Technical Note 2:   Modelling Review

Project:	Land South of Tilden Gill Road, Tenterden
Prepared by:	James Werby
Approved by:	Steve Giles
Date:	08/08/2018

1.0   Introduction

1.1   Motion has been instructed by 127 Consultancies Ltd to undertake a review of junction capacity modelling at the proposed roundabout junction at Ashford Road/Beacon Oak Road in Tenterden.

1.2   Planning permission was granted (reference 14/01420/AS) at appeal for land south of Tilden Gill Road, Tenterden to provide up to 100 residential dwellings. As part of the planning permission, a mitigation measure is to be provided at the Ashford Road/Beacon Oak Road junction to upgrade it from a priority junction operation to a roundabout junction. Condition 8 of the appeal report states that:

"No dwelling shall be occupied until the roundabout at the junction of Ashford Road and Beacon Oak Road, referred to in section 15 of the Statement of Common Ground between the appellant and the Local Highway Authority, has been completed."

1.3   This Technical Note reviews the junction capacity modelling undertaken to accompany this application contained within the 'Stage 1 Outline Design Assessment Background Information Report' prepared by Stuart Michael Associates (SMA) in July 2015.

2.0   Junction Capacity Modelling

Traffic Flows

2.1   A review of the traffic survey information contained within Appendix 2 of the SMA report indicates that the traffic flows contained within the flow diagrams in the body of the report do not reflect the peak hour traffic flows. The flows contained within the body of the report refer to the AM peak of 0800-0900 hours and the PM peak of 1630-1730 hours, whereas the actual peak traffic flows occur between 0815-0915 in the AM and 1645-1745 in the PM. The table below indicates the difference in flows.

Time Period	Traffic Flows
08:00-09:00	1357
08:15-09:15	1416
AM Difference in Traffic Flows Used	**+59**
1630-1730	1237
1645-1745	1247
PM Difference in Traffic Flows Used	**+10**

Table 2.1: Peak Hour Traffic Flows (extracted from January 2015 traffic survey)

2.2   The SMA report does not detail how traffic flows were factored up from 2015 to 2019. Therefore, TEMpro has been used to provide a census check on whether the 2019 flows presented within the SMA assessment are accurate.

2.3   TEMPro version 7.2 enables growth rates to be calculated based on Census mid-layer super output areas (MSOAs); the site is located within the Ashford 013 and 014 MSOAs. The car driver growth factor from 2015 to 2019 averaged between the 013 and 014 areas would be 1.0778 in the weekday morning and 1.07835 in the weekday evening peak hour.

2.4   As SMA only present 2019 with development flows, it has not been able to make a direct comparison to 2019 without development flows. Therefore, development flows have been assumed and added to the 2019 baseline, which was obtained through applying TEMpro factors to the 2015 survey data.

2.5 As a result, it is considered that the 2019 with development flows presented in the SMA assessment are acceptable and provide a robust assessment of the assessment of the junction. However, it is noted that if the actual peak hour traffic flows were used, as indicated in Table 2.1, then the flows would be slightly higher.

Modelling Geometries

2.6 To assess the modelling geometries used within the assessment, SMA drawing number 4773.005 has been used. By printing this drawing at the appropriate scale, the drawing geometries can be checked and compared to the dimensions included within the plan.

2.7 Following this check and comparison it was found that the geometries were broadly similar. The only material difference in measurements was recorded on arm A (Ashford Road north), where SMA measured the effective flare length as 20 metres and the review found it to be 13 metres.

2.8 For the purposes of this assessment the revised measurements, albeit generally similar, have been used.

Model Set Up

2.9 The Arcady model presented within Appendix 3 of the SMA report appears to replicate accurately the junction arrangement excluding the PM time period tested. The PM traffic flows presented in the main body of the report indicate flows between the hours of 1630–1730 were used, whereas the model output labels the PM peak to be between 1700-1800 hours.

2.10 The roundabout was modelled as a standard roundabout, using the one hour traffic profile type and PCUs as the traffic unit input.

2.11 The same parameters were used for the revised roundabout junction assessment with the exception to the PM peak being relabelled as 1630-1730, the traffic unit input being vehicles as this is what the traffic survey data appears to be presented as and the different geometric parameters as mentioned above.

2.12 It is noted that the same traffic flows were used despite the SMA model flows being presented as PCUs and the wrong peak hour traffic flows being used.

Modelling Outputs

2.13 Modelling of the junction has been undertaken using Arcady 9 software. Two versions of the Arcady file have been created, one replicating the SMA assessment and one utilising the alternative geometries and vehicles as the traffic input. Table 2.2 summarises the weekday morning peak hour junction operation, with Table 2.3 summarising the weekday evening peak hour scenarios. The Arcady outputs are included for reference at **Appendix A**.

Arm	SMA Assessment Replication		Alternative Assessment	
	RFC	Queue (PCU)	RFC	Queue (veh)
Ashford Road (North)	0.71	2.5	0.72	2.5
Beacon Oak Road	0.45	0.8	0.43	0.8
Ashford Road (South)	0.51	1.1	0.55	1.2

Table 2.2: Weekday Morning Peak Hour Arcady Comparison

Arm	SMA Assessment Replication		Alternative Assessment	
	RFC	Queue (PCU)	RFC	Queue (veh)
Ashford Road (North)	0.60	1.5	0.58	1.4
Beacon Oak Road	0.29	0.4	0.28	0.4
Ashford Road (South)	0.55	1.2	0.58	1.4

Table 2.3: Weekday Evening Peak Hour Arcady Comparison

2.14   Table 2.2 and 2.3 indicate that the alternative geometries and vehicles as traffic input does not materially change the operation of the roundabout and all arms still operate within capacity.

3.0   Conclusion

3.1   Whilst there are a few discrepancies identified in the SMA modelling assessment, it is considered that the junction would still operate within capacity.

Appendix A

Arcady Output

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Junctions 9
ARCADY 9 - Roundabout Module
Version: 9.0.2.5947 © Copyright TRL Limited, 2017
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Filename: Ashford Road-Beacon Oak Road Roundabout-2018-08-06 (PCU - SMA data).j9
Path: N:\Projects\igtent 1807069\Modelling
Report generation date: 07/08/2018 15:17:38

»Ashford Road/Beacon Oak Road Proposed Roundabout - 2019, AM
»Ashford Road/Beacon Oak Road Proposed Roundabout - 2019, PM

Summary of junction performance

	AM				PM			
	Queue (PCU)	Delay (s)	RFC	LOS	Queue (PCU)	Delay (s)	RFC	LOS
	Ashford Road/Beacon Oak Road Proposed Roundabout - 2019							
Arm 1	2.5	10.51	0.71	B	1.5	7.37	0.60	A
Arm 2	0.8	7.93	0.45	A	0.4	5.48	0.29	A
Arm 3	1.1	6.82	0.51	A	1.2	7.06	0.55	A

Values shown are the highest values encountered over all time segments. Delay is the maximum value of average delay per arriving vehicle.

File summary

File Description

Title	(untitled)
Location	
Site number	
Date	06/08/2018
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	MOTION\JamesWerby
Description	

Units

Distance units	Speed units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
m	kph	PCU	PCU	perHour	s	-Min	perMin

Analysis Options

Calculate Queue Percentiles	Calculate residual capacity	RFC Threshold	Average Delay threshold (s)	Queue threshold (PCU)
		0.85	36.00	20.00

Demand Set Summary

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2019	AM	ONE HOUR	07:45	09:15	15
D2	2019	PM	ONE HOUR	16:45	18:15	15

Analysis Set Details

ID	Name	Network flow scaling factor (%)
A1	Ashford Road/Beacon Oak Road Proposed Roundabout	100.000

Ashford Road/Beacon Oak Road Proposed Roundabout - 2019, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction Type	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout	1, 2, 3	8.83	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description
1	Ashford Road (n)	
2	Beacon Oak Road	
3	Ashford Road (s)	

Roundabout Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit only
1	3.05	4.50	20.0	20.0	24.0	27.0	
2	3.85	4.50	8.0	10.0	24.0	49.0	
3	3.60	4.50	5.0	20.0	24.0	27.0	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Arm	Final slope	Final intercept (PCU/hr)
1	0.582	1294
2	0.518	1171
3	0.579	1277

The slope and intercept shown above include any corrections and adjustments.

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2019	AM	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	803	100.000
2		✓	346	100.000
3		✓	517	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		1	2	3
From	1	0	220	583
	2	239	0	107
	3	442	75	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		1	2	3
From	1	0	8	5
	2	0	0	3
	3	5	7	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max delay (s)	Max Queue (PCU)	Max LOS
1	0.71	10.51	2.5	B
2	0.45	7.93	0.8	A
3	0.51	6.82	1.1	A

Main Results for each time segment

07:45 - 08:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	605	56	1261	0.479	601	1.0	5.732	A
2	260	436	945	0.276	259	0.4	5.282	A
3	389	179	1173	0.332	387	0.5	4.807	A

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	722	67	1255	0.575	720	1.4	7.097	A
2	311	523	900	0.345	310	0.5	6.152	A
3	465	214	1153	0.403	464	0.7	5.496	A

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	884	82	1246	0.709	880	2.5	10.274	B
2	381	639	840	0.453	380	0.8	7.868	A
3	569	262	1125	0.506	568	1.1	6.781	A

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	884	83	1246	0.710	884	2.5	10.505	B
2	381	642	839	0.454	381	0.8	7.933	A
3	569	263	1125	0.506	569	1.1	6.822	A

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	722	68	1255	0.575	726	1.5	7.263	A
2	311	527	898	0.346	312	0.5	6.212	A
3	465	216	1152	0.403	466	0.7	5.537	A

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	605	57	1261	0.479	606	1.0	5.836	A
2	260	440	943	0.276	261	0.4	5.333	A
3	389	180	1173	0.332	390	0.5	4.849	A

Ashford Road/Beacon Oak Road Proposed Roundabout - 2019, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction Type	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout	1, 2, 3	6.94	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D2	2019	PM	ONE HOUR	16:45	18:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	671	100.000
2		✓	247	100.000
3		✓	576	100.000

Origin-Destination Data

Demand (PCU/hr)

From \ To	1	2	3
1	0	270	401
2	194	0	53
3	488	88	0

Vehicle Mix

Heavy Vehicle Percentages

From \ To	1	2	3
1	0	1	3
2	2	0	2
3	2	1	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max delay (s)	Max Queue (PCU)	Max LOS
1	0.60	7.37	1.5	A
2	0.29	5.48	0.4	A
3	0.55	7.06	1.2	A

Main Results for each time segment

16:45 - 17:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	505	66	1256	0.402	502	0.7	4.866	A
2	186	300	1016	0.183	185	0.2	4.417	A
3	434	145	1193	0.364	431	0.6	4.800	A

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	603	79	1248	0.483	602	0.9	5.685	A
2	222	360	985	0.226	222	0.3	4.812	A
3	518	174	1176	0.440	517	0.8	5.555	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	739	97	1238	0.597	737	1.5	7.306	A
2	272	440	943	0.288	271	0.4	5.464	A
3	634	213	1154	0.550	632	1.2	7.011	A

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	739	97	1238	0.597	739	1.5	7.369	A
2	272	441	942	0.289	272	0.4	5.476	A
3	634	214	1153	0.550	634	1.2	7.060	A

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	603	79	1248	0.483	605	1.0	5.745	A
2	222	362	984	0.226	222	0.3	4.826	A
3	518	175	1176	0.440	520	0.8	5.599	A

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	LOS
1	505	66	1255	0.402	506	0.7	4.918	A
2	186	303	1014	0.183	186	0.2	4.437	A
3	434	146	1192	0.364	435	0.6	4.843	A

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Junctions 9

ARCADY 9 - Roundabout Module

Version: 9.0.2.5947
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Filename: Ashford Road-Beacon Oak Road Roundabout-2018-08-06 (vehicles - motion data).j9
Path: N:\Projects\igtent 1807069\Modelling
Report generation date: 07/08/2018 18:02:21

»Ashford Road/Beacon Oak Road Proposed Roundabout - 2019, AM
»Ashford Road/Beacon Oak Road Proposed Roundabout - 2019, PM

Summary of junction performance

	AM				PM			
	Queue (Veh)	Delay (s)	RFC	LOS	Queue (Veh)	Delay (s)	RFC	LOS
	Ashford Road/Beacon Oak Road Proposed Roundabout - 2019							
Arm 1	2.5	10.47	0.72	B	1.4	6.84	0.58	A
Arm 2	0.8	7.25	0.43	A	0.4	5.05	0.28	A
Arm 3	1.2	7.81	0.55	A	1.4	7.90	0.58	A

Values shown are the highest values encountered over all time segments. Delay is the maximum value of average delay per arriving vehicle.

File summary

File Description

Title	(untitled)
Location	
Site number	
Date	06/08/2018
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	MOTION\JamesWerby
Description	

Units

Distance units	Speed units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
m	kph	Veh	Veh	perHour	s	-Min	perMin

Analysis Options

Calculate Queue Percentiles	Calculate residual capacity	RFC Threshold	Average Delay threshold (s)	Queue threshold (PCU)
		0.85	36.00	20.00

Demand Set Summary

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2019	AM	ONE HOUR	07:45	09:15	15
D2	2019	PM	ONE HOUR	16:15	17:45	15

Analysis Set Details

ID	Name	Network flow scaling factor (%)
A1	Ashford Road/Beacon Oak Road Proposed Roundabout	100.000

Ashford Road/Beacon Oak Road Proposed Roundabout - 2019, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction Type	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout	1, 2, 3	9.00	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description
1	Ashford Road (n)	
2	Beacon Oak Road	
3	Ashford Road (s)	

Roundabout Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit only
1	3.00	5.00	13.0	20.0	24.0	22.0	
2	3.75	5.00	7.0	15.0	24.0	52.0	
3	3.50	4.50	5.0	20.0	24.0	33.0	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Arm	Final slope	Final intercept (PCU/hr)
1	0.599	1352
2	0.541	1250
3	0.563	1232

The slope and intercept shown above include any corrections and adjustments.

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D1	2019	AM	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1		✓	803	100.000
2		✓	346	100.000
3		✓	517	100.000

Origin-Destination Data

Demand (Veh/hr)

		To		
		1	2	3
From	1	0	220	583
	2	239	0	107
	3	442	75	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		1	2	3
From	1	0	8	5
	2	0	0	3
	3	5	7	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max delay (s)	Max Queue (Veh)	Max LOS
1	0.72	10.47	2.5	B
2	0.43	7.25	0.8	A
3	0.55	7.81	1.2	A

Main Results for each time segment

07:45 - 08:00

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1	605	56	1243	0.486	601	0.9	5.572	A
2	260	436	993	0.262	259	0.4	4.898	A
3	389	179	1075	0.362	387	0.6	5.218	A

08:00 - 08:15

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1	722	67	1236	0.584	720	1.4	6.948	A
2	311	523	944	0.329	311	0.5	5.677	A
3	465	214	1056	0.440	464	0.8	6.074	A

08:15 - 08:30

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1	884	82	1227	0.720	880	2.5	10.226	B
2	381	639	879	0.433	380	0.8	7.198	A
3	569	262	1030	0.553	567	1.2	7.753	A

08:30 - 08:45

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1	884	83	1227	0.720	884	2.5	10.472	B
2	381	642	877	0.434	381	0.8	7.254	A
3	569	263	1030	0.553	569	1.2	7.813	A

08:45 - 09:00

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1	722	68	1236	0.584	726	1.4	7.120	A
2	311	527	942	0.330	312	0.5	5.730	A
3	465	216	1055	0.440	466	0.8	6.132	A

09:00 - 09:15

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1	605	57	1243	0.486	606	1.0	5.674	A
2	260	440	990	0.263	261	0.4	4.940	A
3	389	180	1074	0.362	390	0.6	5.270	A

Ashford Road/Beacon Oak Road Proposed Roundabout - 2019, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction Type	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout	1, 2, 3	6.95	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D2	2019	PM	ONE HOUR	16:15	17:45	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1		✓	671	100.000
2		✓	247	100.000
3		✓	576	100.000

Origin-Destination Data

Demand (Veh/hr)

From \ To	1	2	3
1	0	270	401
2	194	0	53
3	488	88	0

Vehicle Mix

Heavy Vehicle Percentages

From \ To	1	2	3
1	0	1	3
2	2	0	2
3	2	1	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max delay (s)	Max Queue (Veh)	Max LOS
1	0.58	6.84	1.4	A
2	0.28	5.05	0.4	A
3	0.58	7.90	1.4	A

Main Results for each time segment

16:15 - 16:30

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1	505	66	1284	0.394	503	0.6	4.595	A
2	186	300	1061	0.175	185	0.2	4.106	A
3	434	145	1128	0.384	431	0.6	5.149	A

16:30 - 16:45

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1	603	79	1276	0.473	602	0.9	5.337	A
2	222	360	1029	0.216	222	0.3	4.461	A
3	518	174	1112	0.466	517	0.9	6.041	A

16:45 - 17:00

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1	739	97	1265	0.584	737	1.4	6.785	A
2	272	440	985	0.276	272	0.4	5.044	A
3	634	213	1090	0.582	632	1.4	7.833	A

17:00 - 17:15

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1	739	97	1265	0.584	739	1.4	6.838	A
2	272	441	984	0.276	272	0.4	5.054	A
3	634	214	1090	0.582	634	1.4	7.902	A

17:15 - 17:30

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1	603	79	1276	0.473	605	0.9	5.385	A
2	222	362	1028	0.216	222	0.3	4.474	A
3	518	175	1111	0.466	520	0.9	6.104	A

17:30 - 17:45

Arm	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Capacity (Veh/hr)	RFC	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1	505	66	1283	0.394	506	0.7	4.638	A
2	186	302	1060	0.175	186	0.2	4.122	A
3	434	146	1127	0.385	435	0.6	5.205	A