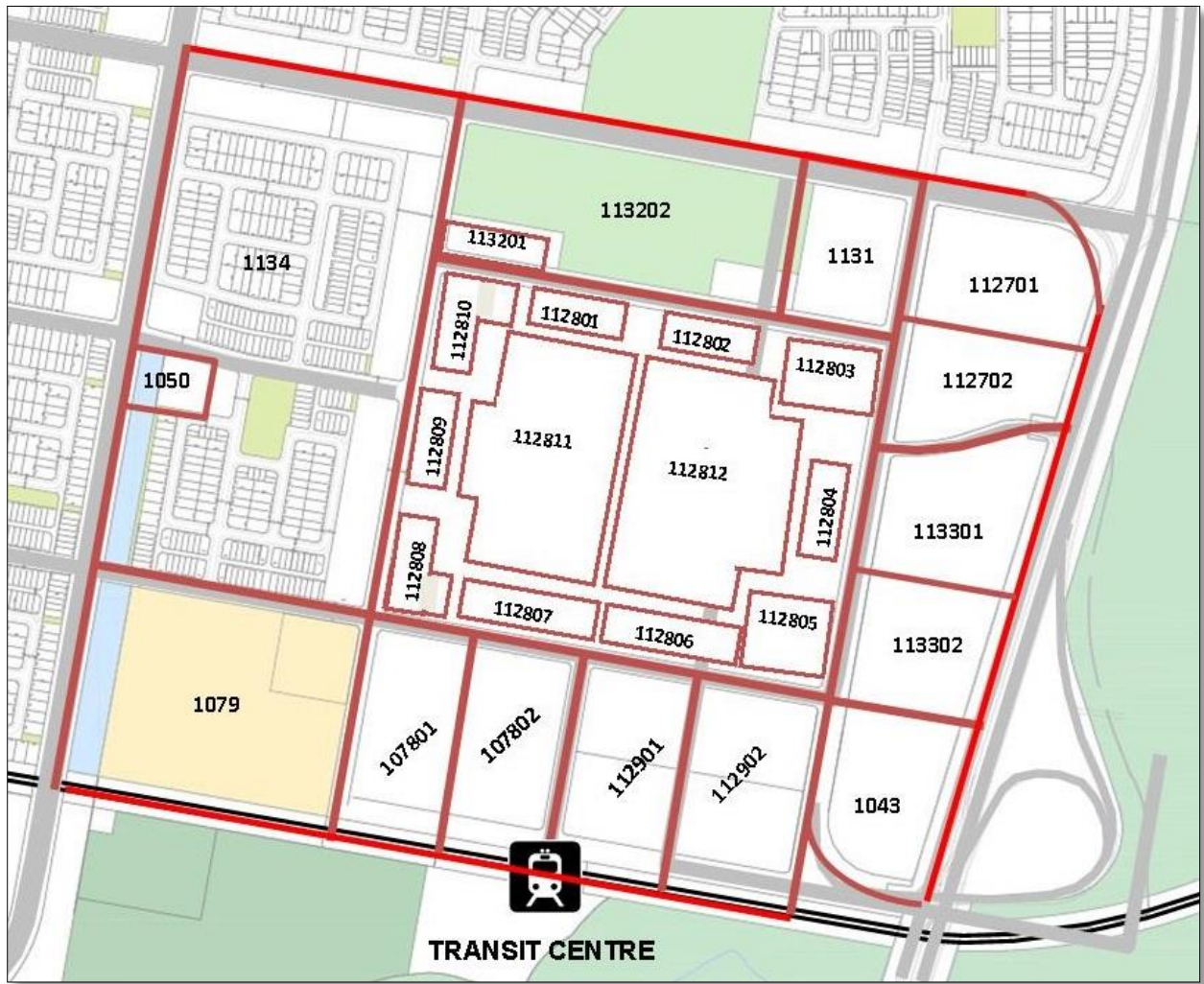


Figure 5-3 Disaggregated Town Centre Zones

The Town Centre zones have been disaggregated based on assumptions explained in sections 5.3 and 5.4.

### 5.3 Land Use Assumptions

Land uses assumed in the zone disaggregation exercise are based on information provided by Urbis and are summarised in Table 5-2.

**Table 5-2: Modelling Assumptions Based Upon Urbis Final GFA Figures**

2031 UCSTM		Dwelling/GFA Assumptions for Design and Traffic/Civil Modelling		2031 Town Centre Zone Disaggregation	
VISUM Zone No.	MWH Land Use Description	No. of Dwellings	GFA (Sq m)	New VISUM Zone No.	Land Use Description
1128	Town Centre Core	460	95,000 (Retail), 5,000 (Commercial), 3,000 (Community)	112811 & 112812	95,000 (Retail), 5,000 (Commercial), 3,000 (Community)  Note: The retail, commercial and community land uses are divided between these two zones based upon Town Centre parking provision split.
				112801-112810	8,000 (Retail), 5,000 (Commercial)  Note: The dwellings, retail and commercial land uses are divided between these ten zones based upon their GFA in Sq m.
1131	Tertiary Education Facility	320	4,000 (Retail) 5,000 (Commercial) 4,000 (People) Student Campus	1131	4,000 (People) Student Campus
1132	Town Centre Core			113201	Residential (320)
		113202	4,000 (Retail), 5,000 (Commercial)		
1127	Town Centre Core	350	8,000 (Retail) 20,000 (Commercial) 2,500 (Community)	112701	4,000 (Retail), 10,000 (Commercial)
				112702	Residential (175)
1133	Town Centre Frame East	350	8,000 (Retail) 20,000 (Commercial) 2,500 (Community)	113301	Residential (175)
				113302	4,000 (Retail), 10,000 (Commercial)
1043	Police Station			1043	Community (2500)

2031 UCSTM		Dwelling/GFA Assumptions for Design and Traffic/Civil Modelling		2031 Town Centre Zone Disaggregation	
VISUM Zone No.	MWH Land Use Description	No. of Dwellings	GFA (Sq m)	New VISUM Zone No.	Land Use Description
1129	Health	400	3,000 (Retail) 10,000 (Commercial)	112901	Residential (400)
				112902	1500 (Retail) 5000 (Commercial)
1078	Regional Community Facility	400	3,000 (Retail) 10,000 (Commercial)	107801	1500 (Retail) 5000 (Commercial)
				107802	Residential (400)
1130	Town Centre Core	800	5,000 (Commercial)	Note: Zone Deleted	
1134	Town Centre Frame West			1134	Residential(800)
1050	Integrated Community Facility			1050	5,000 (Commercial)
1080	Secondary School			Note: Zone Deleted	
1079	Secondary School	-	-	1079	Note: No latest information was given for this zone so previous GFA of 10746 sq. m is used with revised enrolment number of 1,100
Totals		2,730	Retail = 118,000 Commercial = 50,000 Other = 2,500 + 4,000 (people) campus		

## 5.4 State School Enrolment

The student enrolment within the approved UCSTM VISUM model for State School (zone 1079) is 2002. However, based on recent information provided by Urbis, the school enrolment was changed to 1,100 students in the disaggregated 2031+ UCSTM (Town Centre VISUM model).

## 5.5 Town Centre Road Network

The road network for the revised model was based the road network assumed in the 2031+ UCSTM along with inputs provided by Stockland. Once the road network was established, attributes such as functional classifications, speeds, and capacities were decided by comparing against other links used in the 2031+ UCSTM.

### 5.5.1 Functional Classification

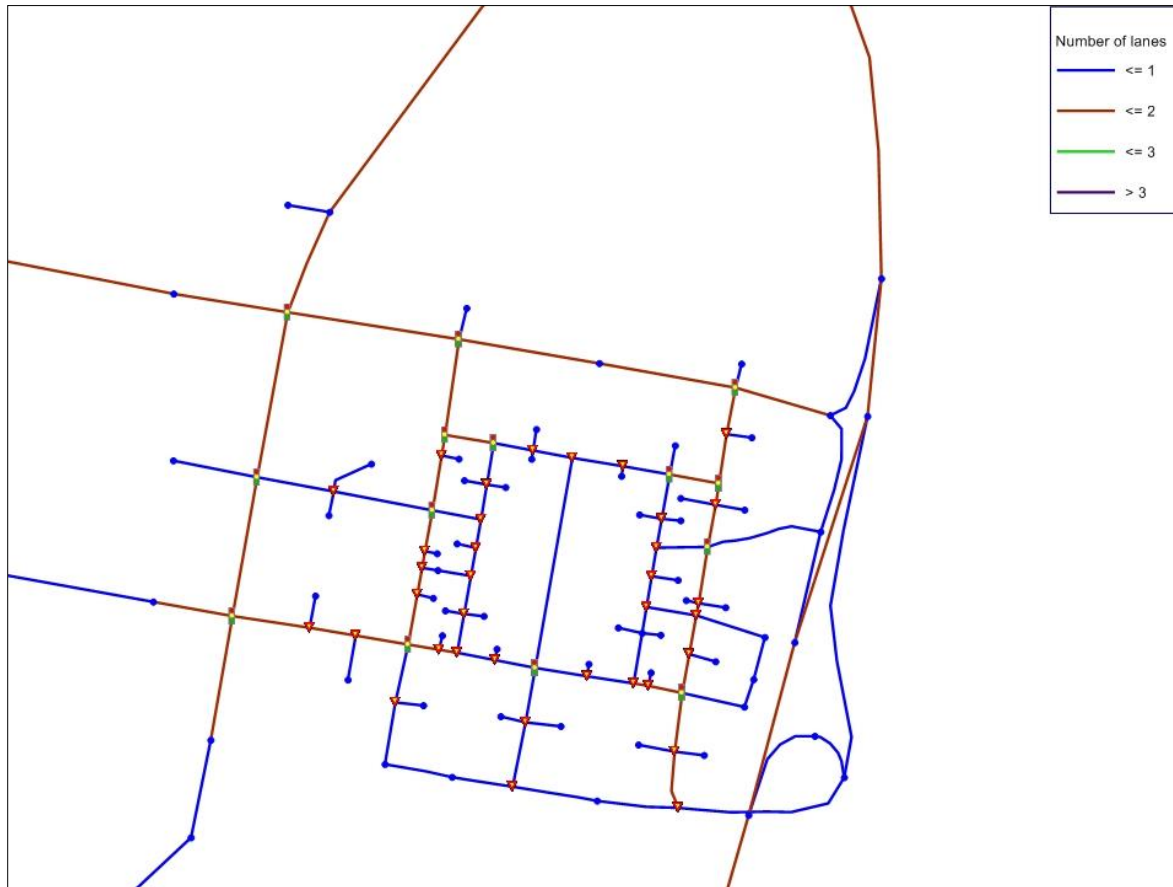
The proposed Bells Creek Arterial and North – South Sub Arterial will provide regional connectivity to and from the Town Centre. Sub-Arterials, Neighbourhood Access, Centre Collector, Centre Access, and Private Thoroughfare will provide local connectivity to and from the Town Centre zones. Functional classification of roads within and in the vicinity of the Town Centre are shown in Figure 5-4. Classification of new links within the Town Centre was conducted by comparing them with similar links at other locations in the model. Classification of 2031+ UCSTM links were kept unchanged except for the East and West Arterials which were coded as Sub-Arterials in the 2031+ UCSTM.



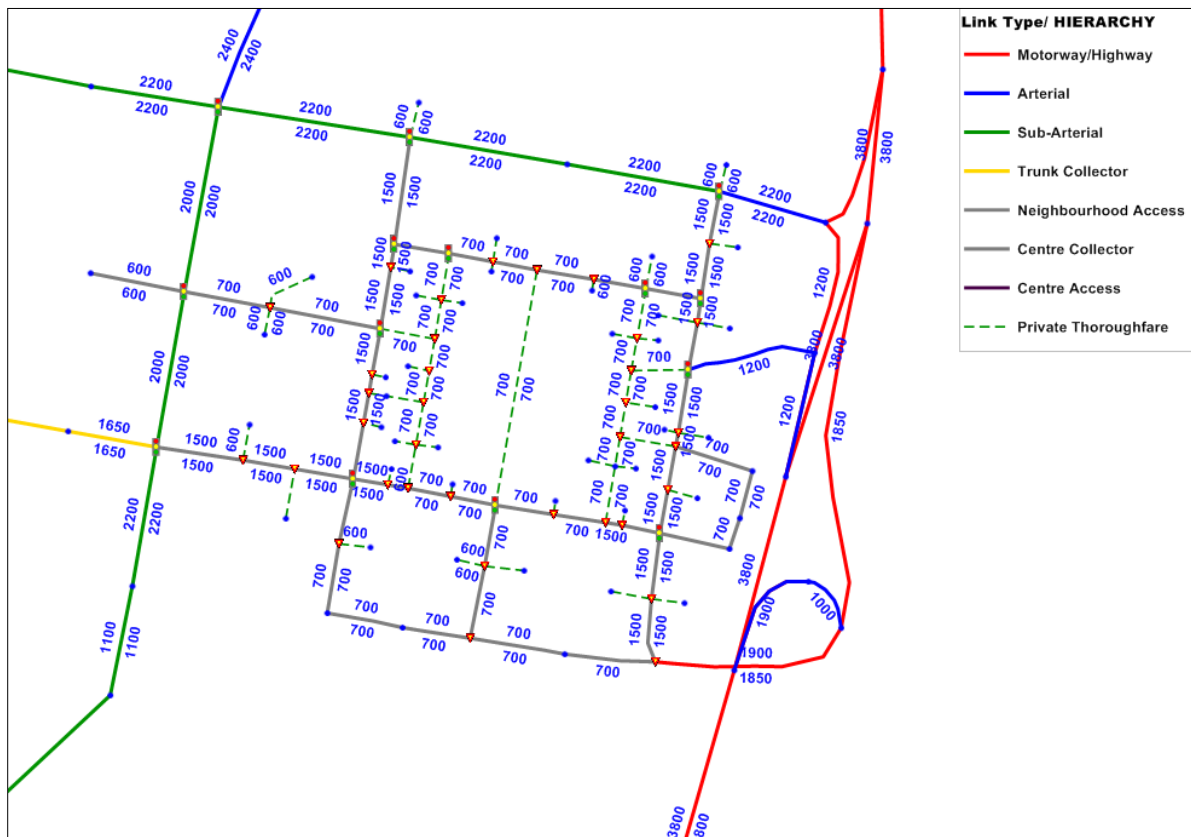
**Figure 5-4: Roadway Functional Classification**

### 5.5.2 Number of Lanes and Road Capacity

Figure 5-5 shows the proposed road capacity for the Town Centre road network along with proposed intersection control types and Figure 5-6 shows the link capacities used for the Town Centre roads. It should be noted that link capacities used in the 2031+ UCSTM were utilised to build the TCM.



**Figure 5-5: Number of Lanes and Intersection Control Type**



**Figure 5-6: Link Capacity for Town Centre Road Network**

### 5.5.3 Intersection Geometry

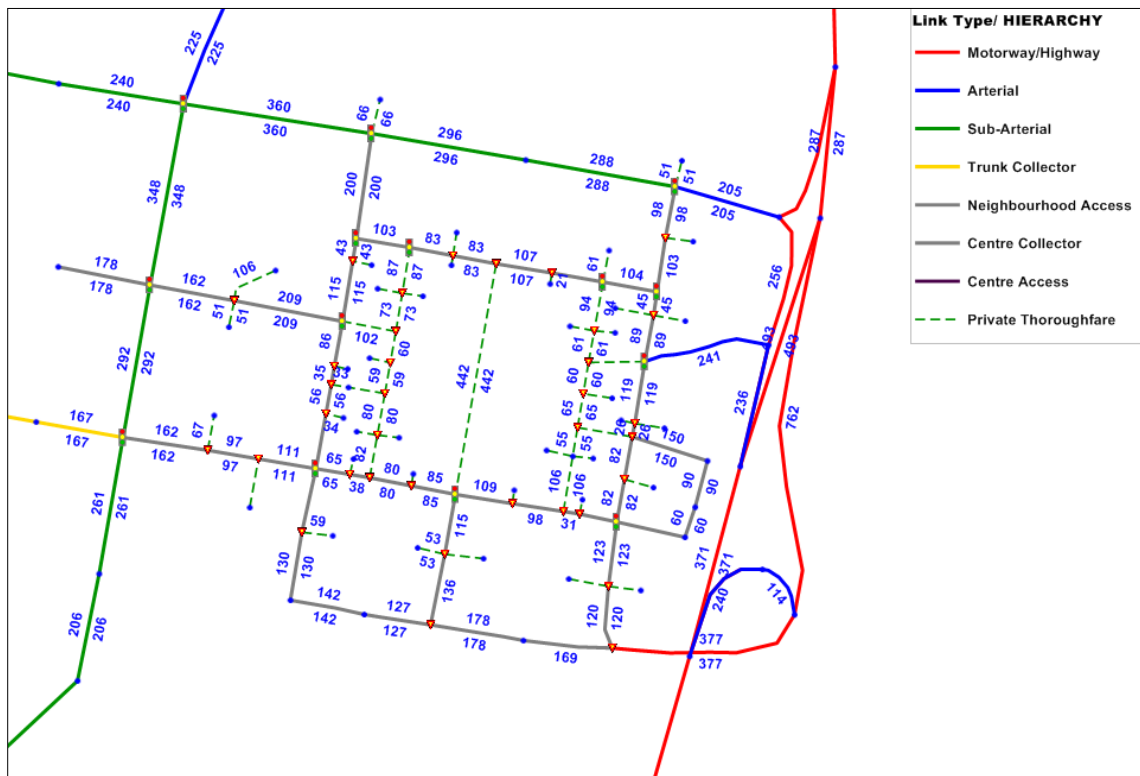
The proposed Town Centre consists of 14 signalised intersections, and 37 unsignalised intersections. Figure 5-7 shows the location of all study area intersections along with numbers assigned to them. Geometric layouts of study area intersections and turn bay lengths at major intersections have been included in Appendix A and Appendix C. It should be noted that proposed bus jumps were not modelled in the TCM as its intent is solely to produce traffic forecasts.



**Figure 5-7: Study Area Intersection Numbers**

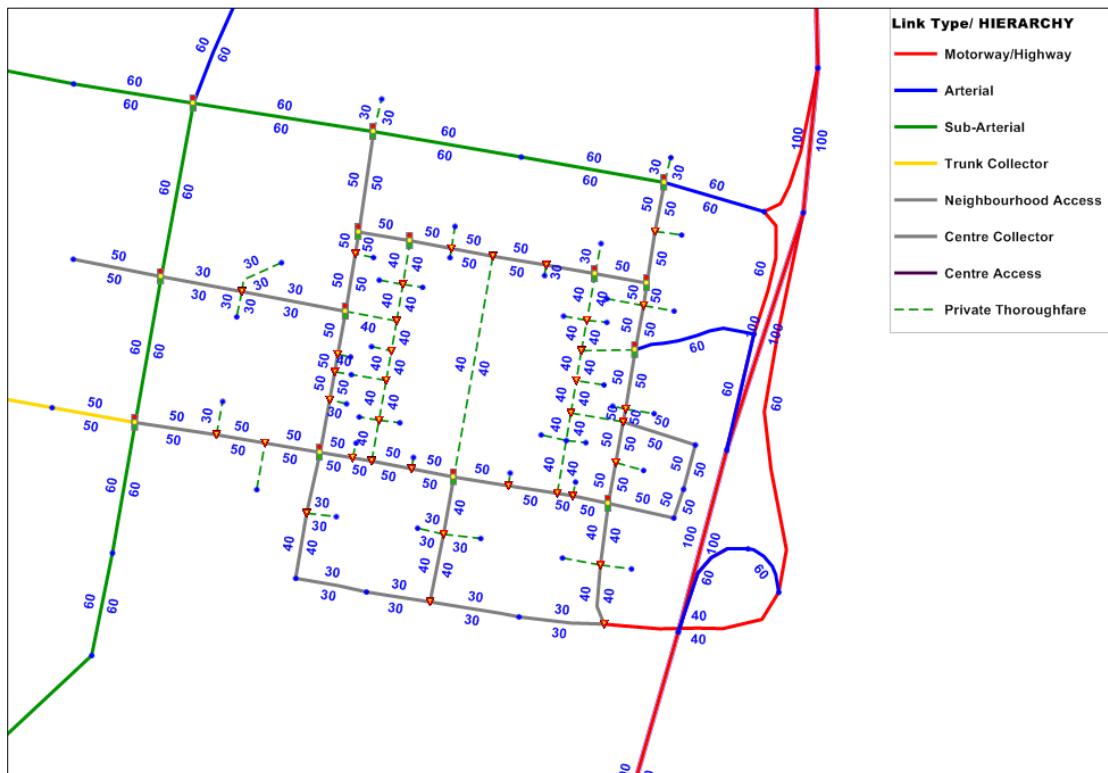
### 5.5.4 Intersection Spacing and Link Speeds

The Town Centre is a major traffic generator and is expected to require traffic signals at its main entrances. As a result, some signalised intersections may have to be located in close proximity of other signals. Figure 5-8 shows the intersection control strategy assumed in the model along with spacing between study area intersections.



**Figure 5-8: Intersection Spacing (metres)**

Figure 5-9 shows speeds in kilometres/hour assumed for the links that form the Town Centre’s road network. Link speeds for the Town Centre road network were provided by Stockland based on their vision for the Town Centre.



**Figure 5-9: Link Speeds (Kilometres/Hour)**

### 5.5.5 Signal Timing Optimisation

The assignment procedure used in the 2031+ UCSTM includes a signal optimisation step. As part of this project, signal phasing was first determined based on the proposed geometry and the signal optimisation step was allowed to optimise green times. Cycle times for all Town Centre intersections were set to 120 seconds with the option of half-cycling at intersections with less traffic.

## 5.6 Traffic Assignment

The revised matrices were reassigned in the Town Centre VISUM model using a modified version of the assignment procedures previously approved and used in the 2031+ UCSTM. The following modifications were made to the assignment procedures to obtain a converged traffic assignment:

1. Executing Equilibrium LUCE assignment with 100 iterations.
2. Running the models with ICA Assignment.

## 6 Demand Modelling

The UCSTM was based on an ultimate demographic dataset for the proposed Caloundra South development, with a development period in the order of 25 to 35 years from year of opening. The 2031 SCTFM models were utilised along with the Caloundra South 'full build' scenario as the most likely representation of the ultimate scenario, 2031+ forecast year. For the Town Centre model, the 2031+ forecast scenario was modified to incorporate the land use data proposed in the TCM.

### 6.1 Trip Generation

Time period and mode choice parameters were also based upon those used within the 2031+ UCSTM. The parameters applied within the 2031+ TCM have been taken from the travel sector 'Caloundra Urban South' and can be found in Tables 8 through 12 of the *UCTSM Revised Model Development Report Rev 7.11* submitted in November 2013.

### 6.2 Mode Share

The 2031+ UCSTM is based on static mode share percentages derived from TMR's Household Travel Surveys as well as its *Connecting Southeast Queensland 2031* targets. The final mode shares were further distinguished as Not Town Centre and Town Centre and are presented Tables 15 and 16 of the *UCTSM Revised Model Development Report Rev 7.11*.

### 6.3 Trip Distribution

Trip length distribution in the 2031+ UCSTM was based on the SCTFMv5 trip distribution. Origin and destination totals for each of the Caloundra South zones in the 2031+ UCSTM were estimated and then used within a furnishing process using the SCFTMv5 origin destination matrix supplied by SCRC. The 2031+ TCM uses the same trip distribution parameters, the details of which can be found in Tables 18 through 21 of the *UCTSM Revised Model Development Report Rev 7.11* submitted in November 2013.

### 6.4 Assignment

The following section provides model network plots extracted from the 2031+ TCM. Plots include:

- Traffic volumes (AM peak hour, and PM peak hour),

- Link Level of service, and
- Intersection Level of service

### 6.4.1 Traffic Volumes

Link level traffic volumes and intersection turning movement counts are shown in Figure 6-1 and Figure 6-2. The 2031 Forecast Link traffic volumes indicate a vast majority of trips use the Bells Creek Arterial and North –South Sub-arterial to access the site. Turn volumes of study area intersections have been included in Appendix B.

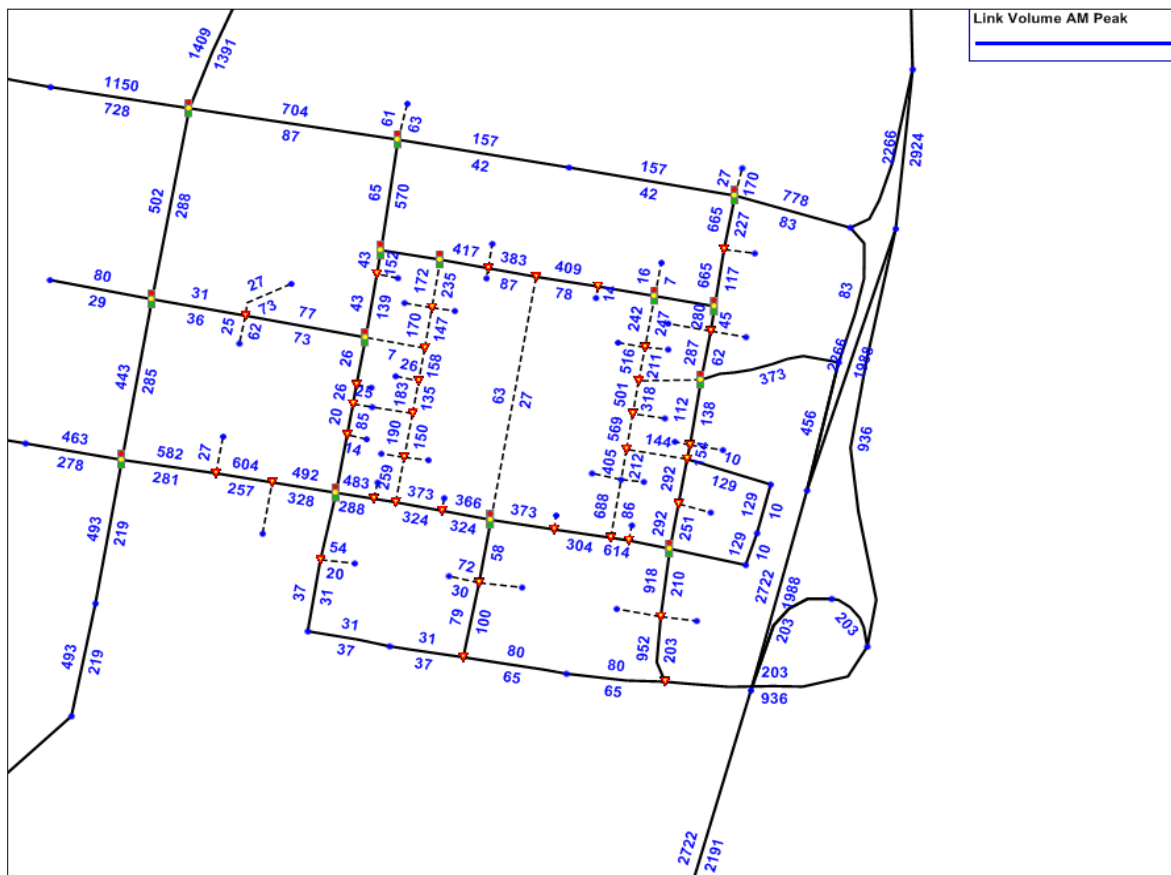
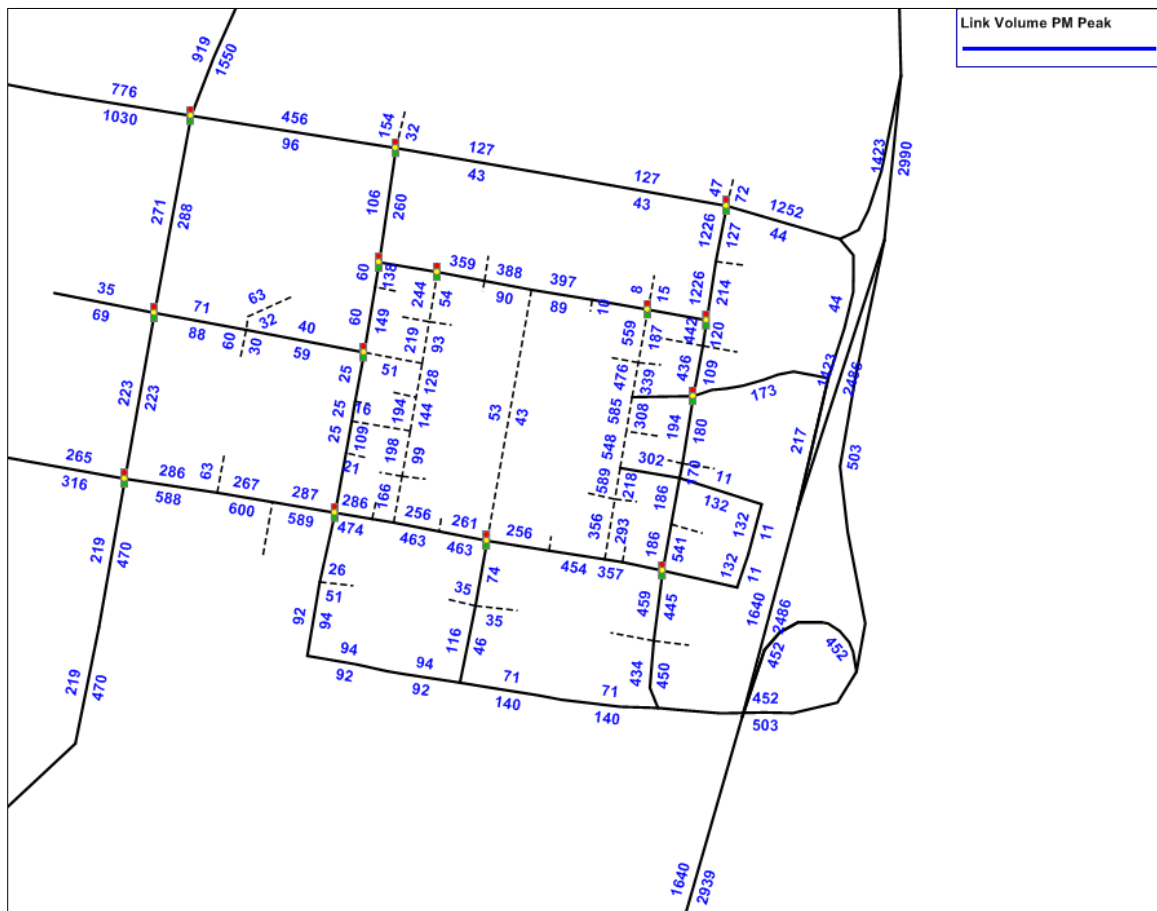


Figure 6-1: 2031 Link AM Peak Traffic Volumes



**Figure 6-2: 2031 Link PM Peak Traffic Volumes**

### 6.4.2 Link Level of Service (LOS)

Link LOS was determined using AustRoads Part 2 together with the HCM 2010 (Exhibit 11-17) using each links volume on capacity (V/C) ratio and is summarised in Table 6-1.

**Table 6-1: Link Level of Service Thresholds**

Level of Service	V/C
LOS A	$\leq 35\%$
LOS B	$35\% < v/c \leq 55\%$
LOS C	$55\% < v/c \leq 80\%$
LOS D	$80\% < v/c \leq 95\%$
LOS E	$95\% < v/c \leq 100\%$
LOS F	$v/c > 100\%$

As shown in Figure 6-3, approximately 98.3% and 96.6% of the study area links operate at LOS C or better, during the AM and PM peak periods, respectively.

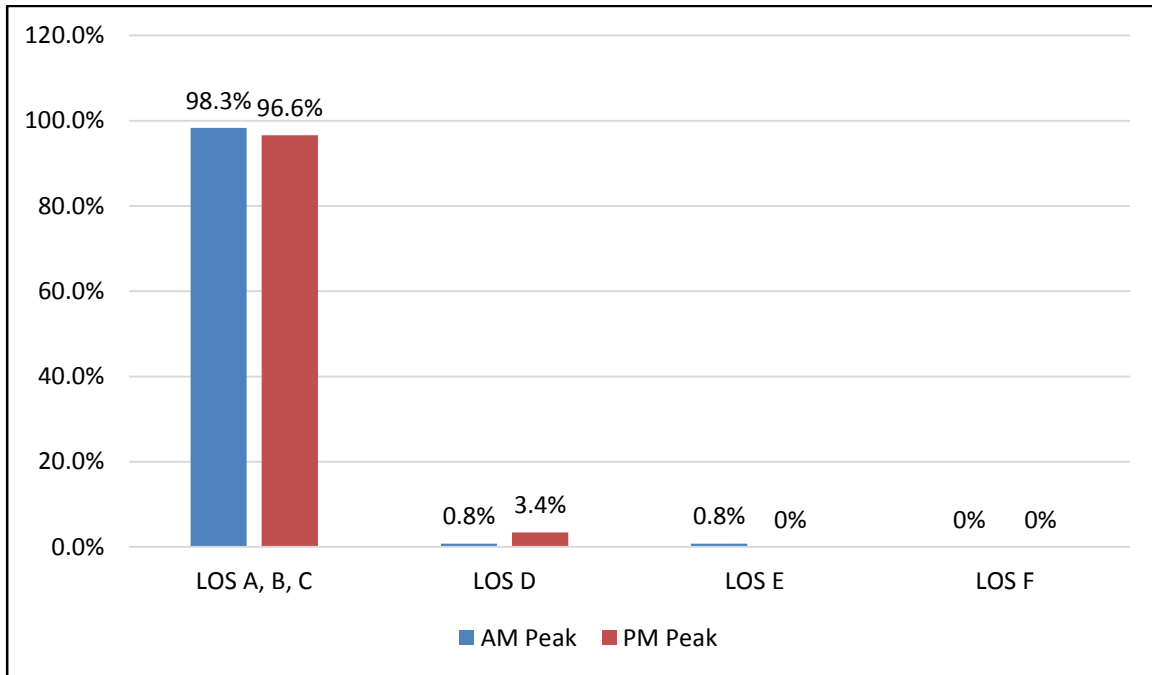


Figure 6-3: Link LOS Distribution

A graphical representation of 2031 AM and PM peak hour link LOS is provided in Figure 6-4 and Figure 6-5, respectively.



Figure 6-4: 2031 AM Peak Link LOS



**Figure 6-5: 2031 PM Peak Link LOS**

### 6.4.3 Intersection Level of Service (LOS)

Signalised intersections LOS were determined using the average delay over the intersection recommended by in HCM 2010. The thresholds for intersection LOS are summarised in Table 6-2. For roundabouts and priority intersections, the worst movement is used to represent the intersection LOS.

**Table 6-2: Intersection Level of Service Thresholds**

Level of Service	Control Delay/Sec
LOS A	$d \leq 10$
LOS B	$10 < d \leq 20$
LOS C	$20 < d \leq 35$
LOS D	$35 < d \leq 55$
LOS E	$55 < d \leq 80$
LOS F	$80 < d$

As shown in Figure 6-6 and Figure 6-7 , approximately 64.3% and 71.4% of the signalized study area intersections and 97.3% and 97.3% of unsignalised intersections operate at LOS C or better, respectively.

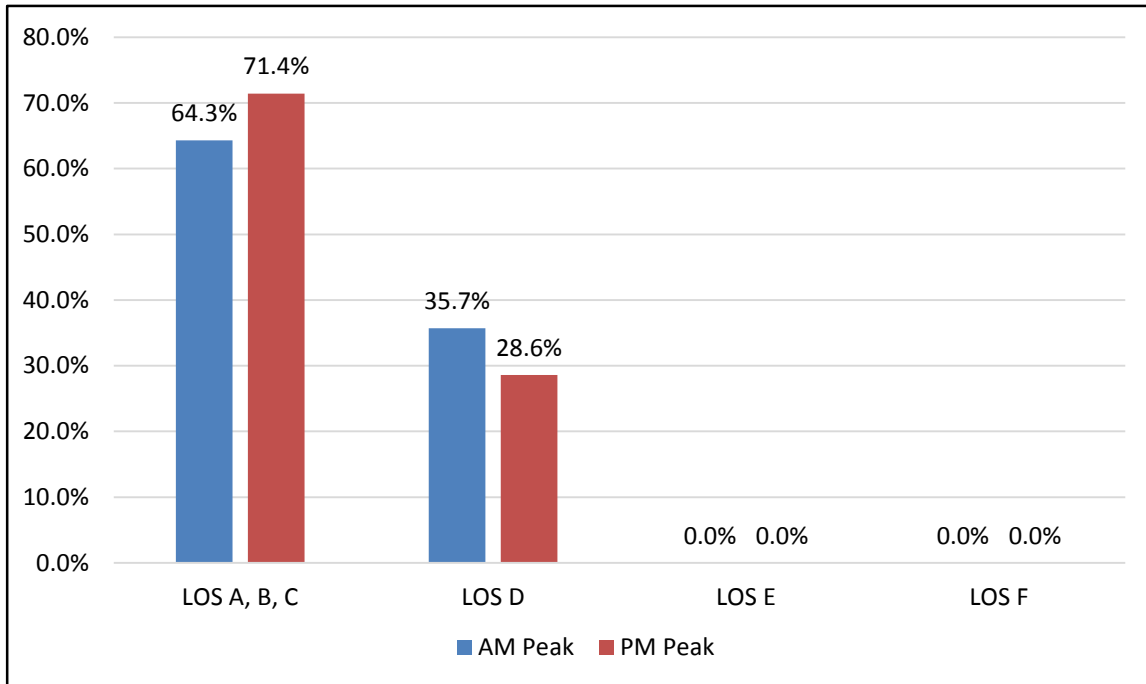


Figure 6-6: Intersection LOS Distribution (Signalised)

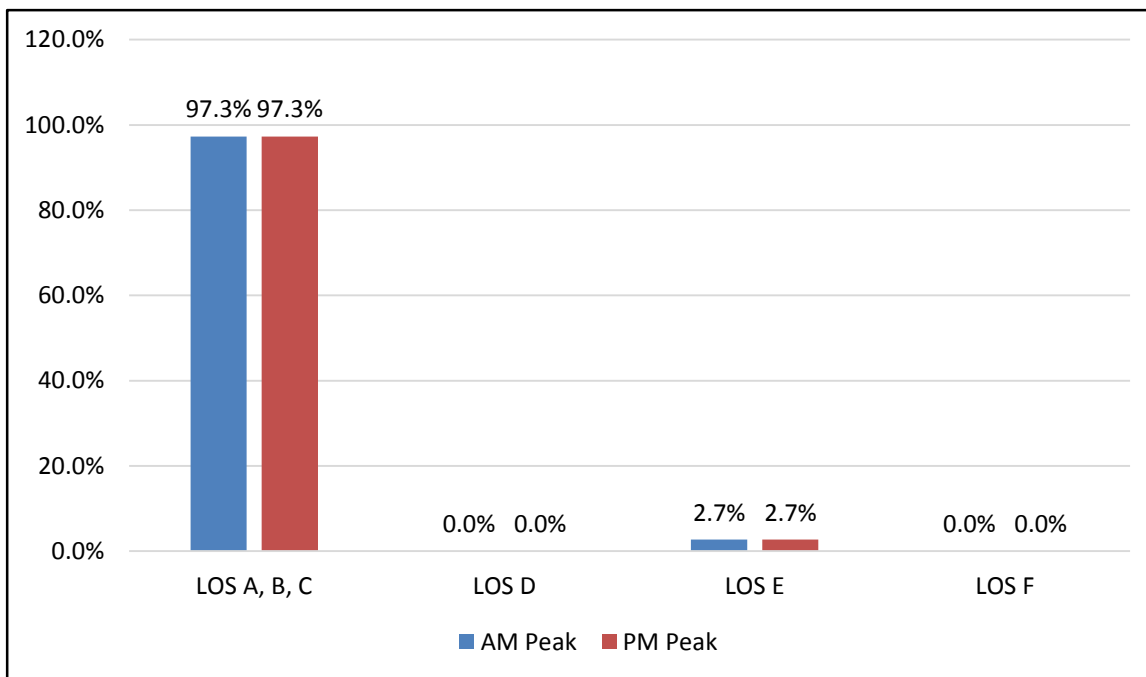


Figure 6-7: Intersection LOS Distribution (Unsignalised)

A graphical representation of 2031 AM and PM peak hour signalized intersection LOS is provided in Figure 6-8 to Figure 6-9 respectively.



Figure 6-8: 2031 Intersection Level of Service AM Peak (Signalised)



Figure 6-9: 2031 Intersection Level of Service PM Peak (Signalised)

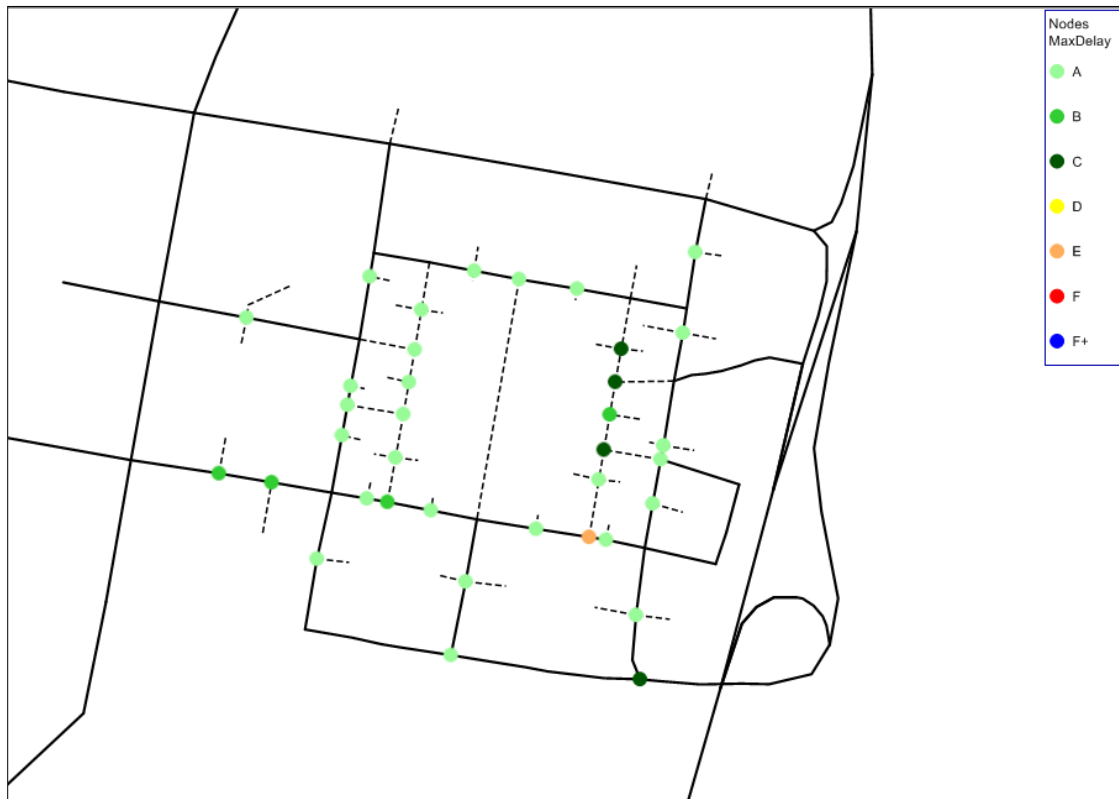


Figure 6-10: 2031 Nodes Level of Service AM Peak (Unsignalised)



Figure 6-11: 2031 Nodes Level of Service PM Peak (Unsignalised)

## 7 Conclusion

The 2031+ TCM model has been developed by updating the 2031+ UCSTM for use within this study. As part of the project, updated forecast demographics and trip generation for the proposed Town Centre development have been disaggregated in to smaller zones to accurately reflect the proposed land use strategy proposed in the Town Centre Master Plan. Further, the road network has also been updated in accordance with the Master Plan.

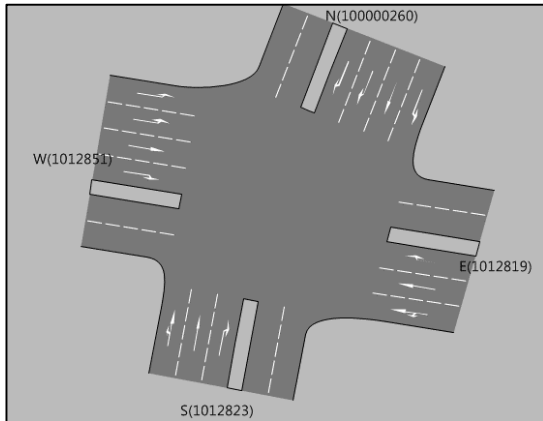
The updated Town Centre area in the model consists of 27 Zones, 14 signalised Intersections, and 37 unsignalised intersections.

Trip generation, distribution, and mode choice parameters used in the approved 2031+ UCSTM have been used in the 2031+ TCM. Minor changes have been made to the assignment procedure in order to improve the model's ability to attain convergence.

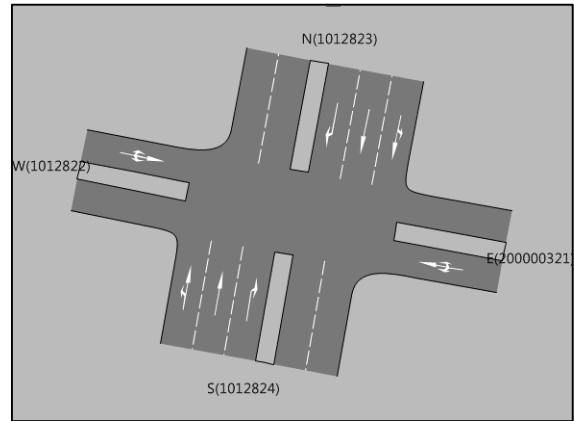
The Sunshine Coast Regional Council (SCRC) and Transport and Main Roads (TMR) have been actively involved throughout the model build and review process. The model was revised to address the comments received from stakeholders and the final model was approved by SCRC and TMR on 8th and 7th April 2016 respectively for further assessment in micro-simulation software VISSIM. Although the Town Centre model includes circulation within the retail centre, the traffic model approval only applies to gazetted road network

The 2031 Town Centre model results indicate that the proposed traffic network operates efficiently with the model predicting over 97% of the network links (mid-blocks) and 83 % of intersections operating at a level of service of C or better

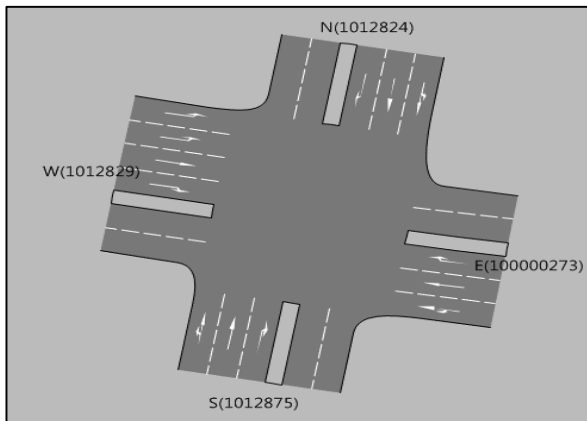
## Appendix A Intersection Geometries



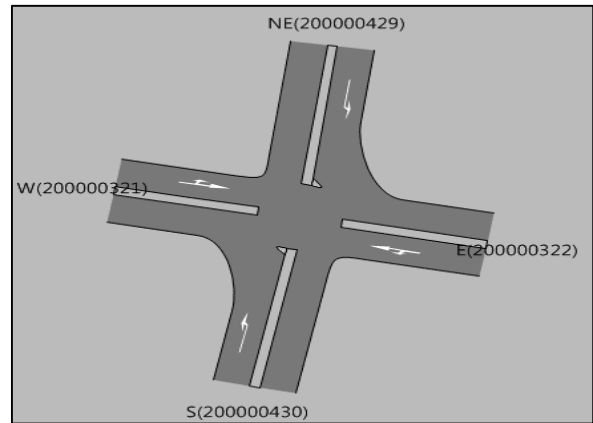
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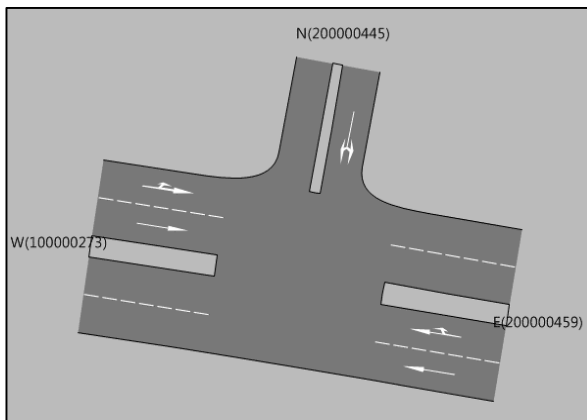
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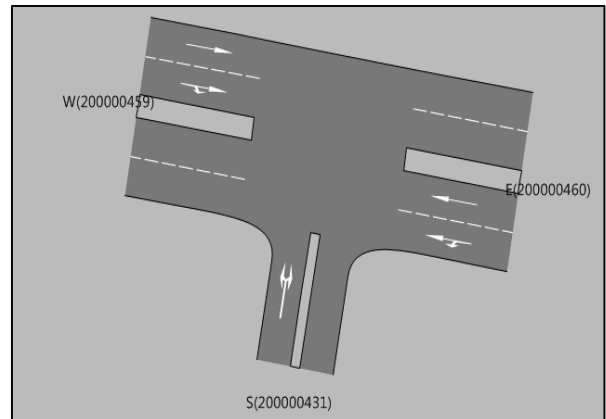
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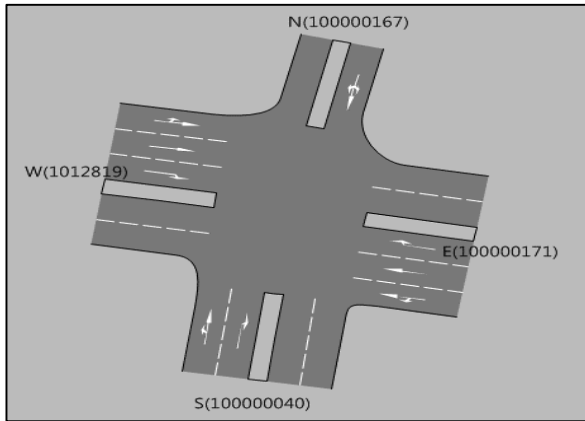
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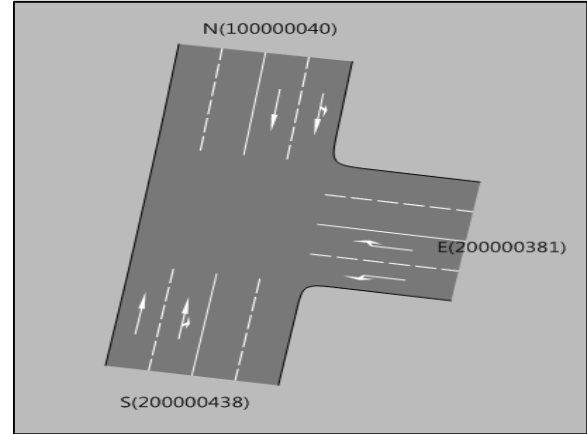
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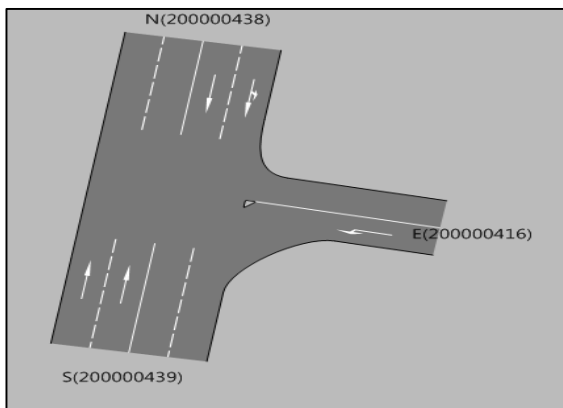
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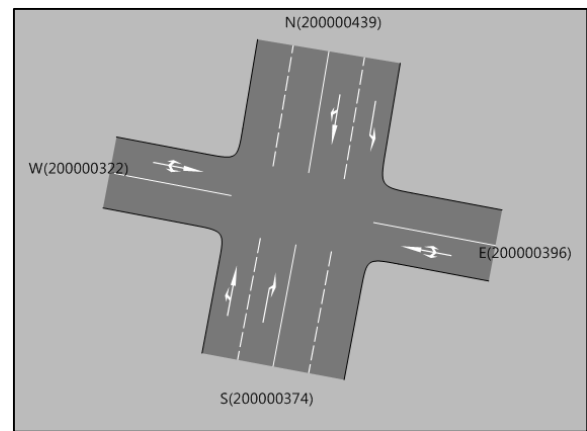
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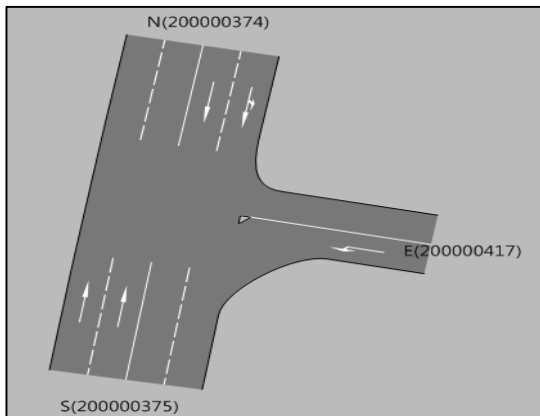
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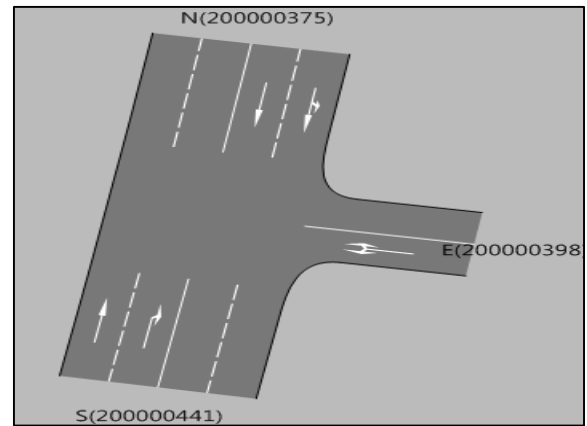
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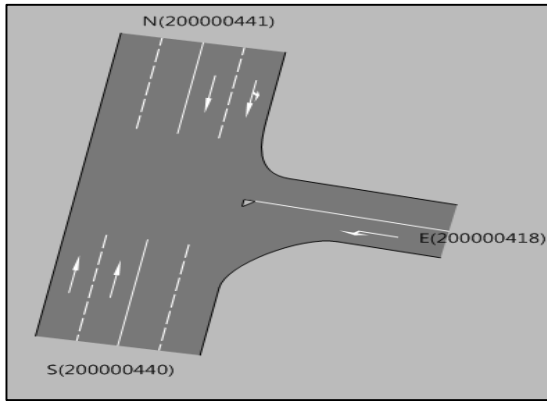
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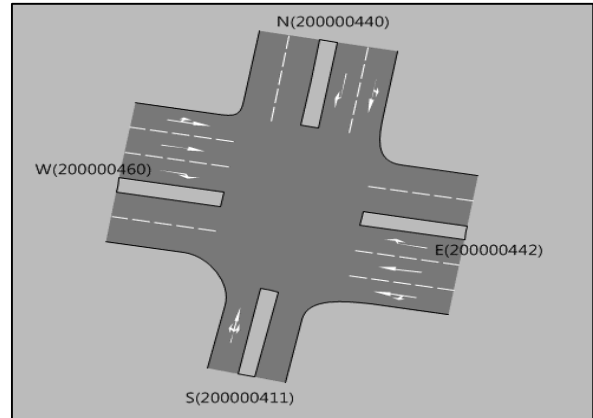
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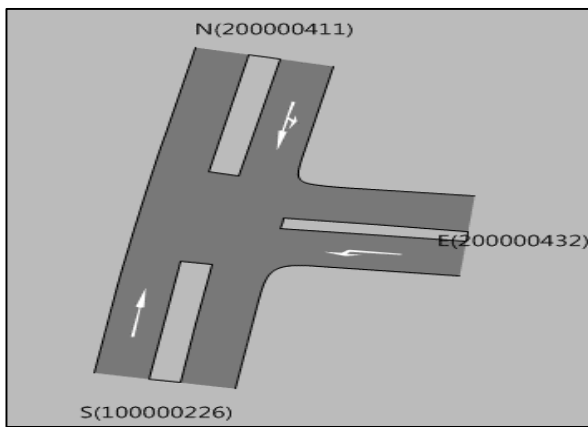
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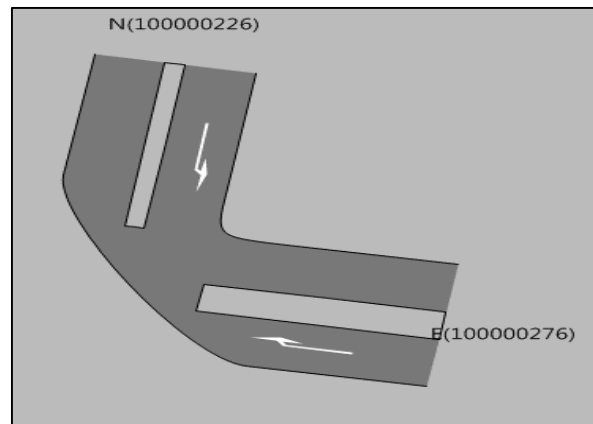
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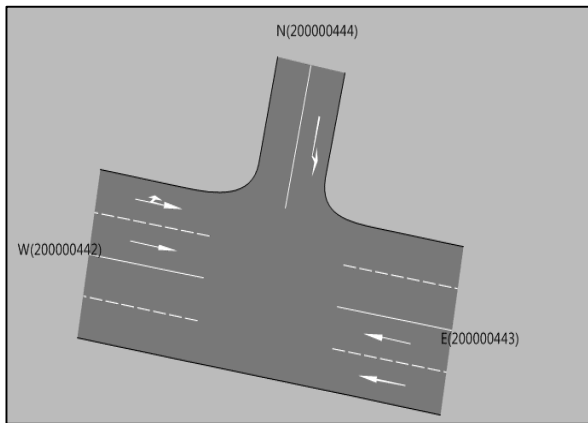
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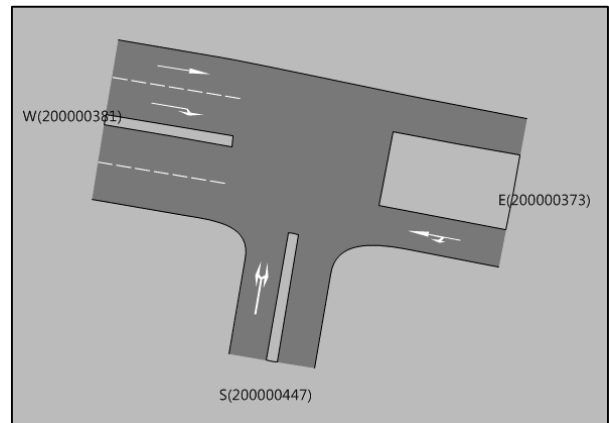
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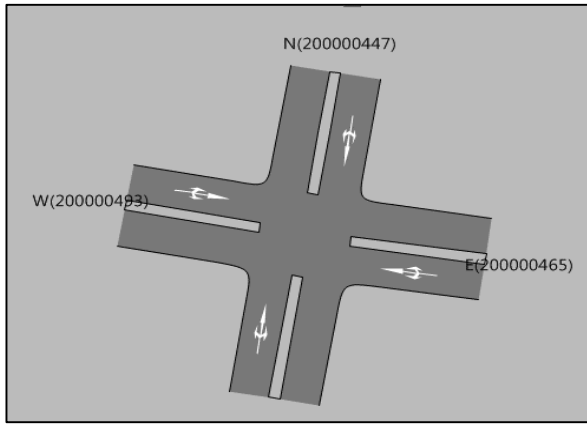
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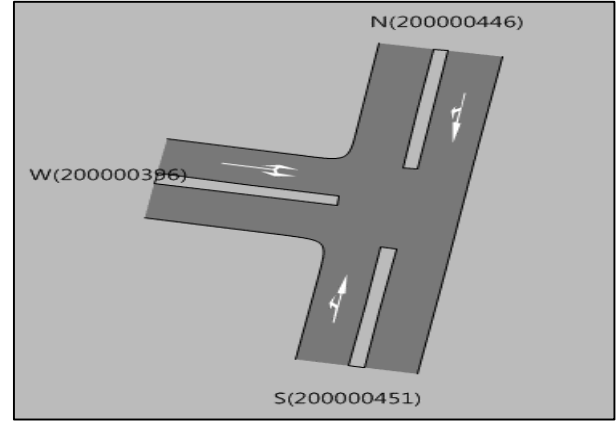
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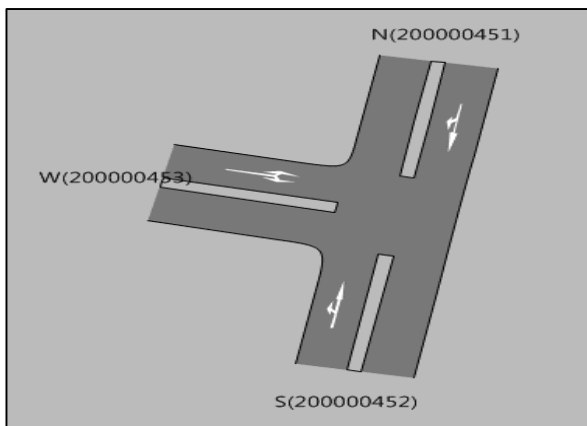
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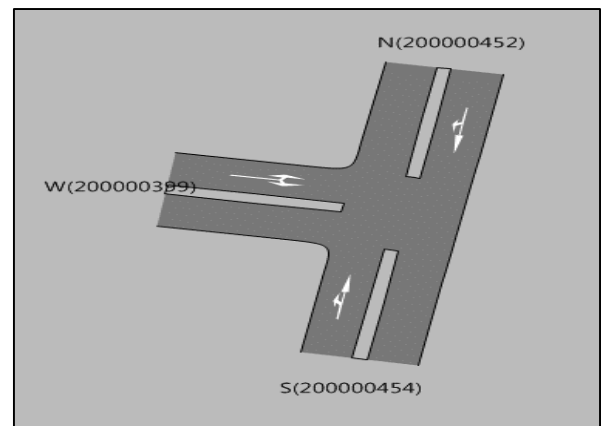
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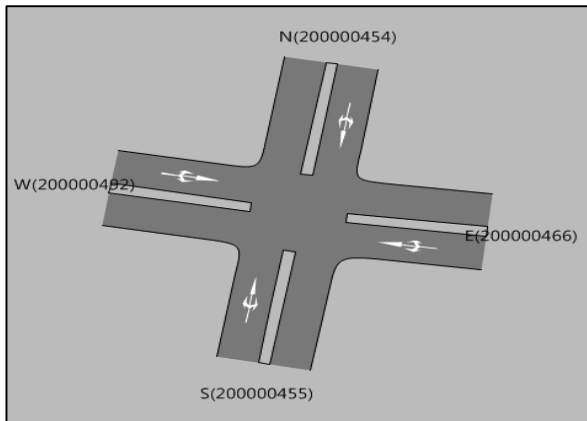
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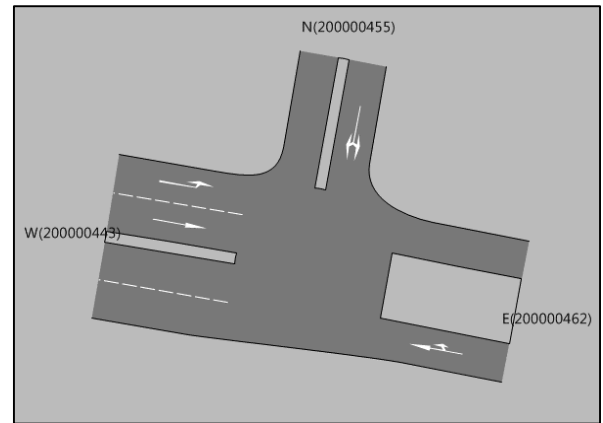
Intersection No 21\*



Intersection No 22\*

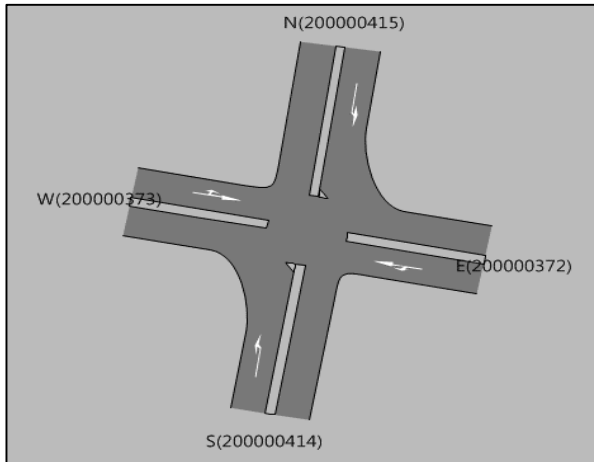


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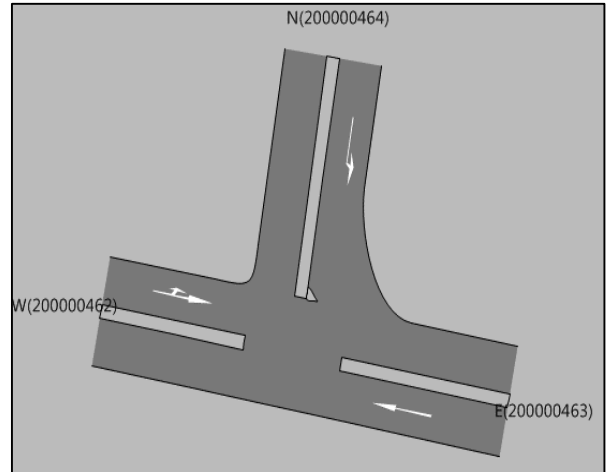


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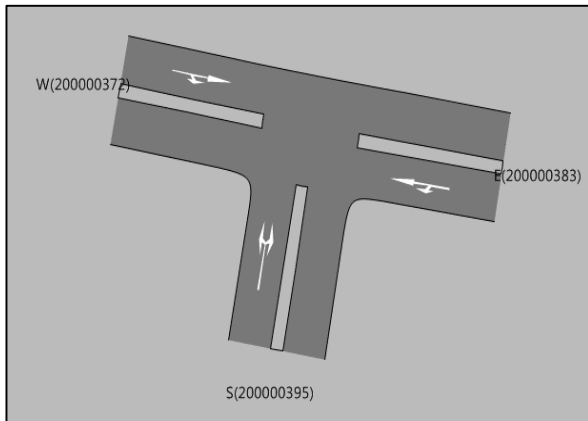
\*Private Throughfares



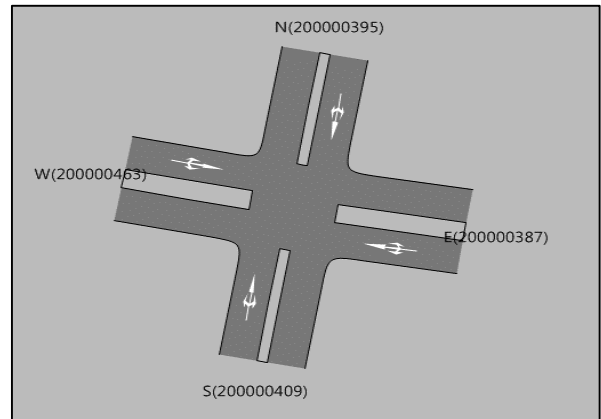
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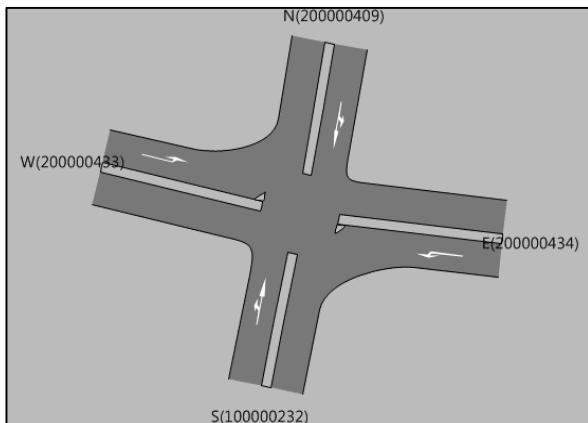
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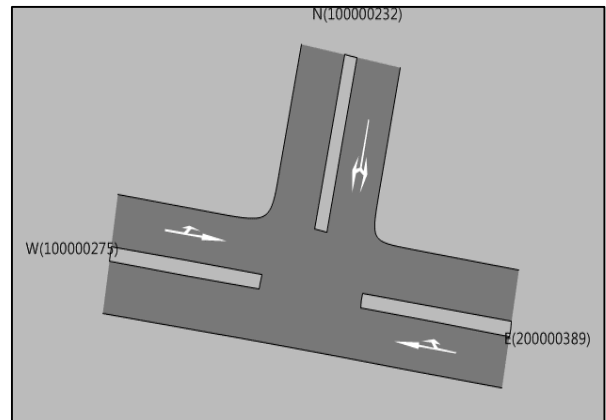
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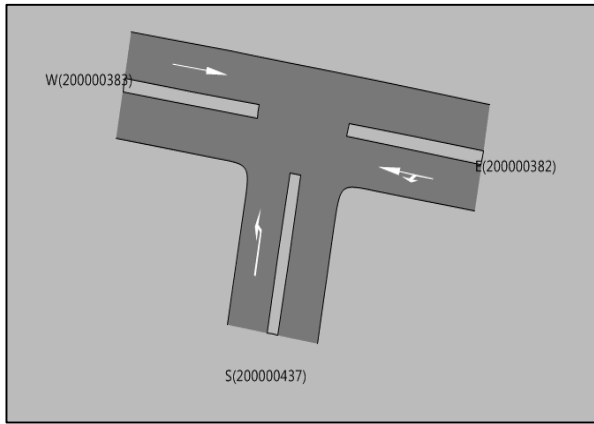
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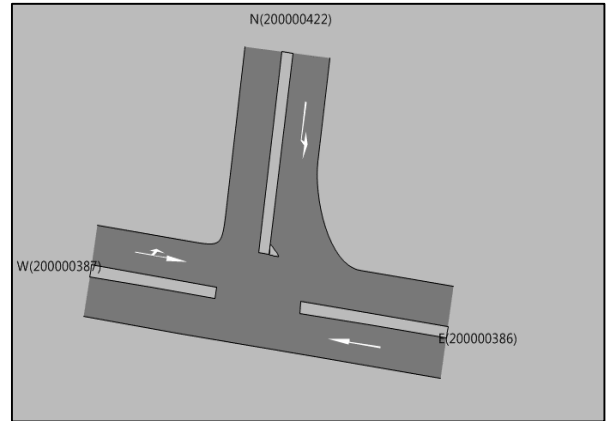
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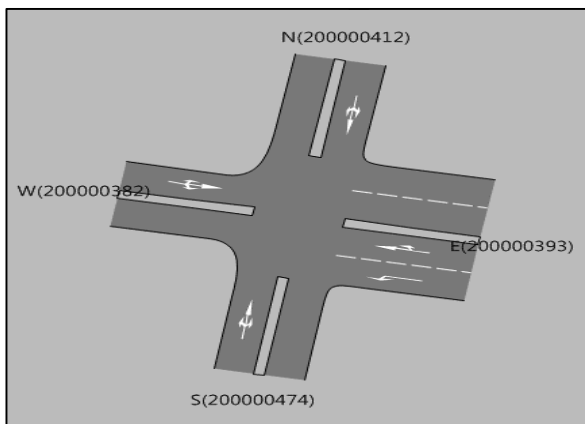
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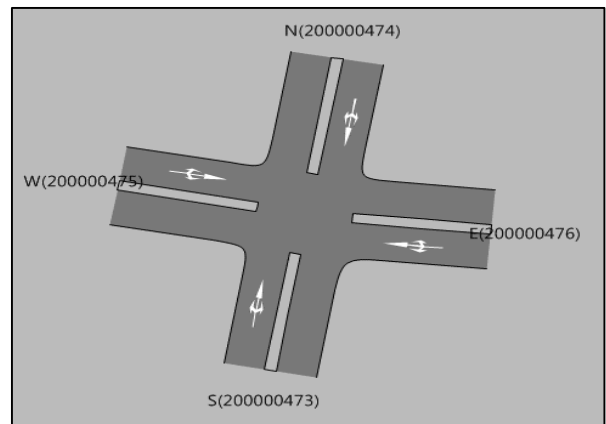
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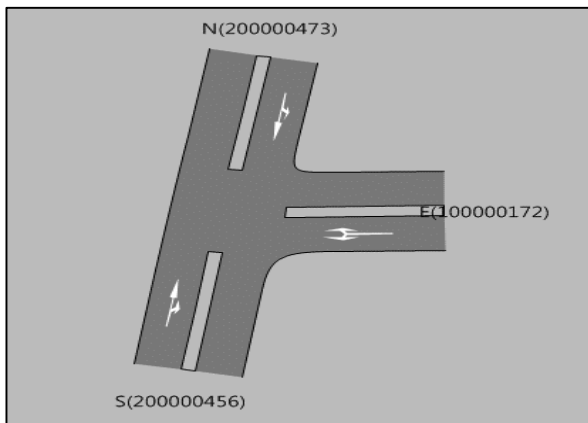
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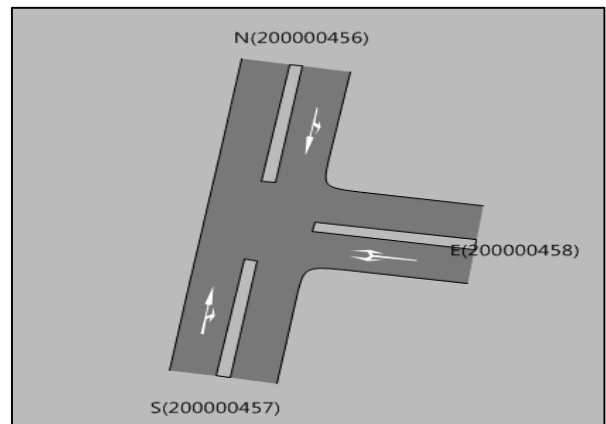
Intersection No 33



Intersection No 34\*

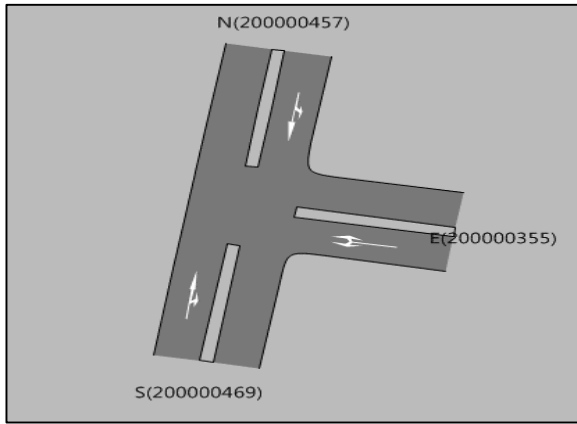


Intersection No 35\*

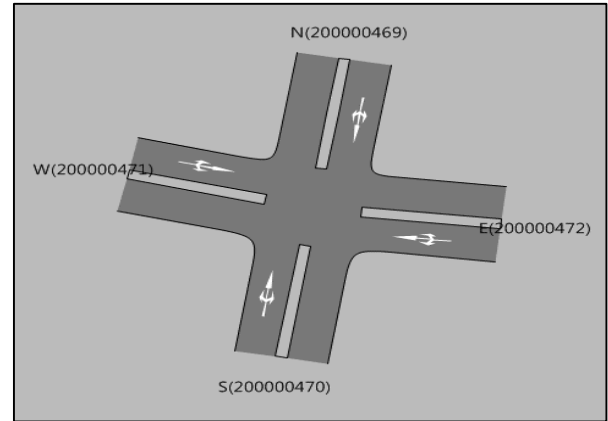


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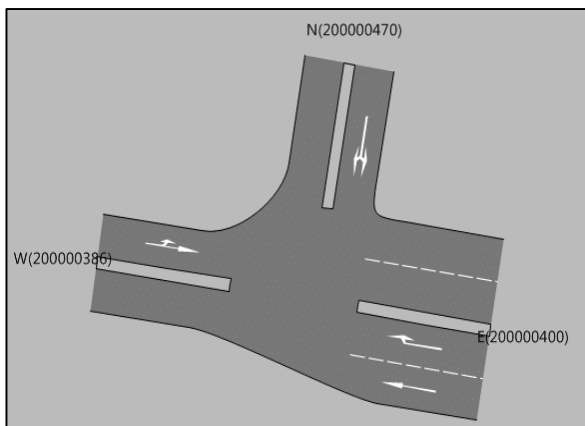
\*Private Throughfares



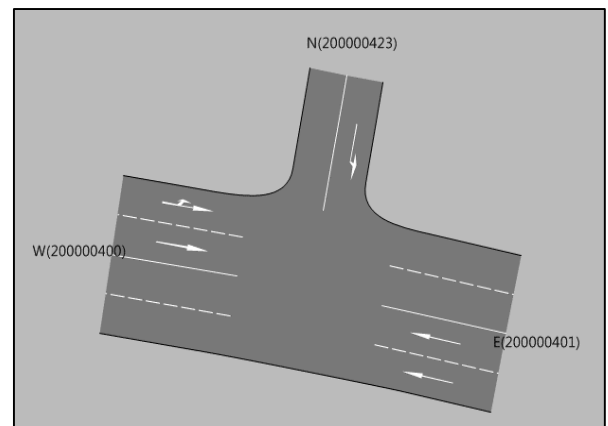
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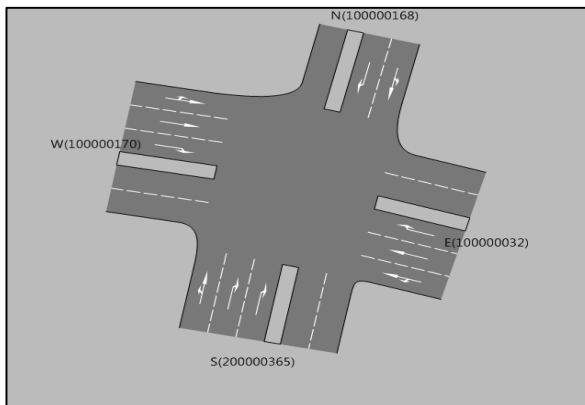
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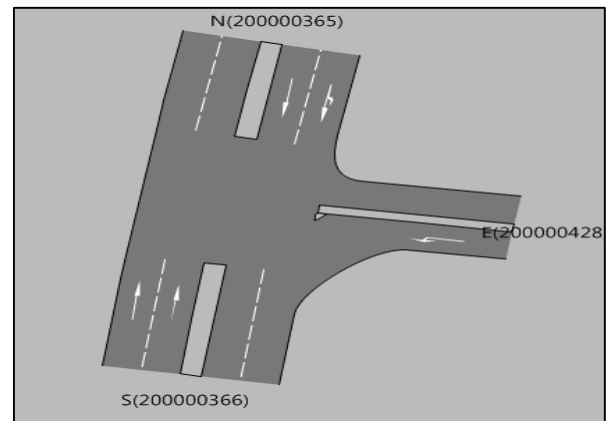
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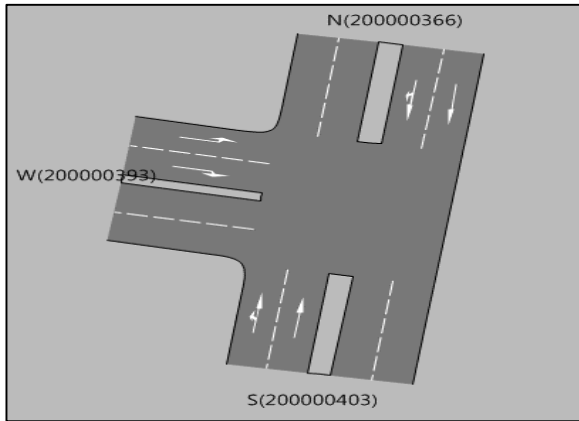


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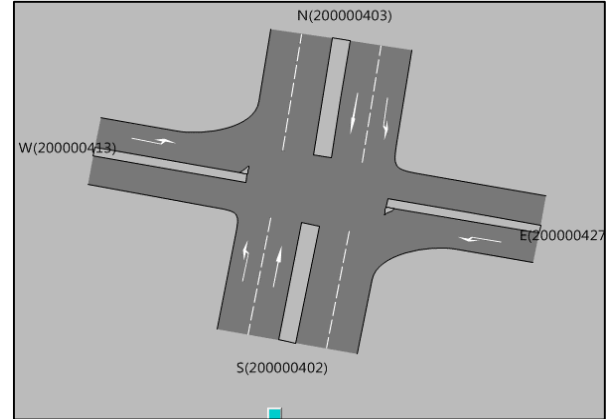


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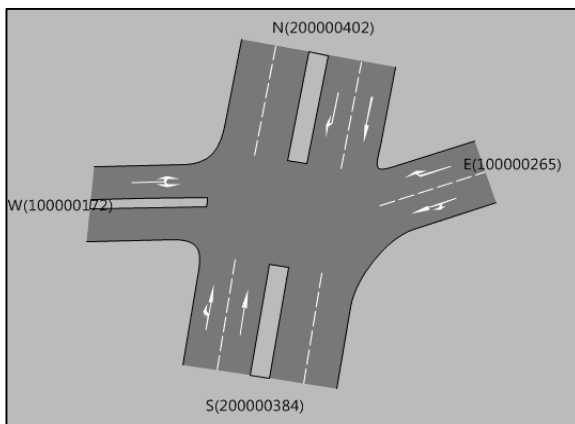
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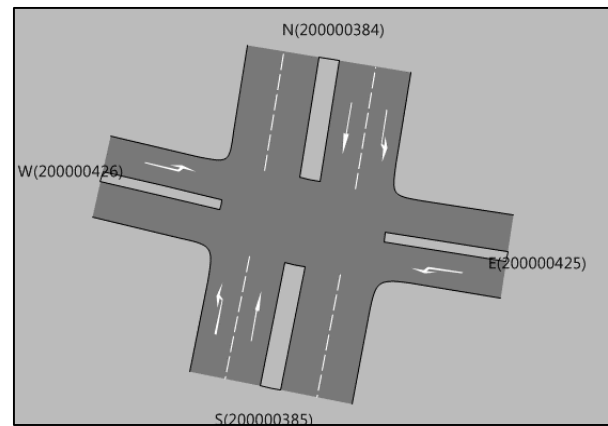
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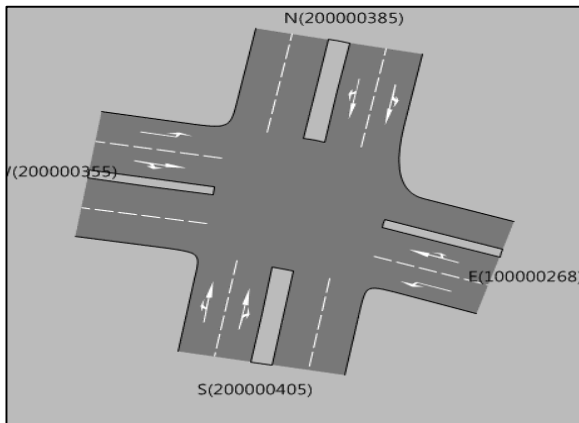
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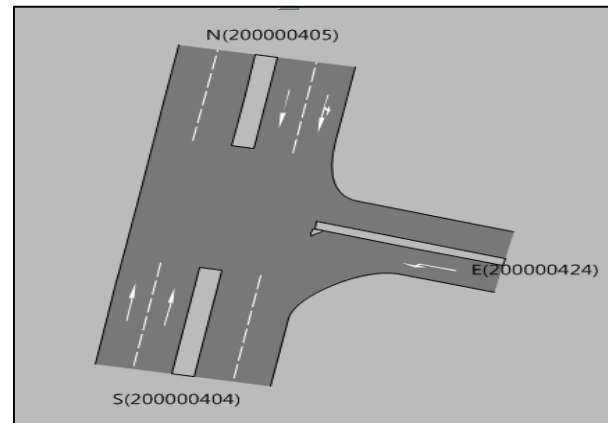
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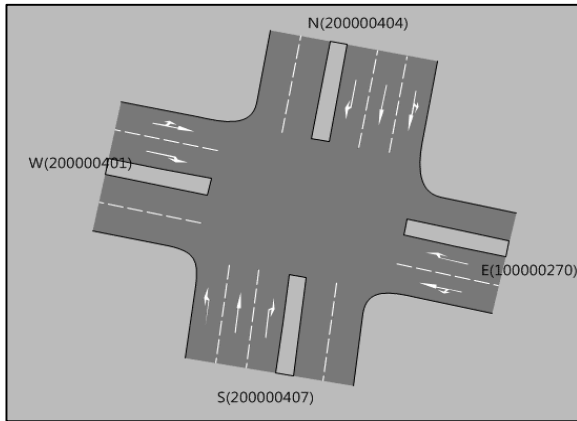
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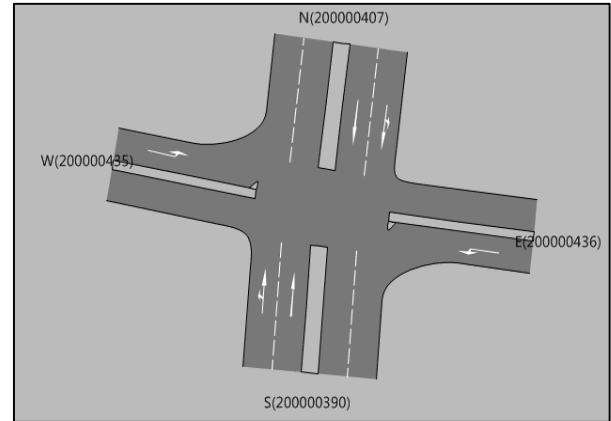
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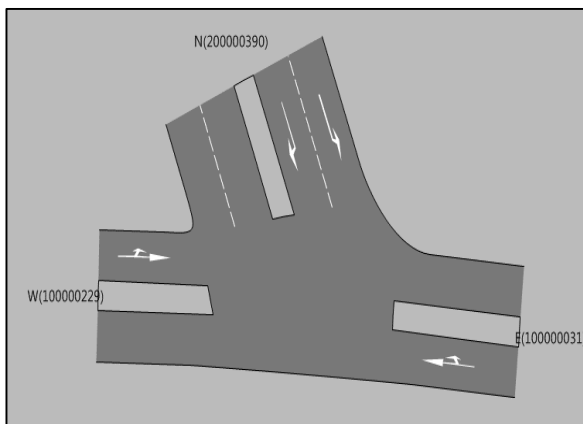
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Intersection No 49



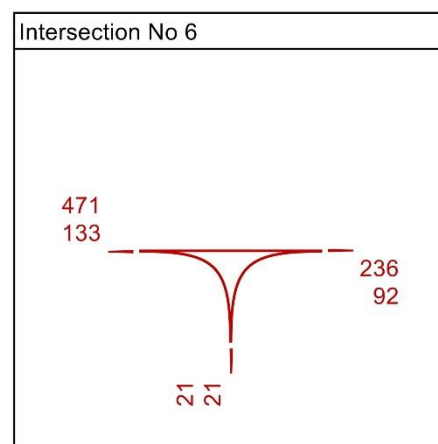
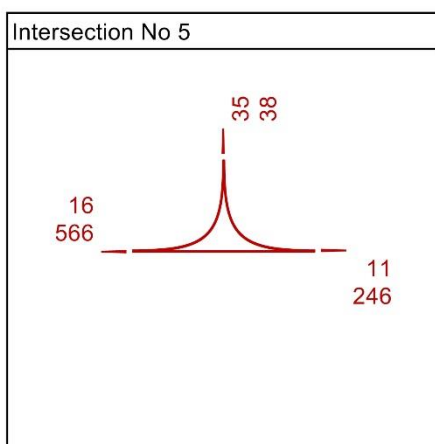
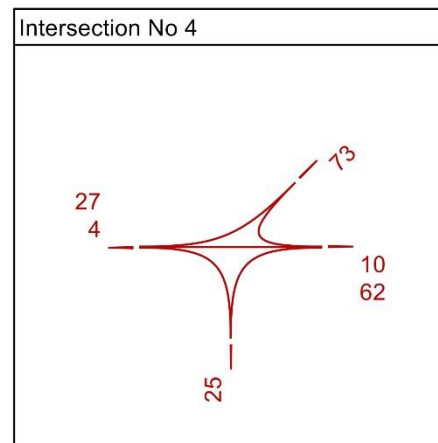
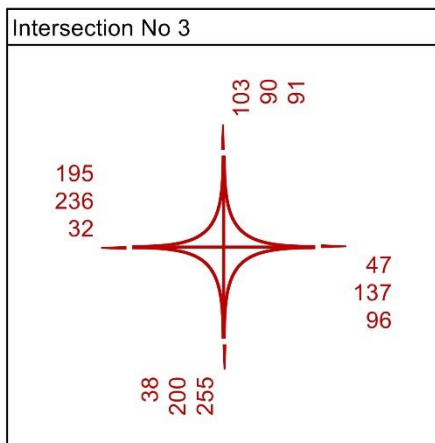
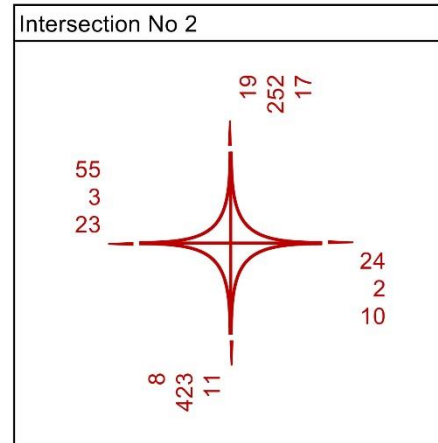
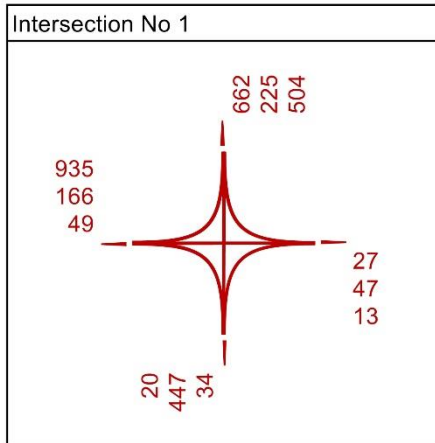
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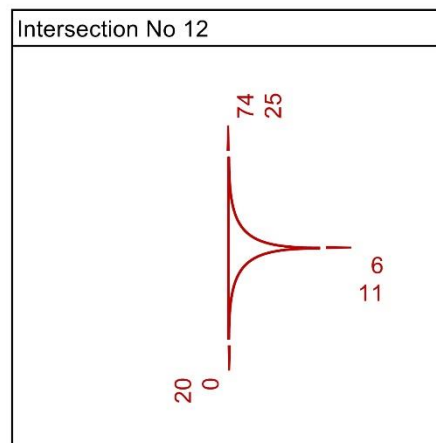
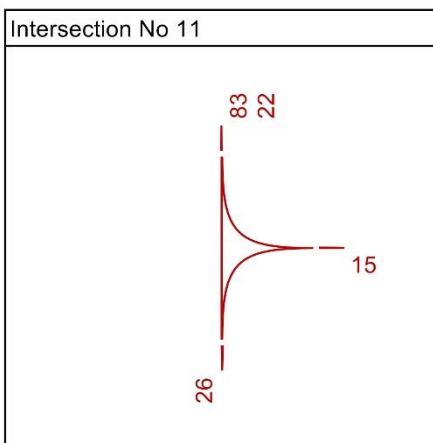
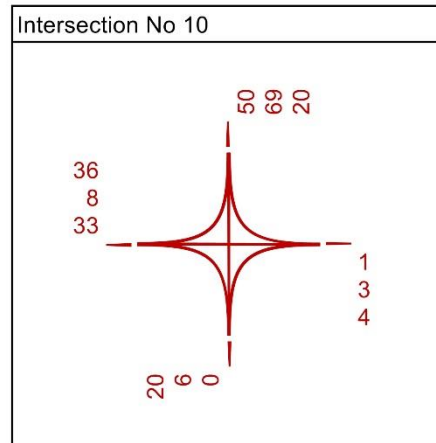
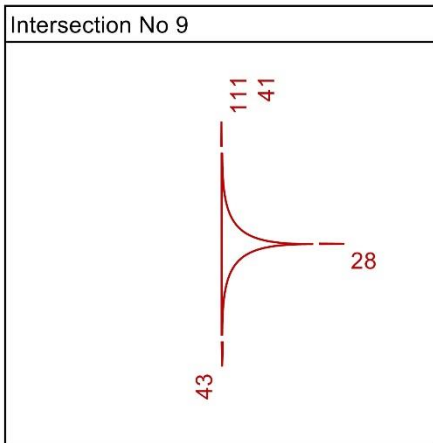
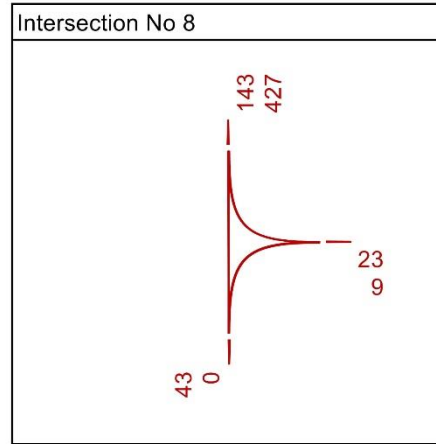
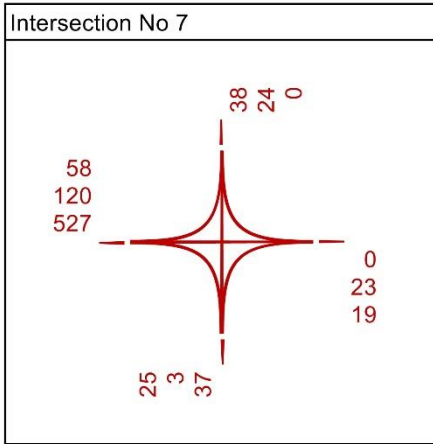


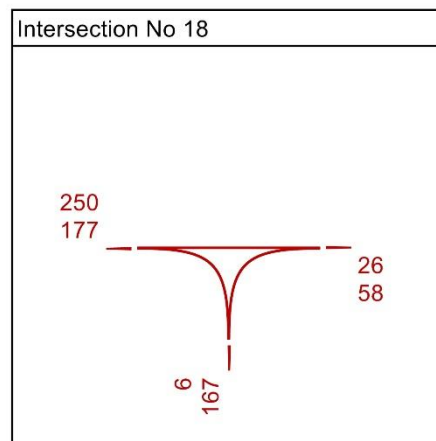
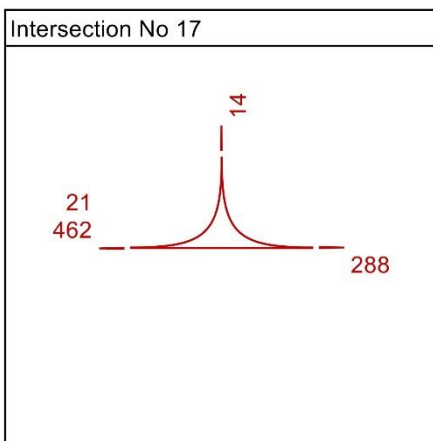
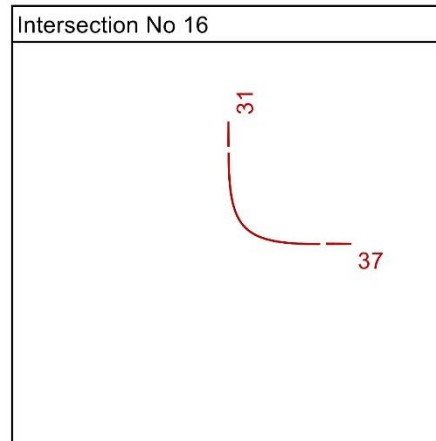
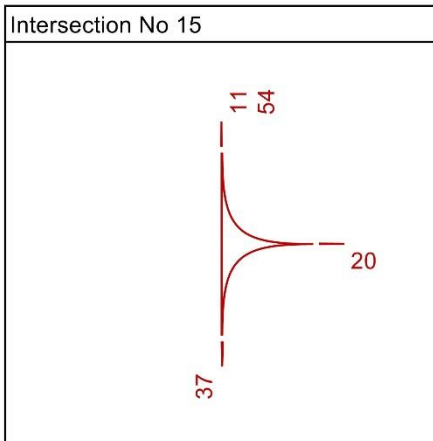
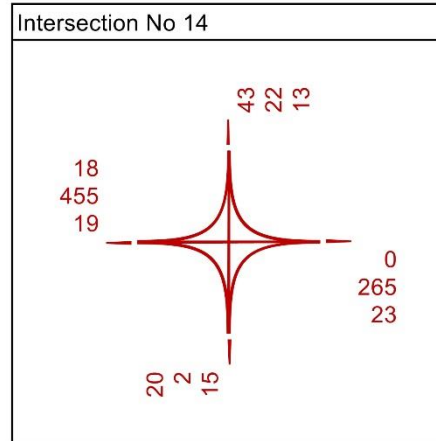
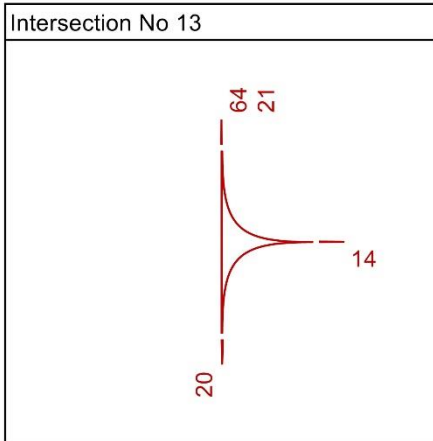
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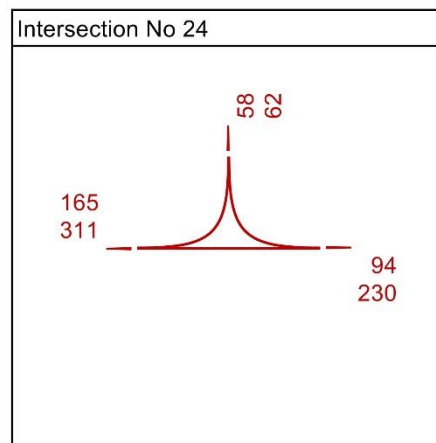
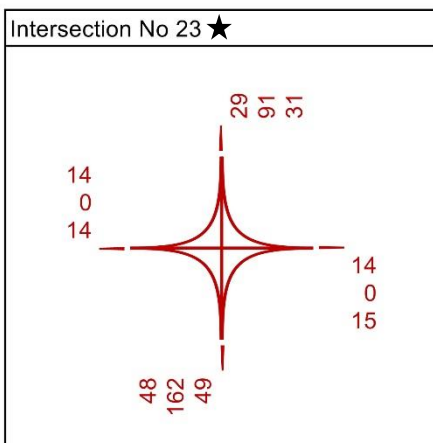
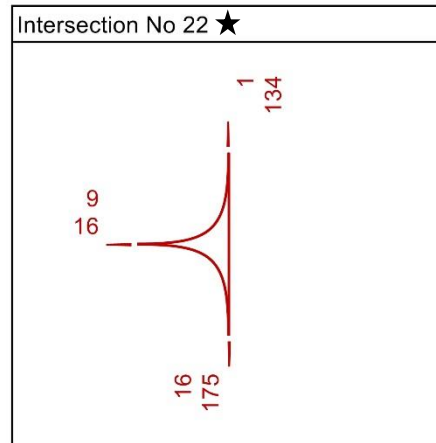
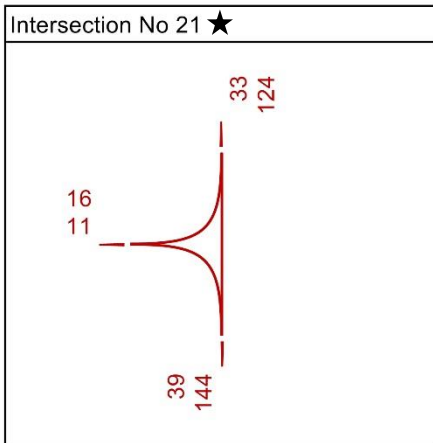
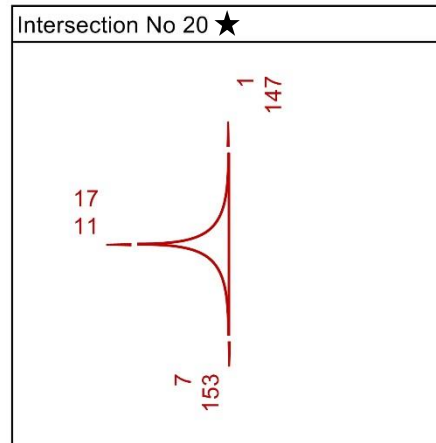
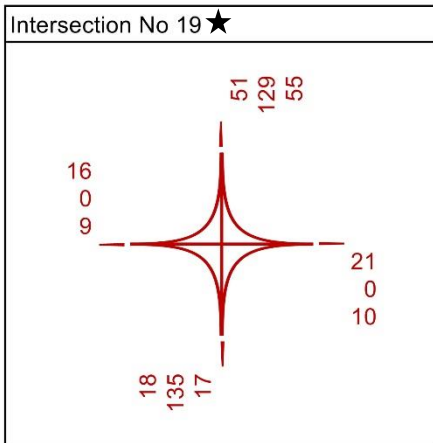
## Appendix B Forecast Intersection Turning Movement Volumes

### AM Peak Turn Volumes

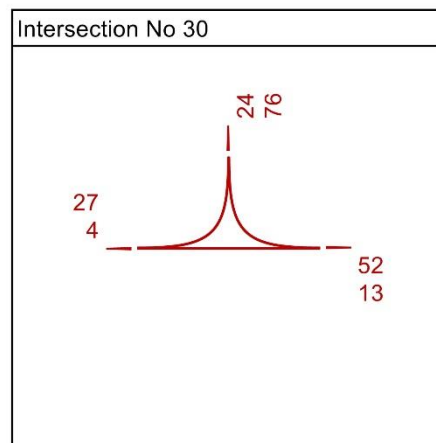
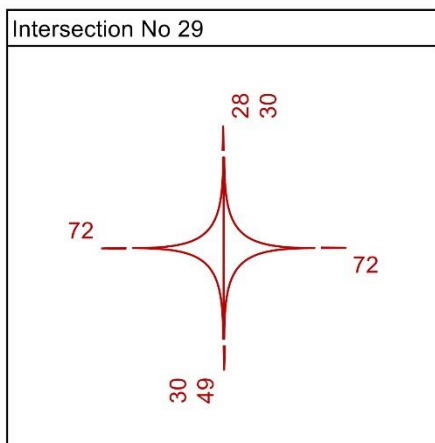
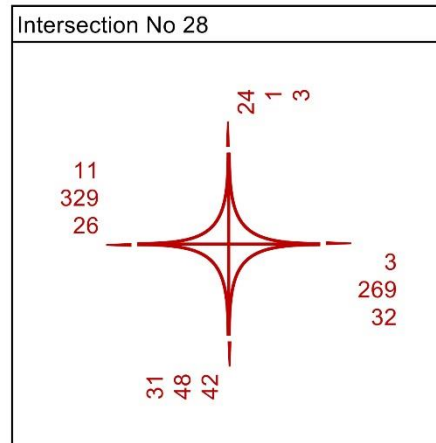
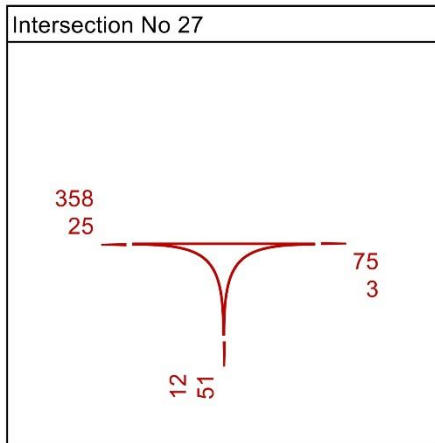
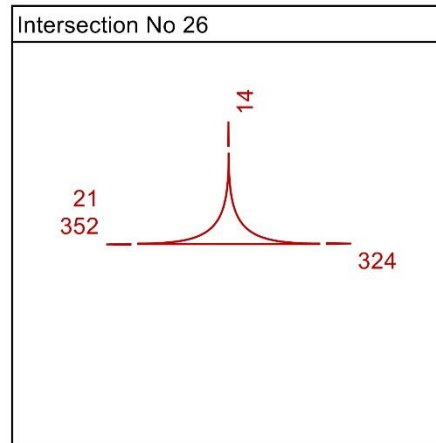
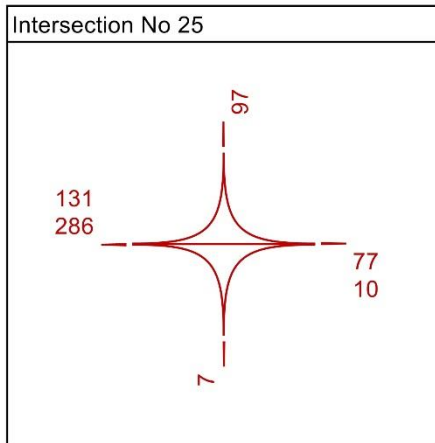


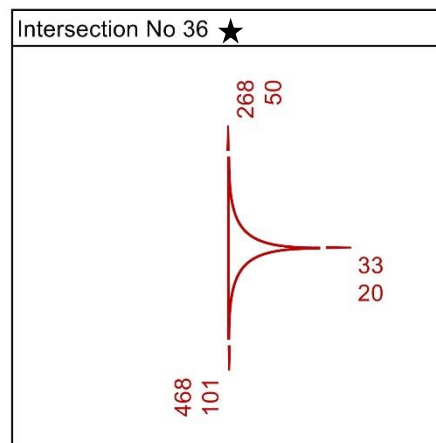
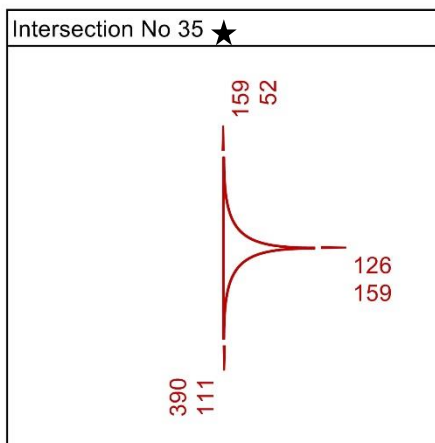
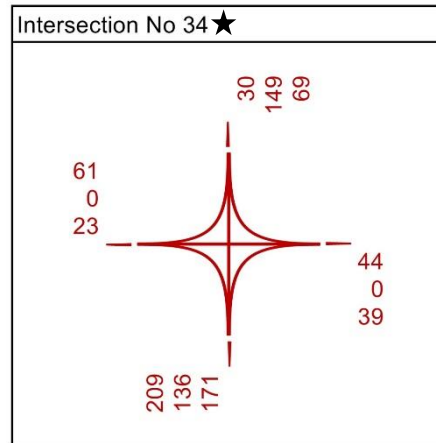
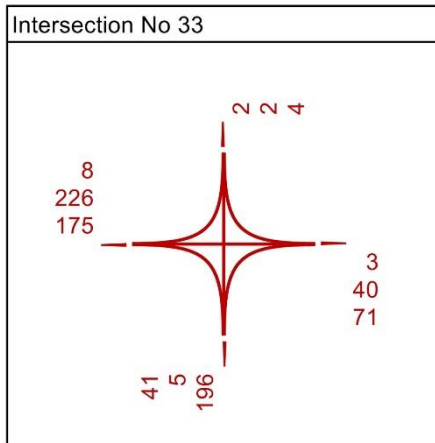
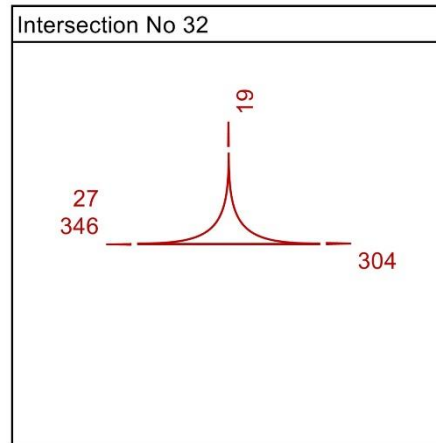
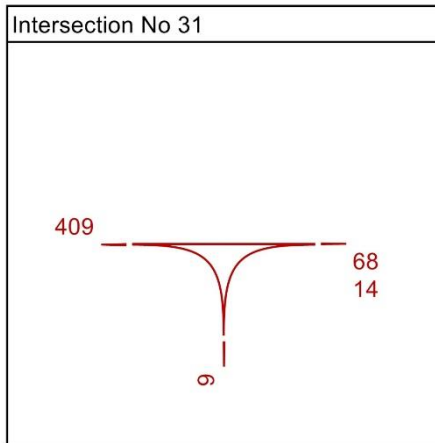




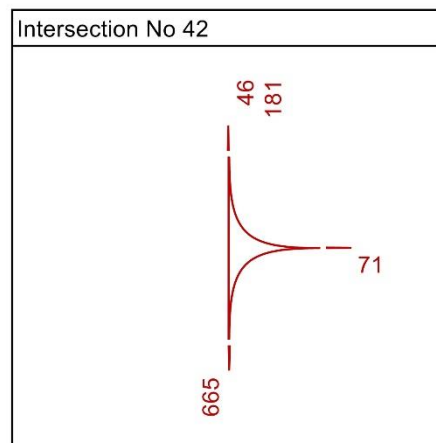
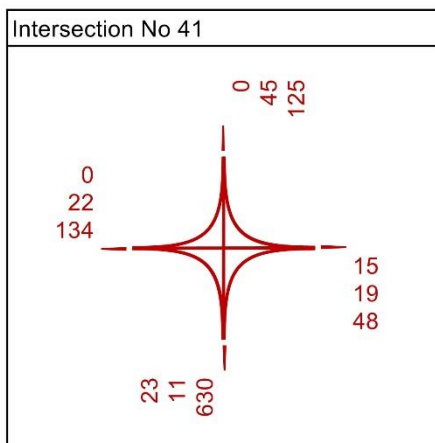
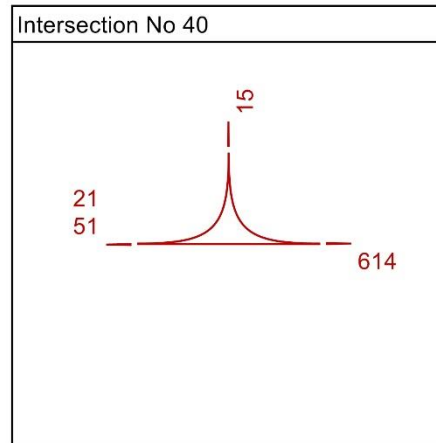
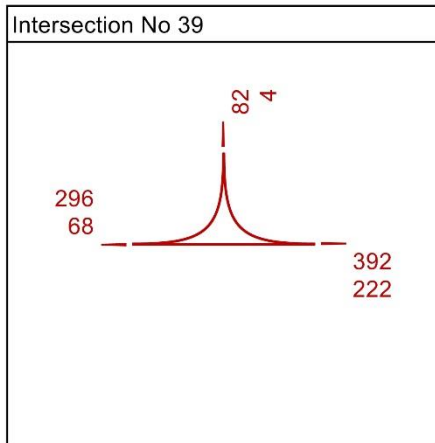
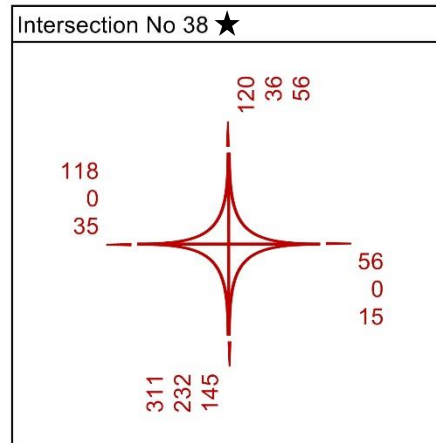
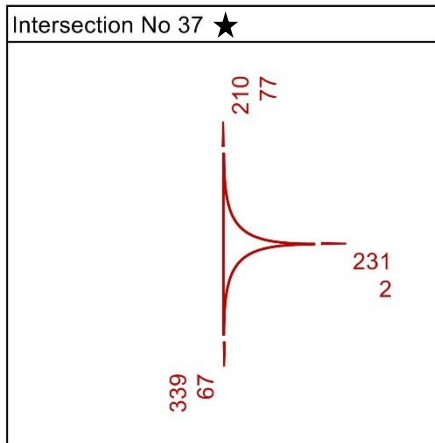


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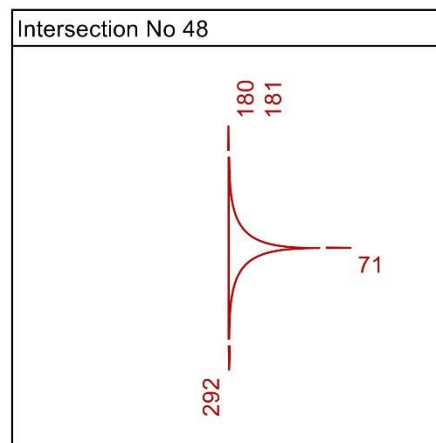
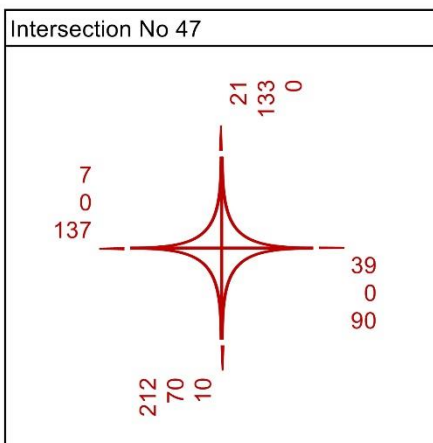
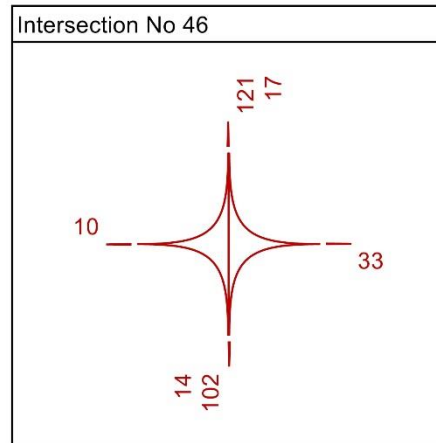
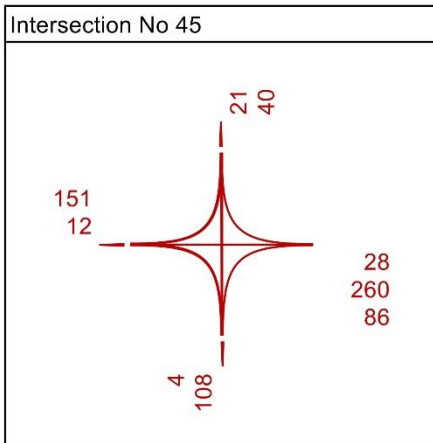
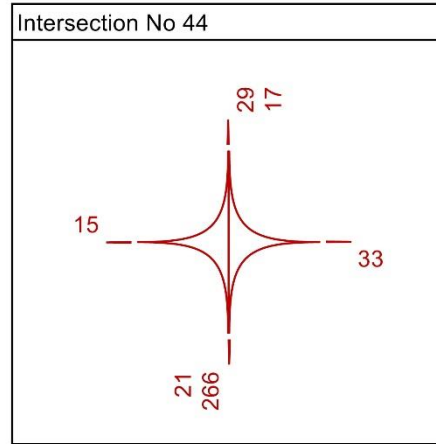
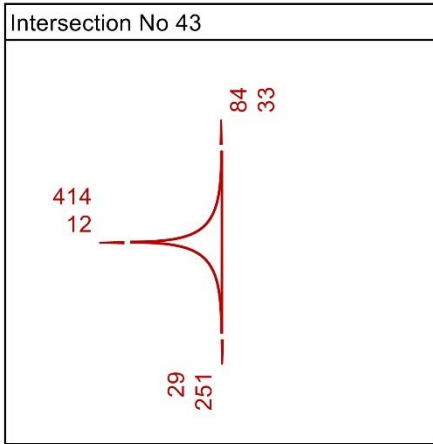


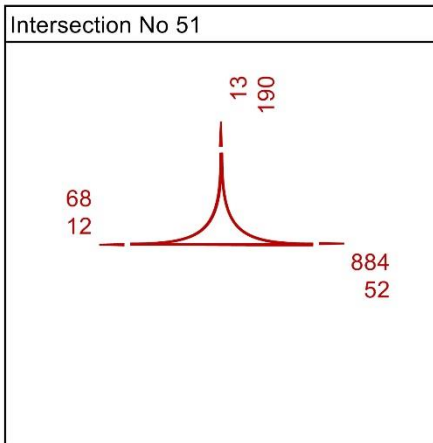
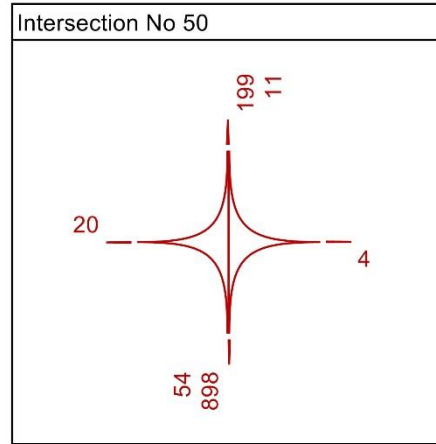
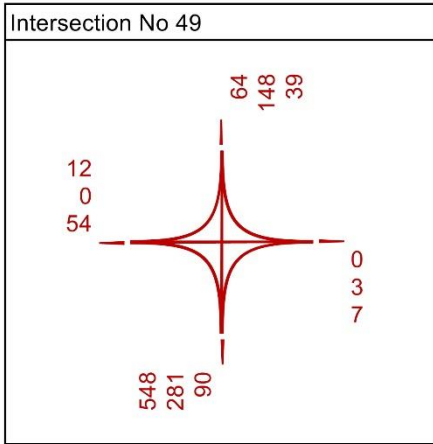


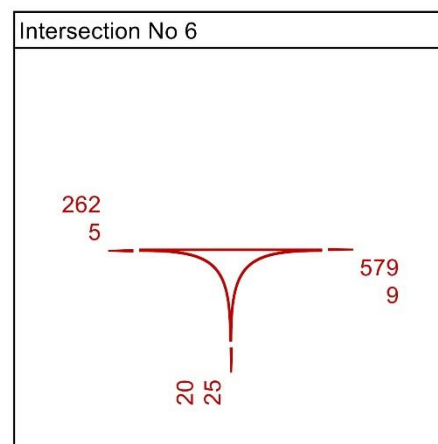
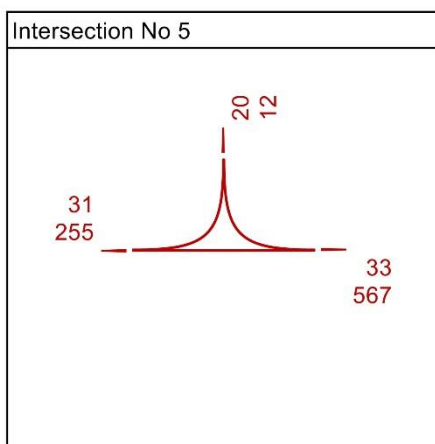
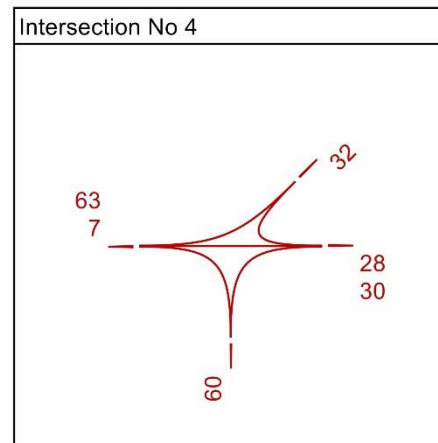
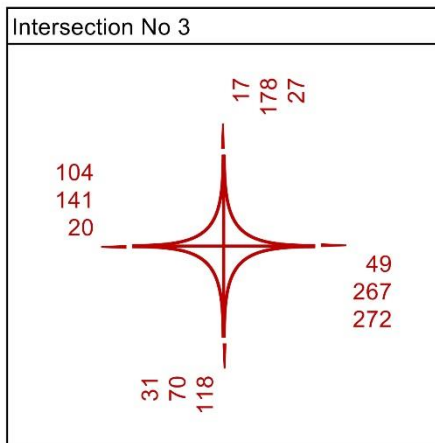
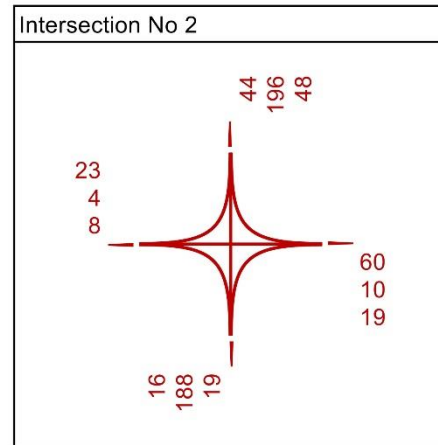
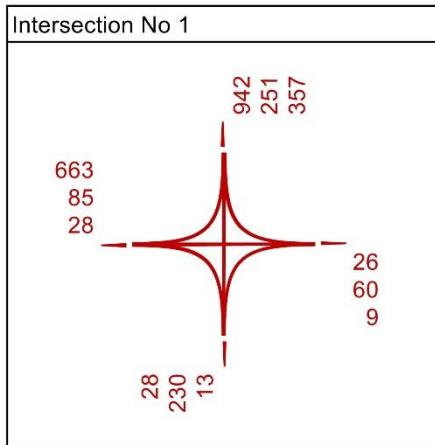
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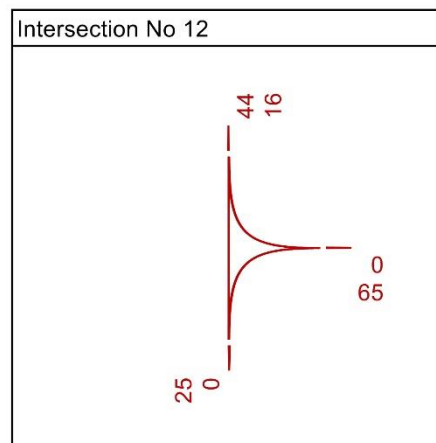
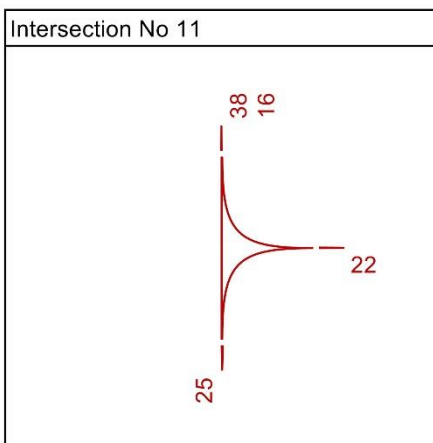
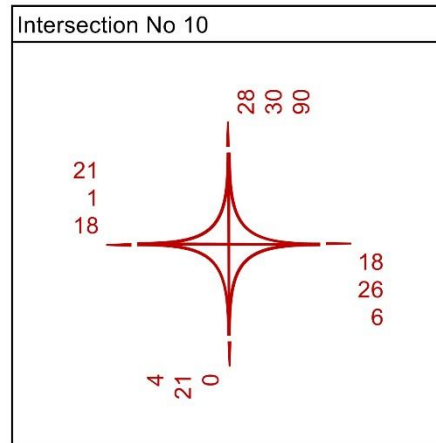
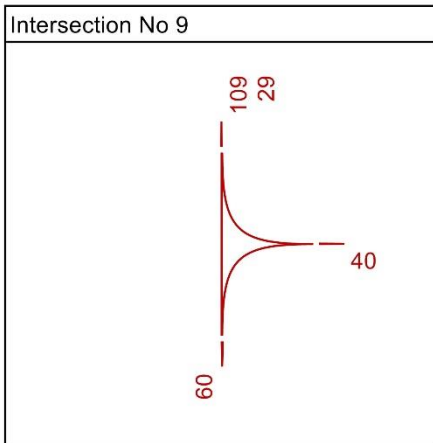
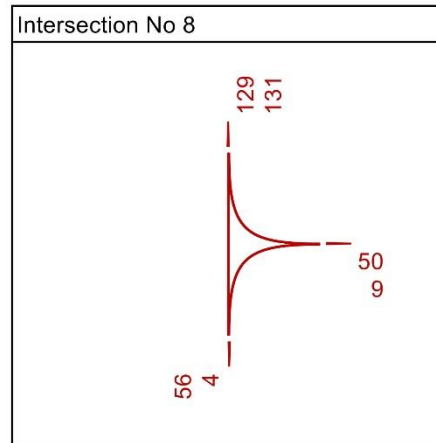
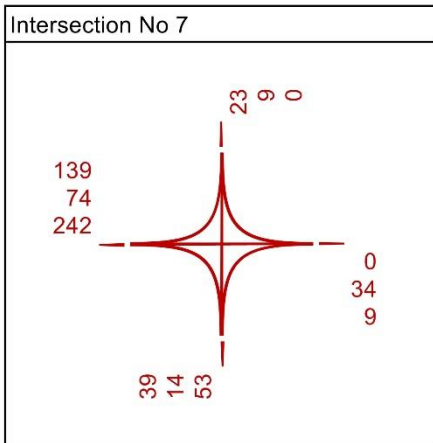


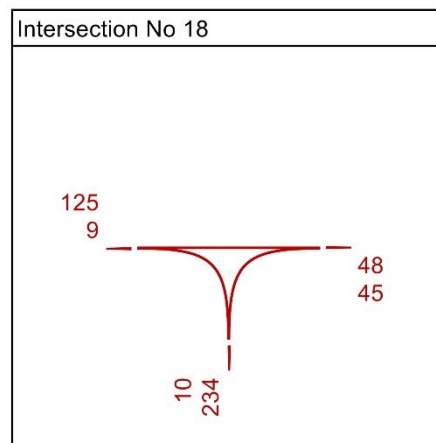
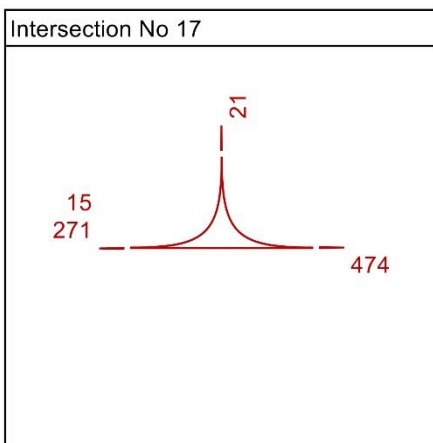
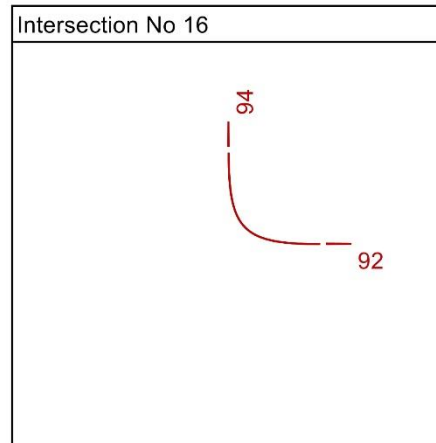
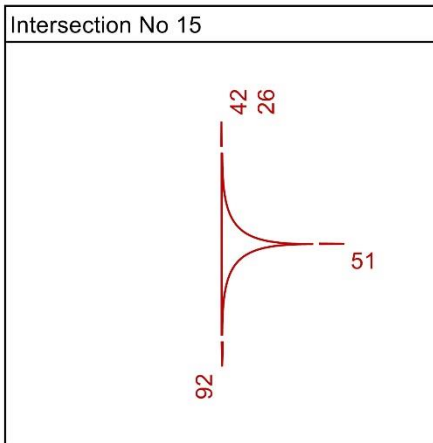
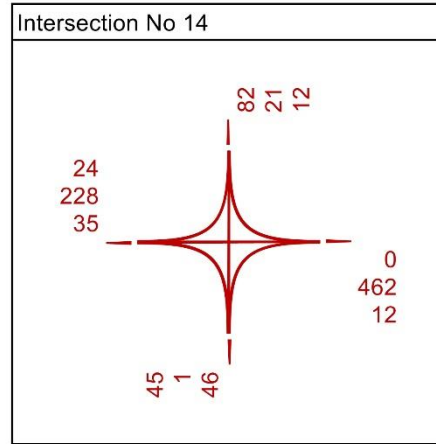
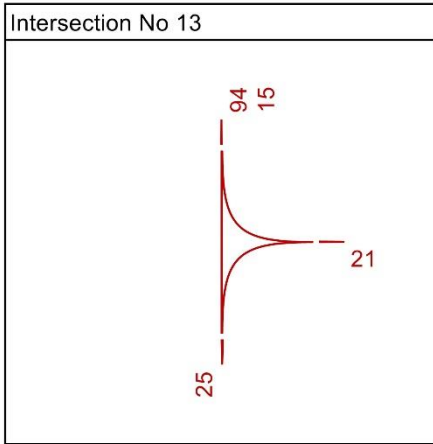
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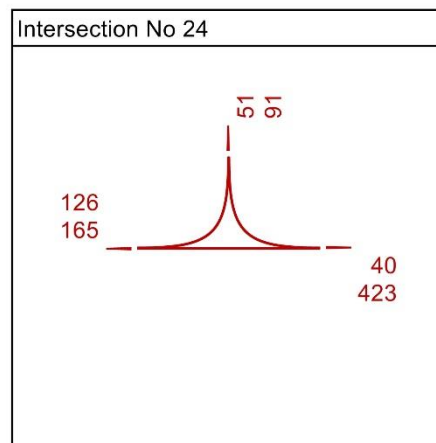
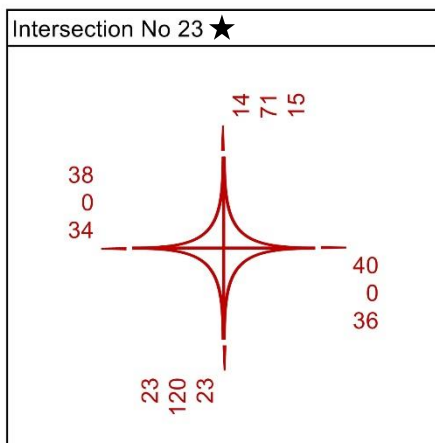
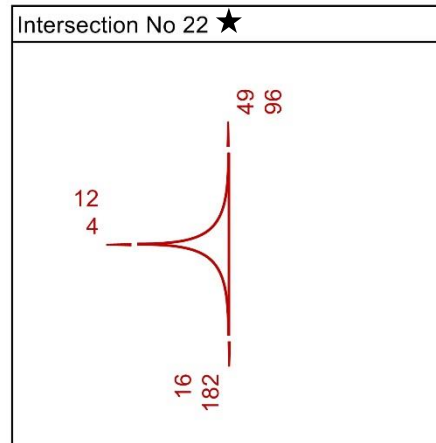
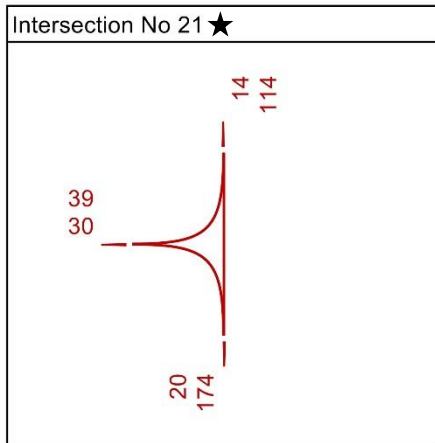
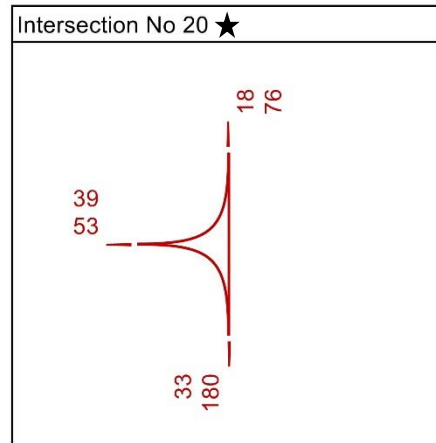
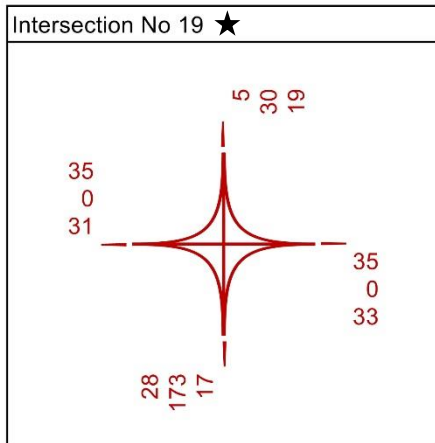




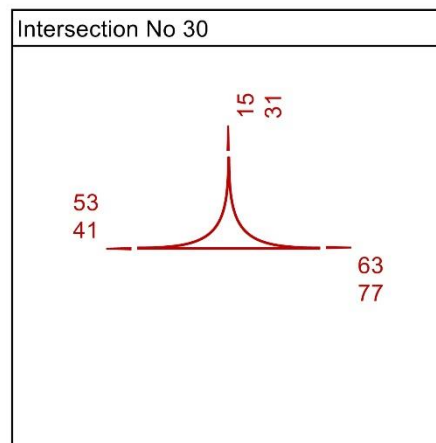
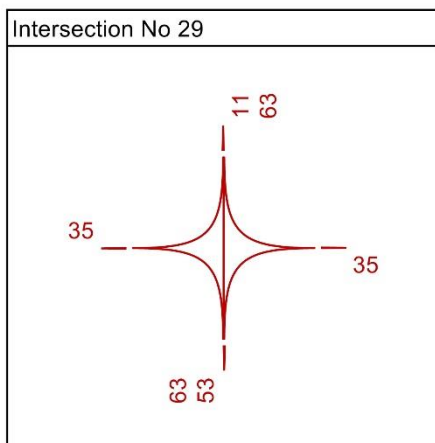
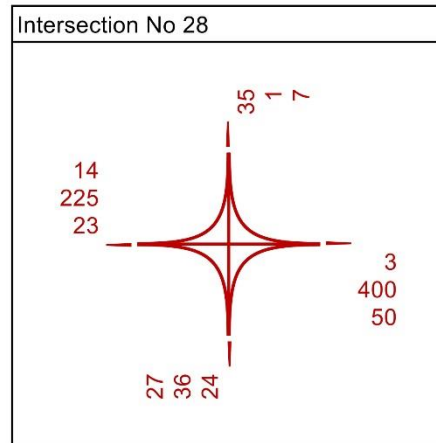
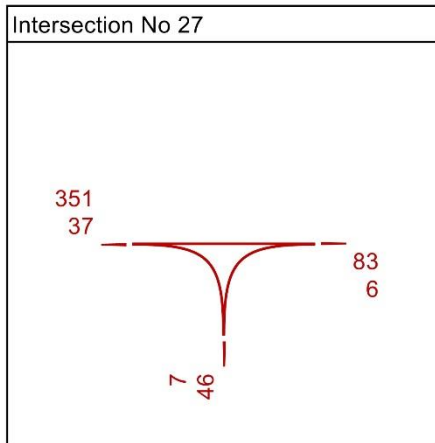
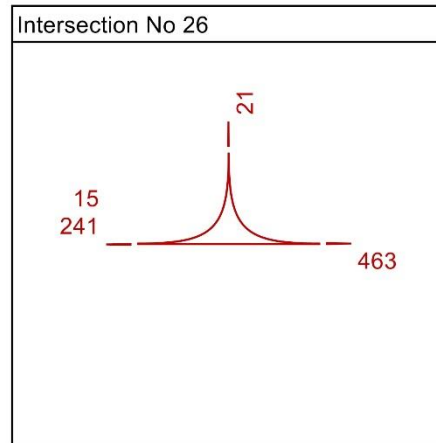
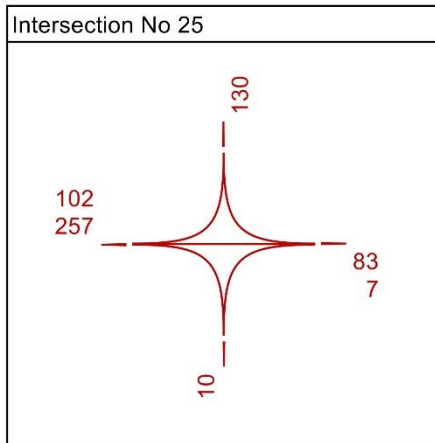
**PM Peak Turn Volumes**


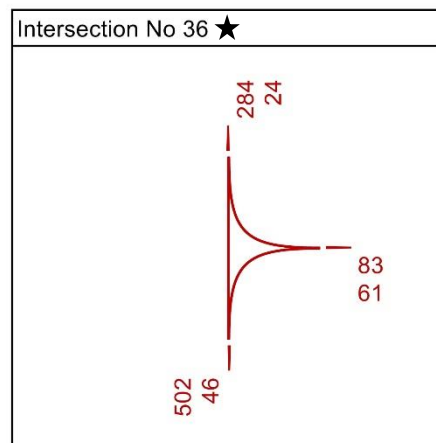
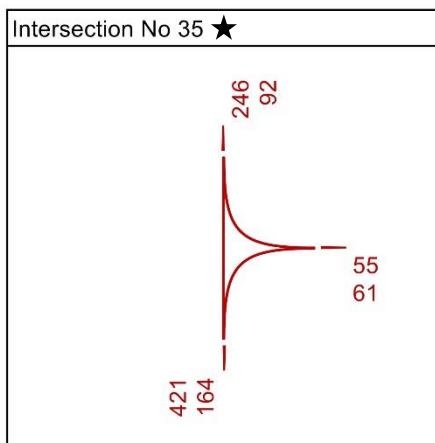
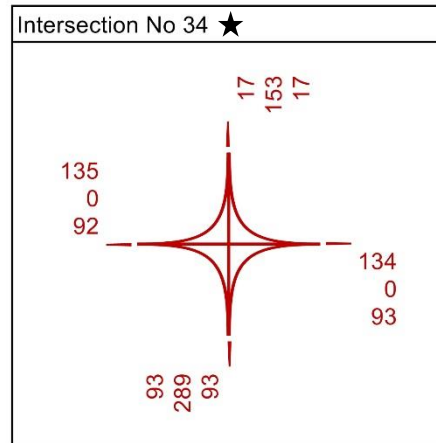
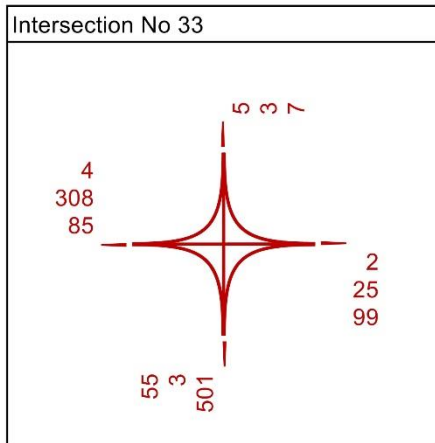
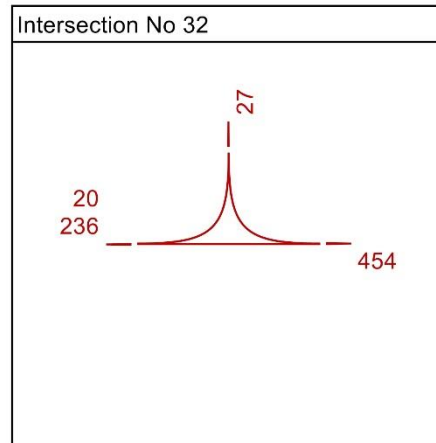
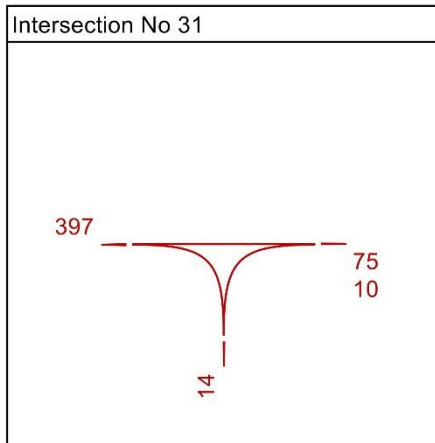




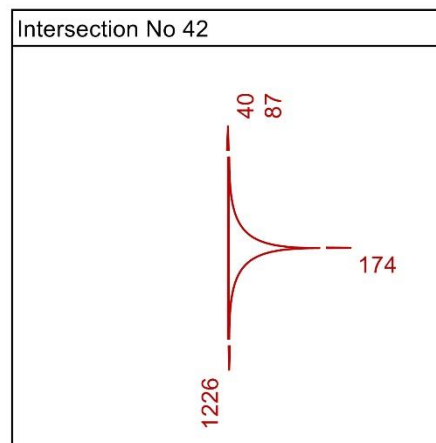
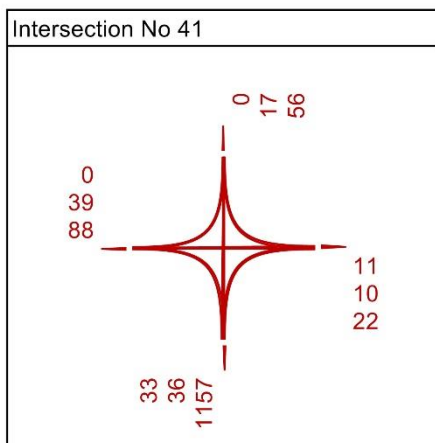
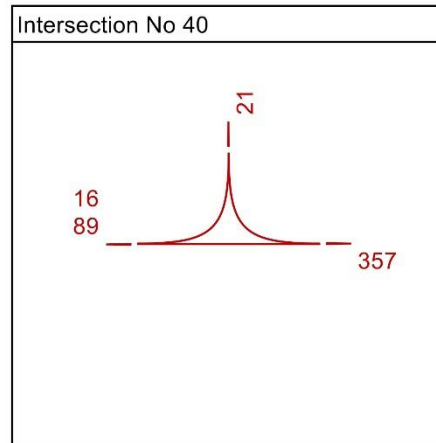
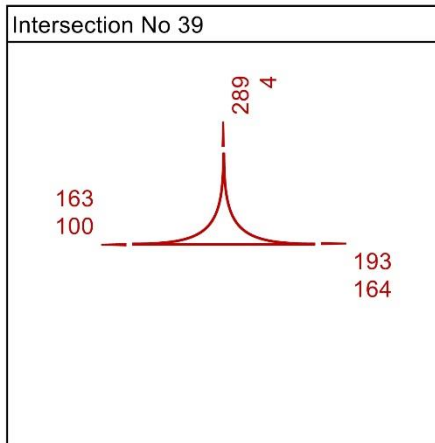
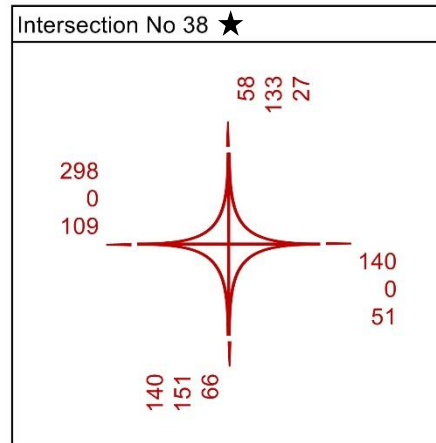
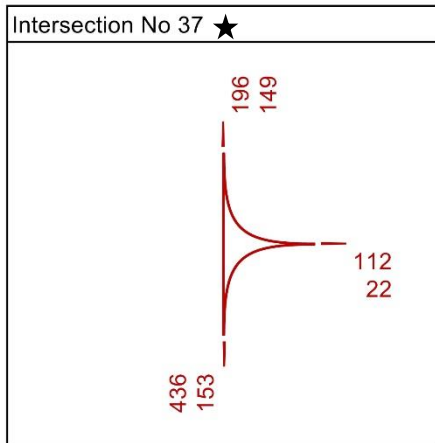


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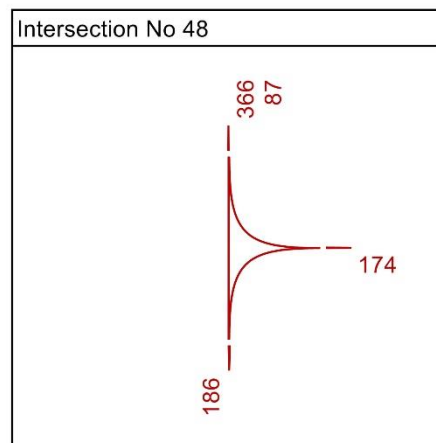
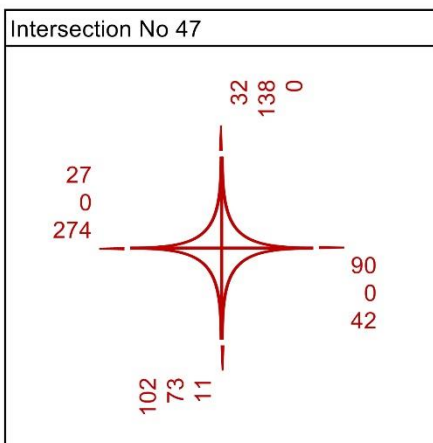
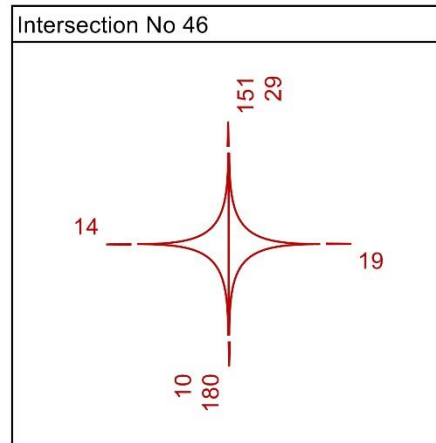
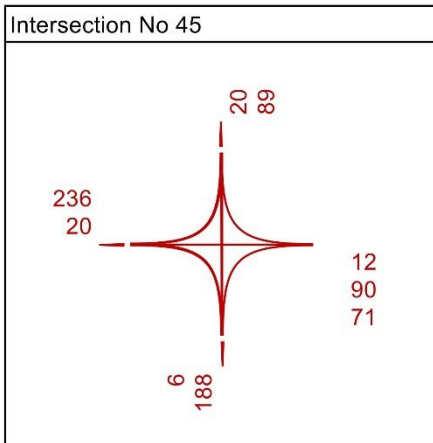
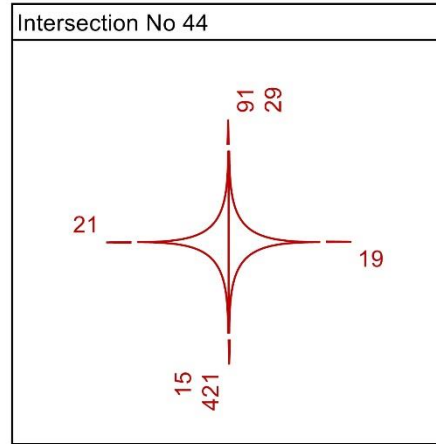
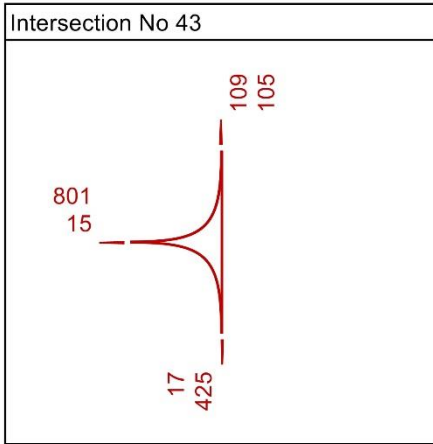


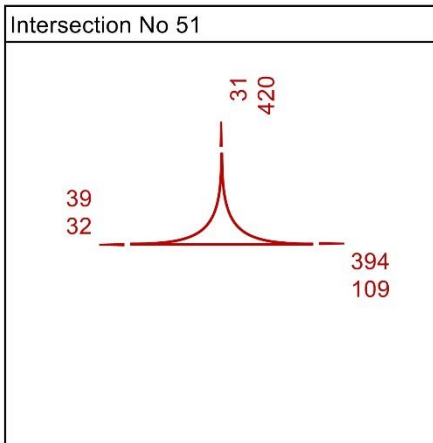
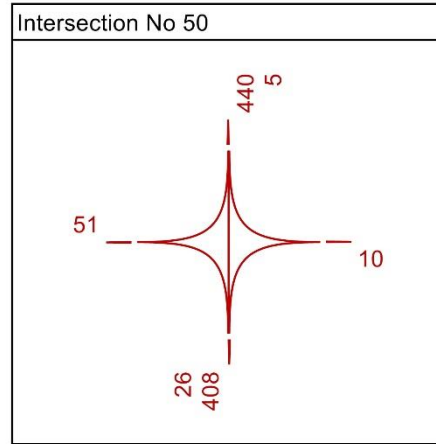
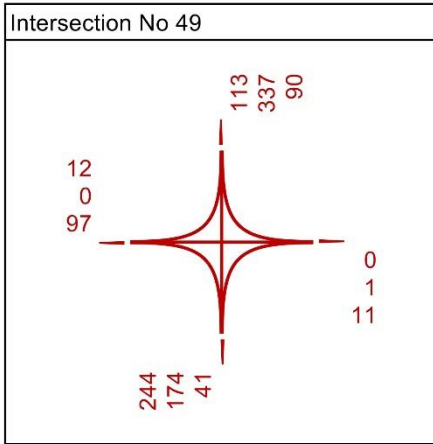


\*Private Throughfares



\*Private Throughfares





## Appendix C Turn Bay Lengths

Inters ection No	Parameters	Movements												
		N				E			S			W		
1	Approach	N				E			S			W		
	Movement	L1	T	R1	R2	L1	T	R1	L1	T	R1	L1	T	R1
	Final Length of Turn Bay			64	64			12			11	43		14
2	Approach	N				E			S			W		
	Movement	L1	T	R1	L1	T	R1	L1	T	R1	L1	T	R1	
	Final Length of Turn Bay			19						8				
3	Approach	N				E			S			W		
	Movement	L1	T	R1	L1	T	R1	L1	T	R1	L1	T	R1	
	Final Length of Turn Bay			31			20			80	6		13	
7	Approach	N				E			S			W		
	Movement	L1	T	R1	L1	T	R1	L1	T	R1	L1	T	R1	
	Final Length of Turn Bay						0.2						97	
14	Approach	N				E			S			W		
	Movement	L1	T	R1	L1	T	R1	L1	T	R1	L1	T	R1	
	Final Length of Turn Bay						0.35						7	
41	Approach	N				E			S			W		
	Movement	L1	T	R1	L1	T	R1	L1	T	R1	L1	T	R1	
	Final Length of Turn Bay			0.42			7			57			45	
45	Approach	N				E			S			W		
	Movement	T	R1	L1	T	R1	L1	T	L1	R1				
	Final Length of Turn Bay					7								
49	Approach	N				E			S			W		
	Movement	L1	T	R1	L1	T	R1	L1	T	R1	L1	T	R1	
	Final Length of Turn Bay			25			0.28			32				

## Appendix D Response to SCRC and TMR Comments and Model Approval Emails

### Model Approval Email From SCRC

**From:** Guy Boughton [<mailto:Guy.Boughton@sunshinecoast.qld.gov.au>]  
**Sent:** Friday, 8 April 2016 6:26 PM  
**To:** Paul McDonald <[paul.mcdonald@stockland.com.au](mailto:paul.mcdonald@stockland.com.au)>  
**Cc:** David Leahy <[david.leahy@pwc.com](mailto:david.leahy@pwc.com)>; Ali Syed <[Ali.Syed@mwhglobal.com](mailto:Ali.Syed@mwhglobal.com)>; Sean Slevin <[Sean.Slevin@sunshinecoast.qld.gov.au](mailto:Sean.Slevin@sunshinecoast.qld.gov.au)>  
**Subject:** RE: Aura Town Centre - VISSUM modelling

Hi Paul,

I understand that Sean Slevin has separately raised land use issues within the Town Centre. These issues will need to be resolved separately with Sean and the model updated accordingly. The following information applies only to suitability of the modelled network to move to the next stage being micro simulation. Any changes to land use and network demands will need to be reflected in the transport model.

It is understood from previous emails from David Leahy that:

- queuing and capacity issues outside of the Town Centre (TC) have been modified only if they are suppressing a material volume of traffic to the town centre
- u-turns have been removed from the model to ensure paths are more sensible and model convergence improved;
- all other updates that do not materially impact on convergence or flows to the town centre will be noted and updated as agreed in the terms of the TMR Infrastructure Agreement (3 yearly model update).

Based on my latest review, I am happy to support that the modelled networks provided to Council on 9 March 2016 are suitable to be used as the basis for simulation of the Caloundra South Town Centre. Please ensure that the simulation model is exported from visum in a way that supports adaptive updating of the model so that any required network changes identified through simulation can be changed in the visum model and re-extracted into the vissim file.

Below are some screenshots showing some of the connector and network constancy (transit systems) issues that need to be addressed at a future time.

Warmest regards

**Guy Boughton | Coordinator Transport Network  
Transport Network Team | Transport & Infrastructure Policy  
Regional Strategy and Planning | Sunshine Coast Regional Council**

Phone: 07 5441 8692

Mobile: 0400 458 152

Mailcode: ED39

Email: [guy.boughton@sunshinecoast.qld.gov.au](mailto:guy.boughton@sunshinecoast.qld.gov.au)

Website: [www.sunshinecoast.qld.gov.au](http://www.sunshinecoast.qld.gov.au)

Mail: Locked Bag 72 Sunshine Coast Mail Centre Qld 4560

Please consider the environment before printing this email

## Model Approval Email From TMR

**From:** Stuart C Duncan [<mailto:stuart.c.duncan@tmr.qld.gov.au>]  
**Sent:** Thursday, 7 April 2016 4:34 PM  
**To:** Paul McDonald <[paul.mcdonald@stockland.com.au](mailto:paul.mcdonald@stockland.com.au)>  
**Cc:** Terry N Upton <[terry.n.upton@tmr.qld.gov.au](mailto:terry.n.upton@tmr.qld.gov.au)>; Anthony S Fichera <[Anthony.S.Fichera@tmr.qld.gov.au](mailto:Anthony.S.Fichera@tmr.qld.gov.au)>; NCDFile <[NCDFile@tmr.qld.gov.au](mailto:NCDFile@tmr.qld.gov.au)>  
**Subject:** RE: Aura Town Centre - VISSUM modelling

500/00388

Hi Paul,

TMR have reviewed the latest models submitted and is satisfied that they incorporate the comments made on the previous release version. TMR is satisfied this should suffice to enable generation of a sub-network for VISSIM model development.

Regards,

**Stuart Duncan**

Principal Advisor (Development Assessment) | North Coast District / Maroochydore  
Program Delivery & Operations | Department of Transport and Main Roads

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W: [www.tmr.qld.gov.au](http://www.tmr.qld.gov.au)

## Response to SCRC Comments (09/03/2016)

Sr. No	TMR Comments	MWH Response
1	The model does not converge within 100 iterations	The convergence parameters has been reviewed to check the consistency with the default VISUM parameters. In the ICA Assignment procedure, the parameter "Relative gap between Blocking back wait and VDF wait time at turns is <=" was set to 1.0 (default 0.9), which was causing the assignment convergence criteria to be too tight. Both AM and PM models are converging within 10 iterations. Link and Turn flows has been assessed to ensure there is no significant change in traffic and model is robust.
2	There is significant queuing on links and connectors (see attached images). Queuing on connectors will affect convergence. Discussion with TMR is required on whether they would allow queuing from Corboud Way to Caloundra Road. In the interim, I have increased lanes in this area to address unacceptable queuing	The queuing issue has now been resolved by undertaking some minor changes to the link capacities in the interim. These changes are shown in the map attached. We note that no changes (CONFIRM) have been made within the Aura PDA. The impact of the placement of these connectors is deemed to not have a material impact on the traffic flows and operations within the Aura Town Centre.
2	There are connectors with flows linking directly to key intersections. Attached is an example of such connectors. Connectors need to be removed from intersections for ICA to function	As discussed in response to the previous comments (Dated Friday, 29th January, 2016), MWH has addressed this issue within the Town Centre study area. All other connectors that load directly are outside of the Town Centre and will be addressed as part of the model update due in 2017/2018. . The impact of the placement of these connectors is deemed to not have a material impact on the traffic flows and operations within the Aura Town Centre.
4	Caloundra Rd west of Parkland appears to be future motorway standard and should have its capacity increased accordingly. This will resolve a number of queuing issues	Noted and changes undertaken as suggested
5	U-turns are permitted at some intersections (particularly roundabouts) but are not included in ICA calculations. This may lead to route choice issues. U-turns need to be included in ICA calculations for the general procedure settings	This is addresses in the latest review of the model and changes has been undertaken in the updated model.

6	8 nodes are not correctly modelled for ICA. This appears to primarily be to the use of shared movement lanes and different phases applied to the same lane. For example, left-through lane with left movements being green also in the right turn phase of the adjacent leg. It is unclear whether this over estimates the performance of the left turn which in turn produces suboptimal routes?	Shared movement turns has now been removed from the updated model. This is considered a conservative approach.
7	One deadend link without a succeeding link	Noted and has been addressed in the reviewed model.
8	3 nodes have inconsistent lanes and lane turns	This change has been undertaken in the reviewed model.
9	30 turns have been specified as car only. Please only ban modes at appropriate location like bus lanes. Ensuring consistency of modes on all links, turns, lanes and lane turns facilitates future modelling of public transport, freight and active modes.	This has been incorporated in the reviewed model.
10	Various intersections could be optimised with a view to reducing queuing. This would improve model stability	All the signals within the study area have been optimised by VISUM with the internal Signal Optimisation operation MWH further refine the signal settings as part of the development of the forthcoming Aura Town Centre VISSIM micro-simulation model.

## SCRC Comments (08/02/2016)

- Comment 1. The model does not appear to converge after the 100 runs of the final assignment in the procedure. In reviewing why this may be the case, the following issues have been identified:*
- Comment 2. There is significant queuing on links and connectors (see attached images). Queuing on connectors will affect convergence. Discussion with TMR is required on whether they would allow queuing from Corboud Way to Caloundra Road. In the interim, I have increased lanes in this area to address unacceptable queuing;*
- Comment 3. There are connectors with flows linking directly to key intersections. Attached is an example of such connectors. Connectors need to be removed from intersections for ICA to function;*
- Comment 4. Caloundra Rd west of Parkland appears to be future motorway standard and should have its capacity increased accordingly. This will resolve a number of queuing issues.*
- Comment 5. U-turns are permitted at some intersections (particularly roundabouts) but are not included in ICA calculations. This may lead to route choice issues. U-turns need to be included in ICA calculations for the general procedure settings.*
- Comment 6. 8 nodes are not correctly modelled for ICA. This appears to primarily be to the use of shared movement lanes and different phases applied to the same lane. For example, left-through lane with left movements being green also in the right turn phase of the adjacent leg. It is unclear whether this over estimates the performance of the left turn which in turn produces suboptimal routes?;*
- Comment 7. One deadend link without a succeeding link;*
- Comment 8. 3 nodes have inconsistent lanes and lane turns.*
- Comment 9. 30 turns have been specified as car only. Please only ban modes at appropriate location like bus lanes. Ensuring consistency of modes on all links, turns, lanes and lane turns facilitates future modelling of public transport, freight and active modes.*
- Comment 10. Various intersections could be optimised with a view to reducing queuing. This would improve model stability.*

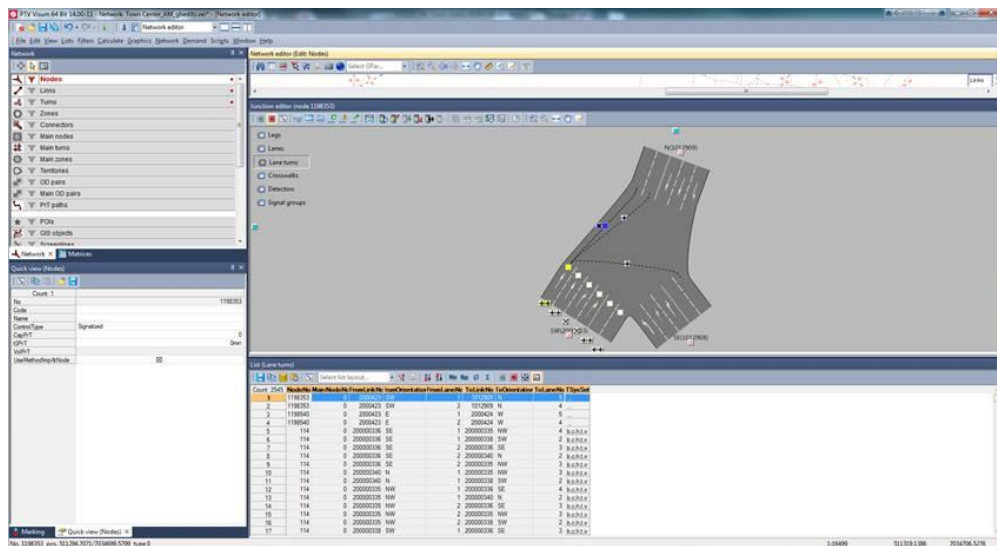
Part of these comments were incorporated within the updated model. .

## Response to SCRC Comments (29/01/2016)

*Comment 1. It is unclear whether the model results provided to Council are from converged assignment. The model provided has both equilibrium and ICA assignment. The am equilibrium assignment does not converge after 20 iterations. Also, the ICA assignment has not converged after 100 runs. Convergence is required to ensure reliable, repeatable and appropriate results. Final comments are not possible until a converged model has been provided.*

Response 1. This comment has been addressed in the revised version of the Town Centre model.

*Comment 2. 4 lane turns have no modes specified (see attached). These have been corrected in the attached file;*



Response 2. This comment has been addressed in the revised version of the Town Centre model.

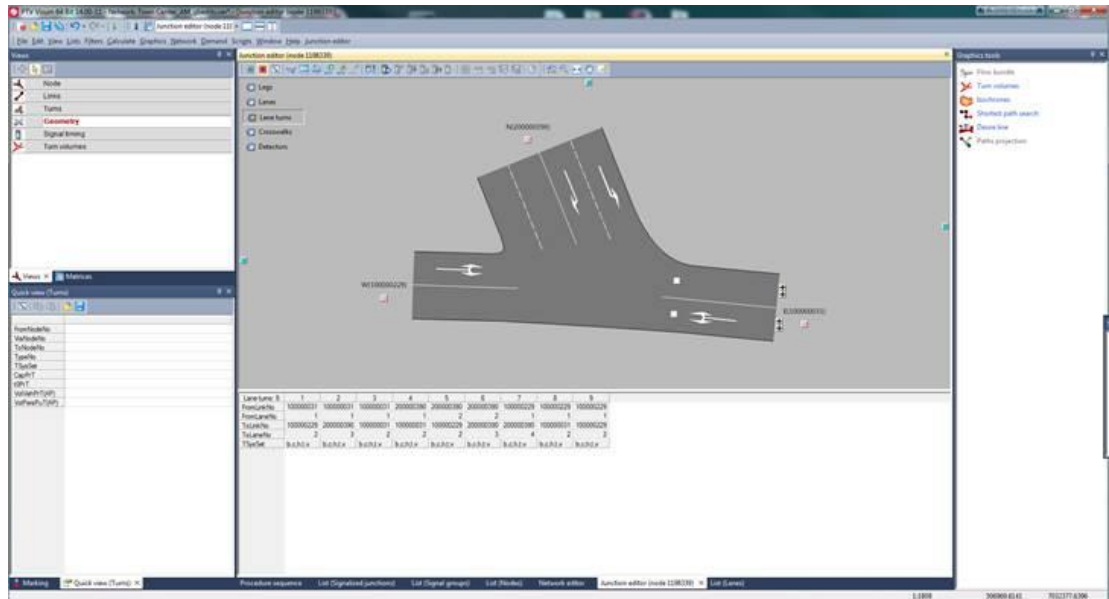
*Comment 3. Nodes 200000253 and 200000260 have no lane turns specified. This may cause issues for simulation. The attached file has corrected these issues;*

Response 3. This comment has been addressed in the revised version of the Town Centre model.

*Comment 4. There are numerous inconsistencies between links, turns, lanes and lane turns. It is unclear what effect if any these inconsistencies may have non-the-less they have been corrected in the attached am file;*

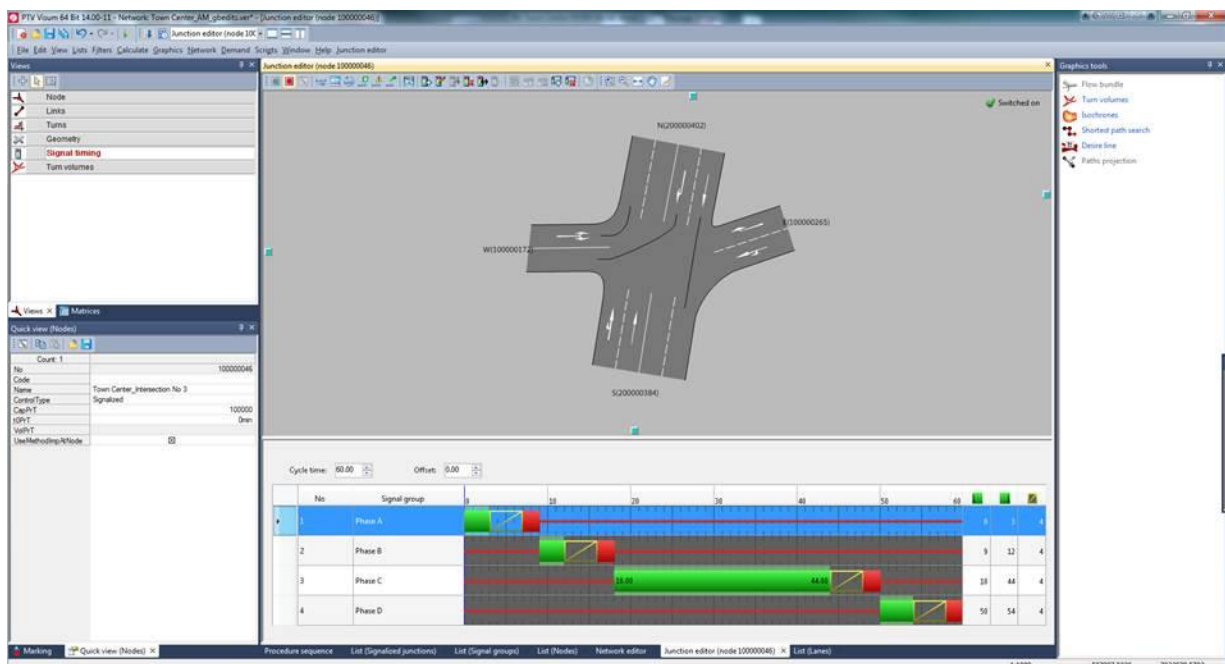
Response 4. This comment has been addressed in the revised version of the Town Centre model.

*Comment 5. In the town centre, some turns are inconsistent with node geometry (see attached). This may impact on turn priority and capacity. Network will export to vissim better if geometry is improved and medians and other intersection attributes are coded in visum;*



Response 5. This comment has been addressed in the revised version of the Town Centre model.

Comment 6. Coding of signal phases, in some instances, may result in over estimation of intersections capacity (see attached). For example, minimum green times need to be appropriately coded and lane turn arrows for lanes shared with other busy turns are questionable;

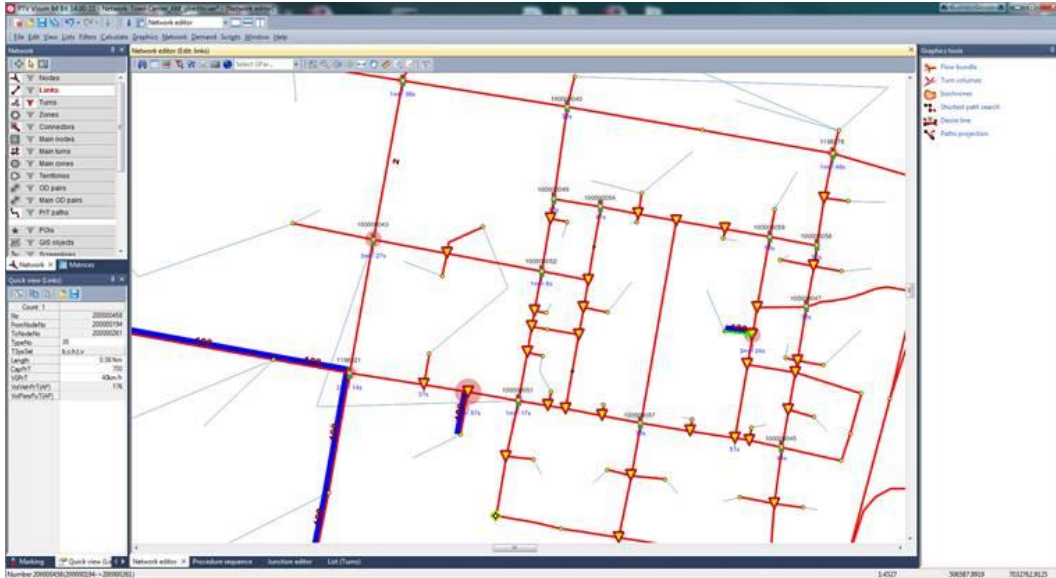


Response 6. Noted. Minimum greens have been set to 6 seconds for signal groups which had less than 6 seconds of minimum green in the original model. Lane turn arrows for shared lanes have been removed.

Comment 7. Several intersection do not appear to have been using ICA due to the issued raised above;

Response 7. This comment has been addressed in the revised version of the Town Centre model.

Comment 8. There is blocking back occurring on connectors. This needs to be addressed and will produce and more stable faster assignment.



Response 8. To reduce blocking back occurring on connectors, additional stubs have been added for Town Centre zones based on confirmation from Stocklands.

*Comment 9. There are large delays at several intersections. These will be generating strange paths and needs to be addressed before simulation. Fixing these issues will also address above blocking back issue.*

Response 9. This comment has been addressed to a great extent in the revised version of the Town Centre model.

*Comment 10. Connectors are attached to ICA intersections. At least some of these have volumes. These connectors need to be moved.*

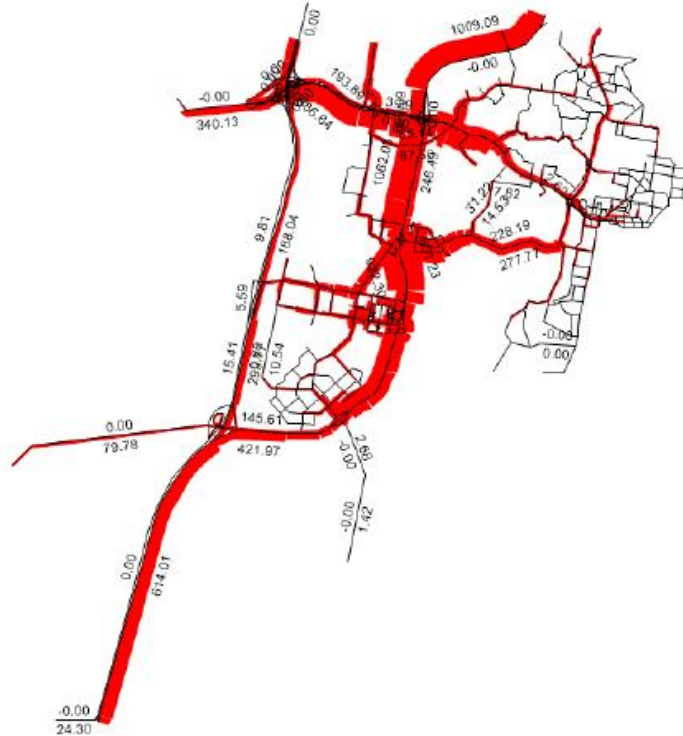
Response 10. This is a pre-existing issue with the original UCSTM approved in 2013. MWH has fixed this error at all signalised intersections. The remaining instances of connectors attached to ICA intersection are either at unsignalised intersections, or at connectors that serve no demand.

*Comment 11. Some of the freeway merges have been coded as giveaway. These need to be unknown to avoid unrealistic merging delays. I have tested this fix and the assignment is better.*

Response 11. This comment has been addressed in the revised version of the Town Centre model.

## Response to TMR Comments (29/01/2016)

*Comment 1. There is a significant amount of latent demand within the model (see image below showing latent demand on links measured in vph).*



**Response 1.** Noted. Latent demand at the edge of the model is outside of the study area and reflects a pre-existing issue with the original model approved in 2014. These issues have been addressed partially with the assumption that they will be addressed separately as part of the model update due in 2017/2018.

*Comment 2. This is mostly due to inadequate detail with regard to connector definition. A number of zonal access points are defined with a single connector onto a stub with a connection to the network via a priority controlled intersection. The priority controlled intersections have inadequate capacity to cater for the demands leaving the zone. More access points (based on the proposed road layout) should be defined to load demands more accurately.*

**Response 2.** Additional stubs have been added for Town Centre zones based on confirmation from Stocklands.

*Comment 3. There are a number of zones connected midblock on links that have significant demands. These should be coded with stubs and appropriate intersections to ensure demand is loaded onto the network accurately*

**Response 3.** This is a pre-existing issue with the original UCSTM approved in 2013. MWH has fixed this error at all intersections within Town Centre. All other connectors that load directly onto unsignalised nodes and links midblock are outside of core study area and will be addressed as part of the model update due in 2017/2018.

*Comment 4. There are a significant number of intersections that are operating with saturated movements – optimisation of signal timings would provide a better assignment and therefore more appropriate flows in the Town Centre prior to generating a sub-network for VISSIM.*

**Response 4.** This comment has been addressed in the revised version of the Town Centre model.

*Comment 5. There are incorrect free flow speeds throughout the model, e.g.*

- Bruce Hwy SB (south of Roys Rd) – 90km/h
- Bruce Hwy SB (between Caloundra Rd and Sunshine Mwy) – 90km/h
- Bruce Hwy NB (between Caloundra Rd and Sunshine Mwy) – 100km/h
- Nicklin Way – 80km/h

Response 5. This comment has been addressed in the revised version of the Town Centre model. The total link length of Nicklin Way is approximately 4.5 KM and will require revalidation of the model. This speed change will be undertaken as part model review in 2017/2018.

*Comment 6. Link capacities appear to be very low, e.g.*

- Nicklin Way – 1100vph/lane
- Ramps at Caloundra Rd / Kawana Arterial interchange – 1000vph/lane

Response 6. Link capacities used in the model were obtained from the SCTFM and were also used to calibrate and validate the base year UCSTM. Changing link capacities at this stage will require recalibrating and revalidating the UCSTM. This is a pre-existing issue with the original UCSTM approved in 2013 and will be addressed as part of the model update due in 2017/2018.

*Comment 7. Points 4, 5 and 6 above are potentially significantly impacting flows within the model study area. For an ICA assignment model, the link capacities seem very low. The constraints should be modelled at the junction (for corridors like Nicklin Way) and delays are potentially being double-counted with the low capacities assumed at link level.*

Response 7. This comment has been addressed in the revised version of the Town Centre model.

*Comment 8. There are a number of zone connectors placed directly onto signalised and priority controlled intersections, which should be defined more accurately at access roads.*

Response 8. This is a pre-existing issue with the original UCSTM approved in 2013. MWH has fixed this error at all signalised intersections. The remaining instances of connectors attached to ICA intersection are either at unsignalised intersections, or at connectors that serve no demand.

*Comment 9. There are a number of links where the link length and the length of the link polygon are different (up to 1.5km difference).*

Response 9. This has been addressed in the revised version of the Town Centre model.

*Comment 10. Incorrect number of lanes on Bruce Hwy (between Caloundra Rd and Sunshine Mwy) – should be 6 lanes (and appropriate capacities) by this time*

Response 10. This is a pre-existing issue with the original UCSTM approved in 2013 but has been addressed in the revised version of the Town Centre model.

