

Moorebank Precinct West Stage 2 Proposal Response to Submissions

Appendix C: Operational sensitivity analysis



SIMTA

SYDNEY INTERMODAL TERMINAL ALLIANCE

Part 4, Division 4.1, State Significant
Development

Date 23/06/2017
To Nathan Cairney (Tactical Group)
From Jerry Xiang (Arcadis) / Lorena Martins (Arcadis) / Michael Yong (Arcadis)
Copy to Westley Owers (Arcadis), Claire Vahtra (Arcadis)
Subject MPW Stage 2 - Sensitivity Test for M5 Motorway and Moorebank Avenue Interchange

1 INTRODUCTION

SIMTA are seeking approval for the construction and operation of the Moorebank Precinct West (MPW) Stage 2 Proposal (the Proposal), which will be the second stage of development under the MPW Concept Approval (SSD 5066).

An Environmental Impact Statement (EIS) was prepared for the Proposal seeking approval under Part 4, Division 4.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The EIS for the Proposal was publicly exhibited between 26 October 2016 and 25 November 2016. During this exhibition period, submissions were invited from all stakeholders including members of the community and government stakeholders. A response to submissions (RtS) report has been prepared which provides a response to the submissions received in relation to the EIS.

During the public exhibition period, Transport for NSW (TfNSW) provided a response in relation to the EIS for the Proposal, which noted that Concept Approval condition 6 (*Projects carried out under this staged development consent are to be assessed with the objective of not exceeding the capacity of the transport network, including the local, regional and State road network.*) had not been adequately addressed.

To supplement the Operational Traffic and Transport Impact Assessment (OTTIA) prepared for the Proposal (and provided at Appendix K of the EIS) and to respond to the TfNSW submission, a sensitivity test has been conducted to examine the potential impact of re-distributing development traffic at the M5 Motorway / Moorebank Avenue interchange.

The aim of the sensitivity test is to demonstrate that the M5 Motorway/ Moorebank Avenue interchange would be able to accommodate changes in traffic distribution for vehicles using the M5 Motorway/ Moorebank Avenue interchange to access/ egress the Proposal site without significantly impacting on the operational performance of the interchange.

Specifically, the sensitivity test has modelled a range of traffic distribution assumptions relating to the proportion of Proposal traffic travelling to and from the Proposal site along the M5 Motorway from the west and east of the interchange, to consider whether the road network would be able to accommodate some additional traffic from the Proposal turning right (eastbound) at the M5 Motorway/ Moorebank Avenue interchange from the south approach. By considering these additional traffic distribution scenarios, the sensitivity test aims to demonstrate that the road network can cater for development traffic under a range of different traffic distribution scenarios, particularly additional traffic from the Proposal turning right at the interchange from Moorebank Avenue to travel eastwards along the M5 Motorway.

This technical memorandum has been prepared to describe the assumptions and approach to, and results of, this sensitivity test on the performance of the M5 Motorway / Moorebank Avenue interchange, and to provide conclusions based on the results.

2 BACKGROUND

An Operational Traffic and Transport Impact Assessment (OTTIA) was prepared as part of the EIS (and provided at Appendix K of the EIS), which provided an assessment of the potential impacts of the operation of the Proposal on the core traffic study area. The distribution of additional traffic generated by the Proposal is a key factor in determining the impact of the Proposal on the road network.

As part of the traffic modelling undertaken for the OTTIA, the following assumptions about operational traffic distribution were assumed:

Heavy vehicles

Of the total trucks generated by the Proposal, 56% would reach the Proposal site via the M5 Motorway from the west. Approximately 25% of trucks generated by the Proposal would reach the site from Moorebank Avenue to the north, and about 17% of trucks would arrive via the Hume Highway. In general, all trucks would travel via Moorebank Avenue north of the Precinct. No trucks would travel via Anzac Road (east of Yulong Close) and Cambridge Avenue to reach the Proposal.

Light vehicles

The majority of employee cars travelling to the Proposal site in the morning peak period would travel via the M5 Motorway to Moorebank Avenue at the northern end of the Proposal. Approximately 18% of employees would enter the M5 Motorway from the Hume Highway to the west, while a minor percentage (8%) of employee traffic would use Anzac Road.

Traffic modelling identified that in 2029 under the Cumulative Development scenario, the M5 Motorway / Moorebank Avenue interchange would operate at either a better than or comparable level of service (LoS) with the operation of the Proposal, than without the Proposal. Under the Cumulative Development scenario, the M5 Motorway / Moorebank Avenue interchange is predicted to operate at a LoS C in the AM peak and a LoS D in the PM peak. The traffic modelling carried out as part of the OTTIA demonstrated that the operation of the Proposal would not result in the exceedance of capacity on the road network within the core traffic study area in 2029.

The MPW Stage 2 RtS also includes amendments to the exhibited Proposal, now known as the Amended Proposal, which is described in Section 6 of the MPW Stage 2 RtS. These amendments have been undertaken to address Proposal design changes, submissions received, and to reduce the overall environmental impact of the Proposal. The operational traffic impacts associated with the Amended Proposal have been considered as part of an Amended Operational Traffic Impact Assessment (OTTIA), provided at Appendix C of the MPW Stage 2 RtS. The Amended OTTIA concluded that the Amended Proposal would result in consistent impacts to those already identified and assessed as part of the OTTIA prepared as part of the EIS.

3 SCOPE OF WORK AND ASSUMPTIONS

The OTTIA for the Proposal included an analysis of the traffic impacts of future traffic demand on the surrounding road network from both background traffic growth and the additional traffic generated by the Proposal when the Proposal site is fully developed. This investigation reviewed the existing infrastructure and then identified the required road and intersection improvements needed to mitigate the additional traffic generated by the Proposal under the cumulative development scenario. It was identified as part of the OTTIA that the road network will need to be improved to cater for the forecast increase in traffic volumes which will result from both the general growth in background traffic and operational vehicles from the Proposal passing through the study area.

The M5 Motorway/ Moorebank Avenue intersection was identified in the OTTIA as an intersection which would operate at a level of service which is unsatisfactory without the operation of the Proposal (i.e. due to background traffic growth). Potential road network solutions were identified in Table 6-2 of the OTTIA as recommendations for consideration by Roads and Maritime to consider to improve the existing and future operation of the local road network.

The sensitivity test involved assessing the performance of the proposed upgraded layout of the M5 Motorway / Moorebank Avenue interchange (refer to **Figure 4-1**), which is based on the recommended improvements due to background traffic included in Section 6 of the OTTIA (Appendix M of the EIS) for the MPW Stage 2 Cumulative Development in 2029 under four different traffic distribution scenarios. The sensitivity test has been undertaken for the interchange using SIDRA 7 intersection analysis software (version 7.0.5.6563).

The Cumulative Development scenario used for the purpose of the sensitivity test is consistent with the cumulative operational scenario used to undertake the OTTIA as part of the EIS, which consists of the following:

- MPW Stage 2 intermodal terminal throughput: 500,000 Twenty-foot equivalent unit (TEU)
- MPW Stage 2 warehousing: 215,000sq. m Gross floor area (GFA)
- MPE Stage 1 intermodal terminal throughput: 250,000 TEU

Four traffic distribution scenarios were investigated as part of the sensitivity test. The performance of the M5 Motorway / Moorebank Avenue interchange was tested using SIDRA for the following 2029¹ traffic distribution scenarios:

- Scenario 1 – without traffic redistribution (as per the EIS)
- Scenario 2 – with traffic redistribution (redistribute 10% of the development traffic from westbound to eastbound along the M5 Motorway)
- Scenario 3 – with traffic redistribution (redistribute 20% of the development traffic from westbound to eastbound along the M5 Motorway)
- Scenario 4 – with traffic redistribution (redistribute 30% of the development traffic from westbound to eastbound along the M5 Motorway)

Scenarios 2 to 4 assume that development traffic is redistributed from westbound to eastbound, namely from the left-turn to the right-turn on the south approach of the M5 Motorway / Moorebank Avenue interchange. The scenarios assume no additional development traffic was generated or reduced for the redistribution i.e. the sum of the left and right-turn volumes remained the same as modelled in the EIS OTTIA.

¹ A 2019 scenario was not assessed as this would not represent the design horizon with a worst-case scenario.

4 SIDRA MODEL DEVELOPMENT

The layout of the M5 Motorway/ Moorebank Avenue interchange used in the SIDRA analysis for this sensitivity assessment is the proposed upgraded layout included in Appendix M of the EIS and replicated in Figure 3-1 below. This layout has been based on the recommended improvements due to background traffic included in Section 6 (mitigation measures) of the OTTIA (Appendix M of the EIS).

It should be noted that in the EIS, intersection performance was modelled and assessed in AIMSUN as this is the platform used for the LMARI Model and mandated for use in traffic modelling of all future development applications by the MPW Concept Conditions of Approval (SSD-5066). The AIMSUN modelling was used to investigate the wider network impact as well as the performance of eight key intersections in the core modelling area.

SIDRA was used to provide an indication of the impact on, and performance of, the intersection and a calibration exercise was conducted between SIDRA and AIMSUN. The use of SIDRA as a method to test the sensitivity of the M5 Motorway/ Moorebank Avenue interchange is considered acceptable as the SIDRA model was calibrated to the AIMSUN model and was used solely for a sensitivity analysis in order to understand to potential changes in intersection performance.

The peak hour traffic volumes (8am to 9am and 5pm to 6pm) from the AIMSUN model were extracted and adopted in the SIDRA model for this sensitivity test. The SIDRA input traffic volume diagrams, for both without and with redistribution, are provided in **Appendix A** of this document.

The AIMSUN models consider traffic influence and interaction between intersections. As a result, the SIDRA models were adjusted for the sensitivity test to account for the network influences (i.e. downstream delay and congestion effects) observed in the AIMSUN models.

The following heavy downstream congestion was observed at the M5 Motorway / Moorebank Avenue interchange within the AIMSUN model at the following locations:

- the M5 Motorway westbound on-ramp from Moorebank Avenue, which impacted on the flow of traffic travelling north along Moorebank Avenue (to the south of the M5 Motorway / Moorebank Avenue interchange) and turning left onto the M5 Motorway from the interchange ,
- the M5 Motorway eastbound off-ramp at the interchange, which impacted on the flow of traffic exiting the Motorway from the west and travelling north along Moorebank Avenue.

The lane capacity at the M5 Motorway / Moorebank Avenue interchange has been adjusted in SIDRA for the two abovementioned left-turns to reflect the downstream congestion and delay. These adjustments were made to calibrate the SIDRA model to align with the observed behaviour in AIMSUN so that the same, or similar, performance can be replicated. In addition, the same signal phases and times from the AIMSUN models were adopted in SIDRA for modelling consistency.

Table 4-1 compares the resulting intersection delay and level of service (LOS) between the AIMSUN models and the SIDRA models. With the lane capacity adjustment², the SIDRA models were able to provide similar results to AIMSUN and were considered appropriate to provide a comparative assessment of the intersection.

² The lane capacity adjustment is a parameter used within SIDRA Intersection modelling software to specify a capacity gain or loss for a lane, based on downstream effects. For this modelling exercise a capacity adjustment of -30% for the south approach left-turn for the AM and PM peak and -15% and 0% for the west approach left-turn for the AM and PM peak, respectively, was adopted to produce similar delays as in the AIMSUN model.

Table 4-1 – M5 Motorway / Moorebank Avenue Interchange - Intersection Average Delay (seconds) and LOS for 2029 Cumulative Development

Model	AIMSUN		SIDRA	
Period	AM (8:00-9:00am)	PM (5:00-6:00pm)	AM (8:00-9:00am)	PM (5:00-6:00pm)
Average intersection delay (seconds) / LOS	35 (C)	53 (D)	41 (C)	53 (D)

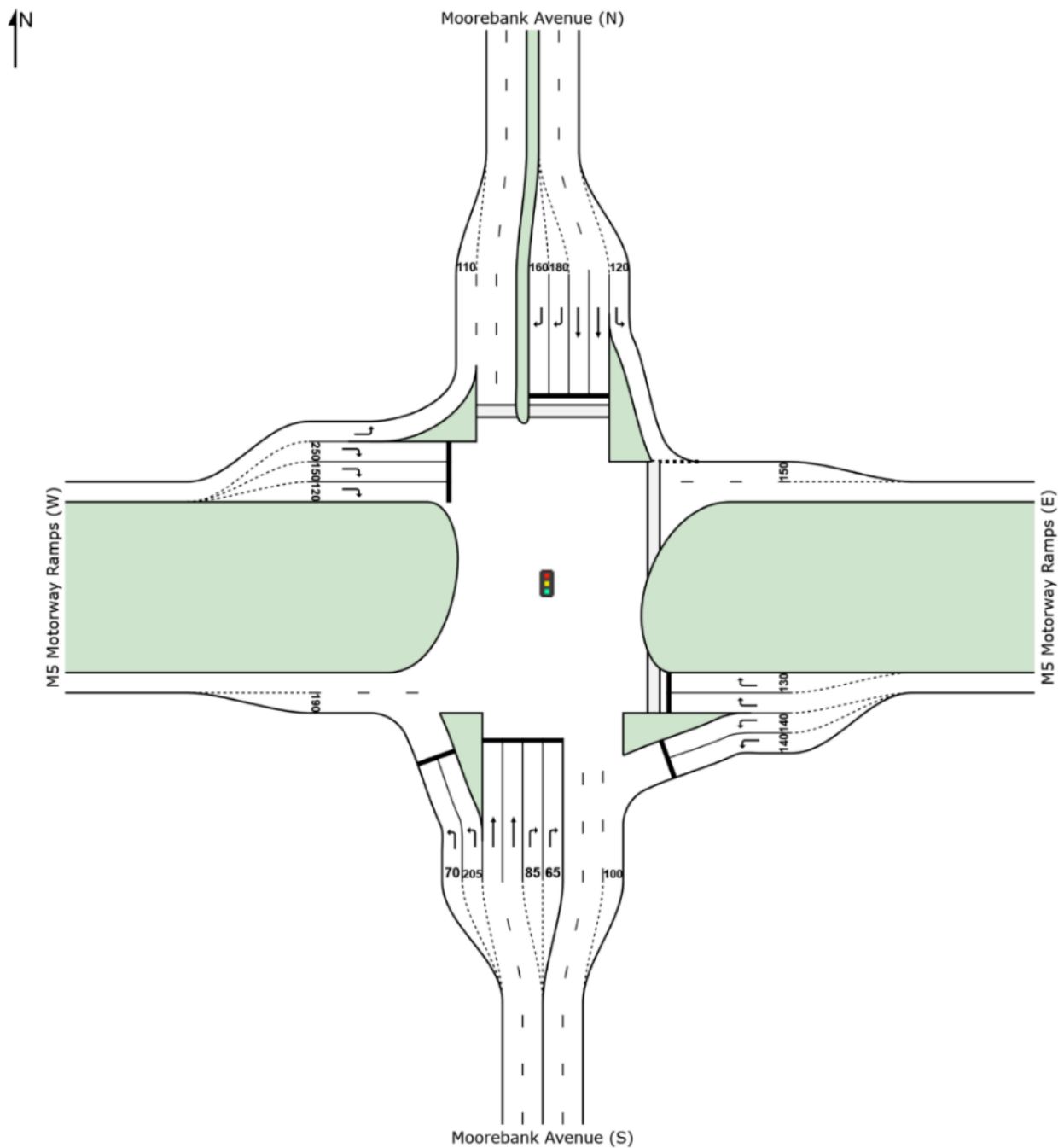


Figure 4-1 – Proposed upgraded layout of the M5 Motorway / Moorebank Avenue interchange (based on the recommended improvements due to background traffic)

5 SIDRA RESULTS

The SIDRA modelling results at the M5 Motorway / Moorebank Avenue interchange for each approach and turning movement and for the overall intersection for each of the four traffic distribution scenarios are summarised in **Table 5-1** (refer to Section 3 for more information).

The detailed SIDRA movement summaries are provided in **Appendix A** of this technical memorandum.

The SIDRA modelling results for the overall intersection performance in 2029 under the Cumulative Development scenario (as presented in **Table 5-1**) show that the performance of the M5 Motorway / Moorebank Avenue interchange as a result of redistributing the development traffic remained unchanged in the AM (LOS C) and PM peak (LOS D) for all scenarios assessed.

With each increase in the percentage of traffic being redistributed from turning westbound to eastbound along the M5 Motorway, the average delay for traffic turning left (westbound) onto the M5 Motorway reduced. However, the performance of the movement would remain at a LoS F in the PM peak and there would continue to be heavy delays due to congestion because of lane merging at the on-ramp and traffic merging on the M5 Motorway. By lowering the proportion of traffic turning westbound onto the M5 Motorway during the AM peak, the average delay was reduced by 24% from 34 seconds to 28 seconds with 30% of the Proposal traffic redistributed, and the LoS improves from a LoS C to a LoS B. In the PM Peak, the average delay was significantly reduced (by 45%) from 170 seconds with no redistribution, to 93 seconds with 30% of the Proposal traffic redistributed.

The average delay for traffic turning east onto the M5 Motorway at the interchange would slightly increase in the AM and PM peak between scenario 1 and scenario 4 by two seconds, and one second respectively. These minor changes to average delay would have no impact on the LoS during the AM or PM peak. The dominant right-turn (westbound) movement from the Moorebank Avenue north approach determines the performance of the right-turn (eastbound) movement on Moorebank Avenue from the south approach. The Moorebank Avenue north approach has much higher traffic volumes than the south approach, ranging from 500 to 600 vehicles per hour in the AM peak and from 900 to 1,000 vehicles per hour in the PM peak (see **Appendix A** for breakdown of traffic volumes and signal phasing for all scenarios).

The right-turn (eastbound) movement onto the M5 Motorway from the Moorebank Avenue south approach has 18 seconds of 'green time' in the AM peak (signal phase D) and 56 seconds of green time in the PM peak (signal phase C) (refer to **Appendix A** of this memo for more information regarding signal phasing). As this interchange works in a diamond configuration, the time allocated to this signal phase is determined by the length of 'green time' required for the predominant right-turn (westbound) movement onto the M5 Motorway from the north approach.

As there are more vehicles undertaking the predominant right-turn (westbound) movement onto the M5 Motorway from the north approach than the right-turn (eastbound) movement from the south approach, there is spare 'green time' for the eastbound turning movement onto the M5 Motorway from the Proposal. Due to the spare 'green time', the average delay for the right-turn on the south approach did not increase significantly when adding development traffic onto this movement.

The right-turn (eastbound) movement onto the M5 Motorway from traffic travelling north along Moorebank Avenue would be able to accommodate additional traffic movements under scenarios 2, 3 and 4 without significantly increasing the average delay or LoS.

The redistribution of traffic under all scenarios would not impact the average delay or LoS for through-traffic along Moorebank Avenue in both directions.

The performance of the remaining intersection movements/approaches (i.e. north, east and west approaches) in Scenarios 2 to 4 remained unchanged compared to Scenario 1 and remained unaffected by the traffic redistribution.

Table 5-1 – SIDRA modelling results for the four traffic distribution scenarios at the M5 Motorway / Moorebank Avenue interchange under the 2029 Cumulative Development scenario

Scenario	Redistribution	Movement	M5 Motorway / Moorebank Avenue interchange traffic approach								Overall Intersection	
			South Approach*		East Approach**		North Approach*		West Approach**			
			AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Scenario 1	No redistribution	Left-turn	34 (C)	170 (F)	44 (D)	27 (B)	8 (A)	7 (A)	39 (C)	6 (A)	41 (C)	53 (D)
		Through	45 (D)	44 (D)	-	-	19 (B)	43 (D)	-	-		
		Right-turn	46 (D)	28 (B)	55 (D)	66 (E)	40 (C)	37 (C)	44 (D)	70 (E)		
Scenario 2	10% redistribution	Left-turn	31 (C)	152 (F)	44 (D)	27 (B)	8 (A)	7 (A)	39 (C)	6 (A)	41 (C)	51 (D)
		Through	45 (D)	44 (D)	-	-	19 (B)	43 (D)	-	-		
		Right-turn	47 (D)	29 (C)	55 (D)	66 (E)	40 (C)	37 (C)	44 (D)	70 (E)		
Scenario 3	20% redistribution	Left-turn	28 (B)	134 (F)	44 (D)	27 (B)	8 (A)	7 (A)	39 (C)	6 (A)	41 (C)	49 (D)
		Through	45 (D)	44 (D)	-	-	19 (B)	43 (D)	-	-		
		Right-turn	48 (D)	29 (C)	55 (D)	66 (E)	40 (C)	37 (C)	44 (D)	70 (E)		

Scenario	Redistribution	Movement	M5 Motorway / Moorebank Avenue interchange traffic approach								Overall Intersection	
			South Approach*		East Approach**		North Approach*		West Approach**			
			AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Scenario 4	30% redistribution	Left-turn	26 (B)	93 (F)	44 (D)	27 (B)	9 (A)	7 (A)	39 (C)	6 (A)		
		Through	45 (D)	44 (D)	-	-	19 (B)	43 (D)	-	-	41 (C)	44 (D)
		Right-turn	48 (D)	29 (C)	55 (D)	66 (E)	40 (C)	37 (C)	44 (D)	70 (E)		

Note: Approach denotes the direction from which traffic is approaching the M5 Motorway / Moorebank Avenue interchange i.e. 'south approach' is traffic travelling north along Moorebank Avenue and approaching the M5 Motorway / Moorebank Avenue interchange from the south.

*traffic approaching from Moorebank Avenue **traffic approaching from M5 Motorway

6 CONCLUSIONS

This technical memorandum has been prepared to describe the assumptions and approach to, and results of, the sensitivity test on the performance of the M5 Motorway / Moorebank Avenue interchange with a redistribution of proposal traffic movements from west to east.

Three redistribution scenarios were assessed using the SIDRA modelling software; with each scenario investigating a proportional redistribution of Proposal traffic from turning westbound to eastbound along the M5 Motorway from the M5 Motorway / Moorebank Avenue interchange from the south approach under the Cumulative Development scenario.

The results of the SIDRA modelling demonstrated that the overall intersection performance as a result of redistributing 10%, 20% and 30% of Proposal traffic from turning westbound to eastbound onto the M5 Motorway under the 2029 Cumulative Development scenario remained unchanged in the AM (LOS C) and PM peak (LOS D) when compared to the results in the EIS.

With each increase in the percentage of traffic being redistributed from turning westbound to eastbound along the M5 Motorway, the average delay for traffic turning left (westbound) onto the M5 Motorway reduced. However, the performance of the movement would remain at a LoS F and there would continue to be heavy delays due to congestion because of lane merging at the on-ramp and traffic merging on the M5 Motorway as a result of existing traffic network demand.

The average delay for traffic turning right (eastbound) onto the M5 Motorway at the interchange from the south approach would slightly increase in the AM and PM peak; however, these minor changes to average delay would have no impact on the LoS during the AM or PM peak. The analysis showed that the performance of the right-turn (eastbound) movement onto the M5 Motorway from the Moorebank Avenue south approach is determined by the (dominant) right-turn movement on Moorebank Avenue north approach and the right-turn movement would have spare capacity for accommodating additional traffic without significantly increasing the average delay for the right-turn movement

The redistribution of traffic under all scenarios would not impact the average delay or LoS for through-traffic along Moorebank Avenue in both directions. The performance of the remaining intersection movements/approaches (i.e. north, east and west approaches) in Scenarios 2 to 4 remained unchanged compared to Scenario 1 and remained unaffected by the traffic redistribution.

The findings of the sensitivity test demonstrated that the M5 Motorway / Moorebank Avenue interchange would be able to accommodate changes in traffic distribution assumptions due to the Proposal without significantly impacting the operation of the interchange.

7 REFERENCES

'Moorebank Precinct West – Stage 2 Proposal – Environmental Impact Statement, Part 4, Division 4.1, State Significant Development, Dated October 2016, Appendix M, Operational Traffic and Transport Impact Assessment'

'Moorebank Precinct East – Stage 2 Proposal – Environmental Impact Statement, Part 4, Division 4.1, State Significant Development, Dated December 2016, Appendix K, Operational Traffic and Transport Impact Assessment'.

APPENDIX A – SIDRA RESULTS

Scenario 1 – AM Peak

MOVEMENT SUMMARY

 Site: MPW_AM_1 [1 - M5 Motorway / Moorebank Avenue 2029 AM Peak]

MPW - AM Peak / Scenario 1

Signals - Fixed Time Isolated Cycle Time = 90 seconds (User-Given Phase Times)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Moorebank Avenue (S)											
1	L2	475	20.6	0.835	34.3	LOS C	8.2	82.9	0.95	1.00	36.4
2	T1	578	12.4	0.841	44.9	LOS D	14.1	124.7	1.00	1.01	32.4
3	R2	426	6.9	0.641	46.2	LOS D	8.9	71.9	0.97	0.84	31.7
Approach		1479	13.5	0.841	41.9	LOS C	14.1	124.7	0.98	0.96	33.4
East: M5 Motorway Ramps (E)											
4	L2	367	12.3	0.752	44.3	LOS D	10.4	92.3	0.97	0.86	30.8
6	R2	496	14.6	0.834	55.0	LOS D	12.1	111.5	1.00	0.97	29.1
Approach		863	13.7	0.834	50.5	LOS D	12.1	111.5	0.99	0.93	29.8
North: Moorebank Avenue (N)											
7	L2	37	45.7	0.045	8.0	LOS A	0.3	4.4	0.26	0.59	49.1
8	T1	161	28.1	0.159	18.7	LOS B	2.4	27.1	0.67	0.54	44.3
9	R2	605	36.0	0.859	39.8	LOS C	9.7	120.3	1.00	1.02	35.5
Approach		803	34.9	0.859	34.1	LOS C	9.7	120.3	0.90	0.90	37.3
West: M5 Motorway Ramps (W)											
10	L2	1398	12.7	1.077	38.8	LOS C	0.0	0.0	0.00	0.04	28.1
12	R2	286	26.1	0.396	43.9	LOS D	4.1	44.3	0.91	0.78	34.4
Approach		1684	15.0	1.077	39.7	LOS C	4.1	44.3	0.15	0.17	29.0
All Vehicles		4829	17.6	1.077	41.3	LOS C	14.1	124.7	0.68	0.67	31.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Queue Distance m	Prop. Queued	Effective Stop Rate per ped	
P21	East Stage 1	53	6.1	LOS A	0.0	0.0	0.37	0.37	
P22	East Stage 2	53	6.1	LOS A	0.0	0.0	0.37	0.37	
P31	North Stage 1	50	35.6	LOS D	0.1	0.1	0.89	0.89	
P32	North Stage 2	50	13.7	LOS B	0.1	0.1	0.78	0.78	
All Pedestrians		205	15.1	LOS B			0.60	0.60	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

SIDRA INTERSECTION 7.0 | Copyright © 2000-2016 Akcelik and Associates Pty Ltd | sidrasolutions.com

Organisation: ARCADIS AUSTRALIA PACIFIC PTY LIMITED | Processed: Monday, 3 April 2017 10:11:07 AM

Project: \\HC-AUS-NS-FS-01\jobs\AA009017\ID - Calculations\Traffic\19 SIMTA Ongoing Support\Sensitivity Test M5 Moorbank Intersection\SIDRA Model\MPW - M5_Moorebank_v2.sip7

PHASING SUMMARY

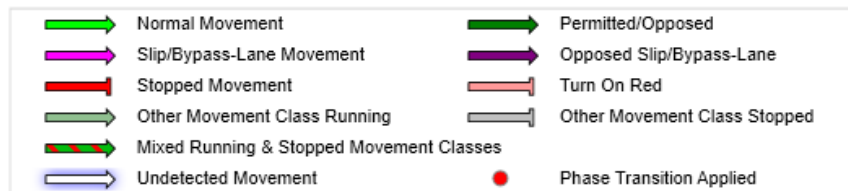
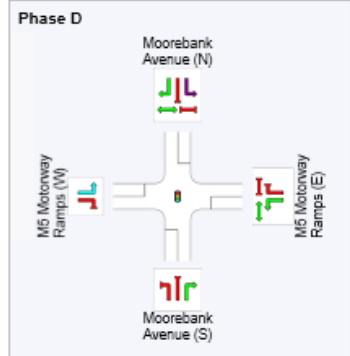
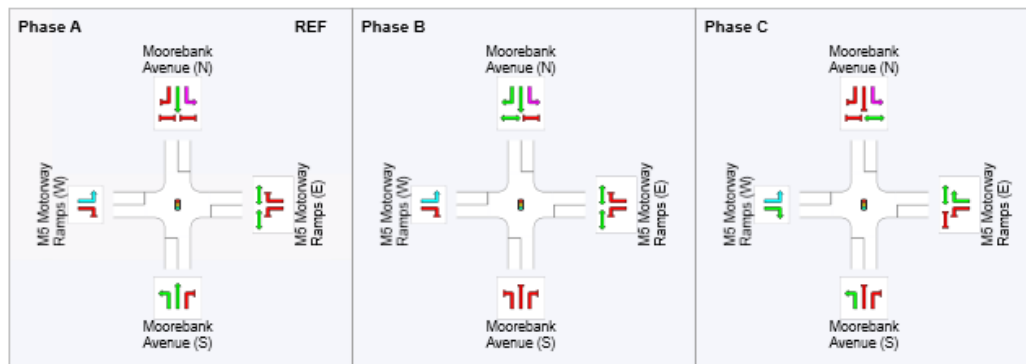
Site: MPW_AM_1 [1 - M5 Motorway / Moorebank Avenue 2029 AM Peak]

MPW - AM Peak / Scenario 1
 Signals - Fixed Time Isolated Cycle Time = 90 seconds (User-Given Phase Times)

Phase times specified by the user
 Sequence: LMARI_SIGNALS_0800_GTA
 Movement Class: All Movement Classes
 Input Sequence: A, B, C, D
 Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Reference Phase	Yes	No	No	No
Phase Change Time (sec)	0	25	42	66
Green Time (sec)	19	11	18	18
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	25	17	24	24
Phase Split	28%	19%	27%	27%



INPUT VOLUMES

Vehicles and pedestrians per 60 minutes

 Site: **MPW_AM_1 [1 - M5 Motorway / Moorebank Avenue 2029 AM Peak]**

MPW - AM Peak / Scenario 1
Signals - Fixed Time Isolated

Volume Display Method: Separate

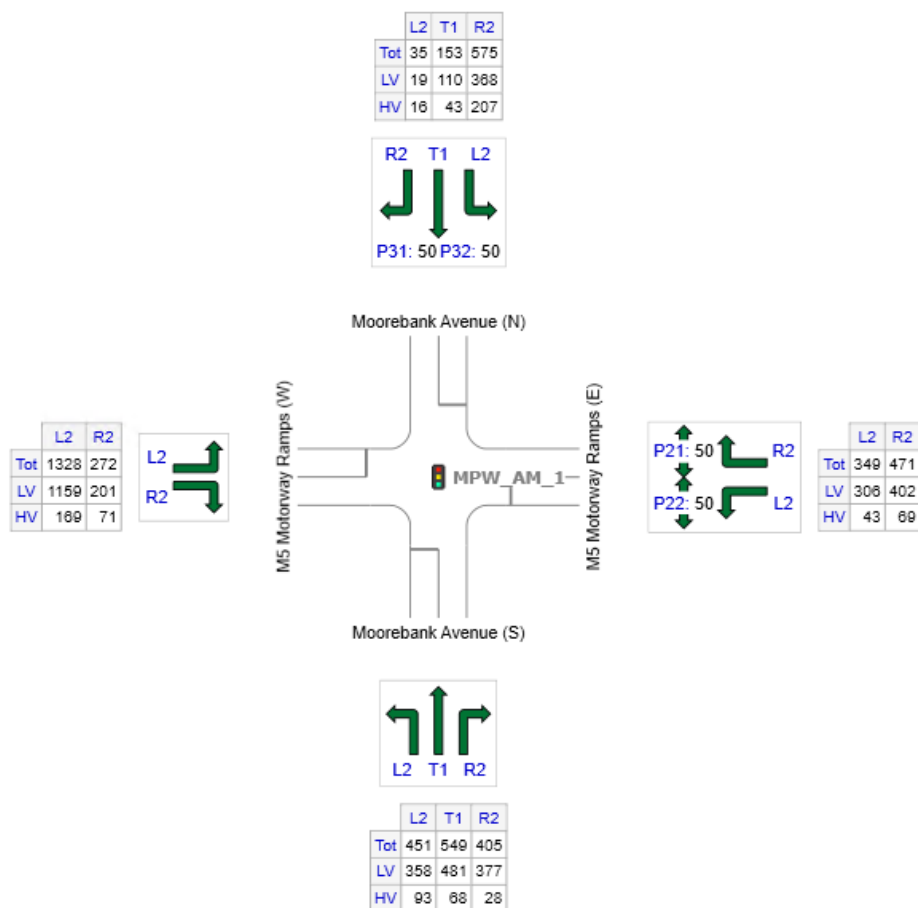
Total Intersection Volumes (veh)

All Movement Classes: 4588

Light Vehicles (LV): 3781

Heavy Vehicles (HV): 807

Pedestrians: 200



Scenario 1 – PM Peak

MOVEMENT SUMMARY

Site: MPW_PM_1 [1 - M5 Motorway / Moorebank Avenue 2029 PM Peak]

MPW - PM Peak / Scenario 1

Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Phase Times)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Moorebank Avenue (S)											
1	L2	569	17.0	1.067	170.1	LOS F	33.4	319.4	1.00	1.38	14.6
2	T1	372	20.1	0.540	44.2	LOS D	9.7	97.3	0.93	0.78	32.7
3	R2	206	6.1	0.131	28.3	LOS B	3.4	26.7	0.60	0.75	39.0
Approach		1147	16.1	1.067	103.8	LOS F	33.4	319.4	0.91	1.07	20.4
East: M5 Motorway Ramps (E)											
4	L2	492	6.2	0.394	27.2	LOS B	11.7	92.9	0.68	0.76	37.8
6	R2	307	17.1	0.712	65.5	LOS E	9.1	87.4	1.00	0.86	26.4
Approach		799	10.4	0.712	42.0	LOS C	11.7	92.9	0.80	0.80	32.3
North: Moorebank Avenue (N)											
7	L2	120	21.1	0.107	6.5	LOS A	0.6	6.6	0.16	0.59	51.2
8	T1	342	11.1	0.469	42.8	LOS D	9.2	80.0	0.90	0.75	33.1
9	R2	994	13.7	0.745	37.3	LOS C	23.8	215.3	0.88	0.87	36.7
Approach		1456	13.7	0.745	36.1	LOS C	23.8	215.3	0.83	0.82	36.6
West: M5 Motorway Ramps (W)											
10	L2	675	20.6	0.490	5.9	LOS A	0.0	0.0	0.00	0.52	53.5
12	R2	506	18.1	0.847	70.2	LOS E	11.7	114.1	1.00	0.94	27.4
Approach		1181	19.5	0.847	33.5	LOS C	11.7	114.1	0.43	0.70	37.7
All Vehicles		4583	15.2	1.067	53.4	LOS D	33.4	319.4	0.74	0.85	30.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Queue Distance m	Prop. Queued	Effective Stop Rate per ped	
P21	East Stage 1	53	4.5	LOS A	0.0	0.0	0.28	0.28	
P22	East Stage 2	53	21.1	LOS C	0.1	0.1	0.59	0.59	
P31	North Stage 1	50	50.5	LOS E	0.2	0.2	0.92	0.92	
P32	North Stage 2	50	20.5	LOS C	0.1	0.1	0.58	0.58	
All Pedestrians		205	23.9	LOS C			0.59	0.59	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

SIDRA INTERSECTION 7.0 | Copyright © 2000-2016 Akcelik and Associates Pty Ltd | sidrasolutions.com

Organisation: ARCADIS AUSTRALIA PACIFIC PTY LIMITED | Processed: Monday, 3 April 2017 10:11:10 AM

Project: \\HC-AUS-NS-FS-01\jobs\AA009017\ID - Calculations\Traffic\19 SIMTA Ongoing Support\Sensitivity Test M5 Moorbank Intersection\SIDRA Model\MPW -

M5_Moorebank_v2.sip7

PHASING SUMMARY

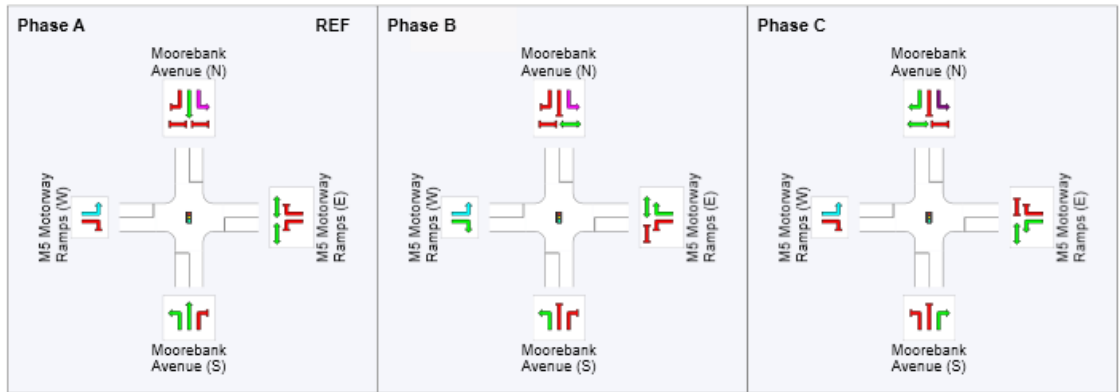
Site: MPW_PM_1 [1 - M5 Motorway / Moorebank Avenue 2029 PM Peak]

MPW - PM Peak / Scenario 1
 Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Phase Times)

Phase times specified by the user
 Sequence: LMARI_SIGNALS_1700
 Movement Class: All Movement Classes
 Input Sequence: A, B, C
 Output Sequence: A, B, C

Phase Timing Results

Phase	A	B	C
Reference Phase	Yes	No	No
Phase Change Time (sec)	0	34	58
Green Time (sec)	28	18	56
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	34	24	62
Phase Split	28%	20%	52%



INPUT VOLUMES

Vehicles and pedestrians per 60 minutes

Site: MPW_PM_1 [1 - M5 Motorway / Moorebank Avenue 2029 PM Peak]

MPW - PM Peak / Scenario 1
 Signals - Fixed Time Isolated

Volume Display Method: Separate

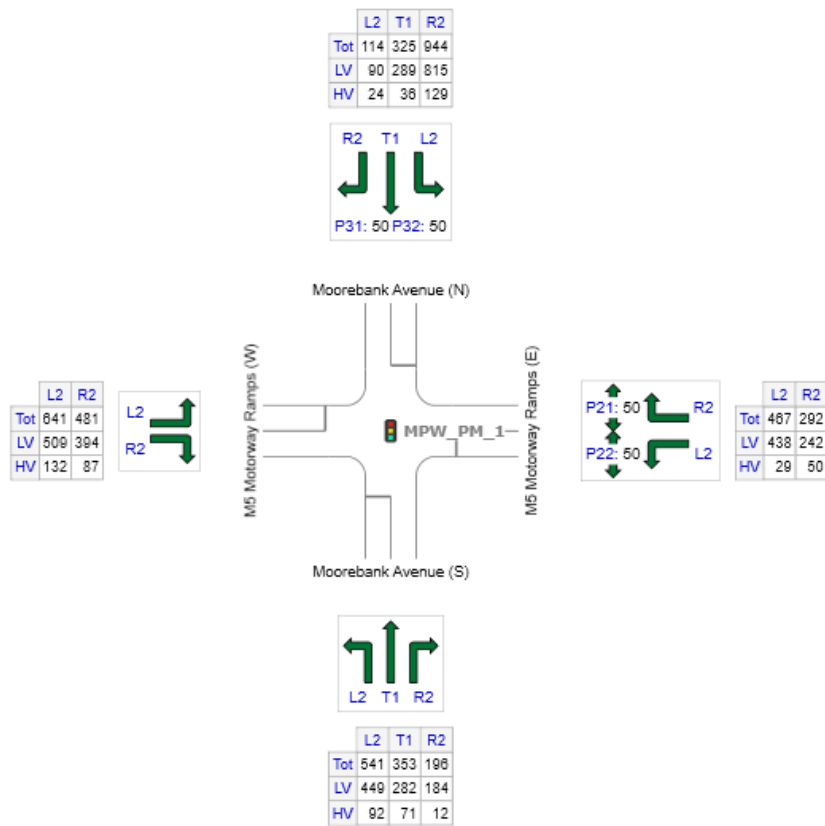
Total Intersection Volumes (veh)

All Movement Classes: 4354

Light Vehicles (LV): 3692

Heavy Vehicles (HV): 662

Pedestrians: 200



Scenario 2 – AM Peak

MOVEMENT SUMMARY

 Site: MPW_AM_2 [2 - M5 Motorway / Moorebank Avenue 2029 AM Peak - 10%]

MPW - AM Peak / Scenario 2

Signals - Fixed Time Isolated Cycle Time = 90 seconds (User-Given Phase Times)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Moorebank Avenue (S)											
1	L2	467	19.8	0.814	31.3	LOS C	7.6	75.8	0.94	0.98	37.7
2	T1	578	12.4	0.841	44.9	LOS D	14.1	124.7	1.00	1.01	32.4
3	R2	435	8.2	0.667	46.8	LOS D	9.3	76.3	0.98	0.85	31.4
Approach		1480	13.5	0.841	41.2	LOS C	14.1	124.7	0.97	0.95	33.7
East: M5 Motorway Ramps (E)											
4	L2	367	12.3	0.752	44.3	LOS D	10.4	92.3	0.97	0.86	30.8
6	R2	496	14.6	0.834	55.0	LOS D	12.1	111.5	1.00	0.97	29.1
Approach		863	13.7	0.834	50.5	LOS D	12.1	111.5	0.99	0.93	29.8
North: Moorebank Avenue (N)											
7	L2	37	45.7	0.046	8.2	LOS A	0.3	4.7	0.27	0.59	48.9
8	T1	161	28.1	0.159	18.7	LOS B	2.4	27.1	0.67	0.54	44.3
9	R2	605	36.0	0.859	39.8	LOS C	9.7	120.3	1.00	1.02	35.5
Approach		803	34.9	0.859	34.1	LOS C	9.7	120.3	0.90	0.90	37.3
West: M5 Motorway Ramps (W)											
10	L2	1398	12.7	1.077	38.8	LOS C	0.0	0.0	0.00	0.04	28.1
12	R2	286	26.1	0.396	43.9	LOS D	4.1	44.3	0.91	0.78	34.4
Approach		1684	15.0	1.077	39.7	LOS C	4.1	44.3	0.15	0.17	29.0
All Vehicles		4831	17.6	1.077	41.1	LOS C	14.1	124.7	0.68	0.67	31.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akcelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Queue Distance m	Prop. Queued	Effective Stop Rate per ped	
P21	East Stage 1	53	6.1	LOS A	0.0	0.0	0.37	0.37	
P22	East Stage 2	53	6.1	LOS A	0.0	0.0	0.37	0.37	
P31	North Stage 1	50	35.6	LOS D	0.1	0.1	0.89	0.89	
P32	North Stage 2	50	13.7	LOS B	0.1	0.1	0.78	0.78	
All Pedestrians		205	15.1	LOS B			0.60	0.60	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

SIDRA INTERSECTION 7.0 | Copyright © 2000-2016 Akcelik and Associates Pty Ltd | sidrasolutions.com

Organisation: ARCADIS AUSTRALIA PACIFIC PTY LIMITED | Processed: Monday, 3 April 2017 10:11:12 AM

Project: \\HC-AUS-NS-FS-01\jobs\AA009017\1D - Calculations\Traffic\19 SIMTA Ongoing Support\Sensitivity Test M5 Moorbank Intersection\SIDRA Model\MPW - M5_Moorebank_v2.sip7

PHASING SUMMARY

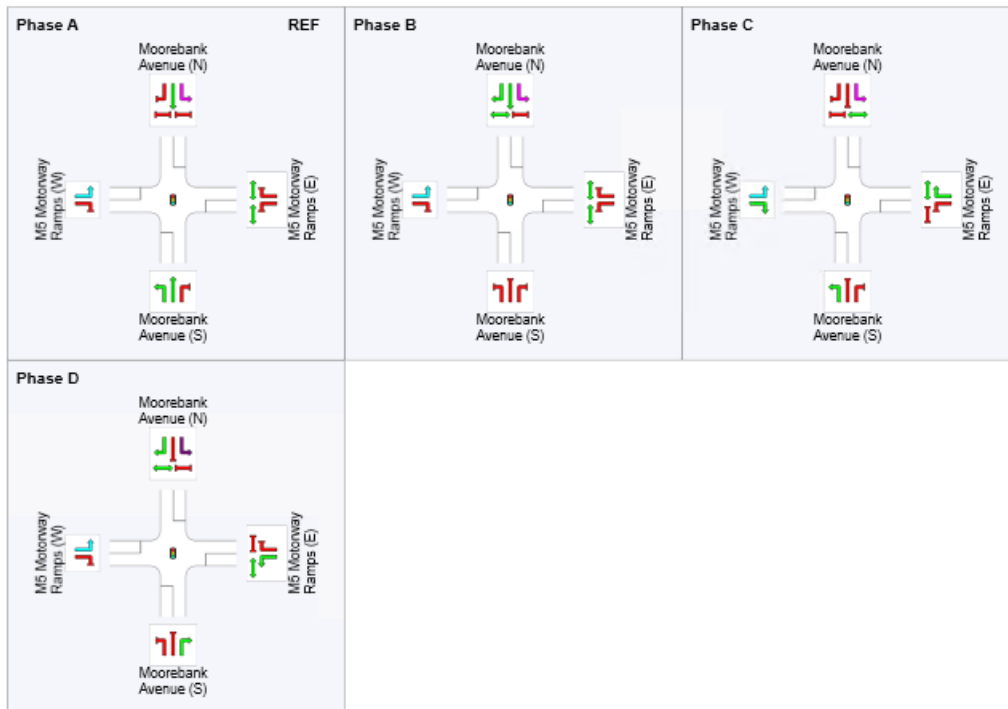
Site: MPW_AM_2 [2 - M5 Motorway / Moorebank Avenue 2029 AM Peak - 10%]

MPW - AM Peak / Scenario 2
 Signals - Fixed Time Isolated Cycle Time = 90 seconds (User-Given Phase Times)

Phase times specified by the user
 Sequence: LMARI_SIGNALS_0800_GTA
 Movement Class: All Movement Classes
 Input Sequence: A, B, C, D
 Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Reference Phase	Yes	No	No	No
Phase Change Time (sec)	0	25	42	66
Green Time (sec)	19	11	18	18
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	25	17	24	24
Phase Split	28%	19%	27%	27%



INPUT VOLUMES

Vehicles and pedestrians per 60 minutes

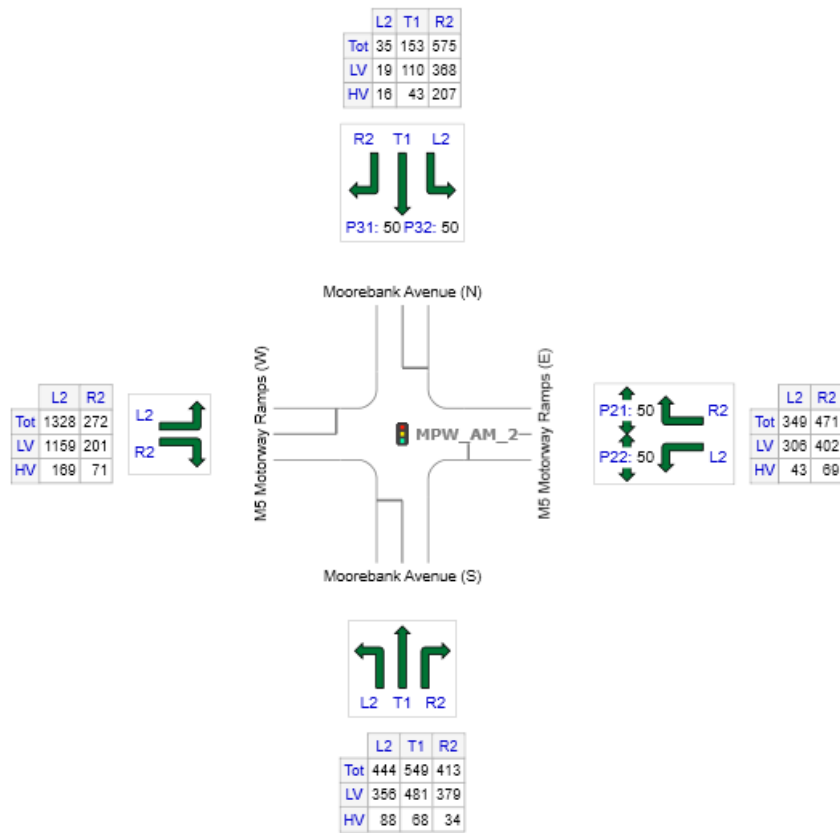
Site: MPW_AM_2 [2 - M5 Motorway / Moorebank Avenue 2029 AM Peak - 10%]

MPW - AM Peak / Scenario 2
 Signals - Fixed Time Isolated

Volume Display Method: Separate

Total Intersection Volumes (veh)

- All Movement Classes: 4589
- Light Vehicles (LV): 3781
- Heavy Vehicles (HV): 808
- Pedestrians: 200



SIDRA INTERSECTION 7.0 | Copyright © 2000-2016 Akcelik and Associates Pty Ltd | sidrasolutions.com
 Organisation: ARCADIS AUSTRALIA PACIFIC PTY LIMITED | Created: Monday, 3 April 2017 11:10:47 AM
 Project: \\HC-AUS-NS-FS-01\jobs\AA009017\D - Calculations\Traffic\19 SIMTA Ongoing Support\Sensitivity Test M5 Moorbank Intersection\SIDRA Model\MPW - M5_Moorbank_v2.sip7

Scenario 2 – PM Peak

MOVEMENT SUMMARY

Site: MPW_PM_2 [2 - M5 Motorway / Moorebank Avenue 2029 PM Peak - 10%]

MPW - PM Peak / Scenario 2

Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Phase Times)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Moorebank Avenue (S)											
1	L2	563	16.1	1.041	151.5	LOS F	31.2	293.4	1.00	1.33	16.0
2	T1	372	20.1	0.540	44.2	LOS D	9.7	97.3	0.93	0.78	32.7
3	R2	214	9.4	0.143	28.5	LOS C	3.5	29.6	0.60	0.75	38.8
Approach		1148	16.1	1.041	93.9	LOS F	31.2	293.4	0.90	1.04	21.7
East: M5 Motorway Ramps (E)											
4	L2	492	6.2	0.394	27.2	LOS B	11.7	92.9	0.68	0.76	37.8
6	R2	307	17.1	0.712	65.5	LOS E	9.1	87.4	1.00	0.86	26.4
Approach		799	10.4	0.712	42.0	LOS C	11.7	92.9	0.80	0.80	32.3
North: Moorebank Avenue (N)											
7	L2	120	21.1	0.108	6.5	LOS A	0.7	6.6	0.16	0.59	51.2
8	T1	342	11.1	0.469	42.8	LOS D	9.2	80.0	0.90	0.75	33.1
9	R2	994	13.7	0.745	37.3	LOS C	23.8	215.3	0.88	0.87	36.7
Approach		1456	13.7	0.745	36.1	LOS C	23.8	215.3	0.83	0.82	36.6
West: M5 Motorway Ramps (W)											
10	L2	675	20.6	0.490	5.9	LOS A	0.0	0.0	0.00	0.52	53.5
12	R2	506	18.1	0.847	70.2	LOS E	11.7	114.1	1.00	0.94	27.4
Approach		1181	19.5	0.847	33.5	LOS C	11.7	114.1	0.43	0.70	37.7
All Vehicles		4584	15.2	1.041	50.9	LOS D	31.2	293.4	0.74	0.84	31.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped	
P21	East Stage 1	53	4.5	LOS A	0.0	0.0	0.28	0.28	
P22	East Stage 2	53	21.1	LOS C	0.1	0.1	0.59	0.59	
P31	North Stage 1	50	50.5	LOS E	0.2	0.2	0.92	0.92	
P32	North Stage 2	50	20.5	LOS C	0.1	0.1	0.58	0.58	
All Pedestrians		205	23.9	LOS C			0.59	0.59	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

SIDRA INTERSECTION 7.0 | Copyright © 2000-2016 Akcelik and Associates Pty Ltd | sidrasolutions.com

Organisation: ARCADIS AUSTRALIA PACIFIC PTY LIMITED | Processed: Monday, 3 April 2017 10:11:14 AM

Project: \\HC-AUS-NS-FS-01\jobs\AA009017\D - Calculations\Traffic\19 SIMTA Ongoing Support\Sensitivity Test M5 Moorbank Intersection\SIDRA Model\MPW - M5_Moorebank_v2.sip7

PHASING SUMMARY

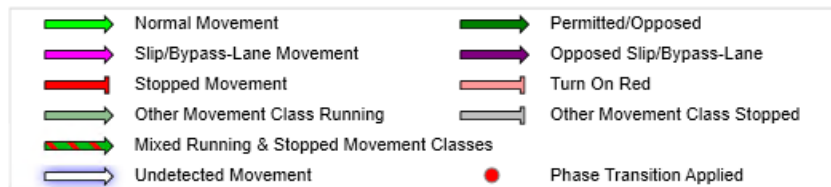
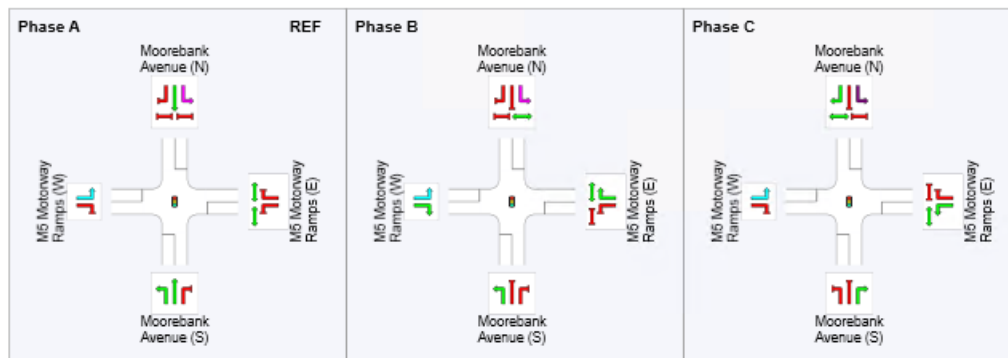
Site: MPW_PM_2 [2 - M5 Motorway / Moorebank Avenue 2029 PM Peak - 10%]

MPW - PM Peak / Scenario 2
 Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Phase Times)

Phase times specified by the user
 Sequence: LMARI_SIGNALS_1700
 Movement Class: All Movement Classes
 Input Sequence: A, B, C
 Output Sequence: A, B, C

Phase Timing Results

Phase	A	B	C
Reference Phase	Yes	No	No
Phase Change Time (sec)	0	34	58
Green Time (sec)	28	18	56
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	34	24	62
Phase Split	28%	20%	52%



SIDRA INTERSECTION 7.0 | Copyright © 2000-2016 Akcelik and Associates Pty Ltd | sidrasolutions.com
 Organisation: ARCADIS AUSTRALIA PACIFIC PTY LIMITED | Processed: Monday, 3 April 2017 10:11:14 AM
 Project: \\HC-AUS-NS-FS-01\jobs\AA009017\D - Calculations\Traffic\19 SIMTA Ongoing Support\Sensitivity Test M5 Moorbank Intersection\SIDRA Model\MPW - M5_Moorebank_v2.sip7

INPUT VOLUMES

Vehicles and pedestrians per 60 minutes

Site: MPW_PM_2 [2 - M5 Motorway / Moorebank Avenue 2029 PM Peak - 10%]

MPW - PM Peak / Scenario 2
 Signals - Fixed Time Isolated

Volume Display Method: Separate

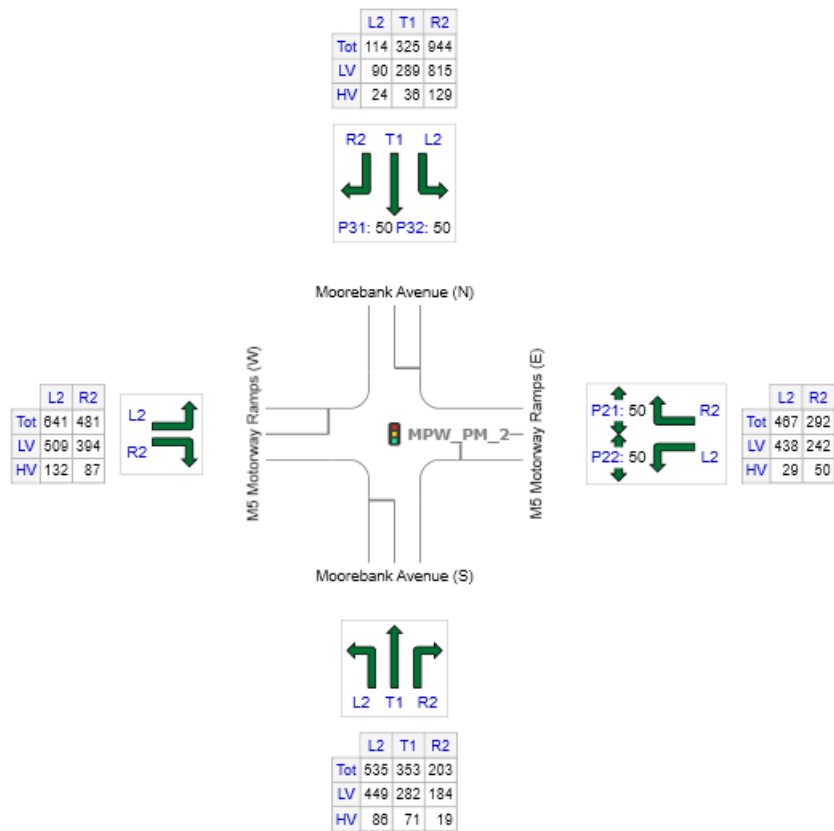
Total Intersection Volumes (veh)

All Movement Classes: 4355

Light Vehicles (LV): 3692

Heavy Vehicles (HV): 663

Pedestrians: 200



Scenario 3 – AM Peak

MOVEMENT SUMMARY

Site: MPW_AM_3 [3 - M5 Motorway / Moorebank Avenue 2029 AM Peak - 20%]

MPW - AM Peak / Scenario 3

Signals - Fixed Time Isolated Cycle Time = 90 seconds (User-Given Phase Times)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h	
South: Moorebank Avenue (S)												
1	L2	459	18.8	0.789	28.4	LOS B	7.0	68.6	0.93	0.95	38.9	
2	T1	578	12.4	0.841	44.9	LOS D	14.1	124.7	1.00	1.01	32.4	
3	R2	443	9.5	0.693	47.6	LOS D	9.6	80.9	0.98	0.86	31.2	
Approach		1480	13.5	0.841	40.6	LOS C	14.1	124.7	0.97	0.95	33.9	
East: M5 Motorway Ramps (E)												
4	L2	367	12.3	0.752	44.3	LOS D	10.4	92.3	0.97	0.86	30.8	
6	R2	496	14.6	0.834	55.0	LOS D	12.1	111.5	1.00	0.97	29.1	
Approach		863	13.7	0.834	50.5	LOS D	12.1	111.5	0.99	0.93	29.8	
North: Moorebank Avenue (N)												
7	L2	37	45.7	0.046	8.3	LOS A	0.3	4.7	0.27	0.59	48.9	
8	T1	161	28.1	0.159	18.7	LOS B	2.4	27.1	0.67	0.54	44.3	
9	R2	605	36.0	0.859	39.8	LOS C	9.7	120.3	1.00	1.02	35.5	
Approach		803	34.9	0.859	34.1	LOS C	9.7	120.3	0.90	0.90	37.3	
West: M5 Motorway Ramps (W)												
10	L2	1398	12.7	1.077	38.8	LOS C	0.0	0.0	0.00	0.04	28.1	
12	R2	286	26.1	0.396	43.9	LOS D	4.1	44.3	0.91	0.78	34.4	
Approach		1684	15.0	1.077	39.7	LOS C	4.1	44.3	0.15	0.17	29.0	
All Vehicles		4831	17.6	1.077	40.9	LOS C	14.1	124.7	0.68	0.66	31.7	

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped	
P21	East Stage 1	53	6.1	LOS A	0.0	0.0	0.37	0.37	
P22	East Stage 2	53	6.1	LOS A	0.0	0.0	0.37	0.37	
P31	North Stage 1	50	35.6	LOS D	0.1	0.1	0.89	0.89	
P32	North Stage 2	50	13.7	LOS B	0.1	0.1	0.78	0.78	
All Pedestrians		205	15.1	LOS B			0.60	0.60	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

SIDRA INTERSECTION 7.0 | Copyright © 2000-2016 Akcelik and Associates Pty Ltd | sidrasolutions.com

Organisation: ARCADIS AUSTRALIA PACIFIC PTY LIMITED | Processed: Monday, 3 April 2017 10:11:15 AM

Project: \\HC-AUS-NS-FS-01\jobs\AA009017\ID - Calculations\Traffic\19 SIMTA Ongoing Support\Sensitivity Test M5 Moorbank Intersection\SIDRA Model\MPW - M5_Moorbank_v2.sip7

PHASING SUMMARY

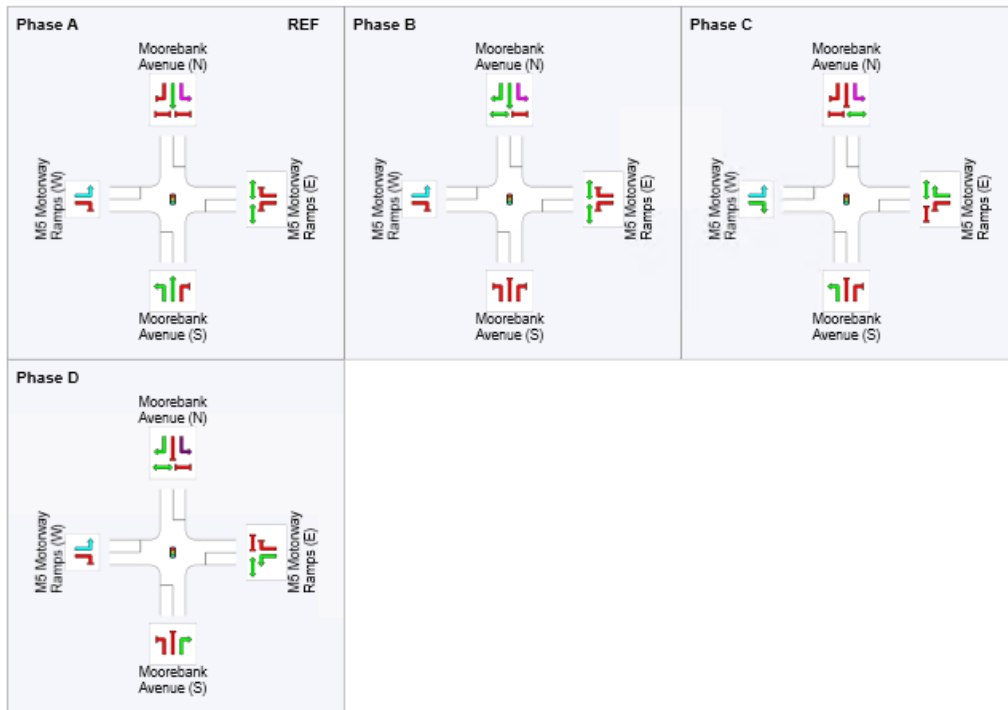
Site: MPW_AM_3 [3 - M5 Motorway / Moorebank Avenue 2029 AM Peak - 20%]

MPW - AM Peak / Scenario 3
 Signals - Fixed Time Isolated Cycle Time = 90 seconds (User-Given Phase Times)

Phase times specified by the user
 Sequence: LMARI_SIGNALS_0800_GTA
 Movement Class: All Movement Classes
 Input Sequence: A, B, C, D
 Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Reference Phase	Yes	No	No	No
Phase Change Time (sec)	0	25	42	66
Green Time (sec)	19	11	18	18
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	25	17	24	24
Phase Split	28%	19%	27%	27%



SIDRA INTERSECTION 7.0 | Copyright © 2000-2016 Akcelik and Associates Pty Ltd | sidrasolutions.com
 Organisation: ARCADIS AUSTRALIA PACIFIC PTY LIMITED | Processed: Monday, 3 April 2017 10:11:15 AM
 Project: \\HC-AUS-NS-FS-01\jobs\AA009017\D - Calculations\Traffic\19 SIMTA Ongoing Support\Sensitivity Test M5 Moorbank Intersection\SIDRA Model\MPW - M5_Moorebank_v2.sip7

INPUT VOLUMES

Vehicles and pedestrians per 60 minutes

 Site: MPW_AM_3 [3 - M5 Motorway / Moorebank Avenue 2029 AM Peak - 20%]

MPW - AM Peak / Scenario 3
Signals - Fixed Time Isolated

Volume Display Method: Separate

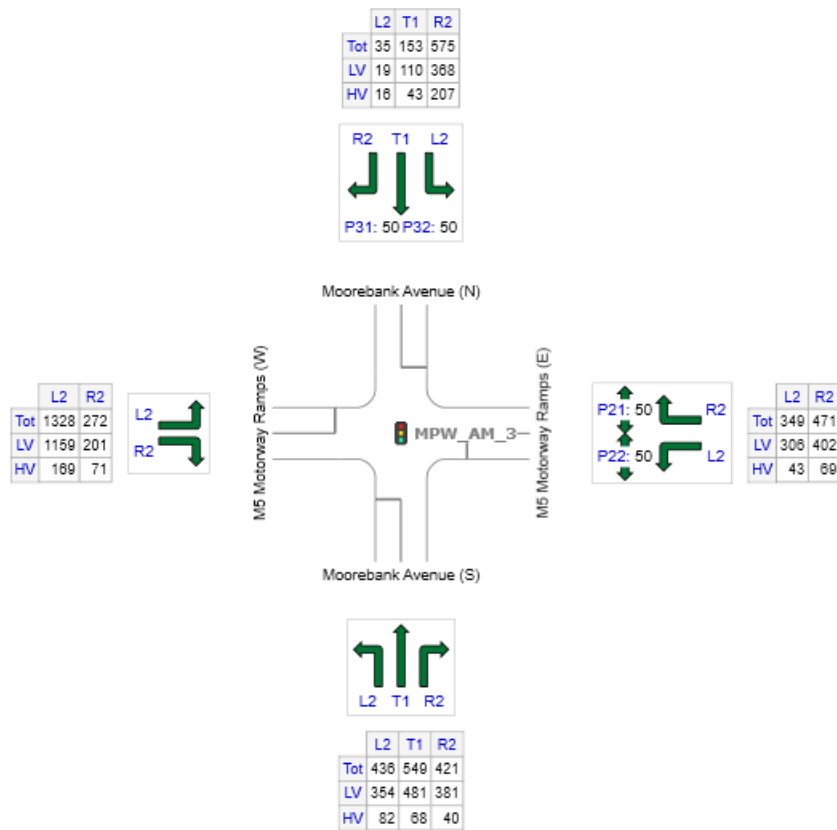
Total Intersection Volumes (veh)

All Movement Classes: 4589

Light Vehicles (LV): 3781

Heavy Vehicles (HV): 808

Pedestrians: 200



Scenario 3 – PM Peak

MOVEMENT SUMMARY

Site: MPW_PM_3 [3 - M5 Motorway / Moorebank Avenue 2029 PM Peak - 20%]

MPW - PM Peak / Scenario 3

Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Phase Times)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h	
South: Moorebank Avenue (S)												
1	L2	557	15.1	1.015	134.2	LOS F	29.0	268.7	1.00	1.27	17.4	
2	T1	372	20.1	0.540	44.2	LOS D	9.7	97.3	0.93	0.78	32.7	
3	R2	220	12.0	0.153	28.7	LOS C	3.7	32.1	0.61	0.75	38.7	
Approach		1148	16.1	1.015	84.9	LOS F	29.0	268.7	0.90	1.01	23.1	
East: M5 Motorway Ramps (E)												
4	L2	492	6.2	0.394	27.2	LOS B	11.7	92.9	0.68	0.76	37.8	
6	R2	307	17.1	0.712	65.5	LOS E	9.1	87.4	1.00	0.86	26.4	
Approach		799	10.4	0.712	42.0	LOS C	11.7	92.9	0.80	0.80	32.3	
North: Moorebank Avenue (N)												
7	L2	120	21.1	0.109	6.5	LOS A	0.7	6.6	0.16	0.59	51.2	
8	T1	342	11.1	0.469	42.8	LOS D	9.2	80.0	0.90	0.75	33.1	
9	R2	994	13.7	0.745	37.3	LOS C	23.8	215.3	0.88	0.87	36.7	
Approach		1456	13.7	0.745	36.1	LOS C	23.8	215.3	0.83	0.82	36.6	
West: M5 Motorway Ramps (W)												
10	L2	675	20.6	0.490	5.9	LOS A	0.0	0.0	0.00	0.52	53.5	
12	R2	506	18.1	0.847	70.2	LOS E	11.7	114.1	1.00	0.94	27.4	
Approach		1181	19.5	0.847	33.5	LOS C	11.7	114.1	0.43	0.70	37.7	
All Vehicles		4584	15.2	1.015	48.7	LOS D	29.0	268.7	0.74	0.83	31.6	

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped	
P21	East Stage 1	53	4.5	LOS A	0.0	0.0	0.28	0.28	
P22	East Stage 2	53	21.1	LOS C	0.1	0.1	0.59	0.59	
P31	North Stage 1	50	50.5	LOS E	0.2	0.2	0.92	0.92	
P32	North Stage 2	50	20.5	LOS C	0.1	0.1	0.58	0.58	
All Pedestrians		205	23.9	LOS C			0.59	0.59	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

SIDRA INTERSECTION 7.0 | Copyright © 2000-2016 Akcelik and Associates Pty Ltd | sidrasolutions.com

Organisation: ARCADIS AUSTRALIA PACIFIC PTY LIMITED | Processed: Monday, 3 April 2017 10:11:17 AM

Project: \\HG-AUS-NS-FS-01\jobs\AA009017\ID - Calculations\Traffic\19 SIMTA Ongoing Support\Sensitivity Test M5 Moorbank Intersection\SIDRA Model\MPW - M5_Moorbank_v2.sip7

PHASING SUMMARY

Site: MPW_PM_3 [3 - M5 Motorway / Moorebank Avenue 2029 PM Peak - 20%]

MPW - PM Peak / Scenario 3

Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Phase Times)

Phase times specified by the user

Sequence: LMARI_SIGNALS_1700

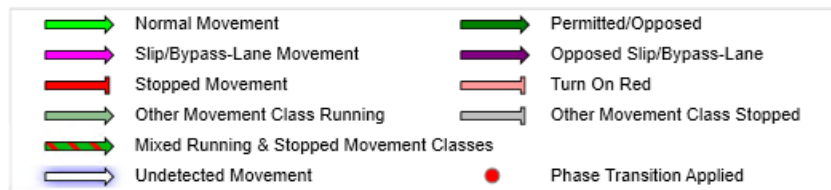
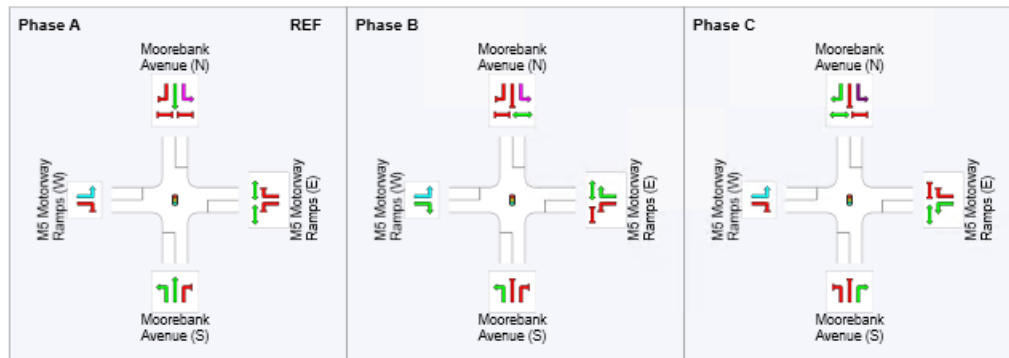
Movement Class: All Movement Classes

Input Sequence: A, B, C

Output Sequence: A, B, C

Phase Timing Results

Phase	A	B	C
Reference Phase	Yes	No	No
Phase Change Time (sec)	0	34	58
Green Time (sec)	28	18	56
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	34	24	62
Phase Split	28%	20%	52%



SIDRA INTERSECTION 7.0 | Copyright © 2000-2016 Akcelik and Associates Pty Ltd | sidrasolutions.com

Organisation: ARCADIS AUSTRALIA PACIFIC PTY LIMITED | Processed: Monday, 3 April 2017 10:11:17 AM

Project: \\HC-AUS-NS-FS-01\jobs\AA009017\D - Calculations\Traffic\19 SIMTA Ongoing Support\Sensitivity Test M5 Moorbank Intersection\SIDRA Model\MPW - M5_Moorbank_v2.sip7

INPUT VOLUMES

Vehicles and pedestrians per 60 minutes

Site: MPW_PM_3 [3 - M5 Motorway / Moorebank Avenue 2029 PM Peak - 20%]

MPW - PM Peak / Scenario 3
 Signals - Fixed Time Isolated

Volume Display Method: Separate

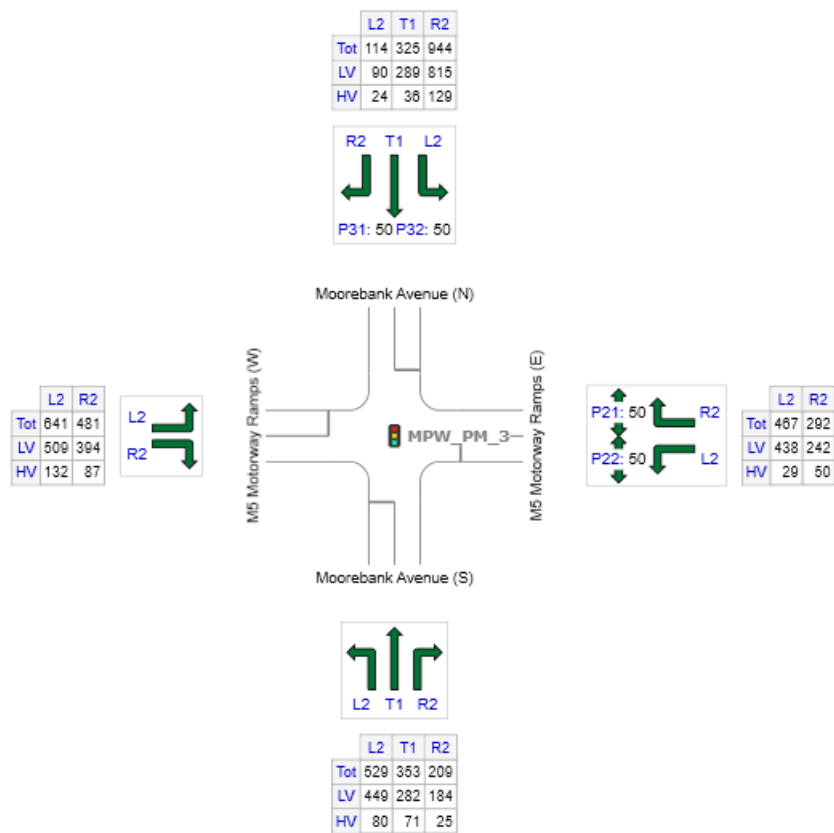
Total Intersection Volumes (veh)

All Movement Classes: 4355

Light Vehicles (LV): 3692

Heavy Vehicles (HV): 663

Pedestrians: 200



Scenario 4 – AM Peak

MOVEMENT SUMMARY

Site: MPW_AM_4 [4 - M5 Motorway / Moorebank Avenue 2029 AM Peak - 30%]

MPW - AM Peak / Scenario 4

Signals - Fixed Time Isolated Cycle Time = 90 seconds (User-Given Phase Times)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Moorebank Avenue (S)											
1	L2	451	17.8	0.764	26.0	LOS B	6.4	62.3	0.91	0.92	40.1
2	T1	578	12.4	0.841	44.9	LOS D	14.1	124.7	1.00	1.01	32.4
3	R2	451	10.7	0.717	48.4	LOS D	9.9	85.4	0.99	0.88	30.9
Approach		1479	13.5	0.841	40.2	LOS C	14.1	124.7	0.97	0.94	34.0
East: M5 Motorway Ramps (E)											
4	L2	367	12.3	0.752	44.3	LOS D	10.4	92.3	0.97	0.86	30.8
6	R2	496	14.6	0.834	55.0	LOS D	12.1	111.5	1.00	0.97	29.1
Approach		863	13.7	0.834	50.5	LOS D	12.1	111.5	0.99	0.93	29.8
North: Moorebank Avenue (N)											
7	L2	37	45.7	0.046	8.5	LOS A	0.4	5.0	0.28	0.59	48.7
8	T1	161	28.1	0.159	18.7	LOS B	2.4	27.1	0.67	0.54	44.3
9	R2	605	36.0	0.859	39.8	LOS C	9.7	120.3	1.00	1.02	35.5
Approach		803	34.9	0.859	34.1	LOS C	9.7	120.3	0.90	0.90	37.3
West: M5 Motorway Ramps (W)											
10	L2	1398	12.7	1.077	38.8	LOS C	0.0	0.0	0.00	0.04	28.1
12	R2	286	26.1	0.396	43.9	LOS D	4.1	44.3	0.91	0.78	34.4
Approach		1684	15.0	1.077	39.7	LOS C	4.1	44.3	0.15	0.17	29.0
All Vehicles		4829	17.6	1.077	40.8	LOS C	14.1	124.7	0.68	0.66	31.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Queue Distance m	Prop. Queued	Effective Stop Rate per ped	
P21	East Stage 1	53	6.1	LOS A	0.0	0.0	0.37	0.37	
P22	East Stage 2	53	6.1	LOS A	0.0	0.0	0.37	0.37	
P31	North Stage 1	50	35.6	LOS D	0.1	0.1	0.89	0.89	
P32	North Stage 2	50	13.7	LOS B	0.1	0.1	0.78	0.78	
All Pedestrians		205	15.1	LOS B			0.60	0.60	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

SIDRA INTERSECTION 7.0 | Copyright © 2000-2016 Akcelik and Associates Pty Ltd | sidrasolutions.com

Organisation: ARCADIS AUSTRALIA PACIFIC PTY LIMITED | Processed: Monday, 3 April 2017 10:11:19 AM

Project: \\HC-AUS-NS-FS-01\jobs\AA009017\D - Calculations\Traffic\19 SIMTA Ongoing Support\Sensitivity Test M5 Moorbank Intersection\SIDRA Model\MPW - M5_Moorebank_v2.sip7

PHASING SUMMARY

Site: MPW_AM_4 [4 - M5 Motorway / Moorebank Avenue 2029 AM Peak - 30%]

MPW - AM Peak / Scenario 4

Signals - Fixed Time Isolated Cycle Time = 90 seconds (User-Given Phase Times)

Phase times specified by the user

Sequence: LMARI_SIGNALS_0800_GTA

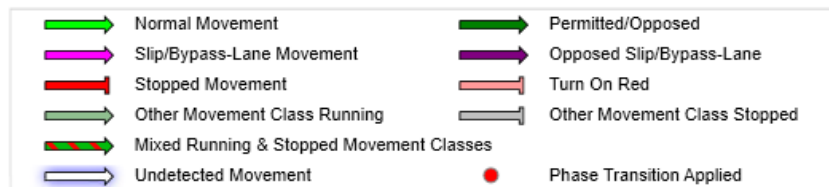
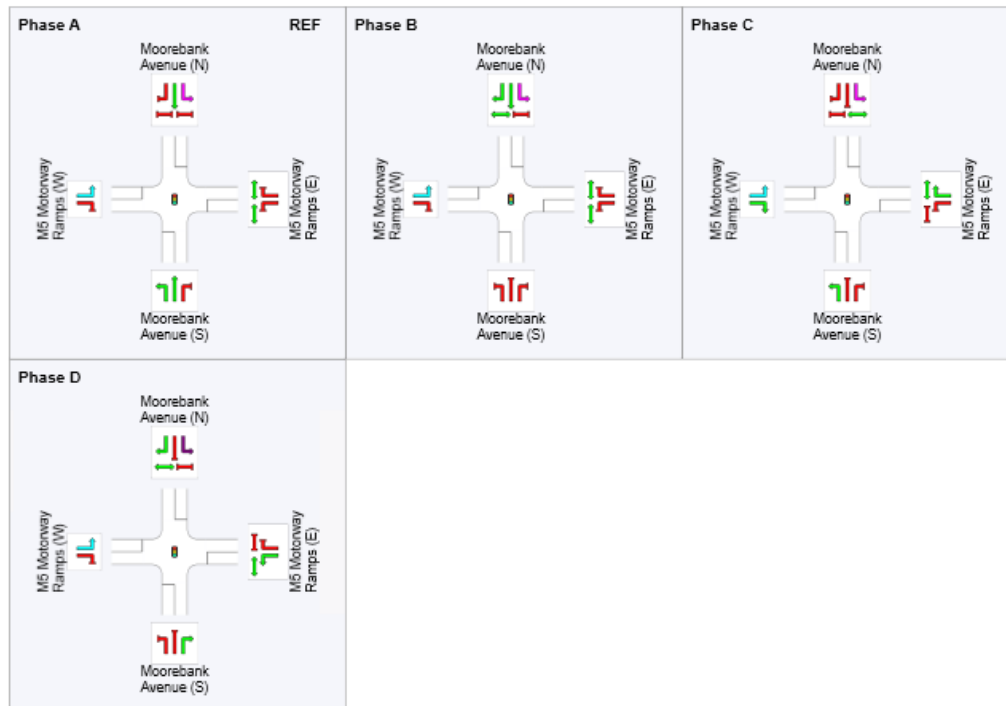
Movement Class: All Movement Classes

Input Sequence: A, B, C, D

Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Reference Phase	Yes	No	No	No
Phase Change Time (sec)	0	25	42	66
Green Time (sec)	19	11	18	18
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	25	17	24	24
Phase Split	28%	19%	27%	27%



SIDRA INTERSECTION 7.0 | Copyright © 2000-2016 Akcelik and Associates Pty Ltd | sidrasolutions.com

Organisation: ARCADIS AUSTRALIA PACIFIC PTY LIMITED | Processed: Monday, 3 April 2017 10:11:19 AM

Project: \\HC-AUS-NS-FS-01\jobs\AA009017\D - Calculations\Traffic\19 SIMTA Ongoing Support\Sensitivity Test M5 Moorbank Intersection\SIDRA Model\MPW - M5_Moorebank_v2.sip7

INPUT VOLUMES

Vehicles and pedestrians per 60 minutes

Site: MPW_AM_4 [4 - M5 Motorway / Moorebank Avenue 2029 AM Peak - 30%]

MPW - AM Peak / Scenario 4
Signals - Fixed Time Isolated

Volume Display Method: Separate

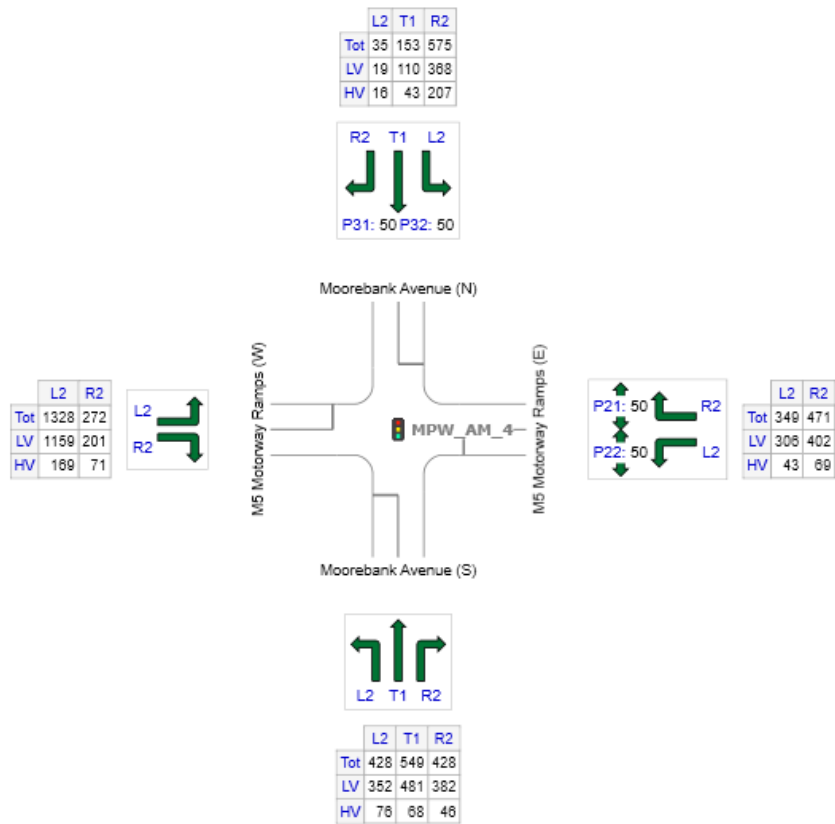
Total Intersection Volumes (veh)

All Movement Classes: 4588

Light Vehicles (LV): 3780

Heavy Vehicles (HV): 808

Pedestrians: 200



SIDRA INTERSECTION 7.0 | Copyright © 2000-2016 Akcelik and Associates Pty Ltd | sidrasolutions.com
 Organisation: ARCADIS AUSTRALIA PACIFIC PTY LIMITED | Created: Monday, 3 April 2017 11:14:41 AM
 Project: \\HC-AUS-NS-FS-01\jobs\AA009017\D - Calculations\Traffic\19 SIMTA Ongoing Support\Sensitivity Test M5 Moorbank Intersection\SIDRA Model\MPW - M5_Moorebank_v2.sip7

Scenario 4 – PM Peak

MOVEMENT SUMMARY

Site: MPW_PM_4 [4 - M5 Motorway / Moorebank Avenue 2029 PM Peak - 30%]

MPW - PM Peak / Scenario 4
Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Phase Times)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Moorebank Avenue (S)											
1	L2	551	14.1	0.962	93.0	LOS F	23.4	213.3	0.96	1.16	22.2
2	T1	372	20.1	0.540	44.2	LOS D	9.7	97.3	0.93	0.78	32.7
3	R2	226	14.4	0.163	28.8	LOS C	3.8	34.6	0.61	0.75	38.6
Approach		1148	16.1	0.962	64.5	LOS E	23.4	213.3	0.88	0.95	27.1
East: M5 Motorway Ramps (E)											
4	L2	492	6.2	0.394	27.2	LOS B	11.7	92.9	0.68	0.76	37.8
6	R2	307	17.1	0.712	65.5	LOS E	9.1	87.4	1.00	0.86	26.4
Approach		799	10.4	0.712	42.0	LOS C	11.7	92.9	0.80	0.80	32.3
North: Moorebank Avenue (N)											
7	L2	120	21.1	0.109	6.6	LOS A	0.7	7.3	0.17	0.59	51.1
8	T1	342	11.1	0.469	42.8	LOS D	9.2	80.0	0.90	0.75	33.1
9	R2	994	13.7	0.745	37.3	LOS C	23.8	215.3	0.88	0.87	36.7
Approach		1456	13.7	0.745	36.1	LOS C	23.8	215.3	0.83	0.82	36.6
West: M5 Motorway Ramps (W)											
10	L2	675	20.6	0.490	5.9	LOS A	0.0	0.0	0.00	0.52	53.5
12	R2	506	18.1	0.847	70.2	LOS E	11.7	114.1	1.00	0.94	27.4
Approach		1181	19.5	0.847	33.5	LOS C	11.7	114.1	0.43	0.70	37.7
All Vehicles		4584	15.2	0.962	43.6	LOS D	23.8	215.3	0.73	0.82	33.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Queue Distance m	Prop. Queued	Effective Stop Rate per ped	
P21	East Stage 1	53	4.5	LOS A	0.0	0.0	0.28	0.28	
P22	East Stage 2	53	21.1	LOS C	0.1	0.1	0.59	0.59	
P31	North Stage 1	50	50.5	LOS E	0.2	0.2	0.92	0.92	
P32	North Stage 2	50	20.5	LOS C	0.1	0.1	0.58	0.58	
All Pedestrians		205	23.9	LOS C			0.59	0.59	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

SIDRA INTERSECTION 7.0 | Copyright © 2000-2016 Akcelik and Associates Pty Ltd | sidrasolutions.com

Organisation: ARCADIS AUSTRALIA PACIFIC PTY LIMITED | Processed: Monday, 3 April 2017 10:11:20 AM

Project: \\HC-AUS-NS-FS-01\jobs\AA009017\1D - Calculations\Traffic\19 SIMTA Ongoing Support\Sensitivity Test M5 Moorbank Intersection\SIDRA Model\MPW - M5_Moorbank_v2.sip7

PHASING SUMMARY

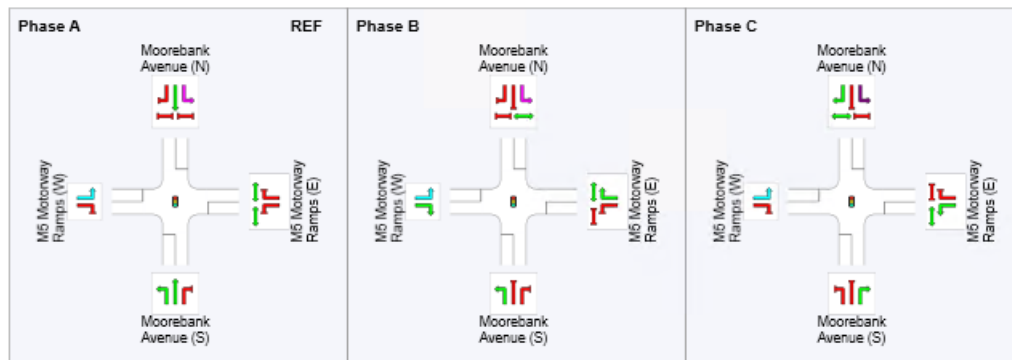
Site: MPW_PM_4 [4 - M5 Motorway / Moorebank Avenue 2029 PM Peak - 30%]

MPW - PM Peak / Scenario 4
 Signals - Fixed Time Isolated Cycle Time = 120 seconds (User-Given Phase Times)

Phase times specified by the user
 Sequence: LMARI_SIGNALS_1700
 Movement Class: All Movement Classes
 Input Sequence: A, B, C
 Output Sequence: A, B, C

Phase Timing Results

Phase	A	B	C
Reference Phase	Yes	No	No
Phase Change Time (sec)	0	34	58
Green Time (sec)	28	18	56
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	34	24	62
Phase Split	28%	20%	52%



SIDRA INTERSECTION 7.0 | Copyright © 2000-2016 Akcelik and Associates Pty Ltd | sidrasolutions.com
 Organisation: ARCADIS AUSTRALIA PACIFIC PTY LIMITED | Processed: Monday, 3 April 2017 10:11:20 AM
 Project: \\HC-AUS-NS-FS-01\jobs\AA009017\D - Calculations\Traffic\19 SIMTA Ongoing Support\Sensitivity Test M5 Moorbank Intersection\SIDRA Model\MPW - M5_Moorbank_v2.sip7

INPUT VOLUMES

Vehicles and pedestrians per 60 minutes

Site: MPW_PM_4 [4 - M5 Motorway / Moorebank Avenue 2029 PM Peak - 30%]

MPW - PM Peak / Scenario 4
 Signals - Fixed Time Isolated

Volume Display Method: Separate

Total Intersection Volumes (veh)

All Movement Classes: 4355

Light Vehicles (LV): 3692

Heavy Vehicles (HV): 663

Pedestrians: 200

