

LAND AT PLAS COCH, WREXHAM

PROPOSAL TO AMEND CONDITION 11 ASSOCIATED WITH PLANNING

APPLICATION: P/2018/0671

IDENTIFICATION TABLE

Client/Project owner	Edwards Homes
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2					

The SYSTRA logo is displayed in a bold, red, sans-serif font. The letters are thick and closely spaced, with a modern, industrial feel.

TABLE OF CONTENTS

1.	INTRODUCTION	3
1.1	CONTEXT	3
2.	METHODOLOGY	3
2.1	INFORMATION	3
2.2	RESULTS	5
3.	SUMMARY AND NEXT STEPS	6
3.1	SUMMARY	6
3.2	NEXT STEPS	7

LIST OF FIGURES

Figure 1.	2018 AM Traffic Survey Data	4
Figure 2.	2018 PM Traffic Survey Data	5

LIST OF TABLES

Table 1.	TA 2018 summary results	6
Table 2.	Revised 2018 Summary Results	6

1. INTRODUCTION

1.1 Context

- 1.1.1 A planning application (P/2018/0671) ***“Demolition of Redundant Student Halls And Outline Application For Up To 410 Residential Units With Access Off B5101 Together With Car Parking, Landscaping And Associated Infrastructure On Surplus Land Within The Overall Plas Coch Academic Campus”*** was submitted in 2018 and subsequently granted permission subject to several conditions. This included Condition 11 which states:

Prior to the first occupation of any part of the development hereby approved, carriageway alignment improvements shall be implemented at the junction of Crispin Lane and Mold Road in accordance with a scheme which has been submitted to and approved in writing by the Local Planning Authority.

- 1.1.2 We are aware that discussions have been held previously with the aim of amending this condition so that it only became triggered after the occupation of the 100th dwelling. However, at the time agreement was not possible.
- 1.1.3 It is understood that the Local Authority considers that the addition of any traffic to the Plas Coch Road / University access roundabout would result in an increase in delay at that junction sufficient enough to cause a redistribution of traffic, with traffic deciding to pass through the Crispin Lane / Mold Road junction.
- 1.1.4 SYSTRA has been commissioned to undertake this study to determine if an acceptable methodology can be developed to demonstrate that the amendment of condition 11 can be made without severely effecting the operation of the Crispin Lane / Mold Road junction.
- 1.1.5 This note will set out the methodology which is submitted to the Local Authority to agree the principal of the assessment.

2. METHODOLOGY

2.1 Information

- 2.1.1 SYSTRA has reviewed the pertinent information available on the Local Authorities online planning portal.
- 2.1.2 Planning application P/2018/0671 included a Transport Assessment and subsequent addendum produced by ITP in 2018/2019. Which included operational assessment of the highway network.

- 2.1.3 It understood that the Local Authority expressed concerns that the modelling exercise did not accurately reflect the operation of the network during peak hours. To address this, SYSTRA has developed an updated model of the Plas Coch Road / University Access roundabout.
- 2.1.4 To undertake this modelling exercise information was extracted from the TA produced by ITP in 2018.
- 2.1.5 As in the TA, Junctions9 (ARCADY) has been used to assess the junction. The geometry of the junction has been reviewed and found to broadly match the layout of the junction as it is on the ground.
- 2.1.6 The 2018 surveyed traffic flows have been extracted from the TA Appendices. Figures 1 and 2 below show these flows.

Figure 1. 2018 AM Traffic Survey Data

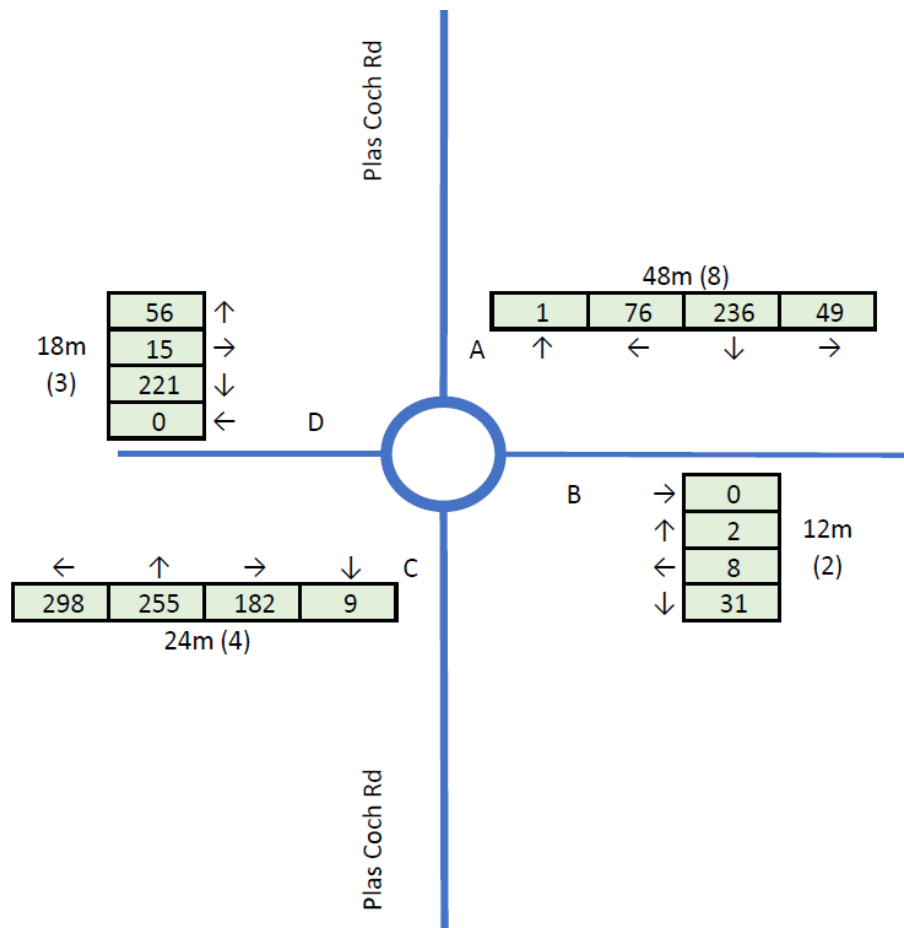
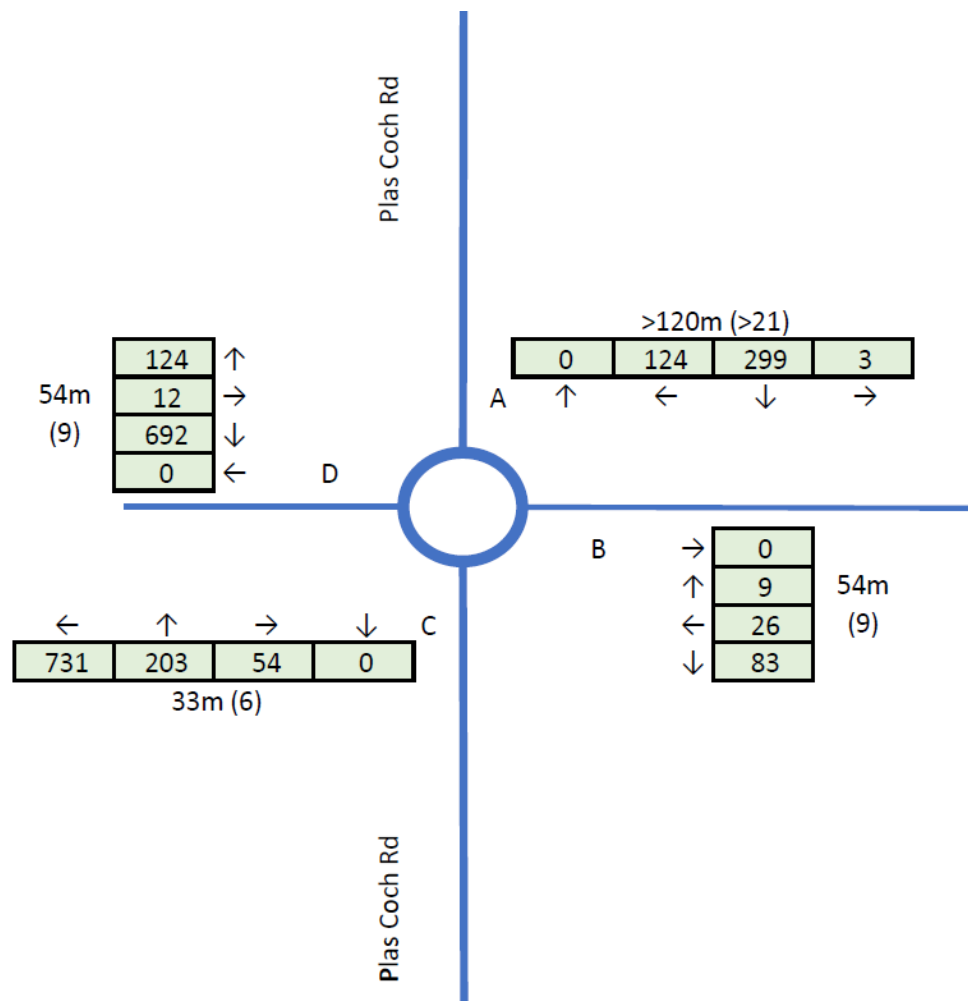


Figure 2. 2018 PM Traffic Survey Data



- 2.1.7 The numbers stated in meters (m) represent the maximum queue length recorded at the time the survey was undertaken. This value is also shown in PCUs with 1 pcu being equivalent to 5.75m.
- 2.1.8 To attempt to provide a robust base model, SYSTRA has attempted to replicate the queue lengths recorded in this survey. To do this, the intercept value for each arm has been adjusted until the queue lengths were achieved. As the AM and PM peaks required different levels of adjustment, to achieve the queues observed, separate models for the AM and PM peak periods were produced.

2.2 Results

- 2.2.1 The results presented in the 2018 TA are shown in Table 1 below

Table 1. TA 2018 summary results

Arm	AM Peak		PM Peak	
	Queue (PCU)	RFC	Queue (PCU)	RFC
2018 Baseline				
Plas Coch Rd (N)	<1	0.32	<1	0.46
Entrance B	<1	0.07	<1	0.39
Plas Coch Rd (S)	<1	0.41	1	0.57
Retail Park	<1	0.16	<1	0.42

2.2.2 A summary of the results from the revised models are presented in table 2 below.

Table 2. Revised 2018 Summary Results

	2018 AM PEAK			2018 PM PEAK		
	Queue (PCU)	Delay (s)	RFC	Queue (PCU)	Delay (s)	RFC
1 - Plas Coch Rd (N)	8.3	74.17	0.882	21.7	148.86	1.046
2 - Access Rd	1.9	135.24	0.617	9.1	235.22	1.043
3 - Plas Coch Rd (S)	4.0	17.05	0.734	6.6	21.00	0.857
4 - Retail Park	3.1	36.93	0.705	9.1	35.77	0.902

2.2.3 As shown the results originally presented the 2018 TA are significantly lower than identified in the survey.

2.2.4 Table 2 shows SYSTRAs revised model outputs more accurately reflect the levels of queuing observed in 2018. It is therefore considered that this model provides a suitable baseline from which to proceed.

2.2.5 The full model output has been appended to this note for review.

3. SUMMARY AND NEXT STEPS

3.1 Summary

3.1.1 SYSTRA has been commissioned to determine if a suitable methodology can be agreed with Wrexham Borough Council to establish a suitable trigger point for condition 11 associated with planning application P/2018/0671.

- 3.1.2 SYSTRA has reviewed the information contained on Wrexham Borough Council's online planning portal.
- 3.1.3 SYSTRA has revised the model to address issues raised with the Plas Coch Road / University access roundabout base model. Using the 2018 survey data and calibrating the models, it is considered that we more accurately reflect the conditions on the ground from which to assess a suitable trigger point for condition 11.

3.2 Next steps

- 3.2.1 It is proposed that this note will be reviewed by the Local Authority and feedback provided.
- 3.2.2 If the suitability of the revised baseline model and methodology set out above is deemed to be acceptable, SYSTRA will add the agreed committed development then undertake an exercise to incrementally add the development traffic to the model anticipated to be in 10% increments.
- 3.2.3 This will determine the point at which the operation of the junction is considered to be substantially effected and identifying the point when traffic is more likely to redistribute to the Crispin Lane / Mold Road junction.
- 3.2.4 This information will then be used to determine a suitable point in the buildout of the development at which to set a revised trigger point for condition 11 to take effect. For example:
 - *Prior to the occupation of the Xth dwelling, carriageway alignment improvements shall be implemented at the junction of Crispin Lane and Mold Road in accordance with a scheme which has been submitted to and approved in writing by the local planning authority.*

Appendix A – Model Outputs

SYSTRA provides advice on transport, to central, regional and local government, agencies, developers, operators and financiers.

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SYSTRA

Junctions 9					
ARCADY 9 - Roundabout Module					
Version: 9.0.2.5947					
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Filename: Plas Coch Rd (Lane Balancing)AM.j9

Path: \\newsrvr002\Company Shared Folders\PROJECTS\2020\Development and Infrastructure\Plas Coch Rd - Wrexham

Report generation date: 15-Jan-21 10:08:41

«2018, AM

- »Junction Network
- »Arms
- »Traffic Demand
- »Origin-Destination Data
- »Vehicle Mix
- »Results
- »Lane Results

Summary of junction performance

	AM				
	Queue (PCU)	Delay (s)	RFC	LOS	Network Residual Capacity
[Lane Simulation] - 2018					
1 - Plas Coch Rd (N)	8.3	74.17		F	% []
2 - Access Rd	1.9	135.24		F	
3 - Plas Coch Rd (S)	4.0	17.05		C	
4 - Retail Park	3.1	36.93		E	

There are warnings associated with one or more model runs - see the 'Data Errors and Warnings' tables for each Analysis or Demand Set.

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

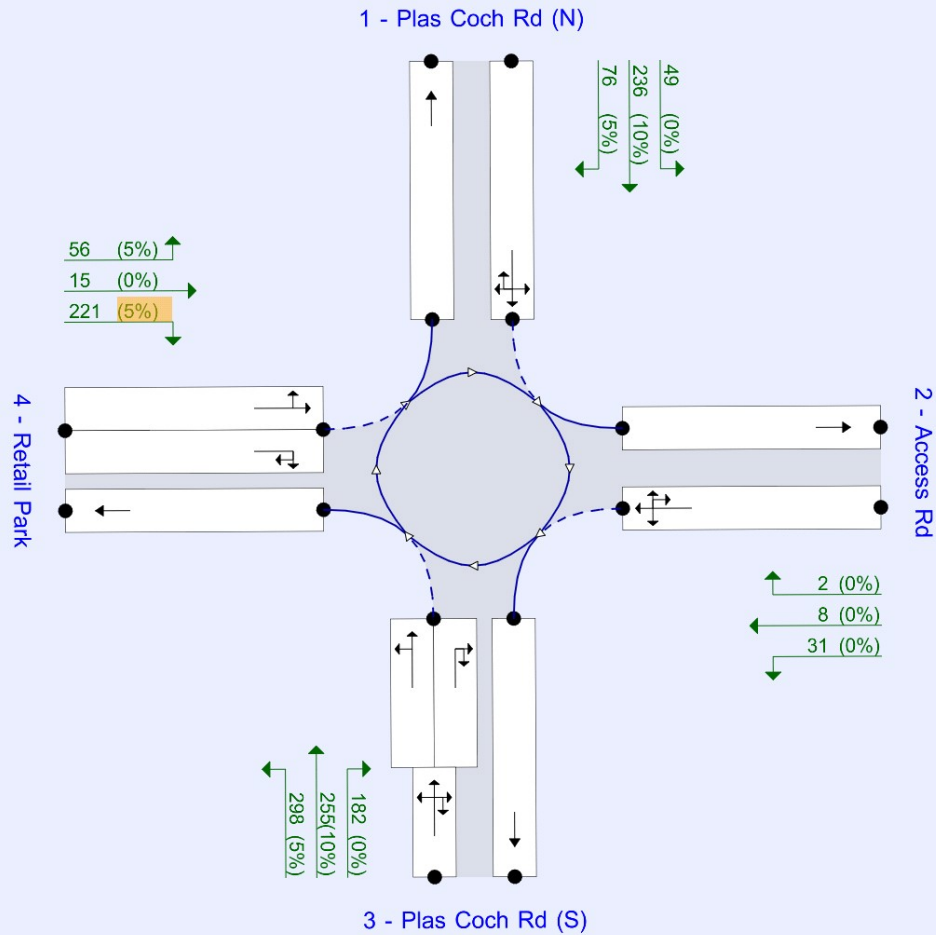
File summary

File Description

Title	Plas Coch Rd / Site Access
Location	Wrexham
Site number	1
Date	11-Jan-21
Version	01
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	ADSYSTRA\ahogg
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



Flows show original traffic demand (PCU/hr).
Lane simulation visualisation time: 07:45:00

The junction diagram reflects the last run of Junctions.

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

Lane Simulation options

Stop criteria (%)	Stop criteria time (s)	Stop criteria number of trials	Random seed	Results refresh speed (s)	Individual vehicle animation number of trials	Use crossings quick response	Last run random seed	Last run number of trials	Last run time taken (s)
1.00	100000	100000	-1	3	1	✓	1914662197	396	29.45

Analysis Set Details

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

2018, AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Lane Simulation	A1 - [Lane Simulation]	This analysis set uses Lane Simulation mode. This is provided as an investigative tool and the user should apply judgement when interpreting the results.

Junction Network

Junctions

Junction	Name	Junction Type	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout	1, 2, 3, 4	38.81	E

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description
1	Plas Coch Rd (N)	
2	Access Rd	
3	Plas Coch Rd (S)	
4	Retail Park	

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 - Plas Coch Rd (N)	3.80	5.60	13.6	13.6	36.3	39.0	
2 - Access Rd	2.70	3.60	13.1	13.6	36.3	25.5	
3 - Plas Coch Rd (S)	3.40	8.10	26.8	26.8	36.3	17.0	
4 - Retail Park	7.30	7.30	0.0	95.0	36.3	13.5	

Slope / Intercept / Capacity

Arm Intercept Adjustments

Arm	Type	Reason	Percentage intercept adjustment (%)
1 - Plas Coch Rd (N)	Percentage	to match survey	50.00
2 - Access Rd	Percentage		37.00
3 - Plas Coch Rd (S)	Percentage		83.00
4 - Retail Park	Percentage		45.00

Roundabout Slope and Intercept used in model

Arm	Final slope	Final intercept (PCU/hr)
1 - Plas Coch Rd (N)	0.583	726
2 - Access Rd	0.513	383
3 - Plas Coch Rd (S)	0.739	1705
4 - Retail Park	0.825	1091

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

Lane Simulation: Arm options

Arm	Lane capacity source	Traffic Considering Secondary Lanes (%)
1 - Plas Coch Rd (N)	Evenly split	10.00
2 - Access Rd	Evenly split	10.00
3 - Plas Coch Rd (S)	Evenly split	10.00
4 - Retail Park	Evenly split	10.00

Lanes

Arm	Lane level	Lane	Destination arms	Has limited storage	Storage (PCU)	Minimum capacity (PCU/hr)	Maximum capacity (PCU/hr)
1 - Plas Coch Rd (N)	1 [Give-way line]	1	1, 2, 3, 4		Infinity	0	99999
2 - Access Rd	1 [Give-way line]	1	1, 2, 3, 4		Infinity	0	99999
3 - Plas Coch Rd (S)	1 [Give-way line]	1	1, 4	✓	3.00	0	99999
		2	2, 3	✓	3.00	0	99999
	2	1	(1, 2, 3, 4)		Infinity		
4 - Retail Park	1 [Give-way line]	1	1, 2		Infinity	0	99999
		2	3, 4		Infinity	0	99999

Entry Lane slope and intercept

Arm	Lane level	Lane	Final slope	Final intercept (PCU/hr)
1 - Plas Coch Rd (N)	1 [Give-way line]	1	0.583	726
2 - Access Rd	1 [Give-way line]	1	0.513	383
3 - Plas Coch Rd (S)	1 [Give-way line]	1	0.369	852
		2	0.369	852
4 - Retail Park	1 [Give-way line]	1	0.412	545
		2	0.412	545

Lane Movements

Arm	Lane Level	Lane	Destination arm			
			Plas Coch Rd (N)	Access Rd	Plas Coch Rd (S)	Retail Park
1 - Plas Coch Rd (N)	1 [Give-way line]	1	✓	✓	✓	✓
2 - Access Rd	1 [Give-way line]	1	✓	✓	✓	✓
3 - Plas Coch Rd (S)	1 [Give-way line]	1	✓			✓
		2		✓	✓	
	2	1	✓	✓	✓	✓
4 - Retail Park	1 [Give-way line]	1	✓	✓		
		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
D1	2018	AM	ONE HOUR	07:45	09:15	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 - Plas Coch Rd (N)		ONE HOUR	✓	362	100.000
2 - Access Rd		ONE HOUR	✓	41	100.000
3 - Plas Coch Rd (S)		ONE HOUR	✓	744	100.000
4 - Retail Park		ONE HOUR	✓	292	100.000

Origin-Destination Data

Demand (PCU/hr)

	To				
		1 - Plas Coch Rd (N)	2 - Access Rd	3 - Plas Coch Rd (S)	4 - Retail Park
From	1 - Plas Coch Rd (N)	1	49	236	76
	2 - Access Rd	2	0	31	8
	3 - Plas Coch Rd (S)	255	182	9	298
	4 - Retail Park	56	15	221	0

Vehicle Mix

Heavy Vehicle Percentages

	To				
		1 - Plas Coch Rd (N)	2 - Access Rd	3 - Plas Coch Rd (S)	4 - Retail Park
From	1 - Plas Coch Rd (N)	0	0	10	5
	2 - Access Rd	0	0	0	0
	3 - Plas Coch Rd (S)	10	0	0	5
	4 - Retail Park	5	0	5	0

Results

Results Summary for whole modelled period

Arm	Max delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
1 - Plas Coch Rd (N)	74.17	8.3	F	331	497
2 - Access Rd	135.24	1.9	F	37	56
3 - Plas Coch Rd (S)	17.05	4.0	C	681	1021
4 - Retail Park	36.93	3.1	E	266	399

Main Results for each time segment

07:45 - 08:00

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	LOS
1 - Plas Coch Rd (N)	272	68	317	275	239	0.0	1.0	13.458	B
2 - Access Rd	30	7	409	31	183	0.0	0.2	22.290	C
3 - Plas Coch Rd (S)	560	140	67	562	373	0.0	1.2	8.685	A
4 - Retail Park	219	55	338	219	291	0.0	0.9	14.041	B

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	LOS
1 - Plas Coch Rd (N)	322	81	378	319	282	1.0	2.2	21.428	C
2 - Access Rd	37	9	479	36	218	0.2	0.5	40.171	E
3 - Plas Coch Rd (S)	668	167	75	668	440	1.2	2.2	10.996	B
4 - Retail Park	260	65	401	259	342	0.9	1.4	18.403	C

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	LOS
1 - Plas Coch Rd (N)	399	100	475	385	341	2.2	7.6	53.826	F
2 - Access Rd	45	11	586	43	274	0.5	1.4	94.929	F
3 - Plas Coch Rd (S)	819	205	94	821	535	2.2	4.0	17.048	C
4 - Retail Park	322	80	497	319	418	1.4	3.1	30.806	D

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	LOS
1 - Plas Coch Rd (N)	397	99	472	397	338	7.6	8.3	74.175	F
2 - Access Rd	47	12	600	44	269	1.4	1.9	135.243	F
3 - Plas Coch Rd (S)	809	202	95	808	549	4.0	3.8	17.033	C
4 - Retail Park	320	80	486	324	417	3.1	3.1	36.933	E

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	LOS
1 - Plas Coch Rd (N)	324	81	388	332	288	8.3	2.2	38.481	E
2 - Access Rd	36	9	495	39	225	1.9	0.6	77.324	F
3 - Plas Coch Rd (S)	668	167	81	670	452	3.8	2.3	11.933	B
4 - Retail Park	263	66	413	263	338	3.1	1.4	22.813	C

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	LOS
1 - Plas Coch Rd (N)	272	68	315	271	234	2.2	1.1	15.944	C
2 - Access Rd	29	7	404	29	183	0.6	0.2	32.516	D
3 - Plas Coch Rd (S)	560	140	66	559	367	2.3	1.5	9.143	A
4 - Retail Park	215	54	334	215	291	1.4	0.9	14.905	B

Lane Results

Lane Level notation: Lane Level 1 is always closest to the junction.

Lanes: Main Results for each time segment

07:45 - 08:00

Arm	Side	Lane level	Lane	Destination arms	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	LOS
1 - Plas Coch Rd (N)	Entry	1	1	1, 2, 3, 4	272	541	0.502	275	0.0	1.0	13.458	B
	Exit	1	1		239			239	0.0	0.0	0.000	A
2 - Access Rd	Entry	1	1	1, 2, 3, 4	30	173	0.172	31	0.0	0.2	22.290	C
	Exit	1	1		183			183	0.0	0.0	0.000	A
3 - Plas Coch Rd (S)	Entry	1	1	1, 4	420	828	0.508	421	0.0	0.9	7.847	A
			2	2, 3	141	828	0.171	141	0.0	0.2	5.252	A
	Exit	2	1	(1, 2, 3, 4)	560			561	0.0	0.1	1.528	A
		1	1		373			373	0.0	0.0	0.000	A
4 - Retail Park	Entry	1	1	1, 2	54	406	0.132	54	0.0	0.2	10.312	B
			2	3, 4	165	406	0.406	165	0.0	0.7	15.256	C
	Exit	1	1		291			291	0.0	0.0	0.000	A

08:00 - 08:15

Arm	Side	Lane level	Lane	Destination arms	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	LOS
1 - Plas Coch Rd (N)	Entry	1	1	1, 2, 3, 4	322	505	0.638	319	1.0	2.2	21.428	C
	Exit	1	1		282			282	0.0	0.0	0.000	A
2 - Access Rd	Entry	1	1	1, 2, 3, 4	37	137	0.272	36	0.2	0.5	40.171	E
	Exit	1	1		218			218	0.0	0.0	0.000	A
3 - Plas Coch Rd (S)	Entry	1	1	1, 4	500	825	0.606	499	0.9	1.3	8.836	A
			2	2, 3	168	825	0.204	169	0.2	0.2	5.562	A
		2	1	(1, 2, 3, 4)	668			668	0.1	0.7	3.032	A
	Exit	1	1		440			440	0.0	0.0	0.000	A
4 - Retail Park	Entry	1	1	1, 2	64	380	0.168	64	0.2	0.2	11.873	B
			2	3, 4	196	380	0.515	196	0.7	1.2	20.542	C
	Exit	1	1		342			342	0.0	0.0	0.000	A

08:15 - 08:30

Arm	Side	Lane level	Lane	Destination arms	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	LOS
1 - Plas Coch Rd (N)	Entry	1	1	1, 2, 3, 4	399	449	0.890	385	2.2	7.6	53.826	F
	Exit	1	1		341			341	0.0	0.0	0.000	A
2 - Access Rd	Entry	1	1	1, 2, 3, 4	45	83	0.547	43	0.5	1.4	94.929	F
	Exit	1	1		274			274	0.0	0.0	0.000	A
3 - Plas Coch Rd (S)	Entry	1	1	1, 4	605	818	0.740	605	1.3	1.7	10.012	B
			2	2, 3	215	818	0.263	215	0.2	0.3	6.147	A
		2	1	(1, 2, 3, 4)	819			820	0.7	1.9	8.077	A
	Exit	1	1		535			535	0.0	0.0	0.000	A
4 - Retail Park	Entry	1	1	1, 2	75	340	0.221	75	0.2	0.3	13.948	B
			2	3, 4	247	340	0.724	244	1.2	2.7	36.115	E
	Exit	1	1		418			418	0.0	0.0	0.000	A

08:30 - 08:45

Arm	Side	Lane level	Lane	Destination arms	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	LOS
1 - Plas Coch Rd (N)	Entry	1	1	1, 2, 3, 4	397	451	0.882	397	7.6	8.3	74.175	F
	Exit	1	1		338			338	0.0	0.0	0.000	A
2 - Access Rd	Entry	1	1	1, 2, 3, 4	47	76	0.617	44	1.4	1.9	135.243	F
	Exit	1	1		269			269	0.0	0.0	0.000	A
3 - Plas Coch Rd (S)	Entry	1	1	1, 4	600	817	0.734	599	1.7	1.7	10.098	B
			2	2, 3	209	817	0.255	209	0.3	0.3	6.104	A
		2	1	(1, 2, 3, 4)	809			808	1.9	1.8	8.029	A
	Exit	1	1		549			549	0.0	0.0	0.000	A
4 - Retail Park	Entry	1	1	1, 2	77	345	0.222	77	0.3	0.3	14.231	B
			2	3, 4	243	345	0.705	247	2.7	2.9	44.190	E
	Exit	1	1		417			417	0.0	0.0	0.000	A

08:45 - 09:00

Arm	Side	Lane level	Lane	Destination arms	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	LOS
1 - Plas Coch Rd (N)	Entry	1	1	1, 2, 3, 4	324	500	0.648	332	8.3	2.2	38.481	E
	Exit	1	1		288			288	0.0	0.0	0.000	A
2 - Access Rd	Entry	1	1	1, 2, 3, 4	36	129	0.278	39	1.9	0.6	77.324	F
	Exit	1	1		225			225	0.0	0.0	0.000	A
3 - Plas Coch Rd (S)	Entry	1	1	1, 4	494	823	0.600	495	1.7	1.3	9.084	A
			2	2, 3	175	823	0.213	176	0.3	0.3	5.634	A
		2	1	(1, 2, 3, 4)	668			669	1.8	0.8	3.802	A
	Exit	1	1		452			452	0.0	0.0	0.000	A
4 - Retail Park	Entry	1	1	1, 2	63	375	0.168	64	0.3	0.2	12.059	B
			2	3, 4	200	375	0.532	199	2.9	1.3	26.307	D
	Exit	1	1		338			338	0.0	0.0	0.000	A

09:00 - 09:15

Arm	Side	Lane level	Lane	Destination arms	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	LOS
1 - Plas Coch Rd (N)	Entry	1	1	1, 2, 3, 4	272	542	0.501	271	2.2	1.1	15.944	C
	Exit	1	1		234			234	0.0	0.0	0.000	A
2 - Access Rd	Entry	1	1	1, 2, 3, 4	29	176	0.167	29	0.6	0.2	32.516	D
	Exit	1	1		183			183	0.0	0.0	0.000	A
3 - Plas Coch Rd (S)	Entry	1	1	1, 4	418	828	0.505	417	1.3	1.0	8.044	A
			2	2, 3	142	828	0.171	141	0.3	0.2	5.282	A
		2	1	(1, 2, 3, 4)	560			560	0.8	0.3	1.860	A
	Exit	1	1		367			367	0.0	0.0	0.000	A
4 - Retail Park	Entry	1	1	1, 2	53	408	0.130	53	0.2	0.2	10.585	B
			2	3, 4	162	408	0.397	162	1.3	0.7	16.293	C
	Exit	1	1		291			291	0.0	0.0	0.000	A

Junctions 9					
ARCADY 9 - Roundabout Module					
Version: 9.0.2.5947					
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Filename: Plas Coch Rd (Lane Balancing).j9

Path: \\newsrvr002\Company Shared Folders\PROJECTS\2020\Development and Infrastructure\Plas Coch Rd - Wrexham

Report generation date: 15-Jan-21 10:03:29

«2018, PM

- »Junction Network
- »Arms
- »Traffic Demand
- »Origin-Destination Data
- »Vehicle Mix
- »Results
- »Lane Results

Summary of junction performance

	PM				
	Queue (PCU)	Delay (s)	RFC	LOS	Network Residual Capacity
[Lane Simulation] - 2018					
1 - Plas Coch Rd (N)	21.7	148.86		F	%
2 - Access Rd	9.1	235.22		F	
3 - Plas Coch Rd (S)	6.6	21.00		C	
4 - Retail Park	9.1	35.77		E	

There are warnings associated with one or more model runs - see the 'Data Errors and Warnings' tables for each Analysis or Demand Set.

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

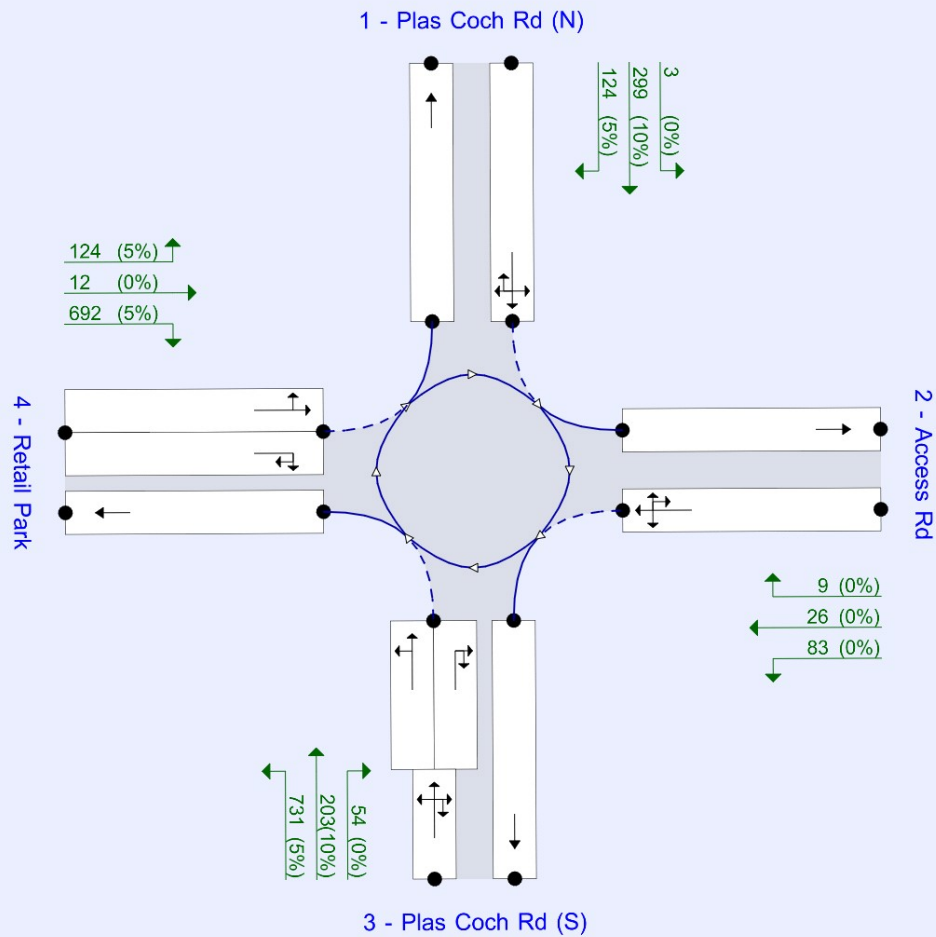
File summary

File Description

Title	Plas Coch Rd / Site Access
Location	Wrexham
Site number	1
Date	11-Jan-21
Version	01
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	ADSYSTRA\ahogg
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



Flows show original traffic demand (PCU/hr).
Lane simulation visualisation time: 16:45:00

The junction diagram reflects the last run of Junctions.

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

Lane Simulation options

Stop criteria (%)	Stop criteria time (s)	Stop criteria number of trials	Random seed	Results refresh speed (s)	Individual vehicle animation number of trials	Use crossings quick response	Last run random seed	Last run number of trials	Last run time taken (s)
1.00	100000	100000	-1	3	1	✓	567126115	392	46.24

Analysis Set Details

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

2018, PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Lane Simulation	A1 - [Lane Simulation]	This analysis set uses Lane Simulation mode. This is provided as an investigative tool and the user should apply judgement when interpreting the results.

Junction Network

Junctions

Junction	Name	Junction Type	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout	1, 2, 3, 4	59.74	F

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description
1	Plas Coch Rd (N)	
2	Access Rd	
3	Plas Coch Rd (S)	
4	Retail Park	

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 - Plas Coch Rd (N)	3.80	5.60	13.6	13.6	36.3	39.0	
2 - Access Rd	2.70	3.60	13.1	13.6	36.3	25.5	
3 - Plas Coch Rd (S)	3.40	8.10	26.8	26.8	36.3	17.0	
4 - Retail Park	7.30	7.30	0.0	95.0	36.3	13.5	

Slope / Intercept / Capacity

Arm Intercept Adjustments

Arm	Type	Reason	Percentage intercept adjustment (%)
1 - Plas Coch Rd (N)	Percentage	to match survey	64.50
2 - Access Rd	Percentage		71.50
3 - Plas Coch Rd (S)	Percentage		124.00
4 - Retail Park	Percentage		80.00

Roundabout Slope and Intercept used in model

Arm	Final slope	Final intercept (PCU/hr)
1 - Plas Coch Rd (N)	0.583	936
2 - Access Rd	0.513	739
3 - Plas Coch Rd (S)	0.739	2547
4 - Retail Park	0.825	1939

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

Lane Simulation: Arm options

Arm	Lane capacity source	Traffic Considering Secondary Lanes (%)
1 - Plas Coch Rd (N)	Evenly split	10.00
2 - Access Rd	Evenly split	10.00
3 - Plas Coch Rd (S)	Evenly split	10.00
4 - Retail Park	Evenly split	10.00

Lanes

Arm	Lane level	Lane	Destination arms	Has limited storage	Storage (PCU)	Minimum capacity (PCU/hr)	Maximum capacity (PCU/hr)
1 - Plas Coch Rd (N)	1 [Give-way line]	1	1, 2, 3, 4		Infinity	0	99999
2 - Access Rd	1 [Give-way line]	1	1, 2, 3, 4		Infinity	0	99999
3 - Plas Coch Rd (S)	1 [Give-way line]	1	1, 4	✓	3.00	0	99999
		2	2, 3	✓	3.00	0	99999
	2	1	(1, 2, 3, 4)		Infinity		
4 - Retail Park	1 [Give-way line]	1	1, 2		Infinity	0	99999
		2	3, 4		Infinity	0	99999

Entry Lane slope and intercept

Arm	Lane level	Lane	Final slope	Final intercept (PCU/hr)
1 - Plas Coch Rd (N)	1 [Give-way line]	1	0.583	936
2 - Access Rd	1 [Give-way line]	1	0.513	739
3 - Plas Coch Rd (S)	1 [Give-way line]	1	0.369	1274
		2	0.369	1274
4 - Retail Park	1 [Give-way line]	1	0.412	970
		2	0.412	970

Lane Movements

Arm	Lane Level	Lane	Destination arm			
			Plas Coch Rd (N)	Access Rd	Plas Coch Rd (S)	Retail Park
1 - Plas Coch Rd (N)	1 [Give-way line]	1	✓	✓	✓	✓
2 - Access Rd	1 [Give-way line]	1	✓	✓	✓	✓
3 - Plas Coch Rd (S)	1 [Give-way line]	1	✓			✓
		2		✓	✓	
	2	1	✓	✓	✓	✓
4 - Retail Park	1 [Give-way line]	1	✓	✓		
		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
D2	2018	PM	ONE HOUR	16:45	18:15	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 - Plas Coch Rd (N)		ONE HOUR	✓	426	100.000
2 - Access Rd		ONE HOUR	✓	118	100.000
3 - Plas Coch Rd (S)		ONE HOUR	✓	988	100.000
4 - Retail Park		ONE HOUR	✓	828	100.000

Origin-Destination Data

Demand (PCU/hr)

	To				
		1 - Plas Coch Rd (N)	2 - Access Rd	3 - Plas Coch Rd (S)	4 - Retail Park
From	1 - Plas Coch Rd (N)	0	3	299	124
	2 - Access Rd	9	0	83	26
	3 - Plas Coch Rd (S)	203	54	0	731
	4 - Retail Park	124	12	692	0

Vehicle Mix

Heavy Vehicle Percentages

	To				
		1 - Plas Coch Rd (N)	2 - Access Rd	3 - Plas Coch Rd (S)	4 - Retail Park
From	1 - Plas Coch Rd (N)	0	0	10	5
	2 - Access Rd	0	0	0	0
	3 - Plas Coch Rd (S)	10	0	0	5
	4 - Retail Park	5	0	5	0

Results

Results Summary for whole modelled period

Arm	Max delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
1 - Plas Coch Rd (N)	148.86	21.7	F	390	585
2 - Access Rd	235.22	9.1	F	107	160
3 - Plas Coch Rd (S)	21.00	6.6	C	911	1366
4 - Retail Park	35.77	9.1	E	762	1143

Main Results for each time segment

16:45 - 17:00

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	LOS
1 - Plas Coch Rd (N)	320	80	569	322	256	0.0	1.4	12.806	B
2 - Access Rd	88	22	838	87	53	0.0	0.5	15.070	C
3 - Plas Coch Rd (S)	753	188	122	753	803	0.0	1.7	7.150	A
4 - Retail Park	622	155	206	619	669	0.0	1.8	9.214	A

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	LOS
1 - Plas Coch Rd (N)	382	95	681	379	300	1.4	3.0	24.278	C
2 - Access Rd	104	26	995	105	66	0.5	1.0	31.725	D
3 - Plas Coch Rd (S)	891	223	142	892	958	1.7	2.5	9.795	A
4 - Retail Park	738	185	240	741	793	1.8	2.7	13.195	B

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	LOS
1 - Plas Coch Rd (N)	463	116	826	428	370	3.0	13.4	75.427	F
2 - Access Rd	127	32	1178	114	76	1.0	5.1	111.258	F
3 - Plas Coch Rd (S)	1091	273	155	1090	1136	2.5	6.3	18.822	C
4 - Retail Park	915	229	293	903	952	2.7	8.8	27.891	D

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	LOS
1 - Plas Coch Rd (N)	471	118	834	438	375	13.4	21.7	148.857	F
2 - Access Rd	131	33	1198	115	74	5.1	9.1	235.215	F
3 - Plas Coch Rd (S)	1098	274	157	1101	1155	6.3	6.6	20.999	C
4 - Retail Park	915	229	296	913	962	8.8	9.1	35.771	E

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	LOS
1 - Plas Coch Rd (N)	384	96	685	425	299	21.7	7.4	106.307	F
2 - Access Rd	104	26	1048	126	62	9.1	3.6	163.004	F
3 - Plas Coch Rd (S)	888	222	160	887	1014	6.6	2.5	11.675	B
4 - Retail Park	746	187	240	744	807	9.1	3.1	18.675	C

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Circulating flow (PCU/hr)	Throughput (PCU/hr)	Throughput (exit side) (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	LOS
1 - Plas Coch Rd (N)	322	80	579	322	257	7.4	1.6	23.392	C
2 - Access Rd	88	22	849	90	53	3.6	0.5	31.562	D
3 - Plas Coch Rd (S)	745	186	123	742	816	2.5	1.5	7.404	A
4 - Retail Park	635	159	204	633	661	3.1	1.7	10.399	B

Lane Results

Lane Level notation: Lane Level 1 is always closest to the junction.

Lanes: Main Results for each time segment

16:45 - 17:00

Arm	Side	Lane level	Lane	Destination arms	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	LOS
1 - Plas Coch Rd (N)	Entry	1	1	1, 2, 3, 4	320	605	0.530	322	0.0	1.4	12.806	B
	Exit	1	1		256			256	0.0	0.0	0.000	A
2 - Access Rd	Entry	1	1	1, 2, 3, 4	88	310	0.283	87	0.0	0.5	15.070	C
	Exit	1	1		53			53	0.0	0.0	0.000	A
3 - Plas Coch Rd (S)	Entry	1	1	1, 4	710	1229	0.578	711	0.0	1.1	5.631	A
			2	2, 3	42	1229	0.034	42	0.0	0.0	3.012	A
	Exit	2	1	(1, 2, 3, 4)	753			752	0.0	0.5	1.662	A
		1	1		803			803	0.0	0.0	0.000	A
4 - Retail Park	Entry	1	1	1, 2	101	885	0.115	101	0.0	0.2	4.760	A
			2	3, 4	520	885	0.588	518	0.0	1.6	10.080	B
	Exit	1	1		669			669	0.0	0.0	0.000	A

17:00 - 17:15

Arm	Side	Lane level	Lane	Destination arms	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	LOS
1 - Plas Coch Rd (N)	Entry	1	1	1, 2, 3, 4	382	539	0.708	379	1.4	3.0	24.278	C
	Exit	1	1		300			300	0.0	0.0	0.000	A
2 - Access Rd	Entry	1	1	1, 2, 3, 4	104	229	0.452	105	0.5	1.0	31.725	D
	Exit	1	1		66			66	0.0	0.0	0.000	A
3 - Plas Coch Rd (S)	Entry	1	1	1, 4	841	1221	0.688	840	1.1	1.6	6.415	A
			2	2, 3	52	1221	0.042	52	0.0	0.1	3.061	A
		2	1	(1, 2, 3, 4)	891			892	0.5	0.9	3.569	A
	Exit	1	1		958			958	0.0	0.0	0.000	A
4 - Retail Park	Entry	1	1	1, 2	122	870	0.141	123	0.2	0.2	5.157	A
			2	3, 4	616	870	0.708	618	1.6	2.5	14.775	B
	Exit	1	1		793			793	0.0	0.0	0.000	A

17:15 - 17:30

Arm	Side	Lane level	Lane	Destination arms	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	LOS
1 - Plas Coch Rd (N)	Entry	1	1	1, 2, 3, 4	463	455	1.017	428	3.0	13.4	75.427	F
	Exit	1	1		370			370	0.0	0.0	0.000	A
2 - Access Rd	Entry	1	1	1, 2, 3, 4	127	136	0.937	114	1.0	5.1	111.258	F
	Exit	1	1		76			76	0.0	0.0	0.000	A
3 - Plas Coch Rd (S)	Entry	1	1	1, 4	1031	1216	0.848	1031	1.6	2.3	7.526	A
			2	2, 3	59	1216	0.048	59	0.1	0.0	3.126	A
		2	1	(1, 2, 3, 4)	1091			1090	0.9	3.9	11.541	B
	Exit	1	1		1136			1136	0.0	0.0	0.000	A
4 - Retail Park	Entry	1	1	1, 2	150	849	0.177	150	0.2	0.2	5.330	A
			2	3, 4	765	849	0.902	753	2.5	8.6	32.321	D
	Exit	1	1		952			952	0.0	0.0	0.000	A

17:30 - 17:45

Arm	Side	Lane level	Lane	Destination arms	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	LOS
1 - Plas Coch Rd (N)	Entry	1	1	1, 2, 3, 4	471	450	1.046	438	13.4	21.7	148.857	F
	Exit	1	1		375			375	0.0	0.0	0.000	A
2 - Access Rd	Entry	1	1	1, 2, 3, 4	131	125	1.043	115	5.1	9.1	235.215	F
	Exit	1	1		74			74	0.0	0.0	0.000	A
3 - Plas Coch Rd (S)	Entry	1	1	1, 4	1042	1216	0.857	1043	2.3	2.3	7.654	A
			2	2, 3	59	1216	0.048	59	0.0	0.0	3.047	A
		2	1	(1, 2, 3, 4)	1098			1101	3.9	4.3	13.604	B
	Exit	1	1		1155			1155	0.0	0.0	0.000	A
4 - Retail Park	Entry	1	1	1, 2	150	848	0.177	150	0.2	0.2	5.338	A
			2	3, 4	765	848	0.902	763	8.6	8.9	41.820	E
	Exit	1	1		962			962	0.0	0.0	0.000	A

17:45 - 18:00

Arm	Side	Lane level	Lane	Destination arms	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	LOS
1 - Plas Coch Rd (N)	Entry	1	1	1, 2, 3, 4	384	537	0.715	425	21.7	7.4	106.307	F
	Exit	1	1		299			299	0.0	0.0	0.000	A
2 - Access Rd	Entry	1	1	1, 2, 3, 4	104	202	0.517	126	9.1	3.6	163.004	F
	Exit	1	1		62			62	0.0	0.0	0.000	A
3 - Plas Coch Rd (S)	Entry	1	1	1, 4	838	1214	0.690	838	2.3	1.6	6.704	A
			2	2, 3	50	1214	0.041	49	0.0	0.0	3.114	A
		2	1	(1, 2, 3, 4)	888			888	4.3	0.9	5.203	A
	Exit	1	1		1014			1014	0.0	0.0	0.000	A
4 - Retail Park	Entry	1	1	1, 2	118	871	0.135	118	0.2	0.2	5.073	A
			2	3, 4	629	871	0.722	626	8.9	2.9	21.282	C
	Exit	1	1		807			807	0.0	0.0	0.000	A

18:00 - 18:15

Arm	Side	Lane level	Lane	Destination arms	Total Demand (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	LOS
1 - Plas Coch Rd (N)	Entry	1	1	1, 2, 3, 4	322	599	0.537	322	7.4	1.6	23.392	C
	Exit	1	1		257			257	0.0	0.0	0.000	A
2 - Access Rd	Entry	1	1	1, 2, 3, 4	88	304	0.289	90	3.6	0.5	31.562	D
	Exit	1	1		53			53	0.0	0.0	0.000	A
3 - Plas Coch Rd (S)	Entry	1	1	1, 4	701	1228	0.571	700	1.6	1.1	5.775	A
			2	2, 3	42	1228	0.034	42	0.0	0.0	3.087	A
		2	1	(1, 2, 3, 4)	745			743	0.9	0.4	1.809	A
	Exit	1	1		816			816	0.0	0.0	0.000	A
4 - Retail Park	Entry	1	1	1, 2	104	886	0.117	104	0.2	0.2	4.808	A
			2	3, 4	531	886	0.600	529	2.9	1.6	11.509	B
	Exit	1	1		661			661	0.0	0.0	0.000	A

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