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Land To North Of Little Green Lane

M1 Junction 5 VISSIM Model Tests

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2025-11-13

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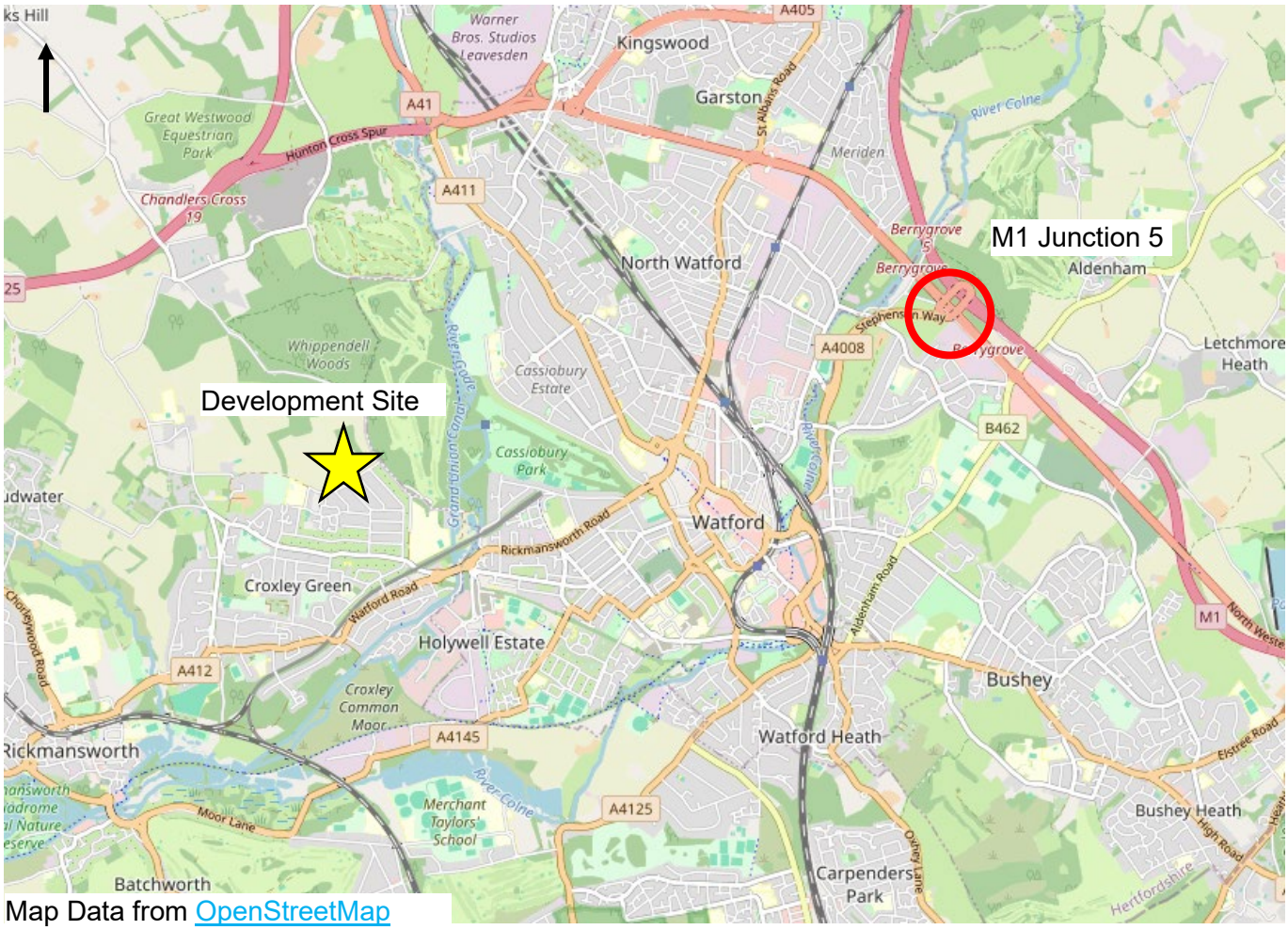
1. Introduction

1.1 Foreword

WSP has been commissioned by Richborough to undertake VISSIM modelling of M1 Junction 5 to respond to questions from National Highways regarding the impact of the proposed development at Croxley Green, Hertfordshire on the proposed scheme at M1 Junction 5 (M1/ A41/ A4108) near Watford. **Figure 1.1** shows the location of the application site and the location of M1 Junction 5.

Figure 1.1 – Location of Application Site and M1 Junction 5



Map Data from OpenStreetMap

1.2 M1 Junction 5 Improvement

The modelling exercise is being used to assess the impact of the proposed development on the proposed improvement scheme that forms part of the planning consent for a site on Land East of Elton Way. The proposed scheme involves the upgrade of the existing traffic signals and installation of MOVA within the traffic signal controllers to allow the traffic signals to respond to fluctuations in traffic conditions.

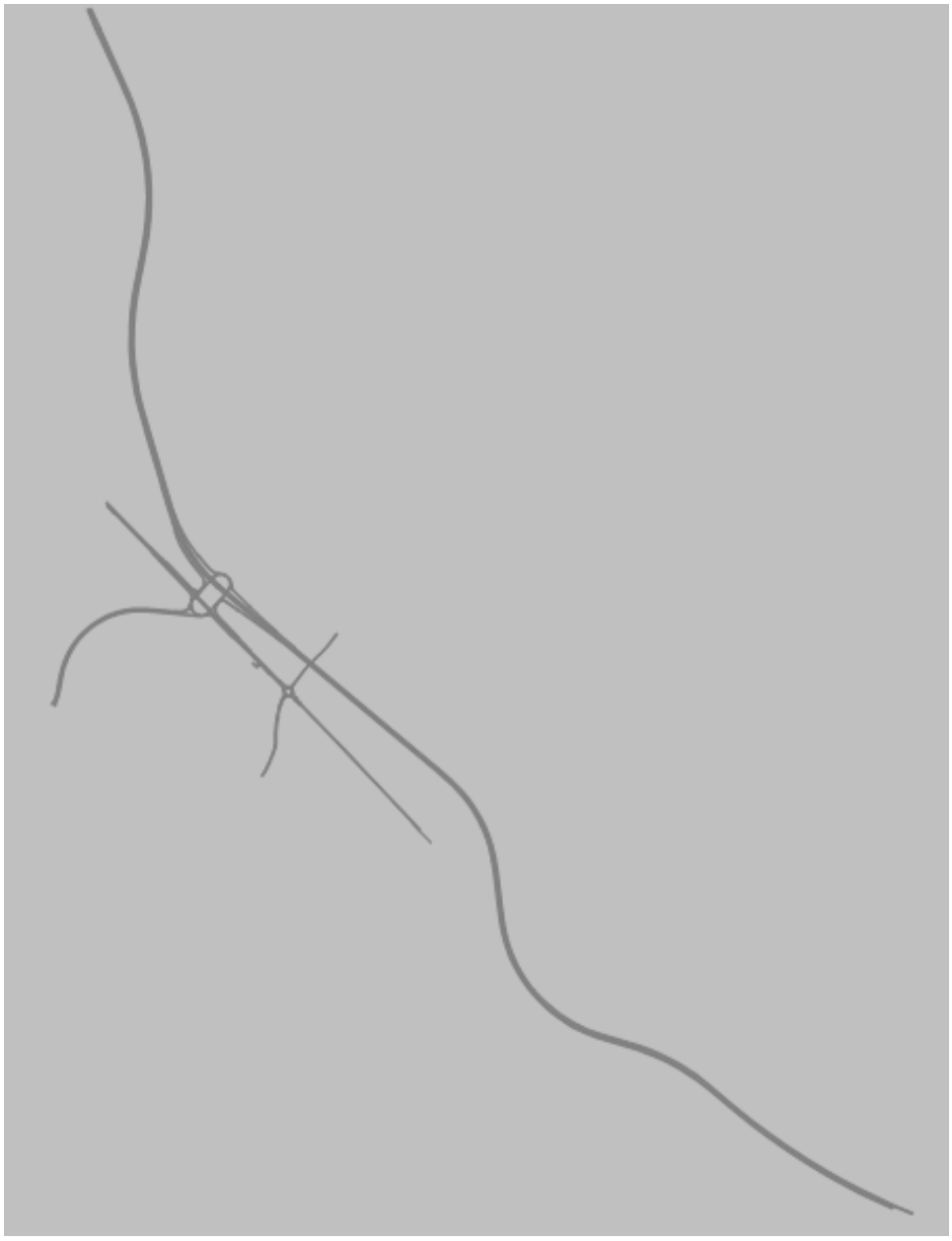
1.3 VISSIM Model

The VISSIM Model covers the following junctions and roads:

- M1 Junction 5;
- M1 Motorway between junction 4 and 6 (not including those junctions); and
- A41/ Hartspring Lane roundabout (Hartspring Roundabout).

Figure 1.2 shows a screenshot of the VISSIM model area.

Figure 1.2 - VISSIM Model Screenshot.



1.3.1 Report Structure

This report comprises the following sections:

- Chapter 2 describes the traffic forecasting used to generate the 2028 traffic flows that have been used in the VISSIM model.
- Chapter 3 describes the VISSIM model, the time periods and model statistics that have been collected and the scenarios that have been modelled.
- Chapter 4 compares the model results with and without the proposed development at Croxley Green.

2. Traffic Forecasting

2.1 Introduction

This section describes the traffic forecasting for the VISSIM Model. The existing VISSIM model represents a 2025 assessment year, and it has been agreed with National Highways that the assessments for this report will be based on a 2028 assessment year.

2.2 Committed Developments

The previous assessment of the junction included three committed development sites, namely:

- Two proposed development sites east of Elton Way; and
- A residential development site at Little Bushey Lane.

Following consultation with National Highways, it was agreed that no further committed developments needed to be included in the traffic forecasts.

2.3 Traffic Growth

In addition to the above developments, the 2028 traffic forecasts have been made assuming that there will be general background traffic growth in the local area. A growth factor from the previous assessment year of 2025 to the 2028 forecast year has been derived from the TEMPRO database, based on the following assumptions:

TEMPRO growth rate from 2025 to 2028 for Watford authority has been taken from Car Driver for AM and PM peak period and has been applied to all background traffic flows, but not the committed developments. **Table 2.1** summarises the growth factors 2025 to 2028 for the morning (AM) and evening (PM) peak periods.

Table 2.1 – TEMPRO growth rate

	AM Period	PM Period
Growth from 2025-2028	1.018	1.02

2.4 Development Traffic Flows

Hub Transport Planning has provided WSP with forecast origin-destination movements for the proposed development. As it is a residential development, the development traffic has been modelled as cars and is included as a separate vehicle class in the model. **Appendix A** contains a copy of the matrices

showing the development flows. The development traffic flows have been profiled over three hours, in a similar manner to the other committed developments in the model.

2.5 Model Scenarios

The VISSIM modelling for this report has been undertaken for the following two scenarios:

- 2028 Do Minimum; and
- 2028 Do Something (the 2028 Do Minimum with traffic from the proposed development).

The content of the model scenarios is summarised in Table 2.2 below

Table 2.2 – Content of the Model Scenarios

	2028 Do Minimum	2028 Do Something
Growth from 2025-2028	Yes	Yes
Committed development traffic	Yes	Yes
Committed M1 J5 Scheme	Yes	Yes
Proposed development traffic	No	Yes

3. VISSIM Model

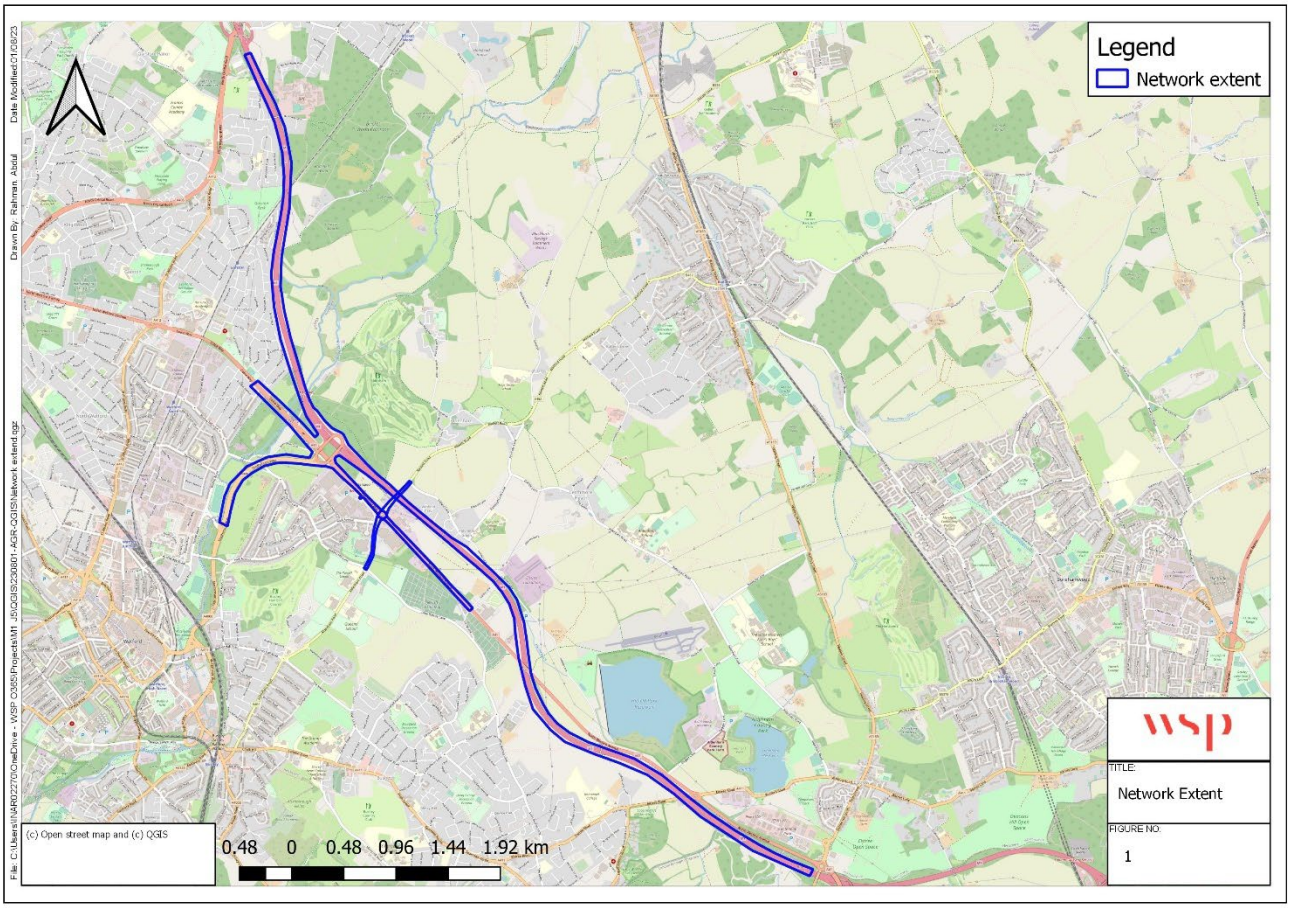
3.1 The VISSIM Model

The VISSIM model was originally created to assess the impact of the proposed MOVA scheme and improvements to the Hartspring Roundabout on the A41 as part of the assessment of the proposed developments next to the A41. Figure 3.1 shows the study area of the model.

Below changes were made in the model due to longer circulatory queues in the model:

- Circulatory priority rules adjusted to reduce overlap of vehicles near A4008 and on southern side of roundabout.

Figure 3.1 – VISSIM Model Study Area



3.2 Model Time Periods

The VISSIM model covers two three hour periods, namely:

- AM peak period – 06:30 to 09:30

- PM peak period – 15:45 to 18:45

Model statistics have been extracted from the VISSIM model for the busiest hour during those peak periods, as follows:

- AM peak hour – 08:00 to 09:00
- PM peak hour – 16:45 to 17:45

3.3 Model Statistics

The following model statistics have been collected from the VISSIM model:

- Network Performance (single values reflecting average performance of all vehicles in the model):
  - Average travel time per vehicle in seconds;
  - Average vehicle speed in mph;
- Route travel time in seconds – the modelled travel time from A to B along predefined routes in the model; and
- Average and maximum queue lengths in metres.

Model statistics will only be reported for the AM and PM peak hours. In order to ensure that model variability is not a factor in the final results, the model statistics will be presented as the average of 10 runs of the model.

In 2028 Do Minimum scenario AM peak, 10th run has outlier outputs, and in 2028 Do Something Scenario AM peak, 7th, 9th and 10th run were outliers, so those runs have been removed from the preparation of results.

3.4 Journey Time Measurement Routes

Table 3.1 shows the routes where modelled journey times have been collected. The journey time routes are displayed in **Appendix B**.

Table 3.1 - Journey Time Routes

Route	From	To
JT 1	M1 SB 300 Yard Board	End of On-slip from Berrygrove
JT 2	M1 NB 300 Yard Board	End of On-slip from Berrygrove
JT 3	M1 SB 300 Yard Board	Off-slip Stop Line
JT 4	M1 NB 300 Yard Board	Off-slip Stop Line
JT 5	A41S – NB Sandy Lane Junction	Hartspring Rbt Stop Line
JT 6	A41 - SB Berrygrove On-slip	Hartspring rbt Stop Line

Route	From	To
JT 7	A41 – NB Hartspring Rbt	Berrygrove Off-Slip Stop Line
JT 8	A41 – SB Woodmere Av Stop Line	Berrygrove Off-Slip Stop Line
JT 9	A41N – NB Hartspring Rbt	Woodmere Av Stop Line
JT 10	A41N – SB Woodmere Av	Hartspring Rbt Stop Line
JT 11	A4108 – NB Rbt	Berrygrove Stop Line
JT 12	B462 – SB Hilfield Lane	Hartspring Rbt Stop Line
JT 13	B462 – NB Bushey Mill Lane	Hartspring Rbt Stop Line

3.5 Queue Collection Points

Figure 3.2 to Figure 3.4 show the locations where the model has collected average and maximum queue lengths.

Figure 3.2 - Location of Queue Counters at M1 Junction 5

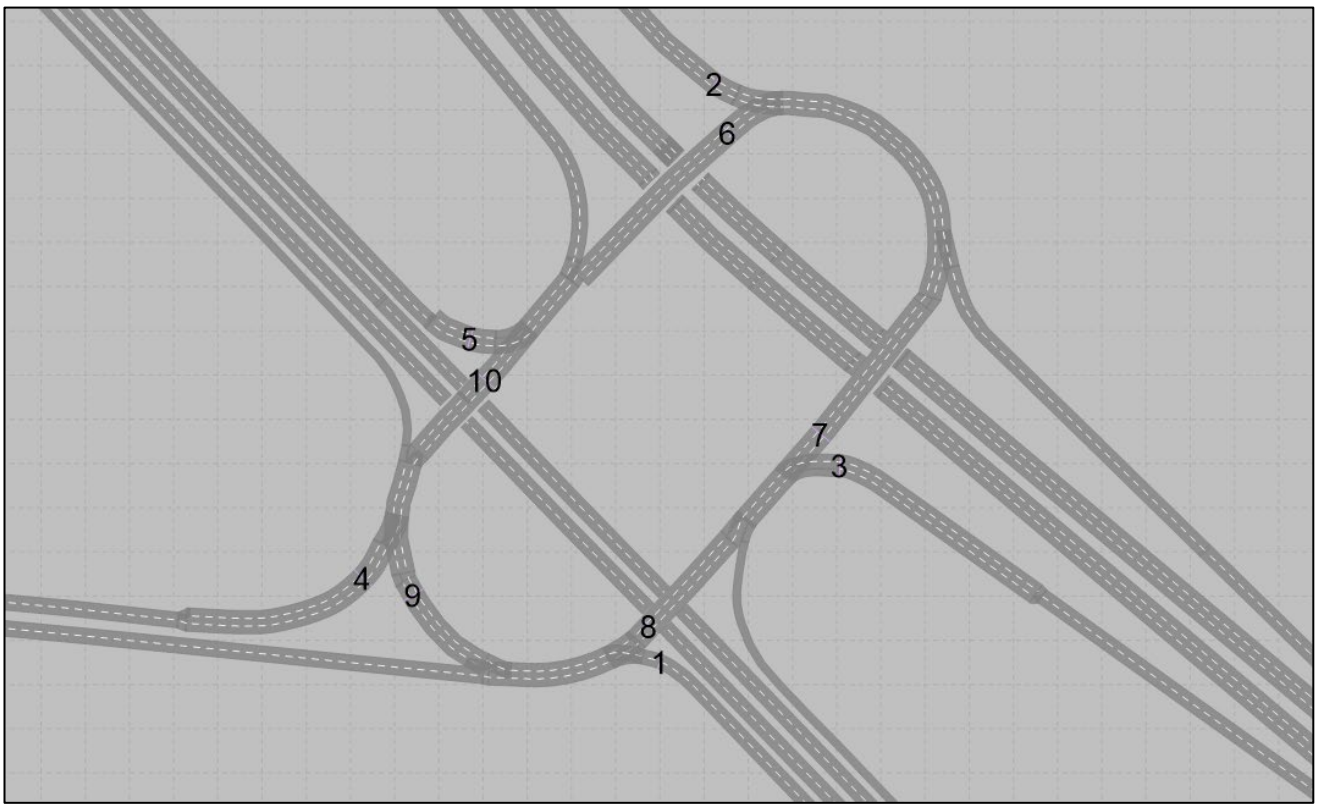


Figure 3.3 - Location of Queue Counters at Otterspool Way/A41 junction

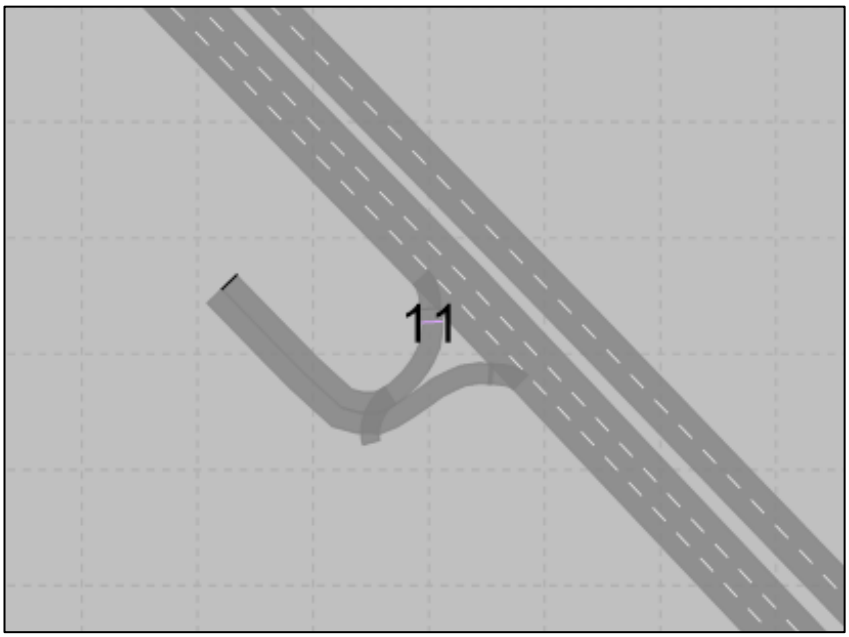
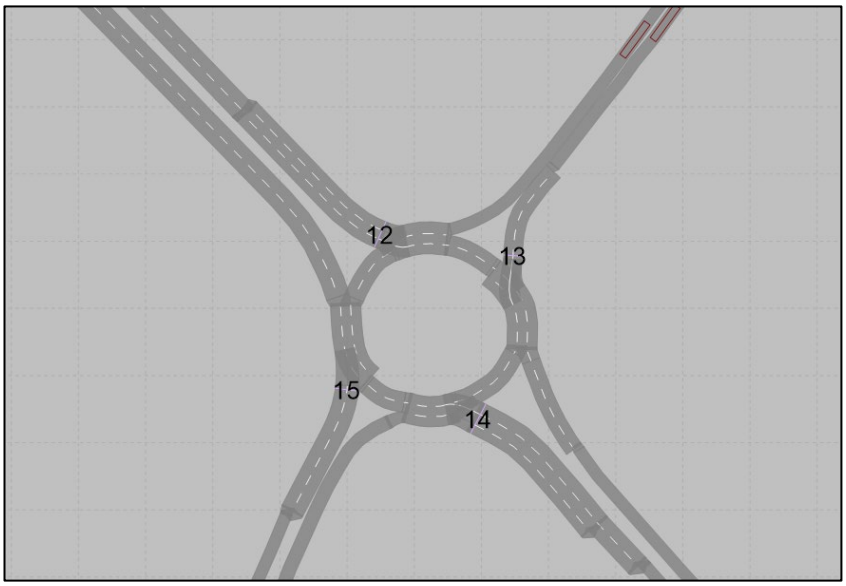


Figure 3.4 - Location of Queue Counters at Hartspring Roundabout



4. Results Comparison

4.1 Network Performance

The network performance statistics allow a high level comparison of the average vehicle behaviour across the model to be identified. The average travel time gives an indication if there is any issues within the model study area and the average speed indicates the overall impact of the development traffic across the study area.

Table 4.1 summarises the network performance statistics for the 2028 Do Minimum and 2028 Do Something scenarios in the AM peak hour.

Table 4.1 – Network Performance Comparison (AM Peak Hour)

Statistic	2028 Do Minimum	2028 Do Something	Difference
Average Travel Time (s)	353	355	2
Average Speed (mph)	37.6	37.3	-0.3

In the AM peak, there are negligible differences between the performance of the model with and without the proposed development, with just a two-second difference in average travel time and a 0.3mph difference in average speed. **Table 4.2** summarises the network performance statistics for the 2028 Do Minimum and 2028 Do Something scenarios in the AM peak hour.

Table 4.2 – Network Performance Comparison (PM Peak Hour)

Statistic	2028 Do Minimum	2028 Do Something	Difference
Average Travel Time (s)	329	326	-3
Average Speed (mph)	41.6	41.9	0.3

In the PM peak, the model again shows very little difference, with a three second difference in average travel time and a 0.33mph difference in average speed. It is noted in both peak hours that the

confidence intervals of the without/ with development runs overlap, suggesting that there may not be a statistical difference between the two scenarios.

4.2 Route Travel Times

A route travel time is measured between a defined start and end point in the VISSIM model and represents the average travel time for all vehicles travelling between those points. **Table 4.3** summarises the route travel times for the morning peak hour.

Table 4.3 – Route Travel Times in Seconds (AM Peak Hour)

Journey Time Section	2028 Do Minimum	2028 Do Something	Difference
JT 1 - M1 SB 300 Yard Board to End of on-slip from Berrygrove	36	35	-1
JT 2 - M1 NB 300 Yard Board to End of on-slip from Berrygrove	31	31	0
JT 3 - M1 SB 300 Yard Board to Off-slip Stop Line	92	94	2
JT 4 - M1 NB 300 Yard Board to Off-slip Stop Line	197	233	36
JT 5 - A41S - NB Sandy Lane Jct to Hartspring rdb stop line	234	252	18
JT 6 - A41 - SB Berrygrove On-slip to Hartspring rdb Stop Line	75	63	-12
JT 7 - A41 - NB Hartspring rdb to Berrygrove Off Slip Stop Line	113	119	6
JT 8 - A41 - SB Woodmere Av Stop Line to Berrygrove Off Slip Stop Line	81	67	-14
JT 9 - A41N - NB Hartspring rdb to Woodmere Av Stop Line	129	137	8
JT 10 - A41N - SB Woodmere Av to Hartspring rdb Stop Line	111	99	-12
JT 11 - A4108 - NB Rdb to Berrygrove Stop Line	118	128	10
JT 12 - B462 - SB Hilfield Lane to Hartspring rdb Stop Line	42	43	1
JT 13 - B462 - NB Bushey Mill Lane to Hartspring rdb Stop Line	211	219	8

In the AM peak, the journey times on the M1 show a very small difference on all locations, with the exception of the northbound slip road, where the journey time is predicted to increase by just over 30 seconds. The predicted differences in journey times with the proposed development elsewhere in the model are less than 20 seconds.

Table 4.4 summarises the route travel times for the evening peak hour.

Table 4.4 – Route Travel Times in Seconds (PM Peak Hour)

Journey Time Section	2028 Do Minimum	2028 Do Something	Difference
JT 1 - M1 SB 300 Yard Board to End of on-slip from Berrygrove	31	31	0
JT 2 - M1 NB 300 Yard Board to End of on-slip from Berrygrove	33	32	-1
JT 3 - M1 SB 300 Yard Board to Off-slip Stop Line	67	66	-1
JT 4 - M1 NB 300 Yard Board to Off-slip Stop Line	71	72	1
JT 5 - A41S - NB Sandy Lane Jct to Hartspring rdb stop line	539	512	-27
JT 6 - A41 - SB Berrygrove On-slip to Hartspring rdb Stop Line	59	55	-4
JT 7 - A41 - NB Hartspring rdb to Berrygrove Off Slip Stop Line	64	64	0
JT 8 - A41 - SB Woodmere Av Stop Line to Berrygrove Off Slip Stop Line	57	58	1
JT 9 - A41N - NB Hartspring rdb to Woodmere Av Stop Line	107	109	2
JT 10 - A41N - SB Woodmere Av to Hartspring rdb Stop Line	104	103	-1
JT 11 - A4108 - NB Rdb to Berrygrove Stop Line	74	76	2
JT 12 - B462 - SB Hilfield Lane to Hartspring rdb Stop Line	51	48	-3
JT 13 - B462 - NB Bushey Mill Lane to Hartspring rdb Stop Line	165	170	5

In the PM peak, the model shows almost no difference in almost all journey times in the model (up to five seconds) with the exception of a slight decrease in the journey time on the A41 northbound, possibly due to small variations in the operations of the traffic signals.

4.3 Queue Lengths

In VISSIM, the queue length is measured upstream from a defined queuing point, which is generally a stop line or a give-way line at a junction. The queues are recorded in metres.

Appendix C contains a series of queue graphs showing the queue lengths recorded in five minute intervals. Table 4.5 below summarises the average queue lengths for the morning peak.

Table 4.5 - Average Queue Lengths in Meters (AM Peak Hour)

Queue Route	2028 Do Minimum	2028 Do Something	Difference
1 - A41S	230	247	17
2 - M1N	205	237	32
3 - M1S	346	396	51
4 - A4108	223	264	41
5 - A41N	116	94	-22
6 - M1N Circ	129	133	4
7 - M1S Circ	226	238	12
8 - A41S Circ	128	130	1
9 - A4108 Circ	103	98	-5
10 - A41N Circ	84	90	6
11 - Otterspool Way (W)	15	18	3
12 - North Western Avenue (N)	226	183	-43
13 - Hartspring Lane (E)	38	43	6
14 - North Western Avenue (S)	736	843	107
15 - Hartspring Lane (W)	535	535	0

In the AM peak, the proposed development is predicted to increase the average queues on the two M1 slip roads by about 32m southbound and 50m northbound. The proposed development is otherwise predicted to have relatively small impacts on queues in the model study area, with the exception of an increase in queueing on Northwestern Avenue northbound at the Hartspring Roundabout. It is noted that there was significant variation between the randomly seeded model runs with some showing very large differences in queue length.

Table 4.6 summarises the predicted maximum queue lengths in the morning peak.

Table 4.6 - Maximum Queue Lengths in Meters (AM Peak Hour)

Queue Route	2028 Do Minimum	2028 Do Something	Difference
1 - A41S	498	533	36
2 - M1N	405	703	298
3 - M1S	585	475	-110
4 - A4108	315	412	97
5 - A41N	175	113	-62
6 - M1N Circ	148	150	2
7 - M1S Circ	247	249	2

Queue Route	2028 Do Minimum	2028 Do Something	Difference
8 - A41S Circ	130	132	2
9 - A4108 Circ	127	126	-1
10 - A41N Circ	115	114	-1
11 - Otterspool Way (W)	40	50	10
12 - North Western Avenue (N)	314	240	-74
13 - Hartspring Lane (E)	87	93	6
14 - North Western Avenue (S)	1044	1088	44
15 - Hartspring Lane (W)	537	538	2

The AM peak maximum queue lengths show bigger difference between the scenarios with and without the development. Due to the variability of the model, the M1 southbound slip road shows an increase of up to 300m (due to one run with a very long queue) while the northbound slip road is predicted to see a decrease in queue length. In most other locations, the difference in queue lengths between scenarios is much less, but again with significant variation between seeded runs.

Table 4.7 summarises the average modelled queue length on each approach in the evening peak.

Table 4.7 - Average Queue Lengths in Meters (PM Peak Hour)

Statistic	2028 Do Minimum	2028 Do Something	Difference
1 - A41S	61	63	2
2 - M1N	95	95	0
3 - M1S	125	130	4
4 - A4108	128	134	6
5 - A41N	67	68	2
6 - M1N Circ	65	70	5
7 - M1S Circ	123	115	-7
8 - A41S Circ	99	97	-2
9 - A4108 Circ	98	96	-2
10 - A41N Circ	54	61	8
11 - Otterspool Way (W)	1	1	0
12 - North Western Avenue (N)	65	59	-6
13 - Hartspring Lane (E)	66	54	-12
14 - North Western Avenue (S)	1053	1037	-16
15 - Hartspring Lane (W)	533	533	0

In the PM peak, the average queue lengths are predicted to be about 95m southbound and 130m northbound. Across all the journey time routes, the difference in queue is up to 15m, showing that the development is having a negligible impact on these average queue lengths.

Table 4.8 summarises the maximum queue lengths from the model in the evening peak

Table 4.8 - Maximum Queue Lengths in Meters (PM Peak Hour)

Statistic	2028 Do Minimum	2028 Do Something	Difference
1 - A41S	83	82	-1
2 - M1N	123	120	-3
3 - M1S	154	175	21
4 - A4108	144	142	-2
5 - A41N	79	85	6
6 - M1N Circ	77	85	8
7 - M1S Circ	176	184	8
8 - A41S Circ	116	113	-3
9 - A4108 Circ	130	111	-19
10 - A41N Circ	68	77	8
11 - Otterspool Way (W)	3	2	-1
12 - North Western Avenue (N)	112	108	-4
13 - Hartspring Lane (E)	159	137	-22
14 - North Western Avenue (S)	1158	1171	12
15 - Hartspring Lane (W)	535	536	2

The maximum queue lengths on the M1 slip roads are about 120m southbound and up to 170m northbound. The largest difference in maximum queue length is just 22m on Hartspring Lane, with all other queue lengths. As with the other statistics, this shows that there is very little difference in the predicted operation of the junction with or without the development in the PM peak.

5. No Growth Scenario (2025 Flows)

5.1 Introduction

In order to understand the impacts of the Croxley Green development on the roundabout without background growth, a scenario has been created where the development traffic has been added to the 2025 traffic flows used to model the roundabout previously, without additional traffic growth to 2028, as that scenario shows excessive queues.

The model was run 10 times for both scenarios for AM and PM peaks. It is noted that in run 10 of the AM peak the model appears to have locked up, with maximum queues on several entries reaching the edge of the model. Run 10 has therefore been removed from the average figures presented below. It is noted that the model runs in the AM peak appear to be more stable overall than with the background traffic growth.

5.2 Network Performance

Table 5.1 summarises the AM peak network performance statistics for the 2025 flow scenarios

Table 5.1 – Network Performance Comparison (AM Peak Hour)

Statistic	2025 Do Minimum	2025 Do Something	Difference
Average Travel Time (s)	299.2	299.4	+0.2
Average Speed (mph)	41.2	39.9	-1.3

In the AM peak, there are negligible differences between the performance of the model with and without the proposed development, with just two seconds difference in average travel time and a 0.3mph difference in average speed. It is noted that more trips complete than in the 2028 scenario as the average queue lengths are much shorter.

Table 5.2 summarises the network performance statistics for the 2028 Do Minimum and 2028 Do Something scenarios in the PM peak hour.

Table 5.2 – Network Performance Comparison (PM Peak Hour)

Statistic	2028 Do Minimum	2028 Do Something	Difference
Average Travel Time (s)	299.2	299.5	+0.4
Average Speed (mph)	41.7	41.8	+0.1

In the PM peak, there is a negligible difference between the Do Minimum and Do Minimum scenarios. Again, more trips are completed because the queues in the model are shorter than those forecast in the 2028 model.

5.3 Route Travel Times

A route travel time is measured between a defined start and end point in the VISSIM model and represents the average travel time for all vehicles travelling between those points. **Table 5.3** summarises the route travel times for the morning peak hour

Table 5.3 – Route Travel Times in Seconds (AM Peak Hour)

Journey Time Section	2025 Do Minimum	2025 Do Something	Difference
JT 1 - M1 SB 300 Yard Board to End of on-slip from Berrygrove	33	34	1
JT 2 - M1 NB 300 Yard Board to End of on-slip from Berrygrove	28	28	0
JT 3 - M1 SB 300 Yard Board to Off-slip Stop Line	82	102	20
JT 4 - M1 NB 300 Yard Board to Off-slip Stop Line	82	86	4
JT 5 - A41S - NB Sandy Lane Jct to Hartspring rdb stop line	194	198	3
JT 6 - A41 - SB Berrygrove On-slip to Hartspring rdb Stop Line	80	105	25
JT 7 - A41 - NB Hartspring rdb to Berrygrove Off Slip Stop Line	87	103	16
JT 8 - A41 - SB Woodmere Av Stop Line to Berrygrove Off Slip Stop Line	66	64	-2

Journey Time Section	2025 Do Minimum	2025 Do Something	Difference
JT 9 - A41N - NB Hartspring rdb to Woodmere Av Stop Line	98	104	7
JT 10 - A41N - SB Woodmere Av to Hartspring rdb Stop Line	99	121	21
JT 11 - A4108 - NB Rdb to Berrygrove Stop Line	79	93	14
JT 12 - B462 - SB Hilfield Lane to Hartspring rdb Stop Line	40	41	1
JT 13 - B462 - NB Bushey Mill Lane to Hartspring rdb Stop Line	203	197	-6

In the AM peak, the journey times on the M1 show very small differences between the do minimum and do something options, with the maximum difference being 25 seconds or less on all routes. It is considered that the traffic associated with the proposed development would have only a small impact on journey times in the AM peak hour.

Table 5.4 summarises the route travel times for the evening peak hour.

Table 5.4 – Route Travel Times in Seconds (PM Peak Hour)

Journey Time Section	2025 Do Minimum	2025 Do Something	Difference
JT 1 - M1 SB 300 Yard Board to End of on-slip from Berrygrove	29	29	0
JT 2 - M1 NB 300 Yard Board to End of on-slip from Berrygrove	30	30	0
JT 3 - M1 SB 300 Yard Board to Off-slip Stop Line	49	49	0
JT 4 - M1 NB 300 Yard Board to Off-slip Stop Line	61	63	2
JT 5 - A41S - NB Sandy Lane Jct to Hartspring rdb stop line	480	491	11
JT 6 - A41 - SB Berrygrove On-slip to Hartspring rdb Stop Line	45	45	-1
JT 7 - A41 - NB Hartspring rdb to Berrygrove Off Slip Stop Line	63	65	1
JT 8 - A41 - SB Woodmere Av Stop Line to Berrygrove Off Slip Stop Line	53	53	0
JT 9 - A41N - NB Hartspring rdb to Woodmere Av Stop Line	98	99	1
JT 10 - A41N - SB Woodmere Av to Hartspring rdb Stop Line	87	84	-3
JT 11 - A4108 - NB Rdb to Berrygrove Stop Line	83	87	5

Journey Time Section	2025 Do Minimum	2025 Do Something	Difference
JT 12 - B462 - SB Hilfield Lane to Hartspring rdb Stop Line	41	41	-1
JT 13 - B462 - NB Bushey Mill Lane to Hartspring rdb Stop Line	163	160	-2

In the PM peak, the model shows that the differences in journey times in the Do Minimum and Do Something scenarios are negligible, with most differences being five seconds or less and the largest difference being 11 seconds. It is considered that the model shows the traffic from the proposed development would have almost no impact on journey times in the PM peak.

5.4 Queue Lengths

Table 5.5 below summarises the average queue lengths for the morning peak. For simplicity, queue length graphs have not been generated for this test.

Table 5.5 - Average Queue Lengths in Meters (AM Peak Hour)

Queue Route	2025 Do Minimum	2025 Do Something	Difference
1 - A41S	74	116	42
2 - M1N	28	28	0
3 - M1S	53	61	8
4 - A4108	50	86	36
5 - A41N	25	26	0
6 - M1N Circ	28	29	1
7 - M1S Circ	47	52	5
8 - A41S Circ	40	43	3
9 - A4108 Circ	18	18	0
10 - A41N Circ	9	10	2
11 - Otterspool Way (W)	0	0	0
12 - North Western Avenue (N)	56	141	85
13 - Hartspring Lane (E)	6	6	0
14 - North Western Avenue (S)	320	323	3
15 - Hartspring Lane (W)	468	464	-4

The AM peak shows that the average queue lengths on both M1 slip roads would be accommodated within the slip road extents, with an 8m difference between the queue length with and without the

scheme southbound and a 36m difference northbound. The model suggests that there is minimal impact associated with the proposed during the AM peak.

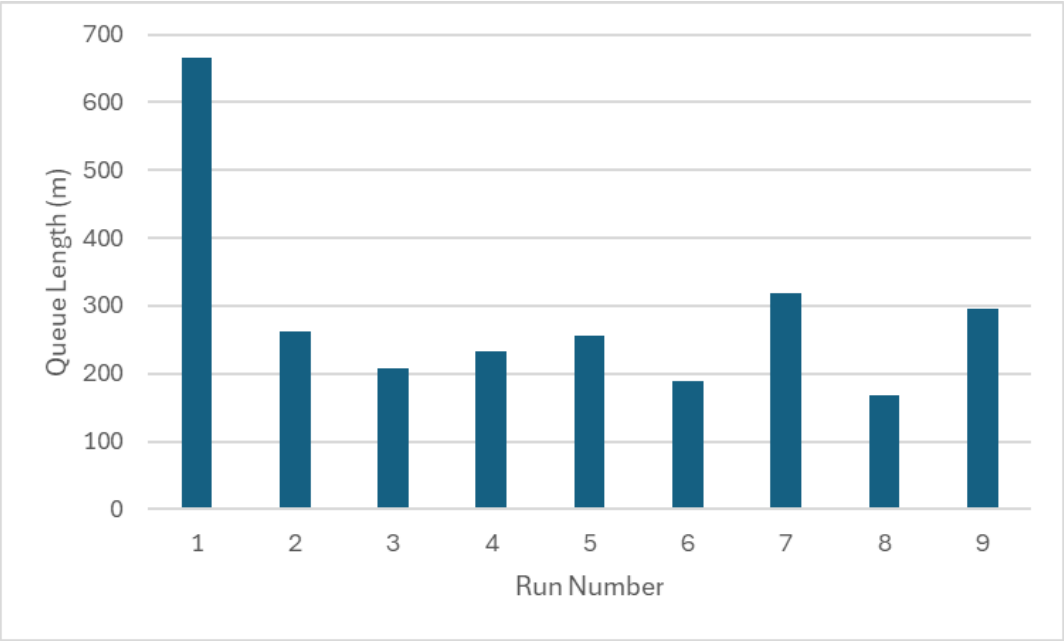
Table 5.6 summarises the predicted maximum queue lengths in the morning peak.

Table 5.6 - Maximum Queue Lengths in Meters (AM Peak Hour)

Queue Route	2025 Do Minimum	2025 Do Something	Difference
1 - A41S	514	476	-38
2 - M1N	321	325	4
3 - M1S	314	666	352
4 - A4108	365	563	198
5 - A41N	171	156	-15
6 - M1N Circ	171	169	-2
7 - M1S Circ	253	259	6
8 - A41S Circ	136	136	0
9 - A4108 Circ	145	135	-10
10 - A41N Circ	124	124	0
11 - Otterspool Way (W)	35	54	19
12 - North Western Avenue (N)	384	742	358
13 - Hartspring Lane (E)	251	358	107
14 - North Western Avenue (S)	1261	1266	5
15 - Hartspring Lane (W)	546	546	0

In the AM peak, the model shows that the development traffic is predicted to have very little impact on the queue length on the M1 northbound, however the maximum recorded on the M1 southbound was 666m. **Figure 5.4** shows the maximum queue length on the northbound M1 diverge slip road in each of the nine retained runs.

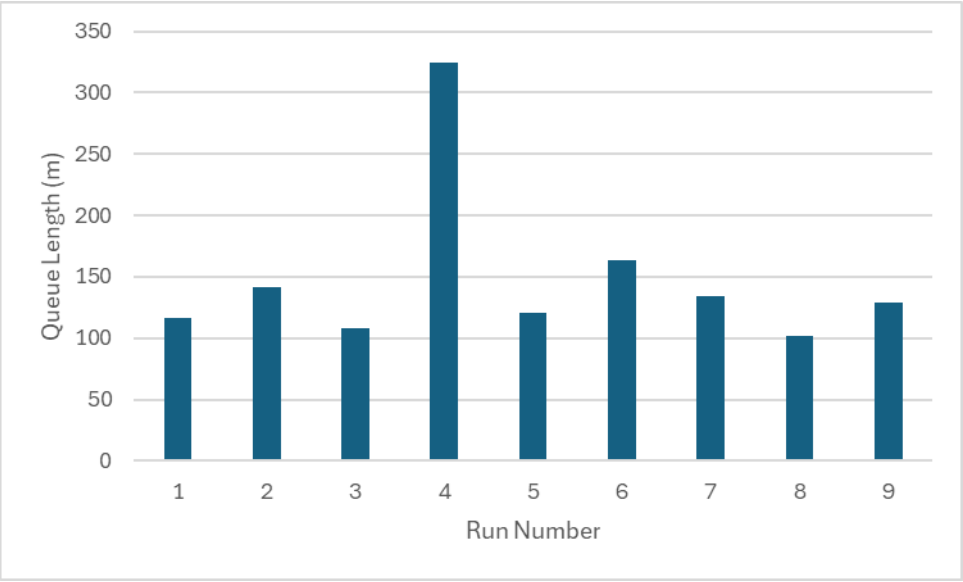
Figure 5.1 – Maximum Queue Length on M1 Northbound Slip Road by Run (Do Something, AM)



It is evident that run 1 shows a considerably different maximum queue length to the other runs (about twice the length). Looking at all nine runs, the mean maximum queue length is 288m, which reduces to 241m if run 1 is removed. It is also apparent in the model that the 666m queue length appears in one five-minute time slice in run 1 with shorter queues predicted afterwards. The shorter queues are more similar to those predicted in the other runs. It is therefore proposed that the queue length from run 1 should be excluded from the results. The next longest maximum queue is 325m, which can be accommodated within the extents of the slip road.

Figure 5.2 shows the maximum queue length on the southbound M1 diverge slip road in each of the nine retained runs.

Figure 5.2 – Maximum Queue Length on M1 Southbound Slip Road by Run (Do Something, AM)



It is evident that the maximum queue length in run 4 is about twice the length of the next longest maximum queue in any of the other eight runs. The average maximum queue length is 149m including run 4 and 127m without run 4. It is considered that even though the predicted queue length in run 4 can be accommodated within the extents of the slip road, this run is an outlier and is not believed to be representative of normal junction performance. If the queue length from run 4 is excluded the next longest queue length is 164m, which is also within the extents of the slip road.

Table 5.7 summarises the average modelled queue length on each approach in the morning peak.

Table 5.7 - Average Queue Lengths in Meters (PM Peak Hour)

Statistic	2025 Do Minimum	2025 Do Something	Difference
1 - A41S	24	25	0
2 - M1N	12	12	0
3 - M1S	35	39	4
4 - A4108	76	89	13
5 - A41N	16	16	0
6 - M1N Circ	14	15	0
7 - M1S Circ	26	26	0
8 - A41S Circ	18	17	0
9 - A4108 Circ	25	25	0
10 - A41N Circ	6	7	1
11 - Otterspool Way (W)	0	0	0
12 - North Western Avenue (N)	12	12	-1
13 - Hartspring Lane (E)	8	7	-1
14 - North Western Avenue (S)	889	881	-9
15 - Hartspring Lane (W)	443	438	-6

In the PM peak, the model predicts that there would be negligible differences in the predicted average queue length on both M1 slip roads and across the other queue counters in the model.

Table 5.8 summarises the maximum queue lengths in the PM peak for the do minimum and do something scenarios.

Table 5.8 - Maximum Queue Lengths in Meters (PM Peak Hour)

Statistic	2025 Do Minimum	2025 Do Something	Difference
1 - A41S	157	152	-5
2 - M1N	165	99	-66
3 - M1S	201	262	61
4 - A4108	393	546	153
5 - A41N	98	98	1
6 - M1N Circ	117	108	-9
7 - M1S Circ	249	248	-1
8 - A41S Circ	130	125	-5
9 - A4108 Circ	145	144	-1
10 - A41N Circ	119	118	-1
11 - Otterspool Way (W)	32	7	-25
12 - North Western Avenue (N)	281	186	-96
13 - Hartspring Lane (E)	274	261	-13
14 - North Western Avenue (S)	1264	1260	-3
15 - Hartspring Lane (W)	542	546	3

The traffic from the proposed development is also predicted to have a negligible impact on maximum queue lengths in the PM peak, with the longest queues on the M1 slip roads predicted to be marginally shorter with the development than without.

5.5 Conclusion

It is evident that for this scenario, once outlier runs are excluded, the model shows that M1 Junction 5 could accommodate the traffic associated with the proposed development without significant detriment to other vehicles. The model also shows that if the outlier runs are excluded, the maximum queue lengths on the two M1 slip roads would be accommodated within the lengths of those slip roads and would not block back onto the M1 mainline.

6. Summary

The VISSIM model shows that there is generally predicted to be very little difference between the network performance of M1 Junction 5 without and with the proposed development at Croxley Green. In the AM peak, the model shows significant variability between runs but also shows that the queue could extend back onto the mainline without the proposed development, and that there would be increases in this queue with the development.

In the PM peak the model shows that the queues would be accommodated within the extents of both M1 slip roads. The model again shows that there is very little difference in the operation of the junction with or without the proposed development.

A test has also been undertaken for a scenario where the development traffic is added to the network without additional traffic growth. The model shows a couple of significant outlier runs for queueing on the M1 slip roads in the AM peak, with the majority of runs showing that the predicted queue would be accommodated within the slip road. The model shows a negligible impact during the PM Peak, similar to the 2028 scenario.

Appendices

Appendix A – Development Flows

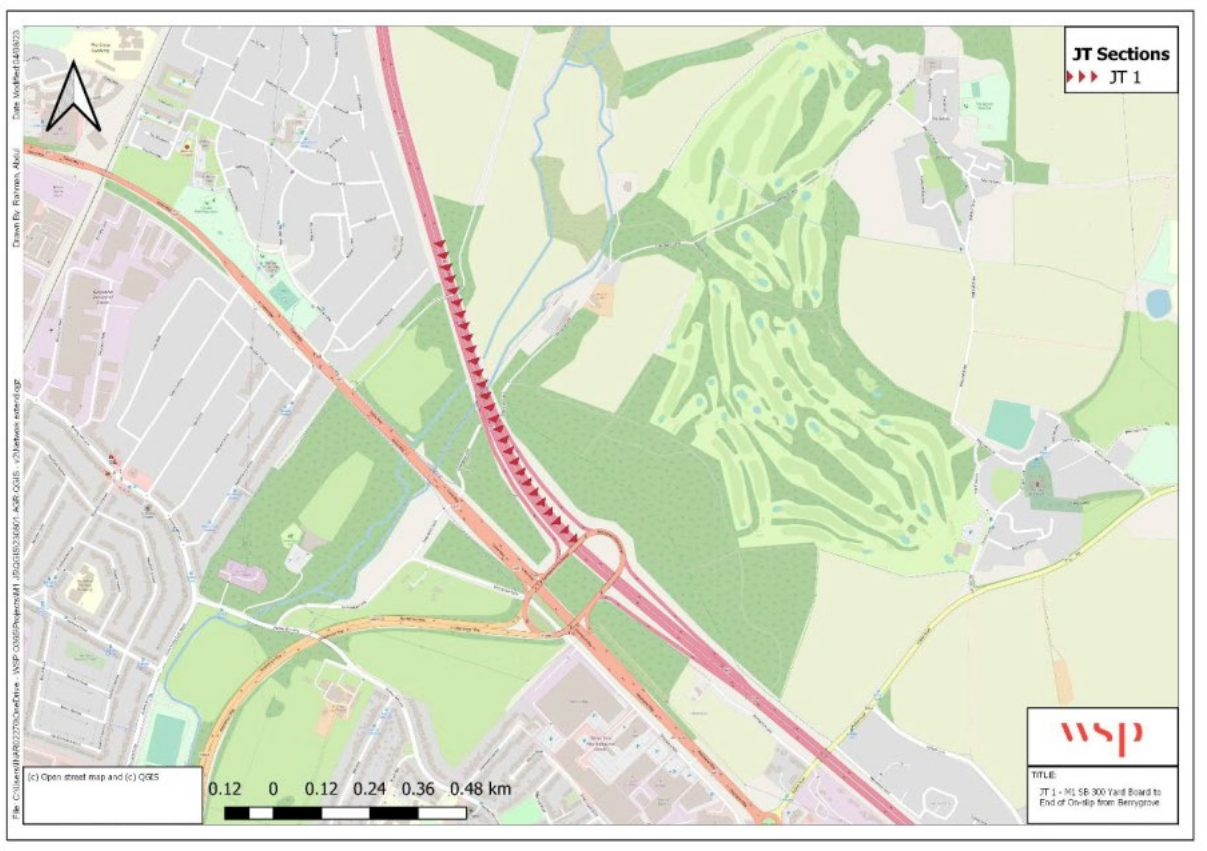
Table 6.1 AM Peak Development Flows

AM PEAK	A4108	A41 (N)	M1 (N)	M1 (S)	A41 (S) & B462 (E)
A4108	0	0	15	14	15
A41 (N)	0	0	0	0	0
M1 (N)	15	0	0	0	0
M1 (S)	12	0	0	0	0
A41 (S) & B462 (E)	15	0	0	0	0

Table 6.2 PM Peak Development Flows

PM PEAK	A4108	A41 (N)	M1 (N)	M1 (S)	A41 (S) & B462 (E)
A4108	0	0	15	14	14
A41 (N)	0	0	0	0	0
M1 (N)	15	0	0	0	0
M1 (S)	12	0	0	0	0
A41 (S) & B462 (E)	14	0	0	0	0

Ap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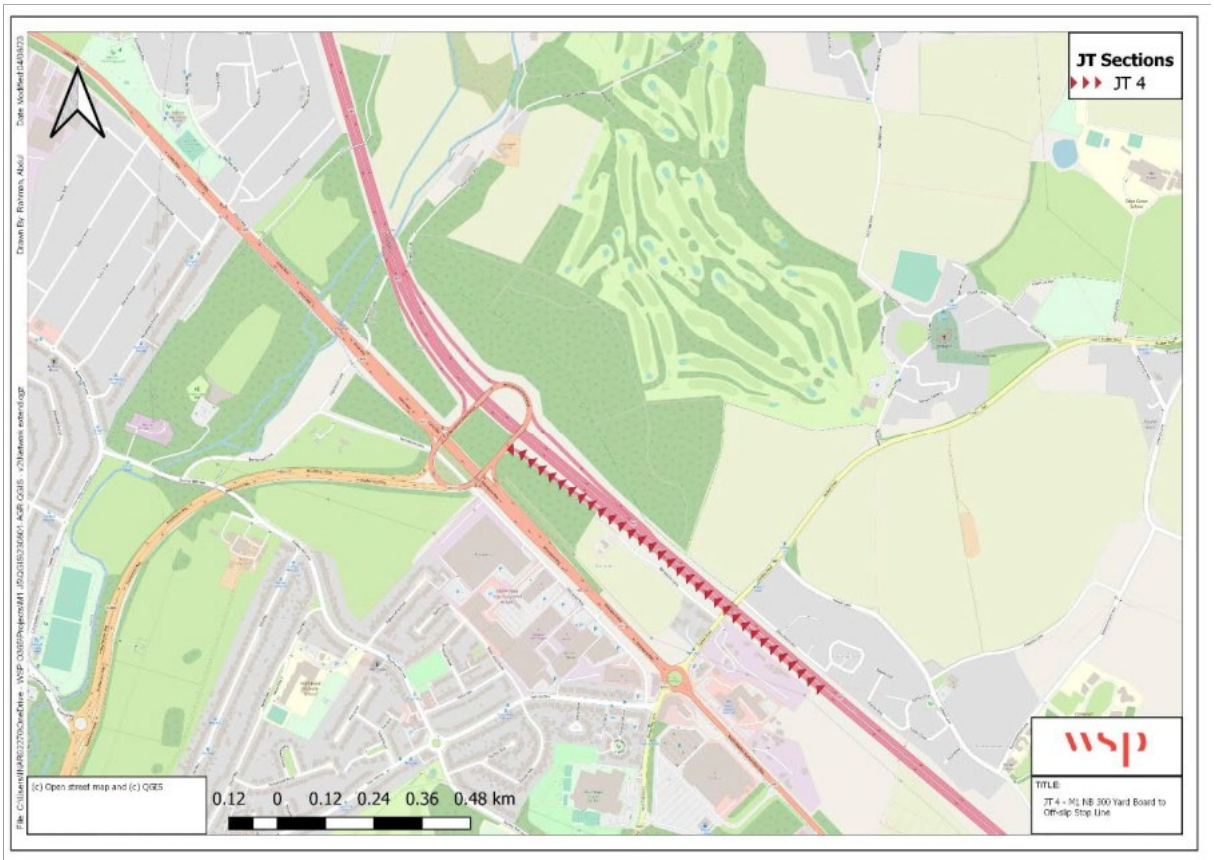
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JT Sections
JT 5
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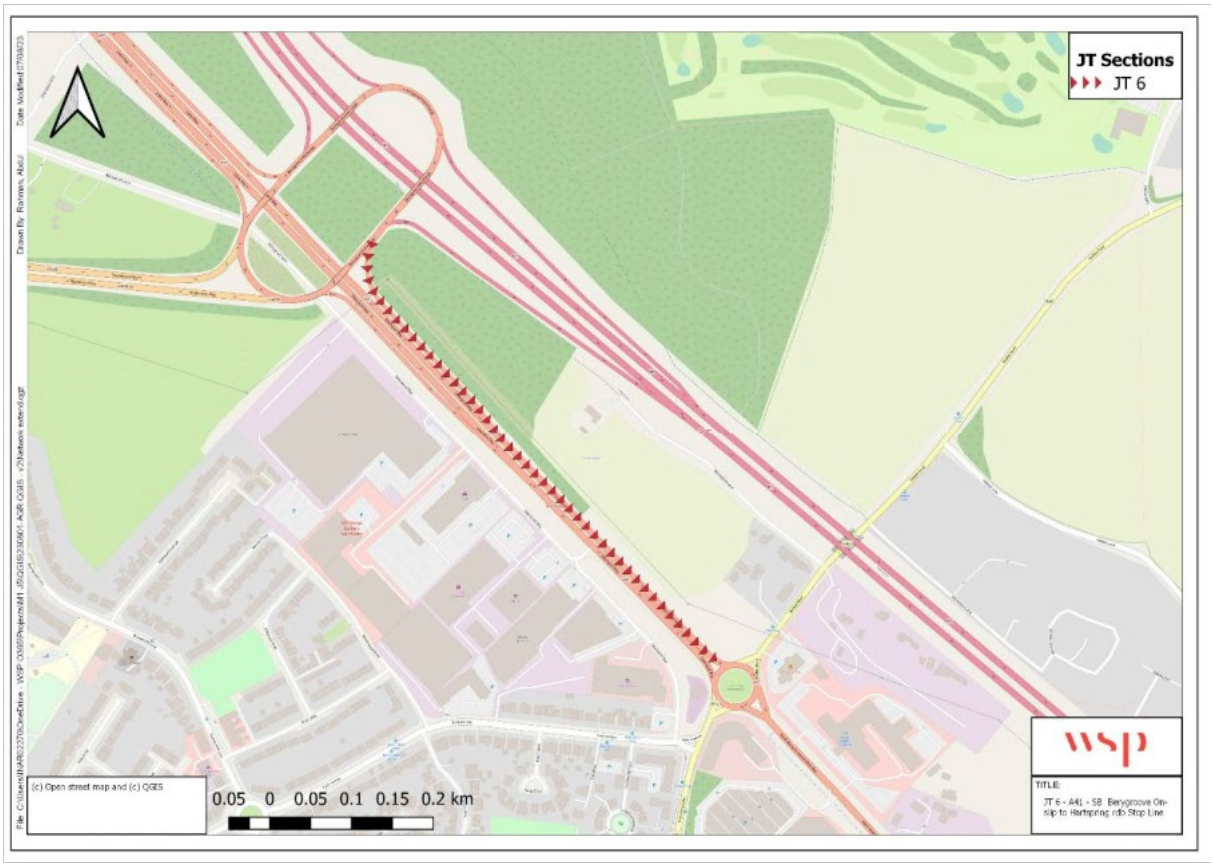
JT Sections
JT 6
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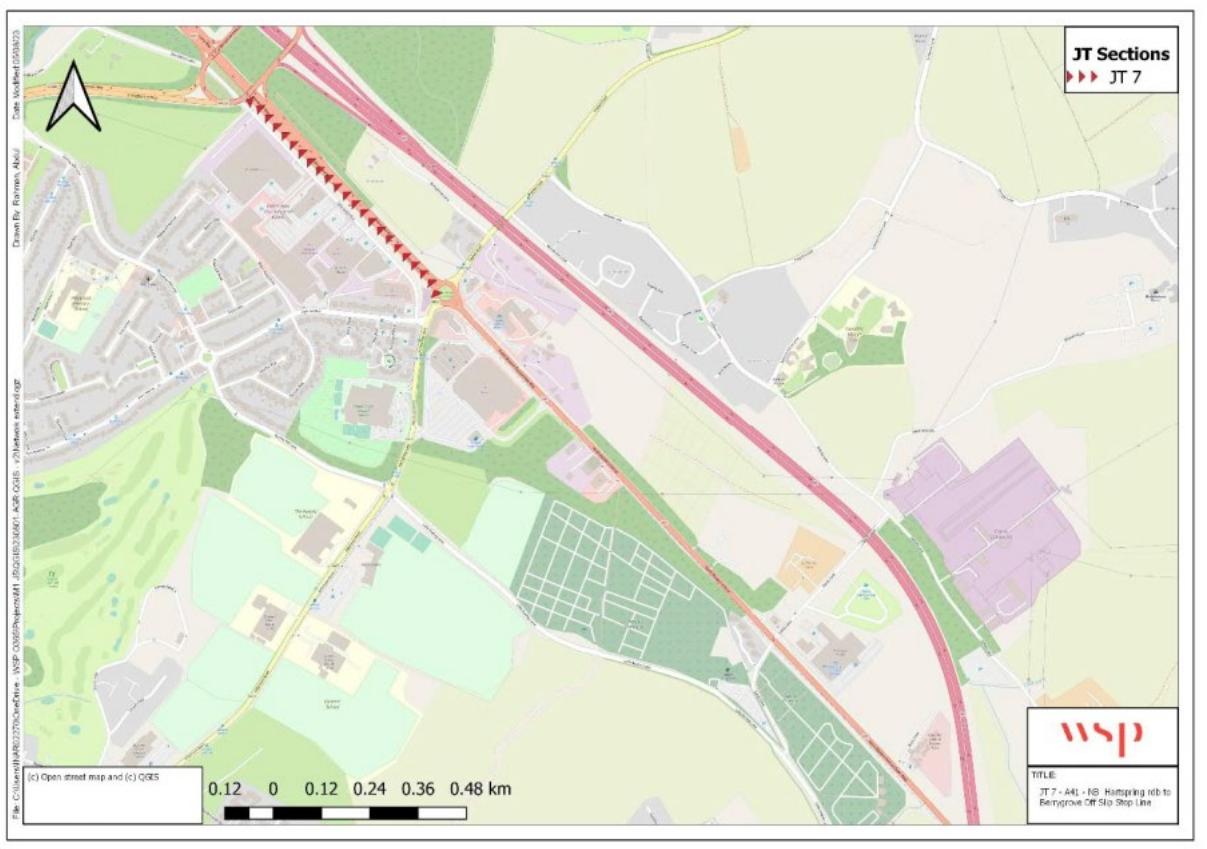
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JT 7
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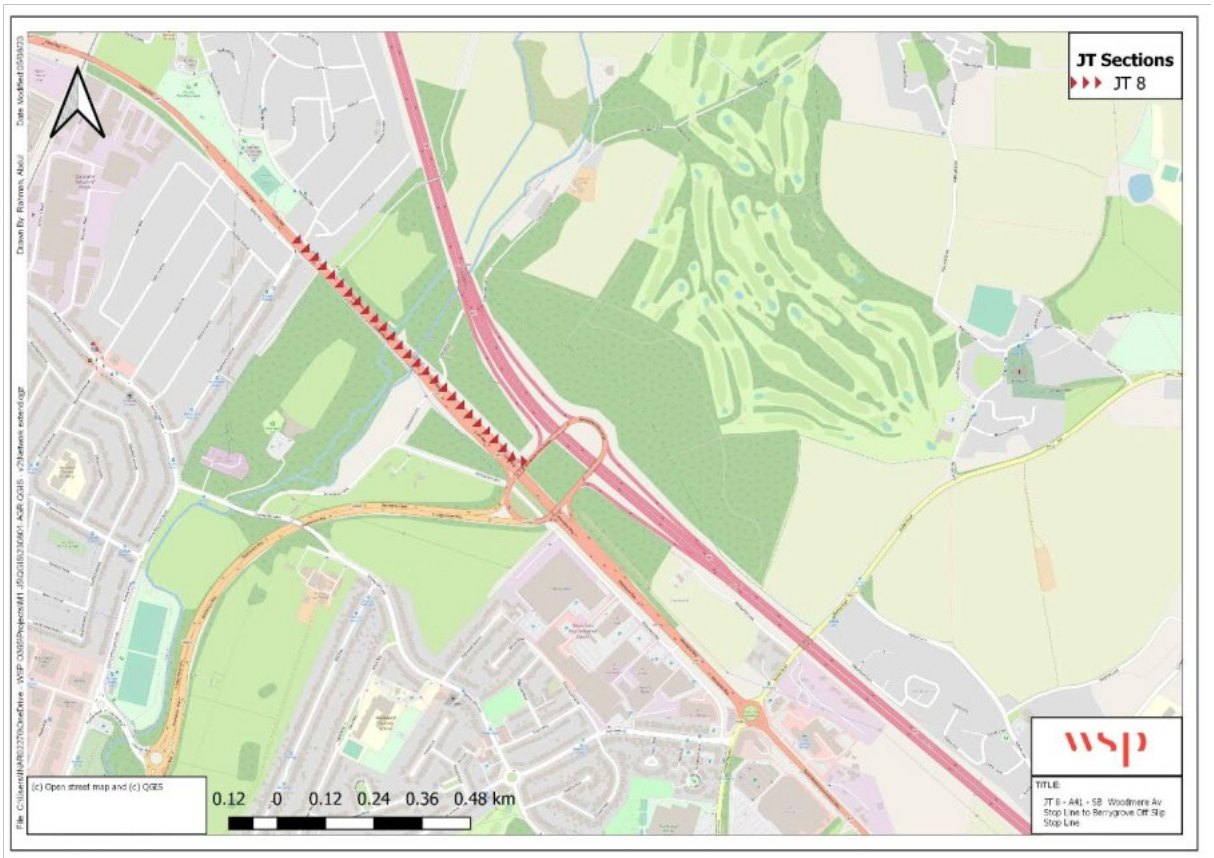
JT Sections
JT 8
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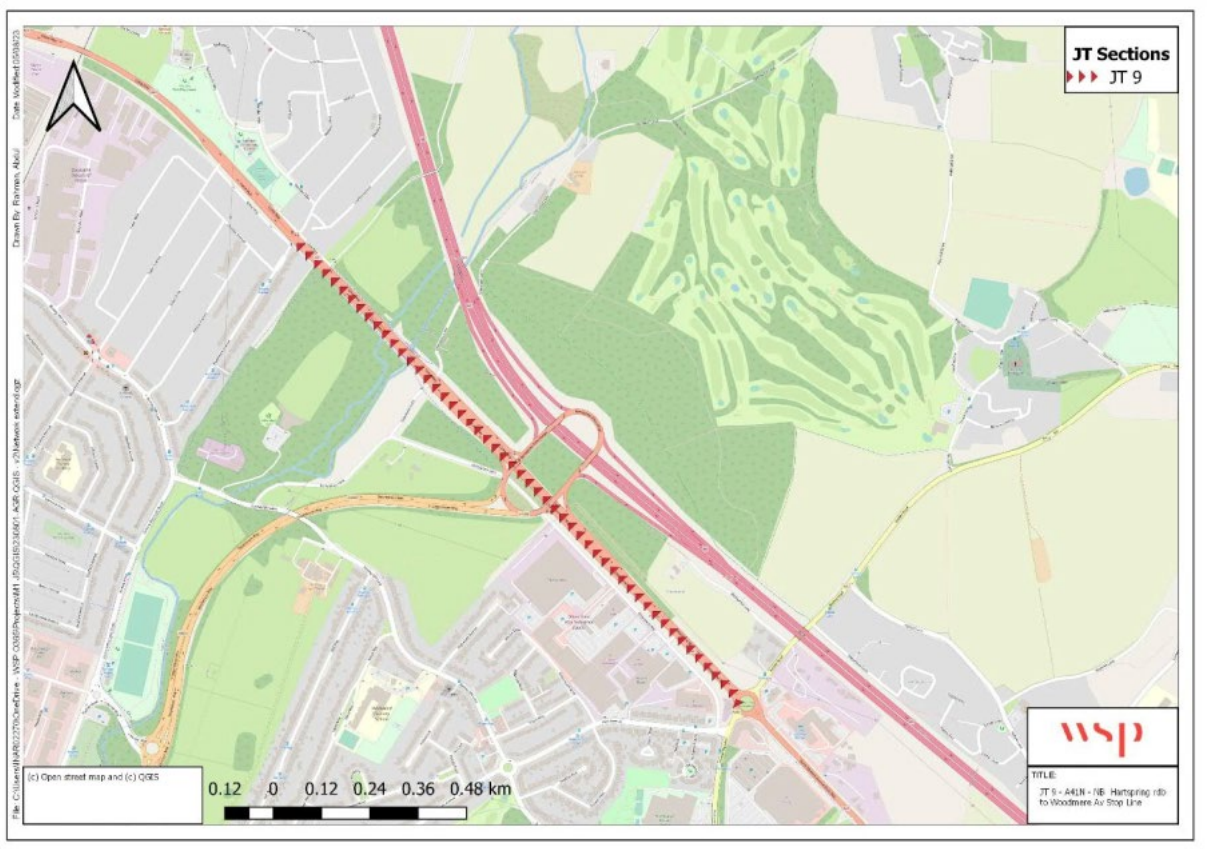
JT Sections
JT 9
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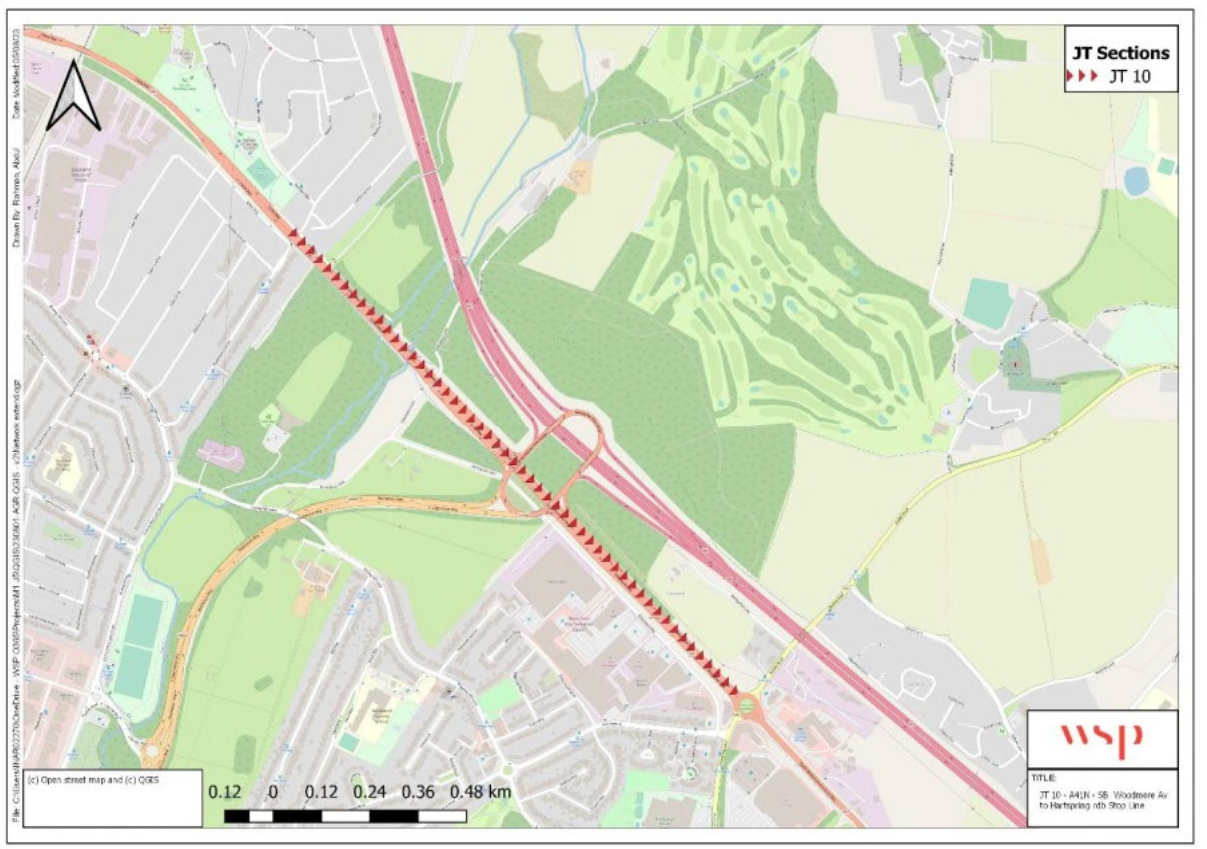
JT Sections
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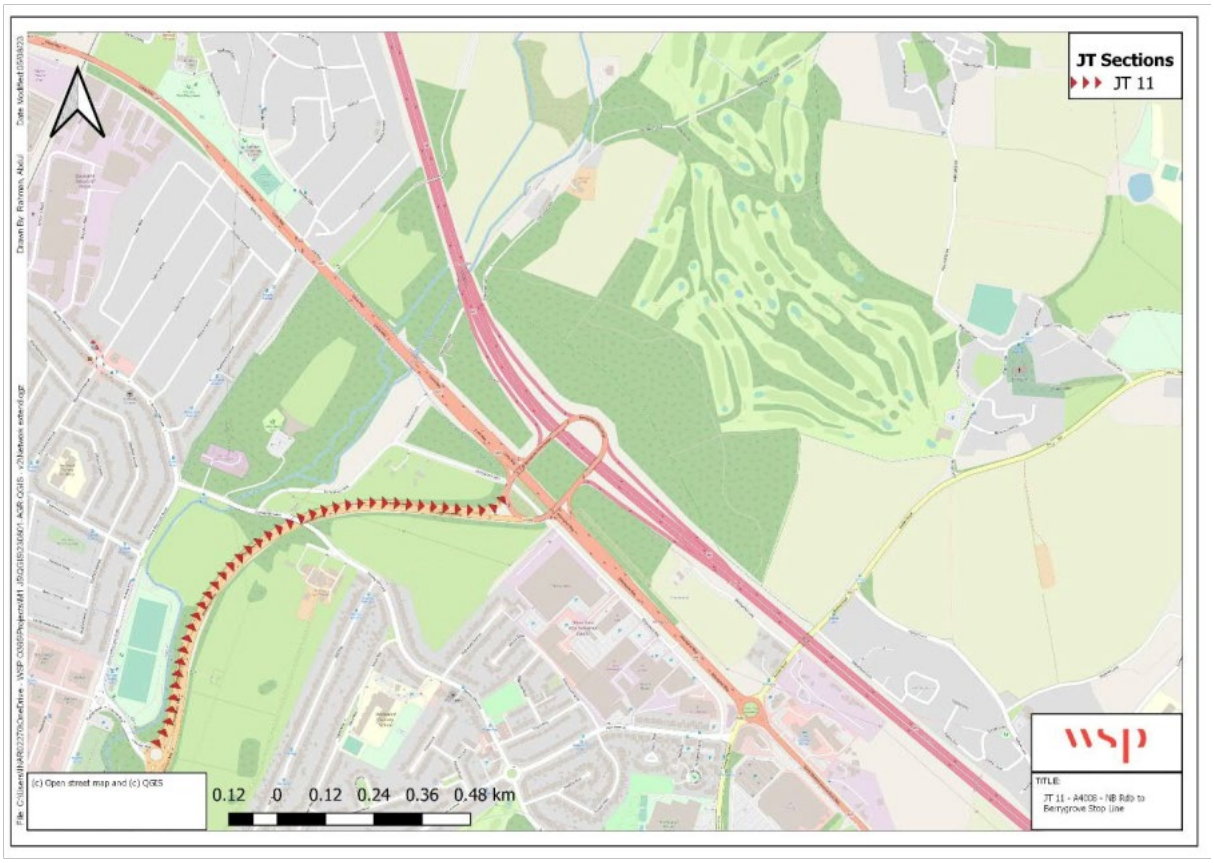
JT Sections
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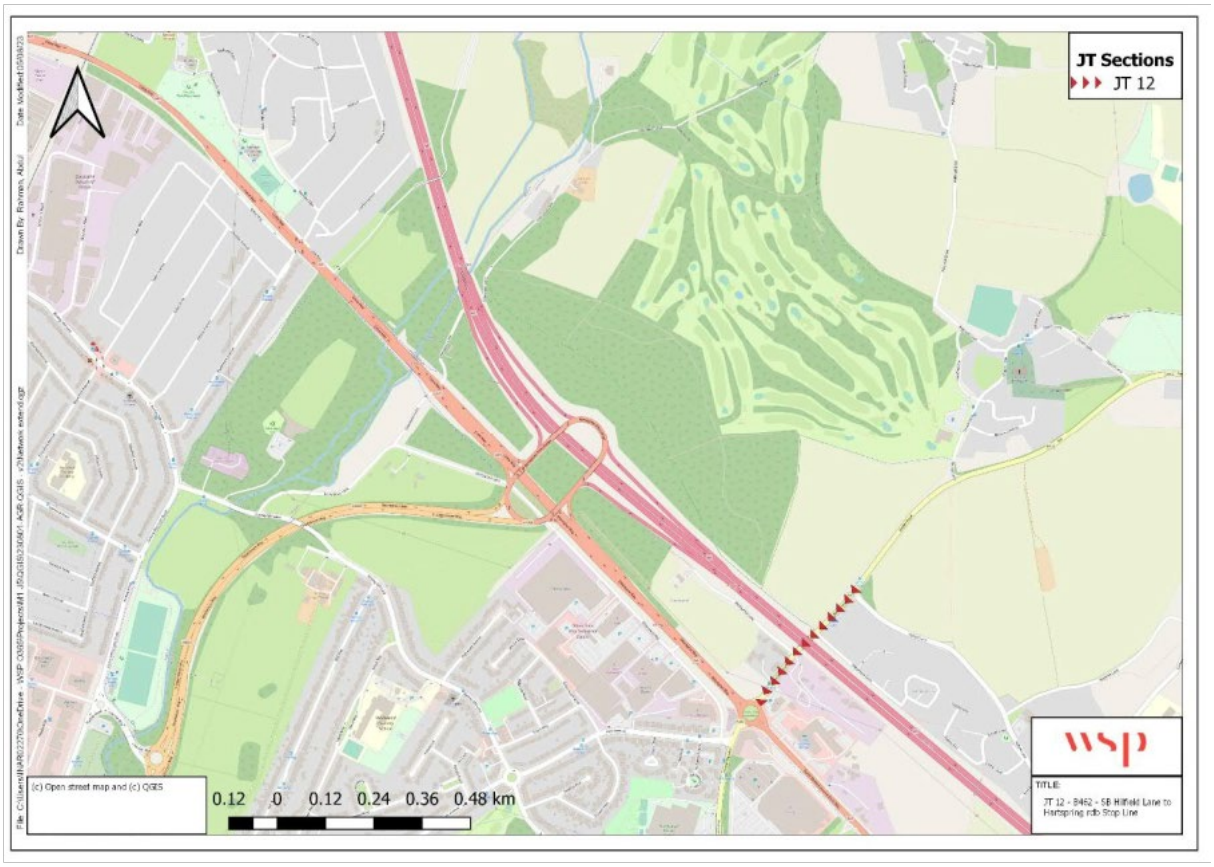
JT Sections
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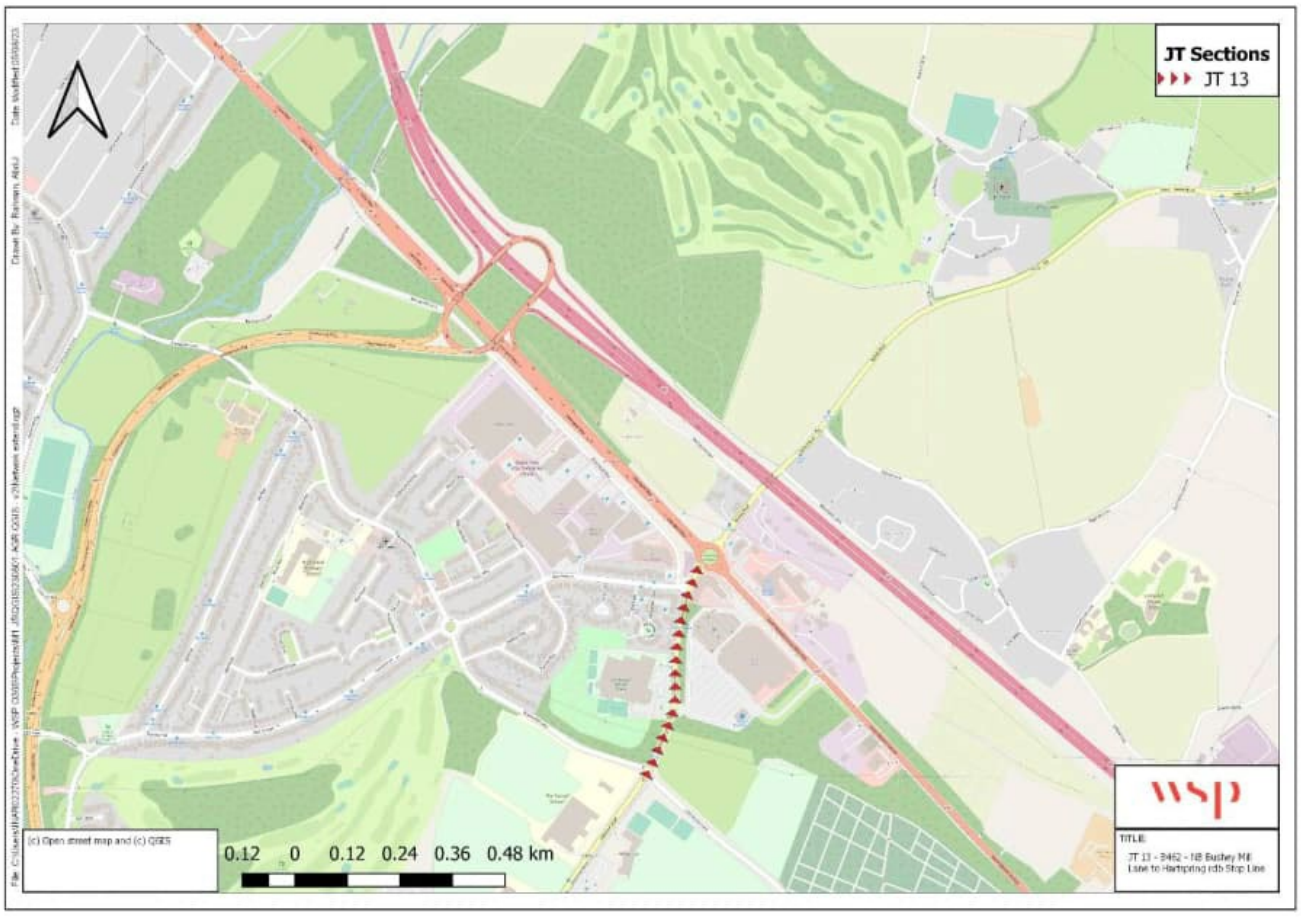
JT Sections
JT 13
0.12 0 0.12 0.24 0.36 0.48 km

Appendix C – Queue Length Graphs

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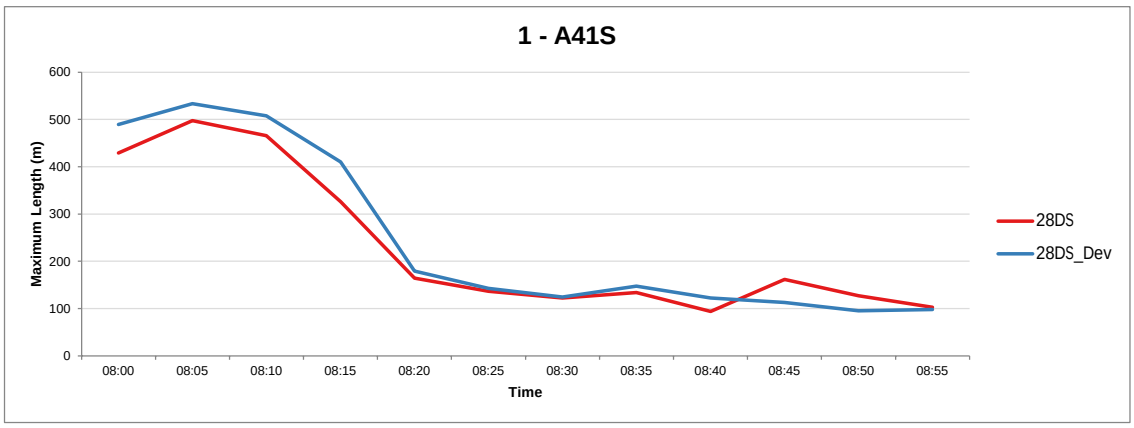
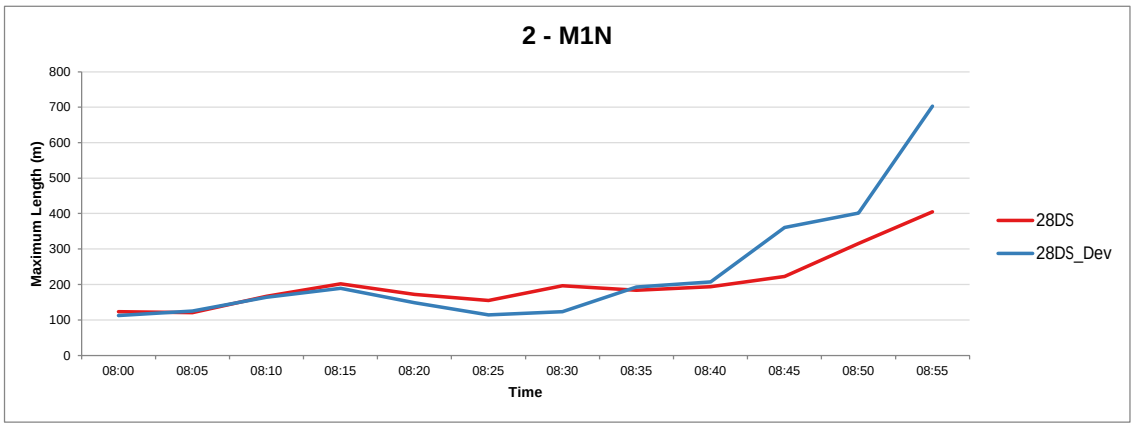
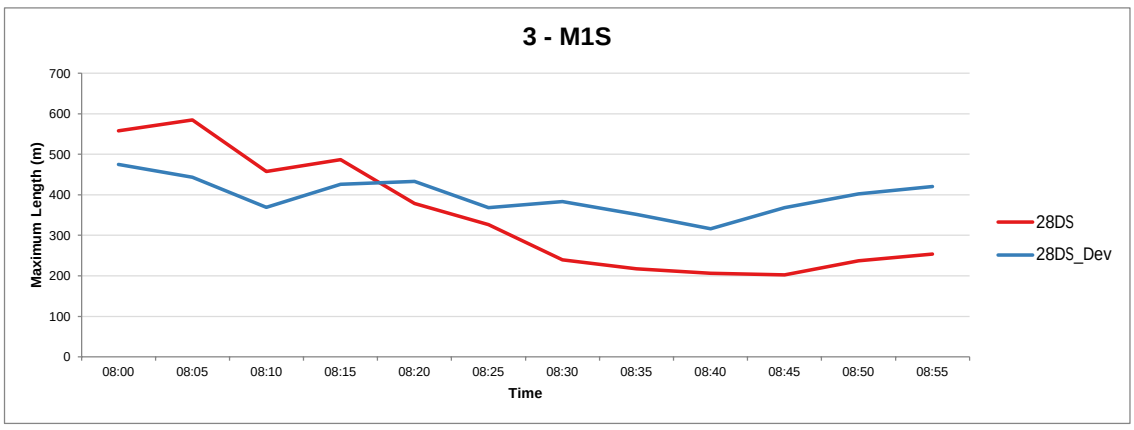
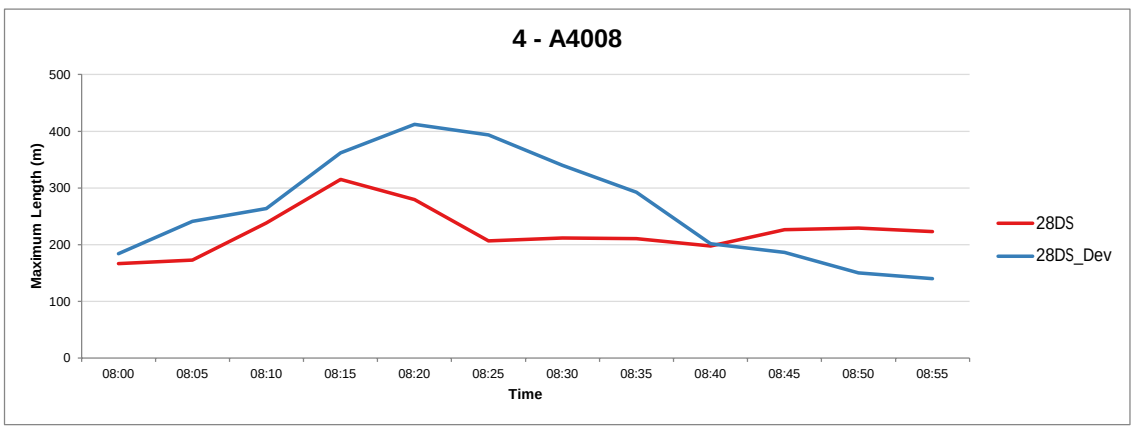
Comparison Graphs
AM

M1 Entry arms



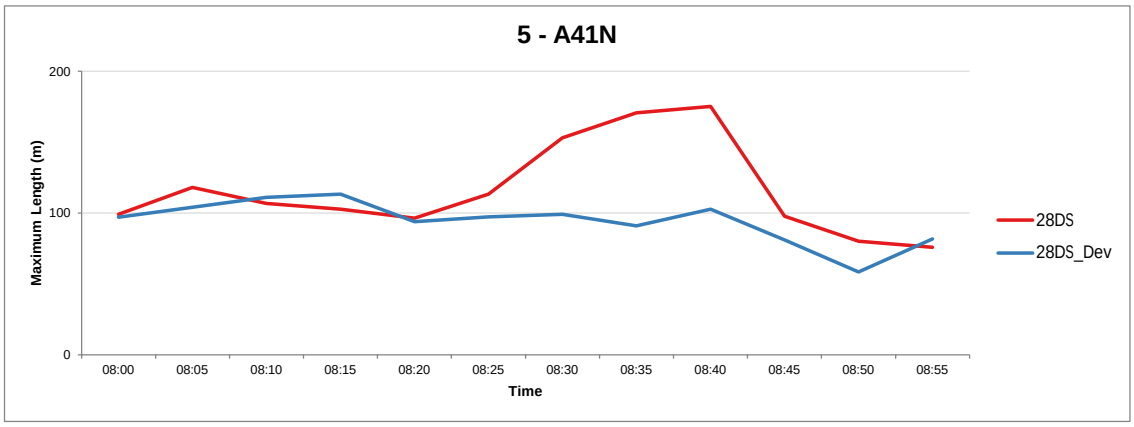






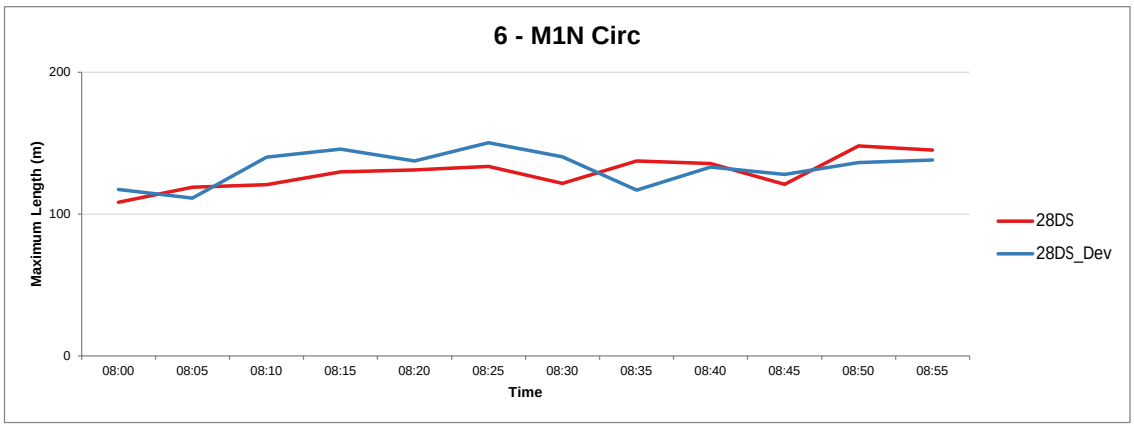
Comparison Graphs
AM

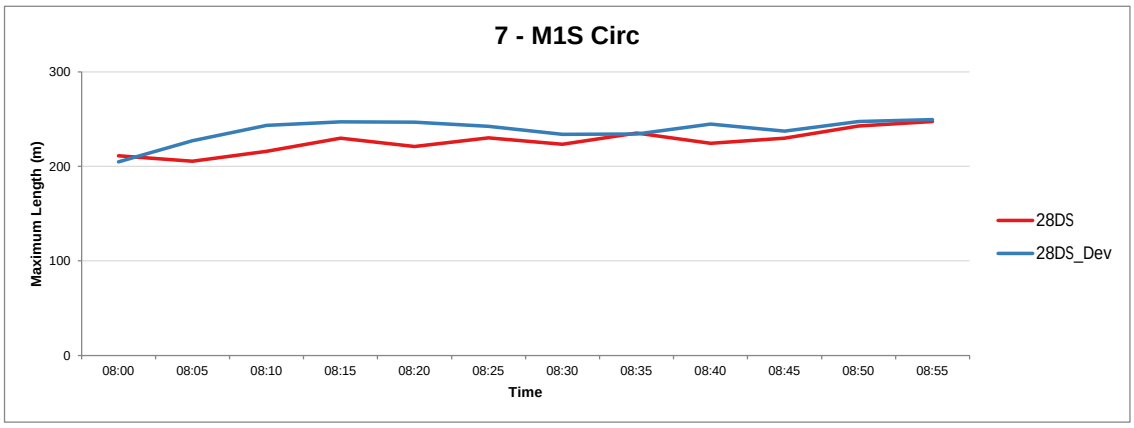
M1 Entry arms

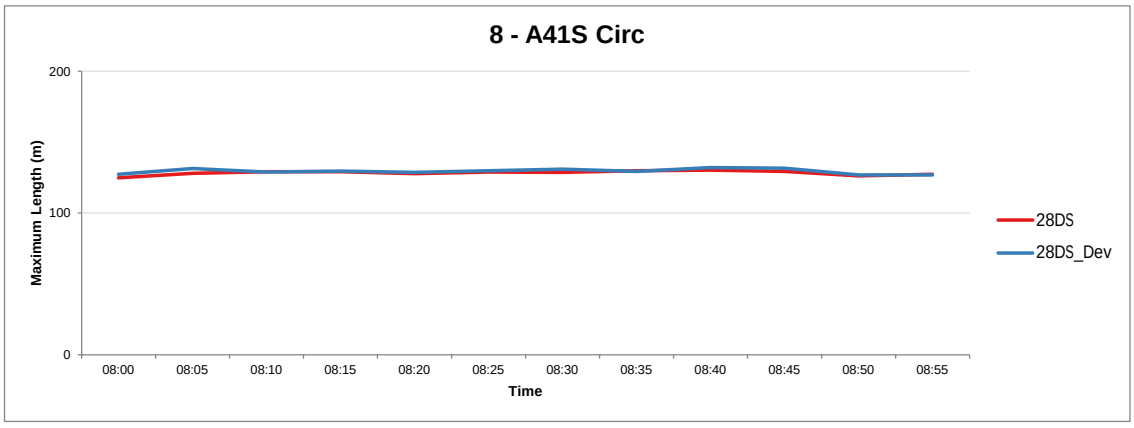


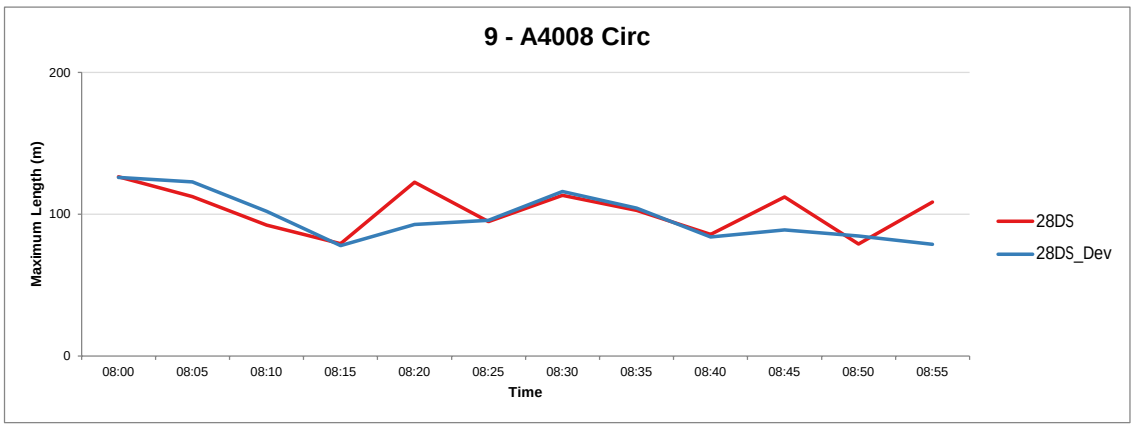
Comparison Graphs
AM

M1 Circulatory



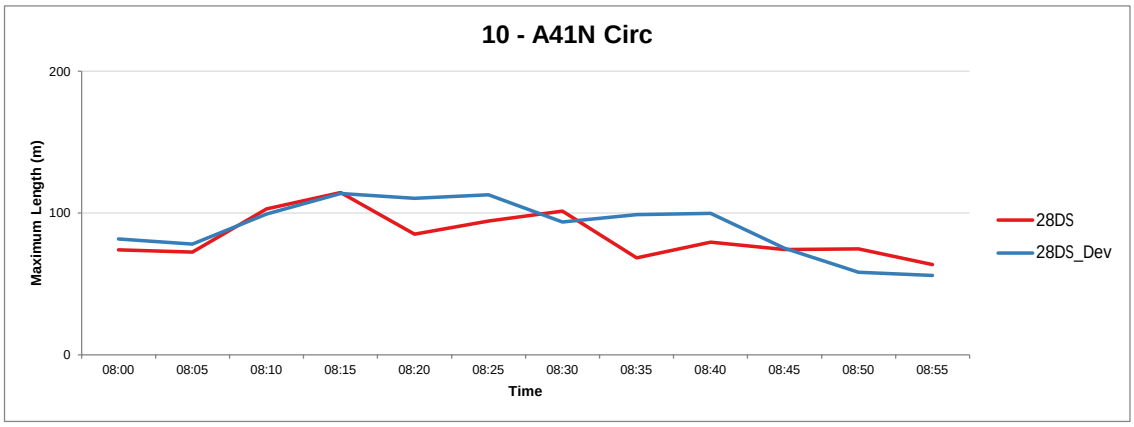






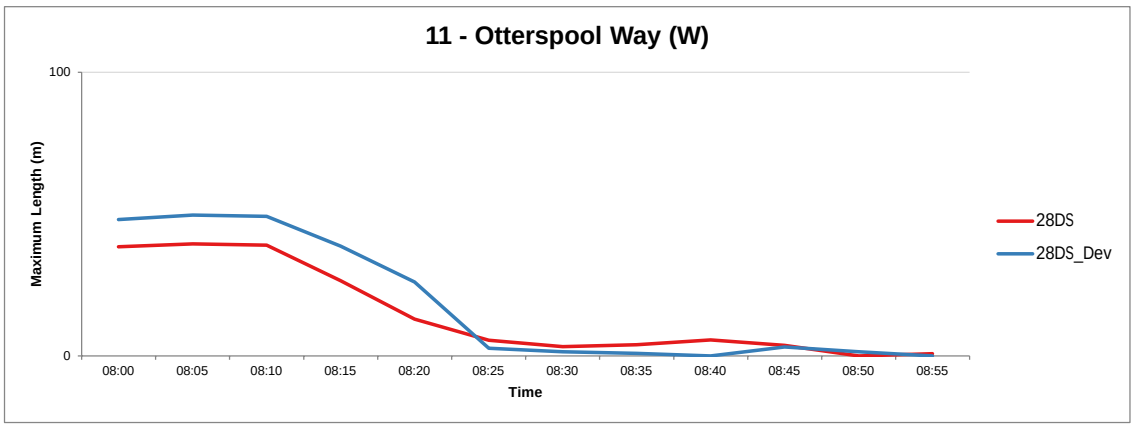
Comparison Graphs
AM

M1 Circulatory



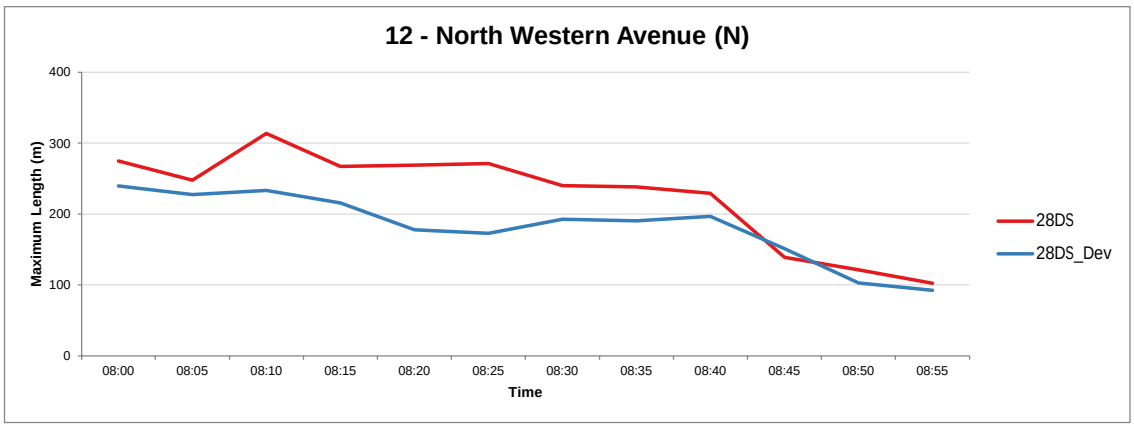
Comparison Graphs
AM

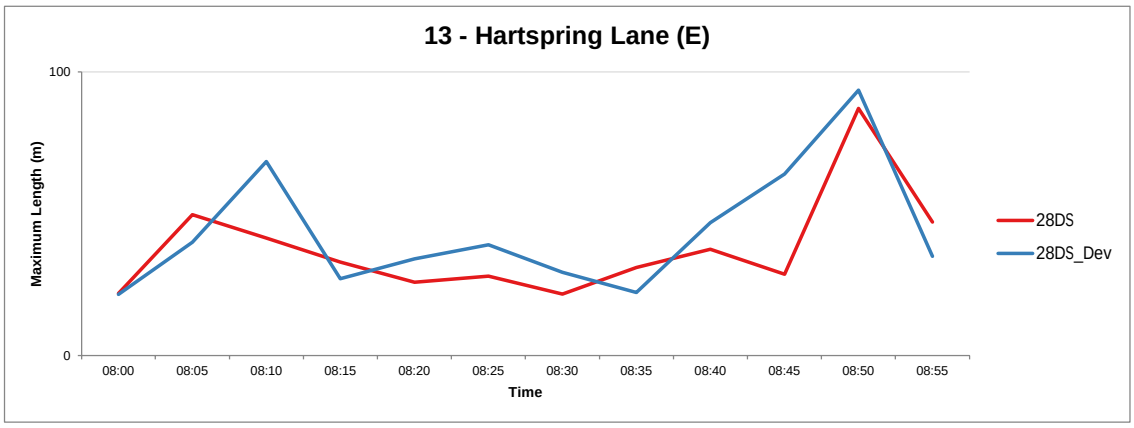
Otterspool Way

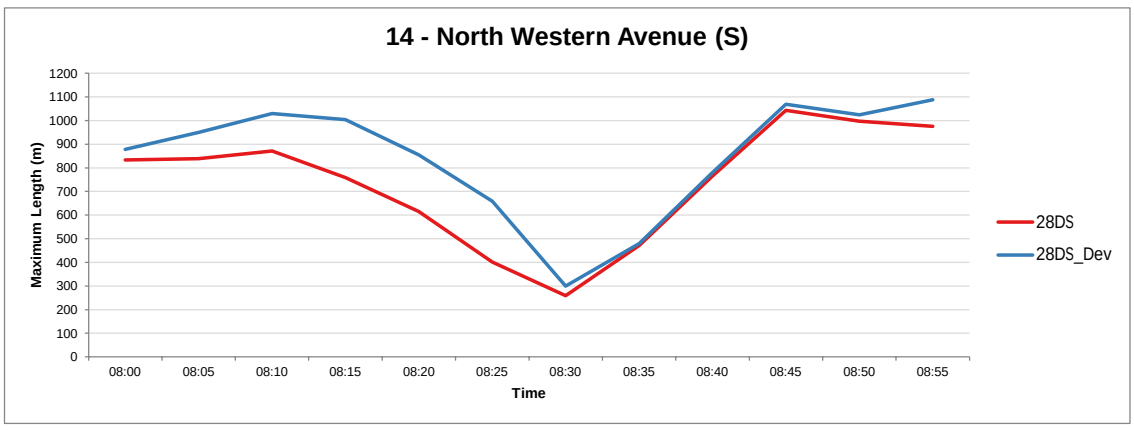


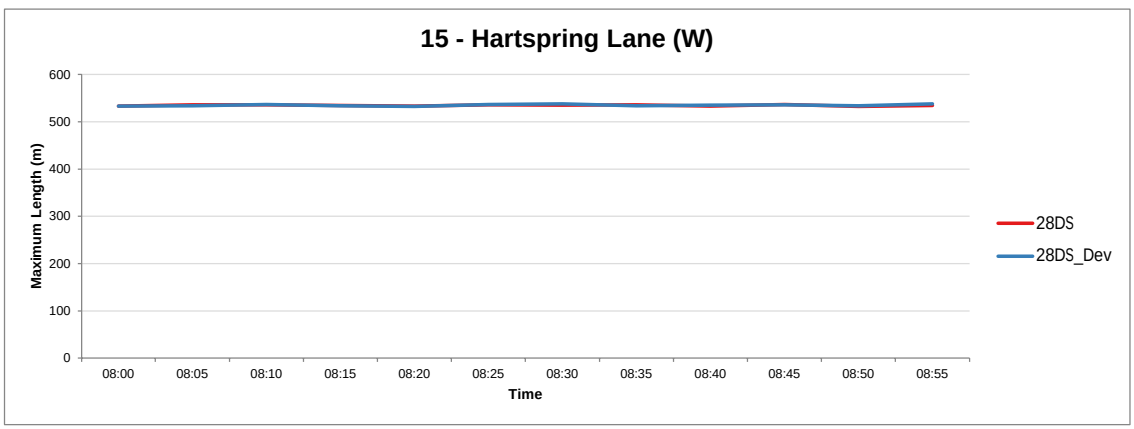
Comparison Graphs
AM

Hartspring Rbt



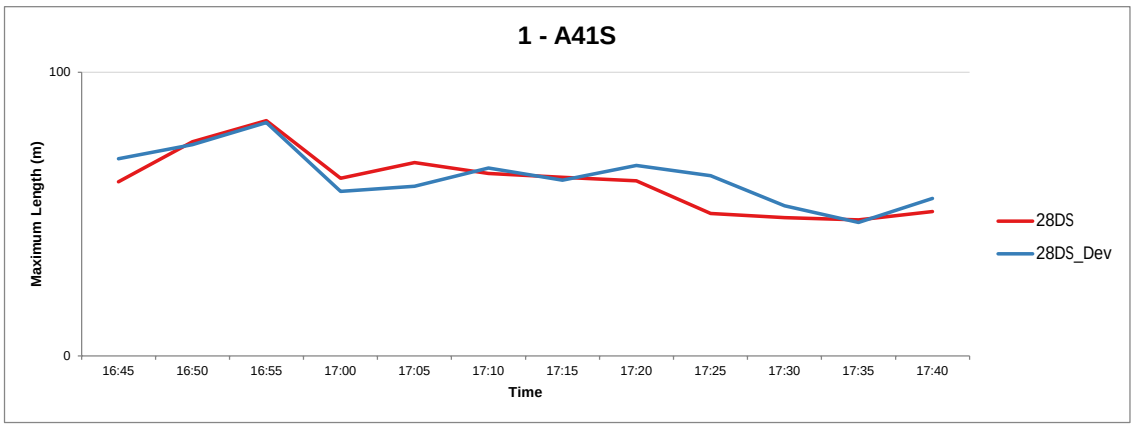


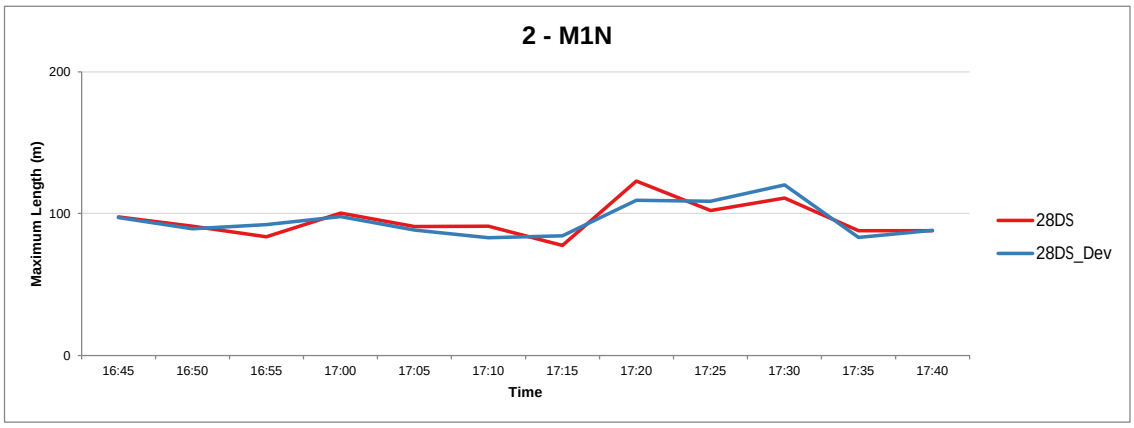


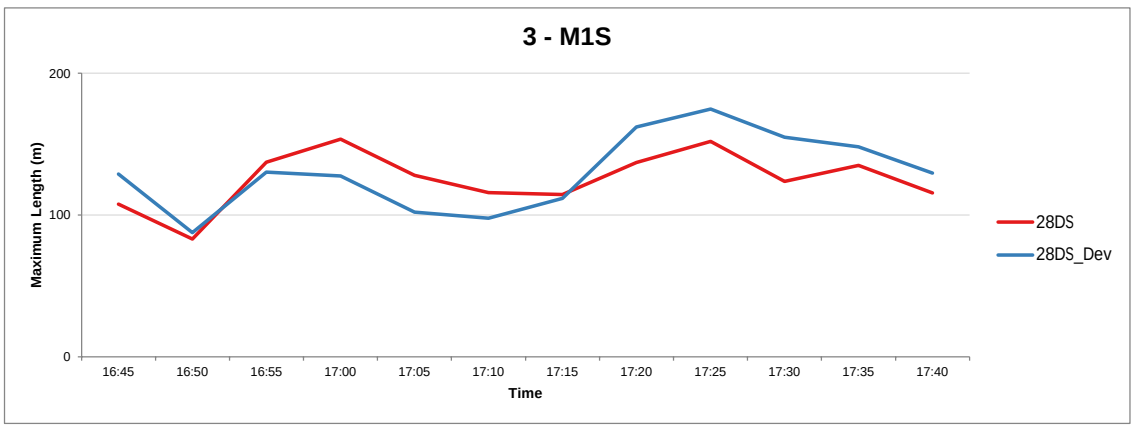


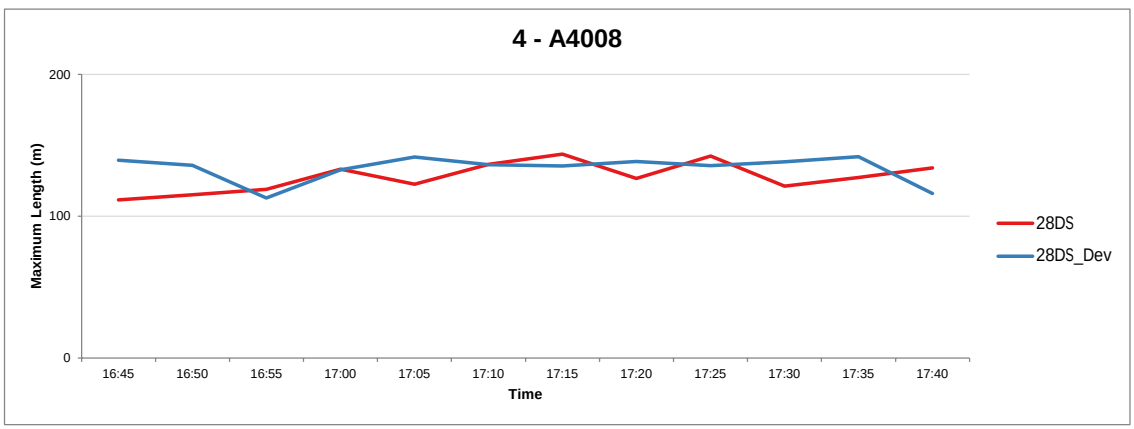
Comparison Graphs
PM

M1 Entry arms









Comparison Graphs
PM

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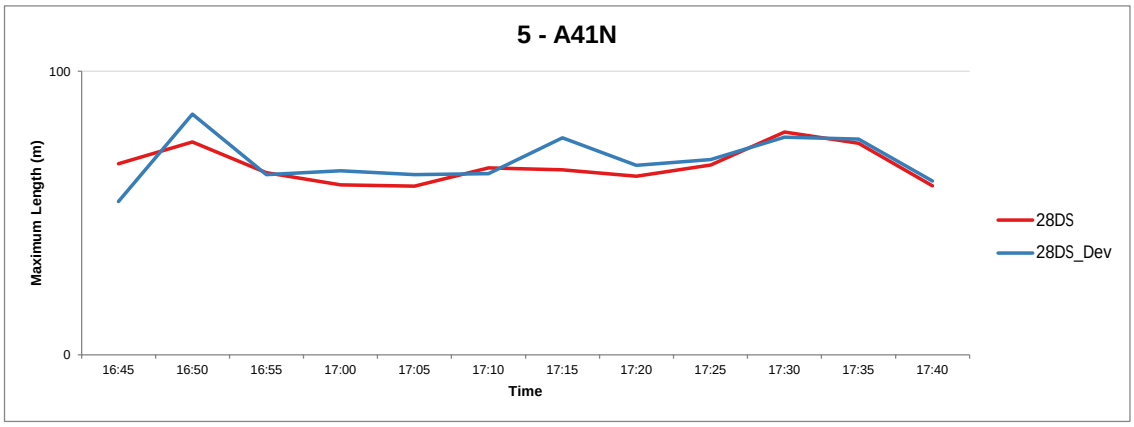
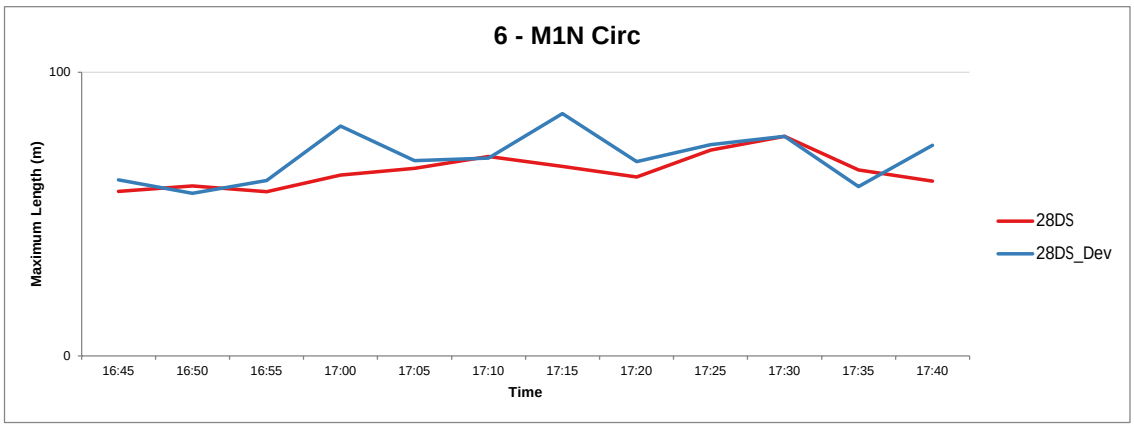
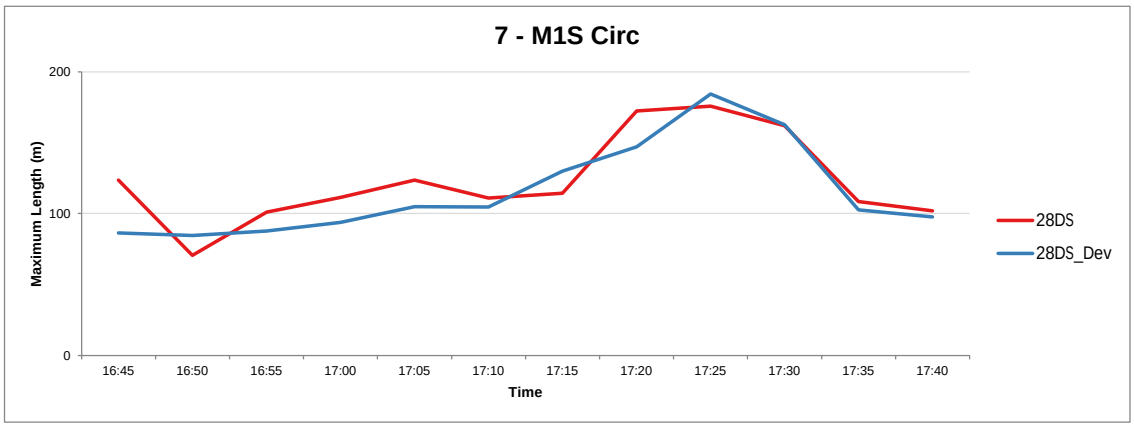
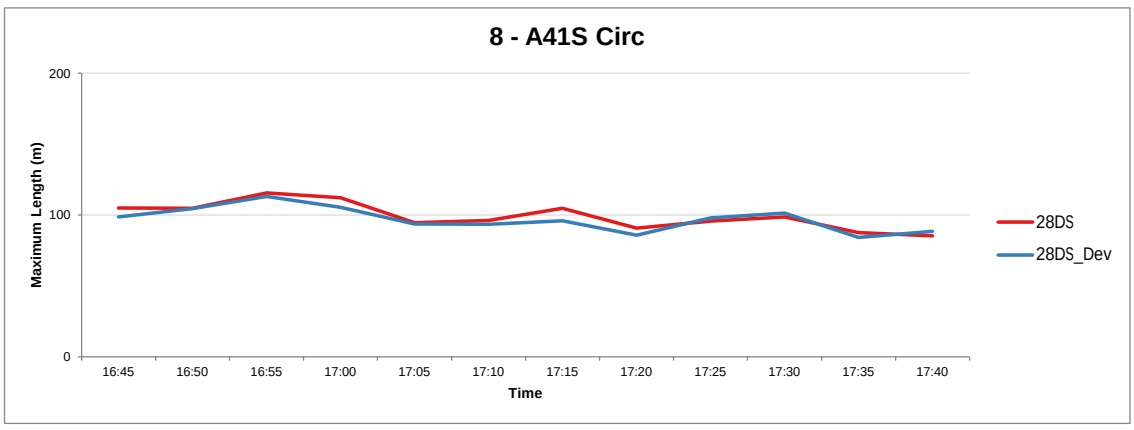


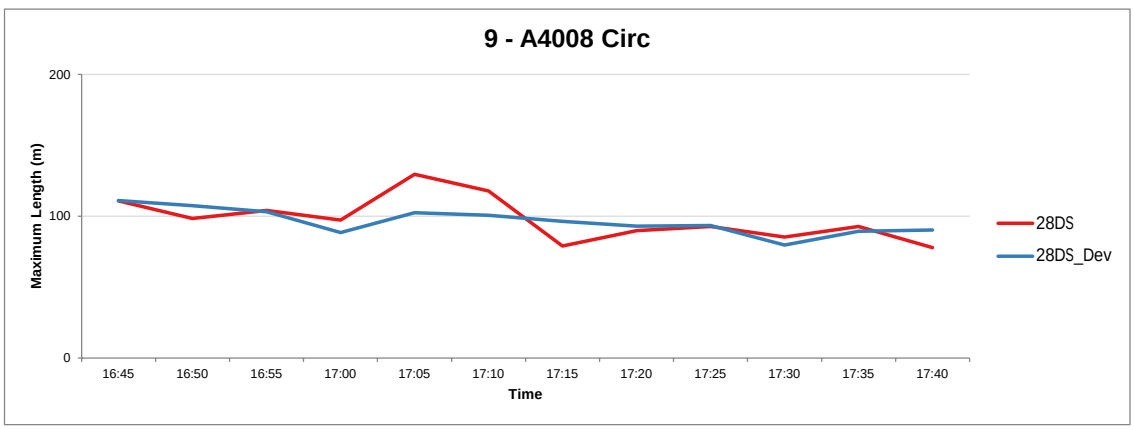
Comparison Graphs
PM

M1 Circulatory



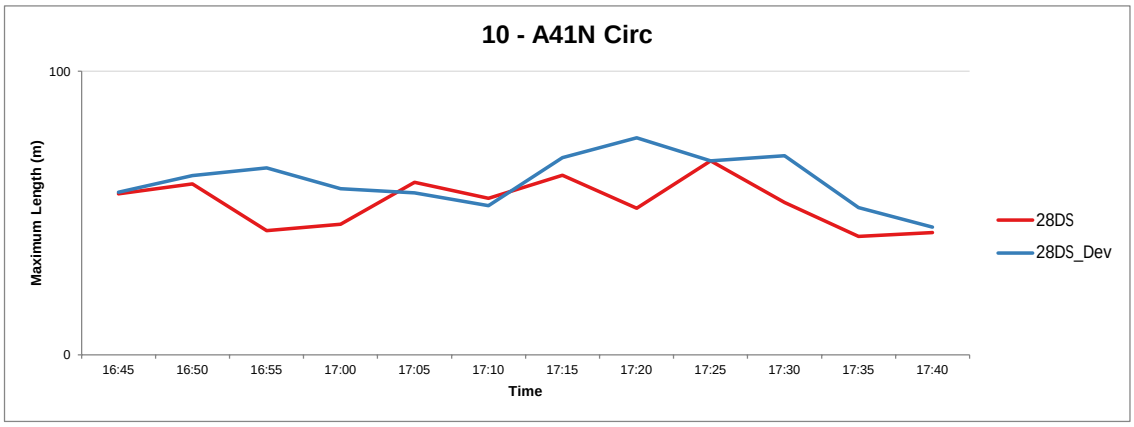






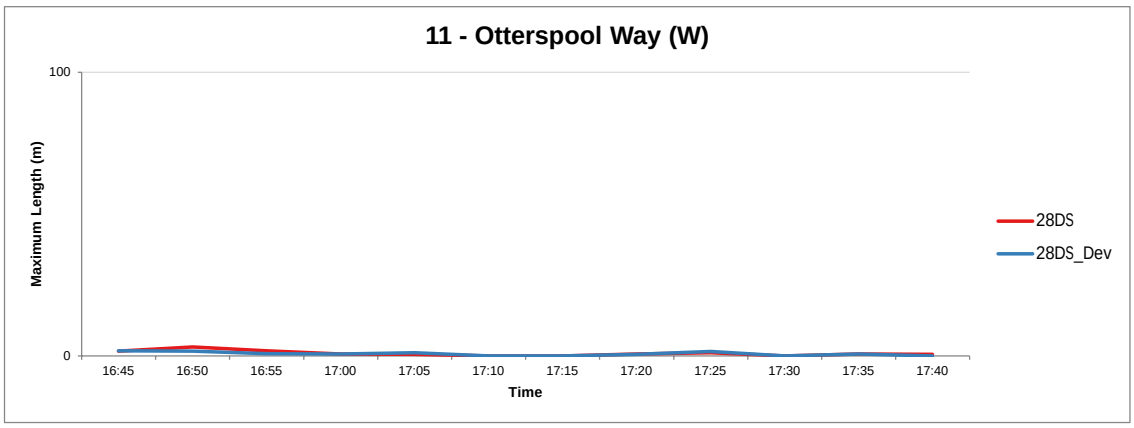
Comparison Graphs
PM

M1 Circulatory



Comparison Graphs
PM

Otterspool Way



Comparison Graphs
PM

Hartspring Rbt