

Briefing Note: Fiveways Assessment

Project	Fiveways Assessment	Reference: 47066341
Prepared by	Colin Romain, Principal Transport Planner	Status: Final
Approved by	Jonathan Crabb, Technical Director	Date: September 2015

INTRODUCTION

AECOM attended a meeting with officers of Hampshire County Council (HCC) on 4th August 2015 to discuss the Fiveways junction in Basingstoke, specifically regarding concerns that the authority have raised to date about the capacity of the junction and the relationship this could have with the delivery of c300 residential units on Plot 6a of the Manydown site.

A review of the concerns raised to date, the Transport Assessment (TA) that has been prepared on behalf of Basingstoke & Deane Borough Council (BDBC) in connection with the emerging Local Plan, and associated modelling of the Fiveways junction was discussed.

HCC and BDBC have previously confirmed that both authorities consider that overall, the TA is fit for purpose as a strategic assessment of the traffic impacts of the proposed Local Plan development, as outlined within their Position Statement.

It has been agreed with HCC however, that the traffic data upon which the modelling presented in the BDBC TA is based upon specifically for the Fiveways junction is not reliable. Whilst it was noted that existing traffic improvement works at Black Dam roundabout in Basingstoke and wider drainage improvements being implemented along the M3 are likely to be affecting traffic flows at the Fiveways junction, it was agreed that a new survey should be obtained so that a new validated baseline model could be prepared.

Surveys have therefore been conducted during September, following the start of the new school year, to update the modelling work. This will allow the findings to be presented to HCC for review and facilitate the preparation of an addendum to their existing comments prior to the EiP (Examination in Public) hearing. The method employed has therefore been agreed with HCC and is considered to be fit for purpose, at this stage of the Local Plan process.

It is acknowledged that irrespective of the findings of the traffic surveys and updated junction modelling presented in this report that follow-up surveys are likely to be required during early 2016 or thereafter once the traffic improvement works have been completed and flow conditions become stable. Depending on timing, it may be appropriate that this work is undertaken to support any planning application that subsequently comes forward for the site at Plot 6a and this may be able to utilise HCC's SYSTRA Traffic Model, once it has been completed and is available.

CONTEXT

The new traffic survey data has been used to develop a validated baseline model of the Fiveways junction (using Linsig v3). This model has then been taken forward to test 'without' and 'with' Plot 6a development related traffic being added into the model, for the future year scenario.

Design alterations, as discussed with HCC, have been incorporated into the model, to consider the relative benefits of introducing amendments to the junction configuration in a manner acceptable to HCC.

The method for undertaking the work outlined above has been discussed and agreed in advance with HCC. As such, a Method Note was prepared (see **ANNEX A**) and reference to this, where appropriate, is made within this report.

NEW SURVEY DATA

HCC's survey team conducted traffic surveys at the Fiveways junction on Wednesday 9th September 2015. The surveys recorded:

- Classified turning counts at the junction, which recorded vehicles by class and movement, between the hours of 07:00 and 19:00
- Queue surveys on all four arms of the junction, by lane and number of vehicles, between the hours of 07:00 and 10:00 in the morning and 16:00 and 19:00 in the afternoon
- Pedestrian and cycle movements, including the number of pedestrians crossing at the junction and the number of cyclists using the junction as well as crossing at the junction
- The utilisation of Advanced Stop Lines (ASLs) which are provided at the junction for cyclists
- The obstruction and utilisation of 'keep clear' markings on the approach roads to turn into or out of private drives during the survey period

In addition to the above, members of the AECOM team visited the junction during the AM (08:00-09:00) and PM (17:00-18:00) peak hours to record supplementary data, to inform the junction modelling. The information recorded is as follows:

- Saturation flows
- Green times
- Cycle times

A topographical survey was also undertaken by a specialist third party company and Personal Injury Accident data for most recent five years for the junction and approaches was obtained.

ANALYSIS OF THE SURVEY DATA

Through liaison with HCC, it has been identified that the traffic data used within the BDBC TA at the Fiveways junction utilises synthesised traffic count information to approximate turning movements and that this has resulted in the junction modelling of Fiveways being unreliable. Additionally, queue data was not available to validate the junction model in the TA making the onward application of it more difficult, in the context of considering improvement and / or development options.

A comparison of the new survey data, against the synthesised information presented in the BDBC TA, has been undertaken and is summarised below at **TABLE 1**.

TABLE 1: HCC (2015) Data compared against synthesised BDBC TA Data

Approach	AM (0800-0900)			PM (1700-1800)		
	HCC (2015)	BDBC TA	Difference	HCC (2015)	BDBC TA	Difference
Buckskin Lane (N)	422	541	-119	661	1352	-691
Pack Lane (E)	256	425	-169	332	505	-173
Kempshott Lane (S)	694	1133	-439	423	804	-381
Pack Lane (W)	300	325	-25	226	238	-12
Combined	1672	2424	-752	1642	2899	-1257

The new survey data collected in September 2015 has identified that the observed traffic flows at the Fiveways junction are considerably lower than those which were synthesised and reported in the BDBC TA. The flows recorded by HCC are lower on all approaches to the junction, in both the AM and PM peak hours, with the total recorded differences being 752 and 1,257 respectively¹.

The observed traffic data recorded by HCC is illustrated at **ANNEX B** of this note. **TABLE 2** below however, provides a summary of the findings, based on on site observations and the data recorded.

TABLE 2: Summary of Survey Data Analysis

Data	AM (0800-0900)	PM (1700-1800)
Queue Surveys	Queues observed were considered to be reasonably 'typical' for the junction, based on local knowledge of the area. The surveys indicated the following queues were the typical maximums observed:	
	Buckskin Lane N: 46 Pack Lane E: 22 Kempshott Lane S: 32 Pack Lane W: 13	Buckskin Lane N: 47 Pack Lane E: 29 Kempshott Lane S: 19 Pack Lane W: 12
Pedestrians	Pedestrian demand was observed to be reasonably limited on most arms of the junction. The surveys indicated the following pedestrian demand at the crossings:	
	Buckskin Lane N: 4 Pack Lane E: 2 Kempshott Lane S: 24 Pack Lane W: 40 Cycle Link (see below): 9	Buckskin Lane N: 7 Pack Lane E: 2 Kempshott Lane S: 12 Pack Lane W: 2 Cycle Link (see below): 3
Cyclists	Cyclists were also observed to utilise the crossings at the junction, although the number of movements were very limited. The surveys indicated the following cyclist demand at the crossings:	
	Buckskin Lane N: 1 Pack Lane E: 0 Kempshott Lane S: 5 Pack Lane W: 2 Cycle Link (see below): 7	Buckskin Lane N: 2 Pack Lane E: 7 Kempshott Lane S: 2 Pack Lane W: 0 Cycle Link (see below): 1

¹ All traffic flows presented in this note are expressed as PCUs (Passenger Car Units), unless otherwise stated

Data	AM (0800-0900)	PM (1700-1800)
Cycle Link ²	Very limited demand was observed on the 'cycle link' at the junction. Of particular note, when this stage is called based on detected presence on the approach to the stopline, the other traffic approaches are given a red signal. Subsequently, the staging of the junction then reverts to Pack Lane W (with each arm being staged separately and running in anti-clockwise sequence around the junction). The stage was observed to operate following Kempshott Lane S, meaning that the junction would essentially double cycle with Pack Lane W and Kempshott Lane S both receiving two green periods, but Pack Lane E and Buckskin Lane N only receiving a single green period within two effective cycle periods. The surveys indicated the following demand on the cycle link:	
	Pedestrians: 9 Cyclists: 7 Additionally, it was noted in the AM peak that whilst the presence of cyclists on the link caused the stage for this approach to be called, none of the cyclists waited for the green signal and rode through the junction. Instead, all cyclists either joined Pack Lane W or crossed the approach(es) and continued on their journeys. The cycle link stage was still called however, essentially creating an all red stage at the junction	Pedestrians: 3 Cyclists: 1 In the PM peak, the cyclist was observed to wait for the green signal and then ride through the junction
ASL	Limited demand for the ASLs was observed on site, with the surveys indicating the following use:	
	Buckskin Lane N: 0 Pack Lane E: 0 Kempshott Lane S: 3 Pack Lane W: 0 No cyclists were recorded in the AM peak on Buckskin Lane N or Pack Lane E. Six cyclists were observed to approach the junction on Pack Lane W, none of which used the ASL. Three cyclists approached the junction on Kempshott Lane S, all of which utilised the ASL (with two travelling ahead and one turning right)	Buckskin Lane N: 0 Pack Lane E: 0 Kempshott Lane S: 2 Pack Lane W: 0 Four cyclists were recorded on Buckskin Lane N, one on Pack Lane E, three on Kempshott Lane S and two on Pack Lane W in the PM peak. None of the cyclists on Buckskin Lane N, Pack Lane E or Pack Lane W used the ASLs, whilst two of three cyclists on Kempshott Lane S used that ASL (both of which turned right)
Keep Clear	Two Keep Clears are provided on the Buckskin Lane N approach, three are provided on the Kempshott Lane S approach and two are provided on the Pack Lane W approach	
	The Keep Clears were observed to be obstructed in the AM peak, as follows, where the first clear is numbered as the one closest to the stopline on the approach:	The Keep Clears were observed to be obstructed in the PM peak, as follows, where the first clear is numbered as the one closest to the stopline on the approach:

² A fifth arm is provided at the junction, with a dedicated signal head for cyclists. Detection is provided on the approach to this stopline, located between Buckskin Lane N and Pack Lane W. When the signal is called, all other traffic approaches receive a red signal

Data	AM (0800-0900)	PM (1700-1800)
	Buckskin Lane N 1: 3 Buckskin Lane N 2: 3 Kempshott Lane S 1: 1 Kempshott Lane S 2: 2 Kempshott Lane S 3: 2 Pack Lane W 1: 3 Pack Lane W 2: 2 The Keep Clears were observed to be used to enter / exit the private driveways that they serve in the AM peak, as follows: Buckskin Lane N 1: 0 Buckskin Lane N 2: 0 Kempshott Lane S 1: 0 Kempshott Lane S 2: 0 Kempshott Lane S 3: 0 Pack Lane W 1: 0 Pack Lane W 2: 1 As shown above, only one Keep Clear was used during the AM Peak (for a vehicle to enter a driveway). No vehicles were observed to exit driveways using the Keep Clears	Buckskin Lane N 1: 2 Buckskin Lane N 2: 3 Kempshott Lane S 1: 0 Kempshott Lane S 2: 0 Kempshott Lane S 3: 0 Pack Lane W 1: 1 Pack Lane W 2: 2 The Keep Clears were observed to be used to enter / exit the private driveways that they serve in the PM peak, as follows: Buckskin Lane N 1: 0 Buckskin Lane N 2: 1 Kempshott Lane S 1: 0 Kempshott Lane S 2: 1 Kempshott Lane S 3: 0 Pack Lane W 1: 0 Pack Lane W 2: 0 As shown above, only two Keep Clears were used during the PM peak (for single vehicles to enter two respective driveways). No vehicles were observed to exit driveways using the Keep Clears
Road Safety	Personal Injury Accident (PIA) data has been obtained from HCC for the most recently available five year period, between 1st August 2010 and 31st July 2015. There have been no reported accidents at the Fiveways junction, during this five year period. One accident was reported on the Kempshott Lane approach, when a motorcyclist collided with a cyclist who was crossing the road. The incident occurred during the late afternoon, but at the time of year, would have been in dark conditions. This resulted in slight severity injuries. One accident was reported away from the junction, on the Pack Lane E approach when a cyclist travelling on the footway collided with a vehicle emerging from a private driveway. The incident occurred during the early evening, but at the time of year, would have been in daylight conditions. This resulted in slight severity injuries. Based on the information reviewed, there is no evidence to suggest that there is an existing road safety issue at the Fiveways junction.	

ESTABLISHMENT OF THE BASELINE MODEL

The observed traffic data has been input into the LINSIG (v3) modelling software to establish a baseline model of the junction. The input data has been carefully reviewed and calibrated with a view to establishing a validated model, whereby the modelled outputs (and in particular, queue levels) are representative of the observed situation. The summary results from the 2015 Base model are presented below at **TABLE 3** and the associated LINSIG output file is included at **ANNEX C**. For reference, a plan showing the existing layout of the Fiveways junction is also included at **ANNEX C**.

TABLE 3: 2015 Base Model Results

Approach	AM (0800-0900)			PM (1700-1800)		
	DoS (%) ³	MMQ ⁴	Obs Q ⁵	DoS (%)	MMQ	Obs Q
Buckskin Lane (N)	114.8	44.7	46	106.5	47.8	47
Pack Lane (E)	99.7	15.4	22	102.6	21.4	29
Kempshott Lane (S)	97.7	30.2	32	102.0	25.0	19
Pack Lane (W)	95.7	15.2	13	96.7	12.7	12
Cycletime (secs)	112			110		
PRC ⁶ (%)	-27.6			-18.3		

Based on the modelled results presented above, it is considered that the base model reflects the current operation of the Fiveways junction with modelled queues and observed queues being very similar. A plan illustrating the queue lengths on the approaches is provided at **ANNEX D** which shows that:

- Buckskin Lane N – the queue on this approach is typically around 350m in length in the AM peak and 400m in the PM peak which means that the back of the queue is generally around the Chiltern Way junction. The queue was observed at some times to extend around 150-200m beyond this however, during both peak hours, taking the back of the queue to around the signal crossing and double mini roundabout junction
- Pack Lane E – the queue on this approach is typically around 120m in length in the AM peak and 150m in the PM peak
- Kempshott Lane S – the queue on this approach is typically around 240m in the AM peak and 180m in the PM peak which means that the back of the queue is generally beyond the Kestrel Road junction in both peak hours
- Pack Lane W – the queue on this approach is typically around 100-120m in both peak hours which means that the back of the queue is generally around the edge of the built area on Pack Lane where the 30mph speed limit restriction begins

Of note, the junction is shown to be operating in excess of its capacity threshold in both peak hours, with PRC values of -27.6% and -18.3% respectively. In the AM peak, one approach (Buckskin Lane N) is shown to be over capacity and in the PM peak, three approaches (Buckskin Lane N, Pack Lane E and Kempshott Lane S) are each shown to be over capacity, although to a lesser extent. This is considered to be reflective of the operation of the junction, with vehicles regularly observed to push through the junction at the end of green periods, utilising the amber safety clearance time as well as red time in a number of cases.

ASSESSMENT OF FUTURE SITUATION

Two future year scenarios have been incorporated into the junction model, as agreed with HCC through the preparation of the Method Note. These scenarios are as follows:

- Future Year Do Minimum – this scenario represents the ‘base’ case in the future year, allowing for forecast background traffic growth derived from TEMPRO and added into the model

³ DoS – Degree of Saturation, by approach: 90% generally taken as most efficient level of saturation. 100% represents theoretical capacity

⁴ MMQ – Mean Max Queue

⁵ Obs Q – Observed Queue

⁶ PRC – Practical Reserve Capacity, for the junction as a whole: 90% used as basis for calculation. 0% indicates junction operating effectively. Positive values indicate spare capacity and that the junction could operate more effectively. Negative values indicate the junction exceeds its capacity

- Future Year Do Something – this scenario takes forward the Do Minimum traffic flows, but adds on the traffic forecast to be generated by 300 units at Plot 6a. The traffic generation has been calculated utilising the existing trip rates employed within the BDBC TA (0.487: AM and 0.516: PM, trips per unit), without any further adjustment. The distribution of the traffic has been estimated using census data and allows for splits between Pack Lane West, Dorset Crescent and Pack Lane East to be incorporated, whereby the Pack Lane East traffic is assumed to pass through the Fiveways junction. A summary of the trip generation and distribution calculations is presented at **ANNEX E**

The future year in all cases has been taken as 2021, which based upon the information presented in the 'BDBC Local Plan Examination in Public: Hearing Statement – Issue 5 – Manydown (Policy SS3.10)' is estimated to represent the likely opening year of development at Plot 6a, based on the housing trajectory information. Therein, Plot 6a is shown to be complete in Year 7 of the 15 year programme up to 2029.

The two scenarios have subsequently been included within the LINSIG model discussed previously, with the outputs presented below at **TABLES 4** and **5** for the Do Minimum and Do Something scenarios respectively.

TABLE 4: 2021 Do Minimum Model Results

Approach	AM (0800-0900)		PM (1700-1800)	
	DoS (%)	MMQ	DoS (%)	MMQ
Buckskin Lane (N)		51.4	109.9	58.3
Pack Lane (E)	104.3	19.6	104.2	23.9
Kempshott Lane (S)	101.1	37.4	104.9	30.2
Pack Lane (W)	98.9	17.5	100.1	14.9
Cycletime (secs)	112		110	
PRC (%)	-31.5		-22.1	

TABLE 5: 2021 Do Something Model Results

Approach	AM (0800-0900)		PM (1700-1800)	
	DoS (%)	MMQ	DoS (%)	MMQ
Buckskin Lane (N)	123.0	60.5	115.5	76.2
Pack Lane (E)	108.4	24.2	111.3	34.5
Kempshott Lane (S)	103.1	43.5	112.4	45.2
Pack Lane (W)	127.1	61.5	120.8	38.2
Cycletime (secs)	112		110	
PRC (%)	-41.2		-34.3	

The model results show that with the addition of forecast background traffic growth in the Do Minimum scenario that the junction is predicted to operate further beyond capacity, with increases in the DoS and queuing levels. In this case, the practical reserve capacity of the junction would extend from -27.6 (Base) to -31.5 (Do Minimum) in the AM peak and from -18.3 (Base) to -22.1 (Do Minimum).

The introduction of forecast development traffic associated with Plot 6a would then also lead to a further deterioration in capacity, with increases in the DoS and queuing again predicted. In comparison to the Do Minimum situation, the practical reserve capacity of the junction would extend from -31.5 (Do

Minimum) in the AM peak to -41.2 (Do Something) and from -22.1 (Do Minimum) to -34.3 (Do Something). A copy of the LINSIG output files for the future year assessments is provided at **ANNEX F**.

In order to ensure that a comparative assessment has been presented, all of the results discussed above utilise the base junction model developed in LINSIG. As such, all parameters such as cycle times, stage times and other criteria have been kept consistent across all of the Base, Do Minimum and Do Something scenarios. In reality, it is likely that the timings may adapt to the different traffic flow scenarios to optimise the performance of the junction, where possible. This is therefore considered in further detail, below.

POTENTIAL JUNCTION IMPROVEMENTS AT FIVEWAYS

A detailed review of the characteristics of the Fiveways junction has been carried out looking at both the physical geometry and layout of the junction, as well as how the junction operates under the existing signal control. In particular reference to the latter, it is considered that the existing signal configuration represents the most appropriate form, with an uncontrolled junction unlikely to offer the same level of capacity and a roundabout junction requiring more space than is available at this location, than that owned by BDBC and / or HCC.

Resultantly, a number of potential improvements to the signal junction have been identified which are expected to be able to release additional capacity within the junction, and enhance its overall performance which in turn should reduce delays and queuing and improve the DoS and PRC levels.

The following measures have therefore been identified:

- Bringing forward stoplines and general 'squaring up' of the junction⁷
- Introducing additional flares and road space – this is most noticeable on the Kempshott Lane (S) and Pack Lane (E) approaches, where the flares should increase to around 10 (instead of 4) and 6 (instead of 2) PCUs respectively. A flare extension is also proposed on Buckskin Lane (N), which should increase storage to around 4 (instead of 2) PCUs
- Reallocating turning lanes – from a review of the observed turning flows at the junction it is proposed that the lane allocations on Pack Lane (E) will be changed from a left lane and an ahead and right lane, to a left and ahead lane and a right turn lane

In the case of each of the potential measures referred to above, it is considered that quantifiable benefits will be able to be derived, in terms of the performance of the junction. As such, the junction modelling has been updated to reflect these amendments and the results for the improved Do Something scenario are presented below at **TABLE 6**. Additionally, in this case the modelling software has been allowed to amend the cycle time of the junction and optimise the signal settings within the software given that the on-street controller should be able to do this on the ground.

⁷

Amending the position of the stoplines and 'squaring up' the junction will reduce travel times through the junctions and have the potential to reduce the required intergreen times – please note however, that no amendments to the intergreens have been made, to ensure that the modelling remains robust and that the safety clearance periods are not compromised

TABLE 6: 2021 Do Something Model Results – Improved Layout

Approach	AM (0800-0900)		PM (1700-1800)	
	DoS (%)	MMQ	DoS (%)	MMQ
Buckskin Lane (N)	104.7	31.2	108.2	58.3
Pack Lane (E)	101.4	14.6	106.0	26.7
Kempshott Lane (S)	104.7	49.1	108.6	39.3
Pack Lane (W)	102.6	26.2	108.6	26.2
Cycletime (secs)	119		120	
PRC (%)	-16.4		-20.7	

The results show that the junction is predicted to continue to operate in excess of its capacity threshold, allowing for the proposed improvements to be introduced, as discussed above. However, the scenario tested is the 2021 Do Something which includes traffic growth projections and the additional traffic that is expected to be generated by the Plot 6a development.

Accordingly, it is noted that the practical reserve capacity for the improved junction in the 2021 Do Something scenario is better than in the 2021 Do Minimum (without Plot 6a development). In the AM peak hour, the improved junction in the 2021 Do Something scenario is also better than the 2015 Base scenario in these terms.

Allowing for the proposed package of improvements to be introduced by way of mitigation for the Plot 6a development, a nil detriment situation with some betterment should therefore be achieved, in terms of the operation of the Fiveways junction. A copy of the LINSIG output files for the future year assessments allowing for the potential improvements is provided at **ANNEX G**.

Notwithstanding those improvements however, it is suggested that other complimentary measures should also be introduced at the junction. These should also enhance the operation of the junction and 'on the ground' are likely to deliver noticeable improvements. In terms of the junction modelling however, it is unlikely that these measures could be incorporated into the modelling in a way that could be reasonably reflected in the capacity analysis. A description of the potential measures, the likely benefits and the context of each measure in terms of the junction modelling is summarised below at **TABLE 7**.

TABLE 7: Additional Measures to Improve Junction Performance at Fiveways

Potential Measure	Anticipated Performance Benefit	Modelling
Removal of ASLs	Background: The junction surveys identified very limited demand for the ASLs which are provided on all arms of the junction. During the peak hour surveys, 8 (AM) and 11 (PM) cyclists were observed to travel through Fiveways in the respective peak hours. Of these, only 3 (AM) and 2 (PM) utilised the ASLs provided meaning that the facility provided is for the very few that use it, rather than the majority of those passing through the junction. Furthermore, all of the ASL users were on the Kempshott Lane (S) arm of the junction, meaning that	A performance benefit of removing the ASLs is predicted, as discussed in the adjacent column. In terms of reflecting this within the modelling however, the intergreens have not been adjusted so as not to overestimate any potential benefits as on a per signal cycle basis, the benefit is likely to be relatively small. In reality however, small performance improvements should be noticed through the removal of the ASLs

Potential Measure	Anticipated Performance Benefit	Modelling
	the ASLs on Buckskin Lane (N) and Pack Lane East and West were not observed to be used at any time, during either of the peak hours Measure: It is subsequently suggested that the ASLs should be removed from all arms of the junction (although consideration to retaining the ASL on Kempshott Lane (S) could be afforded) Performance Benefit: By removing the ASL and bringing forward the vehicle stoplines, the time taken for vehicles to disperse through the junction once a green period is initiated will be reduced. In addition, it is likely that the intergreen periods will be able to be reduced as less time will be needed for vehicles to clear the junction	
Removal of Keep Clears	Background: The junction surveys identified very limited demand for the Keep Clears which are provided on three of the approaches to Fiveways. Furthermore, in some instances vehicles were observed to disobey the Keep Clear markings and obstruct the driveways. Again, the data therefore indicates that the facilities provided (in this case the Keep Clear markings) are for the very few that use them, rather than the many passing through the junction Measure: It is subsequently suggested that the Keep Clears should be removed from all arms of the junction Performance Benefit: By removing the Keep Clears the platoons of traffic waiting to proceed through the junction from the respective approaches will be stacked more closely to one another, allowing a higher discharge rate of traffic across the stopline to be achieved and a reduction in platoon breakdown to occur	A performance benefit of removing the Keep Clears is predicted, as discussed in the adjacent column. In terms of reflecting this within the modelling however, the saturation flows have not been adjusted so as not to overestimate any potential benefits as on a per signal cycle basis, the benefit is likely to be relatively small. In reality however, small performance improvements should be noticed through the removal of the Keep Clears
Removal of Cycle Link	Background: The junction surveys identified very limited demand for the cycle link provided between the Buckskin Lane (N) and Pack Lane (W) approaches to the junction. A total of 7 (AM) and 1 (PM) cyclists were observed to trigger the cycle link stage of the signal operation during the respective peak hours. Of note however, none of the cyclists in the AM peak waited for the green signal and	A performance benefit of removing the signal stage for the Cycle Link is predicted, as discussed in the adjacent column. In terms of reflecting this within the modelling however, as the stage is called so infrequently, it is not currently included in the LINSIG model. In reality however, small performance improvements should be noticed through the removal of the effective 'all-red'

Potential Measure	Anticipated Performance Benefit	Modelling
	instead crossed the roads and cycled off, although the cycle link stage was still called effectively creating an 'all-red' stage adding considerably to vehicular delays in this case, for no other benefit. The single cyclist that used the cycle link in the PM peak did use the green stage, meaning that this link was utilised by only one cyclist across the two peak hours. Again, the data therefore indicates that the facilities provided (in this case the Cycle Link) are for the very few that use them, rather than the many passing through the junction Measure: Remove the signal cycle stage for the Cycle Link and introduce signs to inform cyclists they need to dismount, cross the road(s) and re-join the carriageway Performance Benefit: By removing the Cycle Link stage from the signal control of the junction, the green time available can always be divided between the vehicular approaches to the junction and therefore reduce delays and queuing	stages created by cyclists on the Cycle Link, who in most cases do not use the green stage in any case
Double Yellow Lines	Background: Observations on site identified the presence of a limited amount of parking / waiting on the highway in close proximity to the Fiveways junction. This was particularly noticeable on the Buckskin Lane (N) arm of the junction, on the northbound carriageway which appeared to be associated with car sales business. The presence of parking at this location was recorded in both the AM and PM peak hours and typically involved vehicles being parked partially on the footway causing obstruction to both pedestrians and vehicles. As queuing was observed on Buckskin Lane (N) in both peak hours, the parked vehicles were observed to slow vehicles leaving the junction travelling northbound as they needed to negotiate the parked vehicles whilst not straying into the oncoming lane which was occupied by queuing vehicles Measure: Introduce double yellow no parking / no waiting restrictions on all arms of the junction	A performance benefit of introducing no parking / no waiting restrictions in the vicinity of the Fiveways junction is predicted, as discussed in the adjacent column. In terms of reflecting this within the modelling however, it is not possible to accurately estimate the likely change that this might have on saturation flows, noting that it would only improve them in some situations (not all of the time, when no parking is present). In reality however, small performance improvements should be noticed through the introduction of parking and waiting restrictions

Potential Measure	Anticipated Performance Benefit	Modelling
	Performance Benefit: By introducing no parking / no waiting restrictions in the vicinity of the junction, vehicles should be able to pass into and out of the junction more efficiently, thereby achieving a greater level of saturation	

A plan showing the potential Fiveways layout, allowing for the potential improvement measures discussed above is included at **ANNEX H**.

SUMMARY OF FINDINGS

This Briefing Note has been prepared following discussions with BDBC and HCC. As such, a detailed review of the layout and operation of the Fiveways junction has been carried out such that a validated baseline model has been prepared for the 2015 Base scenario.

Consideration has then been given to the potential operation of the junction, allowing for forecast traffic growth to occur and development traffic predicted to arise specifically in association with the potential Plot 6a development at Manydown. The respective 2021 Do Minimum and 2021 Do Something scenarios indicate that the operation of the junction would be expected to deteriorate in both scenarios, without interventions being introduced by way of mitigation.

Following a detailed review, it is suggested that there is an opportunity to deliver a package measures at the junction; a number of which have been modelled as part of the preparation of this Briefing Note. In addition however, some complimentary measures have also been suggested which are expected to also contribute to improving the operation and traffic management of the junction although it is unlikely that these can be reflected in the modelling.

The updated junction modelling that has been prepared confirms that a nil detriment situation could be achieved and that some potential relative betterment is predicted at the junction in the 2021 Do Something scenario (which includes Plot 6a) allowing for the proposed improvements to be delivered as mitigation for the development at this junction.

It has therefore been shown that mitigation can be delivered for the development, in the context of the Local Plan process at this stage, and the findings are therefore considered to be fit for purpose in this regard.

Wider Context

In real terms, the Plot 6a development is predicted to contribute to approximately a 7% (AM) and 8 (%) increase in traffic flows at the Fiveways junction in the respective peak hours. Taking this into account and the more detailed findings presented herein, it is not considered that the scheme would have a severe impact in transport terms when reviewed in the context of the National Planning Policy Framework (NPPF) which identifies that *“development should not be prevented or refused on transport grounds unless the residual impacts of development are severe, and the need to encourage increased delivery of homes and sustainable economic development should be taken into account”*.

Notwithstanding the above, other highways mitigation and / or demand management for Plot 6a may also be required, but this has not been considered in this note and would need to be determined in liaison with HCC.

Additionally, a comprehensive TA will be needed for the Plot 6a development and it may be appropriate that HCC's SYSTRA model is used to inform that work, assuming that it is available at that time. In this regard, it is recommended that follow-up traffic surveys will need to be conducted in the Spring of next year or thereafter to review changes in traffic flows on the network following completion of major on-going road works in and near the town. The potential improvements to the junction would also need to be designed in detail and then subject to a Road Safety Audit and approval by HCC.

Annex A1

Method Note: Fiveways Assessment

Project	Fiveways Assessment	Reference: 47066341
Prepared by	Colin Romain, Principal Transport Planner	Status: Draft
Approved by	Jonathan Crabb, Technical Director	Date: August 2015

INTRODUCTION

AECOM attended a meeting with officers of Hampshire County Council (HCC) on 4th August 2015 to discuss the Fiveways junction in Basingstoke, specifically regarding concerns that the authority have raised to date about the capacity of the junction and the relationship this could have with the delivery of c300 residential units on Plot 6a of the Manydown site.

A review of the concerns raised to date, the Transport Assessment that has been prepared on behalf of Basingstoke & Deane Borough Council (BDBC) in connection with the emerging Local Plan and associated modelling of the Fiveways junction was discussed.

KEY POINTS

The following key points were discussed at the meeting:

- Traffic data upon which the capacity modelling of the Fiveways junction has been carried out
- Traffic data availability from other sources, including HCC
- The method and assumptions employed as part of the capacity modelling
- Potential improvement options for the junction

A short note was circulated at the meeting concerning the first three points listed above, relating to traffic data and junction modelling. For completeness, a copy of that note is included with this paper at **Appendix A**.

It was subsequently agreed that the traffic data upon which the modelling is based is not robust and that no existing alternative data is available to update the junction modelling. Whilst it was noted that existing traffic improvement works at Black Dam roundabout in Basingstoke and wider drainage improvements being implemented along the M3 will be likely to be affecting traffic flows at the Fiveways junction, it was agreed that new survey should be obtained so that a new validated baseline model can be prepared (see **Action 1** below).

The surveys are to be conducted during early September, following the start of the new school year, with a view to the updated modelling work being completed by the end of September to allow HCC to review the findings and provide an addendum to their existing comments on the junction prior to the EiP (Examination in Public) hearing on 20th October 2015.

It is anticipated that irrespective of the findings of the traffic surveys and updated junction modelling that follow-up surveys are likely to be required during early 2016 once the traffic improvement works have been completed and flow conditions become more stable again. Depending on timing, it may be appropriate that this work is undertaken to support any planning application that subsequently comes forward for the site at Plot 6a.

The new traffic survey data is to be used to develop a validated baseline model of the Fiveways junction (using Linsig v3). This model will then be taken forward to test 'without' and 'with' Plot 6a development related traffic being added into the model, for a future year scenario (assumed to be 2017, as the potential 'opening year' of the development on that site) (see **Action 2** below).

Following the junction capacity modelling work, design amendments as discussed at the meeting will be incorporated into the model, to consider the relative benefits in introducing amendments to the junction configuration in a manner acceptable to HCC and therefore assist in bringing forward the development of Plot 6a (see **Action 3** below).

PROPOSED METHOD

For each of the identified actions, the proposed method for undertaking the work has been presented below, for review and agreement with HCC.

Action 1: Traffic Survey Data to Prepare Validated Baseline Model for Fiveways

It is proposed that the following traffic survey data will be obtained on site, during early September, following the new school year commencing:

- A classified turning count survey at the junction to take place between 0700-1900 on a weekday (ideally 9th or 10th September). This should record vehicles by class and movement, and be broken down into quarter hour periods
- Queue surveys on all four arms of the junction to take place between 0700-1000 and 1600-1900 on the same day as the turning count survey. This should record vehicles by lane and number of vehicles and be broken down into 5 minute records (one record every 5 minutes for each lane and approach)
- A pedestrian and cycle survey, to include the number of pedestrians crossing at the junction and the number of cyclists using the junction as well as crossing at the junction
- Whether the Advanced Stop Lines (ASLs) for cyclists are used during the survey period, and if so, at what times and by how many cyclists
- Whether any vehicles utilise the 'keep clear' markings on the approach roads to turn into or out of private drives during the survey period (please see highlighted 'keep clear' zones on the attached plan provided at **Appendix B**)

The HCC survey team will provide a quote and availability for undertaking the above survey work, including estimated turnaround time to provide the data back to AECOM, following the surveys.

In addition to the above, it is proposed that the following information will also be obtained:

- Saturation flows, to be recorded on site during AM and PM peaks (by AECOM)
- Signal stage and cycle times on day of survey, during AM and PM peaks (by AECOM)
- Topographical survey of junction (third party)
- Personal Injury Accident data for most recent three years for the junction and approaches (from HCC)

The above data will be used to develop a Linsig model of the junction, which we will seek to validate against the observed information, including queue lengths.

Action 2: Prepare Future Year (2017) version of Junction Model 'Without' and 'With' Plot 6a development

Two future year scenarios will be incorporated into the junction model, as follows:

- 2017 Do Minimum – this scenario will represent the 'base' case in the future year, allowing for forecast background traffic growth to be derived from TEMPRO to be added into the model
- 2017 Do Something – this scenario will take forward the 2017 Do Minimum traffic flows, but add on the traffic forecast to be generated by 300 units at Plot 6a. The traffic generation will be calculated utilising the existing trip rates employed within the Local Plan Transport Assessment. The distribution of the traffic will be estimated using census data and will allow for splits between Pack Lane West, Dorset Crescent and Pack Lane East to be incorporated, whereby the Pack Lane East traffic will be the trips assumed to pass through the Fiveways junction

The results of the above two scenarios will allow the 'without' and 'with' development traffic scenarios to be reviewed, in relative terms.

Action 3: Consider Capacity Improvements at Fiveways

This final action will incorporate potential junction improvements to the design of Fiveways into the junction model, to allow the relative impact of the development of Plot 6a to be considered by HCC.

The junction improvements that will be considered, as discussed with HCC, will include although not necessarily be limited to:

- Reallocation of turning lanes
- Introduction of additional flares and road space
- Bringing forward stoplines and general 'squaring up' of junction
- Possible removal of ASLs
- Possible removal of keep clears
- Phasing and staging

In addition, a brief commentary will also be provided concerning potential alternative junction configurations (ie. a roundabout, priority junction etc) and whether or not this is considered feasible.

OUTPUT

The output of the work will comprise a short briefing note, junction capacity analysis and initial design layout drawing showing any proposed improvements. This work will be completed within two weeks of all survey data being received.

Appendix A

FIVEWAYS – TRAFFIC FLOW DATA AND MODELLING

Traffic Flow Data

- Table 7.1 of PB TA – no survey data for Fiveways junction
- Para 7.2.5 of PB TA – either turning proportions derived from SATURN and applied to link counts, or where no link counts, turning flows derived directly from SATURN (model was last validated in 2009)
- HCC has identified no turning count data is held for Fiveways junction. ATCs have been provided for the following:
 - Pack Ln W (2km west of Fiveways) dated 15/11/13
 - Buckskin Ln (1km north of Fiveways, and the other side of Buckskin shops/community facilities) dated 29/09/14
 - Pack Ln E (600m east of Fiveways, and the other side of Stratton Pk & Kempshott Village Hall) dated 28/02/15
- Assumption is Fiveways junction model based on synthesised flows from SATURN model (2009)

Junction Modelling

- Modelled as three stages (Buckskin Ln, Kempshott Ln, Pack Ln E & W) – Para 4.15.6 of PBTA
- Should be four arms separately (based on controller spec obtained from HCC & on site observations)
- Runs generic 120 second cycle times in AM & PM, not believed to be correct
- No on site data (sat flows, queue data etc)
- Modelled base queues do not appear realistic:

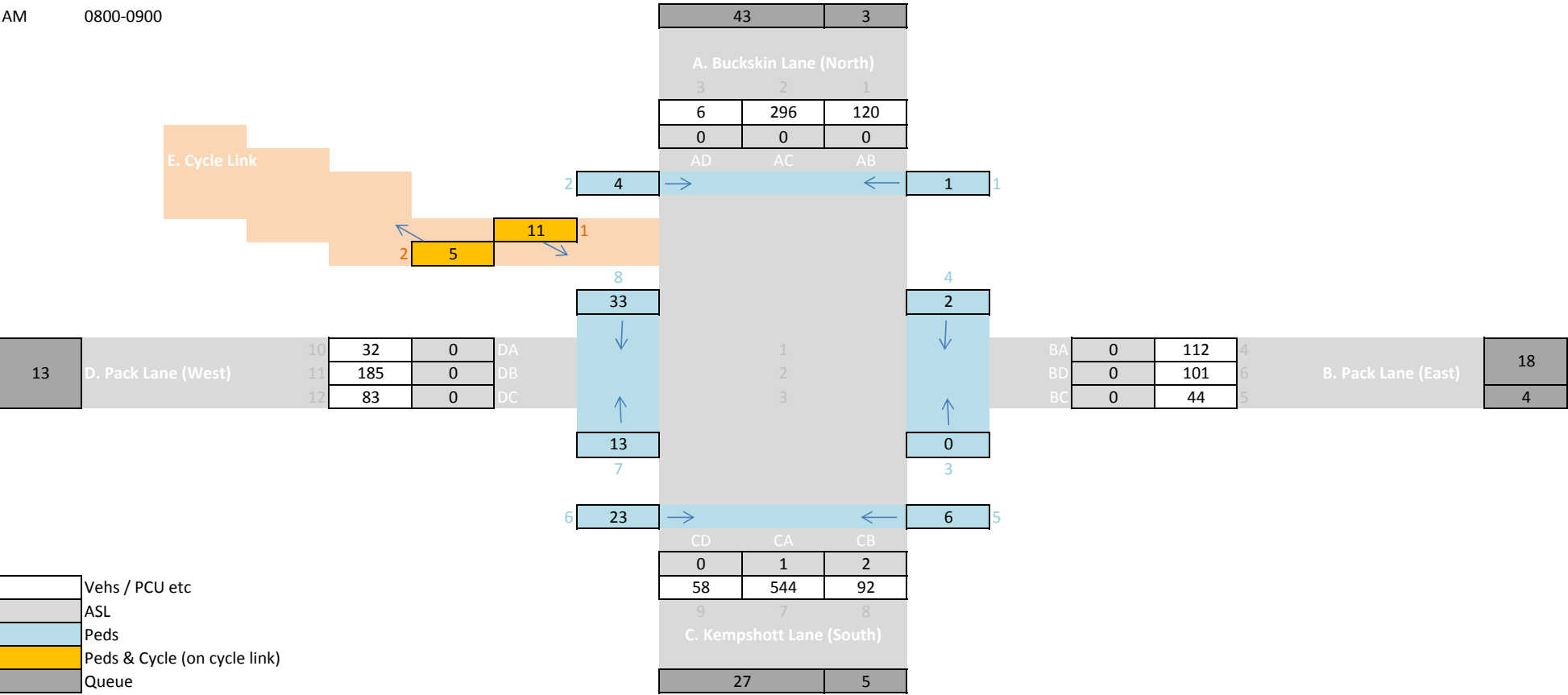
Arm	2012 AM	2012 PM
Buckskin Ln	94	335
Pack Ln E	61	178
Kempshott Ln	201	194
Pack Ln W	11	8

Appendix B



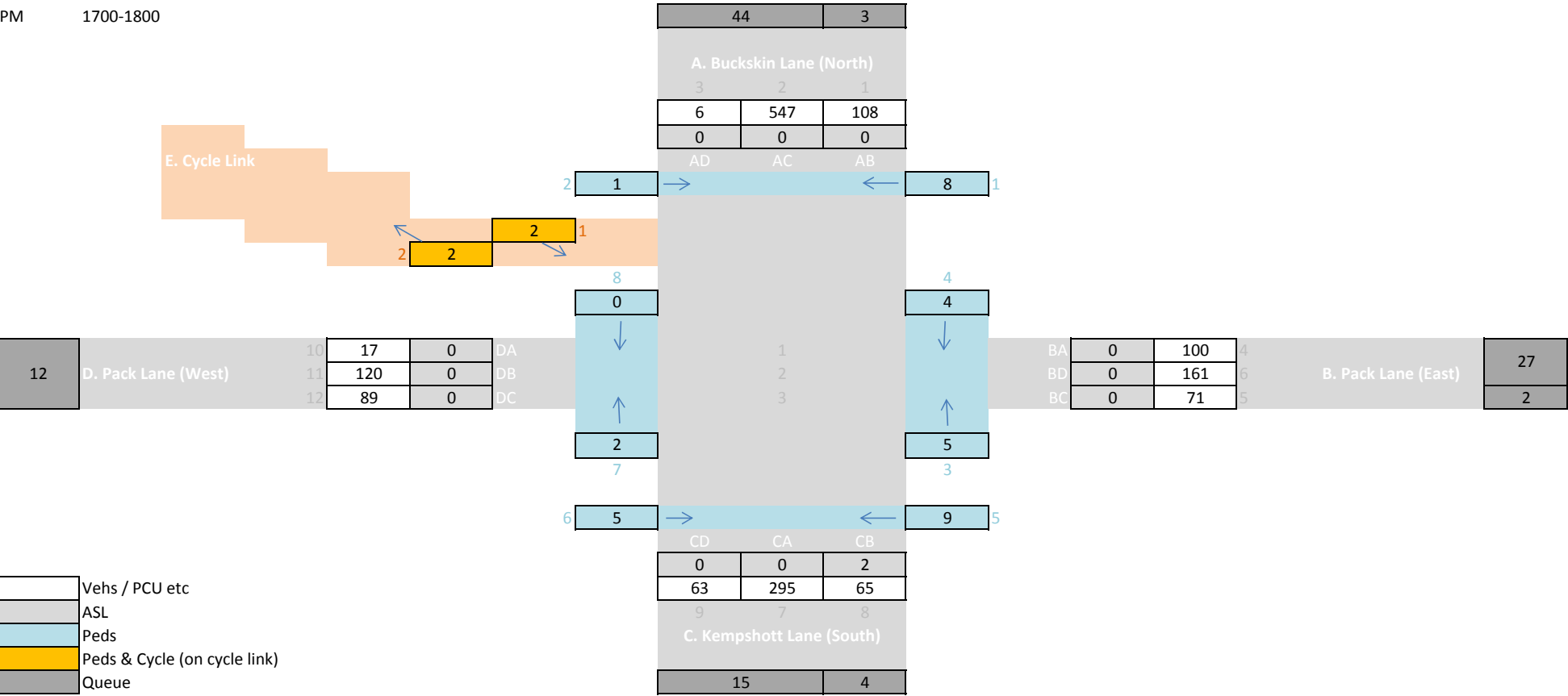
Annex B1

AM 0800-0900



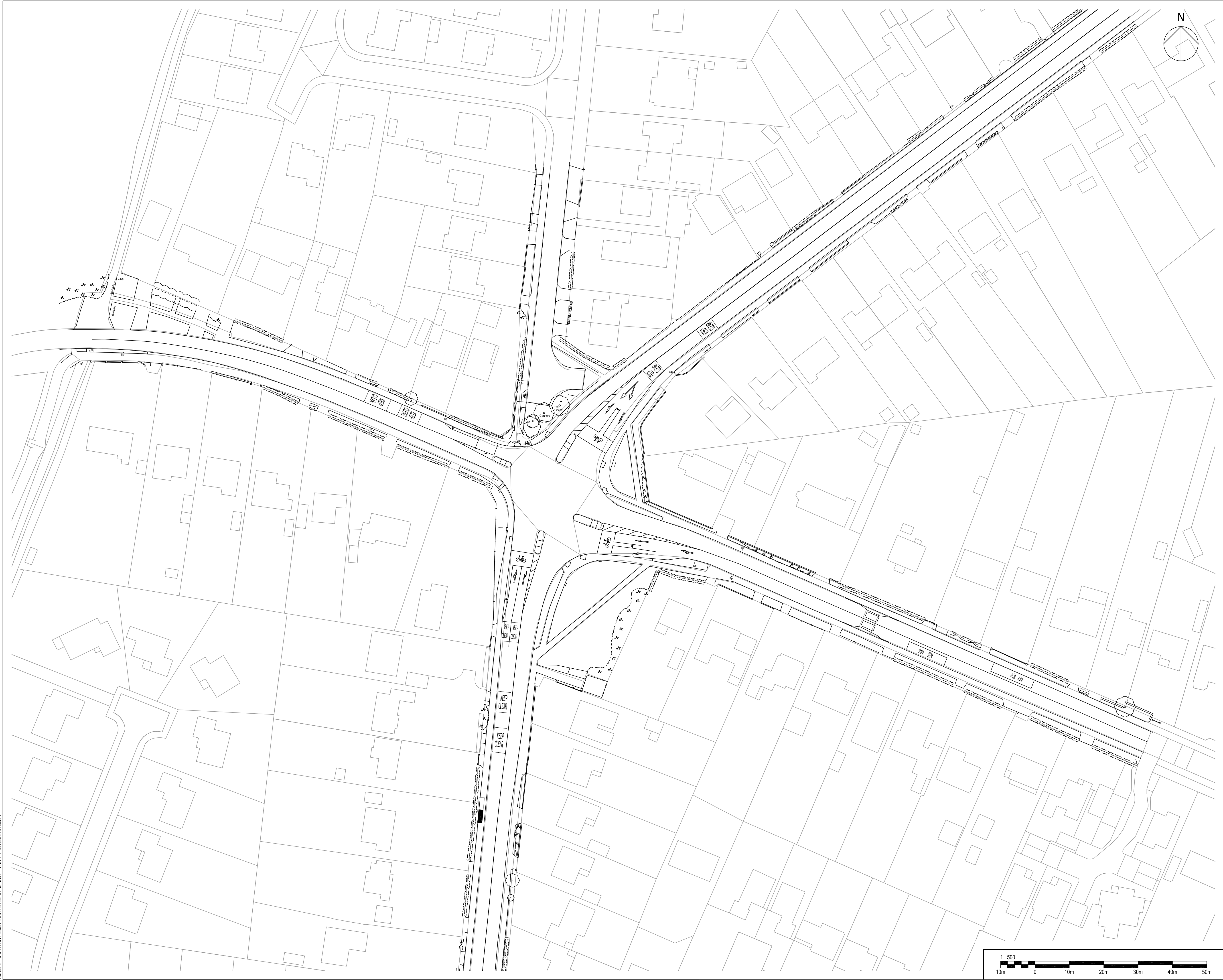
Annex B2

PM 1700-1800



Annex C1

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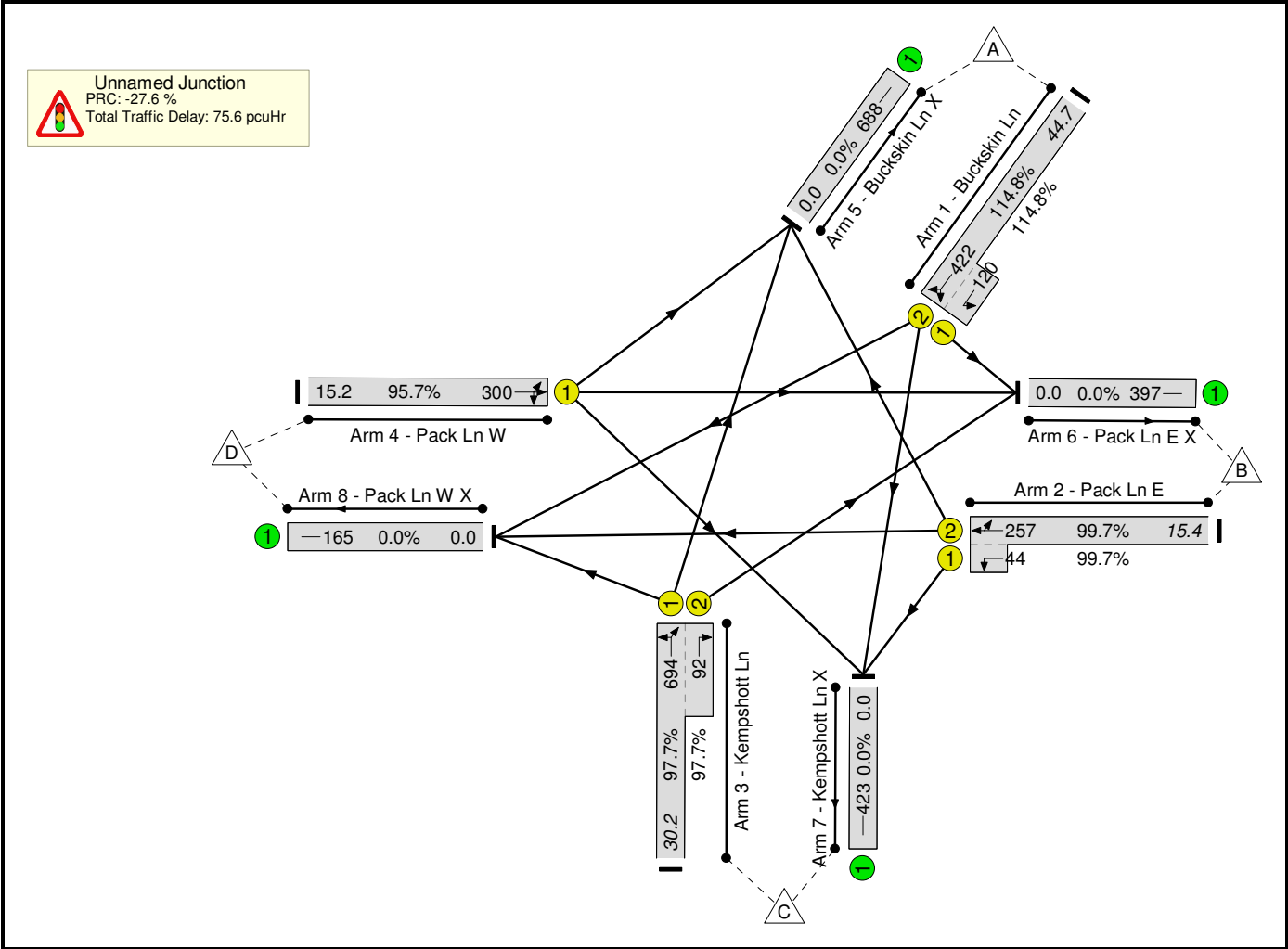
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Project Title					
FIVEWAYS ASSESSMENT					
Drawing Title					
FIVEWAYS JUNCTION EXISTING LAYOUT					
Designed NT	Drawn JC	Checked JR	Approved SES	Date SEP 15	
URS Internal Project No. 47066341			Suitability -		
Scale @ A1 1:500 AND 1:1000 AT A3					
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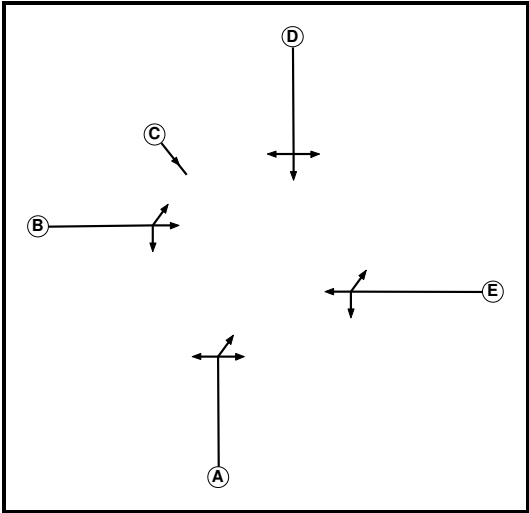
Annex C2

LINSIG Model Output

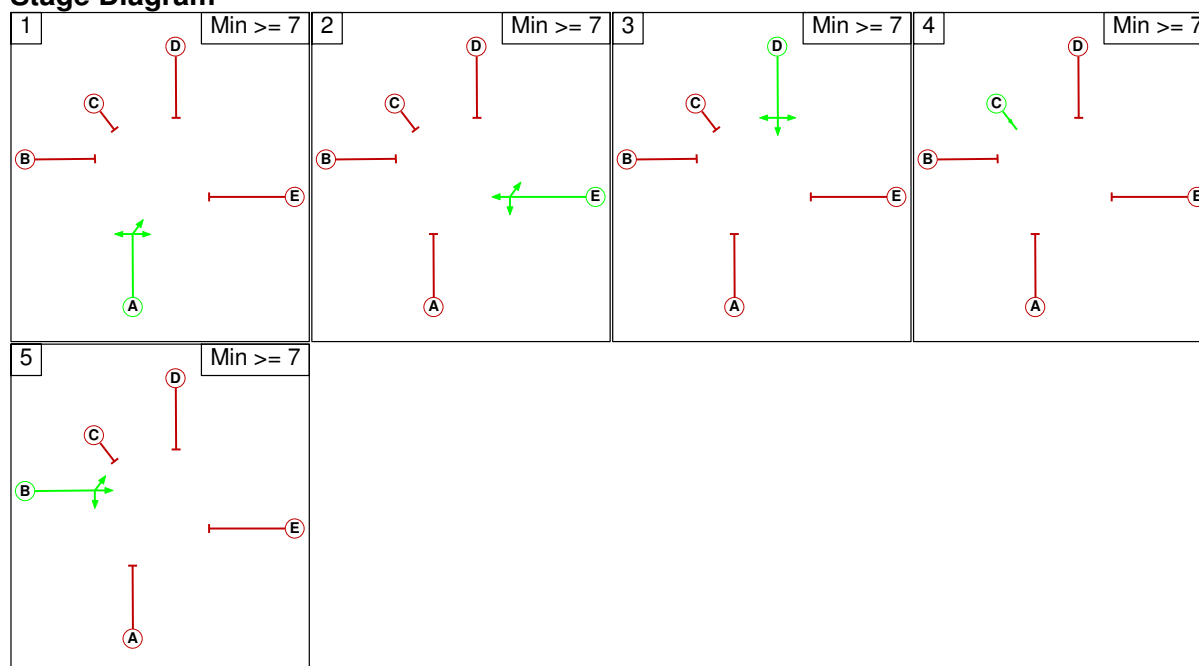
Scenario 1: 'AM Base' (FG1: 'AM Base (2015)', Plan 1: 'Network Control Plan 1')
Network Layout Diagram



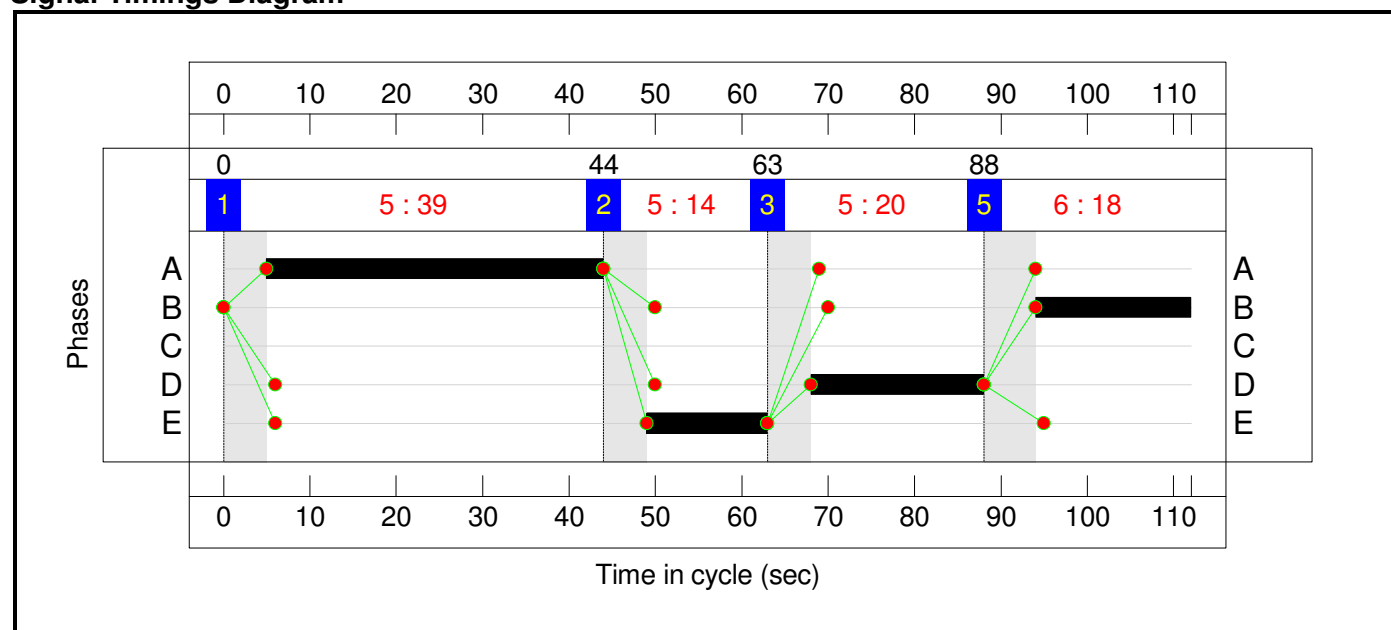
Phase Diagram



Stage Diagram



Signal Timings Diagram

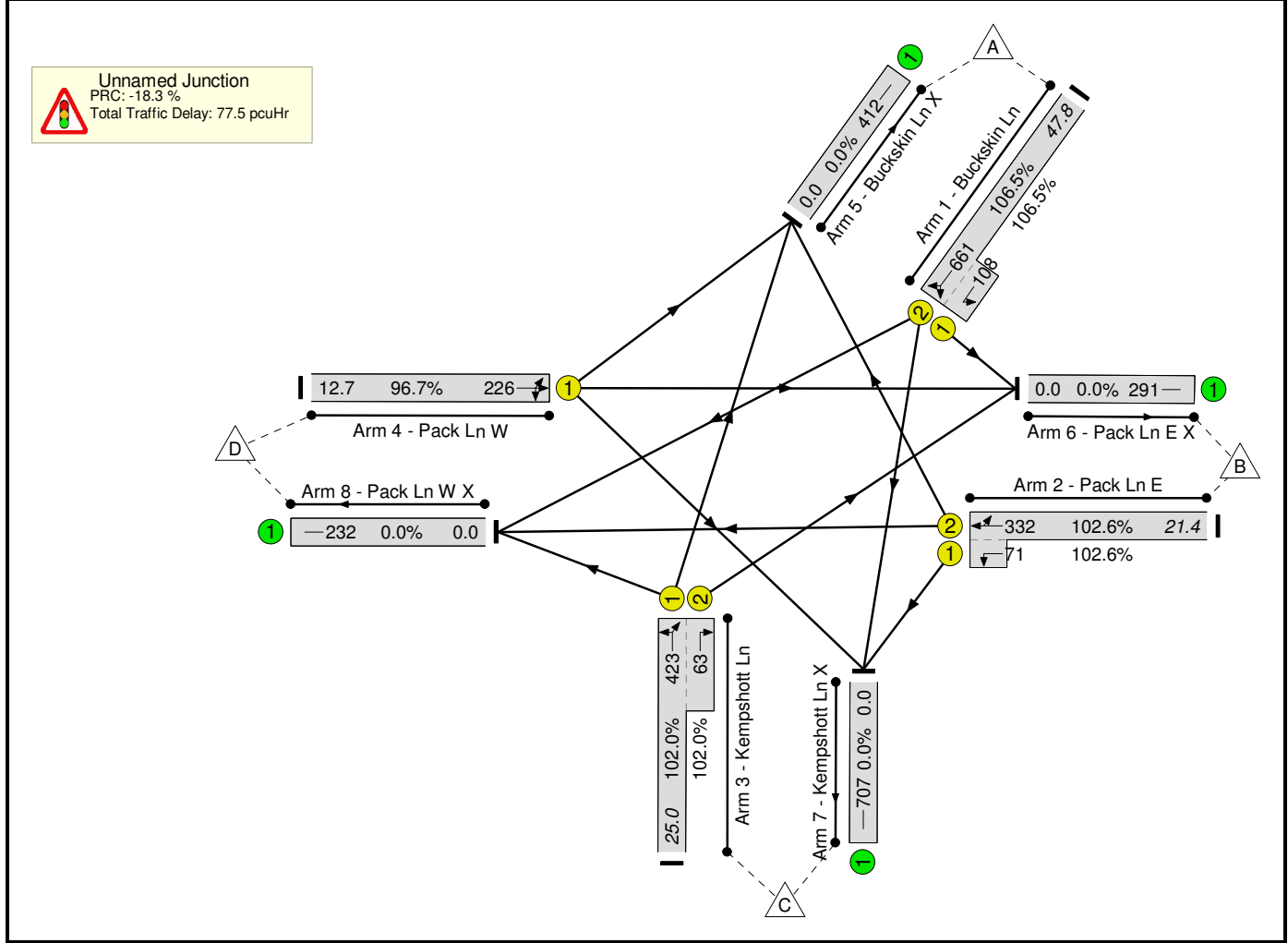


Network Results

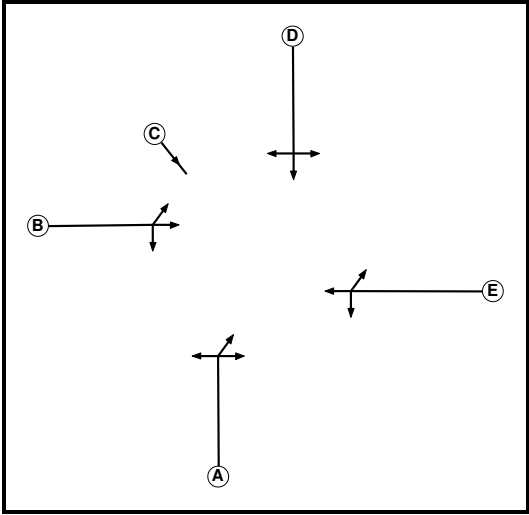
Item	Lane Description	Full Phase	Total Green (s)	Start Green (s)	End Green (s)	Deg Sat (%)	Mean Max Queue (pcu)
Network	-	-	-	-	-	114.8%	-
Unnamed Junction	-	-	-	-	-	114.8%	-
1/2+1/1	Buckskin Ln Left Ahead Right	D	20	68	88	114.8 : 114.8%	44.7
2/2+2/1	Pack Ln E Right Left Ahead	E	14	49	63	99.7 : 99.7%	15.4
3/1+3/2	Kempshott Ln Ahead Right Left	A	39	5	44	97.7 : 97.7%	30.2
4/1	Pack Ln W Left Ahead Right	B	18	94	0	95.7%	15.2
5/1	Buckskin Ln X	-	-	-	-	0.0%	0.0
6/1	Pack Ln E X	-	-	-	-	0.0%	0.0
7/1	Kempshott Ln X	-	-	-	-	0.0%	0.0
8/1	Pack Ln W X	-	-	-	-	0.0%	0.0
C1		PRC for Signalled Lanes (%):	-27.6	Total Delay for Signalled Lanes (pcuHr):		75.59	Cycle Time (s): 112
		PRC Over All Lanes (%):	-27.6	Total Delay Over All Lanes(pcuHr):		75.59	

Scenario 2: 'PM Base' (FG2: 'PM Base (2015)', Plan 1: 'Network Control Plan 1')

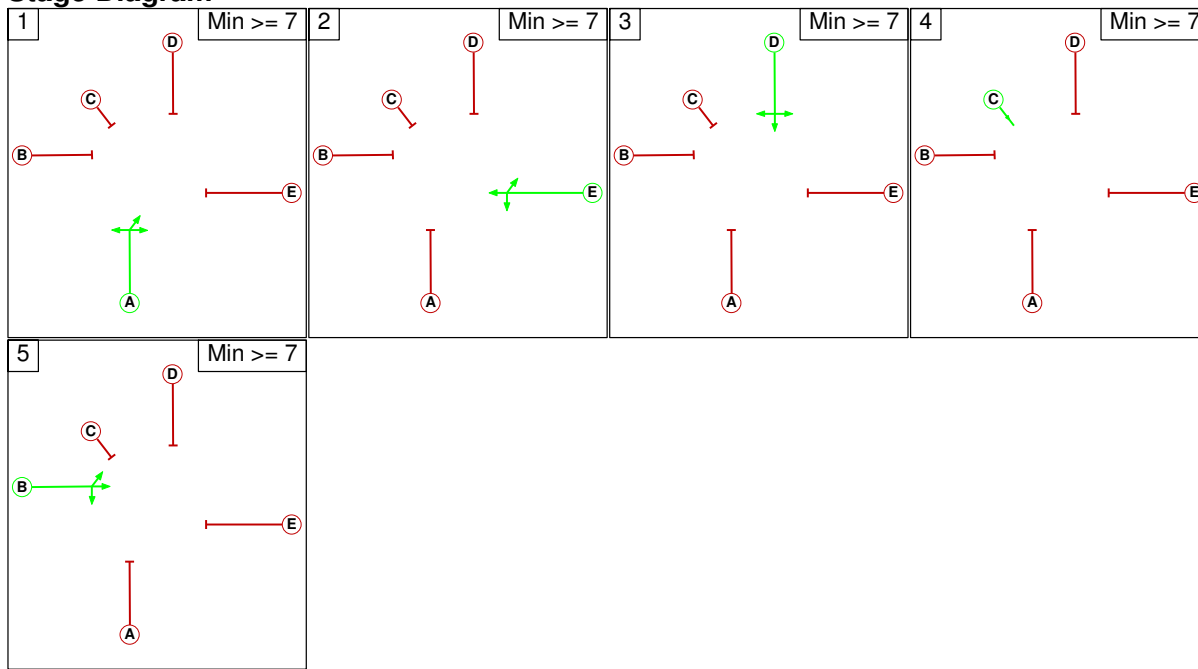
Network Layout Diagram



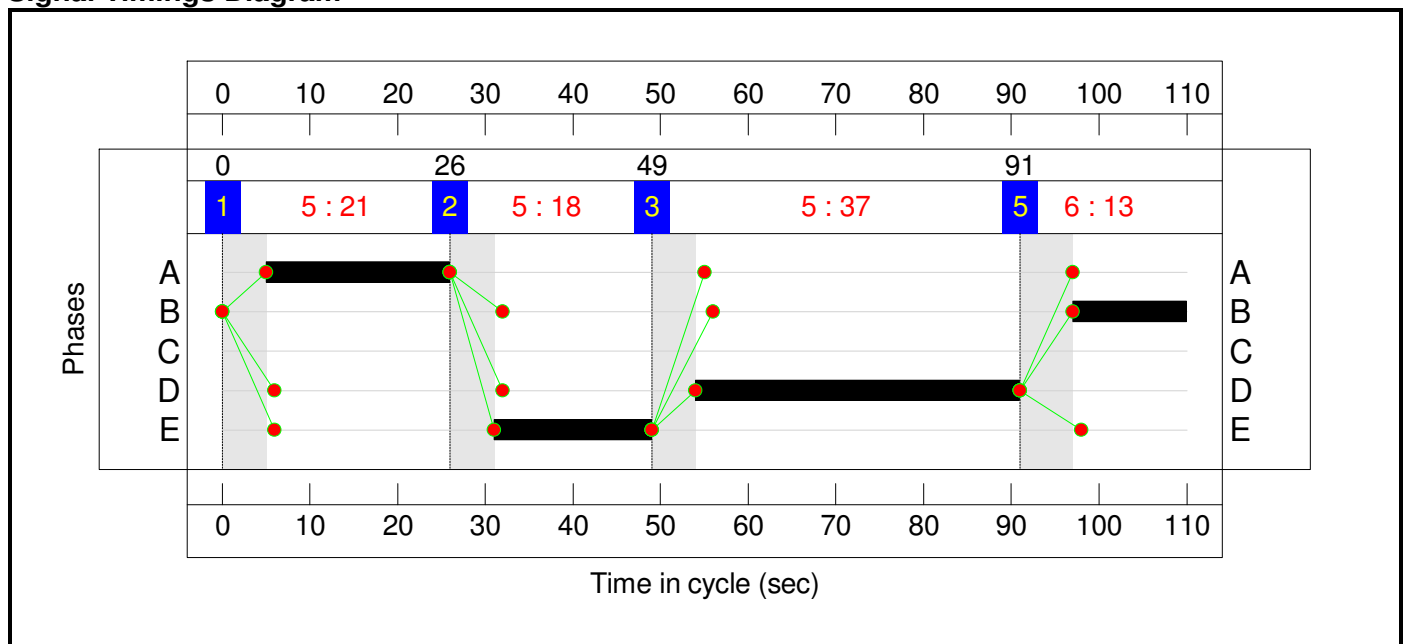
Phase Diagram



Stage Diagram



Signal Timings Diagram



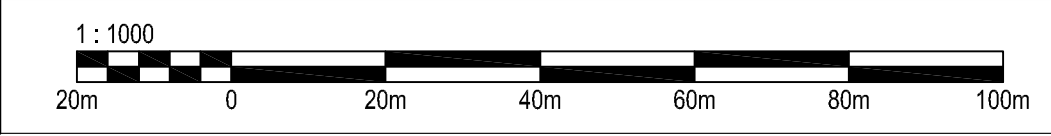
Network Results

Item	Lane Description	Full Phase	Total Green (s)	Start Green (s)	End Green (s)	Deg Sat (%)	Mean Max Queue (pcu)
Network	-	-	-	-	-	106.5%	-
Unnamed Junction	-	-	-	-	-	106.5%	-
1/2+1/1	Buckskin Ln Left Ahead Right	D	37	54	91	106.5 : 106.5%	47.8
2/2+2/1	Pack Ln E Right Left Ahead	E	18	31	49	102.6 : 102.6%	21.4
3/1+3/2	Kempshott Ln Ahead Right Left	A	21	5	26	102.0 : 102.0%	25.0
4/1	Pack Ln W Left Ahead Right	B	13	97	0	96.7%	12.7
5/1	Buckskin Ln X	-	-	-	-	0.0%	0.0
6/1	Pack Ln E X	-	-	-	-	0.0%	0.0
7/1	Kempshott Ln X	-	-	-	-	0.0%	0.0
8/1	Pack Ln W X	-	-	-	-	0.0%	0.0
C1 PRC for Signalled Lanes (%): -18.3 PRC Over All Lanes (%): -18.3 Total Delay for Signalled Lanes (pcuHr): 77.54 Total Delay Over All Lanes(pcuHr): 77.54 Cycle Time (s): 110							

Annex D1



CONSTRUCTION RISKS		MAINTENANCE / CLEANING RISK		DEMOLITION RISKS	
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Project Title					
FIVEWAYS ASSESSMENT					
Drawing Title					
FIVEWAYS JUNCTION 2015 AM BASE MODEL QUEUES					
Designed NT	Drawn JC	Checked JR	Approved SES	Date SEP 15	
URS Internal Project No. 47066341			Suitability -		
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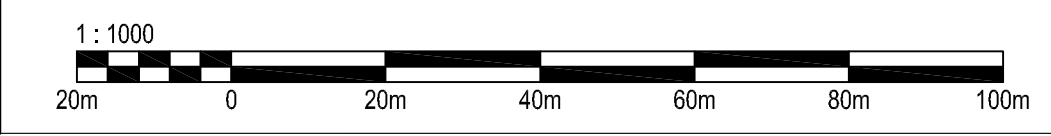


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Annex D2



CONSTRUCTION RISKS		MAINTENANCE / CLEANING RISK		DEMOLITION RISKS	
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FIVEWAYS JUNCTION 2015 PM BASE MODEL QUEUES					
Designed NT	Drawn JC	Checked JR	Approved SES	Date SEP 15	
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Annex E1

Proposed Development:

300 Units proposed at Plot 6a

Trip Rates derived from BDBC TA (Table 8-10):

	Arr	Dep	Total
AM	0.152	0.335	0.487
PM	0.327	0.189	0.516

Trip rates applied to 300 units:

	Arr	Dep	Total
AM	46	101	146
PM	98	57	155

Trip Distribution (area):

0.04	West to / from site (via Pack Lane W)
0.11	East to / from site (via Dorset Crescent)
0.85	East to / from site (via Pack Lane E & Fiveways Junction)
1.00	

Trip Distribution (Fiveways):

Of the 0.85 traffic that would pass through Fiveways:

0.33	Approach to/from Pack Lane W and turn into / out of Buckskin Lane N
0.22	Approach to/from Pack Lane W and turn into / out of Pack Lane E
0.30	Approach to/from Pack Lane W and turn into / out of Kempshott Lane S
0.85	

Plot 6a Turning Movements at Fiveways:

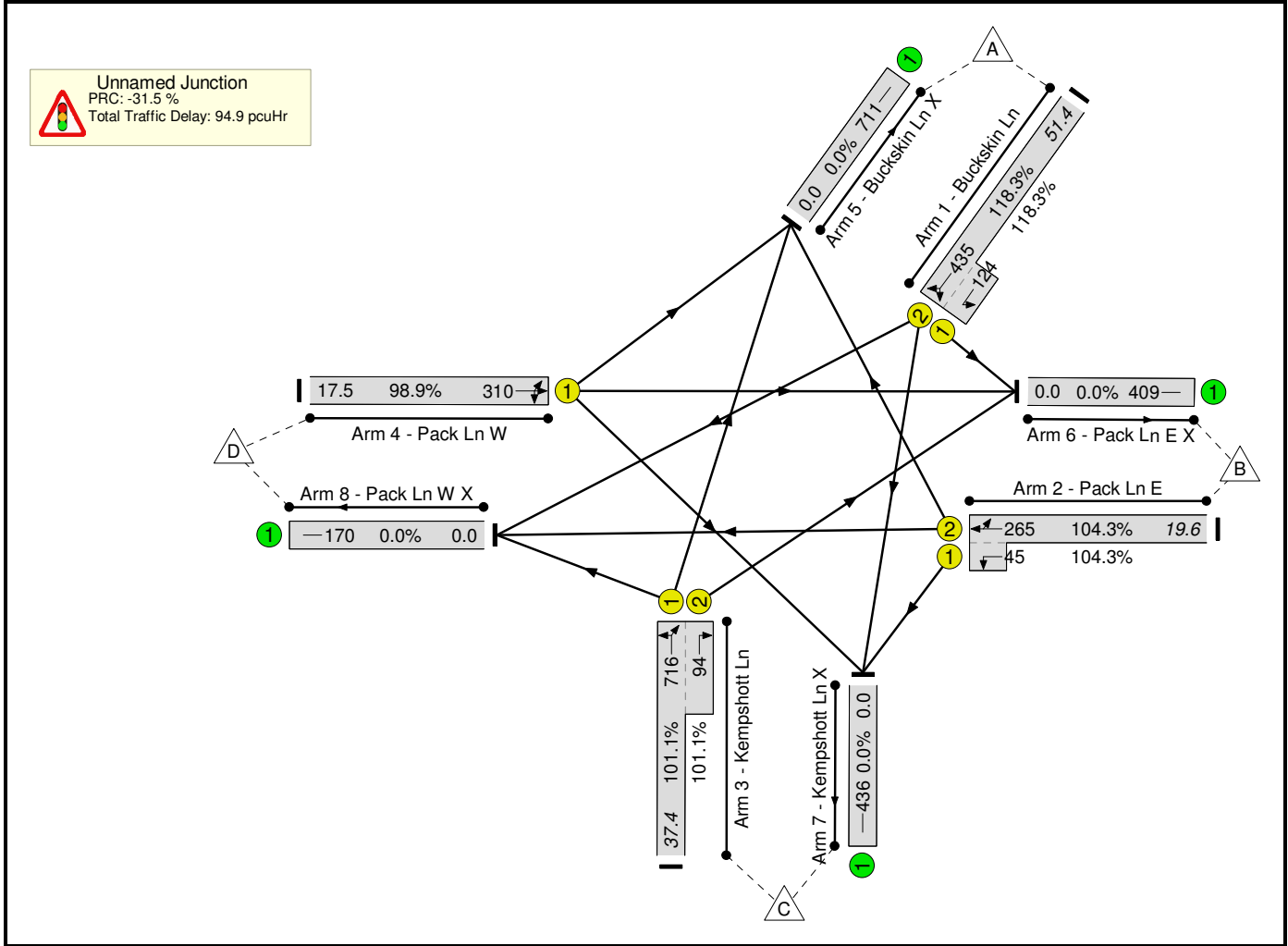
AM		Buckskin Lane N												
		<table><tr><td>15</td><td>0</td><td>0</td></tr></table>			15	0	0							
15	0	0												
Pack Lane W	<table><tr><td>33</td></tr><tr><td>22</td></tr><tr><td>30</td></tr></table>		33	22	30				<table><tr><td>0</td></tr><tr><td>10</td></tr><tr><td>0</td></tr></table>		0	10	0	Pack Lane E
	33													
	22													
30														
0														
10														
0														
<table><tr><td>14</td><td>0</td><td>0</td></tr></table>					14	0	0							
14	0	0												
		Kempshott Lane S												

PM	Buckskin Lane N			
	32	0	0	
Pack Lane W	19			0
	12			22
	17			0
	29	0	0	
	Kempshott Lane S			

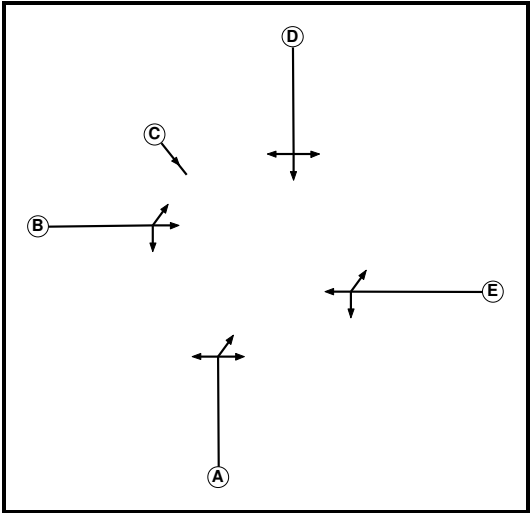
Annex F1

LINSIG Model Output

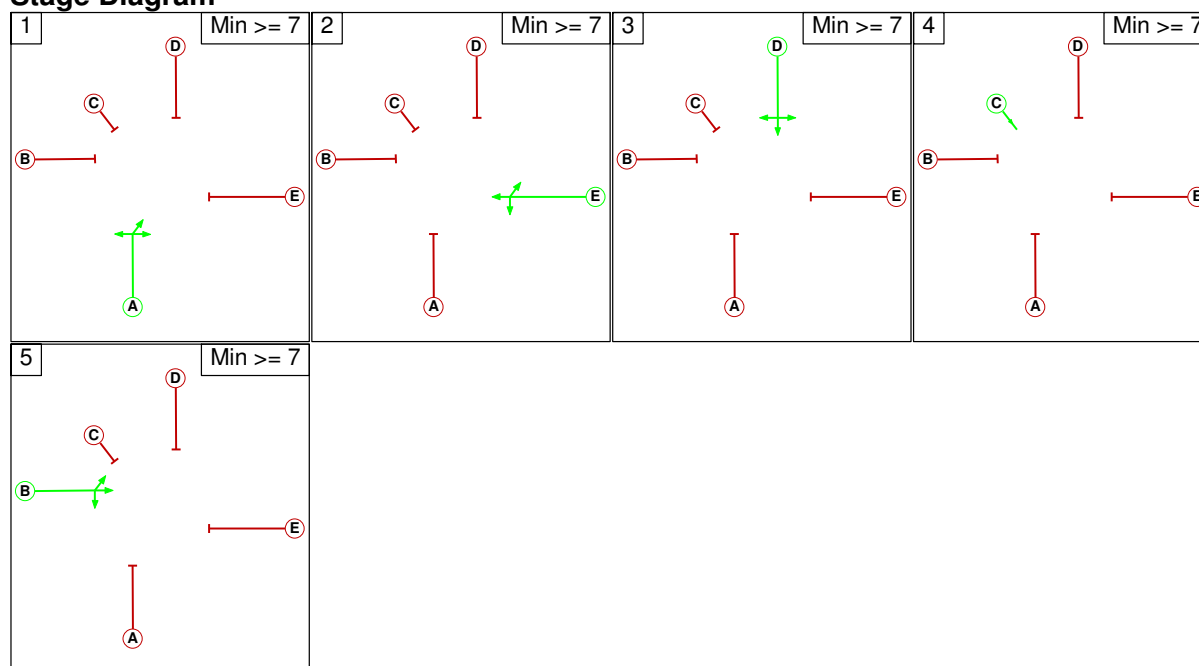
Scenario 3: '2021 DM AM' (FG3: '2021 DM AM', Plan 1: 'Network Control Plan 1')
Network Layout Diagram



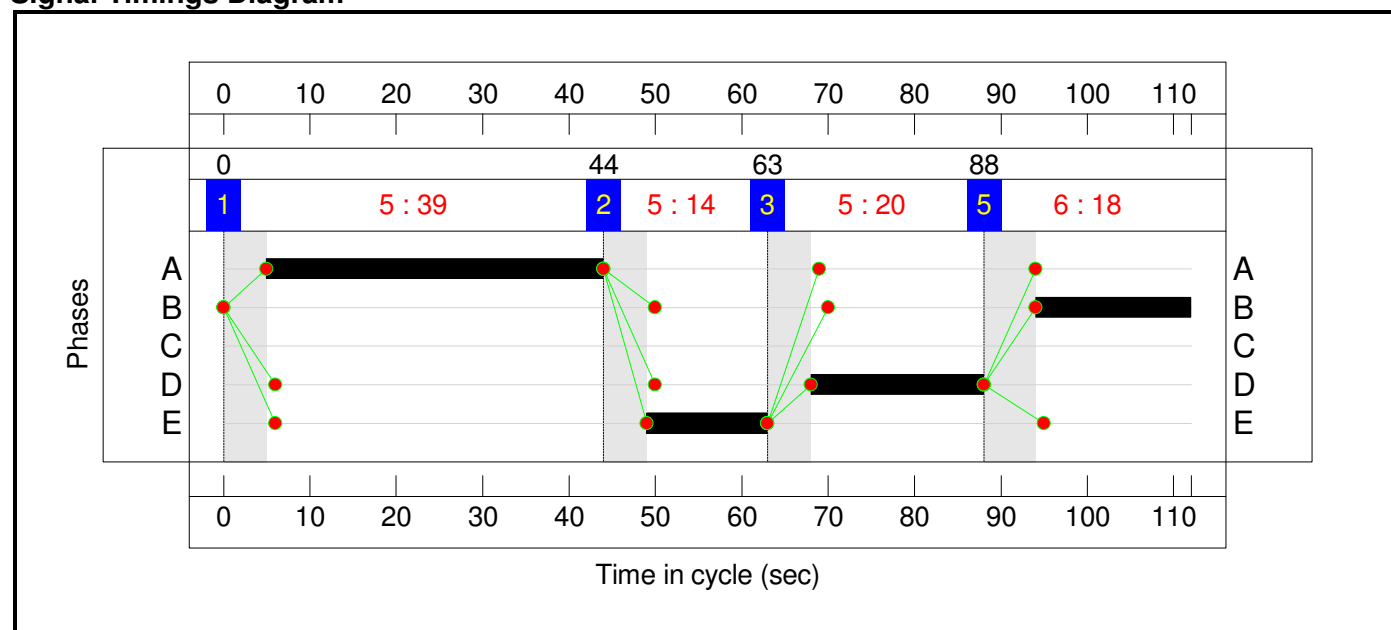
Phase Diagram



Stage Diagram



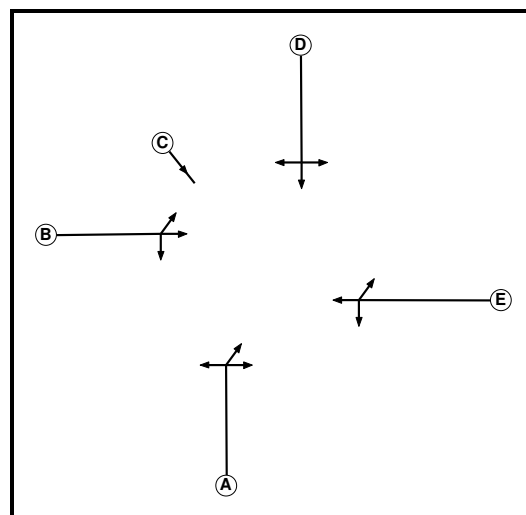
Signal Timings Diagram



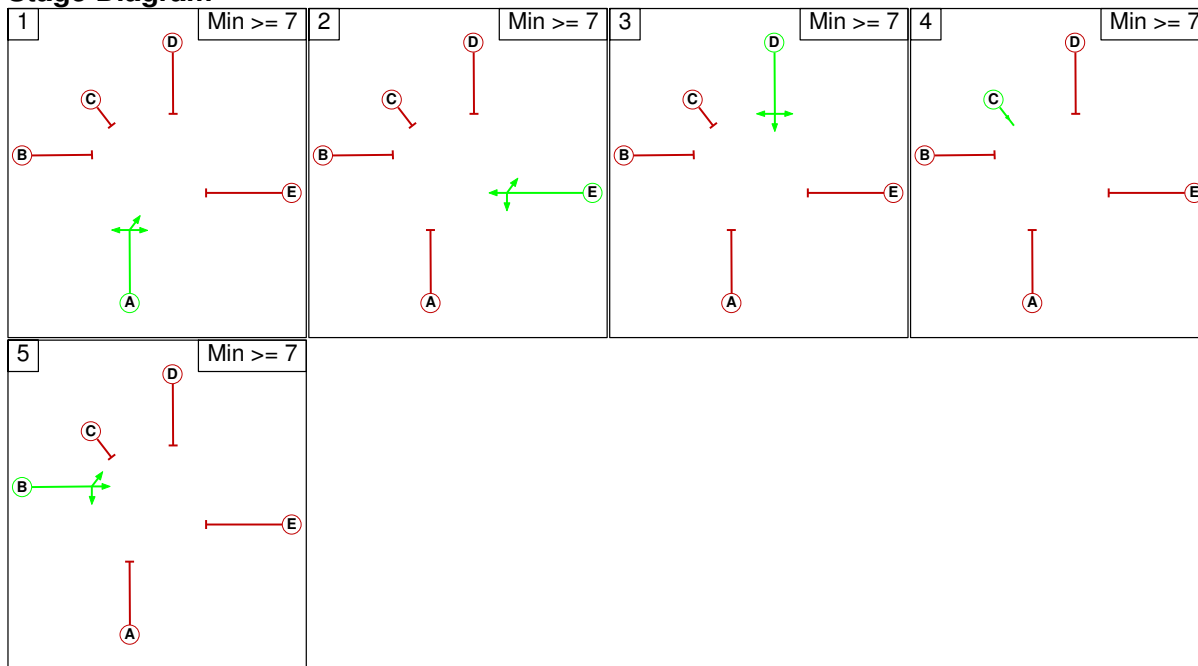
Network Results

Item	Lane Description	Full Phase	Total Green (s)	Start Green (s)	End Green (s)	Deg Sat (%)	Mean Max Queue (pcu)
Network	-	-	-	-	-	118.3%	-
Unnamed Junction	-	-	-	-	-	118.3%	-
1/2+1/1	Buckskin Ln Left Ahead Right	D	20	68	88	118.3 : 118.3%	51.4
2/2+2/1	Pack Ln E Right Left Ahead	E	14	49	63	104.3 : 104.3%	19.6
3/1+3/2	Kempshott Ln Ahead Right Left	A	39	5	44	101.1 : 101.1%	37.4
4/1	Pack Ln W Left Ahead Right	B	18	94	0	98.9%	17.5
5/1	Buckskin Ln X	-	-	-	-	0.0%	0.0
6/1	Pack Ln E X	-	-	-	-	0.0%	0.0
7/1	Kempshott Ln X	-	-	-	-	0.0%	0.0
8/1	Pack Ln W X	-	-	-	-	0.0%	0.0
C1 PRC for Signalled Lanes (%): -31.5 PRC Over All Lanes (%): -31.5 Total Delay for Signalled Lanes (pcuHr): 94.90 Total Delay Over All Lanes(pcuHr): 94.90 Cycle Time (s): 112							

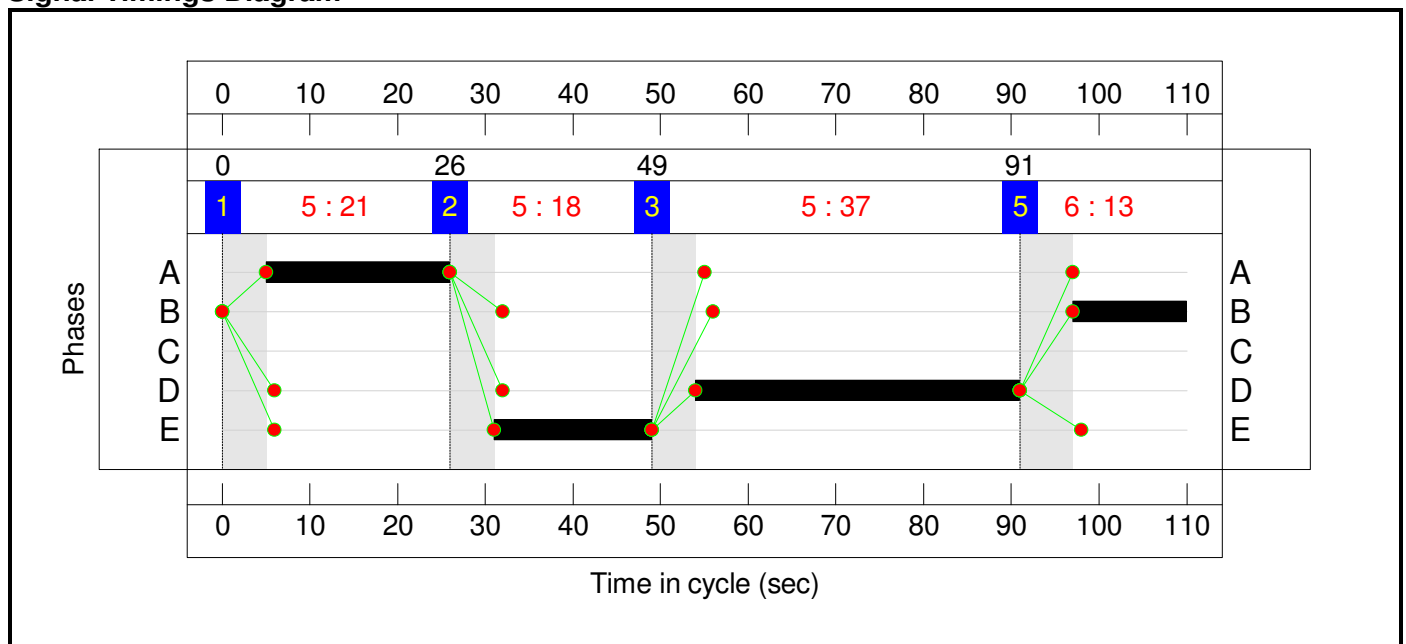
Network Layout Diagram



Stage Diagram



Signal Timings Diagram

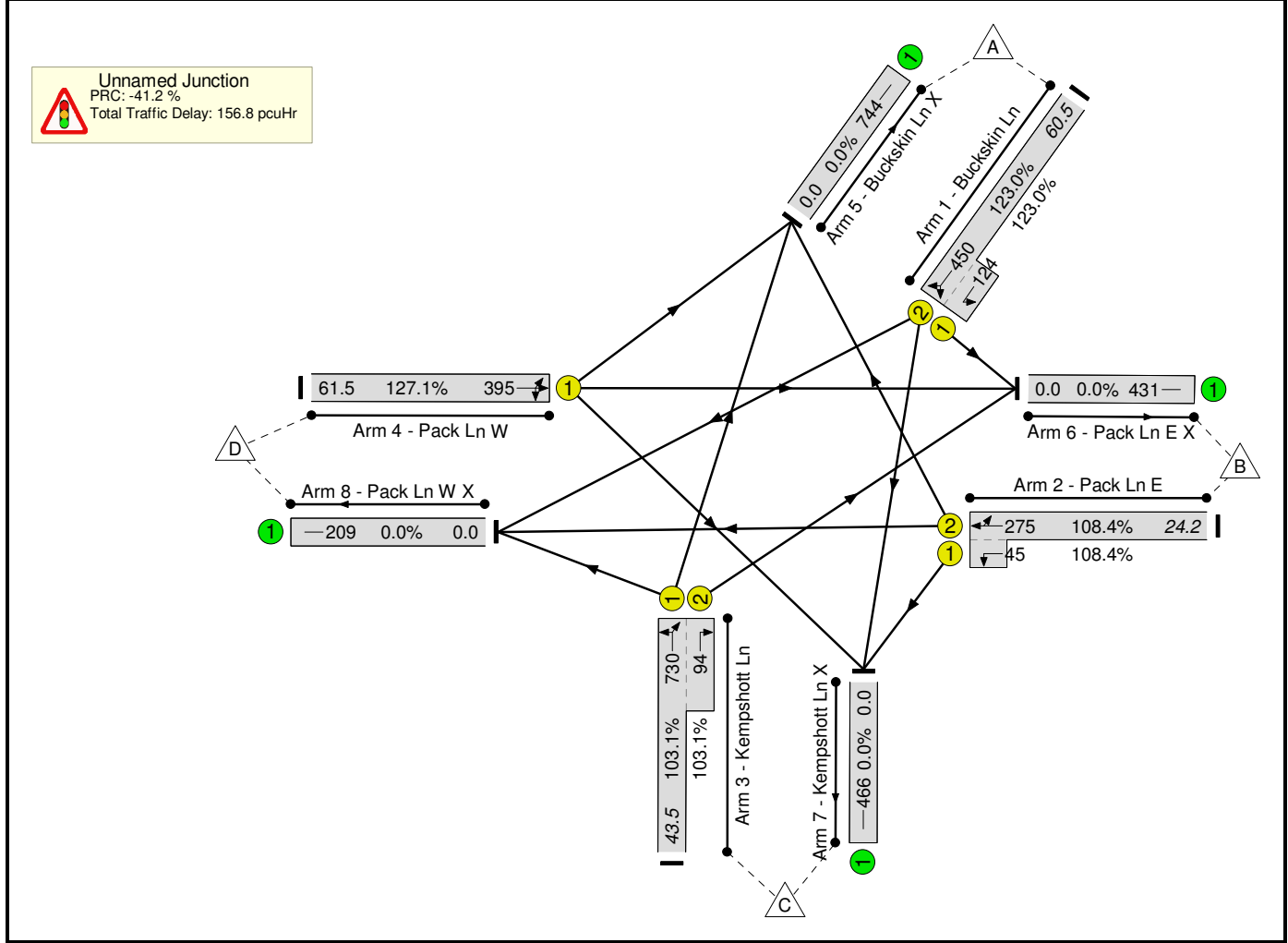


Network Results

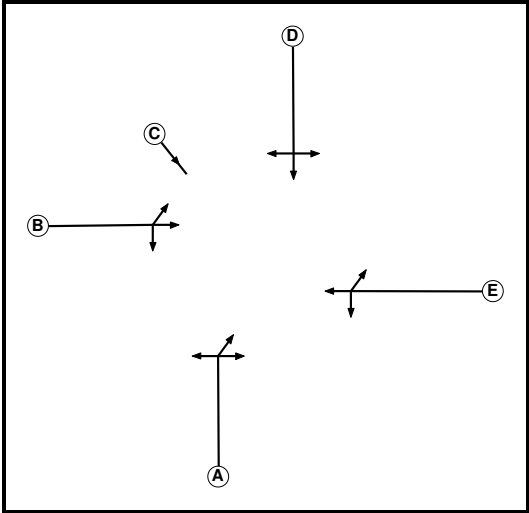
Item	Lane Description	Full Phase	Total Green (s)	Start Green (s)	End Green (s)	Deg Sat (%)	Mean Max Queue (pcu)
Network	-	-	-	-	-	109.9%	-
Unnamed Junction	-	-	-	-	-	109.9%	-
1/2+1/1	Buckskin Ln Left Ahead Right	D	37	54	91	109.9 : 109.9%	58.3
2/2+2/1	Pack Ln E Right Left Ahead	E	18	31	49	104.2 : 104.2%	23.9
3/1+3/2	Kempshott Ln Ahead Right Left	A	21	5	26	104.9 : 104.9%	30.2
4/1	Pack Ln W Left Ahead Right	B	13	97	0	100.1%	14.9
5/1	Buckskin Ln X	-	-	-	-	0.0%	0.0
6/1	Pack Ln E X	-	-	-	-	0.0%	0.0
7/1	Kempshott Ln X	-	-	-	-	0.0%	0.0
8/1	Pack Ln W X	-	-	-	-	0.0%	0.0
C1 PRC for Signalled Lanes (%): -22.1 PRC Over All Lanes (%): -22.1 Total Delay for Signalled Lanes (pcuHr): Total Delay Over All Lanes(pcuHr): 97.17 97.17 Cycle Time (s): 110							

Scenario 5: '2021 DS AM' (FG5: '2021 DS AM', Plan 1: 'Network Control Plan 1')

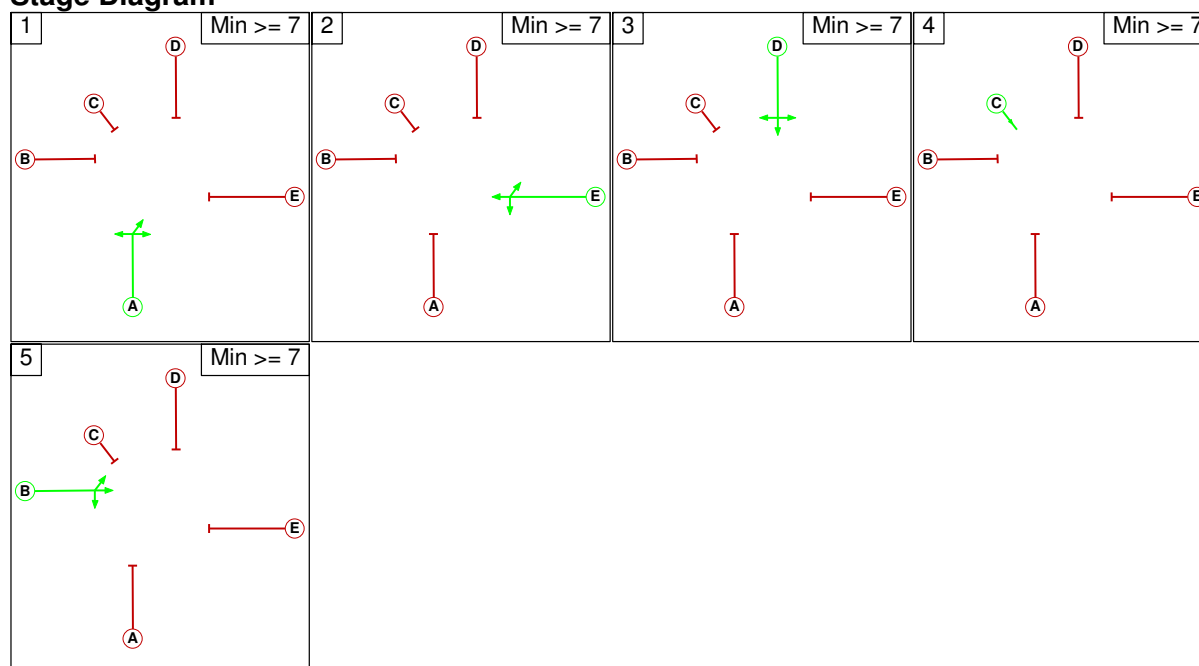
Network Layout Diagram



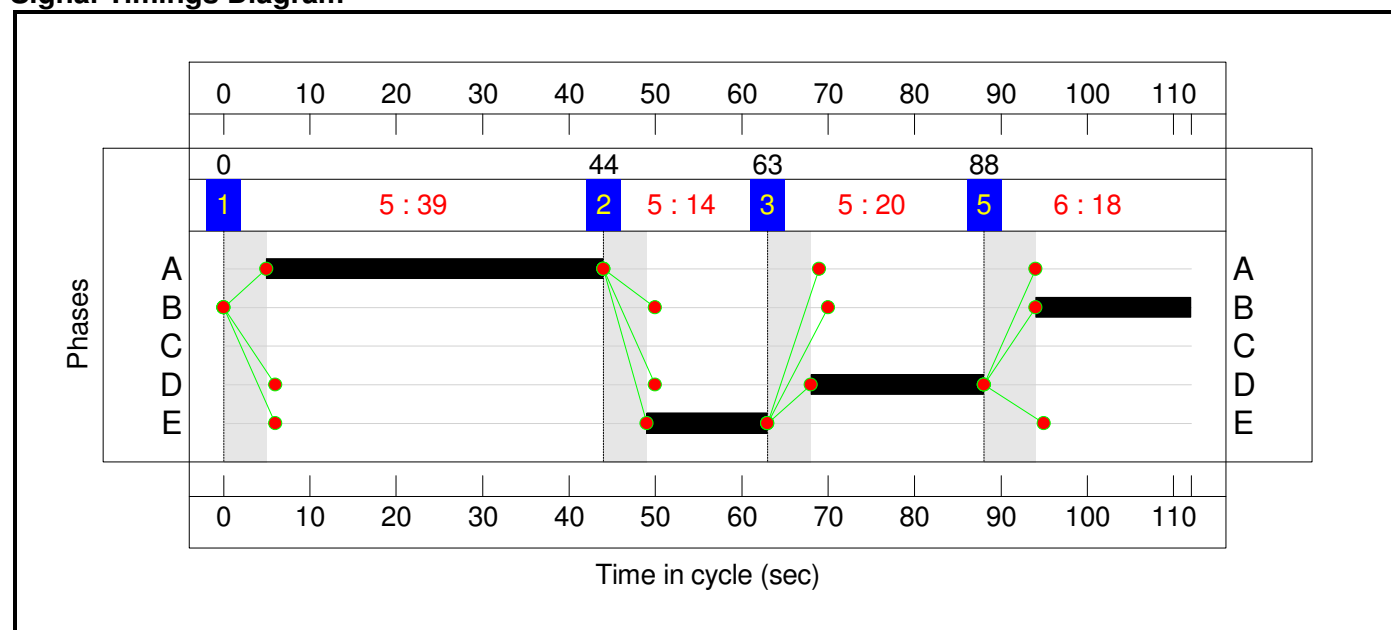
Phase Diagram



Stage Diagram



Signal Timings Diagram

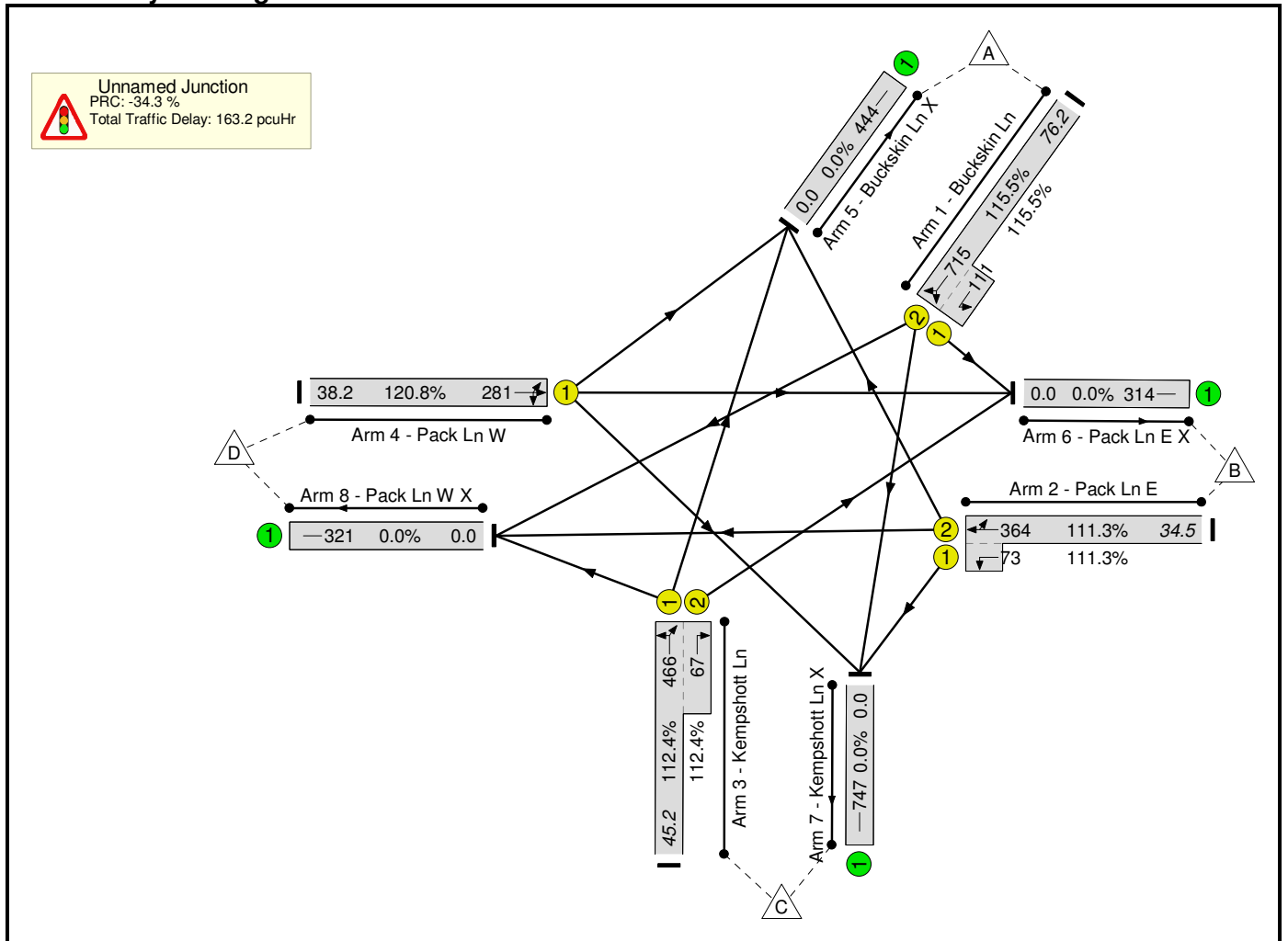


Network Results

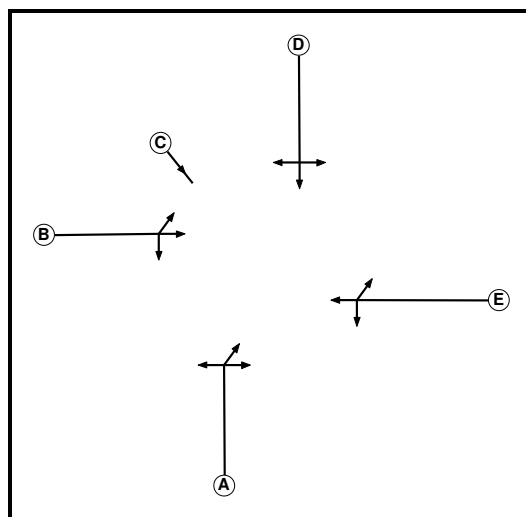
Item	Lane Description	Full Phase	Total Green (s)	Start Green (s)	End Green (s)	Deg Sat (%)	Mean Max Queue (pcu)
Network	-	-	-	-	-	127.1%	-
Unnamed Junction	-	-	-	-	-	127.1%	-
1/2+1/1	Buckskin Ln Left Ahead Right	D	20	68	88	123.0 : 123.0%	60.5
2/2+2/1	Pack Ln E Right Left Ahead	E	14	49	63	108.4 : 108.4%	24.2
3/1+3/2	Kempshott Ln Ahead Right Left	A	39	5	44	103.1 : 103.1%	43.5
4/1	Pack Ln W Left Ahead Right	B	18	94	0	127.1%	61.5
5/1	Buckskin Ln X	-	-	-	-	0.0%	0.0
6/1	Pack Ln E X	-	-	-	-	0.0%	0.0
7/1	Kempshott Ln X	-	-	-	-	0.0%	0.0
8/1	Pack Ln W X	-	-	-	-	0.0%	0.0
C1 PRC for Signalled Lanes (%): -41.2 Total Delay for Signalled Lanes (pcuHr): 156.78 Cycle Time (s): 112 PRC Over All Lanes (%): -41.2 Total Delay Over All Lanes(pcuHr): 156.78							

Scenario 6: '2021 DS PM' (FG6: '2021 DS PM', Plan 1: 'Network Control Plan 1')

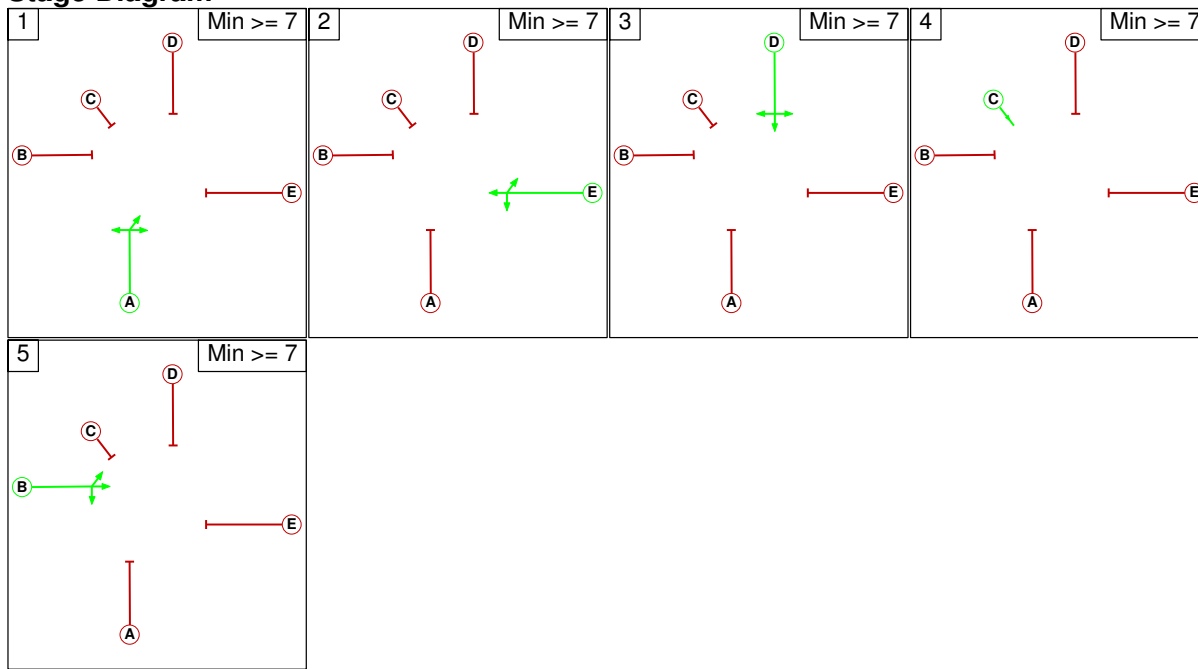
Network Layout Diagram



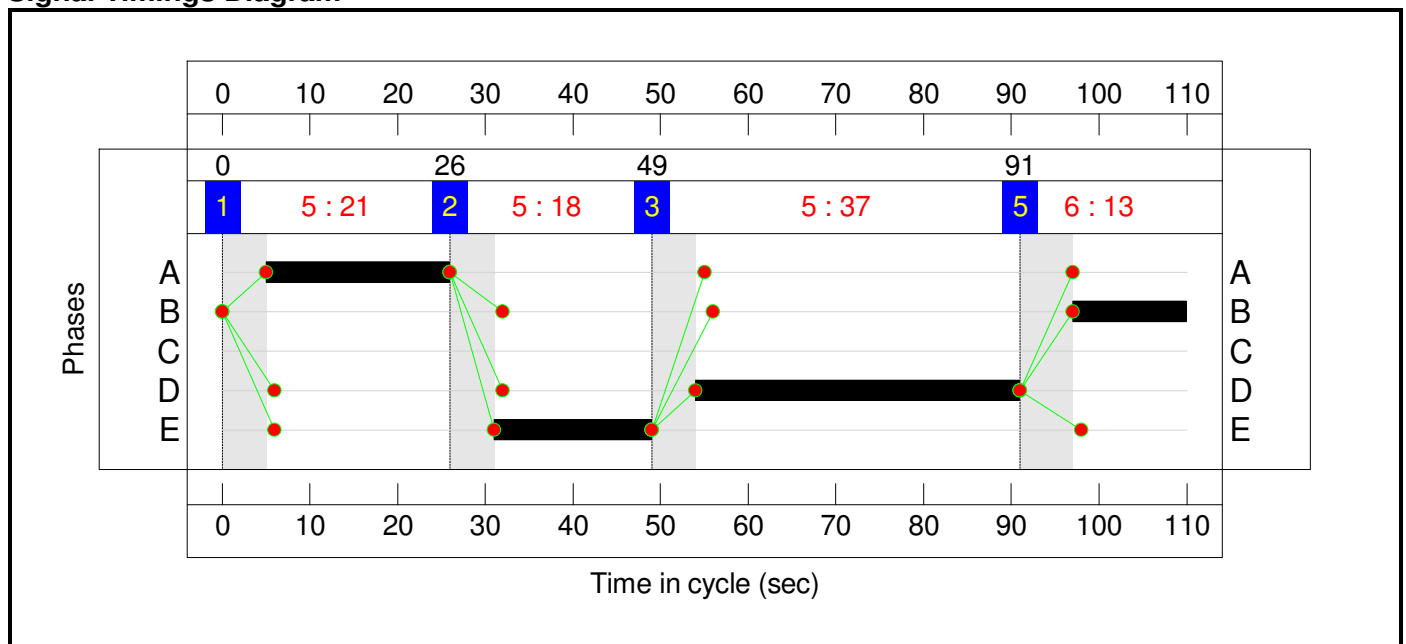
Phase Diagram



Stage Diagram



Signal Timings Diagram



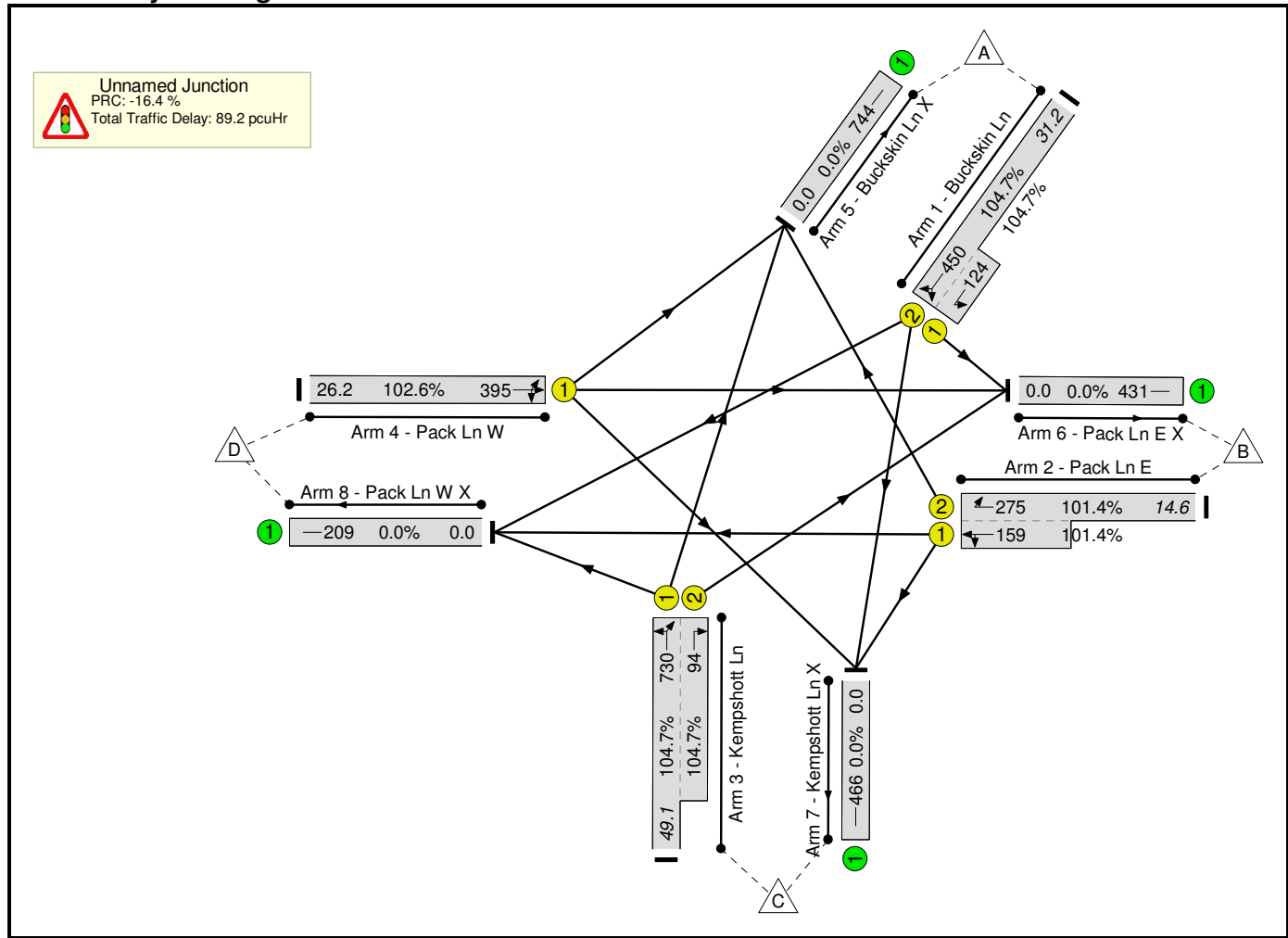
Network Results

Item	Lane Description	Full Phase	Total Green (s)	Start Green (s)	End Green (s)	Deg Sat (%)	Mean Max Queue (pcu)
Network	-	-	-	-	-	120.8%	-
Unnamed Junction	-	-	-	-	-	120.8%	-
1/2+1/1	Buckskin Ln Left Ahead Right	D	37	54	91	115.5 : 115.5%	76.2
2/2+2/1	Pack Ln E Right Left Ahead	E	18	31	49	111.3 : 111.3%	34.5
3/1+3/2	Kempshott Ln Ahead Right Left	A	21	5	26	112.4 : 112.4%	45.2
4/1	Pack Ln W Left Ahead Right	B	13	97	0	120.8%	38.2
5/1	Buckskin Ln X	-	-	-	-	0.0%	0.0
6/1	Pack Ln E X	-	-	-	-	0.0%	0.0
7/1	Kempshott Ln X	-	-	-	-	0.0%	0.0
8/1	Pack Ln W X	-	-	-	-	0.0%	0.0
C1 PRC for Signalled Lanes (%): -34.3 Total Delay for Signalled Lanes (pcuHr): 163.16 Cycle Time (s): 110 PRC Over All Lanes (%): -34.3 Total Delay Over All Lanes(pcuHr): 163.16							

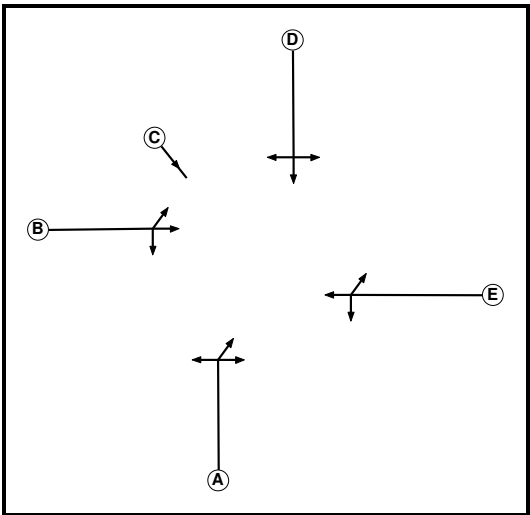
Annex G1

LINSIG Model Output

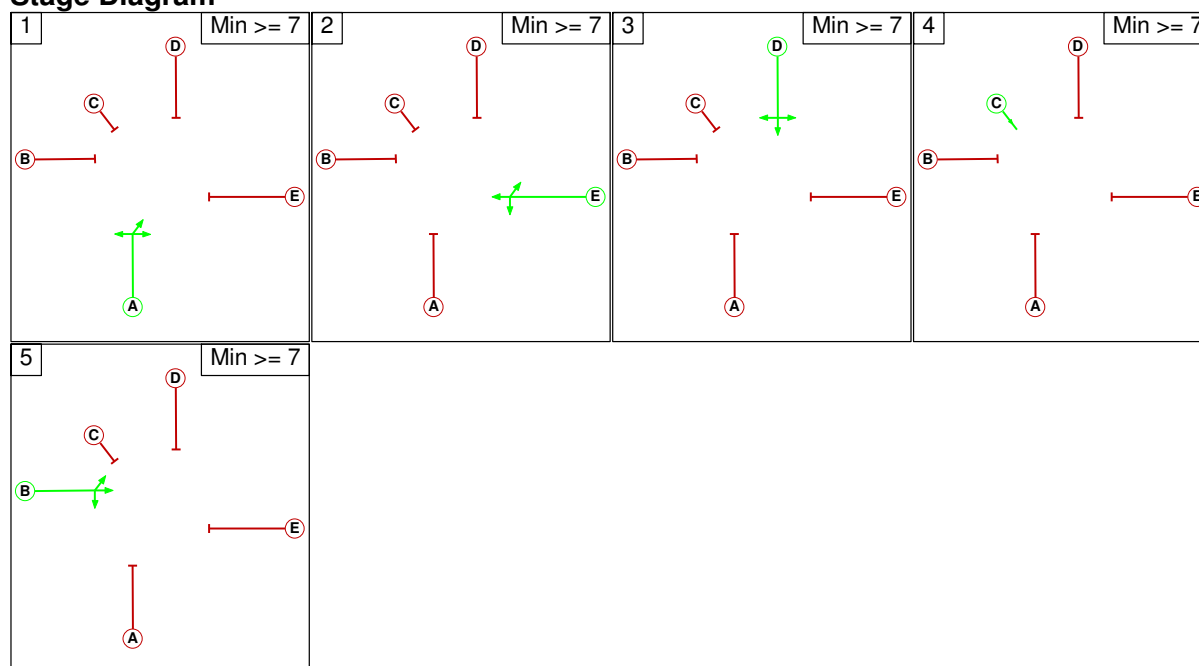
Scenario 5: '2021 DS AM' (FG5: '2021 DS AM', Plan 1: 'Network Control Plan 1')
Network Layout Diagram



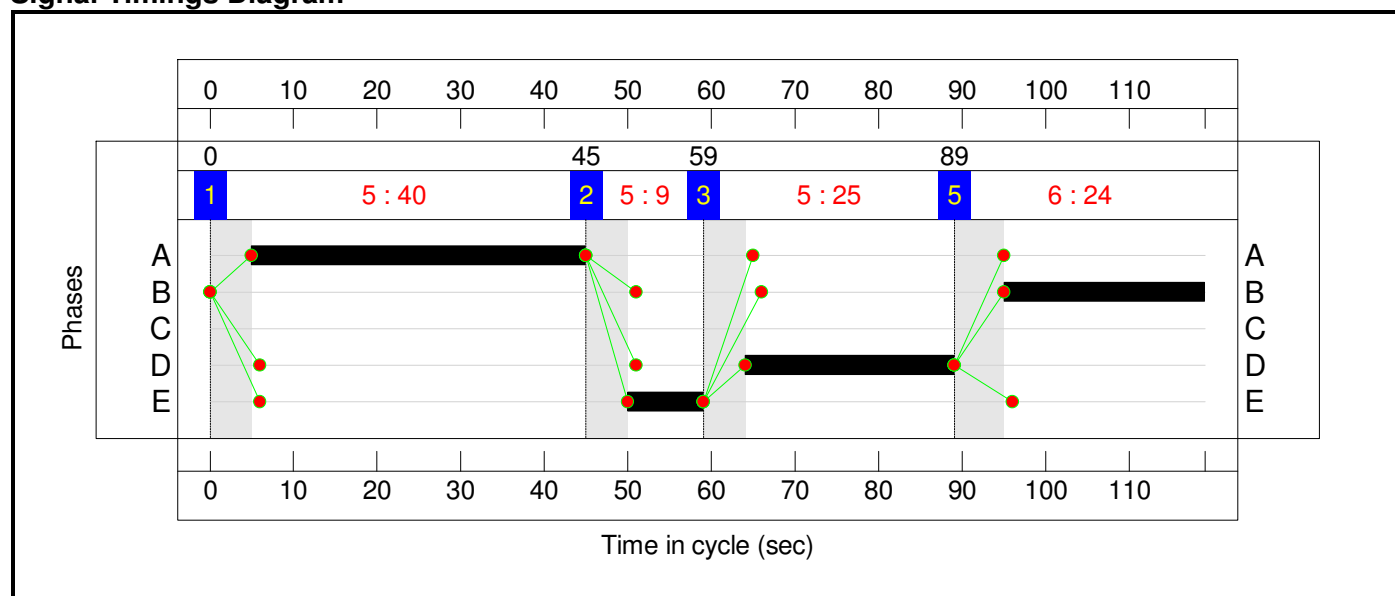
Phase Diagram



Stage Diagram



Signal Timings Diagram

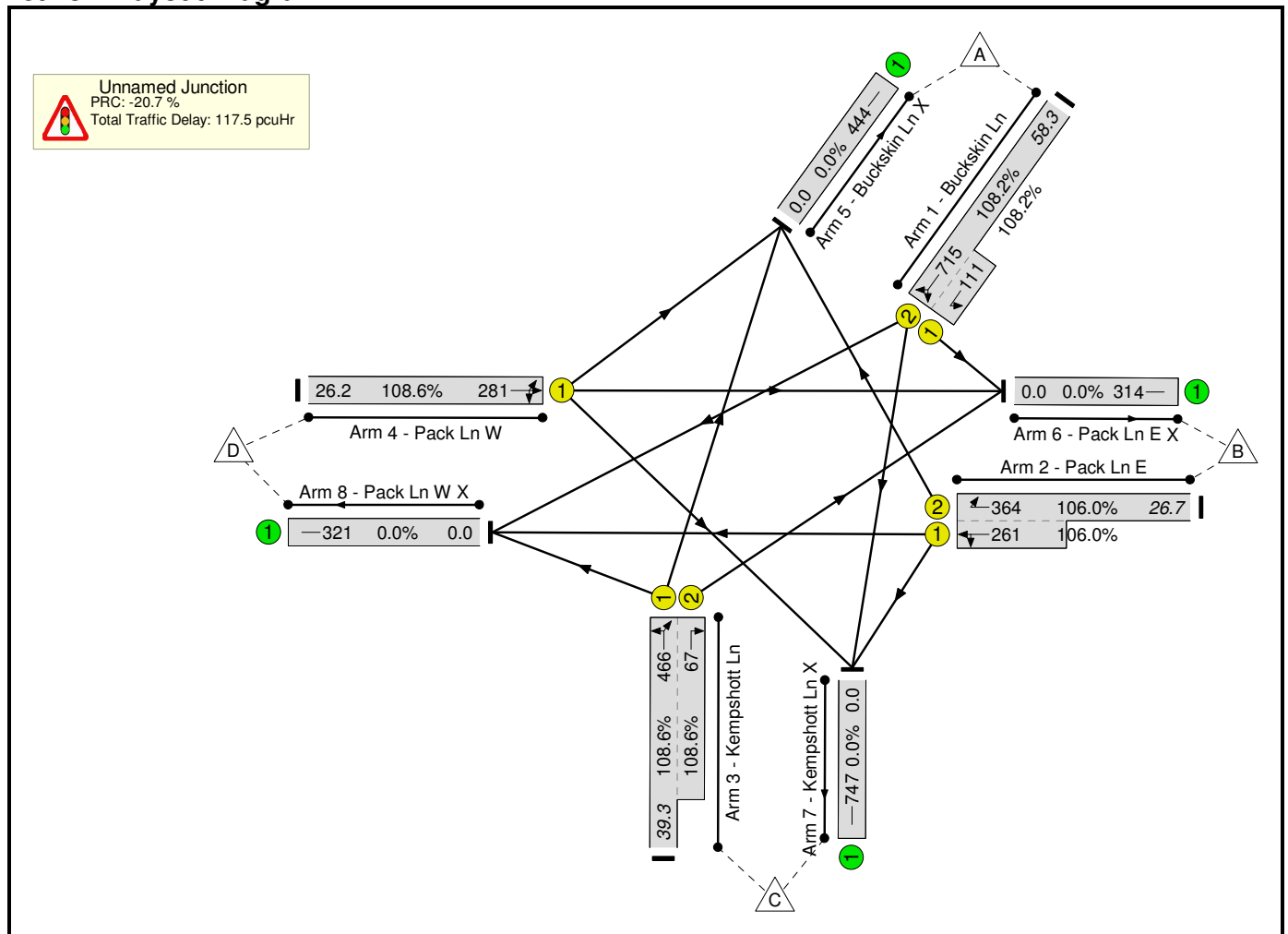


Network Results

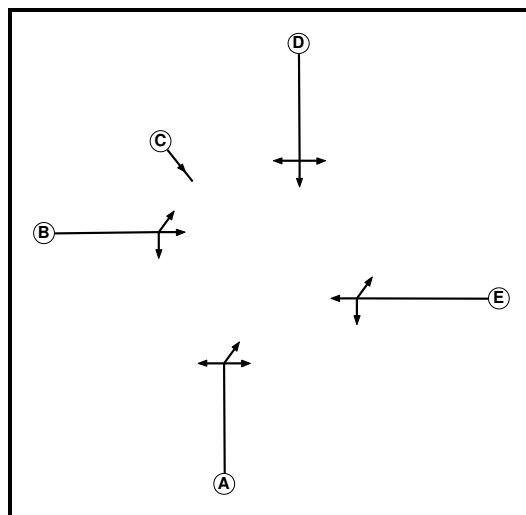
Item	Lane Description	Full Phase	Total Green (s)	Start Green (s)	End Green (s)	Deg Sat (%)	Mean Max Queue (pcu)
Network	-	-	-	-	-	104.7%	-
Unnamed Junction	-	-	-	-	-	104.7%	-
1/2+1/1	Buckskin Ln Left Ahead Right	D	25	64	89	104.7 : 104.7%	31.2
2/2+2/1	Pack Ln E Right Left Ahead	E	9	50	59	101.4 : 101.4%	14.6
3/1+3/2	Kempshott Ln Ahead Right Left	A	40	5	45	104.7 : 104.7%	49.1
4/1	Pack Ln W Left Ahead Right	B	24	95	0	102.6%	26.2
5/1	Buckskin Ln X	-	-	-	-	0.0%	0.0
6/1	Pack Ln E X	-	-	-	-	0.0%	0.0
7/1	Kempshott Ln X	-	-	-	-	0.0%	0.0
8/1	Pack Ln W X	-	-	-	-	0.0%	0.0
C1 PRC for Signalled Lanes (%): -16.4 PRC Over All Lanes (%): -16.4 Total Delay for Signalled Lanes (pcuHr): 89.25 Total Delay Over All Lanes(pcuHr): 89.25 Cycle Time (s): 119							

Scenario 6: '2021 DS PM' (FG6: '2021 DS PM', Plan 1: 'Network Control Plan 1')

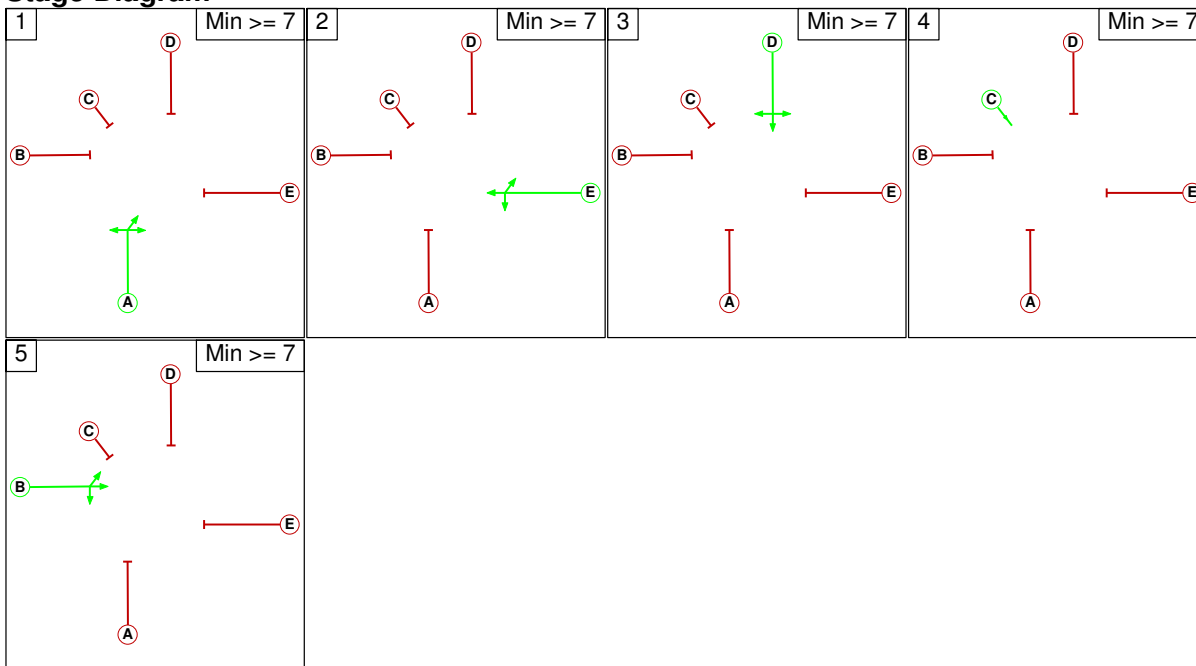
Network Layout Diagram



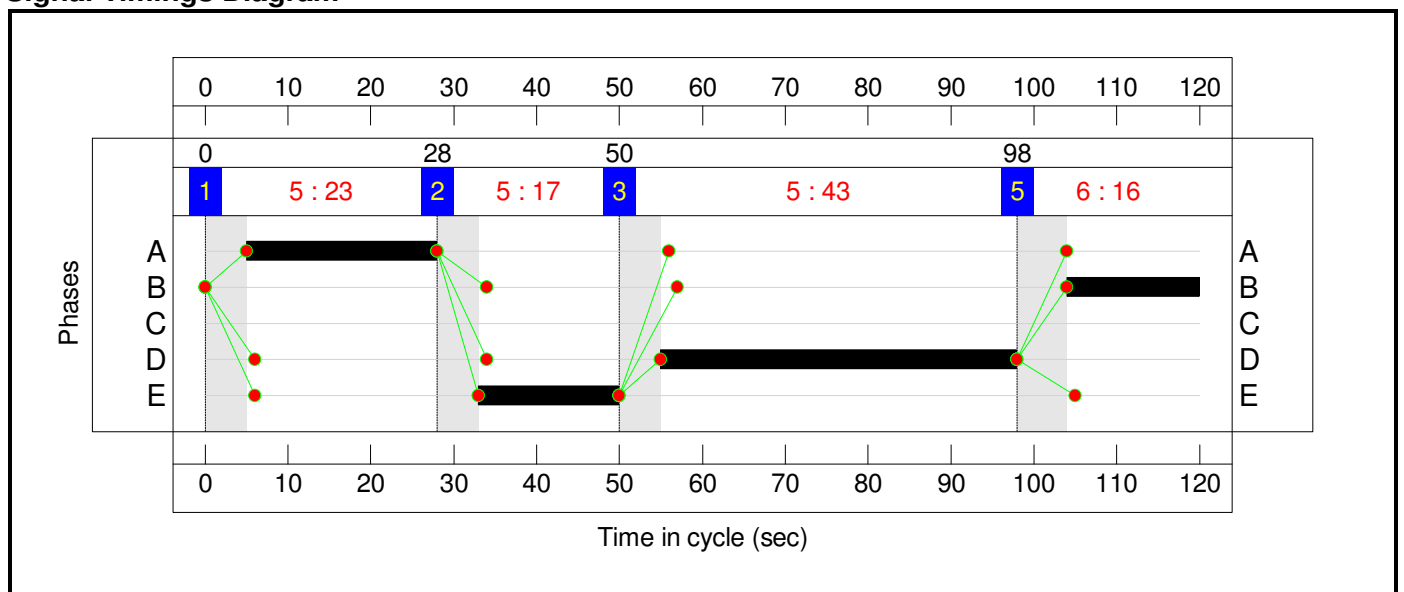
Phase Diagram



Stage Diagram



Signal Timings Diagram



Network Results

Item	Lane Description	Full Phase	Total Green (s)	Start Green (s)	End Green (s)	Deg Sat (%)	Mean Max Queue (pcu)
Network	-	-	-	-	-	108.6%	-
Unnamed Junction	-	-	-	-	-	108.6%	-
1/2+1/1	Buckskin Ln Left Ahead Right	D	43	55	98	108.2 : 108.2%	58.3
2/2+2/1	Pack Ln E Right Left Ahead	E	17	33	50	106.0 : 106.0%	26.7
3/1+3/2	Kempshott Ln Ahead Right Left	A	23	5	28	108.6 : 108.6%	39.3
4/1	Pack Ln W Left Ahead Right	B	16	104	0	108.6%	26.2
5/1	Buckskin Ln X	-	-	-	-	0.0%	0.0
6/1	Pack Ln E X	-	-	-	-	0.0%	0.0
7/1	Kempshott Ln X	-	-	-	-	0.0%	0.0
8/1	Pack Ln W X	-	-	-	-	0.0%	0.0
C1 PRC for Signalled Lanes (%): -20.7 PRC Over All Lanes (%): -20.7 Total Delay for Signalled Lanes (pcuHr): 117.47 Total Delay Over All Lanes(pcuHr): 117.47 Cycle Time (s): 120							

Annex H1

