

Project number: 17204
Prepared by: Andy Roberts
Subject: Additional modelling of the A477 London Road/A477 Waterloo Road roundabout
Date: 30th April 2020
File name: 17204 d3

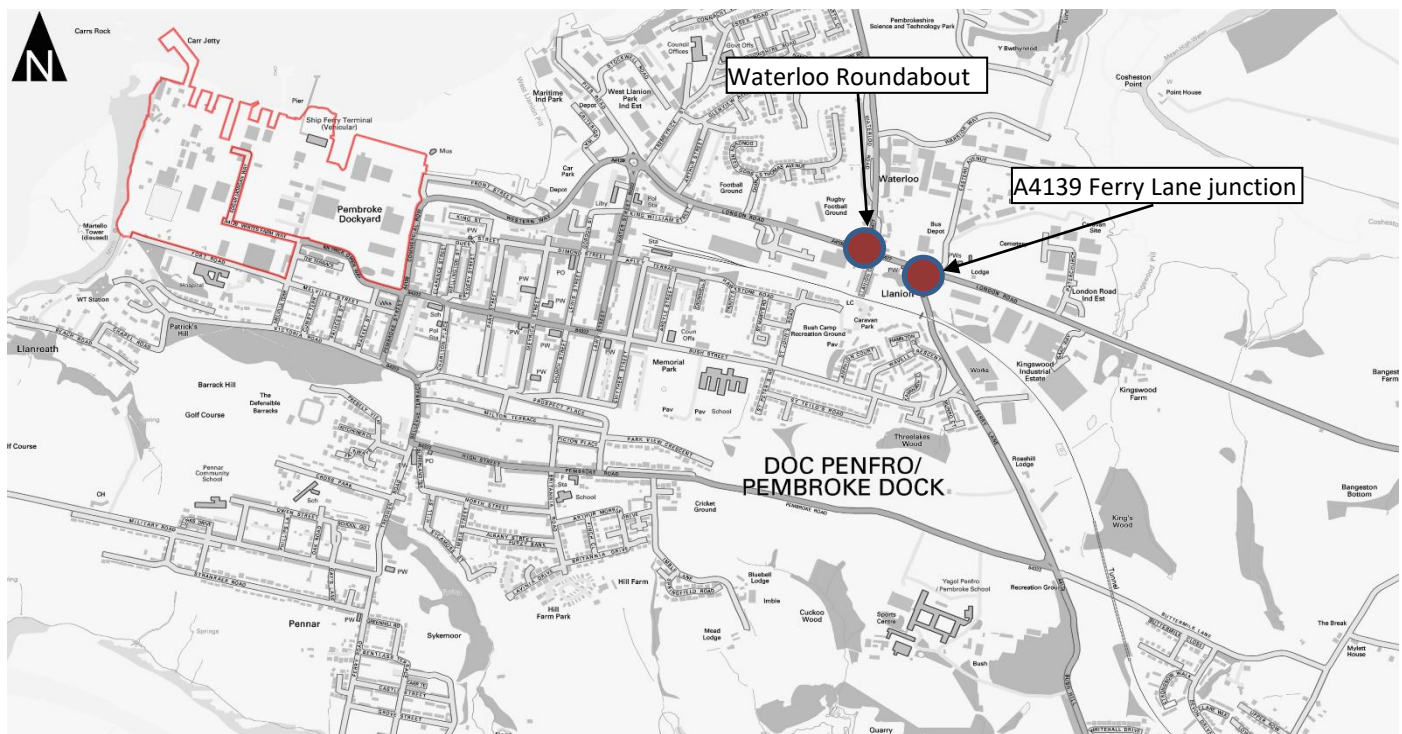
1 Introduction

1.1 Background

1.1.1 This technical note has been prepared by Lime Transport in response to the issues raised by the Welsh Government in relation to the impact of the proposed re-development of Pembroke Port (as a centre for renewable energy) on the operation of the A477 London Road/A477 Waterloo Road roundabout.

1.1.2 The proposed development is located within Pembroke Dockyard, Pembroke Dock, approximately 4km northwest of Pembroke Town Centre.

1.1.3 The location of Pembroke Dock, together with the A477 London Road/A477 Waterloo Road roundabout and the A477 London Road/A4193 Ferry Lane junction is identified in **Figure 1.1** below.



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Figure 1.1 Location of the port and the A477 London Road/Waterloo Road roundabout and the A477 London Road/A4193 Ferry Lane junction

1.1.4 The Welsh Government concerns were outlined in an email from Richard Jones, dated 17th March 2020 (see **Appendix A**), which stated:

'On review of the Transport Assessment it appears queues at the Waterloo Roundabout junction as per the base scenario are not representative of the existing situation with very little queueing shown in the TA. This is not the case in the peak periods and the model should be revisited so that it accurately reflects current operation and therefore better outline the impacts from the development proposals.'

1.2 Scope of this report

1.2.1 This technical note has been produced in response to the issues raised by the Trunk Road Agents, and in particular:

- The extent of existing queues at the A477 London Road/A477 Waterloo Road roundabout; and,
- The methodology used to assess the operation of the roundabout.

2 Operation of the roundabout

2.1 Introduction

2.1.1 As stated in their email, the Welsh Government were concerned that the modelling (of the roundabout) was not representative of existing queues.

2.1.2 Therefore, in order to provide a robust, validated 'base' model, queue length observations have been obtained from the Welsh Government. These observations were undertaken during the peak periods (8am-9am and 5pm-6pm) between Tuesday 17th March and Monday 23rd March 2020 (inclusive).

2.1.3 Junctions 9 User Guidance states that:

'if proper validation of an ARCADY/PICADY/OSCADY model is required, the junction operation will need to be observed on many occasions and the measured queue lengths averaged' and 'In general, for any use of the program, you should check wherever possible that the results approximately match observed behaviour at the junction before modelling other scenarios.' (p. 197)

2.1.4 The observed queue lengths on each approach to the roundabout are presented in full in **Appendix B**, and the mean maximum queues are summarised in **Table 2.1** below.

2.1.5 It should be noted, however, that due to the current Coronavirus Pandemic, the majority of schools throughout England and Wales were closed on (or from) Friday 20th March 2020). Therefore, for the purposes of this updated assessment, only data from Tuesday 17th March to Thursday 19th March has been used.

Table 2.1 Observed queue lengths

Survey day	A477 Waterloo Road			A477 London Road			Llianon Cottages	London Road		
	nearside	offside	Total	nearside	offside	Total	nearside	nearside	offside	Total
AM peak										
Tues. 17 th March	5	2	7	2	4	6	1	7	0	7
Wed. 18 th March	4	2	7	2	4	6	1	6	0	6
Thurs. – 19 th March	5	2	6	2	3	5	0	8	0	8
Average	5	2	7	2	4	6	0	7	0	7
PM peak										
Tues. 17 th March	3	1	4	2	3	5	0	9	0	9
Wed. 18 th March	5	2	6	2	5	7	0	7	0	7
Thurs. – 19 th March	3	2	5	2	3	5	0	7	0	7
Average	3	2	5	2	4	6	0	8	0	8

2.2 Validated base model

2.2.1 It should be noted that the queues differ during the AM and PM peaks, therefore, the models for the AM and PM peaks were created separately to provide a more robust and accurate representation of the existing traffic conditions and observed queues.

2.2.2 The operation of the existing roundabout has been undertaken based on the observed turning movements and queue length surveys. After an initial model run, the base 2018 models were validated and calibrated. The capacities of each arm were manually adjusted (increased or decreased), and the model re-run until the modelled queues replicate the observed queues (iterative process).

2.2.3 The results of the validated baseline scenario are presented in full in **Appendix C**, and summarised in **Table 2.2** below.

Table 2.2 Junction capacity results, validated base model

Approach arm	8am-9am		5pm-6pm	
	Mean Max Queue	RFC	Mean Max Queue	RFC
A477 London Road	6	0.83	6	0.83
London Road	7	0.86	8	0.89
A477 Waterloo Road	7	0.84	5	0.81

2.2.4 It can be seen from the table above that comparing the observed queues (in Table 2.1) with the modelled results (in Table 2.2) the validated/calibrated base 2018 model is representative of the observed conditions on site.

2.2.5 It can also be seen that the existing roundabout is already operating above the practical reserve flow to capacity (RFC) of 0.85 on the London Road approach in both the AM and the PM peak period.

2.3 Future year assessments

2.3.1 The operation of the roundabout has been assessed for the following ‘future’ year scenarios:

- 2030 ‘opening year’ plus 10 years
- 2035 ‘opening year’ plus 15 years.

2.3.2 As with the validated base model, a separate model for AM and PM peak periods has been created to provide a more robust analysis. The results of the future year assessments are presented in full in Appendix C and summarised in **Table 2.3** below.

Table 2.3 Junction capacity results, future year assessments

Approach arm	Base				Base + Development			
	8am-9am		5pm-6pm		8am-9am		5pm-6pm	
	Mean Max Queue	RFC	Mean Max Queue	RFC	Mean Max Queue	RFC	Mean Max Queue	RFC
2030 ‘opening year’ plus 10 years								
A477 London Road	8	0.87	8	0.88	9	0.90	11	0.92
London Road	10	0.91	13	0.95	10	0.91	27	1.02
A477 Waterloo Road	9	0.89	7	0.87	13	0.93	9	0.92
2035 ‘opening year’ plus 15 years								
A477 London Road	14	0.93	15	0.95	19	0.97	24	0.99
London Road	20	1.00	32	1.04	19	1.00	57	1.11
A477 Waterloo Road	18	0.97	12	0.94	25	1.01	18	0.98

2.3.3 It can be seen from the table above that the existing junction is predicted to operate at or close to capacity with background traffic growth to 2030. The maximum RFC is 0.95, with a mean maximum queue of 13 vehicles on the London Road Approach to the junction in the PM peak. It can also be seen that with background traffic growth the 2035, the maximum RFC increases to 1.04 and the mean max queue increases to 32 vehicles on the London Road Approach to the junction in the PM peak.

2.3.4 The model also predicts that with the additional traffic generated by the proposed development, the maximum RFC increases to 1.11 (an increase of just 0.07) and the mean maximum queues increase to 57 vehicles. However, it should be noted that queuing predictions at junctions become inaccurate once the junction is close to capacity. This is also stated in Junction 9 User Guide:

‘At the point where the demand is close to capacity (i.e. RFC is around 1.0), the throughput is less than both the demand and the capacity. This is due to the random nature of traffic arrivals and random queueing theory. When the RFC is close to 1.0, this randomness is most noticeable and means that vehicles may randomly bunch up and cause momentary queueing, which results in the throughput being less than the theoretically available capacity.’ (p. 92)

- 2.3.5 It is also noted from on-site observations that the level of queueing at the roundabout is not related to the operation of the roundabout itself, but is caused by the level of queueing at the A477 London Road/A4139 Ferry Road traffic signal controlled junction (and to a lesser extent the level of queueing at the Tesco Superstore). It is considered that this causes blocking back beyond the roundabout (see **Figures 2.1** and **2.2** from Google Earth street view below).



Figure 2.1 Queueing at the A4139 Ferry Lane/A477 London Road junction



Figure 2.1 Queueing at the A4139 Ferry Lane/A477 London Road junction

- 2.3.6 The A477 London Road/A4139 Ferry Lane junction arrangement was implemented by the local highway authority in 2018. However, the layout and operation of the signal-controlled junction appears to be inefficient. The stop lines on the A477 are approximately 80m apart which require long inter-green periods, resulting in a significant amount of 'lost' time every cycle. This lost time results in significant queueing and blocking back to the Waterloo Roundabout, which causes queueing on both the London Road and A477 Waterloo Road approaches.

2.4 Summary

- 2.4.1 The Analysis within the Transport Assessment indicates that, if the operation of the Waterloo Roundabout is considered in isolation, then the impact of the proposed development is marginal.
- 2.4.2 The analysis also indicates that the operation of the A477 London Road/A4139 Ferry Lane traffic signal-controlled junction has a greater impact on the operation of the roundabout than the proposed development.
- 2.4.3 It is therefore considered that, once the highway authority improves the operation of this junction (which was only implemented in 2018), this will also reduce the level of queues and delays along the A477 London Road toward the Waterloo Road Roundabout. It is, therefore, anticipated that any improvements to the operation of the A477 London Road/A4139 Ferry Lane junction will result in A477 London Road/Waterloo Roundabout operating within capacity (even with development generated traffic) in the future year scenarios.

3 Conclusions

3.1 Background

- 3.1.1 This technical note has been prepared by Lime Transport in response to the issues raised by the Welsh Government in relation to the impact of the proposed re-development of Pembroke Port (as a centre for renewable energy) on the operation of the A477 London Road/A477 Waterloo Road roundabout.
- 3.1.2 The Welsh Government concerns were outlined in an email from Richard Jones, dated 17th March 2020 (see **Appendix A**), which stated that queues at the Waterloo Roundabout junction are not representative of the existing situation.

Queue length observations

- 3.1.3 In order to provide a robust, validated 'base' model, queue length observations have been obtained from the Welsh Government. These observations were undertaken during the peak periods (8am-9am and 5pm-6pm) between Tuesday 17th March and Monday 23rd March 2020 (inclusive). However, only data from Tuesday 17th March to Thursday 19th March has been used.

Validated base model

- 3.1.4 The operation of the existing roundabout has been undertaken based on the observed turning movements and queue length surveys, with the capacities of each arm manually adjusted (increased or decreased) until the modelled queues replicate the observed queues.

Model results

- 3.1.5 The results of the updated analysis indicate that the existing junction is predicted to operate at or close to capacity with background traffic growth to 2030, with a maximum RFC of 0.95 and a mean maximum queue of 13 vehicles on the London Road Approach to the junction in the PM peak. As the background traffic increases (to 2035) the level of queues and delays increase.
- 3.1.6 The model also predicts that with the additional traffic generated by the proposed development, the maximum RFC increases to 1.11 (an increase of just 0.07) and the mean maximum queues increases to 57 vehicles.
- 3.1.7 However, on-site observations suggest that the level of queueing at the roundabout is not related to the operation of the roundabout itself, but is caused by the level of queueing at the A477 London Road/A4139 Ferry Road traffic signal controlled junction, which blocks back beyond the roundabout.
- 3.1.8 The Analysis within the Transport Assessment indicates that, if the operation of the Waterloo Roundabout is considered in isolation, then the impact of the proposed development is marginal, and that the operation of the A477 London Road/A4139 Ferry Lane traffic signal-controlled junction has a greater impact on the operation of the roundabout.
- 3.1.9 It is considered that, once the highway authority improves the operation of this junction (which was only implemented in 2018), this will also reduce the level of queues and delays along the A477 London Road towards the Waterloo Road roundabout. It is, therefore, anticipated that any improvements to the operation of the A477 London Road/A4139 Ferry Lane junction will result in A477 London Road/Waterloo Roundabout operating within capacity (even with development generated traffic) in the future year scenarios.

Appendices



Appendix A



From: Jones, Richard (EST - Transport)

Sent: 17 March 2020 14:34

To: Dafydd.williams@rpsgroup.com

Cc: Chris Davies (C.W.Davies@southwales-tra.gov.uk) <C.W.Davies@southwales-tra.gov.uk>; LGC Development Control (South) <LGC_Development_Control-South@gov.wales>; Thomas, Rhodri <Rhodri.Thomas@wsp.com>

Subject: Gate 4 2D pre-app consultation

Dear Dafydd,

Thankyou for the above pre-application consultation at Gate 4 Pembroke Dock.

On review of the Transport Assessment it appears queues at the **Waterloo** roundabout junction as per the base scenario are not representative of the existing situation with very little queuing shown in the TA. This is not the case in the peak period and the model should be revisited so that it accurately reflects current operation and therefore better outline the impacts from the development proposals.

Kind regards

Richard Jones

Peiriannydd Ffyrdd / Route Engineer

[Is-adran Rheoli'r Rhwydwaith](#) - Network Management Division
[Trafnidiaeth](#) / Transport
[Llywodraeth Cymru](#) / Welsh Government
[Parc Cathays](#) / Cathays Park
[Caerdydd](#) / Cardiff

Ffôn / Tel: 03000 256573

Sganiwyd y neges hon am bob feirws hysbys wrth iddi adael Llywodraeth Cymru. Mae Llywodraeth Cymru yn cymryd o ddifrif yr angen i ddiogelu eich data. Os cysylltwch â Llywodraeth Cymru, mae ein [hysbysiad preifatrwydd](#) yn esbonio sut rydym yn defnyddio eich gwybodaeth a sut rydym yn diogelu eich preifatrwydd. Rydym yn croesawu gohebiaeth yn Gymraeg. Byddwn yn anfon ateb yn Gymraeg i ohebiaeth a dderbynnir yn Gymraeg ac ni fydd gohebu yn Gymraeg yn arwain at oedi. On leaving the Welsh Government this email was scanned for all known viruses. The Welsh Government takes the protection of your data seriously. If you contact the Welsh Government then our [Privacy Notice](#) explains how we use your information and the ways in which we protect your privacy. We welcome receiving correspondence in Welsh. Any correspondence received in Welsh will be answered in Welsh and corresponding in Welsh will not lead to a delay in responding.

Appendix B



Tues 17th

	A - A477 Waterloo		B - A477 London Road		C - London Road		A - A477 Waterloo		B - A477 London Road		D - London Road	
	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2
AM PEAK							Average					
08:00- 08:05	3	1	1	4	12	0	5	2	2	4	7	0
08:05- 08:10	3	1	2	1	3	0						
08:10-08:15	5	1	1	4	6	0						
08:15-08:20	8	1	5	5	5	0						
08:20-08:25	4	1	2	2	7	0						
08:25-08:30	4	3	5	6	5	0						
08:30-08:35	16	3	4	2	6	0						
08:35-08:40	6	2	3	6	8	0						
08:40-08:45	5	2	1	4	9	0						
08:45-08:50	2	3	1	1	5	0						
08:50-08:55	2	1	1	3	9	0						
08:55-09:00	4	2	3	5	3	0						
PM PEAK												
17:00-17:05	5	1	1	3	19	0	3	1	2	3	9	0
17:05-17:10	3	2	4	5	11	0						
17:10-17:15	3	1	2	5	12	0						
17:15-17:20	3	1	3	5	5	0						
17:20-17:25	1	1	1	1	8	0						
17:25-17:30	4	1	3	4	13	0						
17:30-17:35	2	1	2	4	9	0						
17:35-17:40	4	1	0	0	6	0						
17:40-17:45	2	1	1	2	8	0						
17:45-17:50	1	2	1	3	12	0						
17:50-17:55	2	2	1	2	4	0						
17:55-18:00	2	1	2	1	6	0						

Tues 17th

Wed 18th

	A - A477 Waterloo		B - A477 London Road		C - London Road		A - A477 Waterloo		B - A477 London Road		D - London Road	
	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2
AM PEAK							Average					
08:00- 08:05	5	2	0	1	5	0	4	2	2	4	6	0
08:05- 08:10	4	4	1	1	6	0						
08:10-08:15	2	0	2	6	3	0						
08:15-08:20	3	1	2	3	6	0						
08:20-08:25	6	4	1	2	5	0						
08:25-08:30	4	1	1	4	8	0						
08:30-08:35	4	2	1	8	4	0						
08:35-08:40	4	3	4	7	15	0						
08:40-08:45	2	1	3	4	9	0						
08:45-08:50	6	5	5	4	9	0						
08:50-08:55	9	2	2	3	5	0						
08:55-09:00	3	2	2	6	2	0						
PM PEAK												
17:00-17:05	4	4	1	8	7	0	5	2	2	5	7	0
17:05-17:10	6	1	2	3	6	0						
17:10-17:15	3	1	1	3	19	0						
17:15-17:20	6	2	3	6	3	0						
17:20-17:25	6	2	5	6	11	0						
17:25-17:30	6	1	2	8	8	0						
17:30-17:35	5	0	1	7	10	0						
17:35-17:40	4	2	4	1	4	0						
17:40-17:45	2	1	1	3	5	0						
17:45-17:50	4	2	2	4	3	0						
17:50-17:55	6	1	2	5	3	0						
17:55-18:00	3	3	2	3	5	0						

Wed 18th

Thurs 19th

	A - A477 Waterloo		B - A477 London Road		C - London Road		A - A477 Waterloo		B - A477 London Road		D - London Road	
	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2
AM PEAK							Average					
08:00- 08:05	9	1	0	0	2	0	5	2	2	3	8	0
08:05- 08:10	6	1	2	1	9	0						
08:10-08:15	4	3	2	4	5	0						
08:15-08:20	10	2	3	7	13	0						
08:20-08:25	1	1	1	4	12	0						
08:25-08:30	3	0	1	3	7	0						
08:30-08:35	4	1	1	2	5	0						
08:35-08:40	11	2	1	2	8	0						
08:40-08:45	3	2	5	4	12	0						
08:45-08:50	2	2	7	2	5	0						
08:50-08:55	1	2	3	2	9	0						
08:55-09:00	2	3	1	4	4	0						
PM PEAK												
17:00-17:05	5	1	2	6	5	0	3	2	2	3	7	0
17:05-17:10	4	1	1	3	7	0						
17:10-17:15	6	4	2	7	6	0						
17:15-17:20	2	7	4	6	6	0						
17:20-17:25	3	1	1	0	20	0						
17:25-17:30	3	2	5	5	6	0						
17:30-17:35	1	2	1	3	9	0						
17:35-17:40	2	3	1	1	2	0						
17:40-17:45	3	1	1	2	2	0						
17:45-17:50	1	3	2	3	5	0						
17:50-17:55	6	2	2	2	7	0						
17:55-18:00	1	1	0	2	4	0						

Thurs 19th

Friday 20th

	A - A477 Waterloo		B - A477 London Road		C - London Road		A - A477 Waterloo		B - A477 London Road		D - London Road	
	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2
AM PEAK							Average					
08:00- 08:05	10	1	2	5	6	0	5	2	2	2	6	0
08:05- 08:10	6	1	1	1	6	0						
08:10-08:15	4	2	3	2	4	0						
08:15-08:20	4	1	1	1	6	0						
08:20-08:25	3	1	0	2	9	0						
08:25-08:30	10	2	1	1	7	0						
08:30-08:35	6	2	4	2	3	0						
08:35-08:40	1	2	4	3	5	0						
08:40-08:45	4	2	1	2	3	0						
08:45-08:50	5	3	5	3	8	0						
08:50-08:55	4	1	2	3	7	0						
08:55-09:00	5	1	4	3	9	0						
PM PEAK												
17:00-17:05	4	2	4	2	7	0	3	1	2	2	5	0
17:05-17:10	2	2	3	1	12	0						
17:10-17:15	5	1	0	2	4	0						
17:15-17:20	1	1	2	1	8	0						
17:20-17:25	4	1	4	3	2	0						
17:25-17:30	9	1	1	4	5	0						
17:30-17:35	2	3	1	4	5	0						
17:35-17:40	1	1	1	1	3	0						
17:40-17:45	1	2	1	2	5	0						
17:45-17:50	3	1	1	2	4	0						
17:50-17:55	1	1	1	1	4	0						
17:55-18:00	1	0	0	1	2	0						

Friday 20th

Saturday 21st

	A - A477 Waterloo		B - A477 London Road		C - London Road		A - A477 Waterloo		B - A477 London Road		D - London Road	
	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2
AM PEAK							Average					
08:00- 08:05	2	1	1	1	0	0	1	1	1	0	1	0
08:05- 08:10	1	0	0	0	0	0						
08:10-08:15	0	1	0	0	0	0						
08:15-08:20	0	1	1	0	0	0						
08:20-08:25	0	1	1	1	2	0						
08:25-08:30	1	0	2	0	7	0						
08:30-08:35	1	1	0	0	2	0						
08:35-08:40	1	0	0	0	0	0						
08:40-08:45	1	2	1	0	1	0						
08:45-08:50	2	3	2	0	0	0						
08:50-08:55	2	3	2	0	4	0						
08:55-09:00	1	0	3	2	1	0						
PM PEAK												
17:00-17:05	2	1	0	2	3	0	2	1	1	1	2	0
17:05-17:10	1	1	0	0	0	0						
17:10-17:15	2	1	0	0	4	0						
17:15-17:20	2	0	0	0	0	0						
17:20-17:25	1	0	0	1	2	0						
17:25-17:30	1	1	2	0	3	0						
17:30-17:35	1	0	2	0	2	0						
17:35-17:40	0	0	0	0	1	0						
17:40-17:45	2	2	1	2	0	0						
17:45-17:50	4	0	2	1	4	0						
17:50-17:55	1	1	0	0	0	0						
17:55-18:00	2	1	1	0	4	0						

Saturday 21st

Sunday 22nd

	A - A477 Waterloo		B - A477 London Road		C - London Road		A - A477 Waterloo		B - A477 London Road		D - London Road	
	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2
AM PEAK							Average					
08:00- 08:05	0	0	0	0	0	0	0	0	0	0	0	0
08:05- 08:10	0	0	0	0	0	0						
08:10-08:15	0	0	0	0	0	0						
08:15-08:20	0	0	0	0	0	0						
08:20-08:25	0	0	0	0	0	0						
08:25-08:30	0	0	0	0	0	0						
08:30-08:35	0	0	0	0	0	0						
08:35-08:40	1	0	0	0	3	0						
08:40-08:45	0	0	0	0	1	0						
08:45-08:50	0	0	0	0	1	0						
08:50-08:55	1	0	0	1	0	0						
08:55-09:00	0	0	0	0	0	0						
PM PEAK												
17:00-17:05	1	0	0	1	1	0	0	0	1	0	1	0
17:05-17:10	1	0	3	1	1	0						
17:10-17:15	0	0	0	1	3	0						
17:15-17:20	0	0	2	0	1	0						
17:20-17:25	0	0	1	0	1	0						
17:25-17:30	1	0	0	0	1	0						
17:30-17:35	0	0	0	0	0	0						
17:35-17:40	0	0	0	0	0	0						
17:40-17:45	1	1	1	0	1	0						
17:45-17:50	0	0	0	0	1	0						
17:50-17:55	0	0	0	0	0	0						
17:55-18:00	1	0	0	0	0	0						

Sunday 22nd

Monday 23rd

	A - A477 Waterloo		B - A477 London Road		C - London Road		A - A477 Waterloo		B - A477 London Road		D - London Road	
	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2	Lane 1	Lane 2
AM PEAK							Average					
08:00- 08:05	2	1	1	2	7	0	3	1	2	3	5	0
08:05- 08:10	1	0	1	5	4	0						
08:10-08:15	2	1	1	5	3	0						
08:15-08:20	1	1	2	2	4	0						
08:20-08:25	2	2	2	8	3	0						
08:25-08:30	3	1	2	2	4	0						
08:30-08:35	9	1	4	5	7	0						
08:35-08:40	2	1	1	1	6	0						
08:40-08:45	1	0	2	3	7	0						
08:45-08:50	4	1	2	2	3	0						
08:50-08:55	3	1	3	2	3	0						
08:55-09:00	3	2	4	2	5	0						
PM PEAK												
17:00-17:05	3	1	2	2	9	0	3	1	3	2	6	0
17:05-17:10	3	2	11	1	9	0						
17:10-17:15	2	1	2	3	5	0						
17:15-17:20	1	2	2	1	10	0						
17:20-17:25	2	2	2	8	3	0						
17:25-17:30	5	1	3	3	7	0						
17:30-17:35	3	1	1	3	4	0						
17:35-17:40	2	1	3	2	2	0						
17:40-17:45	5	2	1	2	6	0						
17:45-17:50	4	2	1	2	4	0						
17:50-17:55	3	1	2	0	3	0						
17:55-18:00	2	1	3	1	6	0						

Monday 23rd

Tuesday - Thursday average

	A - A477 Waterloo Road			B - A477 London Road			C - London Road		
	Lane 1	Lane 2	Total	Lane 1	Lane 2	Total	Lane 1	Lane 2	Total
AM PEAK									
Tuesday	5	2	7	2	4	6	7	0	7
Wednesday	4	2	7	2	4	6	6	0	6
Thursday	5	2	6	2	3	5	8	0	8
Average	5	2	7	2	4	6	7	0	7
PM PEAK									
Tuesday	3	1	4	2	3	5	9	0	9
Wednesday	5	2	6	2	5	7	7	0	7
Thursday	3	2	5	2	3	5	7	0	7
Average	3	2	5	2	4	6	8	0	8

Tuesday - Thursday average

Appendix C



Junctions 9	
ARCADY 9 - Roundabout Module	
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Filename: London Road - Waterloo Road junction - AM - base.j9

Path: Z:\Lime\Projects\2017\17204 Pembroke Port, Pembroke\Analysis\JUNCTIONS 9\2020

Report generation date: 01/05/2020 09:50:38

«2020 Base , AM

»Junction Network

»Arms

»Traffic Demand

»Origin-Destination Data

»Vehicle Mix

»Results

Summary of junction performance

AM					
	Queue (PCU)	Delay (s)	RFC	LOS	Network Residual Capacity
2020 Base					
Arm 1	5.5	18.27	0.83	C	-3 % [Arm 2]
Arm 2	6.5	42.17	0.86	E	
Arm 3	6.5	36.12	0.84	E	

Values shown are the highest values encountered over all time segments. Delay is the maximum value of average delay per arriving vehicle. Network Residual Capacity indicates the amount by which network flow could be increased before a user-definable threshold (see Analysis Options) is met.

File summary

File Description

Title	
Location	
Site number	
Date	18/01/2019
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	DESKTOP-U7G8RPA\Andy
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

Vehicle length (m)	Calculate Queue Percentiles	Calculate detailed queueing delay	Calculate residual capacity	Residual capacity criteria type	RFC Threshold	Average Delay threshold (s)	Queue threshold (PCU)
5.75			✓	Delay	0.85	36.00	20.00

Analysis Set Details

ID	Include in report	Network flow scaling factor (%)	Network capacity scaling factor (%)
A1	✓	100.000	100.000

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D3	2020 Base	AM	ONE HOUR	08:00	09:30	15	✓

2020 Base , AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3	29.21	D

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	-3	Arm 2

Arms

Arms

Arm	Name	Description
1	London Road	
2	A4139	
3	Waterloo Road A477	

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	4.00	8.59	20.0	9.1	56.0	19.7	
2	4.00	6.88	21.8	44.3	55.4	7.2	
3	4.99	8.03	6.6	38.3	55.2	16.1	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Arm	Final slope	Final intercept (PCU/hr)
1	0.621	1968
2	0.669	2019
3	0.661	2019

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

Arm Capacity Adjustments

Arm	Type	Reason	Percentage capacity adjustment (%)
1	Percentage		73.00
2	Percentage		44.20
3	Percentage		48.75

Traffic Demand

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		ONE HOUR	✓	1031	100.000
2		ONE HOUR	✓	537	100.000
3		ONE HOUR	✓	624	100.000

Origin-Destination Data

Demand (PCU/hr)

	To			
		1	2	3
From	1	57	413	561
	2	416	4	117
	3	504	119	1

Vehicle Mix

Heavy Vehicle Percentages

	To			
		1	2	3
From	1	2	15	34
	2	31	0	13
	3	45	10	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
1	0.83	18.27	5.5	C	946	1419
2	0.86	42.17	6.5	E	493	739
3	0.84	36.12	6.5	E	573	859

Main Results for each time segment

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	776	194	92	1395	0.556	770	726	0.0	1.5	7.058	A
2	404	101	462	756	0.535	399	400	0.0	1.4	12.549	B
3	470	117	354	870	0.540	464	507	0.0	1.6	11.921	B

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	927	232	111	1387	0.668	923	872	1.5	2.4	9.533	A
2	483	121	554	728	0.663	479	480	1.4	2.4	17.948	C
3	561	140	426	847	0.662	557	608	1.6	2.5	16.710	C

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1135	284	134	1376	0.825	1124	1053	2.4	5.3	16.902	C
2	591	148	675	693	0.853	577	583	2.4	5.8	35.638	E
3	687	172	514	819	0.839	674	738	2.5	5.9	31.248	D

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1135	284	136	1375	0.826	1134	1072	5.3	5.5	18.272	C
2	591	148	681	691	0.856	589	589	5.8	6.5	42.168	E
3	687	172	523	816	0.842	685	746	5.9	6.5	36.122	E

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	927	232	114	1385	0.669	939	902	5.5	2.6	10.225	B
2	483	121	564	726	0.665	498	489	6.5	2.7	21.137	C
3	561	140	441	842	0.666	575	620	6.5	2.9	19.321	C

09:15 - 09:30

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	776	194	94	1394	0.557	780	743	2.6	1.6	7.301	A
2	404	101	468	754	0.536	409	406	2.7	1.5	13.351	B
3	470	117	363	867	0.542	475	514	2.9	1.7	12.672	B

Junctions 9	
ARCADY 9 - Roundabout Module	
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Filename: London Road - Waterloo Road junction - PM - base.j9

Path: Z:\Lime\Projects\2017\17204 Pembroke Port, Pembroke\Analysis\JUNCTIONS 9\2020

Report generation date: 01/05/2020 09:53:14

«2020 Base , PM

»Junction Network

»Arms

»Traffic Demand

»Origin-Destination Data

»Vehicle Mix

»Results

Summary of junction performance

PM					
	Queue (PCU)	Delay (s)	RFC	LOS	Network Residual Capacity
2020 Base					
Arm 1	5.5	17.17	0.83	C	-1 % [Arm 2]
Arm 2	7.5	37.26	0.89	E	
Arm 3	4.5	24.47	0.81	C	

Values shown are the highest values encountered over all time segments. Delay is the maximum value of average delay per arriving vehicle. Network Residual Capacity indicates the amount by which network flow could be increased before a user-definable threshold (see Analysis Options) is met.

File summary

File Description

Title	
Location	
Site number	
Date	18/01/2019
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	DESKTOP-U7G8RPA\Andy
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

Vehicle length (m)	Calculate Queue Percentiles	Calculate detailed queueing delay	Calculate residual capacity	Residual capacity criteria type	RFC Threshold	Average Delay threshold (s)	Queue threshold (PCU)
5.75			✓	Delay	0.85	36.00	20.00

Analysis Set Details

ID	Include in report	Network flow scaling factor (%)	Network capacity scaling factor (%)
A1	✓	100.000	100.000

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D4	2020 Base	PM	ONE HOUR	17:00	18:30	15	✓

2020 Base , PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3	24.92	C

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	-1	Arm 2

Arms

Arms

Arm	Name	Description
1	London Road	
2	A4139	
3	Waterloo Road A477	

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	4.00	8.59	20.0	9.1	56.0	19.7	
2	4.00	6.88	21.8	44.3	55.4	7.2	
3	4.99	8.03	6.6	38.3	55.2	16.1	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Arm	Final slope	Final intercept (PCU/hr)
1	0.621	1968
2	0.669	2019
3	0.661	2019

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

Arm Capacity Adjustments

Arm	Type	Reason	Percentage capacity adjustment (%)
1	Percentage		77.50
2	Percentage		55.35
3	Percentage		54.50

Traffic Demand

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		ONE HOUR	✓	1083	100.000
2		ONE HOUR	✓	703	100.000
3		ONE HOUR	✓	635	100.000

Origin-Destination Data

Demand (PCU/hr)

	To			
		1	2	3
From	1	40	479	564
	2	571	1	131
	3	466	169	0

Vehicle Mix

Heavy Vehicle Percentages

	To			
		1	2	3
From	1	5	15	21
	2	13	0	4
	3	15	2	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
1	0.83	17.17	5.5	C	994	1491
2	0.89	37.26	7.5	E	645	968
3	0.81	24.47	4.5	C	583	874

Main Results for each time segment

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	815	204	127	1464	0.557	810	803	0.0	1.5	6.411	A
2	529	132	451	950	0.557	524	485	0.0	1.4	9.272	A
3	478	120	456	936	0.511	474	519	0.0	1.1	8.575	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	974	243	152	1452	0.670	970	963	1.5	2.3	8.719	A
2	632	158	541	917	0.689	628	581	1.4	2.4	13.654	B
3	571	143	547	904	0.632	568	622	1.1	1.8	11.831	B

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1192	298	185	1437	0.830	1181	1164	2.3	5.2	15.874	C
2	774	194	659	874	0.886	757	707	2.4	6.7	30.521	D
3	699	175	659	863	0.810	690	756	1.8	4.2	21.966	C

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1192	298	187	1435	0.831	1191	1182	5.2	5.5	17.169	C
2	774	194	664	871	0.888	771	714	6.7	7.5	37.263	E
3	699	175	671	859	0.814	698	764	4.2	4.5	24.469	C

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	974	243	156	1451	0.671	986	992	5.5	2.5	9.332	A
2	632	158	550	914	0.691	651	591	7.5	2.6	16.262	C
3	571	143	566	896	0.637	581	635	4.5	2.0	13.064	B

18:15 - 18:30

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	815	204	129	1463	0.557	819	817	2.5	1.5	6.614	A
2	529	132	457	948	0.558	534	491	2.6	1.4	9.768	A
3	478	120	465	933	0.512	481	526	2.0	1.2	8.928	A

Appendix D



Junctions 9				
ARCADY 9 - Roundabout Module				
Version: 9.5.0.6896				
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Filename: London Road - Waterloo Road junction - AM future.j9

Path: Z:\Lime\Projects\2017\17204 Pembroke Port, Pembroke\Analysis\JUNCTIONS 9\2020

Report generation date: 01/05/2020 09:52:20

- »2030 Base , AM
- »2035 Base, AM
- »2020 + Dev, AM
- »2030 + Dev , AM
- »2035 + Dev, AM

Summary of junction performance

	AM				
	Queue (PCU)	Delay (s)	RFC	LOS	Network Residual Capacity
	2030 Base				
Arm 1	7.6	24.30	0.87	C	-8 % [Arm 2]
Arm 2	9.8	60.96	0.91	F	
Arm 3	9.3	50.05	0.89	F	
	2035 Base				
Arm 1	13.6	41.02	0.93	E	-15 % [Arm 2]
Arm 2	20.3	111.83	1.00	F	
Arm 3	17.5	85.44	0.97	F	
	2020 + Dev				
Arm 1	6.8	22.18	0.86	C	-4 % [Arm 3]
Arm 2	6.5	42.09	0.86	E	
Arm 3	8.3	44.84	0.88	E	
	2030 + Dev				
Arm 1	9.8	30.78	0.90	D	-9 % [Arm 3]
Arm 2	9.7	60.67	0.91	F	
Arm 3	12.6	64.53	0.93	F	
	2035 + Dev				
Arm 1	19.4	56.03	0.97	F	-15 % [Arm 2]
Arm 2	19.9	109.85	1.00	F	
Arm 3	25.2	113.73	1.01	F	

Values shown are the highest values encountered over all time segments. Delay is the maximum value of average delay per arriving vehicle. Network Residual Capacity indicates the amount by which network flow could be increased before a user-definable threshold (see Analysis Options) is met.

File summary

File Description

Title	
Location	
Site number	
Date	18/01/2019
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	DESKTOP-U7G8RPA\Andy
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

Vehicle length (m)	Calculate Queue Percentiles	Calculate detailed queueing delay	Calculate residual capacity	Residual capacity criteria type	RFC Threshold	Average Delay threshold (s)	Queue threshold (PCU)
5.75			✓	Delay	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)	Run automatically
D5	2030 Base	AM	ONE HOUR	08:00	09:30	15	✓
D7	2035 Base	AM	ONE HOUR	08:00	09:30	15	✓
D9	2020 + Dev	AM	ONE HOUR	08:00	09:30	15	✓
D11	2030 + Dev	AM	ONE HOUR	08:00	09:30	15	✓
D13	2035 + Dev	AM	ONE HOUR	08:00	09:30	15	✓

Analysis Set Details

ID	Include in report	Network flow scaling factor (%)	Network capacity scaling factor (%)
A1	✓	100.000	100.000

2030 Base , AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3	40.61	E

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	-8	Arm 2

Arms

Arms

Arm	Name	Description
1	London Road	
2	A4139	
3	Waterloo Road A477	

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	4.00	8.59	20.0	9.1	56.0	19.7	
2	4.00	6.88	21.8	44.3	55.4	7.2	
3	4.99	8.03	6.6	38.3	55.2	16.1	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Arm	Final slope	Final intercept (PCU/hr)
1	0.621	1968
2	0.669	2019
3	0.661	2019

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

Arm Capacity Adjustments

Arm	Type	Reason	Percentage capacity adjustment (%)
1	Percentage		73.00
2	Percentage		44.20
3	Percentage		48.75

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)	Run automatically
D5	2030 Base	AM	ONE HOUR	08:00	09:30	15	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		ONE HOUR	✓	1085	100.000
2		ONE HOUR	✓	565	100.000
3		ONE HOUR	✓	656	100.000

Origin-Destination Data

Demand (PCU/hr)

	To			
		1	2	3
	1	60	435	590
	2	438	4	123
	3	530	125	1

Proportions

	To			
		1	2	3
	1	0.06	0.40	0.54
	2	0.78	0.01	0.22
	3	0.81	0.19	0.00

Vehicle Mix

Heavy Vehicle Percentages

	To			
		1	2	3
	1	2	16	36
	2	32	0	14
	3	48	11	0

Average PCU Per Veh

	To			
		1	2	3
	1	1.020	1.160	1.360
	2	1.320	1.000	1.140
	3	1.480	1.110	1.000

Detailed Demand Data

Demand for each time segment

Time Segment	Arm	Demand (PCU/hr)	Demand in PCU (PCU/hr)
08:00-08:15	1	817	817
	2	425	425
	3	494	494
08:15-08:30	1	975	975
	2	508	508
	3	590	590
08:30-08:45	1	1195	1195
	2	622	622
	3	722	722
08:45-09:00	1	1195	1195
	2	622	622
	3	722	722
09:00-09:15	1	975	975
	2	508	508
	3	590	590
09:15-09:30	1	817	817
	2	425	425
	3	494	494

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
1	0.87	24.30	7.6	C	996	1493
2	0.91	60.96	9.8	F	518	778
3	0.89	50.05	9.3	F	602	903

Main Results for each time segment

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	817	204	96	1393	0.586	810	763	0.0	1.7	7.632	A
2	425	106	486	749	0.568	419	420	0.0	1.6	13.650	B
3	494	123	372	864	0.571	487	532	0.0	1.8	13.024	B

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	975	244	116	1384	0.705	971	916	1.7	2.9	10.768	B
2	508	127	583	720	0.705	503	504	1.6	2.8	20.638	C
3	590	147	447	840	0.702	585	638	1.8	3.1	19.188	C

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1195	299	139	1374	0.870	1178	1098	2.9	7.1	21.315	C
2	622	156	707	683	0.910	601	610	2.8	8.2	46.365	E
3	722	181	535	812	0.890	702	772	3.1	8.0	39.782	E

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1195	299	142	1372	0.870	1192	1123	7.1	7.6	24.304	C
2	622	156	715	681	0.914	616	619	8.2	9.8	60.958	F
3	722	181	548	808	0.894	717	784	8.0	9.3	50.048	F

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	975	244	121	1382	0.706	993	964	7.6	3.1	12.089	B
2	508	127	596	716	0.709	534	519	9.8	3.4	27.934	D
3	590	147	472	832	0.709	613	657	9.3	3.6	24.745	C

09:15 - 09:30

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	817	204	99	1392	0.587	822	785	3.1	1.8	7.972	A
2	425	106	493	747	0.570	432	428	3.4	1.7	14.850	B
3	494	123	383	861	0.574	501	542	3.6	1.9	14.147	B

2035 Base, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3	71.03	F

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	-15	Arm 2

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)	Run automatically
D7	2035 Base	AM	ONE HOUR	08:00	09:30	15	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		ONE HOUR	✓	1162	100.000
2		ONE HOUR	✓	606	100.000
3		ONE HOUR	✓	704	100.000

Origin-Destination Data

Demand (PCU/hr)

	To			
		1	2	3
	1	64	466	632
	2	469	5	132
	3	569	134	1

Proportions

	To			
		1	2	3
	1	0.06	0.40	0.54
	2	0.77	0.01	0.22
	3	0.81	0.19	0.00

Vehicle Mix

Heavy Vehicle Percentages

	To			
		1	2	3
	1	2	17	38
	2	35	0	15
	3	51	12	0

Average PCU Per Veh

	To			
		1	2	3
	1	1.020	1.170	1.380
	2	1.350	1.000	1.150
	3	1.510	1.120	1.000

Detailed Demand Data

Demand for each time segment

Time Segment	Arm	Demand (PCU/hr)	Demand in PCU (PCU/hr)
08:00-08:15	1	875	875
	2	456	456
	3	530	530
08:15-08:30	1	1045	1045
	2	545	545
	3	633	633
08:30-08:45	1	1279	1279
	2	667	667
	3	775	775
08:45-09:00	1	1279	1279
	2	667	667
	3	775	775
09:00-09:15	1	1045	1045
	2	545	545
	3	633	633
09:15-09:30	1	875	875
	2	456	456
	3	530	530

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
1	0.93	41.02	13.6	E	1066	1599
2	1.00	111.83	20.3	F	556	834
3	0.97	85.44	17.5	F	646	969

Main Results for each time segment

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	875	219	104	1390	0.629	866	816	0.0	2.1	8.567	A
2	456	114	520	739	0.618	448	450	0.0	2.0	15.678	C
3	530	133	398	856	0.619	521	570	0.0	2.2	14.855	B

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1045	261	124	1380	0.757	1038	978	2.1	3.7	13.045	B
2	545	136	623	708	0.769	537	540	2.0	3.9	26.189	D
3	633	158	477	831	0.762	625	683	2.2	4.1	23.932	C

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1279	320	147	1370	0.934	1248	1150	3.7	11.6	31.190	D
2	667	167	748	671	0.994	626	646	3.9	14.3	69.933	F
3	775	194	558	805	0.963	739	816	4.1	13.2	57.655	F

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1279	320	151	1369	0.935	1271	1180	11.6	13.6	41.020	E
2	667	167	762	667	1.000	643	659	14.3	20.3	111.826	F
3	775	194	573	800	0.969	758	833	13.2	17.5	85.437	F

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1045	261	135	1375	0.760	1082	1077	13.6	4.2	17.229	C
2	545	136	649	700	0.778	605	568	20.3	5.3	60.656	F
3	633	158	533	813	0.779	680	721	17.5	5.7	45.874	E

09:15 - 09:30

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	875	219	108	1388	0.630	883	850	4.2	2.2	9.156	A
2	456	114	530	736	0.620	469	461	5.3	2.2	18.223	C
3	530	133	415	851	0.623	543	583	5.7	2.4	17.203	C

2020 + Dev, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3	33.51	D

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	-4	Arm 3

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)	Run automatically
D9	2020 + Dev	AM	ONE HOUR	08:00	09:30	15	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		ONE HOUR	✓	1060	100.000
2		ONE HOUR	✓	537	100.000
3		ONE HOUR	✓	652	100.000

Origin-Destination Data

Demand (PCU/hr)

	To			
		1	2	3
	1	57	442	561
	2	416	4	117
	3	504	147	1

Proportions

	To			
		1	2	3
	1	0.05	0.42	0.53
	2	0.77	0.01	0.22
	3	0.77	0.23	0.00

Vehicle Mix

Heavy Vehicle Percentages

	To			
		1	2	3
	1	2	15	34
	2	31	0	13
	3	45	14	0

Average PCU Per Veh

	To			
		1	2	3
	1	1.020	1.150	1.340
	2	1.310	1.000	1.130
	3	1.450	1.140	1.000

Detailed Demand Data

Demand for each time segment

Time Segment	Arm	Demand (PCU/hr)	Demand in PCU (PCU/hr)
08:00-08:15	1	798	798
	2	404	404
	3	491	491
08:15-08:30	1	953	953
	2	483	483
	3	586	586
08:30-08:45	1	1167	1167
	2	591	591
	3	718	718
08:45-09:00	1	1167	1167
	2	591	591
	3	718	718
09:00-09:15	1	953	953
	2	483	483
	3	586	586
09:15-09:30	1	798	798
	2	404	404
	3	491	491

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
1	0.86	22.18	6.8	C	973	1459
2	0.86	42.09	6.5	E	493	739
3	0.88	44.84	8.3	E	598	897

Main Results for each time segment

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	798	200	113	1386	0.576	791	726	0.0	1.6	7.397	A
2	404	101	462	756	0.535	399	442	0.0	1.4	12.550	B
3	491	123	354	870	0.564	484	506	0.0	1.7	12.518	B

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	953	238	136	1375	0.693	949	872	1.6	2.7	10.311	B
2	483	121	554	729	0.663	479	530	1.4	2.4	17.942	C
3	586	147	426	847	0.692	581	607	1.7	2.9	18.159	C

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1167	292	163	1363	0.856	1152	1050	2.7	6.4	19.806	C
2	591	148	673	693	0.853	577	643	2.4	5.8	35.525	E
3	718	179	514	819	0.877	700	737	2.9	7.3	36.725	E

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1167	292	166	1361	0.857	1165	1070	6.4	6.8	22.184	C
2	591	148	680	691	0.855	589	651	5.8	6.5	42.095	E
3	718	179	523	816	0.880	714	746	7.3	8.3	44.836	E

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	953	238	141	1373	0.694	969	906	6.8	2.9	11.395	B
2	483	121	566	725	0.666	498	544	6.5	2.7	21.184	C
3	586	147	442	842	0.696	606	622	8.3	3.3	22.329	C

09:15 - 09:30

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	798	200	116	1384	0.576	803	744	2.9	1.7	7.703	A
2	404	101	469	754	0.536	409	450	2.7	1.5	13.360	B
3	491	123	363	867	0.566	497	515	3.3	1.8	13.471	B

2030 + Dev , AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3	47.70	E

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	-9	Arm 3

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)	Run automatically
D11	2030 + Dev	AM	ONE HOUR	08:00	09:30	15	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		ONE HOUR	✓	1113	100.000
2		ONE HOUR	✓	565	100.000
3		ONE HOUR	✓	684	100.000

Origin-Destination Data

Demand (PCU/hr)

	To			
		1	2	3
	1	60	463	590
	2	438	4	123
	3	530	153	1

Proportions

	To			
		1	2	3
	1	0.05	0.42	0.53
	2	0.78	0.01	0.22
	3	0.77	0.22	0.00

Vehicle Mix

Heavy Vehicle Percentages

	To			
		1	2	3
	1	2	16	36
	2	32	0	14
	3	48	15	0

Average PCU Per Veh

	To			
		1	2	3
	1	1.020	1.160	1.360
	2	1.320	1.000	1.140
	3	1.480	1.150	1.000

Detailed Demand Data

Demand for each time segment

Time Segment	Arm	Demand (PCU/hr)	Demand in PCU (PCU/hr)
08:00-08:15	1	838	838
	2	425	425
	3	515	515
08:15-08:30	1	1001	1001
	2	508	508
	3	615	615
08:30-08:45	1	1225	1225
	2	622	622
	3	753	753
08:45-09:00	1	1225	1225
	2	622	622
	3	753	753
09:00-09:15	1	1001	1001
	2	508	508
	3	615	615
09:15-09:30	1	838	838
	2	425	425
	3	515	515

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
1	0.90	30.78	9.8	D	1021	1532
2	0.91	60.67	9.7	F	518	778
3	0.93	64.53	12.6	F	628	941

Main Results for each time segment

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	838	209	117	1384	0.606	830	762	0.0	1.9	8.019	A
2	425	106	486	749	0.568	419	462	0.0	1.6	13.648	B
3	515	129	372	864	0.596	507	532	0.0	2.0	13.722	B

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1001	250	141	1373	0.729	995	915	1.9	3.2	11.722	B
2	508	127	582	720	0.705	503	554	1.6	2.8	20.629	C
3	615	154	447	840	0.732	609	638	2.0	3.5	21.042	C

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1225	306	168	1361	0.901	1203	1093	3.2	8.8	25.440	D
2	622	156	704	684	0.909	601	667	2.8	8.1	46.095	E
3	753	188	535	812	0.927	726	770	3.5	10.3	47.465	E

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1225	306	172	1359	0.902	1221	1119	8.8	9.8	30.784	D
2	622	156	714	681	0.913	616	679	8.1	9.7	60.666	F
3	753	188	547	808	0.932	744	783	10.3	12.6	64.529	F

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1001	250	150	1369	0.731	1026	971	9.8	3.6	13.945	B
2	508	127	600	715	0.710	533	575	9.7	3.4	28.044	D
3	615	154	473	832	0.739	648	661	12.6	4.3	30.835	D

09:15 - 09:30

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	838	209	121	1382	0.606	844	786	3.6	2.0	8.453	A
2	425	106	494	746	0.570	432	471	3.4	1.7	14.862	B
3	515	129	383	861	0.598	524	542	4.3	2.1	15.194	C

2035 + Dev, AM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3	85.63	F

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	-15	Arm 2

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)	Run automatically
D13	2035 + Dev	AM	ONE HOUR	08:00	09:30	15	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		ONE HOUR	✓	1191	100.000
2		ONE HOUR	✓	606	100.000
3		ONE HOUR	✓	733	100.000

Origin-Destination Data

Demand (PCU/hr)

	To			
		1	2	3
From	1	64	495	632
	2	469	5	132
	3	569	163	1

Proportions

	To			
		1	2	3
From	1	0.05	0.42	0.53
	2	0.77	0.01	0.22
	3	0.78	0.22	0.00

Vehicle Mix

Heavy Vehicle Percentages

	To			
		1	2	3
From	1	2	17	38
	2	35	0	15
	3	51	16	0

Average PCU Per Veh

	To			
		1	2	3
From	1	1.020	1.170	1.380
	2	1.350	1.000	1.150
	3	1.510	1.160	1.000

Detailed Demand Data

Demand for each time segment

Time Segment	Arm	Demand (PCU/hr)	Demand in PCU (PCU/hr)
08:00-08:15	1	897	897
	2	456	456
	3	552	552
08:15-08:30	1	1071	1071
	2	545	545
	3	659	659
08:30-08:45	1	1311	1311
	2	667	667
	3	807	807
08:45-09:00	1	1311	1311
	2	667	667
	3	807	807
09:00-09:15	1	1071	1071
	2	545	545
	3	659	659
09:15-09:30	1	897	897
	2	456	456
	3	552	552

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
1	0.97	56.03	19.4	F	1093	1639
2	1.00	109.85	19.9	F	556	834
3	1.01	113.73	25.2	F	673	1009

Main Results for each time segment

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	897	224	125	1380	0.650	888	815	0.0	2.3	9.065	A
2	456	114	519	739	0.618	448	493	0.0	2.0	15.675	C
3	552	138	398	856	0.645	542	569	0.0	2.4	15.767	C

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1071	268	150	1369	0.782	1063	977	2.3	4.2	14.471	B
2	545	136	622	708	0.769	537	591	2.0	3.9	26.162	D
3	659	165	477	831	0.793	650	682	2.4	4.8	26.772	D

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1311	328	174	1358	0.966	1267	1140	4.2	15.3	38.404	E
2	667	167	742	673	0.991	627	700	3.9	14.0	68.966	F
3	807	202	558	805	1.003	757	810	4.8	17.4	69.927	F

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1311	328	179	1356	0.967	1295	1170	15.3	19.4	56.026	F
2	667	167	758	668	0.998	644	716	14.0	19.9	109.846	F
3	807	202	573	800	1.009	776	828	17.4	25.2	113.726	F

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1071	268	168	1360	0.787	1128	1094	19.4	5.1	23.324	C
2	545	136	660	697	0.781	603	636	19.9	5.5	60.829	F
3	659	165	532	813	0.811	730	731	25.2	7.4	71.948	F

09:15 - 09:30

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	897	224	132	1377	0.651	907	855	5.1	2.4	9.873	A
2	456	114	531	735	0.620	469	508	5.5	2.2	18.317	C
3	552	138	416	850	0.649	571	584	7.4	2.8	19.274	C

Junctions 9				
ARCADY 9 - Roundabout Module				
Version: 9.5.0.6896 © Copyright TRL Limited, 2018				
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The users of this computer program for the solution of an engineering problem are in no way relieved of their responsibility for the correctness of the solution				

Filename: London Road - Waterloo Road junction - PM future.j9

Path: Z:\Lime\Projects\2017\17204 Pembroke Port, Pembroke\Analysis\JUNCTIONS 9\2020

Report generation date: 01/05/2020 09:54:07

- »2030 Base, PM
- »2035 Base, PM
- »2020 + Dev, PM
- »2030 + Dev, PM
- »2035 + Dev, PM

Summary of junction performance

	PM				
	Queue (PCU)	Delay (s)	RFC	LOS	Network Residual Capacity
	2030 Base				
Arm 1	7.7	23.42	0.88	C	-6 % [Arm 2]
Arm 2	12.8	59.85	0.95	F	
Arm 3	6.5	33.60	0.87	D	
	2035 Base				
Arm 1	15.1	43.00	0.95	E	-13 % [Arm 2]
Arm 2	31.8	125.88	1.04	F	
Arm 3	12.1	58.35	0.94	F	
	2020 + Dev				
Arm 1	7.0	21.67	0.87	C	-8 % [Arm 2]
Arm 2	16.2	71.96	0.97	F	
Arm 3	6.3	33.01	0.87	D	
	2030 + Dev				
Arm 1	10.7	31.75	0.92	D	-11 % [Arm 2]
Arm 2	26.7	107.98	1.02	F	
Arm 3	9.4	46.74	0.92	E	
	2035 + Dev				
Arm 1	23.8	63.31	0.99	F	-17 % [Arm 2]
Arm 2	57.1	203.66	1.11	F	
Arm 3	18.2	81.58	0.98	F	

Values shown are the highest values encountered over all time segments. Delay is the maximum value of average delay per arriving vehicle. Network Residual Capacity indicates the amount by which network flow could be increased before a user-definable threshold (see Analysis Options) is met.

File summary

File Description

Title	
Location	
Site number	
Date	18/01/2019
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	DESKTOP-U7G8RPA\Andy
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

Vehicle length (m)	Calculate Queue Percentiles	Calculate detailed queueing delay	Calculate residual capacity	Residual capacity criteria type	RFC Threshold	Average Delay threshold (s)	Queue threshold (PCU)
5.75			✓	Delay	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)	Run automatically
D6	2030 Base	PM	ONE HOUR	17:00	18:30	15	✓
D8	2035 Base	PM	ONE HOUR	17:00	18:30	15	✓
D10	2020 + Dev	PM	ONE HOUR	17:00	18:30	15	✓
D12	2030 + Dev	PM	ONE HOUR	17:00	18:30	15	✓
D14	2035 + Dev	PM	ONE HOUR	17:00	18:30	15	✓

Analysis Set Details

ID	Include in report	Network flow scaling factor (%)	Network capacity scaling factor (%)
A1	✓	100.000	100.000

2030 Base, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3	36.66	E

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	-6	Arm 2

Arms

Arms

Arm	Name	Description
1	London Road	
2	A4139	
3	Waterloo Road A477	

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	4.00	8.59	20.0	9.1	56.0	19.7	
2	4.00	6.88	21.8	44.3	55.4	7.2	
3	4.99	8.03	6.6	38.3	55.2	16.1	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Arm	Final slope	Final intercept (PCU/hr)
1	0.621	1968
2	0.669	2019
3	0.661	2019

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

Arm Capacity Adjustments

Arm	Type	Reason	Percentage capacity adjustment (%)
1	Percentage		77.50
2	Percentage		55.35
3	Percentage		54.50

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)	Run automatically
D6	2030 Base	PM	ONE HOUR	17:00	18:30	15	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		ONE HOUR	✓	1141	100.000
2		ONE HOUR	✓	740	100.000
3		ONE HOUR	✓	669	100.000

Origin-Destination Data

Demand (PCU/hr)

	To			
		1	2	3
	1	42	504	595
	2	601	1	138
	3	491	178	0

Proportions

	To			
		1	2	3
	1	0.04	0.44	0.52
	2	0.81	0.00	0.19
	3	0.73	0.27	0.00

Vehicle Mix

Heavy Vehicle Percentages

	To			
		1	2	3
	1	5	16	22
	2	14	0	4
	3	16	2	0

Average PCU Per Veh

	To			
		1	2	3
	1	1.050	1.160	1.220
	2	1.140	1.000	1.040
	3	1.160	1.020	1.000

Detailed Demand Data

Demand for each time segment

Time Segment	Arm	Demand (PCU/hr)	Demand in PCU (PCU/hr)
17:00-17:15	1	859	859
	2	557	557
	3	504	504
17:15-17:30	1	1026	1026
	2	665	665
	3	601	601
17:30-17:45	1	1256	1256
	2	815	815
	3	737	737
17:45-18:00	1	1256	1256
	2	815	815
	3	737	737
18:00-18:15	1	1026	1026
	2	665	665
	3	601	601
18:15-18:30	1	859	859
	2	557	557
	3	504	504

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
1	0.88	23.42	7.7	C	1047	1571
2	0.95	59.85	12.8	F	679	1019
3	0.87	33.60	6.5	D	614	921

Main Results for each time segment

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	859	215	133	1461	0.588	852	845	0.0	1.7	6.938	A
2	557	139	476	941	0.592	551	510	0.0	1.6	10.168	B
3	504	126	479	928	0.543	498	547	0.0	1.3	9.278	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1026	256	160	1448	0.708	1021	1012	1.7	2.8	9.889	A
2	665	166	570	906	0.734	660	611	1.6	2.9	16.009	C
3	601	150	574	894	0.673	598	656	1.3	2.2	13.453	B

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1256	314	193	1432	0.877	1239	1214	2.8	7.2	20.397	C
2	815	204	692	861	0.946	786	740	2.9	10.2	42.261	E
3	737	184	685	854	0.863	722	792	2.2	5.7	28.013	D

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1256	314	196	1431	0.878	1254	1238	7.2	7.7	23.417	C
2	815	204	700	858	0.949	805	750	10.2	12.8	59.854	F
3	737	184	701	848	0.869	734	804	5.7	6.5	33.601	D

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1026	256	165	1446	0.709	1045	1062	7.7	3.0	11.106	B
2	665	166	583	902	0.738	703	627	12.8	3.4	23.417	C
3	601	150	610	881	0.683	617	676	6.5	2.5	16.100	C

18:15 - 18:30

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	859	215	136	1460	0.588	864	863	3.0	1.7	7.227	A
2	557	139	482	939	0.593	564	518	3.4	1.7	10.940	B
3	504	126	491	924	0.545	508	556	2.5	1.4	9.800	A

2035 Base, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3	71.07	F

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	-13	Arm 2

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)	Run automatically
D8	2035 Base	PM	ONE HOUR	17:00	18:30	15	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		ONE HOUR	✓	1226	100.000
2		ONE HOUR	✓	795	100.000
3		ONE HOUR	✓	720	100.000

Origin-Destination Data

Demand (PCU/hr)

	To			
		1	2	3
	1	45	542	639
	2	646	1	148
	3	528	192	0

Proportions

	To			
		1	2	3
	1	0.04	0.44	0.52
	2	0.81	0.00	0.19
	3	0.73	0.27	0.00

Vehicle Mix

Heavy Vehicle Percentages

	To			
		1	2	3
	1	6	18	23
	2	15	0	5
	3	18	2	0

Average PCU Per Veh

	To			
		1	2	3
	1	1.060	1.180	1.230
	2	1.150	1.000	1.050
	3	1.180	1.020	1.000

Detailed Demand Data

Demand for each time segment

Time Segment	Arm	Demand (PCU/hr)	Demand in PCU (PCU/hr)
17:00-17:15	1	923	923
	2	599	599
	3	542	542
17:15-17:30	1	1102	1102
	2	715	715
	3	647	647
17:30-17:45	1	1350	1350
	2	875	875
	3	793	793
17:45-18:00	1	1350	1350
	2	875	875
	3	793	793
18:00-18:15	1	1102	1102
	2	715	715
	3	647	647
18:15-18:30	1	923	923
	2	599	599
	3	542	542

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
1	0.95	43.00	15.1	E	1125	1687
2	1.04	125.88	31.8	F	730	1094
3	0.94	58.35	12.1	F	661	991

Main Results for each time segment

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	923	231	144	1456	0.634	915	906	0.0	2.0	7.871	A
2	599	150	510	928	0.645	591	548	0.0	2.0	11.781	B
3	542	136	514	915	0.592	536	587	0.0	1.6	10.573	B

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1102	276	172	1443	0.764	1096	1085	2.0	3.7	12.218	B
2	715	179	611	891	0.802	706	656	2.0	4.1	21.039	C
3	647	162	615	879	0.736	642	702	1.6	3.0	16.801	C

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1350	337	205	1427	0.946	1314	1269	3.7	12.6	31.460	D
2	875	219	733	846	1.035	812	786	4.1	20.1	69.207	F
3	793	198	709	845	0.938	766	836	3.0	9.7	41.643	E

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1350	337	210	1424	0.948	1340	1296	12.6	15.1	43.004	E
2	875	219	747	841	1.041	828	802	20.1	31.8	125.878	F
3	793	198	723	840	0.944	783	852	9.7	12.1	58.354	F

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1102	276	182	1438	0.767	1146	1205	15.1	4.2	16.735	C
2	715	179	639	881	0.811	818	689	31.8	6.1	76.934	F
3	647	162	708	846	0.765	679	750	12.1	4.1	28.035	D

18:15 - 18:30

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	923	231	148	1454	0.635	931	938	4.2	2.1	8.389	A
2	599	150	520	925	0.647	614	559	6.1	2.1	13.689	B
3	542	136	534	908	0.597	551	600	4.1	1.7	11.710	B

2020 + Dev, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3	39.78	E

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	-8	Arm 2

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)	Run automatically
D10	2020 + Dev	PM	ONE HOUR	17:00	18:30	15	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		ONE HOUR	✓	1116	100.000
2		ONE HOUR	✓	769	100.000
3		ONE HOUR	✓	669	100.000

Origin-Destination Data

Demand (PCU/hr)

	To			
		1	2	3
	1	40	512	564
	2	604	1	164
	3	466	203	0

Proportions

	To			
		1	2	3
	1	0.04	0.46	0.51
	2	0.79	0.00	0.21
	3	0.70	0.30	0.00

Vehicle Mix

Heavy Vehicle Percentages

	To			
		1	2	3
	1	5	15	21
	2	17	0	4
	3	15	2	0

Average PCU Per Veh

	To			
		1	2	3
	1	1.050	1.150	1.210
	2	1.170	1.000	1.040
	3	1.150	1.020	1.000

Detailed Demand Data

Demand for each time segment

Time Segment	Arm	Demand (PCU/hr)	Demand in PCU (PCU/hr)
17:00-17:15	1	840	840
	2	579	579
	3	504	504
17:15-17:30	1	1003	1003
	2	691	691
	3	601	601
17:30-17:45	1	1229	1229
	2	847	847
	3	737	737
17:45-18:00	1	1229	1229
	2	847	847
	3	737	737
18:00-18:15	1	1003	1003
	2	691	691
	3	601	601
18:15-18:30	1	840	840
	2	579	579
	3	504	504

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
1	0.87	21.67	7.0	C	1024	1536
2	0.97	71.96	16.2	F	706	1058
3	0.87	33.01	6.3	D	614	921

Main Results for each time segment

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	840	210	152	1452	0.579	834	826	0.0	1.6	6.775	A
2	579	145	451	950	0.609	572	535	0.0	1.7	10.658	B
3	504	126	480	928	0.543	499	543	0.0	1.3	9.184	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1003	251	182	1438	0.698	999	990	1.6	2.6	9.557	A
2	691	173	541	917	0.754	685	641	1.7	3.2	17.223	C
3	601	150	575	893	0.673	598	651	1.3	2.2	13.319	B

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1229	307	220	1419	0.866	1213	1183	2.6	6.6	19.179	C
2	847	212	657	874	0.968	810	777	3.2	12.3	47.878	E
3	737	184	681	855	0.861	723	786	2.2	5.7	27.561	D

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1229	307	224	1418	0.867	1227	1208	6.6	7.0	21.666	C
2	847	212	664	872	0.971	831	787	12.3	16.2	71.961	F
3	737	184	698	849	0.867	734	797	5.7	6.3	33.010	D

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1003	251	188	1435	0.699	1020	1048	7.0	2.8	10.586	B
2	691	173	552	913	0.757	741	656	16.2	3.9	28.957	D
3	601	150	619	877	0.685	617	673	6.3	2.5	16.087	C

18:15 - 18:30

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	840	210	155	1451	0.579	845	846	2.8	1.6	7.040	A
2	579	145	457	948	0.611	587	543	3.9	1.8	11.602	B
3	504	126	492	923	0.546	508	552	2.5	1.4	9.714	A

2030 + Dev, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3	58.38	F

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	-11	Arm 2

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)	Run automatically
D12	2030 + Dev	PM	ONE HOUR	17:00	18:30	15	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		ONE HOUR	✓	1175	100.000
2		ONE HOUR	✓	796	100.000
3		ONE HOUR	✓	703	100.000

Origin-Destination Data

Demand (PCU/hr)

	To			
		1	2	3
From	1	42	538	595
	2	629	1	166
	3	491	212	0

Proportions

	To			
		1	2	3
From	1	0.04	0.46	0.51
	2	0.79	0.00	0.21
	3	0.70	0.30	0.00

Vehicle Mix

Heavy Vehicle Percentages

	To			
		1	2	3
From	1	5	16	22
	2	18	0	4
	3	16	3	0

Average PCU Per Veh

	To			
		1	2	3
From	1	1.050	1.160	1.220
	2	1.180	1.000	1.040
	3	1.160	1.030	1.000

Detailed Demand Data

Demand for each time segment

Time Segment	Arm	Demand (PCU/hr)	Demand in PCU (PCU/hr)
17:00-17:15	1	885	885
	2	599	599
	3	529	529
17:15-17:30	1	1056	1056
	2	716	716
	3	632	632
17:30-17:45	1	1294	1294
	2	876	876
	3	774	774
17:45-18:00	1	1294	1294
	2	876	876
	3	774	774
18:00-18:15	1	1056	1056
	2	716	716
	3	632	632
18:15-18:30	1	885	885
	2	599	599
	3	529	529

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
1	0.92	31.75	10.7	D	1078	1617
2	1.02	107.98	26.7	F	730	1096
3	0.92	46.74	9.4	E	645	968

Main Results for each time segment

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	885	221	159	1449	0.610	877	864	0.0	1.8	7.371	A
2	599	150	476	941	0.637	592	560	0.0	1.9	11.567	B
3	529	132	500	921	0.575	523	568	0.0	1.5	9.987	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1056	264	190	1434	0.737	1051	1035	1.8	3.2	10.980	B
2	716	179	570	907	0.789	708	671	1.9	3.9	20.000	C
3	632	158	598	885	0.714	627	680	1.5	2.6	15.318	C

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1294	323	228	1416	0.914	1269	1220	3.2	9.4	25.512	D
2	876	219	688	863	1.016	821	809	3.9	17.7	62.610	F
3	774	194	695	850	0.911	753	814	2.6	7.9	35.553	E

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1294	323	233	1413	0.915	1289	1247	9.4	10.7	31.747	D
2	876	219	699	859	1.021	841	823	17.7	26.7	107.980	F
3	774	194	711	844	0.917	768	828	7.9	9.4	46.738	E

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1056	264	199	1430	0.739	1085	1130	10.7	3.5	13.303	B
2	716	179	588	900	0.795	802	696	26.7	5.2	56.171	F
3	632	158	673	858	0.737	656	717	9.4	3.4	21.886	C

18:15 - 18:30

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	885	221	163	1447	0.611	891	890	3.5	1.9	7.757	A
2	599	150	483	939	0.638	612	571	5.2	2.1	13.083	B
3	529	132	516	915	0.579	536	579	3.4	1.6	10.827	B

2035 + Dev, PM

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3	109.84	F

Junction Network Options

Driving side	Lighting	Network residual capacity (%)	First arm reaching threshold
Left	Normal/unknown	-17	Arm 2

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)	Run automatically
D14	2035 + Dev	PM	ONE HOUR	17:00	18:30	15	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		ONE HOUR	✓	1260	100.000
2		ONE HOUR	✓	852	100.000
3		ONE HOUR	✓	754	100.000

Origin-Destination Data

Demand (PCU/hr)

	To			
		1	2	3
	1	45	576	639
	2	674	1	177
From	3	528	226	0

Proportions

	To			
		1	2	3
	1	0.04	0.46	0.51
	2	0.79	0.00	0.21
From	3	0.70	0.30	0.00

Vehicle Mix

Heavy Vehicle Percentages

	To			
		1	2	3
	1	6	18	23
	2	19	0	5
From	3	18	2	0

Average PCU Per Veh

	To			
		1	2	3
	1	1.060	1.180	1.230
	2	1.190	1.000	1.050
From	3	1.180	1.020	1.000

Detailed Demand Data

Demand for each time segment

Time Segment	Arm	Demand (PCU/hr)	Demand in PCU (PCU/hr)
17:00-17:15	1	949	949
	2	641	641
	3	568	568
17:15-17:30	1	1133	1133
	2	766	766
	3	678	678
17:30-17:45	1	1387	1387
	2	938	938
	3	830	830
17:45-18:00	1	1387	1387
	2	938	938
	3	830	830
18:00-18:15	1	1133	1133
	2	766	766
	3	678	678
18:15-18:30	1	949	949
	2	641	641
	3	568	568

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
1	0.99	63.31	23.8	F	1156	1734
2	1.11	203.66	57.1	F	782	1173
3	0.98	81.58	18.2	F	692	1038

Main Results for each time segment

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	949	237	169	1444	0.657	940	926	0.0	2.2	8.421	A
2	641	160	510	929	0.691	632	598	0.0	2.5	13.618	B
3	568	142	534	908	0.625	560	608	0.0	1.8	11.442	B

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1133	283	202	1428	0.793	1124	1105	2.2	4.3	13.847	B
2	766	191	610	891	0.859	752	716	2.5	5.8	27.566	D
3	678	169	636	871	0.778	671	727	1.8	3.6	19.531	C

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1387	347	238	1411	0.983	1334	1259	4.3	17.6	40.525	E
2	938	235	724	849	1.104	831	848	5.8	32.5	99.041	F
3	830	208	706	846	0.981	791	849	3.6	13.4	52.692	F

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1387	347	244	1408	0.985	1363	1281	17.6	23.8	63.310	F
2	938	235	740	844	1.112	840	867	32.5	57.1	203.665	F
3	830	208	714	843	0.984	811	866	13.4	18.2	81.576	F

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1133	283	220	1420	0.798	1207	1232	23.8	5.2	25.667	D
2	766	191	655	875	0.875	857	771	57.1	34.2	193.915	F
3	678	169	722	840	0.807	729	790	18.2	5.4	44.616	E

18:15 - 18:30

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	949	237	175	1441	0.658	960	1047	5.2	2.4	9.174	A
2	641	160	521	925	0.694	767	614	34.2	2.8	44.957	E
3	568	142	642	869	0.653	581	646	5.4	2.2	14.625	B