TECHNICAL NOTE

Job Name: Heyford Park

Job No: 39304

Note No: 024 Rev D

Date: 05th March 2020

Prepared By: Phil Rawlins / Jack Harris

Subject: **Detailed LinSig Modelling associated with the DS1 SATURN Model Scenario**

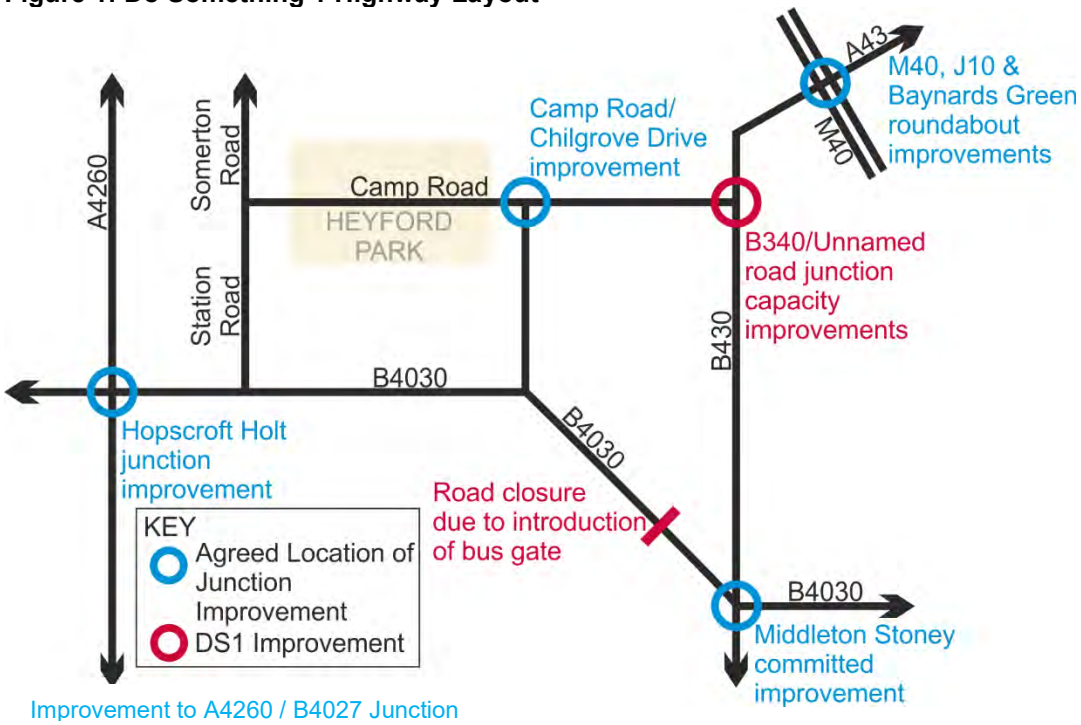
Item	Subject
1.	**Introduction** This Technical Note (TN) has been prepared by Stantec, on behalf of Dorchester Group and Oxfordshire County Council (OCC) and sets out detailed modelling analysis of the Middleton Stoney Signalised junction and Ardley Road / Unnamed Road junction following strategic modelling of the Do Something 1 (DS1) scenario using OCCs Bicester SATURN model. By way of background to this modelling exercise, a planning application was submitted for the Heyford Park development in May 2018. A Transport Assessment (TA) accompanied this application and set out that the Middleton Stoney junction was predicted to operate over capacity in the 2031 forecast year scenario both with and without the Heyford Park allocation. A number of scheme options were considered as mitigation however no further improvement scheme was considered deliverable in this location beyond the previously approved S278 scheme associated with delivery of the previously approved 1,075 dwelling scheme. On this basis, consideration of a more strategic solution to providing mitigation in this location was requested by OCC and a number of options have been considered as a package of schemes and set out below. These schemes have been assessed through a SATURN Variable Demand Model (VDM). Do Something 1 (DS1) – The DS1 scenario is a similar scheme to that proposed as part of the testing that was undertaken to inform the allocation of the site within the Cherwell Local Plan 2011 – 2031 (December 2016). The scheme includes the introduction of a bus gate on the B4030 Heyford Road arm of the Middleton Stoney junction. This bus gate will be located to the west of Heyford Village, allowing access to the Middleton Stoney junction for Middleton Stoney residents but banning through movements associated with both Heyford Park and the wider area from using the arm. In this scenario the Middleton Stoney junction will operate with a reduced number of signal stages with the B4030 Heyford Road arm operating on demand to serve buses and local residential traffic and therefore extra capacity can be created at the junction. In this scenario it is considered that the mitigation proposals in the form of traffic signals identified for the B430 Ardley Road / Unnamed Road junction to the north of Middleton Stoney are likely to require amending to increase the flare lengths at the junction in order to accommodate the extra traffic using this junction as a consequence of local re-routing. It is considered that this scenario represents an option that is promoting sustainable travel in line with the Cherwell Local Plan Policy Villages 5 objective that states *"The settlement should be designed to encourage walking, cycling and use of public transport rather than travel by private car, with the provision of footpaths and cycleways that link to existing networks. Improved access to public transport will be required".*

Item	Subject

Improvements to public transport will be achieved with the introduction of the bus gate on the western arm of the junction which will improve bus journey times and service reliability between Heyford Park and Bicester when compared to a scenario without the bus gate. The bus gate will also provide a relatively low traffic environment for people wishing to cycle between Heyford Park and Bicester along the B4030 as far as Middleton Stoney and it is therefore considered that this could form part of a strategic cycle route into Bicester.

It is also considered that this scheme represents a scenario that could be delivered by Dorchester / OCC without a requirement for third-party land. **Figure 1** below illustrates the proposals included in the DS1 scenario. It should be noted that improvements at the B430 / Ardley Road junction are not included within this scenario, but mitigation options are being considered in this location in conjunction with OCC.

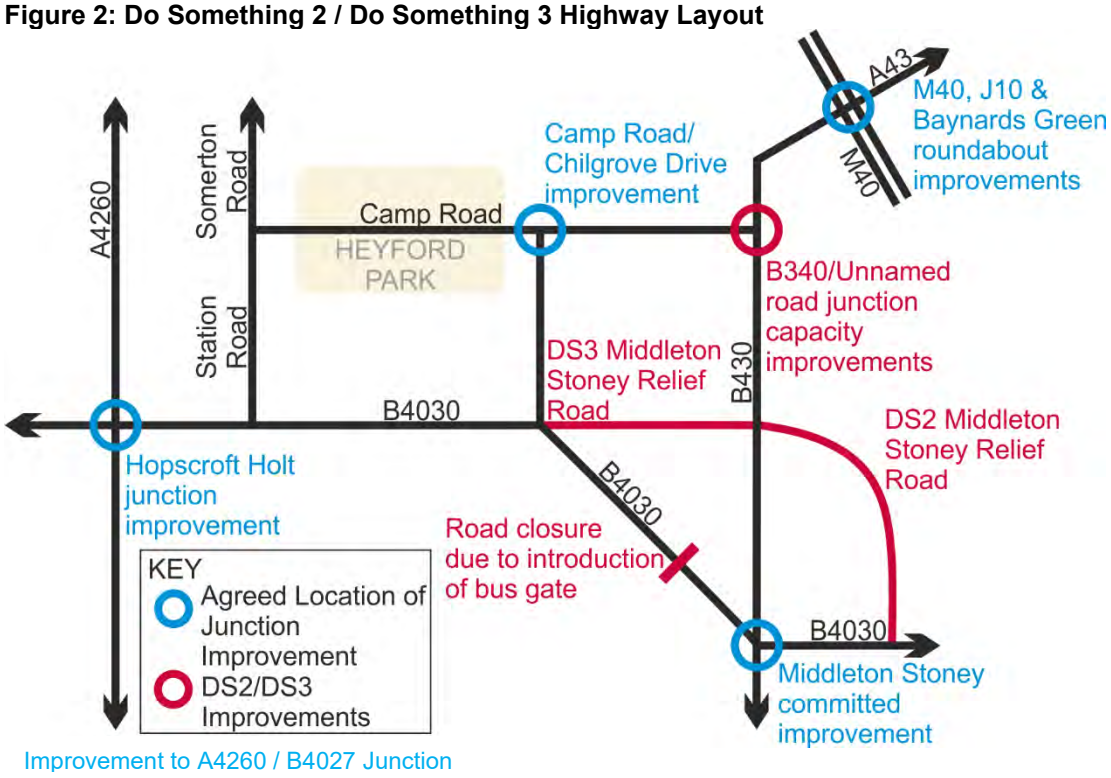
Figure 1: Do Something 1 Highway Layout



The DS1 scenario has been run through the VDM process and this Technical Note sets out detailed modelling analysis of the Middleton Stoney Signalised junction and Ardley Road / Unnamed Road junction.

Do Something 2 and 3 (DS2 and DS3) – The DS2 and DS3 scenarios take the mitigation for Middleton Stoney a step further and provide a new highway connection to bypass the junction in Middleton Stoney. DS2 provides a connection between the B430 Ardley Road in the north and the B4030 Bicester Road in the east. DS3 includes the connection provided in DS2 but also includes a connection from the B430 Ardley Road in the north to the B4030 Heyford Road to the west.

It is considered that whilst the DS2 option is able to provide some of the sustainable transport benefits that are delivered by the DS1 scenario it will also create extra highway capacity and therefore encourage more people to use the private car to travel into Bicester rather than choose an alternative option. In the DS3 scenario it is considered that the sustainable transport benefits, especially to cycling are removed through the introduction of the link road between the B4030 Heyford Road and B430 Ardley Road. **Figure 2** illustrates the schemes included for the DS2 and DS3 scenarios. It should be noted that improvements at the B430 /

Item	Subject
	Ardley Road junction are not included within this scenario, but mitigation options are currently being considered in this location in conjunction with OCC. **Figure 2: Do Something 2 / Do Something 3 Highway Layout** 
2.	**Junction Operation at B430 Ardley Road / Unnamed Road (Junction 5)** Flows for the B430 Ardley Road / Unnamed Road junction have been extracted from the 2031 Do Something 1 (DS1) SATURN model that includes the bus gate on the western arm of the Middleton Stoney junction. The flows have been assessed in LinSig using the proposed mitigation model set up for the Heyford Park TA. The outcomes of this modelling are set out within **Table 1** with full modelling outputs provided at **Appendix A**. **Table 1: B430 Ardley Road / Unnamed Road – TA Mitigation**

Link	AM Peak			PM Peak		
	DoS (%)	MMQ	Delay (Secs)	DoS (%)	MMQ	Delay (Secs)
B430 Ardley Road (S)	89.5	14	34	102.3	49	99
Minor Road	88.8	19	34	100.4	28	95
B430 Ardley Road (N)	88.5	18	32	93.6	7	21

Table 1 demonstrates that the junction is predicted to operate with a maximum DoS of 90% in the AM peak hour and 102% in the PM peak hour. These results are better than those predicted by the SATURN modelling which predicted a maximum V/C of 139% in the AM peak hour and 109% in the PM peak hour.

Item	Subject
	As the junction was shown to operate over capacity in the PM peak using the mitigation put forward within the TA a further assessment was undertaken with revised flare lengths on two of the arms. These adjustments included: - Increasing the left turn flare length on the B430 south arm from 74m to 85m - Increasing the right turn flare length on the Unnamed Road west arm from 29m to 60m The revised junction design is shown on **Drawing 39304/5501/SK58**. The outcomes of this modelling are set out within **Table 2** with full modelling outputs provided at **Appendix A**. **Table 2: B430 Ardley Road / Unnamed Road – DS1 Mitigation**

Link	AM Peak			PM Peak		
	DoS (%)	MMQ	Delay (Secs)	DoS (%)	MMQ	Delay (Secs)
B430 Ardley Road (S)	82.0	12	7	89.5	20	8
Minor Road	82.2	12	6	88.5	13	9
B430 Ardley Road (N)	79.2	16	8	85.8	6	4

Table 2 demonstrates that the junction is predicted to operate with a maximum DoS of 82.2% in the AM peak hour and 89.5% in the PM peak hour. The results show improved performance compared with those predicted by the SATURN modelling which predicted a maximum V/C of 139% in the AM peak hour and 109% in the PM peak hour.

Table 2 demonstrates that the junction layout illustrated in **Drawing 39304/5501/SK58** is predicted to operate within capacity in a scenario where a bus gate is introduced on the B4030 Heyford Road. These improvements are considered to be deliverable within land under the control of Dorchester Group or dedicated as highway.

3.	**Junction Operation at Middleton Stoney (Junction 6)** <u>Reference Case Scenario</u> In order to understand how the Middleton Stoney junction operated in the DS1 scenario when compared to the Reference Case scenario, the committed improvement scheme at Middleton Stoney has been tested in LinSig using flows extracted from the 2031 Reference Case SATURN model. This model does not include the current Heyford Park development allocation but does include the previously consented development at Heyford Park. The results of this modelling are set out within **Table 3** below with full modelling outputs provided at **Appendix A**.

Item	Subject

Table 3: Middleton Stoney 2031 Reference Case

Link	AM Peak			PM Peak		
	DoS (%)	MMQ	Delay (Secs)	DoS (%)	MMQ	Delay (Secs)
B430 Ardley Road (N)	109.2	67	231	86.0	19	59
B4030 Bicester Road (E)	109.9	37	265	93.0	21	79
B430 Oxford Road (S)	75.4	17	43	93.6	24	74
B4030 Heyford Road (W)	109.7	50	256	92.8	18	88

Table 3 demonstrates that the junction is predicted to operate with a maximum Degree of Saturation (DoS) of 110% in the AM peak hour and 94% in the PM peak hour. The results show improved performance compared with the SATURN modelling outcomes which predicted a maximum V/C of 123% in the AM peak hour and 105% in the PM peak hour.

Do Minimum Scenario

As a further comparison against the DS1 mitigation scenario the committed improvement scheme at Middleton Stoney has been tested in LinSig using flows extracted from the 2031 Do Minimum SATURN model. This model includes the previously consented Heyford Park development, the Heyford Park allocation and highway mitigation as set out within the TA but no mitigation at Middleton Stoney over and above the consented S278 improvement scheme. It should be noted that the Do Minimum scheme includes junction improvements at the B430 / Unnamed Road junction but the improvements are not as extensive as included within the DS1 scenario. The results of this modelling are set out within **Table 4** below with full modelling outputs provided at **Appendix A**.

Table 4: Middleton Stoney 2031 Do Minimum

Link	AM Peak			PM Peak		
	DoS (%)	MMQ	Delay (Secs)	DoS (%)	MMQ	Delay (Secs)
B430 Ardley Road (N)	108.8	67	223	82.8	18	53
B4030 Bicester Road (E)	106.2	30	246	100.9	29	134
B430 Oxford Road (S)	83.3	21	47	100.1	36	110
B4030 Heyford Road (W)	107.0	45	221	99.1	23	126

Table 4 demonstrates that the junction is predicted to operate over capacity with a maximum Degree of Saturation (DoS) of 109% in the AM peak hour and 101% in the PM peak hour. These results show that the junction will operate with a similar level of capacity when compared to the Reference Case scenario in the AM peak but with worsening conditions in the PM peak. The results predict improved performance in both the AM and PM peaks compared with the results predicted by the SATURN modelling.

Item	Subject

Do Something 1 Scenario

Flows extracted from the 2031 Do Something 1 (DS1) SATURN model scenario have also been assessed. The DS1 scenario includes all of the elements from the Do Minimum scenario with the addition of a bus gate on the Heyford Road west of the junction preventing through traffic from using this arm and further improvements at the B430 / Unnamed Road junction beyond the improvements included in the Do Minimum scenario. Traffic associated with existing development in Middleton Stoney Village can still use this arm however, as can buses. Within LinSig all of the improvements associated with the committed Middleton Stoney scheme have been included but the Heyford Road arm has only been run every 3 cycles to represent the average operation of this arm with reduced traffic levels.

It is considered that the flows extracted directly from SATURN are likely to over estimate the level of flow that is likely to be using the B430 Heyford Road arm of the junction because the model has the Middleton Stoney zone accessed directly off of this arm. This zone accounts for traffic from a much wider area than the development that can access directly from this arm and was a known limitation of the SATURN model in this area. On this basis PBA have calculated the number of trips that are likely to be associated with this arm in the following manner:

- The number of dwellings that have direct access from the Heyford Road arm between the approximate location of the proposed bus gate and Middleton Stoney have been calculated from a simple review of aerial mapping. This determined that there were approximately 70 dwellings with access from this arm.
- The number of trips generated by 70 dwellings were calculated using the sensitivity trip rates used within the Heyford Park TA.
- The distribution of trips at the junction was calculated using the distribution of trips into and out of the arm in the SATURN model.
- 3 buses per hour in each direction were added to these flows.

The flows with adjustments made to the Heyford Road arm were run through the LinSig model and the results are set out within **Table 5** below with full modelling outputs provided at **Appendix A**.

Table 5: Middleton Stoney 2031 Do Something 1 Flows

Link	AM Peak			PM Peak		
	DoS (%)	MMQ	Delay (Secs)	DoS (%)	MMQ	Delay (Secs)
B430 Ardley Road (N)	115.2	169	375	89.4	30	41
B4030 Bicester Road (E)	114.3	83	397	88.9	20	64
B430 Oxford Road (S)	75.0	9	30	66.9	19	27
B4030 Heyford Road (W)	97.6	7	447	45.6	2	255

Table 5 demonstrates that the junction is predicted to operate over capacity in the AM peak hour and within capacity in the PM peak hour. Compared with the Reference Case scenario the operation of the junction is marginally worse in the AM peak hour with a DoS of 115% compared to 110% in the Reference Case. In the PM peak, the junction is predicted to

Item	Subject
	operate slightly better than the Reference Case scenario with a DoS of 89% compared with 94% in the Reference Case. It also operates better than the Do Minimum scenario in the PM peak hour. When comparing the queues from this scenario with the Reference Case, **Table 5** shows that the queue lengths are forecast to be a maximum of 169 PCUs during the AM peak compared with 67 in the reference case scenario on the B430 Ardley Road arm. The queue lengths on the B4030 Bicester Road arm are predicted to 83 compared with 37 in the Reference Case scenario. Queues in the PM peak hour are much more comparable between the two scenarios.
4.	**Junction Operation at Middleton Stoney Junction – PBA TA Trip Rate** The TA includes details of the trip generation methodology that was undertaken to inform the modelling assessment. This included residential trip rates based on a typical large, mixed use and sustainable development comparable to Heyford Park as well as a sensitivity test undertaken using higher residential person trip rates that were agreed with OCC. These higher sensitivity rates were used in the subsequent modelling analysis to support the application and followed through to be used within the DS1 modelling scenario. For reference, the sensitivity trip rates and original PBA TA trip rates are set out in **Table 6**.

Table 6: Sensitivity and Standard Trip Rates

	Time Period	Arrival	Departure	Total
Sensitivity Trip Rate	AM Peak	0.147	0.452	0.599
	PM Peak	0.319	0.165	0.485
PBA TA Trip Rate	AM Peak	0.110	0.369	0.479
	PM Peak	0.281	0.187	0.469

Since the original assessment was completed, a number of sustainable access improvements are confirmed to be implemented or proposals put forward that are likely to reduce the vehicle trip generation of the proposed development. This includes the impact of proposed walk and cycle infrastructure and the implementation of the site Travel Plan, which will aim to reduce the overall vehicular trip generation of Heyford Park. Dorchester and consultants Calibro (who are undertaking the Travel Plan) have met with OCCs Travel Plan officer to discuss the Travel Plan measures that would be required to be implemented in order to achieve the level of trip reduction between the development and Bicester that is reflected by the reduction in trip rate. It is understood that full Travel Plans are being prepared for the development and they will include but are not limited to measures such as:

- Provision of Travel Plan welcome packs and leaflets including plans showing walk and cycle routes, and bus service locations.
- Personalised Travel Planning for residents and employees
- Provision of a free 3 month bus pass for residents and employees
- Implementation of a bike hire scheme and one free annual membership for residents and employees
- Adult and child cycle training will be made available
- Public bike maintenance and bike pump stands will be installed and maintained within the development.
- A community club will be established offering leisure cycle rides and walks around the development.

Item	Subject
	- Setting up and management of a car share club for residents and employees - The introduction of an electric car club vehicle - Twice annual public travel events - Secure and sheltered employee cycle parking - A forum of workplace champions will be established to share knowledge, issues and opportunities - Where possible the incorporation of showers and drying rooms into commercial buildings - Assess with each business the potential to provide car sharer only parking and smart parking. - A commitment to undertake bike maintenance sessions at travel plan events and have a monthly mobile bike repair service. - The community cycle club will organise biker breakfasts, buddy schemes and encourage cycle champions from the site to encourage work alongside the TPC. - Establish a bike miles scheme where employees can earn points in exchange for vouchers - Businesses at the site will be able to claim 50% of the cost of installing audio and video conferencing systems at their premises up to £500 - Up to 5 desks with wifi access will be made available within offices on site to create an informal co-working space to provide an alternative to home working without the need to travel. In addition to these Travel Plan specific measures, there are proposals to increase the bus service that connects Heyford Park with Bicester from one service per hour up to three. This is anticipated to increase the patronage of the bus service and as a result, reduce the vehicle trips generated by Heyford Park, especially for trips travelling to Bicester. Furthermore, the provision of a bus gate on the B4030 Heyford Road to the west of Middleton Stoney will improve the travel time and reliability for buses between Heyford park and Bicester due to the removal of through traffic on the link. This is expected to further incentivise public transport trips and reduce vehicle trips. It is also anticipated that the implementation of the bus gate will make for a low traffic route along the B4030 to Middleton Stoney and therefore this is likely to encourage people to cycle between the development and Bicester. It is proposed that a contribution be made towards cycle infrastructure between Camp Road and Middleton Stoney as part of the proposed package of measures to support the Middleton Stoney mitigation. Therefore, the residential trip rates that were set out within the TA, but not used within the DS1 modelling exercise are considered to be appropriate for use within this assessment. In addition, it is considered that these lower trip rates should be applied to the consented residential development that is also located within Heyford Park as these residents would also benefit from the Travel Plan measures. In addition to the above, the lower trip rates have been applied to the approximately 70 dwellings that are within Middleton Stoney and accessed via Heyford Road. The improved bus service provision is also anticipated to provide a benefit for Middleton Stoney residents and as such the lower trip rates are considered to be appropriate for application here as well. It is noted that the currently consented dwellings do not currently benefit from a Travel Plan associated with the development. Notwithstanding this it is considered appropriate that the lower trip rate is applied to the consented dwellings at the development because: - All existing residents will benefit from the same increase in provision of services and travel choices as future residents. - Not all of the consented units have been built and occupied at the current time. At the end of 2019 there were 755 occupations on site. On this basis there are approximately 423

Item	Subject

units or 36% left to be occupied. The majority of these will benefit from a Travel Plan on day 1.

- The currently occupied dwellings will experience a level of turn over and therefore future residents of the existing dwellings will also benefit from moving into a property with a Travel Plan in place. In order to provide an estimate of this Dorchester have provided turnover statistics for the Heyford site as set out below:
  - Open Market Sales – 350 units. Turnover of 15% – 20% every 5 years
  - Open Market Rental – 325 units. Turnover of 20% every year
  - Affordable Rental – 80 units. Turn over of 10% every 5 years.

  On the basis of the above the number of units that will have been turned over by 2031 (assuming 10 years) is set out below:
  - Open Market Sale – 123 units in new ownership (assuming 17.5% turnover)
  - Open market rental – 325 units with new tenants
  - Affordable Rental – 16 units with new tenants

  On this basis it is likely that 464 of the currently occupied properties will have a new owner / tenant and will benefit from the proposed travel plan by 2031. Once these are added to the new properties, it is likely that there will be 887 (75%) of the total 1178 consented units that benefit from moving into a property with an established Travel Plan in place.

Based on the comparison with the Reference Case, there are not considered to be any capacity issues at the junction during the PM peak. As such, only the AM peak results are reported for the remainder of this report. The total reduction in vehicle trips is set out in the **Table 7**.

Table 7: Trip Reductions from Sensitivity Trip Rates

Link	Consented Heyford Development	Allocated Heyford Development	Middleton Stoney Reduction	Total
B430 Ardley Road (N)	30	38	1	69
B4030 Bicester Road (E)	14	17	1	32
B430 Oxford Road (S)	2	3	1	6
B4030 Heyford Road (W)	0	0	6	6
Total	46	58	9	113

These adjusted flows have been run through the LinSig model and the results are set out within **Table 8** below with full modelling outputs provided at **Appendix A**. The Heyford Road arm is still set to run every 3 cycles.

Item	Subject

Table 8: Middleton Stoney Do Something – PBA TA Trip Rates

Link	AM Peak		
	DoS (%)	MMQ	Delay (Secs)
B430 Ardley Road (N)	108.4%	119	246
B4030 Bicester Road (E)	108.1%	62	273
B430 Oxford Road (S)	75%	10	31
B4030 Heyford Road (W)	82.1%	5	353

Table 8 demonstrates that the junction is predicted to operate with a maximum DoS of 108% in the AM peak hour. Compared with the Reference Case scenario the operation of the junction is marginally better in the AM peak hour with a DoS of 108% compared to 110% in the Reference Case, however the queue lengths are higher with a maximum forecast of 119 and 62 PCUs on Ardley Road and Bicester Road in this scenario, compared to 67 and 37 PCUs respectively in the Reference Case.

The queue lengths in the Do Minimum scenario are broadly the same as those recorded in the Reference case and so the queue length increase when compared to this scenario is similar.

However, whilst the queues have increased on Ardley Road and Bicester Road, the queue lengths forecast on Oxford Road have reduced from 17 / 21 PCUs in the Reference case / Do minimum scenario to 10 PCUs in this scenario. Similarly, the queues forecast on Heyford Road have reduced from 45 / 50 PCUs in the Reference Case / Do Minimum to 5 PCUs in the scenario set out above. This is predominantly due to the bus gate significantly reducing the amount of traffic using this route.

Impact of Enhanced Public Transport Provision

As set out above there are proposals for the provision of up to 3 buses per hour to connect the site with Bicester town centre. The provision of 3 buses per hour is one of the factors that has permitted the use of the lower trip rates set out in **Table 7**, alongside the implementation of the Travel Plan and the potential for a higher level of cycling trips to Bicester. In addition to the 3 proposed buses per hour, there is the potential that an additional bus service could be provided, which would have the potential to encourage further modal shift by providing additional capacity.

In order to forecast the potential impact that the provision of additional bus services may have on the traffic flows through the junction, an assessment has been made on the likely uptake of patronage due to the additional service. Using a standard demand elasticity factor of 0.4 (as set out in Section 7.4.1 and Table 7.5 of TRL Report 593 "The Demand for Public Transport a Practical Guide", extract attached at **Appendix B**) it is likely that there will be an additional 12% of passengers due to the introduction of a 4th bus. The calculation associated with this is provided at **Appendix C**.

This factor has been applied to the target public transport mode share in order to calculate the likely additional passengers that will use the bus service. The Travel Plan sets a residential target of 6.8% by bus and an employment target of 2.0%. On this basis it is predicted that there will be a mode shift to bus of 0.82% for residential trips and 0.24% for employment trips. The number of trips that are likely to shift to use the new bus service are set out within **Table 9** below.

Item	Subject

Table 9: Modal Shift Due to Extra Bus Service

	AM Peak Hour	Inbound	Outbound	Total
Residential	Committed Heyford Development	3	8	11
	Allocated Heyford Development	4	11	15
Employment	Committed Heyford Development	2	0	2
	Allocated Heyford Development	2	0	2
Total		11	19	30

The trips set out within **Table 9** were removed from the turning movements at the Middleton Stoney junction such that Inbound trips were removed from the right turn movement between Bicester Road and Ardley Road and the outbound trips were removed from the left turn movement between Ardley Road and Bicester Road.

The impact of these 19 fewer left turn movements on Ardley Road and 11 right turn movements on Bicester road on the operation of the junction has been tested in the LinSig model, the results of which are set out in **Table 10** with full modelling outputs provided at **Appendix A**.

Table 10: Middleton Stoney Do Something – Enhanced Public Transport Provision

Link	AM Peak		
	DoS (%)	MMQ	Delay (Secs)
B430 Ardley Road (N)	106.5%	99	203
B4030 Bicester Road (E)	106.4%	53	238
B430 Oxford Road (S)	75.0%	9	30
B4030 Heyford Road (W)	87.0%	5	378

Table 10 demonstrates that the junction is predicted to operate with a maximum DoS of 106% in the AM peak hour, an improvement over the Reference Case which is predicted to be at 110%. When compared to the Reference Case results, the maximum queue lengths are forecast to increase on the Ardley Road arm, from 67 to 99 PCUs and on the Bicester Road arm from 37 to 53 PCUs. However, there is a reduction in queueing overall at the junction when compared with the reference case scenario with total queuing in the DS1 scenario of 166 PCUs compared with 171 in the reference case scenario. Total queue lengths at the junction are similar when compared with the Do Minimum scenario where total queues at the junction are predicted to be 163 PCUs

Item	Subject
	The inclusion of the bus gate, Travel Planning measures, additional bus services and contribution towards cycle infrastructure result in the junction operating with a similar level of capacity and queuing as that set out in the Reference case (Table 3) and Do minimum scenarios (Table 4). It is therefore considered that this scenario is able to effectively mitigate the impact of the Heyford Park development on the Middleton Stoney junction.
5.	**Junction Operation at Middleton Stoney – HGV Restriction on B4030 East** In addition to the measures set out above OCC have been in discussion with Middleton Stoney Parish council regarding the implementation of a HGV restriction on the B4030 Bicester Road to the east of the junction. It was considered that this would help to reduce the number of HGV trips travelling through the village and improve air quality in the area. It is considered that this scheme could be delivered as part of the mitigation proposed for the Middleton Stoney as it would also help to reduce the number of trips travelling through Middleton Stoney and is likely to improve the operation of the junction. On this basis Select Link Analysis has been undertaken in the SATURN model for the AM peak DS1 scenario in order to determine the number of HGV trips that are using the B4030 Bicester Road and travelling through the Middleton Stoney junction. **Table 11** sets out the number of HGV trips using the B4030 Bicester Road and the SATURN plots setting out the total HGVs on this link are provided at **Appendix D**.

Table 11: HGV Trips using the B4030 Bicester Road Junction

Direction of Movement on B4030 Bicester Road	Trip Route	Movement at Middleton Stoney	Flow (PCUs) AM Peak DS1
Eastbound	M40 to Bicester	B430 North to B4030 East	14
Eastbound	Heyford Park to Bicester	B430 North to B4030 East	17
Eastbound	Middleton Stoney to Bicester	B4030 West to B4030 East	2
Westbound	Bicester to M40	B4030 East to B430 North	25
Westbound	Bicester to Heyford Park	B4030 East to B430 North	10
Westbound	Bicester to Middleton Stoney	B4030 East to B4030 West	1

If an HGV restriction were to be placed on the B4030 Bicester Road the HGV trips set out in **Table 11** would re-assign to other parts of the network in order to avoid the restriction. The following assumptions for this re-assignment have been agreed with OCC.

- Trips between Bicester and the M40 (and vice-versa) will reassign via the B4100 and Baynards Green Roundabout in order to access the motorway.
- Trips between Bicester and Heyford Park (and vice-versa) will reassign to the following routes:
    - 50% via the B4100, M40, J10 and B430 / Unnamed Junction (J5) to Camp Road.
    - 50% via the A41, A34, B430 and B430 / Unnamed Junction (J5) to Camp Road.
- Trips between Bicester and Middleton Stoney (and vice-versa) would reassign to the A41, A34, B430 and Middleton Stoney Junction to Heyford Road.

Item	Subject

On the basis of the implementation of a HGV restriction and these assumptions the change in traffic flow at the Middleton Stoney junction in the AM peak DS1 scenario is set out in **Table 12**.

Table 12: Change in Traffic Flow at Middleton Stoney associated with HGV Restriction on B4030 Bicester Road

	B430 North	B4030 East	B430 South	B4030 West	Total
B430 North	0	-31	9	0	-22
B4030 East	-35	0	0	-1	-36
B430 South	5	0	0	1	6
B4030 West	0	-2	2	0	0
Total	-30	-33	11	0	-52

The flow changes set out within **Table 12** have been applied to the DS1 LinSig model. The results of this revised model are set out in **Table 13** with full modelling outputs provided at **Appendix A**.

Table 13: Middleton Stoney Do Something – Enhanced Public Transport Provision and HGV Restriction

Link	AM Peak		
	DoS (%)	MMQ	Delay (Secs)
B430 Ardley Road (N)	102.7%	74	127
B4030 Bicester Road (E)	102.4%	37	171
B430 Oxford Road (S)	75.0%	9	29
B4030 Heyford Road (W)	87.0%	5	378

Table 13 demonstrates that the junction is predicted to operate with a maximum DoS of 103% in the AM peak hour which is an improvement over the Reference Case which is predicted to be at 110%. When compared to Reference Case results, the maximum queue lengths are forecast to have a minor increase on the Ardley Road arm, from 67 to 74 PCUs and they remain consistent on the Bicester Road arm with both scenarios having a queue of 37 PCUs. There is a reduction in queueing overall at the junction when compared with the Reference Case scenario with total queuing in the DS1 scenario of 125 PCUs compared with 171 in the Reference Case scenario. Total queue lengths at the junction are also predicted to be lower than when compared with the Do Minimum scenario where total queues at the junction are predicted to be 163 PCUs

It should also be noted that the way in which the signals have been modelled means that the delay shown on the western arm of the junction is significantly overestimated in the scenarios where the bus gate is present. The modelling is based on a fixed operation and the western arm has been set to run once every third cycle, or approximately once every 360 seconds. In the model vehicles arriving ahead of the arm obtaining a green light would need to wait until its next scheduled which could be up to 360 seconds time, hence the model is reporting large delays on this arm. In reality the junction would adapt to allow vehicles through when they

Item	Subject
	arrive such that a vehicle would be unlikely to wait longer than one cycle or 120 seconds. **Table 13** shows that the western arm has a delay per vehicle of 378 seconds. In practice we would expect this delay to be approximately 120 seconds. On the ground the traffic signals will operate via an adaptive traffic control system called MOVA. The MOVA operation is continuously adapting the signal timing and stage sequence within set parameters to try and reduce the delay at the junction. The system detects traffic travelling towards the junction by sensing cars travelling towards the junction via inductive loops that are cut into the road surface. These sensors are located based on road speed and user behaviour to ensure reliable detection. The system is flexible enough that if an arm did not have any vehicle demand then the associated stage could be skipped and will only be called when there is demand. In this way the junction will not run the stage associated with the western arm if there is no demand but can run this stage at the appropriate time in the cycle if a vehicle is present at the junction. The inclusion of the bus gate, HGV restriction on the B4030 east, Travel Plan measures, additional bus services (4 bus per hour) and contribution towards local cycle infrastructure result in the junction operating with a better level of performance and reduced queuing compared with both the Reference Case (Table 3) and Do minimum scenarios (Table 4). It is therefore considered that in this scenario the combination of measures are able to effectively mitigate the impact of the Heyford Park development on the Middleton Stoney junction.
6.	**Conclusion** This Technical Note has tested the impact of the Heyford Park development on the B430 Ardley Road / Unnamed Road junction and Middleton Stoney junction in the DS1 mitigation scenario. The DS1 scenario includes putting a bus gate on the B4030 Heyford Road arm of the Middleton Stoney junction to prevent through traffic and capacity enhancements at the B430 Ardley Road / Unnamed Road junction. It was identified that whilst the junction mitigation identified for the B430 Ardley Road / Unnamed Road junction within the Heyford Park TA did not operate within capacity in the DS1 scenario improvements could be made to this design, through increasing flare lengths, that would allow the junction to operate within capacity. The junction could be delivered on land within the control of Dorchester or dedicated as highway. The note has also identified that the operation of the Middleton Stoney signalised junction in the DS1 scenario is likely to be similar or better than in the Reference Case scenario (albeit with a slightly different distribution of DoS and queuing across all the arms of the junction) if there is a mode shift away from the private car for trips between Heyford Park and Bicester compared to the Sensitivity Test trips that were assessed within the TA. A summary of the operation of the junction in the different scenarios set out within the note is provided at **Table 14**.

Item	Subject

Table 14: Summary of Operation of Middleton Stoney Junction

Link	AM Peak		PM Peak	
	Worst DoS (%)	Total Queue	Worst DoS (%)	Total Queue
2031 Reference Case	109.9	171	93.6	83
2031 Do Minimum	108.8	163	100.9	106
2031 Do Something 1	115.2	268	89.4	72
Do Something 1: PBA TA Trip Rates	108.4	196	-	-
Do Something 1: PBA TA Trip Rates and Enhanced Public Transport	106.5	166	-	-
Do Something 1: PBA TA Trip Rates, Enhanced Public Transport and HGV Restriction	102.7	125	-	-

It is considered that a mode shift to more sustainable modes for trips from Heyford Park is likely due to:

- A comprehensive Travel Plan being prepared for the development
- The introduction of a more frequent bus service to Bicester (up to 4 buses per hour) would encourage a move to public transport trips
- The introduction of the bus gate on the Heyford Road arm of the junction will improve bus journey times and reliability between the development and Bicester and encourage shift to public transport.
- The introduction of the bus gate on the Heyford Road arm of the junction will provide for a low traffic environment on the B4030 between the development and Middleton Stoney. This could allow the route to form part of a strategic cycle route to Bicester which is likely to encourage a mode shift to bike and it is proposed that a contribution be made towards cycle infrastructure between Camp Road and Middleton Stoney.

It is also considered that the introduction of a HGV restriction on the B4030 Bicester would reduce the number of HGVs travelling through the junction which would provide an improvement in operation as well as improving the environmental amenity for Middleton Stoney residents.

It should be noted that in the DS1 scenario with a reduced trip rate, an additional bus service and the HGV restriction in place the junction is predicted to operate with improved levels of capacity and queuing when compared to the reference case scenario whilst accommodating an increase in person movements through the junction. This increase in person movements is due to higher traffic flows in this scenario and an increase in bus patronage due to the improved service provision and associated benefits for journey times and reliability afforded by the bus gate.

In the context of the above, this exercise demonstrates that the package of off-site highway mitigation schemes, proposed public transport infrastructure and bus service improvements set out in this note can adequately mitigate the impacts of the proposed development traffic at the Middleton Stoney signalised junction with overall junction performance operating better than in the without development scenario (Reference Case).

Item	Subject
	The DS1 mitigation measures can be implemented and delivered by the developer and it is therefore considered that they represent a preferred mitigation solution for the development when compared with the DS2 and DS3 scenarios. The DS2 and DS3 scenarios have significant risk and uncertainty associated with delivery due to the requirements for third party land, external funding which is not secured and the additional uncertainty that this causes in terms of timescale. On this basis it is considered that the implementation of the following measures would form an appropriate and deliverable package of mitigation measures for Middleton Stoney in combination with other off-site local highway mitigation measures on the local road network as discussed with OCC**:** - a bus gate on the B4030 Heyford Road arm of the Middleton Stoney junction; - enhanced improvements at the B430 Ardley Road / Unnamed Road junction; - new / revised bus services; - a HGV restriction on the B4030 Bicester Road arm; and - contributions towards cycle infrastructure between Camp Road and Middleton Stoney,

DOCUMENT ISSUE RECORD

Technical Note No	Rev	Date	Prepared	Checked	Reviewed (Discipline Lead)	Approved (Project Director)
39304/TN024	-	09.01.19	PR / JH	PR	-	MW
39304/TN024	A	30.01.19	PR	-	-	MW
39304/TN024	B	10.06.19	PR	-	-	MW
39304/TN024	C	29.08.19	PR	-	-	-
39304/TN024	D	06.03.20	RK	-	PR	MW

This report has been prepared by Stantec UK Limited ('Stantec') on behalf of its client to whom this report is addressed ('Client') in connection with the project described in this report and takes into account the Client's particular instructions and requirements. This report was prepared in accordance with the professional services appointment under which Stantec was appointed by its Client. This report is not intended for and should not be relied on by any third party (i.e. parties other than the Client). Stantec accepts no duty or responsibility (including in negligence) to any party other than the Client and disclaims all liability of any nature whatsoever to any such party in respect of this report.
Stantec 10 Queen Square Bristol BS1 4NT
T: +44 (0)117 332 7840

TECHNICAL NOTE

DRAWINGS

NOTES:

1. THE LAYOUT IS SUBJECT TO DETAILED DESIGN, ROAD SAFETY AUDIT, CAPACITY TESTING, GROUND INVESTIGATIONS RESULTS & EARTHWORKS MODELLING, UTILITIES & SERVICES AND CONFIRMATION OF LAND OWNERSHIP;

2. THE DETAILED DESIGN LAYOUT WILL BE DESIGNED IN ACCORDANCE WITH ALL RELEVANT DESIGN GUIDANCE AND STANDARDS;

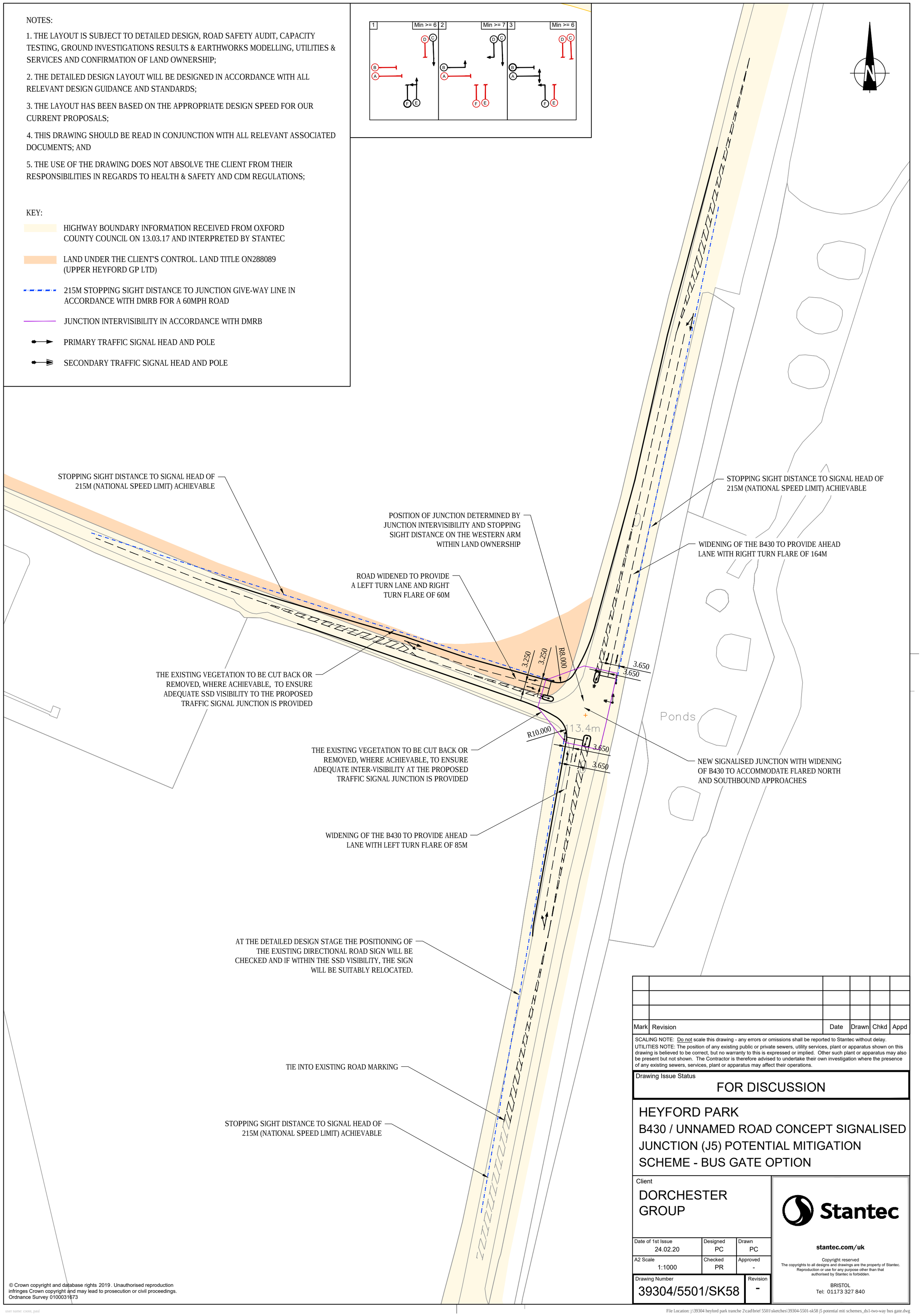
3. THE LAYOUT HAS BEEN BASED ON THE APPROPRIATE DESIGN SPEED FOR OUR CURRENT PROPOSALS;

4. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL RELEVANT ASSOCIATED DOCUMENTS; AND

5. THE USE OF THE DRAWING DOES NOT ABSOLVE THE CLIENT FROM THEIR RESPONSIBILITIES IN REGARDS TO HEALTH & SAFETY AND CDM REGULATIONS;

KEY:

- HIGHWAY BOUNDARY INFORMATION RECEIVED FROM OXFORD COUNTY COUNCIL ON 13.03.17 AND INTERPRETED BY STANTEC
- LAND UNDER THE CLIENT'S CONTROL. LAND TITLE ON288089 (UPPER HEYFORD GP LTD)
- 215M STOPPING SIGHT DISTANCE TO JUNCTION GIVE-WAY LINE IN ACCORDANCE WITH DMRB FOR A 60MPH ROAD
- JUNCTION INTERVISIBILITY IN ACCORDANCE WITH DMRB
- PRIMARY TRAFFIC SIGNAL HEAD AND POLE
- SECONDARY TRAFFIC SIGNAL HEAD AND POLE



© Crown copyright and database rights 2019 . Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Ordnance Survey 0100031673

Mark	Revision	Date	Drawn	Chkd	Appd

SCALING NOTE: Do not scale this drawing - any errors or omissions shall be reported to Stantec without delay.

UTILITIES NOTE: The position of any existing public or private sewers, utility services, plant or apparatus shown on this drawing is believed to be correct, but no warranty to this is expressed or implied. Other such plant or apparatus may also be present but not shown. The Contractor is therefore advised to undertake their own investigation where the presence of any existing sewers, services, plant or apparatus may affect their operations.

Drawing Issue Status

FOR DISCUSSION

HEYFORD PARK

B430 / UNNAMED ROAD CONCEPT SIGNALISED JUNCTION (J5) POTENTIAL MITIGATION SCHEME - BUS GATE OPTION

Client

DORCHESTER GROUP

Date of 1st Issue	Designed	Drawn
24.02.20	PC	PC
A2 Scale	Checked	Approved
1:1000	PR	-

Drawing Number: 39304/5501/SK58

Revision: -

Stantec

stantec.com/uk

Copyright reserved
The copyrights to all designs and drawings are the property of Stantec. Reproduction or use for any purpose other than that authorised by Stantec is forbidden.

BRISTOL
Tel: 01173 327 840

TECHNICAL NOTE

APPENDIX A

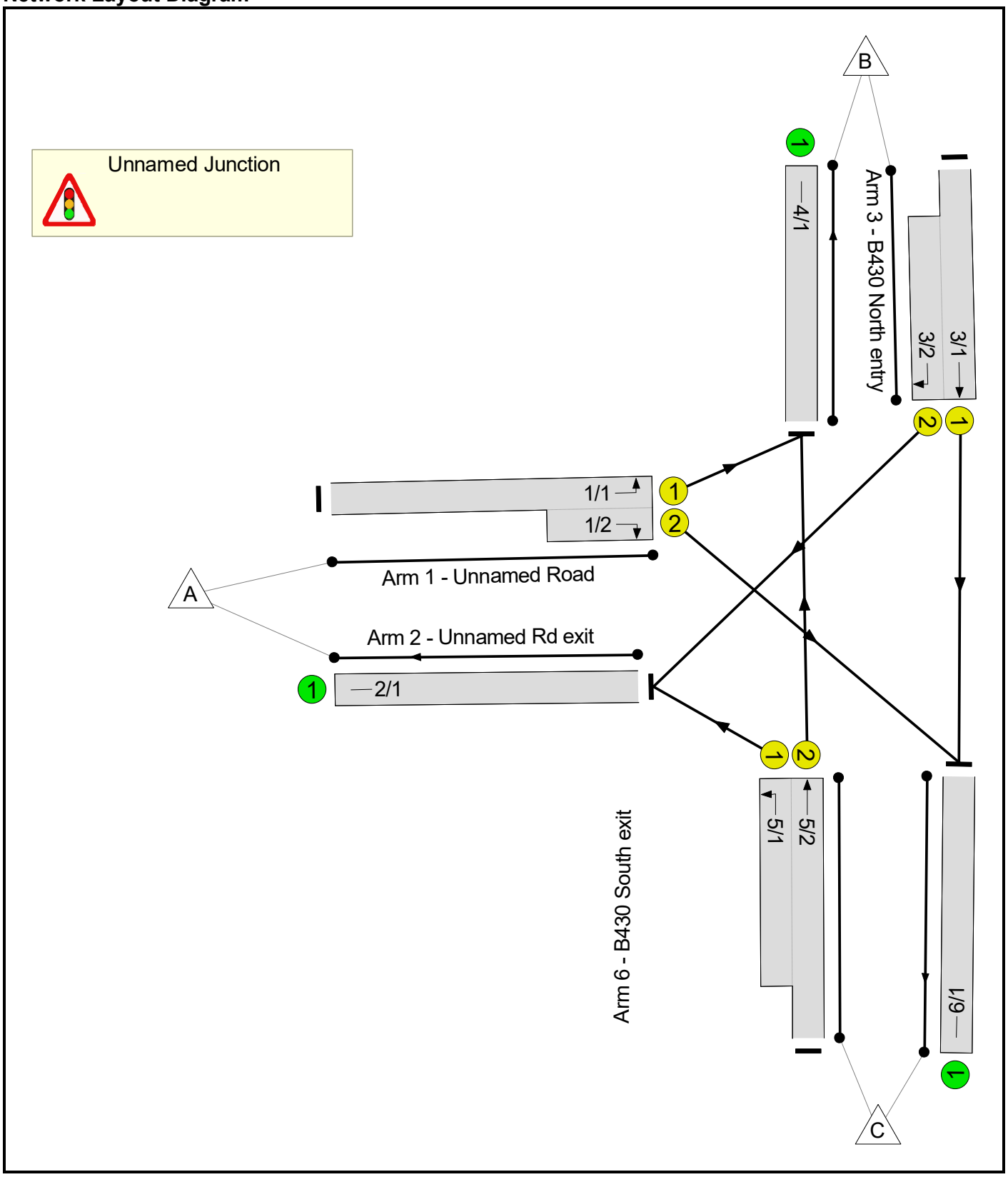
Full Input Data And Results

User and Project Details

Project:	
Title:	
Location:	
File name:	J5 B430 minor rd single lane (possible mit Opt4) V6.lsg3x – TA Geometry
Author:	
Company:	
Address:	
Notes:	

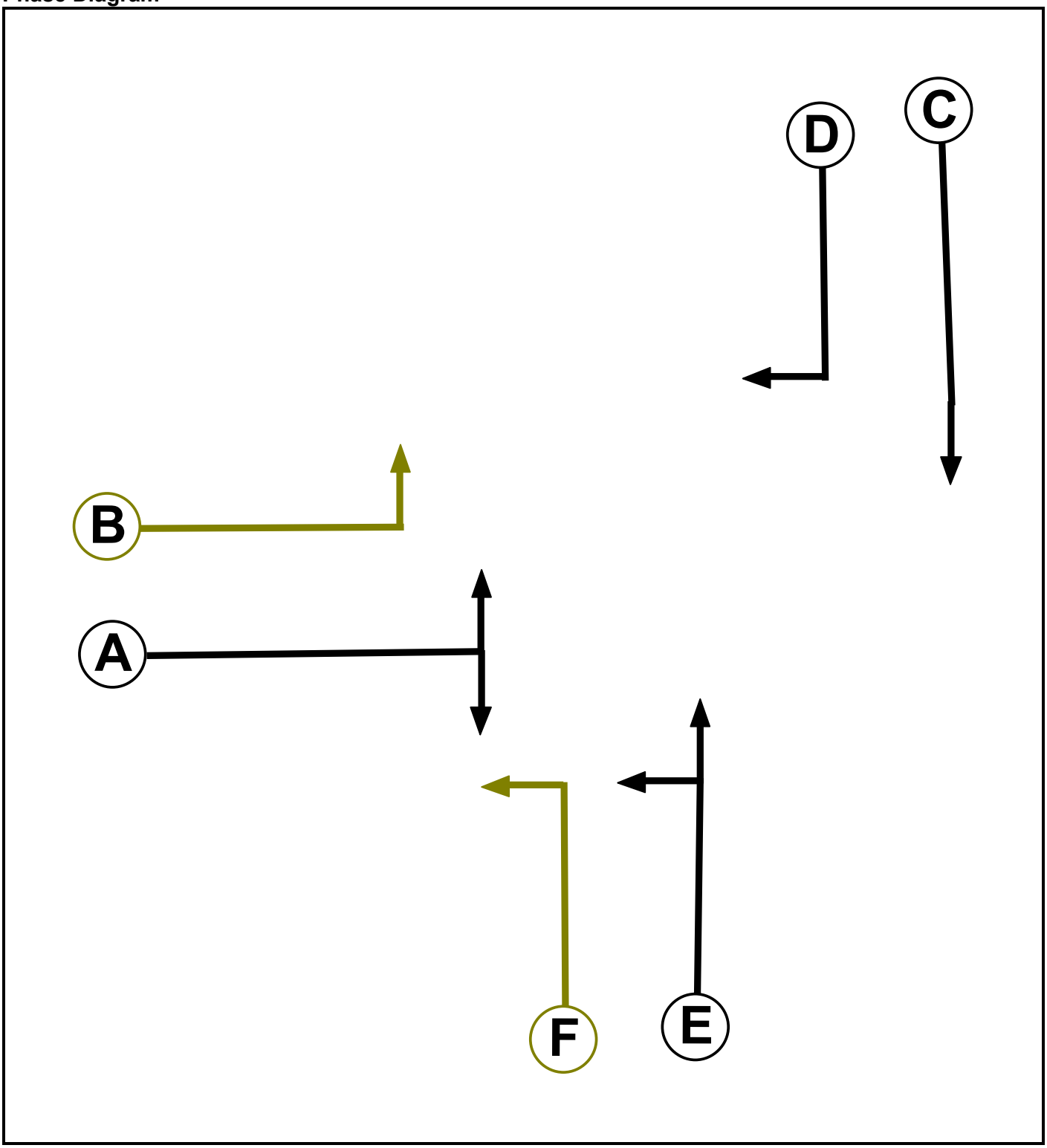
Full Input Data And Results

Network Layout Diagram



Full Input Data And Results

Phase Diagram



Full Input Data And Results

Phase Input Data

Phase Name	Phase Type	Assoc. Phase	Street Min	Cont Min
A	Traffic		7	7
B	Filter	A	4	0
C	Traffic		7	7
D	Traffic		7	7
E	Traffic		7	7
F	Filter	E	4	0

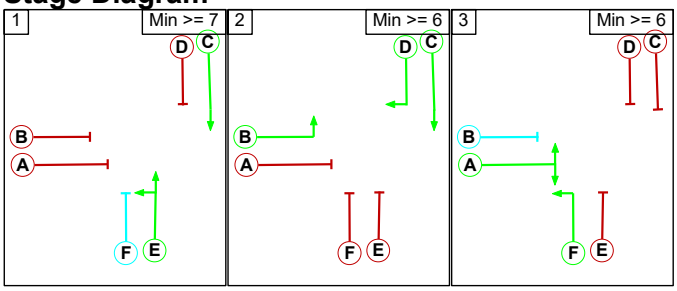
Phase Intergreens Matrix

		Starting Phase					
		A	B	C	D	E	F
Terminating Phase	A		-	5	5	5	-
	B	-		-	-	5	-
	C	5	-		-	-	-
	D	5	-	-		5	6
	E	5	6	-	5		-
	F	-	-	-	5	-	

Phases in Stage

Stage No.	Phases in Stage
1	C E
2	B C D
3	A F

Stage Diagram



Phase Delays

Term. Stage	Start Stage	Phase	Type	Value	Cont value
There are no Phase Delays defined					

Full Input Data And Results

Prohibited Stage Change

From Stage	To Stage			
		1	2	3
	1		6	5
	2	X		6
	3	5	X	

Full Input Data And Results

Give-Way Lane Input Data

Junction: Unnamed Junction
There are no Opposed Lanes in this Junction

Full Input Data And Results

Lane Input Data

Junction: Unnamed Junction												
Lane	**Lane Type**	**Phases**	**Start Disp.**	**End Disp.**	**Physical Length (PCU)**	**Sat Flow Type**	**Def User Saturation Flow (PCU/Hr)**	**Lane Width (m)**	**Gradient**	**Nearside Lane**	**Turns**	**Turning Radius (m)**
1/1 (Unnamed Road)	U	A B	2	3	60.0	Geom	-	3.25	0.00	Y	Arm 4 Left	15.00
1/2 (Unnamed Road)	U	A	2	3	5.0	Geom	-	3.25	0.00	Y	Arm 6 Right	20.00
2/1 (Unnamed Rd exit)	U		2	3	60.0	Inf	-	-	-	-	-	-
3/1 (B430 North entry)	U	C	2	3	60.0	Geom	-	3.65	0.00	Y	Arm 6 Ahead	Inf
3/2 (B430 North entry)	U	D	2	3	28.5	Geom	-	3.65	0.00	Y	Arm 2 Right	15.00
4/1 (B430 North exit)	U		2	3	60.0	Inf	-	-	-	-	-	-
5/1 (B430 South)	U	E F	2	3	12.9	Geom	-	3.65	0.00	Y	Arm 2 Left	10.00
5/2 (B430 South)	U	E	2	3	60.0	Geom	-	3.65	0.00	Y	Arm 4 Ahead	Inf
6/1 (B430 South exit)	U		2	3	60.0	Inf	-	-	-	-	-	-

Traffic Flow Groups

Flow Group	Start Time	End Time	Duration	Formula
13: 'SATURN Run DS1 AM'	08:00	09:00	01:00	
14: 'SATURN Run DS1 PM'	17:00	18:00	01:00	

Scenario 13: 'SATURN Run DS1 AM' (FG13: 'SATURN Run DS1 AM', Plan 1: 'Network Control Plan 1')

Traffic Flows, Desired

Desired Flow :

		Destination			
		A	B	C	Tot.
Origin	A	0	319	487	806
	B	301	0	754	1055
	C	476	433	0	909
	Tot.	777	752	1241	2770

Full Input Data And Results

Traffic Lane Flows

Lane	Scenario 13: SATURN Run DS1 AM
Junction: Unnamed Junction	
1/1 (with short)	806(In) 319(Out)
1/2 (short)	487
2/1	777
3/1 (with short)	1055(In) 754(Out)
3/2 (short)	301
4/1	752
5/1 (short)	476
5/2 (with short)	909(In) 433(Out)
6/1	1241

Lane Saturation Flows

Junction: Unnamed Junction								
Lane	**Lane Width (m)**	**Gradient**	**Nearside Lane**	**Allowed Turns**	**Turning Radius (m)**	**Turning Prop.**	**Sat Flow (PCU/Hr)**	**Flared Sat Flow (PCU/Hr)**
1/1 (Unnamed Road)	3.25	0.00	Y	Arm 4 Left	15.00	100.0 %	1764	1764
1/2 (Unnamed Road)	3.25	0.00	Y	Arm 6 Right	20.00	100.0 %	1805	1805
2/1 (Unnamed Rd exit Lane 1)	Infinite Saturation Flow						Inf	Inf
3/1 (B430 North entry)	3.65	0.00	Y	Arm 6 Ahead	Inf	100.0 %	1980	1980
3/2 (B430 North entry)	3.65	0.00	Y	Arm 2 Right	15.00	100.0 %	1800	1800
4/1 (B430 North exit Lane 1)	Infinite Saturation Flow						Inf	Inf
5/1 (B430 South)	3.65	0.00	Y	Arm 2 Left	10.00	100.0 %	1722	1722
5/2 (B430 South)	3.65	0.00	Y	Arm 4 Ahead	Inf	100.0 %	1980	1980
6/1 (B430 South exit Lane 1)	Infinite Saturation Flow						Inf	Inf

Full Input Data And Results

Scenario 14: 'SATURN Run DS1 PM' (FG14: 'SATURN Run DS1 PM', Plan 1: 'Network Control Plan 1')

Traffic Flows, Desired

Desired Flow :

		Destination			
		A	B	C	Tot.
Origin	A	0	367	384	751
	B	206	0	489	695
	C	354	765	0	1119
	Tot.	560	1132	873	2565

Traffic Lane Flows

Lane	Scenario 14: SATURN Run DS1 PM
Junction: Unnamed Junction	
1/1 (with short)	751(In) 367(Out)
1/2 (short)	384
2/1	560
3/1 (with short)	695(In) 489(Out)
3/2 (short)	206
4/1	1132
5/1 (short)	354
5/2 (with short)	1119(In) 765(Out)
6/1	873

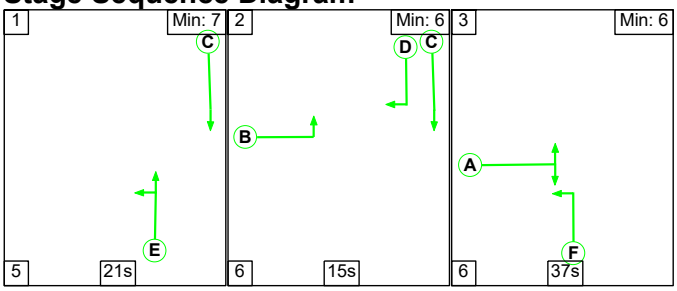
Full Input Data And Results

Lane Saturation Flows

Junction: Unnamed Junction								
Lane	**Lane Width (m)**	**Gradient**	**Nearside Lane**	**Allowed Turns**	**Turning Radius (m)**	**Turning Prop.**	**Sat Flow (PCU/Hr)**	**Flared Sat Flow (PCU/Hr)**
1/1 (Unnamed Road)	3.25	0.00	Y	Arm 4 Left	15.00	100.0 %	1764	1764
1/2 (Unnamed Road)	3.25	0.00	Y	Arm 6 Right	20.00	100.0 %	1805	1805
2/1 (Unnamed Rd exit Lane 1)	Infinite Saturation Flow						Inf	Inf
3/1 (B430 North entry)	3.65	0.00	Y	Arm 6 Ahead	Inf	100.0 %	1980	1980
3/2 (B430 North entry)	3.65	0.00	Y	Arm 2 Right	15.00	100.0 %	1800	1800
4/1 (B430 North exit Lane 1)	Infinite Saturation Flow						Inf	Inf
5/1 (B430 South)	3.65	0.00	Y	Arm 2 Left	10.00	100.0 %	1722	1722
5/2 (B430 South)	3.65	0.00	Y	Arm 4 Ahead	Inf	100.0 %	1980	1980
6/1 (B430 South exit Lane 1)	Infinite Saturation Flow						Inf	Inf

Scenario 13: 'SATURN Run DS1 AM' (FG13: 'SATURN Run DS1 AM', Plan 1: 'Network Control Plan 1')

Stage Sequence Diagram

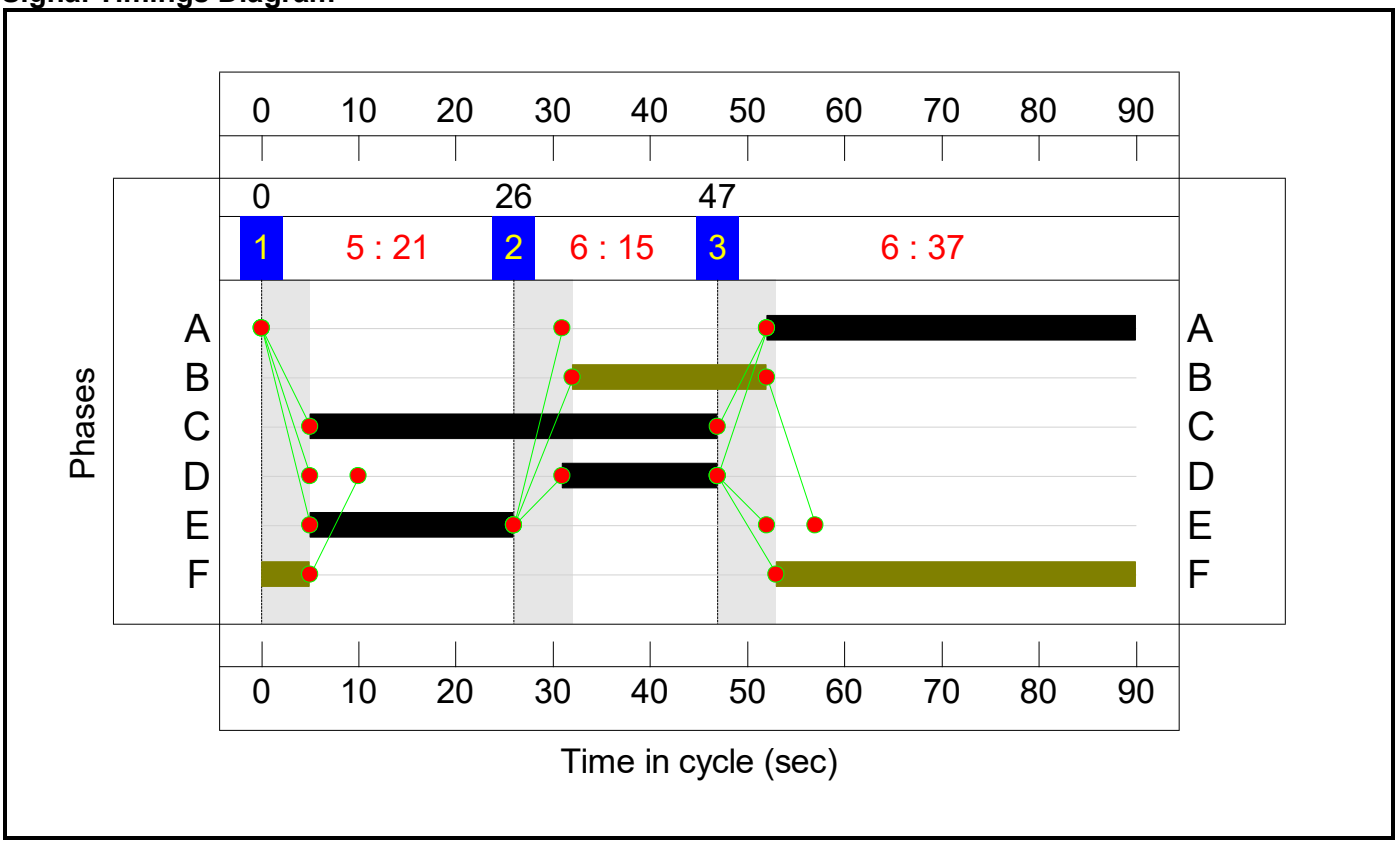


Stage Timings

Stage	1	2	3
Duration	21	15	37
Change Point	0	26	47

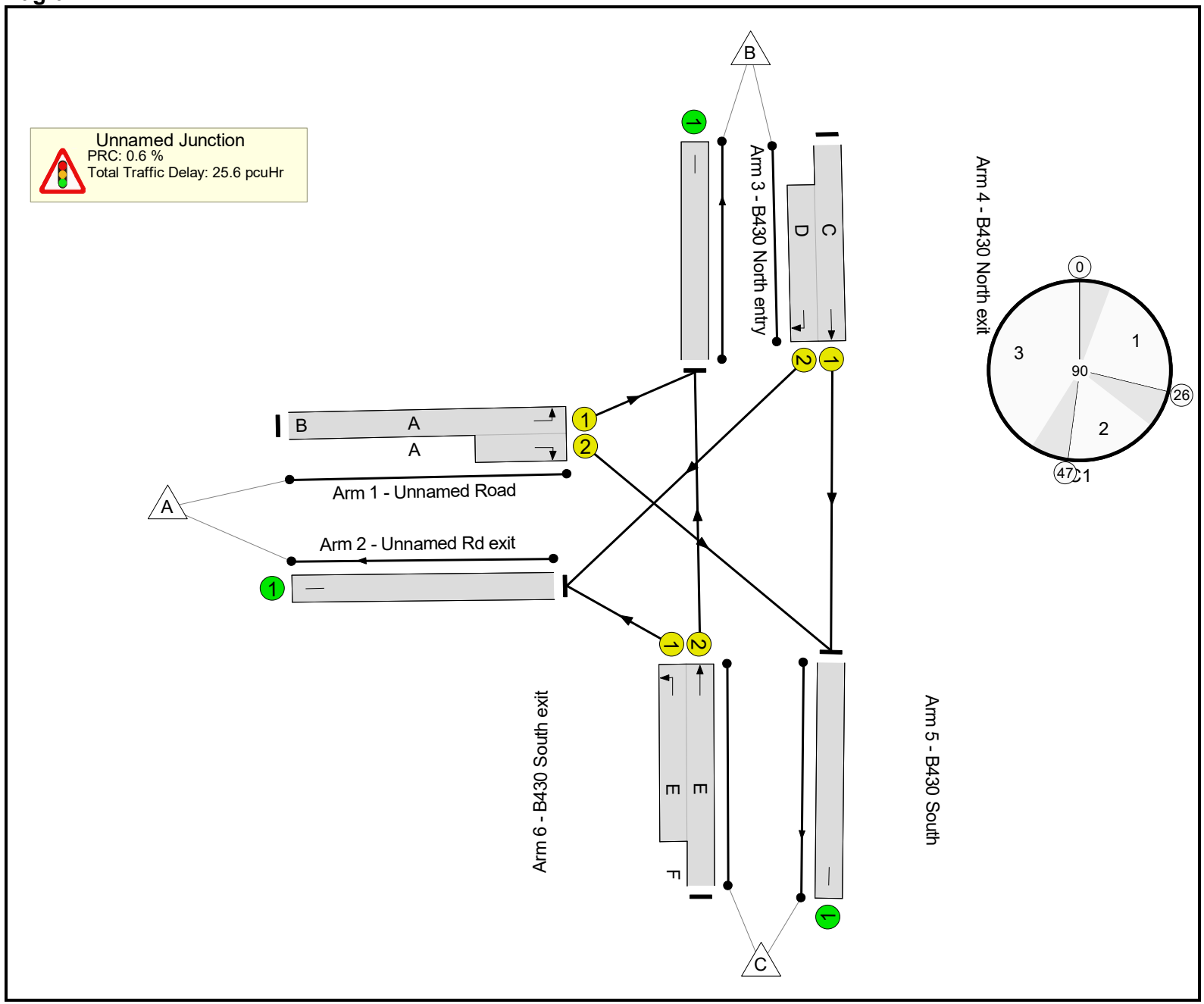
Full Input Data And Results

Signal Timings Diagram



Full Input Data And Results

Network Layout Diagram



Full Input Data And Results

Network Results

Item	Lane Description	Lane Type	Controller Stream	Position In Filtered Route	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)
Network	**-**	**-**	**N/A**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**89.5%**
Unnamed Junction	**-**	**-**	**N/A**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**89.5%**
1/1+1/2	Unnamed Road Left Right	U	N/A	N/A	A	B	1	58:38	20	806	1764:1805	359+548	88.8 : 88.8%
2/1	Unnamed Rd exit	U	N/A	N/A	-		-	-	-	777	Inf	Inf	0.0%
3/1+3/2	B430 North entry Right Ahead	U	N/A	N/A	C D		1	42:16	-	1055	1980:1800	946+340	79.7 : 88.5%
4/1	B430 North exit	U	N/A	N/A	-		-	-	-	752	Inf	Inf	0.0%
5/2+5/1	B430 South Left Ahead	U	N/A	N/A	E	F	1	21:63	42	909	1980:1722	484+532	89.5 : 89.5%
6/1	B430 South exit	U	N/A	N/A	-		-	-	-	1241	Inf	Inf	0.0%

Item	Arriving (pcu)	Leaving (pcu)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Uniform Delay (pcuHr)	Rand + Oversat Delay (pcuHr)	Storage Area Uniform Delay (pcuHr)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Max. Back of Uniform Queue (pcu)	Rand + Oversat Queue (pcu)	Mean Max Queue (pcu)
Network	**-**	**-**	**0**	**0**	**0**	**15.7**	**9.9**	**0.0**	**25.6**	**-**	**-**	**-**	**-**
Unnamed Junction	**-**	**-**	**0**	**0**	**0**	**15.7**	**9.9**	**0.0**	**25.6**	**-**	**-**	**-**	**-**
1/1+1/2	806	806	-	-	-	4.0	3.7	-	7.7	34.3	14.9	3.7	18.6
2/1	777	777	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
3/1+3/2	1055	1055	-	-	-	7.1	2.2	-	9.4	32.0	15.7	2.2	17.9
4/1	752	752	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
5/2+5/1	909	909	-	-	-	4.6	4.0	-	8.6	34.0	10.5	4.0	14.4
6/1	1241	1241	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0

C1 PRC for Signalled Lanes (%): 0.6 Total Delay for Signalled Lanes (pcuHr): 25.64 Cycle Time (s): 90
PRC Over All Lanes (%): 0.6 Total Delay Over All Lanes(pcuHr): 25.64

Full Input Data And Results

Network Results

Item	Lane Description	Lane Type	Controller Stream	Position In Filtered Route	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Start Green (s)	End Green (s)	Arrow Green (s)	Bonus Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Max Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Arriving (pcu)	Leaving (pcu)
Network	**-**	**-**	**N/A**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**89.5%**	**-**	**-**
Unnamed Junction	**-**	**-**	**N/A**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**89.5%**	**-**	**-**
1/1+1/2	Unnamed Road Left Right	U	N/A	N/A	A	B	1	58:38	32:52	0	20	-	806	1764:1805	1764	359+548	88.8 : 88.8%	806	806
2/1	Unnamed Rd exit	U	N/A	N/A	-		-	-	-	-	-	-	777	Inf	Inf	Inf	0.0%	777	777
3/1+3/2	B430 North entry Right Ahead	U	N/A	N/A	C D		1	42:16	5:31	47	-	-	1055	1980:1800	1980	946+340	79.7 : 88.5%	1055	1055
4/1	B430 North exit	U	N/A	N/A	-		-	-	-	-	-	-	752	Inf	Inf	Inf	0.0%	752	752
5/2+5/1	B430 South Left Ahead	U	N/A	N/A	E	F	1	21:63	5:53	26	42	-	909	1980:1722	1980	484+532	89.5 : 89.5%	909	909
6/1	B430 South exit	U	N/A	N/A	-		-	-	-	-	-	-	1241	Inf	Inf	Inf	0.0%	1241	1241

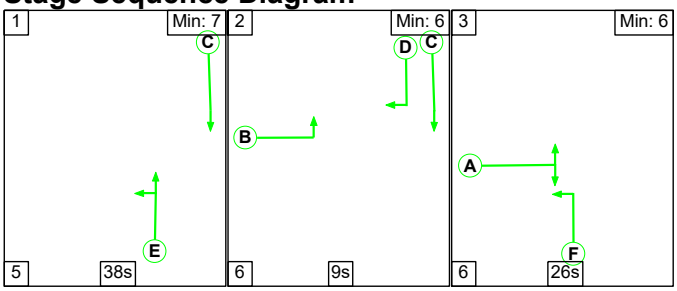
Item	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Uniform Delay (pcuHr)	Rand + Oversat Delay (pcuHr)	Storage Area Uniform Delay (pcuHr)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Uniform Stops (stops)	Av. Uniform Stops Per PCU (stops/pcu)	Back of Uniform Q At End of Red(pcu)	Max. Back of Uniform Queue (pcu)	Rand + Oversat Queue (pcu)	Mean Max Queue (pcu)	De-sliver Threshold (pcu)	Average Excess Queue (pcu)	Weighted Deg Sat (%)	Weighted Total Delay (pcuHr)	Ignoring Random Delay ?
Network	**0**	**0**	**0**	**15.7**	**9.9**	**0.0**	**25.6**	**-**	**2247.5**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**89.5%**	**29.7**	**-**
Unnamed Junction	**0**	**0**	**0**	**15.7**	**9.9**	**0.0**	**25.6**	**-**	**2247.5**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**89.5%**	**29.7**	**-**
1/1+1/2	-	-	-	4.0	3.7	-	7.7	34.3	724.5	0.9	3.9	14.9	3.7	18.6	-	0.00	88.8 : 88.8%	9.0	-
2/1	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	-	0.00	0.0%	0.0	-
3/1+3/2	-	-	-	7.1	2.2	-	9.4	32.0	919.3	0.9	9.4	15.7	2.2	17.9	-	0.00	79.7 : 88.5%	11.0	-
4/1	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	-	0.00	0.0%	0.0	-
5/2+5/1	-	-	-	4.6	4.0	-	8.6	34.0	603.7	0.7	7.9	10.5	4.0	14.4	-	0.00	89.5 : 89.5%	9.7	-
6/1	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	-	0.00	0.0%	0.0	-

C1 PRC for Signalled Lanes (%): 0.6 Total Delay for Signalled Lanes (pcuHr): 25.64 Cycle Time (s): 90
PRC Over All Lanes (%): 0.6 Total Delay Over All Lanes(pcuHr): 25.64

Full Input Data And Results

Scenario 14: 'SATURN Run DS1 PM' (FG14: 'SATURN Run DS1 PM', Plan 1: 'Network Control Plan 1')

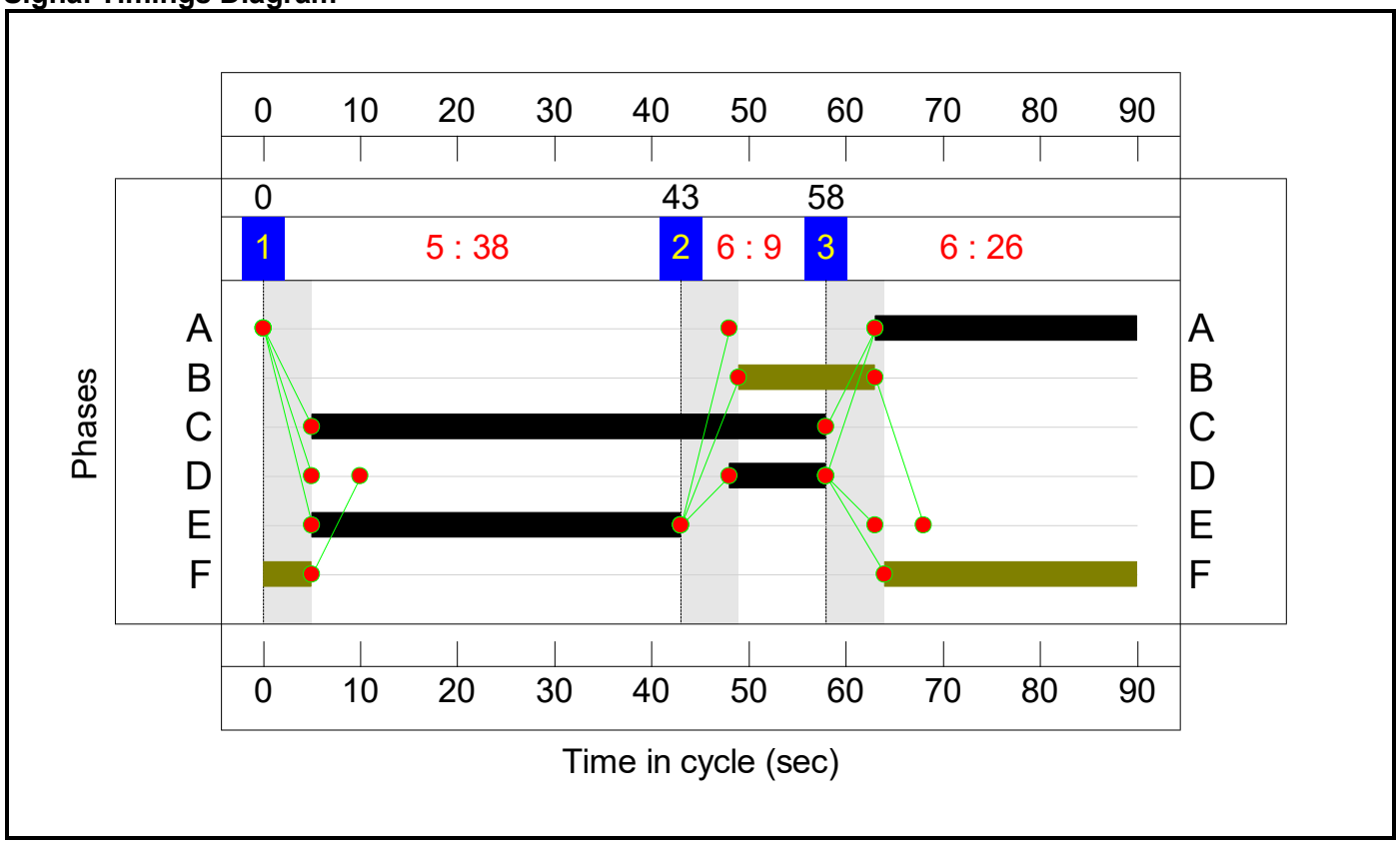
Stage Sequence Diagram



Stage Timings

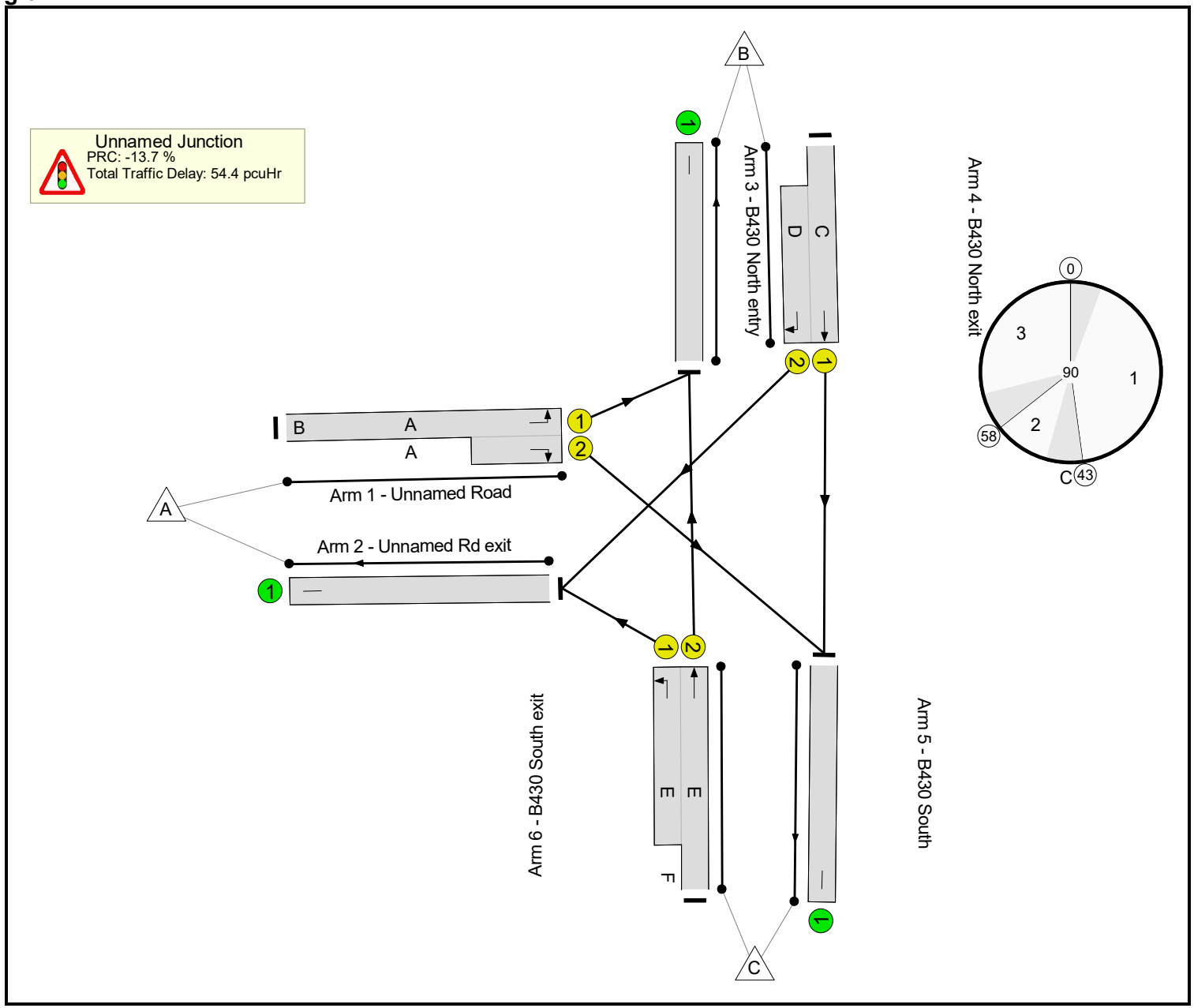
Stage	1	2	3
Duration	38	9	26
Change Point	0	43	58

Signal Timings Diagram



Full Input Data And Results

Network Layout Diagram



Full Input Data And Results

Network Results

Item	Lane Description	Lane Type	Controller Stream	Position In Filtered Route	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)
Network	-	-	**N/A**	-	-		-	-	-	-	-	-	**102.3%**
Unnamed Junction	-	-	**N/A**	-	-		-	-	-	-	-	-	**102.3%**
1/1+1/2	Unnamed Road Left Right	U	N/A	N/A	A	B	1	41:27	14	751	1764:1805	366+383	100.4 : 100.4%
2/1	Unnamed Rd exit	U	N/A	N/A	-		-	-	-	560	Inf	Inf	0.0%
3/1+3/2	B430 North entry Right Ahead	U	N/A	N/A	C D		1	53:10	-	695	1980:1800	1179+220	41.5 : 93.6%
4/1	B430 North exit	U	N/A	N/A	-		-	-	-	1132	Inf	Inf	0.0%
5/2+5/1	B430 South Left Ahead	U	N/A	N/A	E	F	1	38:69	31	1119	1980:1722	748+346	102.3 : 102.3%
6/1	B430 South exit	U	N/A	N/A	-		-	-	-	873	Inf	Inf	0.0%

Item	Arriving (pcu)	Leaving (pcu)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Uniform Delay (pcuHr)	Rand + Oversat Delay (pcuHr)	Storage Area Uniform Delay (pcuHr)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Max. Back of Uniform Queue (pcu)	Rand + Oversat Queue (pcu)	Mean Max Queue (pcu)
Network	-	-	**0**	**0**	**0**	**15.4**	**39.1**	**0.0**	**54.4**	-	-	-	-
Unnamed Junction	-	-	**0**	**0**	**0**	**15.4**	**39.1**	**0.0**	**54.4**	-	-	-	-
1/1+1/2	751	748	-	-	-	5.3	14.4	-	19.8	94.7	14.0	14.4	28.4
2/1	560	560	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
3/1+3/2	695	695	-	-	-	3.5	0.5	-	4.0	20.9	6.4	0.5	6.9
4/1	1113	1113	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
5/2+5/1	1119	1102	-	-	-	6.5	24.1	-	30.6	98.6	24.4	24.1	48.5
6/1	872	872	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0

C1

PRC for Signalled Lanes (%): -13.7
PRC Over All Lanes (%): -13.7

Total Delay for Signalled Lanes (pcuHr): 54.44
Total Delay Over All Lanes(pcuHr): 54.44

Cycle Time (s): 90

Full Input Data And Results

Network Results

Item	Lane Description	Lane Type	Controller Stream	Position In Filtered Route	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Start Green (s)	End Green (s)	Arrow Green (s)	Bonus Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Max Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Arriving (pcu)	Leaving (pcu)
Network	**-**	**-**	**N/A**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**102.3%**	**-**	**-**
Unnamed Junction	**-**	**-**	**N/A**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**102.3%**	**-**	**-**
1/1+1/2	Unnamed Road Left Right	U	N/A	N/A	A	B	1	41:27	49:63	0	14	-	751	1764:1805	1764	366+383	100.4 : 100.4%	751	748
2/1	Unnamed Rd exit	U	N/A	N/A	-		-	-	-	-	-	-	560	Inf	Inf	Inf	0.0%	560	560
3/1+3/2	B430 North entry Right Ahead	U	N/A	N/A	C D		1	53:10	5:48	58	-	-	695	1980:1800	1980	1179+220	41.5 : 93.6%	695	695
4/1	B430 North exit	U	N/A	N/A	-		-	-	-	-	-	-	1132	Inf	Inf	Inf	0.0%	1113	1113
5/2+5/1	B430 South Left Ahead	U	N/A	N/A	E	F	1	38:69	5:64	43	31	-	1119	1980:1722	1980	748+346	102.3 : 102.3%	1119	1102
6/1	B430 South exit	U	N/A	N/A	-		-	-	-	-	-	-	873	Inf	Inf	Inf	0.0%	872	872

Item	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Uniform Delay (pcuHr)	Rand + Oversat Delay (pcuHr)	Storage Area Uniform Delay (pcuHr)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Uniform Stops (stops)	Av. Uniform Stops Per PCU (stops/pcu)	Back of Uniform Q At End of Red(pcu)	Max. Back of Uniform Queue (pcu)	Rand + Oversat Queue (pcu)	Mean Max Queue (pcu)	De-sliver Threshold (pcu)	Average Excess Queue (pcu)	Weighted Deg Sat (%)	Weighted Total Delay (pcuHr)	Ignoring Random Delay ?
Network	**0**	**0**	**0**	**15.4**	**39.1**	**0.0**	**54.4**	**-**	**2353.3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**102.3%**	**58.7**	**-**
Unnamed Junction	**0**	**0**	**0**	**15.4**	**39.1**	**0.0**	**54.4**	**-**	**2353.3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**102.3%**	**58.7**	**-**
1/1+1/2	-	-	-	5.3	14.4	-	19.8	94.7	758.3	1.0	4.9	14.0	14.4	28.4	-	0.00	100.4 : 100.4%	21.2	-
2/1	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	-	0.00	0.0%	0.0	-
3/1+3/2	-	-	-	3.5	0.5	-	4.0	20.9	459.1	0.7	4.6	6.4	0.5	6.9	-	0.00	41.5 : 93.6%	4.9	-
4/1	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	-	0.00	0.0%	0.0	-
5/2+5/1	-	-	-	6.5	24.1	-	30.6	98.6	1135.9	1.0	10.8	24.4	24.1	48.5	-	0.00	102.3 : 102.3%	32.7	-
6/1	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	-	0.00	0.0%	0.0	-

C1

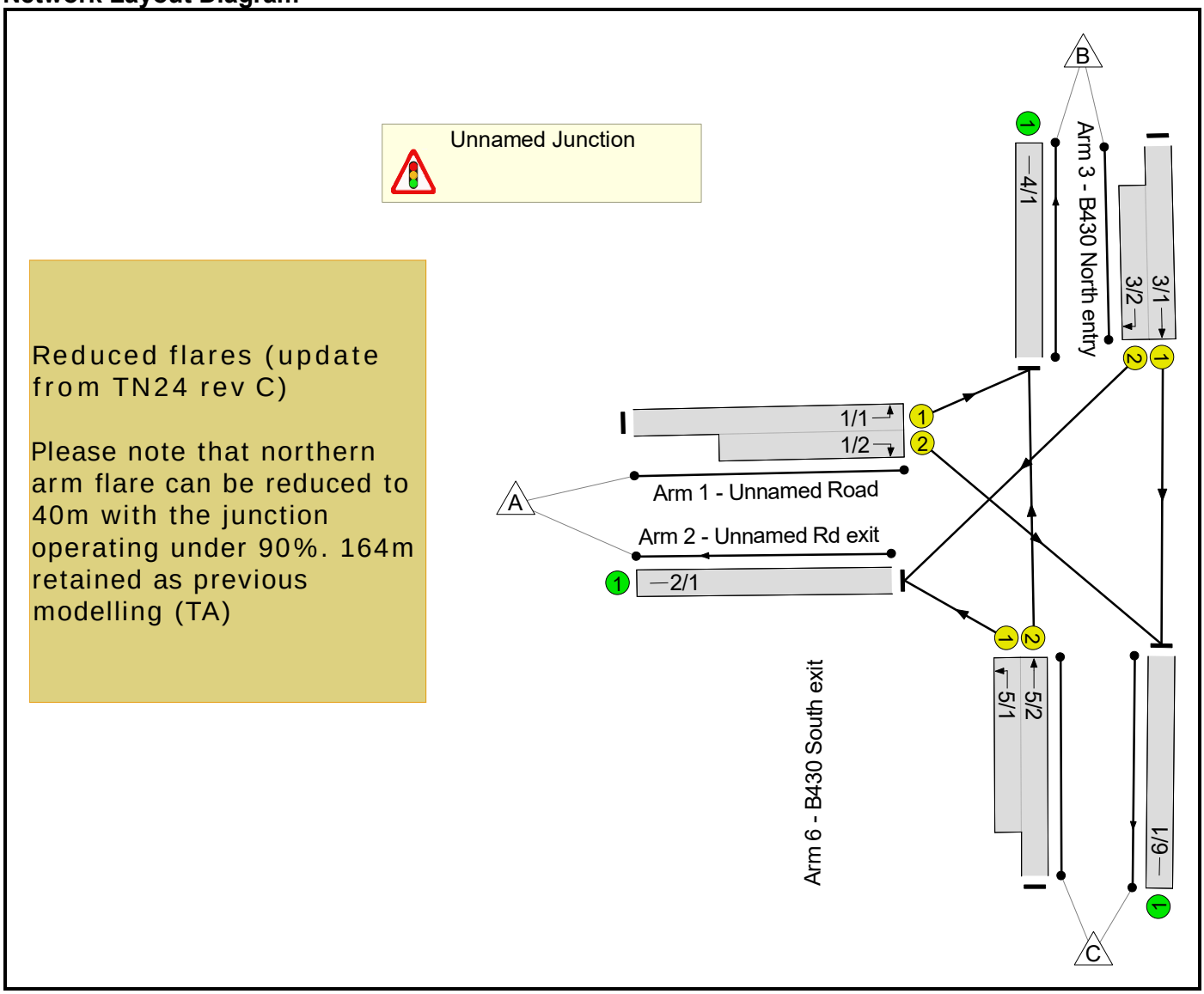
PRC for Signalled Lanes (%): -13.7
PRC Over All Lanes (%): -13.7
Total Delay for Signalled Lanes (pcuHr): 54.44
Total Delay Over All Lanes(pcuHr): 54.44
Cycle Time (s): 90

Full Input Data And Results

User and Project Details

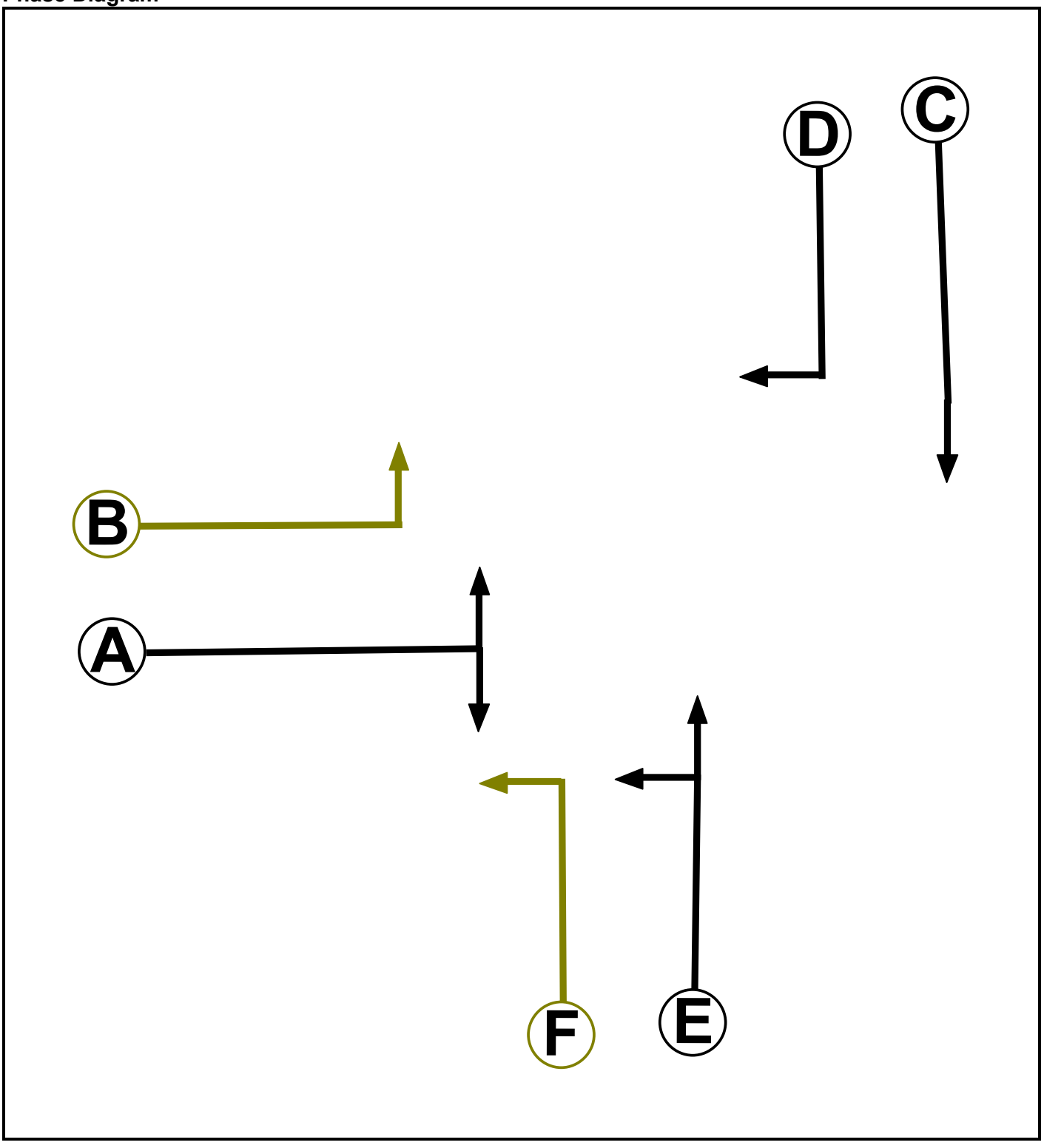
Project:	
Title:	
Location:	
File name:	J5 B430 minor rd single lane (possible mit Opt4) V7 - TEST FOR SATURN MOD_Feb 2020.lsg3x
Author:	
Company:	
Address:	
Notes:	

Network Layout Diagram



Full Input Data And Results

Phase Diagram



Full Input Data And Results

Phase Input Data

Phase Name	Phase Type	Assoc. Phase	Street Min	Cont Min
A	Traffic		7	7
B	Filter	A	4	0
C	Traffic		7	7
D	Traffic		7	7
E	Traffic		7	7
F	Filter	E	4	0

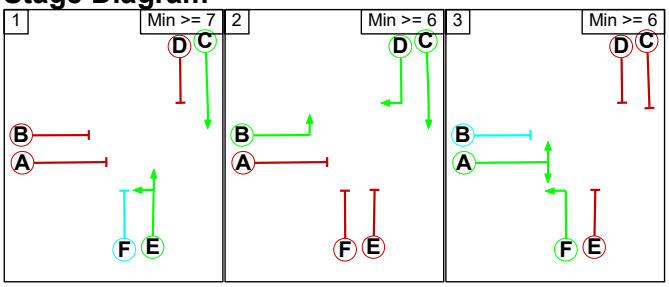
Phase Intergreens Matrix

		Starting Phase					
		A	B	C	D	E	F
Terminating Phase	A		-	5	5	5	-
	B	-		-	-	5	-
	C	5	-		-	-	-
	D	5	-	-		5	6
	E	5	6	-	5		-
	F	-	-	-	5	-	

Phases in Stage

Stage No.	Phases in Stage
1	C E
2	B C D
3	A F

Stage Diagram



Phase Delays

Term. Stage	Start Stage	Phase	Type	Value	Cont value
There are no Phase Delays defined					

Full Input Data And Results

Prohibited Stage Change

From Stage	To Stage			
		1	2	3
	1		6	5
	2	X		6
	3	5	X	

Full Input Data And Results

Give-Way Lane Input Data

Junction: Unnamed Junction
There are no Opposed Lanes in this Junction

Full Input Data And Results

Lane Input Data

Junction: Unnamed Junction												
Lane	**Lane Type**	**Phases**	**Start Disp.**	**End Disp.**	**Physical Length (PCU)**	**Sat Flow Type**	**Def User Saturation Flow (PCU/Hr)**	**Lane Width (m)**	**Gradient**	**Nearside Lane**	**Turns**	**Turning Radius (m)**
1/1 (Unnamed Road)	U	A B	2	3	60.0	Geom	-	3.25	0.00	Y	Arm 4 Left	15.00
1/2 (Unnamed Road)	U	A	2	3	10.4	Geom	-	3.25	0.00	Y	Arm 6 Right	20.00
2/1 (Unnamed Rd exit)	U		2	3	60.0	Inf	-	-	-	-	-	-
3/1 (B430 North entry)	U	C	2	3	60.0	Geom	-	3.65	0.00	Y	Arm 6 Ahead	Inf
3/2 (B430 North entry)	U	D	2	3	28.5	Geom	-	3.65	0.00	Y	Arm 2 Right	15.00
4/1 (B430 North exit)	U		2	3	60.0	Inf	-	-	-	-	-	-
5/1 (B430 South)	U	E F	2	3	14.8	Geom	-	3.65	0.00	Y	Arm 2 Left	10.00
5/2 (B430 South)	U	E	2	3	60.0	Geom	-	3.65	0.00	Y	Arm 4 Ahead	Inf
6/1 (B430 South exit)	U		2	3	60.0	Inf	-	-	-	-	-	-

Traffic Flow Groups

Flow Group	Start Time	End Time	Duration	Formula
13: 'SATURN Run DS1 AM'	07:45	08:45	01:00	
14: 'SATURN Run DS1 PM'	17:00	18:00	01:00	

Scenario 13: 'SATURN Run DS1 AM' (FG13: 'SATURN Run DS1 AM', Plan 1: 'Network Control Plan 1')

Traffic Flows, Desired

Desired Flow :

		Destination			
		A	B	C	Tot.
Origin	A	0	319	487	806
	B	301	0	754	1055
	C	476	433	0	909
	Tot.	777	752	1241	2770

Full Input Data And Results

Traffic Lane Flows

Lane	Scenario 13: SATURN Run DS1 AM
Junction: Unnamed Junction	
1/1 (with short)	806(In) 319(Out)
1/2 (short)	487
2/1	777
3/1 (with short)	1055(In) 754(Out)
3/2 (short)	301
4/1	752
5/1 (short)	476
5/2 (with short)	909(In) 433(Out)
6/1	1241

Lane Saturation Flows

Junction: Unnamed Junction								
Lane	**Lane Width (m)**	**Gradient**	**Nearside Lane**	**Allowed Turns**	**Turning Radius (m)**	**Turning Prop.**	**Sat Flow (PCU/Hr)**	**Flared Sat Flow (PCU/Hr)**
1/1 (Unnamed Road)	3.25	0.00	Y	Arm 4 Left	15.00	100.0 %	1764	1764
1/2 (Unnamed Road)	3.25	0.00	Y	Arm 6 Right	20.00	100.0 %	1805	1805
2/1 (Unnamed Rd exit Lane 1)	Infinite Saturation Flow						Inf	Inf
3/1 (B430 North entry)	3.65	0.00	Y	Arm 6 Ahead	Inf	100.0 %	1980	1980
3/2 (B430 North entry)	3.65	0.00	Y	Arm 2 Right	15.00	100.0 %	1800	1800
4/1 (B430 North exit Lane 1)	Infinite Saturation Flow						Inf	Inf
5/1 (B430 South)	3.65	0.00	Y	Arm 2 Left	10.00	100.0 %	1722	1722
5/2 (B430 South)	3.65	0.00	Y	Arm 4 Ahead	Inf	100.0 %	1980	1980
6/1 (B430 South exit Lane 1)	Infinite Saturation Flow						Inf	Inf

Full Input Data And Results

Scenario 14: 'SATURN Run DS1 PM' (FG14: 'SATURN Run DS1 PM', Plan 1: 'Network Control Plan 1')

Traffic Flows, Desired

Desired Flow :

		Destination			
		A	B	C	Tot.
Origin	A	0	367	384	751
	B	206	0	489	695
	C	354	765	0	1119
	Tot.	560	1132	873	2565

Traffic Lane Flows

Lane	Scenario 14: SATURN Run DS1 PM
Junction: Unnamed Junction	
1/1 (with short)	751(In) 367(Out)
1/2 (short)	384
2/1	560
3/1 (with short)	695(In) 489(Out)
3/2 (short)	206
4/1	1132
5/1 (short)	354
5/2 (with short)	1119(In) 765(Out)
6/1	873

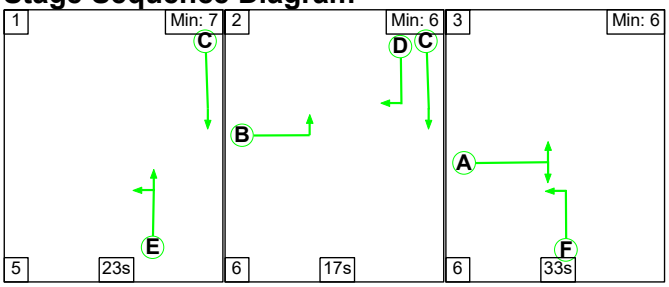
Full Input Data And Results

Lane Saturation Flows

Junction: Unnamed Junction								
Lane	**Lane Width (m)**	**Gradient**	**Nearside Lane**	**Allowed Turns**	**Turning Radius (m)**	**Turning Prop.**	**Sat Flow (PCU/Hr)**	**Flared Sat Flow (PCU/Hr)**
1/1 (Unnamed Road)	3.25	0.00	Y	Arm 4 Left	15.00	100.0 %	1764	1764
1/2 (Unnamed Road)	3.25	0.00	Y	Arm 6 Right	20.00	100.0 %	1805	1805
2/1 (Unnamed Rd exit Lane 1)	Infinite Saturation Flow						Inf	Inf
3/1 (B430 North entry)	3.65	0.00	Y	Arm 6 Ahead	Inf	100.0 %	1980	1980
3/2 (B430 North entry)	3.65	0.00	Y	Arm 2 Right	15.00	100.0 %	1800	1800
4/1 (B430 North exit Lane 1)	Infinite Saturation Flow						Inf	Inf
5/1 (B430 South)	3.65	0.00	Y	Arm 2 Left	10.00	100.0 %	1722	1722
5/2 (B430 South)	3.65	0.00	Y	Arm 4 Ahead	Inf	100.0 %	1980	1980
6/1 (B430 South exit Lane 1)	Infinite Saturation Flow						Inf	Inf

Scenario 13: 'SATURN Run DS1 AM' (FG13: 'SATURN Run DS1 AM', Plan 1: 'Network Control Plan 1')

Stage Sequence Diagram

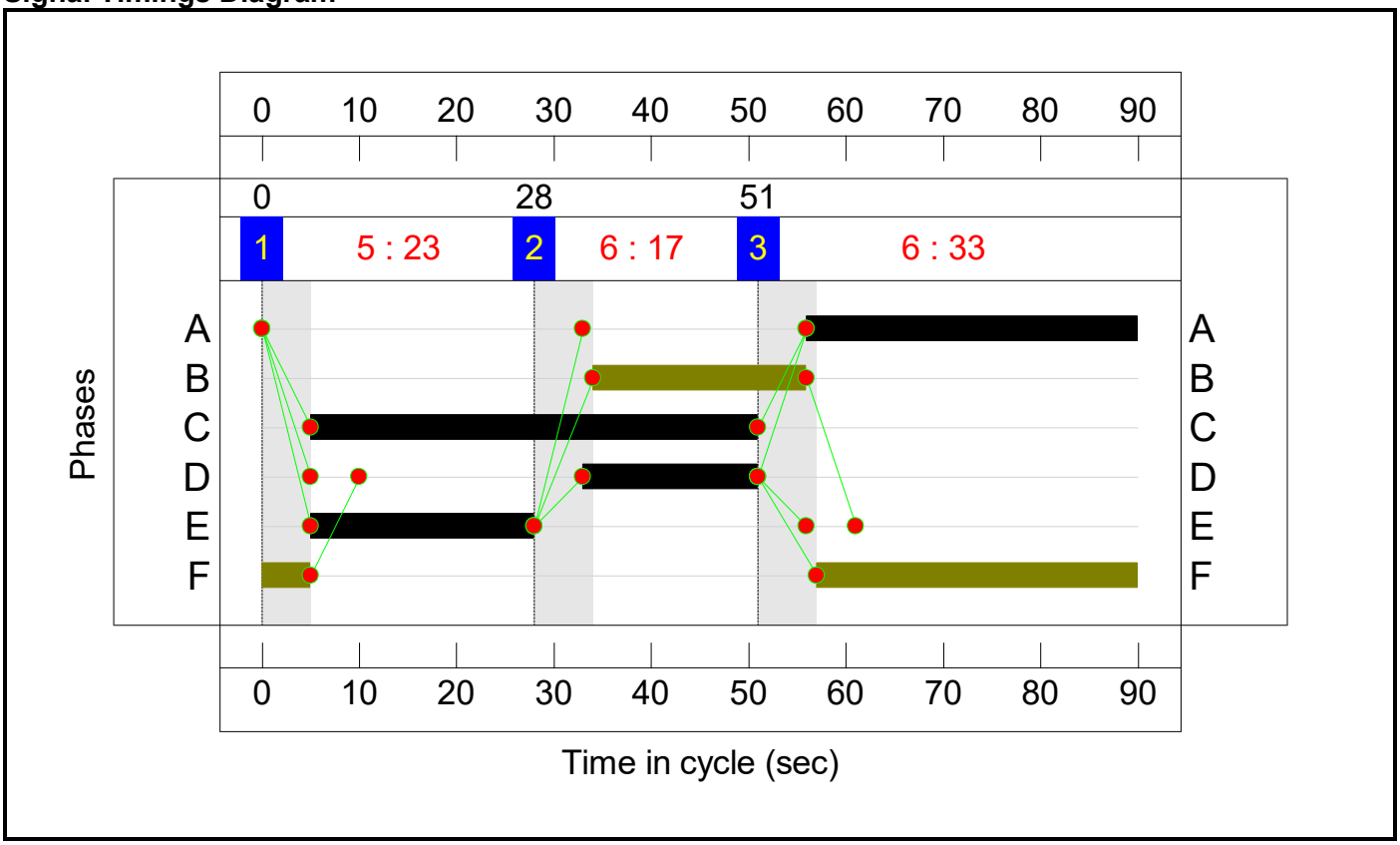


Stage Timings

Stage	1	2	3
Duration	23	17	33
Change Point	0	28	51

Full Input Data And Results

Signal Timings Diagram



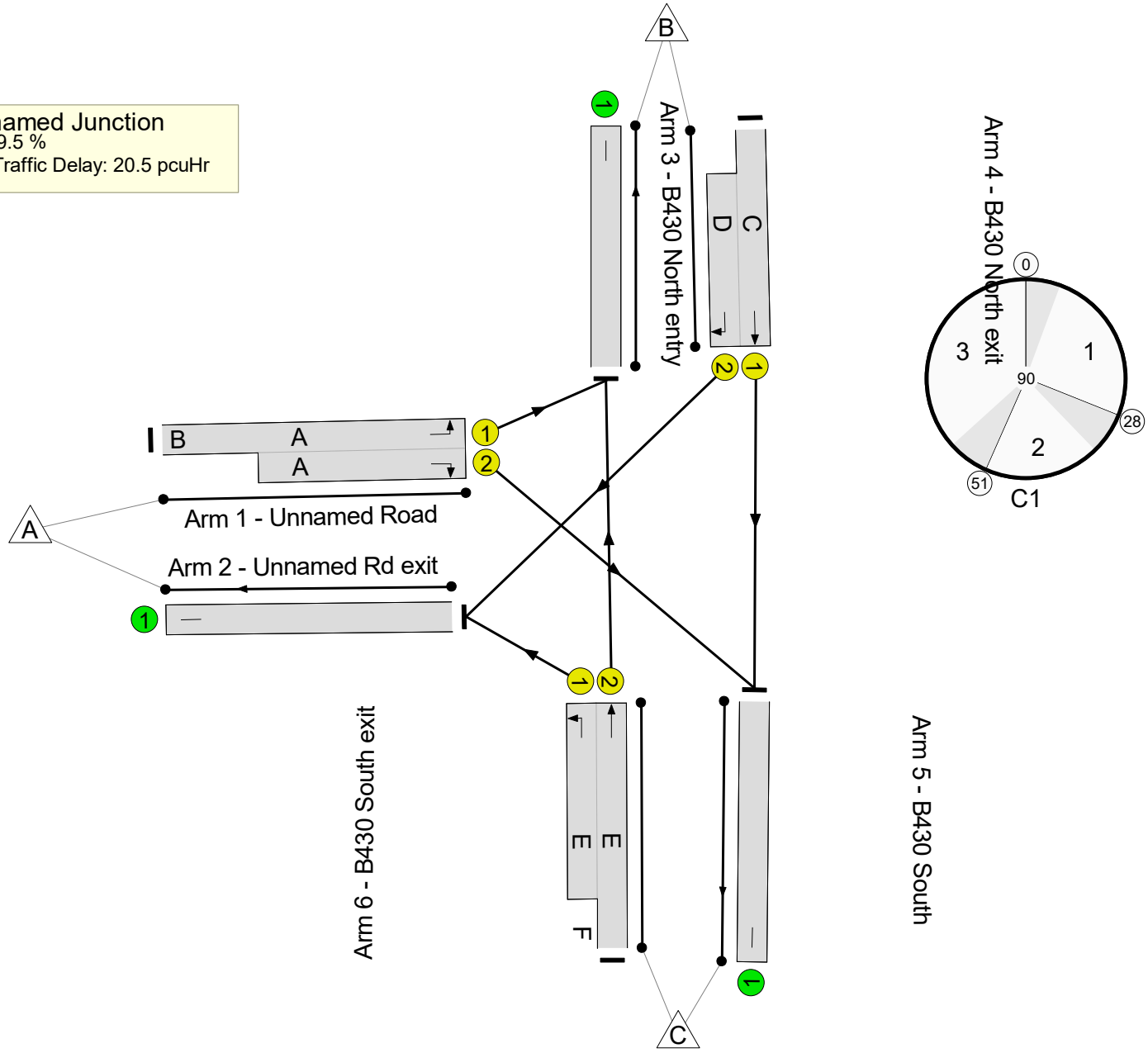
Full Input Data And Results

Network Layout Diagram

Unnamed Junction
PRC: 9.5 %
Total Traffic Delay: 20.5 pcuHr

Reduced flares (update from TN24 rev C)

Please note that northern arm flare can be reduced to 40m with the junction operating under 90%. 164m retained as previous modelling (TA)



Full Input Data And Results

Network Results

Item	Lane Description	Lane Type	Controller Stream	Position In Filtered Route	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)
Network	**-**	**-**	**N/A**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**82.2%**
Unnamed Junction	**-**	**-**	**N/A**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**82.2%**
1/1+1/2	Unnamed Road Left Right	U	N/A	N/A	A	B	1	56:34	22	806	1764:1805	388+593	82.2 : 82.2%
2/1	Unnamed Rd exit	U	N/A	N/A	-		-	-	-	777	Inf	Inf	0.0%
3/1+3/2	B430 North entry Right Ahead	U	N/A	N/A	C D		1	46:18	-	1055	1980:1800	1034+380	72.9 : 79.2%
4/1	B430 North exit	U	N/A	N/A	-		-	-	-	752	Inf	Inf	0.0%
5/2+5/1	B430 South Left Ahead	U	N/A	N/A	E	F	1	23:61	38	909	1980:1722	528+580	82.0 : 82.0%
6/1	B430 South exit	U	N/A	N/A	-		-	-	-	1241	Inf	Inf	0.0%

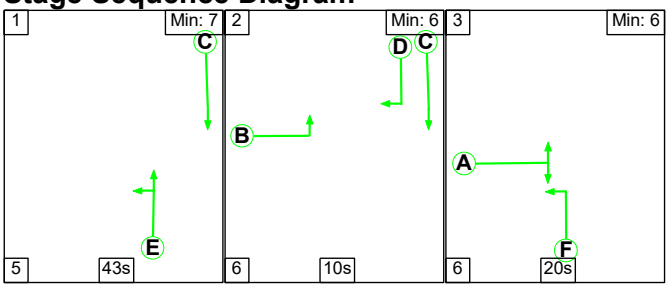
Item	Arriving (pcu)	Leaving (pcu)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Uniform Delay (pcuHr)	Rand + Oversat Delay (pcuHr)	Storage Area Uniform Delay (pcuHr)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Max. Back of Uniform Queue (pcu)	Rand + Oversat Queue (pcu)	Mean Max Queue (pcu)
Network	**-**	**-**	**0**	**0**	**0**	**14.6**	**5.9**	**0.0**	**20.5**	**-**	**-**	**-**	**-**
Unnamed Junction	**-**	**-**	**0**	**0**	**0**	**14.6**	**5.9**	**0.0**	**20.5**	**-**	**-**	**-**	**-**
1/1+1/2	806	806	-	-	-	3.8	2.2	-	6.0	26.9	10.1	2.2	12.4
2/1	777	777	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
3/1+3/2	1055	1055	-	-	-	6.3	1.5	-	7.7	26.4	14.5	1.5	15.9
4/1	752	752	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
5/2+5/1	909	909	-	-	-	4.5	2.2	-	6.8	26.7	10.1	2.2	12.3
6/1	1241	1241	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0

C1 PRC for Signalled Lanes (%): 9.5 Total Delay for Signalled Lanes (pcuHr): 20.51 Cycle Time (s): 90
PRC Over All Lanes (%): 9.5 Total Delay Over All Lanes(pcuHr): 20.51

Full Input Data And Results

Scenario 14: 'SATURN Run DS1 PM' (FG14: 'SATURN Run DS1 PM', Plan 1: 'Network Control Plan 1')

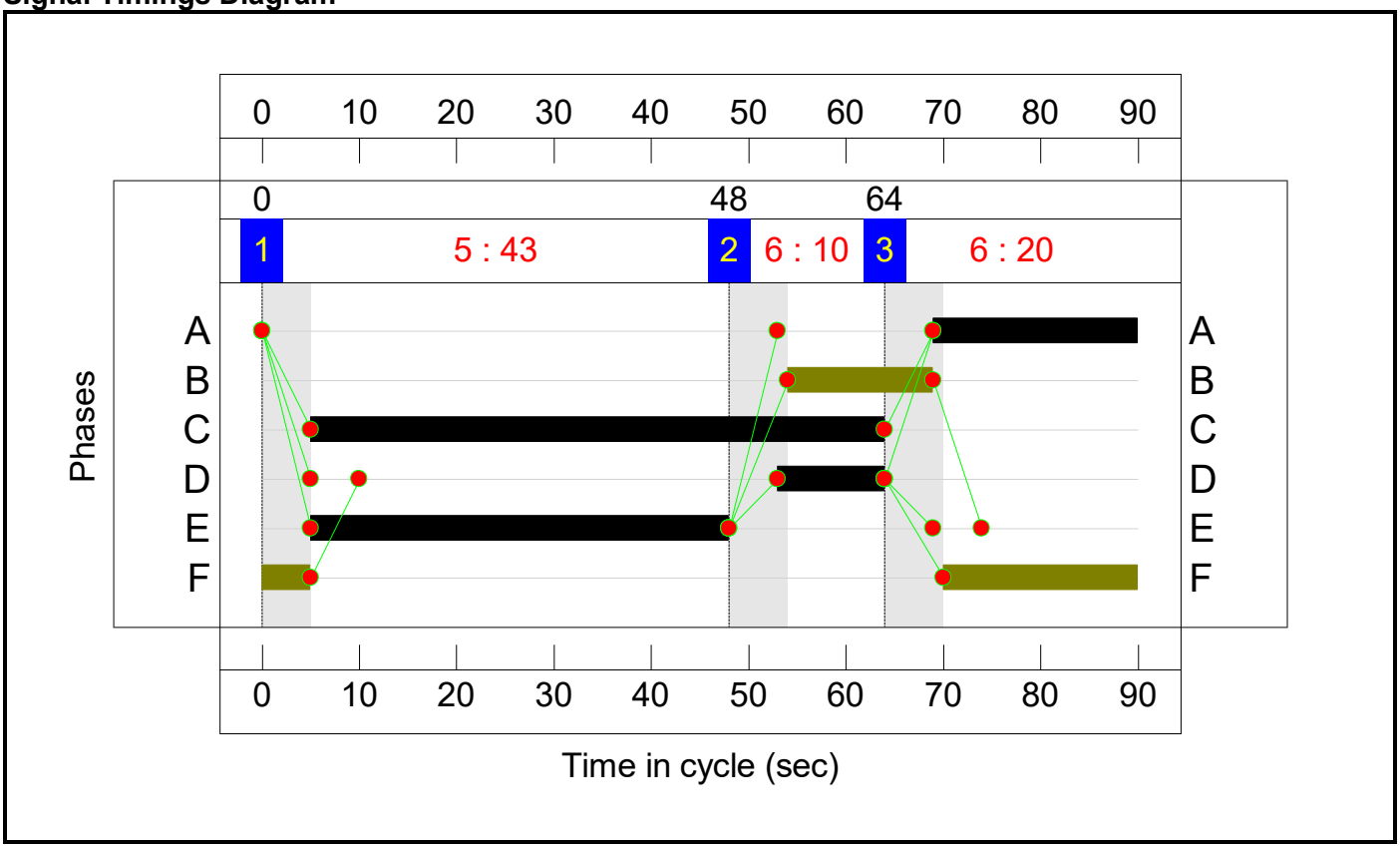
Stage Sequence Diagram



Stage Timings

Stage	1	2	3
Duration	43	10	20
Change Point	0	48	64

Signal Timings Diagram



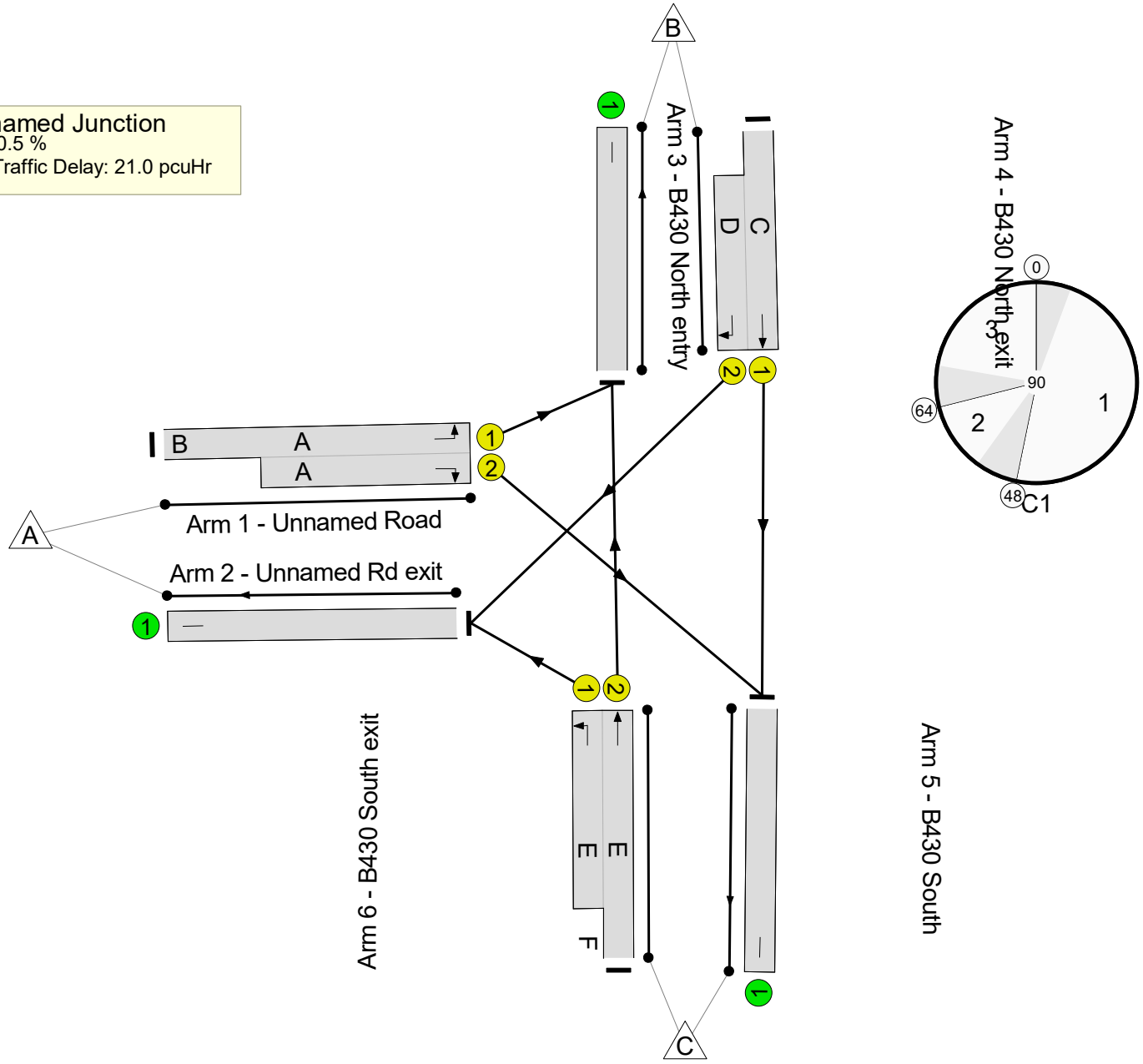
Full Input Data And Results

Network Layout Diagram

Unnamed Junction
PRC: 0.5 %
Total Traffic Delay: 21.0 pcuHr

Reduced flares (update from TN24 rev C)

Please note that northern arm flare can be reduced to 40m with the junction operating under 90%. 164m retained as previous modelling (TA)



Full Input Data And Results

Network Results

Item	Lane Description	Lane Type	Controller Stream	Position In Filtered Route	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)
Network	**-**	**-**	**N/A**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**89.5%**
Unnamed Junction	**-**	**-**	**N/A**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**89.5%**
1/1+1/2	Unnamed Road Left Right	U	N/A	N/A	A	B	1	36:21	15	751	1764:1805	415+434	88.5 : 88.5%
2/1	Unnamed Rd exit	U	N/A	N/A	-		-	-	-	560	Inf	Inf	0.0%
3/1+3/2	B430 North entry Right Ahead	U	N/A	N/A	C D		1	59:11	-	695	1980:1800	1269+240	38.5 : 85.8%
4/1	B430 North exit	U	N/A	N/A	-		-	-	-	1132	Inf	Inf	0.0%
5/2+5/1	B430 South Left Ahead	U	N/A	N/A	E	F	1	43:68	25	1119	1980:1722	854+395	89.5 : 89.5%
6/1	B430 South exit	U	N/A	N/A	-		-	-	-	873	Inf	Inf	0.0%

Item	Arriving (pcu)	Leaving (pcu)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Uniform Delay (pcuHr)	Rand + Oversat Delay (pcuHr)	Storage Area Uniform Delay (pcuHr)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Max. Back of Uniform Queue (pcu)	Rand + Oversat Queue (pcu)	Mean Max Queue (pcu)
Network	**-**	**-**	**0**	**0**	**0**	**13.0**	**8.0**	**0.0**	**21.0**	**-**	**-**	**-**	**-**
Unnamed Junction	**-**	**-**	**0**	**0**	**0**	**13.0**	**8.0**	**0.0**	**21.0**	**-**	**-**	**-**	**-**
1/1+1/2	751	751	-	-	-	5.5	3.6	-	9.1	43.6	9.2	3.6	12.8
2/1	560	560	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
3/1+3/2	695	695	-	-	-	3.1	0.4	-	3.5	18.2	5.3	0.4	5.7
4/1	1132	1132	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
5/2+5/1	1119	1119	-	-	-	4.4	4.0	-	8.4	27.1	16.4	4.0	20.4
6/1	873	873	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0

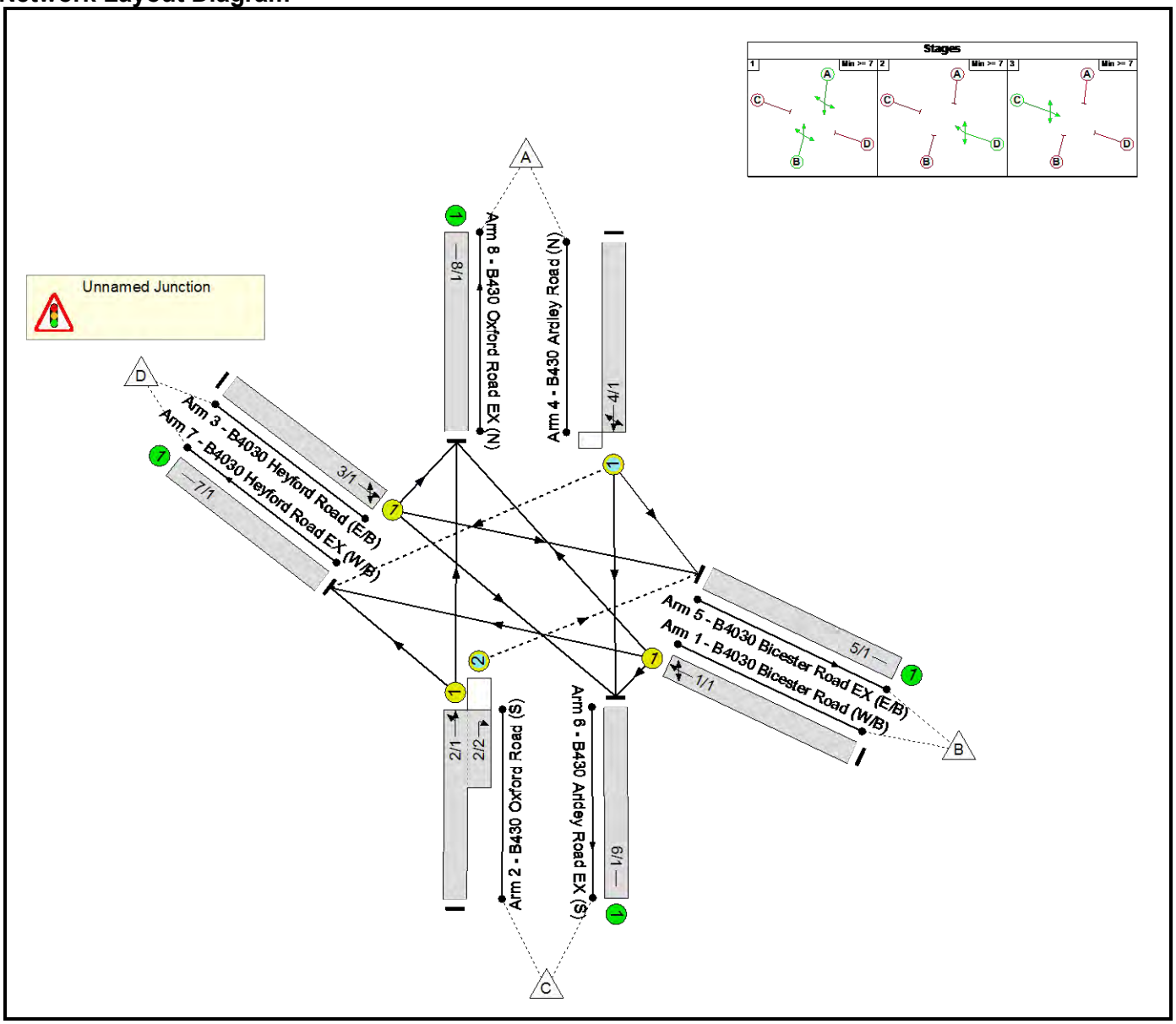
C1 PRC for Signalled Lanes (%): 0.5 Total Delay for Signalled Lanes (pcuHr): 21.01 Cycle Time (s): 90
PRC Over All Lanes (%): 0.5 Total Delay Over All Lanes(pcuHr): 21.01

Full Input Data And Results

User and Project Details

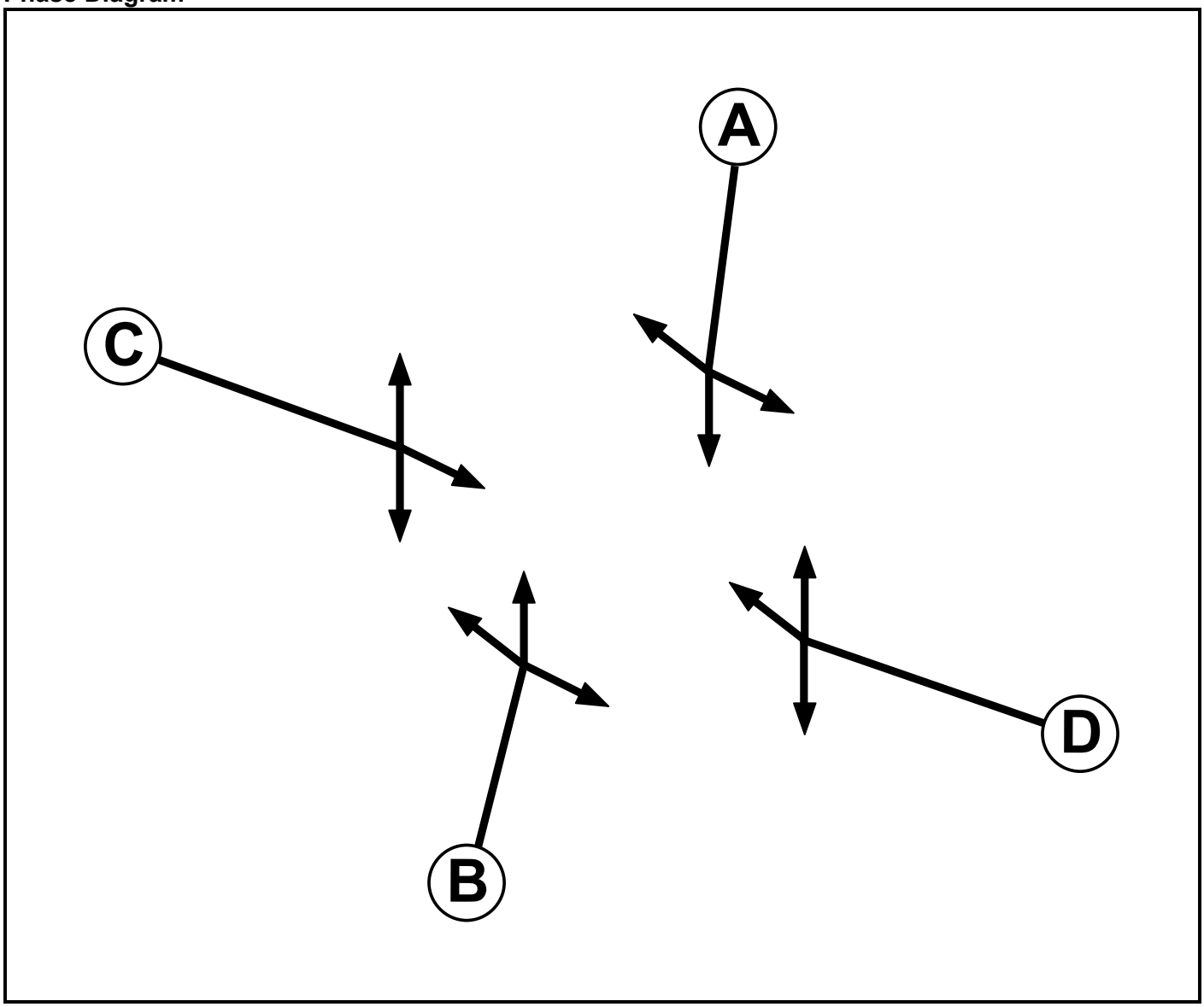
Project:	**Heyford Park**
Title:	**Middleton Stoney Junction**
Location:	
File name:	Middleton Stoney Signalised Junction_Consented V4 Bus Gate Test.lsg3x
Author:	ekeen
Company:	Peter Brett Associates
Address:	10 Queen Square
Notes:	Existing Layout

Network Layout Diagram



Full Input Data And Results

Phase Diagram



Phase Input Data

Phase Name	Phase Type	Assoc. Phase	Street Min	Cont Min
A	Traffic		7	7
B	Traffic		7	7
C	Traffic		7	7
D	Traffic		7	7

Full Input Data And Results

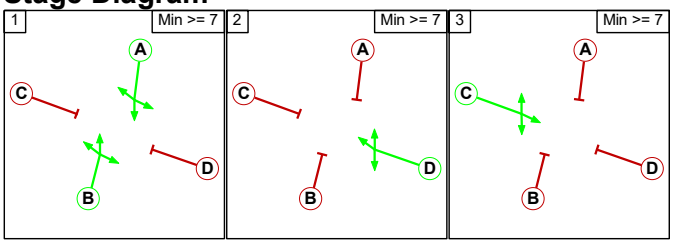
Phase Intergreens Matrix

Terminating Phase	Starting Phase				
		A	B	C	D
	A		-	5	8
	B	-		8	5
	C	5	7		8
	D	7	5	8	

Phases in Stage

Stage No.	Phases in Stage
1	A B
2	D
3	C

Stage Diagram



Phase Delays

Term. Stage	Start Stage	Phase	Type	Value	Cont value
1	2	B	Losing	3	3

Prohibited Stage Change

From Stage	To Stage			
		1	2	3
	1		8	8
	2	7		8
	3	7	8	

Full Input Data And Results

Give-Way Lane Input Data

Junction: Unnamed Junction											
Lane	**Movement**	**Max Flow when Giving Way (PCU/Hr)**	**Min Flow when Giving Way (PCU/Hr)**	**Opposing Lane**	**Opp. Lane Coeff.**	**Opp. Mvmnts.**	**Right Turn Storage (PCU)**	**Non-Blocking Storage (PCU)**	**RTF**	**Right Turn Move up (s)**	**Max Turns in Intergreen (PCU)**
2/2 (B430 Oxford Road (S))	5/1 (Right)	1439	0	4/1	1.09	To 5/1 (Left) To 6/1 (Ahead)	2.00	-	0.50	2	2.00
4/1 (B430 Ardley Road (N))	7/1 (Right)	1439	0	2/1	1.09	To 7/1 (Left) To 8/1 (Ahead)	1.00	1.00	0.50	1	1.00

Full Input Data And Results

Lane Input Data

Junction: Unnamed Junction												
Lane	**Lane Type**	**Phases**	**Start Disp.**	**End Disp.**	**Physical Length (PCU)**	**Sat Flow Type**	**Def User Saturation Flow (PCU/Hr)**	**Lane Width (m)**	**Gradient**	**Nearside Lane**	**Turns**	**Turning Radius (m)**
1/1 (B4030 Bicester Road (W/B))	U	D	2	3	60.0	Geom	-	3.00	0.00	Y	Arm 6 Left	13.00
											Arm 7 Ahead	30.00
											Arm 8 Right	30.00
2/1 (B430 Oxford Road (S))	U	B	2	3	60.0	Geom	-	3.00	0.00	Y	Arm 7 Left	30.00
											Arm 8 Ahead	Inf
2/2 (B430 Oxford Road (S))	O	B	2	3	5.0	Geom	-	3.00	0.00	N	Arm 5 Right	10.00
3/1 (B4030 Heyford Road (E/B))	U	C	2	3	60.0	Geom	-	3.00	0.00	Y	Arm 5 Ahead	30.00
											Arm 6 Right	30.00
											Arm 8 Left	7.00
4/1 (B430 Ardley Road (N))	O	A	2	3	60.0	Geom	-	3.32	0.00	Y	Arm 5 Left	12.00
											Arm 6 Ahead	Inf
											Arm 7 Right	8.00
5/1 (B4030 Bicester Road EX (E/B))	U		2	3	60.0	Inf	-	-	-	-	-	-
6/1 (B430 Arldey Road EX (S))	U		2	3	60.0	Inf	-	-	-	-	-	-
7/1 (B4030 Heyford Road EX (W/B))	U		2	3	60.0	Inf	-	-	-	-	-	-
8/1 (B430 Oxford Road EX (N))	U		2	3	60.0	Inf	-	-	-	-	-	-

Full Input Data And Results

Traffic Flow Groups

Flow Group	Start Time	End Time	Duration	Formula
21: 'SATURN Modelling RC AM'	07:30	08:30	01:00	
22: 'SATURN Modelling RC PM'	17:00	18:00	01:00	
23: 'SATURN Run DS1 Middleton Stoney Amend AM'	07:30	08:30	01:00	
24: 'SATURN Run DS1 Middleton Stoney Amend PM'	17:00	18:00	01:00	
25: 'SATURN Run DS1 Mid Stoney Amend - Low TR AM'	07:30	08:30	01:00	
26: 'SATURN Modelling DM AM'	07:30	08:30	01:00	
27: 'SATURN Modelling DM PM'	17:00	18:00	01:00	
28: 'SATURN Run DS1 Mid Stoney Amend - Low TR - Extra BusAM'	07:30	08:30	01:00	

Scenario 21: 'SATURN Modelling RC AM' (FG21: 'SATURN Modelling RC AM', Plan 1: 'Network Control Plan 1')

Traffic Flows, Desired

Desired Flow :

		Destination				
		A	B	C	D	Tot.
Origin	A	0	23	755	14	792
	B	59	0	60	278	397
	C	454	20	0	84	558
	D	14	490	44	0	548
	Tot.	527	533	859	376	2295

Traffic Lane Flows

Lane	Scenario 21: SATURN Modelling RC AM
Junction: Unnamed Junction	
1/1	397
2/1 (with short)	558(In) 538(Out)
2/2 (short)	20
3/1	548
4/1	792
5/1	533
6/1	859
7/1	376
8/1	527

Full Input Data And Results

Lane Saturation Flows

Junction: Unnamed Junction								
Lane	**Lane Width (m)**	**Gradient**	**Nearside Lane**	**Allowed Turns**	**Turning Radius (m)**	**Turning Prop.**	**Sat Flow (PCU/Hr)**	**Flared Sat Flow (PCU/Hr)**
1/1 (B4030 Bicester Road (W/B))	3.00	0.00	Y	Arm 6 Left	13.00	15.1 %	1807	1807
				Arm 7 Ahead	30.00	70.0 %		
				Arm 8 Right	30.00	14.9 %		
2/1 (B430 Oxford Road (S))	3.00	0.00	Y	Arm 7 Left	30.00	15.6 %	1900	1900
				Arm 8 Ahead	Inf	84.4 %		
2/2 (B430 Oxford Road (S))	3.00	0.00	N	Arm 5 Right	10.00	100.0 %	1787	1787
3/1 (B4030 Heyford Road (E/B))	3.00	0.00	Y	Arm 5 Ahead	30.00	89.4 %	1817	1817
				Arm 6 Right	30.00	8.0 %		
				Arm 8 Left	7.00	2.6 %		
4/1 (B430 Ardley Road (N))	3.32	0.00	Y	Arm 5 Left	12.00	2.9 %	1934	1934
				Arm 6 Ahead	Inf	95.3 %		
				Arm 7 Right	8.00	1.8 %		
5/1 (B4030 Bicester Road EX (E/B) Lane 1)	Infinite Saturation Flow						Inf	Inf
6/1 (B430 Arldey Road EX (S) Lane 1)	Infinite Saturation Flow						Inf	Inf
7/1 (B4030 Heyford Road EX (W/B) Lane 1)	Infinite Saturation Flow						Inf	Inf
8/1 (B430 Oxford Road EX (N) Lane 1)	Infinite Saturation Flow						Inf	Inf

Scenario 22: 'SATURN Modelling RC PM' (FG22: 'SATURN Modelling RC PM', Plan 1: 'Network Control Plan 1')

Traffic Flows, Desired

Desired Flow :

		Destination				
		A	B	C	D	Tot.
Origin	A	0	89	418	10	517
	B	41	0	25	427	493
	C	488	72	0	42	602
	D	5	368	35	0	408
	Tot.	534	529	478	479	2020

Full Input Data And Results

Traffic Lane Flows

Lane	Scenario 22: SATURN Modelling RC PM
Junction: Unnamed Junction	
1/1	493
2/1 (with short)	602(In) 530(Out)
2/2 (short)	72
3/1	408
4/1	517
5/1	529
6/1	478
7/1	479
8/1	534

Lane Saturation Flows

Junction: Unnamed Junction								
Lane	**Lane Width (m)**	**Gradient**	**Nearside Lane**	**Allowed Turns**	**Turning Radius (m)**	**Turning Prop.**	**Sat Flow (PCU/Hr)**	**Flared Sat Flow (PCU/Hr)**
1/1 (B4030 Bicester Road (W/B))	3.00	0.00	Y	Arm 6 Left	13.00	5.1 %	1818	1818
				Arm 7 Ahead	30.00	86.6 %		
				Arm 8 Right	30.00	8.3 %		
2/1 (B430 Oxford Road (S))	3.00	0.00	Y	Arm 7 Left	30.00	7.9 %	1907	1907
				Arm 8 Ahead	Inf	92.1 %		
2/2 (B430 Oxford Road (S))	3.00	0.00	N	Arm 5 Right	10.00	100.0 %	1787	1787
3/1 (B4030 Heyford Road (E/B))	3.00	0.00	Y	Arm 5 Ahead	30.00	90.2 %	1820	1820
				Arm 6 Right	30.00	8.6 %		
				Arm 8 Left	7.00	1.2 %		
4/1 (B430 Ardley Road (N))	3.32	0.00	Y	Arm 5 Left	12.00	17.2 %	1899	1899
				Arm 6 Ahead	Inf	80.9 %		
				Arm 7 Right	8.00	1.9 %		
5/1 (B4030 Bicester Road EX (E/B) Lane 1)	Infinite Saturation Flow						Inf	Inf
6/1 (B430 Arldey Road EX (S) Lane 1)	Infinite Saturation Flow						Inf	Inf
7/1 (B4030 Heyford Road EX (W/B) Lane 1)	Infinite Saturation Flow						Inf	Inf
8/1 (B430 Oxford Road EX (N) Lane 1)	Infinite Saturation Flow						Inf	Inf

Full Input Data And Results

Scenario 23: 'SATURN Run Modelling DS1 Middleton Stoney Amend AM' (FG23: 'SATURN Run DS1 Middleton Stoney Amend AM', Plan 2: 'Bus Gate Heyford Road')

Traffic Flows, Desired

Desired Flow :

Origin	Destination					
		A	B	C	D	Tot.
	A	0	464	757	4	1225
	B	500	0	76	10	586
	C	388	45	0	2	435
	D	10	17	11	0	38
	Tot.	898	526	844	16	2284

Traffic Lane Flows

Lane	Scenario 23: SATURN Run Modelling DS1 Middleton Stoney Amend AM
Junction: Unnamed Junction	
1/1	586
2/1 (with short)	435(In) 390(Out)
2/2 (short)	45
3/1	38
4/1	1225
5/1	526
6/1	844
7/1	16
8/1	898

Full Input Data And Results

Lane Saturation Flows

Junction: Unnamed Junction								
Lane	**Lane Width (m)**	**Gradient**	**Nearside Lane**	**Allowed Turns**	**Turning Radius (m)**	**Turning Prop.**	**Sat Flow (PCU/Hr)**	**Flared Sat Flow (PCU/Hr)**
1/1 (B4030 Bicester Road (W/B))	3.00	0.00	Y	Arm 6 Left	13.00	13.0 %	1809	1809
				Arm 7 Ahead	30.00	1.7 %		
				Arm 8 Right	30.00	85.3 %		
2/1 (B430 Oxford Road (S))	3.00	0.00	Y	Arm 7 Left	30.00	0.5 %	1915	1915
				Arm 8 Ahead	Inf	99.5 %		
2/2 (B430 Oxford Road (S))	3.00	0.00	N	Arm 5 Right	10.00	100.0 %	1787	1787
3/1 (B4030 Heyford Road (E/B))	3.00	0.00	Y	Arm 5 Ahead	30.00	44.7 %	1752	1752
				Arm 6 Right	30.00	28.9 %		
				Arm 8 Left	7.00	26.3 %		
4/1 (B430 Ardley Road (N))	3.32	0.00	Y	Arm 5 Left	12.00	37.9 %	1858	1858
				Arm 6 Ahead	Inf	61.8 %		
				Arm 7 Right	8.00	0.3 %		
5/1 (B4030 Bicester Road EX (E/B) Lane 1)	Infinite Saturation Flow						Inf	Inf
6/1 (B430 Arldey Road EX (S) Lane 1)	Infinite Saturation Flow						Inf	Inf
7/1 (B4030 Heyford Road EX (W/B) Lane 1)	Infinite Saturation Flow						Inf	Inf
8/1 (B430 Oxford Road EX (N) Lane 1)	Infinite Saturation Flow						Inf	Inf

Scenario 24: 'SATURN Run Modelling DS1 Middleton Stoney Amend PM' (FG24: 'SATURN Run DS1 Middleton Stoney Amend PM', Plan 2: 'Bus Gate Heyford Road')

Traffic Flows, Desired

Desired Flow :

		Destination				
		A	B	C	D	Tot.
Origin	A	0	519	336	7	862
	B	466	0	38	16	520
	C	642	87	0	5	734
	D	3	11	4	0	18
	Tot.	1111	617	378	28	2134

Full Input Data And Results

Traffic Lane Flows

Lane	Scenario 24: SATURN Run Modelling DS1 Middleton Stoney Amend PM
Junction: Unnamed Junction	
1/1	520
2/1 (with short)	734(In) 647(Out)
2/2 (short)	87
3/1	18
4/1	862
5/1	617
6/1	378
7/1	28
8/1	1111

Full Input Data And Results

Lane Saturation Flows

Junction: Unnamed Junction								
Lane	**Lane Width (m)**	**Gradient**	**Nearside Lane**	**Allowed Turns**	**Turning Radius (m)**	**Turning Prop.**	**Sat Flow (PCU/Hr)**	**Flared Sat Flow (PCU/Hr)**
1/1 (B4030 Bicester Road (W/B))	3.00	0.00	Y	Arm 6 Left	13.00	7.3 %	1816	1816
				Arm 7 Ahead	30.00	3.1 %		
				Arm 8 Right	30.00	89.6 %		
2/1 (B430 Oxford Road (S))	3.00	0.00	Y	Arm 7 Left	30.00	0.8 %	1914	1914
				Arm 8 Ahead	Inf	99.2 %		
2/2 (B430 Oxford Road (S))	3.00	0.00	N	Arm 5 Right	10.00	100.0 %	1787	1787
3/1 (B4030 Heyford Road (E/B))	3.00	0.00	Y	Arm 5 Ahead	30.00	61.1 %	1777	1777
				Arm 6 Right	30.00	22.2 %		
				Arm 8 Left	7.00	16.7 %		
4/1 (B430 Ardley Road (N))	3.32	0.00	Y	Arm 5 Left	12.00	60.2 %	1808	1808
				Arm 6 Ahead	Inf	39.0 %		
				Arm 7 Right	8.00	0.8 %		
5/1 (B4030 Bicester Road EX (E/B) Lane 1)	Infinite Saturation Flow						Inf	Inf
6/1 (B430 Arldey Road EX (S) Lane 1)	Infinite Saturation Flow						Inf	Inf
7/1 (B4030 Heyford Road EX (W/B) Lane 1)	Infinite Saturation Flow						Inf	Inf
8/1 (B430 Oxford Road EX (N) Lane 1)	Infinite Saturation Flow						Inf	Inf

Scenario 25: 'SATURN Run Modelling DS1 Mid Stoney Amend - Low TR AM' (FG25: 'SATURN Run DS1 Mid Stoney Amend - Low TR AM', Plan 2: 'Bus Gate Heyford Road')

Traffic Flows, Desired

Desired Flow :

	Destination					
Origin		A	B	C	D	Tot.
	A	0	401	753	3	1157
	B	469	0	76	9	554
	C	383	45	0	1	429
	D	8	15	9	0	32
	Tot.	860	461	838	13	2172

Full Input Data And Results

Traffic Lane Flows

Lane	Scenario 25: SATURN Run Modelling DS1 Mid Stoney Amend - Low TR AM
Junction: Unnamed Junction	
1/1	554
2/1 (with short)	429(In) 384(Out)
2/2 (short)	45
3/1	32
4/1	1157
5/1	461
6/1	838
7/1	13
8/1	860

Full Input Data And Results

Lane Saturation Flows

Junction: Unnamed Junction								
Lane	**Lane Width (m)**	**Gradient**	**Nearside Lane**	**Allowed Turns**	**Turning Radius (m)**	**Turning Prop.**	**Sat Flow (PCU/Hr)**	**Flared Sat Flow (PCU/Hr)**
1/1 (B4030 Bicester Road (W/B))	3.00	0.00	Y	Arm 6 Left	13.00	13.7 %	1808	1808
				Arm 7 Ahead	30.00	1.6 %		
				Arm 8 Right	30.00	84.7 %		
2/1 (B430 Oxford Road (S))	3.00	0.00	Y	Arm 7 Left	30.00	0.3 %	1915	1915
				Arm 8 Ahead	Inf	99.7 %		
2/2 (B430 Oxford Road (S))	3.00	0.00	N	Arm 5 Right	10.00	100.0 %	1787	1787
3/1 (B4030 Heyford Road (E/B))	3.00	0.00	Y	Arm 5 Ahead	30.00	46.9 %	1755	1755
				Arm 6 Right	30.00	28.1 %		
				Arm 8 Left	7.00	25.0 %		
4/1 (B430 Ardley Road (N))	3.32	0.00	Y	Arm 5 Left	12.00	34.7 %	1865	1865
				Arm 6 Ahead	Inf	65.1 %		
				Arm 7 Right	8.00	0.3 %		
5/1 (B4030 Bicester Road EX (E/B) Lane 1)	Infinite Saturation Flow						Inf	Inf
6/1 (B430 Arldey Road EX (S) Lane 1)	Infinite Saturation Flow						Inf	Inf
7/1 (B4030 Heyford Road EX (W/B) Lane 1)	Infinite Saturation Flow						Inf	Inf
8/1 (B430 Oxford Road EX (N) Lane 1)	Infinite Saturation Flow						Inf	Inf

Scenario 26: 'SATURN Modelling DM AM' (FG26: 'SATURN Modelling DM AM', Plan 1: 'Network Control Plan 1')

Traffic Flows, Desired

Desired Flow :

		Destination				
		A	B	C	D	Tot.
Origin	A	0	123	661	25	809
	B	30	0	36	277	343
	C	269	20	0	331	620
	D	13	506	34	0	553
	Tot.	312	649	731	633	2325

Full Input Data And Results

Traffic Lane Flows

Lane	Scenario 26: SATURN Modelling DM AM
Junction: Unnamed Junction	
1/1	343
2/1 (with short)	620(In) 600(Out)
2/2 (short)	20
3/1	553
4/1	809
5/1	649
6/1	731
7/1	633
8/1	312

Lane Saturation Flows

Junction: Unnamed Junction								
Lane	**Lane Width (m)**	**Gradient**	**Nearside Lane**	**Allowed Turns**	**Turning Radius (m)**	**Turning Prop.**	**Sat Flow (PCU/Hr)**	**Flared Sat Flow (PCU/Hr)**
1/1 (B4030 Bicester Road (W/B))	3.00	0.00	Y	Arm 6 Left	13.00	10.5 %	1812	1812
				Arm 7 Ahead	30.00	80.8 %		
				Arm 8 Right	30.00	8.7 %		
2/1 (B430 Oxford Road (S))	3.00	0.00	Y	Arm 7 Left	30.00	55.2 %	1864	1864
				Arm 8 Ahead	Inf	44.8 %		
2/2 (B430 Oxford Road (S))	3.00	0.00	N	Arm 5 Right	10.00	100.0 %	1787	1787
3/1 (B4030 Heyford Road (E/B))	3.00	0.00	Y	Arm 5 Ahead	30.00	91.5 %	1817	1817
				Arm 6 Right	30.00	6.1 %		
				Arm 8 Left	7.00	2.4 %		
4/1 (B430 Ardley Road (N))	3.32	0.00	Y	Arm 5 Left	12.00	15.2 %	1900	1900
				Arm 6 Ahead	Inf	81.7 %		
				Arm 7 Right	8.00	3.1 %		
5/1 (B4030 Bicester Road EX (E/B) Lane 1)	Infinite Saturation Flow						Inf	Inf
6/1 (B430 Arldey Road EX (S) Lane 1)	Infinite Saturation Flow						Inf	Inf
7/1 (B4030 Heyford Road EX (W/B) Lane 1)	Infinite Saturation Flow						Inf	Inf
8/1 (B430 Oxford Road EX (N) Lane 1)	Infinite Saturation Flow						Inf	Inf

Full Input Data And Results

Scenario 27: 'SATURN Modelling DM PM' (FG27: 'SATURN Modelling DM PM', Plan 1: 'Network Control Plan 1')

Traffic Flows, Desired

Desired Flow :

		Destination				
		A	B	C	D	Tot.
Origin	A	0	207	301	14	522
	B	11	0	16	478	505
	C	559	43	0	80	682
	D	6	381	34	0	421
	Tot.	576	631	351	572	2130

Traffic Lane Flows

Lane	Scenario 27: SATURN Modelling DM PM
Junction: Unnamed Junction	
1/1	505
2/1 (with short)	682(In) 639(Out)
2/2 (short)	43
3/1	421
4/1	522
5/1	631
6/1	351
7/1	572
8/1	576

Full Input Data And Results

Lane Saturation Flows

Junction: Unnamed Junction								
Lane	**Lane Width (m)**	**Gradient**	**Nearside Lane**	**Allowed Turns**	**Turning Radius (m)**	**Turning Prop.**	**Sat Flow (PCU/Hr)**	**Flared Sat Flow (PCU/Hr)**
1/1 (B4030 Bicester Road (W/B))	3.00	0.00	Y	Arm 6 Left	13.00	3.2 %	1820	1820
				Arm 7 Ahead	30.00	94.7 %		
				Arm 8 Right	30.00	2.2 %		
2/1 (B430 Oxford Road (S))	3.00	0.00	Y	Arm 7 Left	30.00	12.5 %	1903	1903
				Arm 8 Ahead	Inf	87.5 %		
2/2 (B430 Oxford Road (S))	3.00	0.00	N	Arm 5 Right	10.00	100.0 %	1787	1787
3/1 (B4030 Heyford Road (E/B))	3.00	0.00	Y	Arm 5 Ahead	30.00	90.5 %	1820	1820
				Arm 6 Right	30.00	8.1 %		
				Arm 8 Left	7.00	1.4 %		
4/1 (B430 Ardley Road (N))	3.32	0.00	Y	Arm 5 Left	12.00	39.7 %	1846	1846
				Arm 6 Ahead	Inf	57.7 %		
				Arm 7 Right	8.00	2.7 %		
5/1 (B4030 Bicester Road EX (E/B) Lane 1)	Infinite Saturation Flow						Inf	Inf
6/1 (B430 Arldey Road EX (S) Lane 1)	Infinite Saturation Flow						Inf	Inf
7/1 (B4030 Heyford Road EX (W/B) Lane 1)	Infinite Saturation Flow						Inf	Inf
8/1 (B430 Oxford Road EX (N) Lane 1)	Infinite Saturation Flow						Inf	Inf

Scenario 28: 'SATURN Run Modelling DS1 Mid Stoney Amend - Low TR - Extra Bus AM' (FG28: 'SATURN Run DS1 Mid Stoney Amend - Low TR - Extra BusAM', Plan 2: 'Bus Gate Heyford Road')

Traffic Flows, Desired

Desired Flow :

		Destination				
		A	B	C	D	Tot.
Origin	A	0	382	753	3	1138
	B	458	0	76	11	545
	C	383	45	0	1	429
	D	8	17	9	0	34
	Tot.	849	444	838	15	2146

Full Input Data And Results

Traffic Lane Flows

Lane	Scenario 28: SATURN Run Modelling DS1 Mid Stoney Amend - Low TR - Extra Bus AM
Junction: Unnamed Junction	
1/1	545
2/1 (with short)	429(In) 384(Out)
2/2 (short)	45
3/1	34
4/1	1138
5/1	444
6/1	838
7/1	15
8/1	849

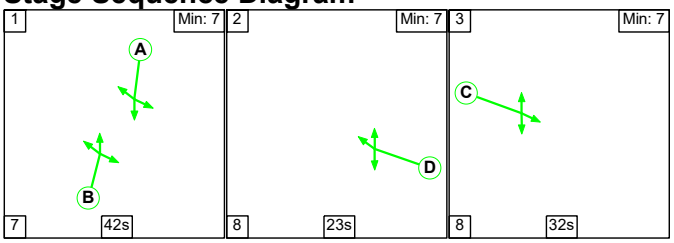
Full Input Data And Results

Lane Saturation Flows

Junction: Unnamed Junction								
Lane	**Lane Width (m)**	**Gradient**	**Nearside Lane**	**Allowed Turns**	**Turning Radius (m)**	**Turning Prop.**	**Sat Flow (PCU/Hr)**	**Flared Sat Flow (PCU/Hr)**
1/1 (B4030 Bicester Road (W/B))	3.00	0.00	Y	Arm 6 Left	13.00	13.9 %	1808	1808
				Arm 7 Ahead	30.00	2.0 %		
				Arm 8 Right	30.00	84.0 %		
2/1 (B430 Oxford Road (S))	3.00	0.00	Y	Arm 7 Left	30.00	0.3 %	1915	1915
				Arm 8 Ahead	Inf	99.7 %		
2/2 (B430 Oxford Road (S))	3.00	0.00	N	Arm 5 Right	10.00	100.0 %	1787	1787
3/1 (B4030 Heyford Road (E/B))	3.00	0.00	Y	Arm 5 Ahead	30.00	50.0 %	1759	1759
				Arm 6 Right	30.00	26.5 %		
				Arm 8 Left	7.00	23.5 %		
4/1 (B430 Ardley Road (N))	3.32	0.00	Y	Arm 5 Left	12.00	33.6 %	1868	1868
				Arm 6 Ahead	Inf	66.2 %		
				Arm 7 Right	8.00	0.3 %		
5/1 (B4030 Bicester Road EX (E/B) Lane 1)	Infinite Saturation Flow						Inf	Inf
6/1 (B430 Arldey Road EX (S) Lane 1)	Infinite Saturation Flow						Inf	Inf
7/1 (B4030 Heyford Road EX (W/B) Lane 1)	Infinite Saturation Flow						Inf	Inf
8/1 (B430 Oxford Road EX (N) Lane 1)	Infinite Saturation Flow						Inf	Inf

Scenario 21: 'SATURN Modelling RC AM' (FG21: 'SATURN Modelling RC AM', Plan 1: 'Network Control Plan 1')

Stage Sequence Diagram

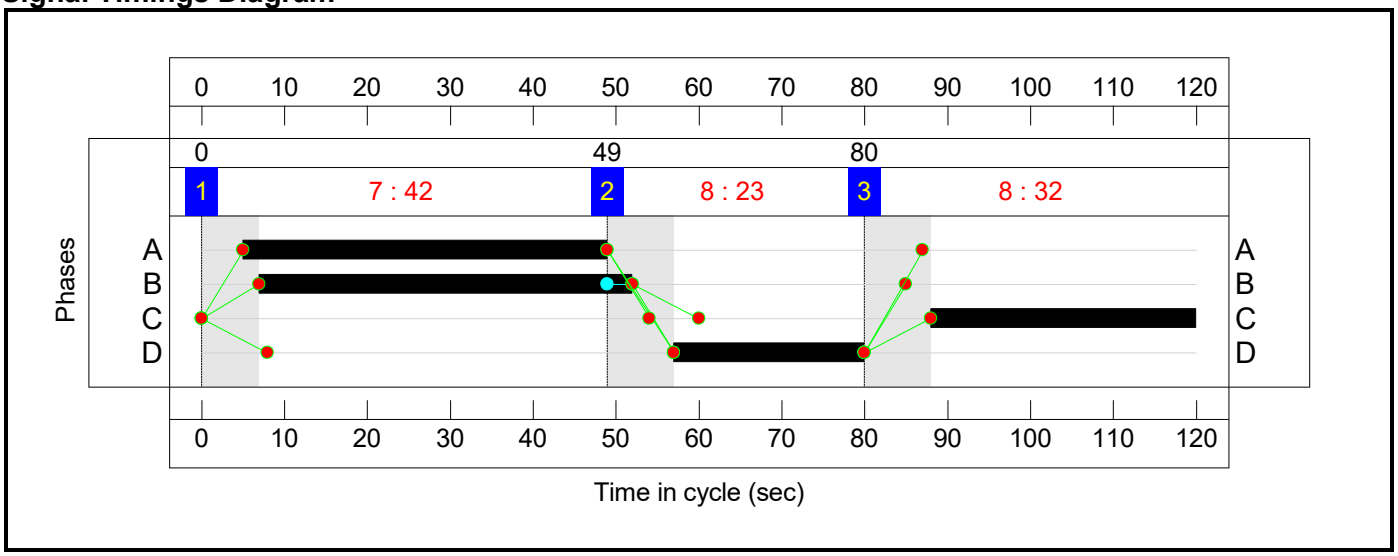


Stage Timings

Stage	1	2	3
Duration	42	23	32
Change Point	0	49	80

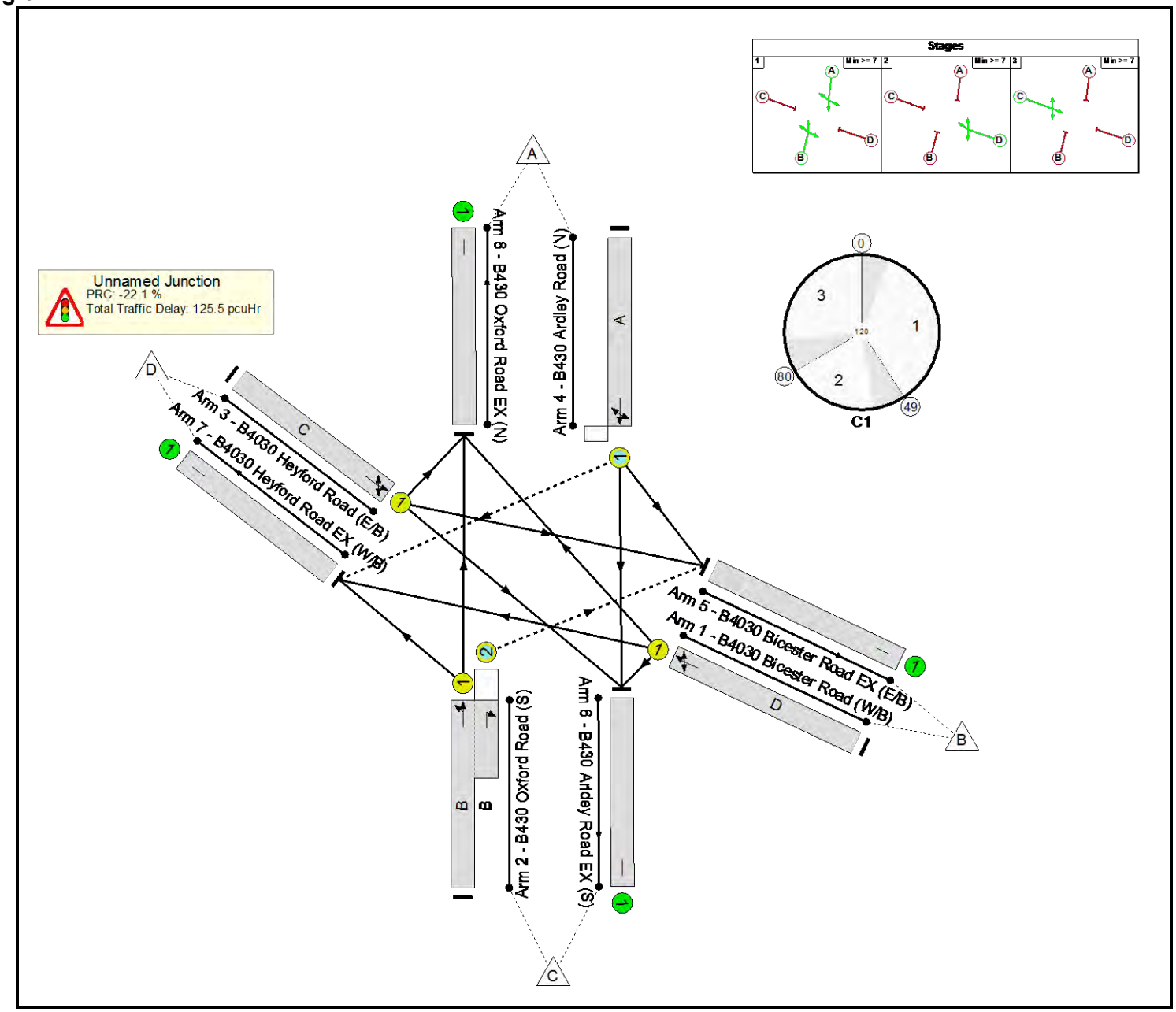
Full Input Data And Results

Signal Timings Diagram



Full Input Data And Results

Network Layout Diagram



Full Input Data And Results

Network Results

Item	Lane Description	Lane Type	Controller Stream	Position In Filtered Route	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)
Network: Middleton Stoney Junction	-	-	**N/A**	-	-		-	-	-	-	-	-	**109.9%**
Unnamed Junction	-	-	**N/A**	-	-		-	-	-	-	-	-	**109.9%**
1/1	B4030 Bicester Road (W/B) Left Ahead Right	U	N/A	N/A	D		1	23	-	397	1807	361	109.9%
2/1+2/2	B430 Oxford Road (S) Right Left Ahead	U+O	N/A	N/A	B		1	45	-	558	1900:1787	740	75.4%
3/1	B4030 Heyford Road (E/B) Ahead Right Left	U	N/A	N/A	C		1	32	-	548	1817	500	109.7%
4/1	B430 Ardley Road (N) Left Ahead Right	O	N/A	N/A	A		1	44	-	792	1934	725	109.2%
5/1	B4030 Bicester Road EX (E/B)	U	N/A	N/A	-		-	-	-	533	Inf	Inf	0.0%
6/1	B430 Arldey Road EX (S)	U	N/A	N/A	-		-	-	-	859	Inf	Inf	0.0%
7/1	B4030 Heyford Road EX (W/B)	U	N/A	N/A	-		-	-	-	376	Inf	Inf	0.0%
8/1	B430 Oxford Road EX (N)	U	N/A	N/A	-		-	-	-	527	Inf	Inf	0.0%

Full Input Data And Results

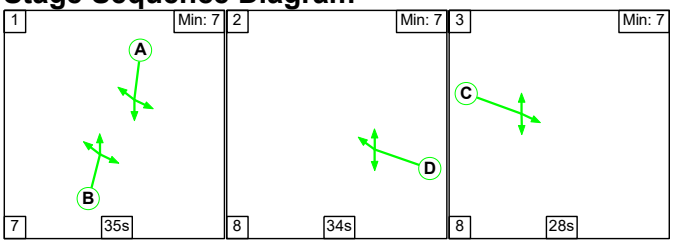
Item	Arriving (pcu)	Leaving (pcu)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Uniform Delay (pcuHr)	Rand + Oversat Delay (pcuHr)	Storage Area Uniform Delay (pcuHr)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Max. Back of Uniform Queue (pcu)	Rand + Oversat Queue (pcu)	Mean Max Queue (pcu)
Network: Middleton Stoney Junction	**-**	**-**	**13**	**15**	**5**	**34.1**	**91.2**	**0.2**	**125.5**	**-**	**-**	**-**	**-**
Unnamed Junction	**-**	**-**	**13**	**15**	**5**	**34.1**	**91.2**	**0.2**	**125.5**	**-**	**-**	**-**	**-**
1/1	397	361	-	-	-	7.0	22.3	-	29.2	265.0	14.4	22.3	36.7
2/1+2/2	558	558	0	15	5	4.9	1.5	0.1	6.6	42.5	15.8	1.5	17.3
3/1	548	500	-	-	-	10.0	28.9	-	38.9	255.8	21.0	28.9	49.9
4/1	792	725	13	0	0	12.2	38.5	0.0	50.7	230.5	28.6	38.5	67.1
5/1	488	488	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
6/1	786	786	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
7/1	350	350	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
8/1	520	520	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0

C1 PRC for Signalled Lanes (%): -22.1 Total Delay for Signalled Lanes (pcuHr): 125.47 Cycle Time (s): 120
PRC Over All Lanes (%): -22.1 Total Delay Over All Lanes(pcuHr): 125.47

Full Input Data And Results

Scenario 22: 'SATURN Modelling RC PM' (FG22: 'SATURN Modelling RC PM', Plan 1: 'Network Control Plan 1')

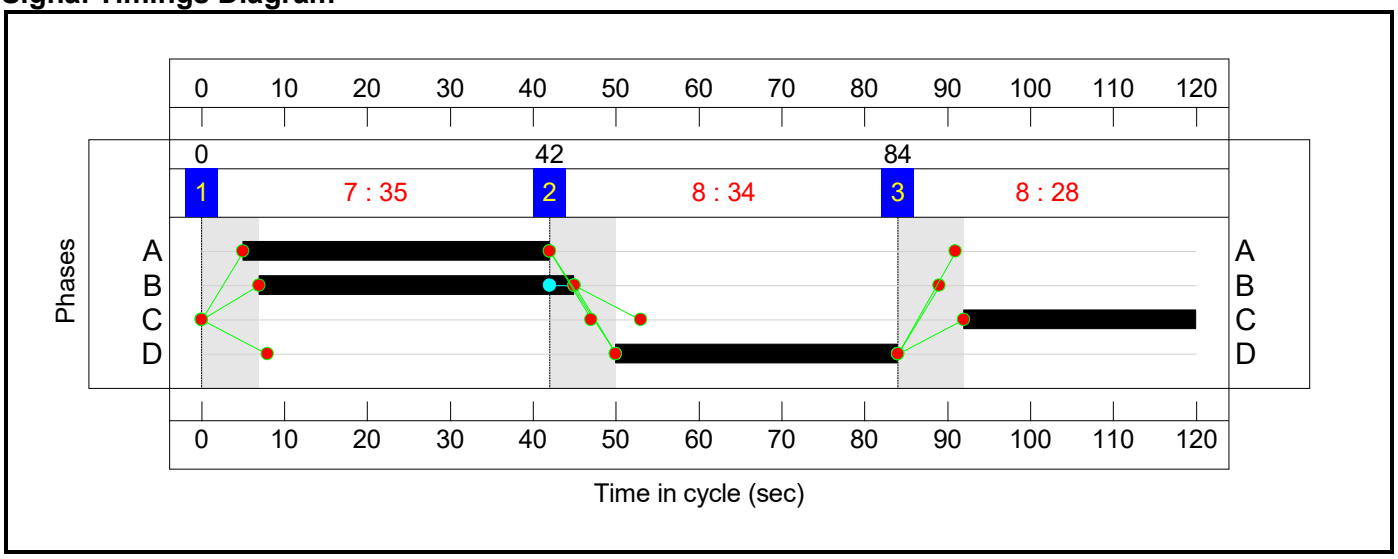
Stage Sequence Diagram



Stage Timings

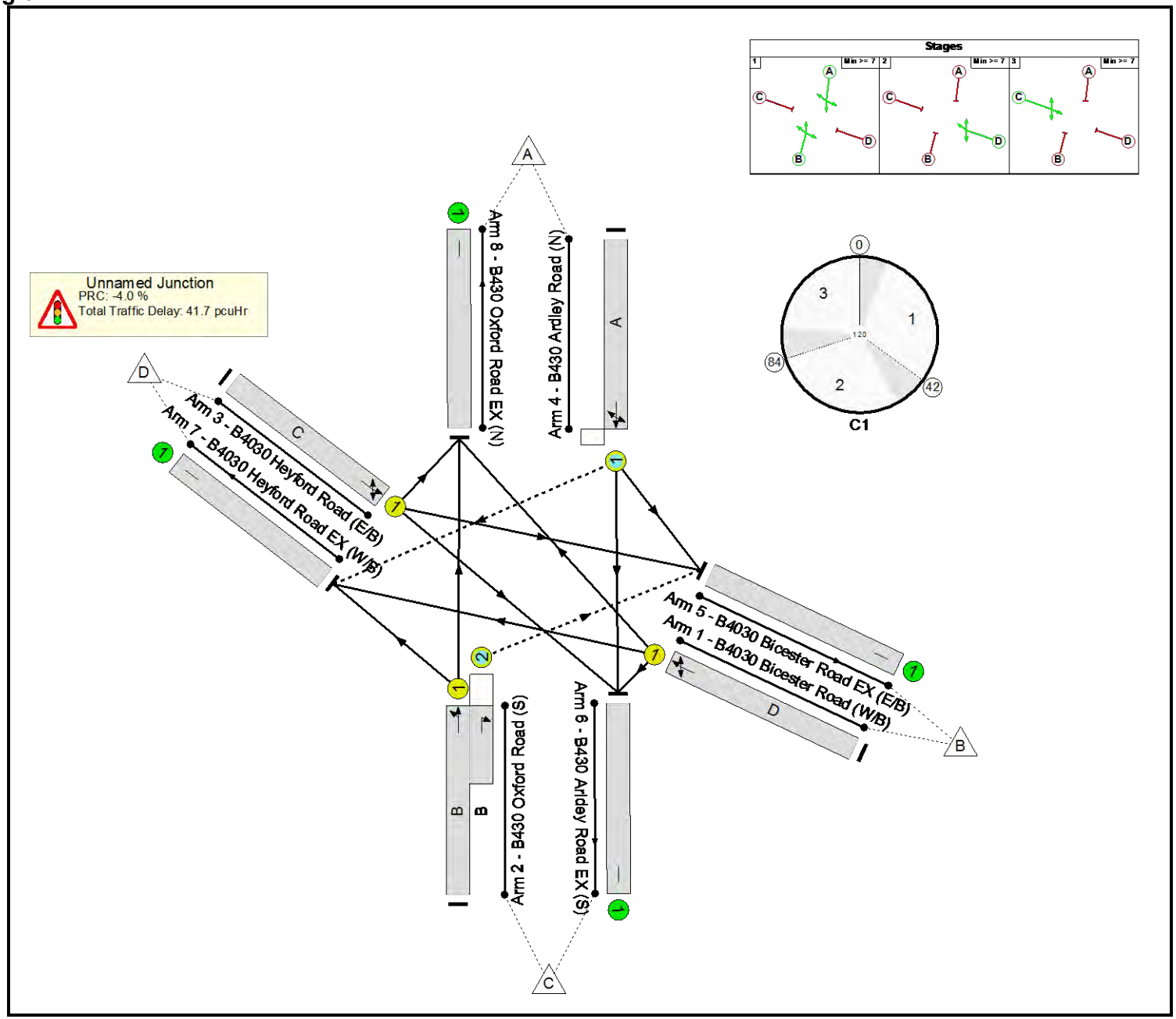
Stage	1	2	3
Duration	35	34	28
Change Point	0	42	84

Signal Timings Diagram



Full Input Data And Results

Network Layout Diagram



Full Input Data And Results

Network Results

Item	Lane Description	Lane Type	Controller Stream	Position In Filtered Route	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)
Network: Middleton Stoney Junction	-	-	**N/A**	-	-		-	-	-	-	-	-	**93.6%**
Unnamed Junction	-	-	**N/A**	-	-		-	-	-	-	-	-	**93.6%**
1/1	B4030 Bicester Road (W/B) Left Ahead Right	U	N/A	N/A	D		1	34	-	493	1818	530	93.0%
2/1+2/2	B430 Oxford Road (S) Right Left Ahead	U+O	N/A	N/A	B		1	38	-	602	1907:1787	643	93.6%
3/1	B4030 Heyford Road (E/B) Ahead Right Left	U	N/A	N/A	C		1	28	-	408	1820	440	92.8%
4/1	B430 Ardley Road (N) Left Ahead Right	O	N/A	N/A	A		1	37	-	517	1899	601	86.0%
5/1	B4030 Bicester Road EX (E/B)	U	N/A	N/A	-		-	-	-	529	Inf	Inf	0.0%
6/1	B430 Arldey Road EX (S)	U	N/A	N/A	-		-	-	-	478	Inf	Inf	0.0%
7/1	B4030 Heyford Road EX (W/B)	U	N/A	N/A	-		-	-	-	479	Inf	Inf	0.0%
8/1	B430 Oxford Road EX (N)	U	N/A	N/A	-		-	-	-	534	Inf	Inf	0.0%

Full Input Data And Results

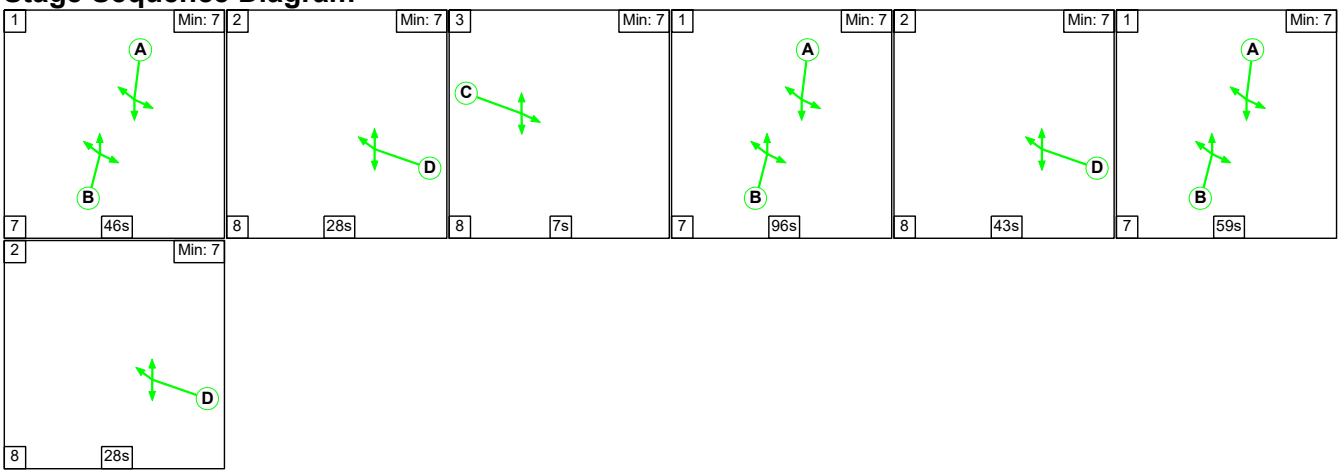
Item	Arriving (pcu)	Leaving (pcu)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Uniform Delay (pcuHr)	Rand + Oversat Delay (pcuHr)	Storage Area Uniform Delay (pcuHr)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Max. Back of Uniform Queue (pcu)	Rand + Oversat Queue (pcu)	Mean Max Queue (pcu)
Network: Middleton Stoney Junction	**-**	**-**	**61**	**15**	**5**	**22.7**	**18.7**	**0.4**	**41.7**	**-**	**-**	**-**	**-**
Unnamed Junction	**-**	**-**	**61**	**15**	**5**	**22.7**	**18.7**	**0.4**	**41.7**	**-**	**-**	**-**	**-**
1/1	493	493	-	-	-	5.7	5.2	-	10.8	79.1	15.9	5.2	21.1
2/1+2/2	602	602	52	15	5	6.5	5.7	0.3	12.5	74.7	18.7	5.7	24.4
3/1	408	408	-	-	-	5.0	4.9	-	9.9	87.7	13.3	4.9	18.2
4/1	517	517	10	0	0	5.5	2.9	0.1	8.5	58.9	16.1	2.9	19.0
5/1	529	529	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
6/1	478	478	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
7/1	479	479	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
8/1	534	534	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0

C1 PRC for Signalled Lanes (%): -4.0 Total Delay for Signalled Lanes (pcuHr): 41.73 Cycle Time (s): 120
PRC Over All Lanes (%): -4.0 Total Delay Over All Lanes(pcuHr): 41.73

Full Input Data And Results

Scenario 23: 'SATURN Run Modelling DS1 Middleton Stoney Amend AM' (FG23: 'SATURN Run DS1 Middleton Stoney Amend AM', Plan 2: 'Bus Gate Heyford Road')

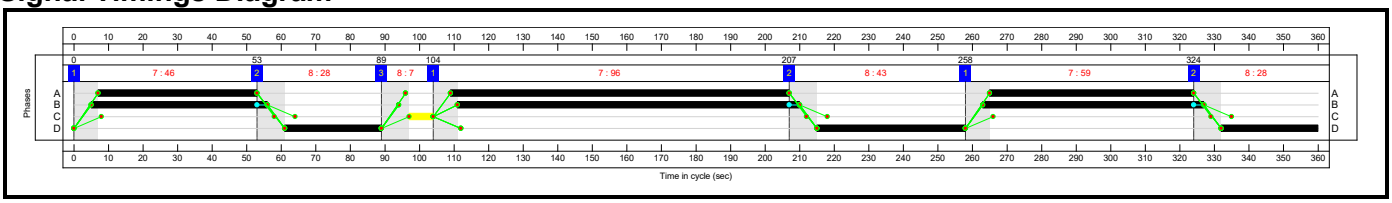
Stage Sequence Diagram



Stage Timings

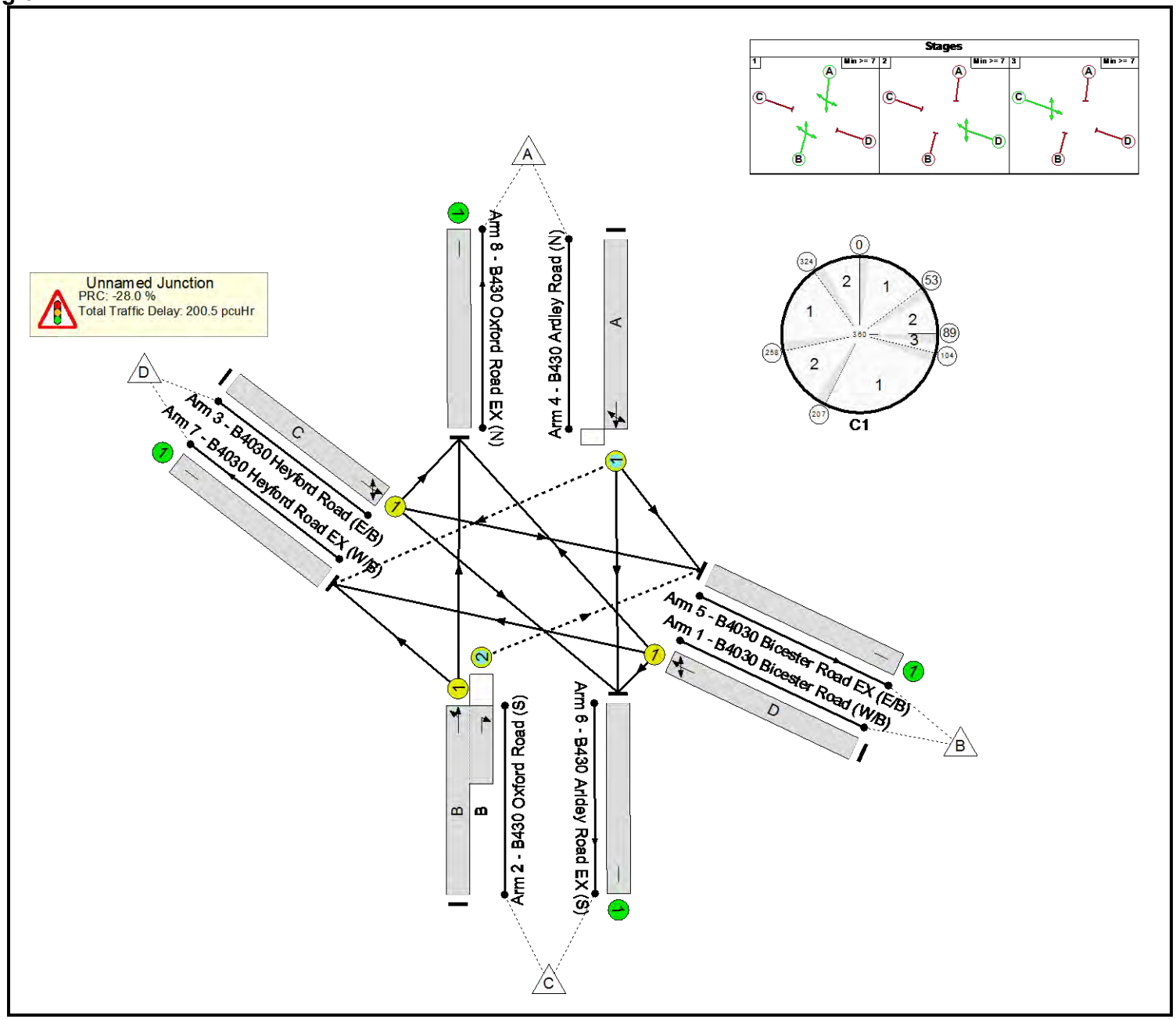
Stage	1	2	3	1	2	1	2
Duration	46	28	7	96	43	59	28
Change Point	0	53	89	104	207	258	324

Signal Timings Diagram



Full Input Data And Results

Network Layout Diagram



Full Input Data And Results

Network Results

Item	Lane Description	Lane Type	Controller Stream	Position In Filtered Route	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)
Network: Middleton Stoney Junction	-	-	**N/A**	-	-		-	-	-	-	-	-	**115.2%**
Unnamed Junction	-	-	**N/A**	-	-		-	-	-	-	-	-	**115.2%**
1/1	B4030 Bicester Road (W/B) Left Ahead Right	U	N/A	N/A	D		3	99	-	586	1809	513	114.3%
2/1+2/2	B430 Oxford Road (S) Right Left Ahead	U+O	N/A	N/A	B		3	214	-	435	1915:1787	580	75.0%
3/1	B4030 Heyford Road (E/B) Ahead Right Left	U	N/A	N/A	C		1	7	-	38	1752	39	97.6%
4/1	B430 Ardley Road (N) Left Ahead Right	O	N/A	N/A	A		3	203	-	1225	1858	1063	115.2%
5/1	B4030 Bicester Road EX (E/B)	U	N/A	N/A	-		-	-	-	526	Inf	Inf	0.0%
6/1	B430 Arldey Road EX (S)	U	N/A	N/A	-		-	-	-	844	Inf	Inf	0.0%
7/1	B4030 Heyford Road EX (W/B)	U	N/A	N/A	-		-	-	-	16	Inf	Inf	0.0%
8/1	B430 Oxford Road EX (N)	U	N/A	N/A	-		-	-	-	898	Inf	Inf	0.0%

Full Input Data And Results

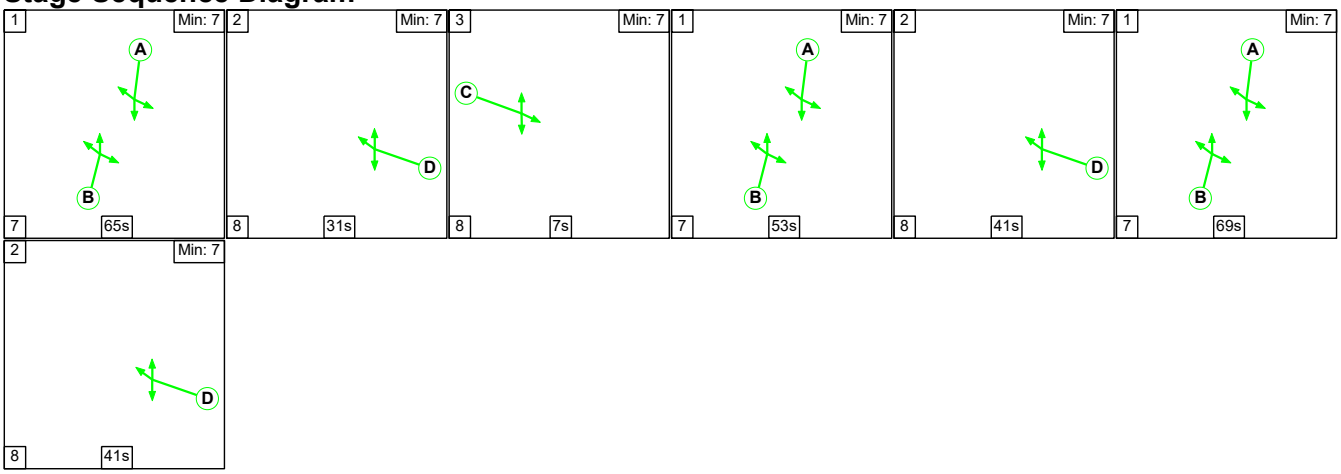
Item	Arriving (pcu)	Leaving (pcu)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Uniform Delay (pcuHr)	Rand + Oversat Delay (pcuHr)	Storage Area Uniform Delay (pcuHr)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Max. Back of Uniform Queue (pcu)	Rand + Oversat Queue (pcu)	Mean Max Queue (pcu)
Network: Middleton Stoney Junction	**-**	**-**	**3**	**15**	**30**	**70.6**	**129.2**	**0.6**	**200.5**	**-**	**-**	**-**	**-**
Unnamed Junction	**-**	**-**	**3**	**15**	**30**	**70.6**	**129.2**	**0.6**	**200.5**	**-**	**-**	**-**	**-**
1/1	586	513	-	-	-	24.3	40.4	-	64.6	397.0	42.2	40.4	82.6
2/1+2/2	435	435	0	15	30	1.5	1.5	0.6	3.6	29.5	7.5	1.5	9.0
3/1	38	38	-	-	-	1.9	2.9	-	4.7	446.6	3.8	2.9	6.6
4/1	1225	1063	3	0	0	43.0	84.5	0.0	127.6	374.9	84.8	84.5	169.3
5/1	465	465	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
6/1	734	734	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
7/1	14	14	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
8/1	835	835	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0

C1 PRC for Signalled Lanes (%): -28.0 Total Delay for Signalled Lanes (pcuHr): 200.46 Cycle Time (s): 360
PRC Over All Lanes (%): -28.0 Total Delay Over All Lanes(pcuHr): 200.46

Full Input Data And Results

Scenario 24: 'SATURN Run Modelling DS1 Middleton Stoney Amend PM' (FG24: 'SATURN Run DS1 Middleton Stoney Amend PM', Plan 2: 'Bus Gate Heyford Road')

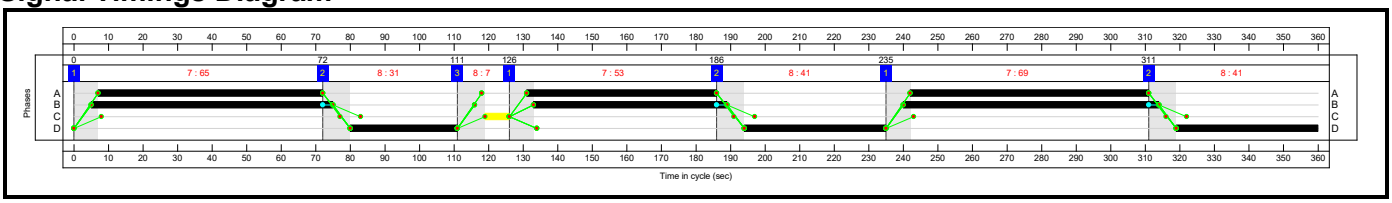
Stage Sequence Diagram



Stage Timings

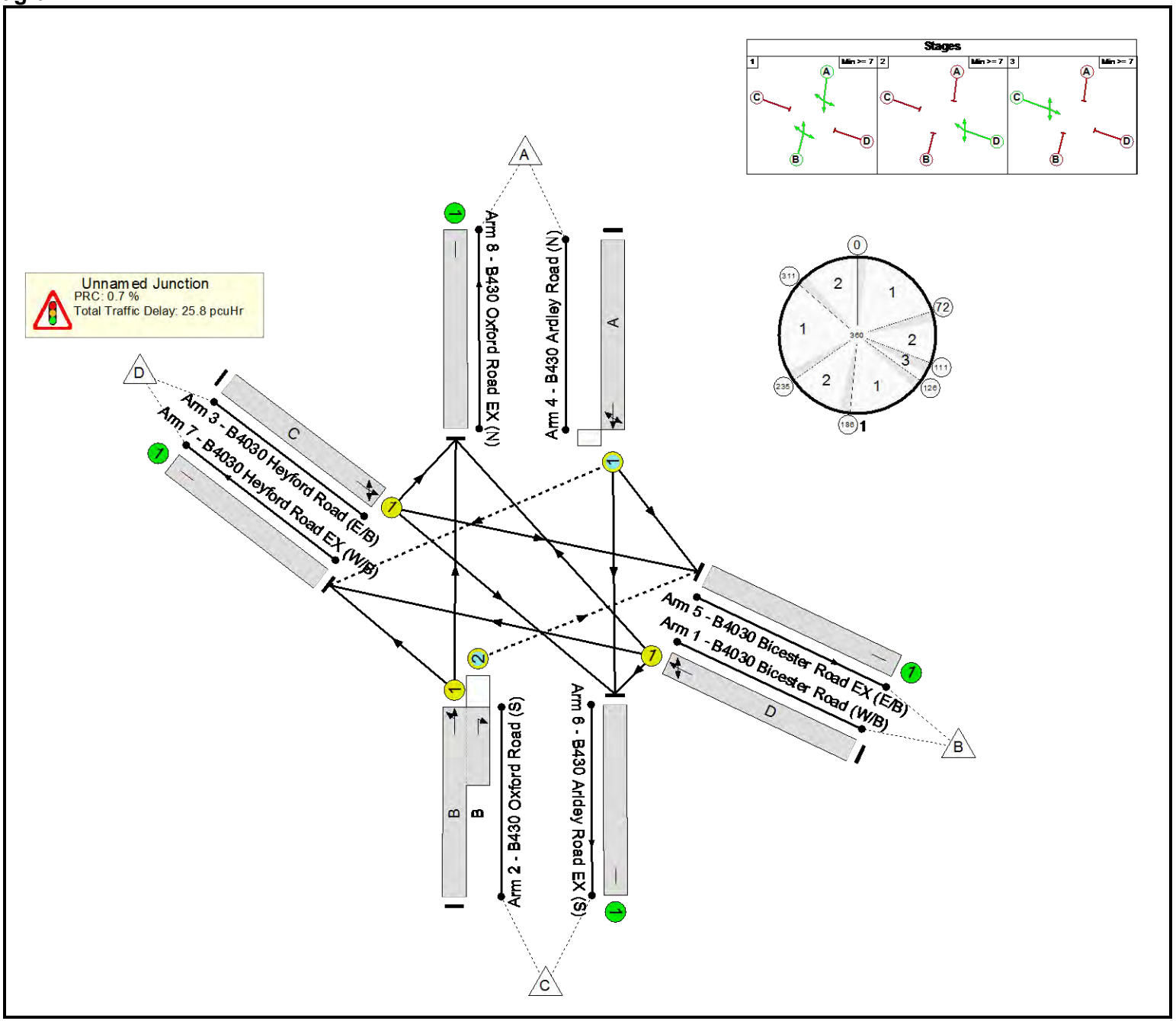
Stage	1	2	3	1	2	1	2
Duration	65	31	7	53	41	69	41
Change Point	0	72	111	126	186	235	311

Signal Timings Diagram



Full Input Data And Results

Network Layout Diagram



Full Input Data And Results

Network Results

Item	Lane Description	Lane Type	Controller Stream	Position In Filtered Route	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)
Network: Middleton Stoney Junction	-	-	**N/A**	-	-		-	-	-	-	-	-	**89.4%**
Unnamed Junction	-	-	**N/A**	-	-		-	-	-	-	-	-	**89.4%**
1/1	B4030 Bicester Road (W/B) Left Ahead Right	U	N/A	N/A	D		3	113	-	520	1816	585	88.9%
2/1+2/2	B430 Oxford Road (S) Right Left Ahead	U+O	N/A	N/A	B		3	200	-	734	1914:1787	1097	66.9%
3/1	B4030 Heyford Road (E/B) Ahead Right Left	U	N/A	N/A	C		1	7	-	18	1777	39	45.6%
4/1	B430 Ardley Road (N) Left Ahead Right	O	N/A	N/A	A		3	189	-	862	1808	964	89.4%
5/1	B4030 Bicester Road EX (E/B)	U	N/A	N/A	-		-	-	-	617	Inf	Inf	0.0%
6/1	B430 Arldey Road EX (S)	U	N/A	N/A	-		-	-	-	378	Inf	Inf	0.0%
7/1	B4030 Heyford Road EX (W/B)	U	N/A	N/A	-		-	-	-	28	Inf	Inf	0.0%
8/1	B430 Oxford Road EX (N)	U	N/A	N/A	-		-	-	-	1111	Inf	Inf	0.0%

Full Input Data And Results

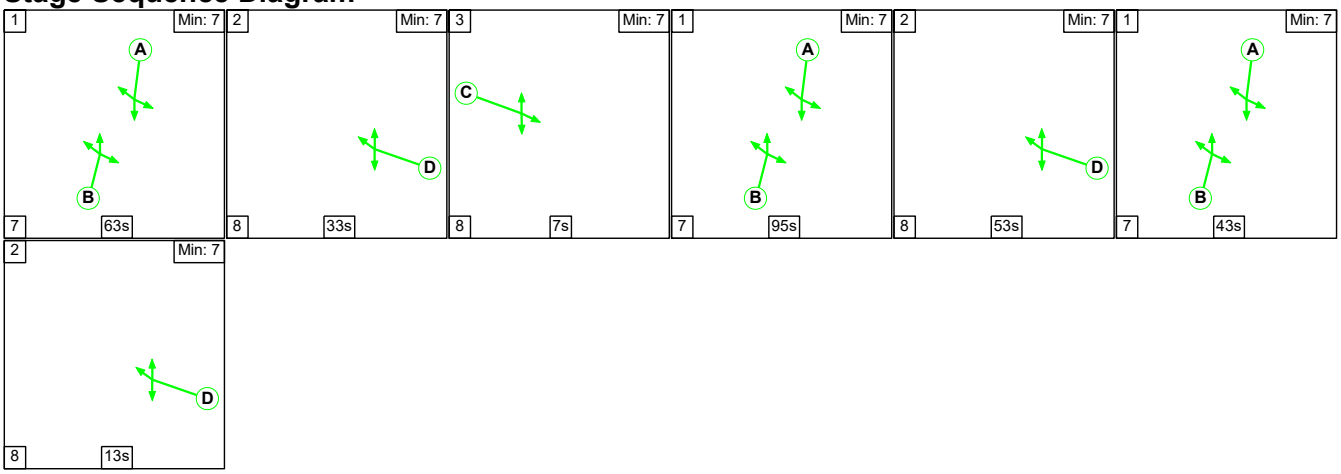
Item	Arriving (pcu)	Leaving (pcu)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Uniform Delay (pcuHr)	Rand + Oversat Delay (pcuHr)	Storage Area Uniform Delay (pcuHr)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Max. Back of Uniform Queue (pcu)	Rand + Oversat Queue (pcu)	Mean Max Queue (pcu)
Network: Middleton Stoney Junction	**-**	**-**	**61**	**12**	**21**	**16.1**	**8.9**	**0.8**	**25.8**	**-**	**-**	**-**	**-**
Unnamed Junction	**-**	**-**	**61**	**12**	**21**	**16.1**	**8.9**	**0.8**	**25.8**	**-**	**-**	**-**	**-**
1/1	520	520	-	-	-	5.6	3.6	-	9.2	63.5	16.8	3.6	20.3
2/1+2/2	734	734	54	12	21	3.7	1.0	0.8	5.5	26.8	17.7	1.0	18.7
3/1	18	18	-	-	-	0.9	0.4	-	1.3	254.6	1.8	0.4	2.2
4/1	862	862	7	0	0	6.0	3.9	0.0	9.9	41.4	26.3	3.9	30.3
5/1	617	617	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
6/1	378	378	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
7/1	28	28	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
8/1	1111	1111	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0

C1 PRC for Signalled Lanes (%): 0.7 Total Delay for Signalled Lanes (pcuHr): 25.82 Cycle Time (s): 360
PRC Over All Lanes (%): 0.7 Total Delay Over All Lanes(pcuHr): 25.82

Full Input Data And Results

Scenario 25: 'SATURN Run Modelling DS1 Mid Stoney Amend - Low TR AM' (FG25: 'SATURN Run DS1 Mid Stoney Amend - Low TR AM', Plan 2: 'Bus Gate Heyford Road')

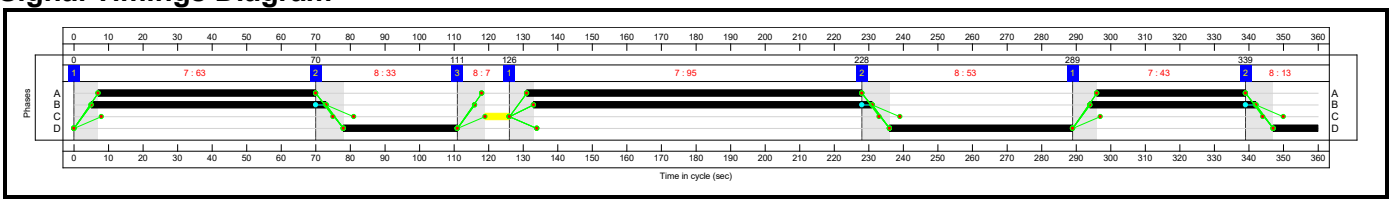
Stage Sequence Diagram



Stage Timings

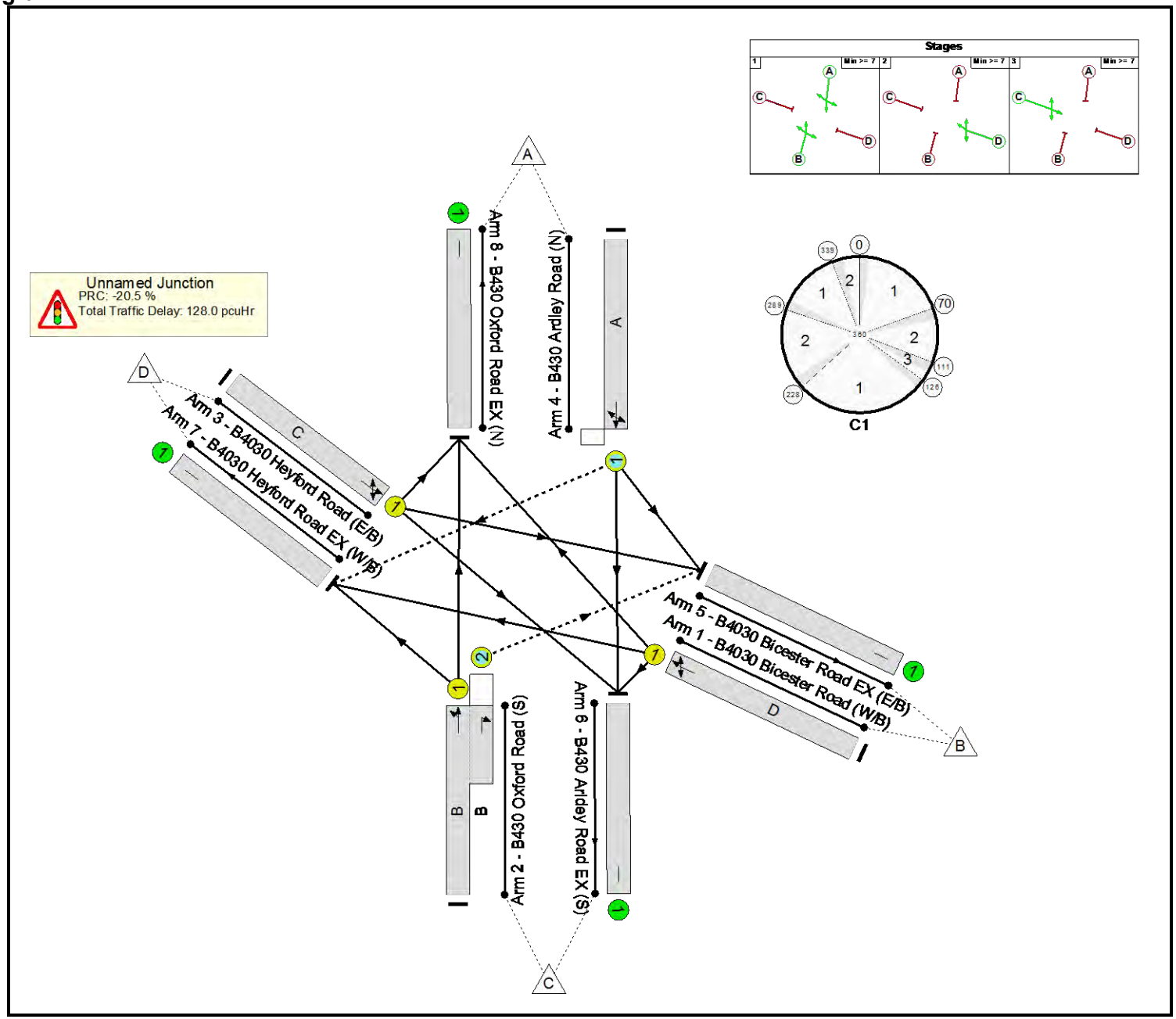
Stage	1	2	3	1	2	1	2
Duration	63	33	7	95	53	43	13
Change Point	0	70	111	126	228	289	339

Signal Timings Diagram



Full Input Data And Results

Network Layout Diagram



Full Input Data And Results

Network Results

Item	Lane Description	Lane Type	Controller Stream	Position In Filtered Route	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)
Network: Middleton Stoney Junction	-	-	**N/A**	-	-		-	-	-	-	-	-	**108.4%**
Unnamed Junction	-	-	**N/A**	-	-		-	-	-	-	-	-	**108.4%**
1/1	B4030 Bicester Road (W/B) Left Ahead Right	U	N/A	N/A	D		3	99	-	554	1808	512	108.1%
2/1+2/2	B430 Oxford Road (S) Right Left Ahead	U+O	N/A	N/A	B		3	214	-	429	1915:1787	572	75.0%
3/1	B4030 Heyford Road (E/B) Ahead Right Left	U	N/A	N/A	C		1	7	-	32	1755	39	82.1%
4/1	B430 Ardley Road (N) Left Ahead Right	O	N/A	N/A	A		3	203	-	1157	1865	1067	108.4%
5/1	B4030 Bicester Road EX (E/B)	U	N/A	N/A	-		-	-	-	461	Inf	Inf	0.0%
6/1	B430 Arldey Road EX (S)	U	N/A	N/A	-		-	-	-	838	Inf	Inf	0.0%
7/1	B4030 Heyford Road EX (W/B)	U	N/A	N/A	-		-	-	-	13	Inf	Inf	0.0%
8/1	B430 Oxford Road EX (N)	U	N/A	N/A	-		-	-	-	860	Inf	Inf	0.0%

Full Input Data And Results

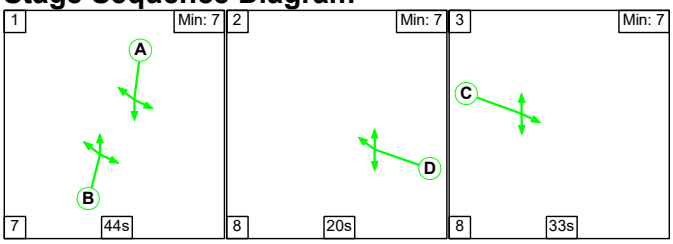
Item	Arriving (pcu)	Leaving (pcu)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Uniform Delay (pcuHr)	Rand + Oversat Delay (pcuHr)	Storage Area Uniform Delay (pcuHr)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Max. Back of Uniform Queue (pcu)	Rand + Oversat Queue (pcu)	Mean Max Queue (pcu)
Network: Middleton Stoney Junction	**-**	**-**	**3**	**15**	**30**	**47.5**	**79.8**	**0.6**	**128.0**	**-**	**-**	**-**	**-**
Unnamed Junction	**-**	**-**	**3**	**15**	**30**	**47.5**	**79.8**	**0.6**	**128.0**	**-**	**-**	**-**	**-**
1/1	554	512	-	-	-	15.9	26.2	-	42.0	273.2	35.7	26.2	61.9
2/1+2/2	429	429	0	15	30	1.6	1.5	0.6	3.7	31.0	8.7	1.5	10.2
3/1	32	32	-	-	-	1.6	1.6	-	3.1	352.6	3.2	1.6	4.8
4/1	1157	1067	3	0	0	28.5	50.6	0.0	79.1	246.2	68.7	50.6	119.4
5/1	430	430	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
6/1	774	774	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
7/1	12	12	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
8/1	825	825	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0

C1 PRC for Signalled Lanes (%): -20.5 Total Delay for Signalled Lanes (pcuHr): 127.99 Cycle Time (s): 360
PRC Over All Lanes (%): -20.5 Total Delay Over All Lanes(pcuHr): 127.99

Full Input Data And Results

Scenario 26: 'SATURN Modelling DM AM' (FG26: 'SATURN Modelling DM AM', Plan 1: 'Network Control Plan 1')

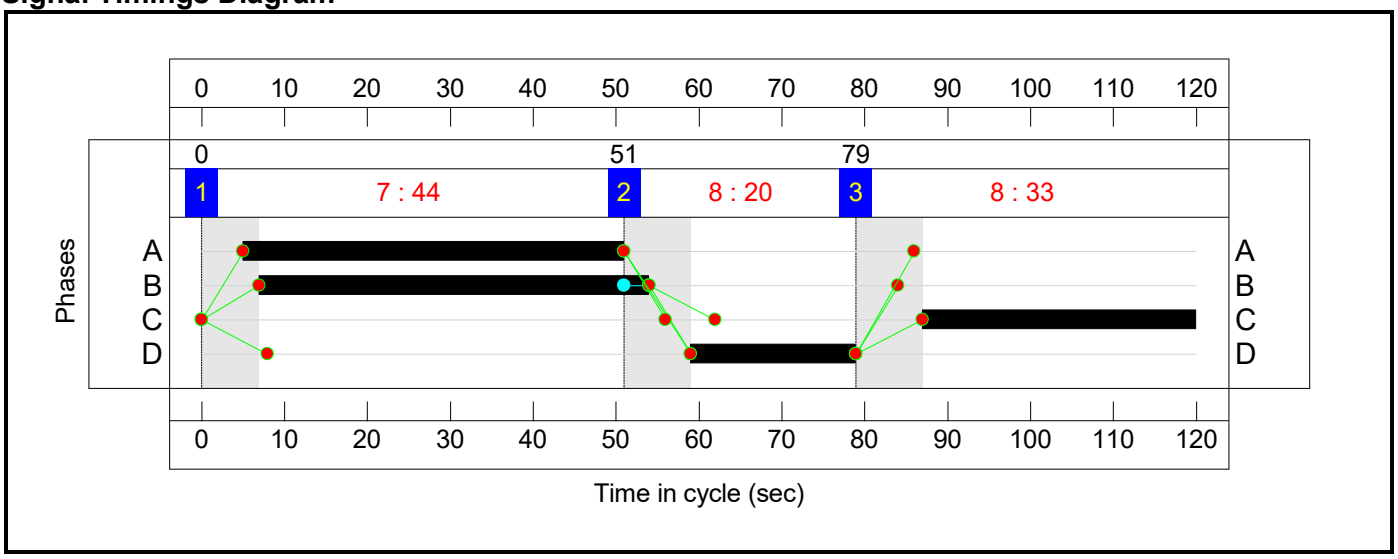
Stage Sequence Diagram



Stage Timings

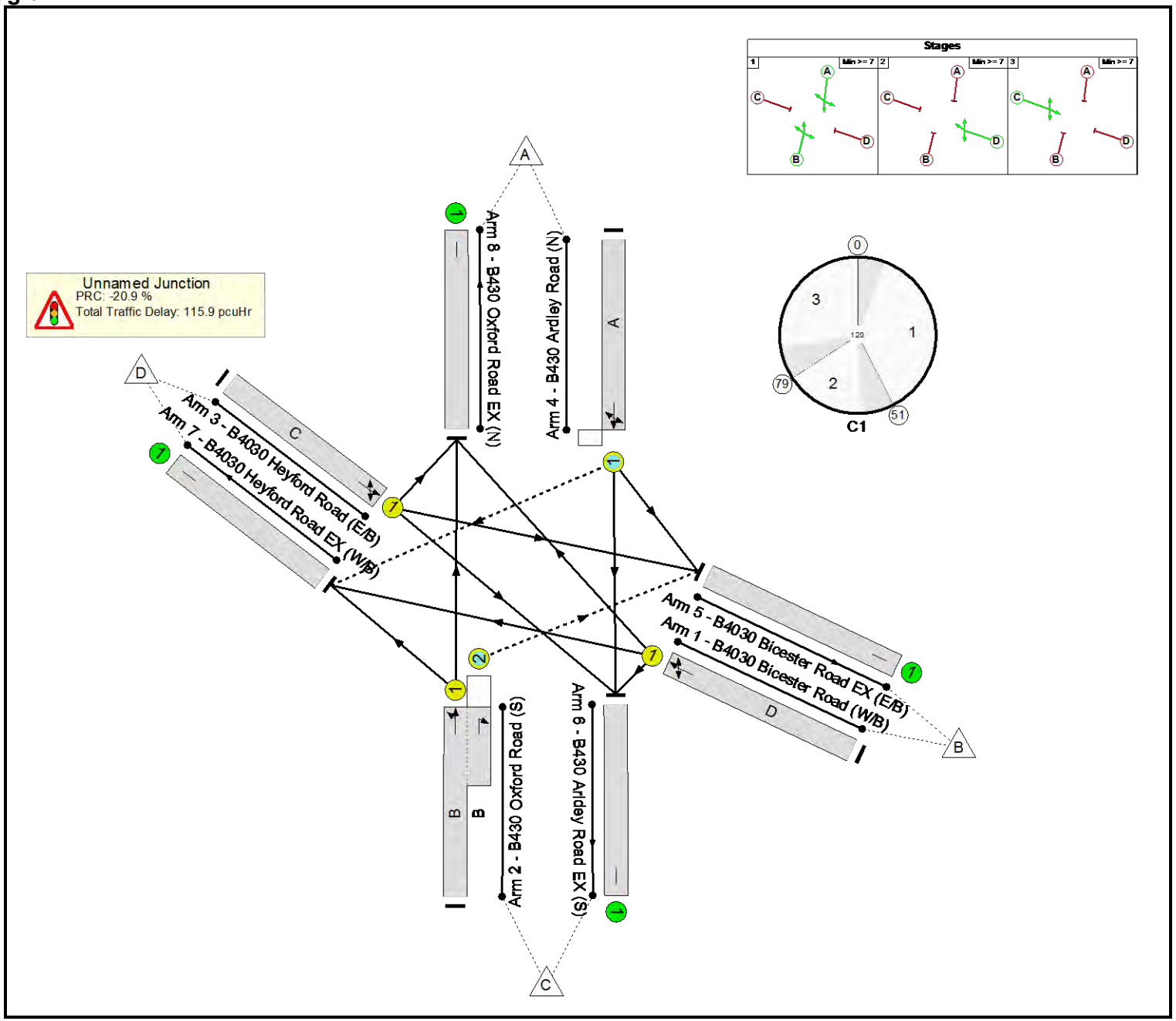
Stage	1	2	3
Duration	44	20	33
Change Point	0	51	79

Signal Timings Diagram



Full Input Data And Results

Network Layout Diagram



Full Input Data And Results

Network Results

Item	Lane Description	Lane Type	Controller Stream	Position In Filtered Route	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)
Network: Middleton Stoney Junction	-	-	**N/A**	-	-		-	-	-	-	-	-	**108.8%**
Unnamed Junction	-	-	**N/A**	-	-		-	-	-	-	-	-	**108.8%**
1/1	B4030 Bicester Road (W/B) Left Ahead Right	U	N/A	N/A	D		1	20	-	343	1812	317	108.2%
2/1+2/2	B430 Oxford Road (S) Right Left Ahead	U+O	N/A	N/A	B		1	47	-	620	1864:1787	744	83.3%
3/1	B4030 Heyford Road (E/B) Ahead Right Left	U	N/A	N/A	C		1	33	-	553	1817	515	107.4%
4/1	B430 Ardley Road (N) Left Ahead Right	O	N/A	N/A	A		1	46	-	809	1900	744	108.8%
5/1	B4030 Bicester Road EX (E/B)	U	N/A	N/A	-		-	-	-	649	Inf	Inf	0.0%
6/1	B430 Arldey Road EX (S)	U	N/A	N/A	-		-	-	-	731	Inf	Inf	0.0%
7/1	B4030 Heyford Road EX (W/B)	U	N/A	N/A	-		-	-	-	633	Inf	Inf	0.0%
8/1	B430 Oxford Road EX (N)	U	N/A	N/A	-		-	-	-	312	Inf	Inf	0.0%

Full Input Data And Results

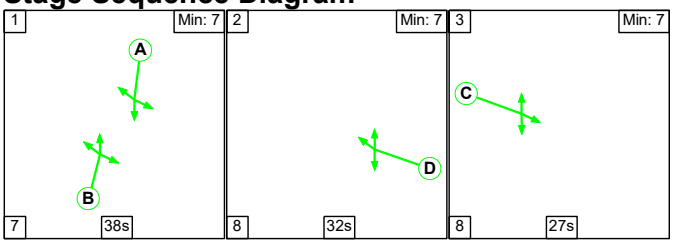
Item	Arriving (pcu)	Leaving (pcu)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Uniform Delay (pcuHr)	Rand + Oversat Delay (pcuHr)	Storage Area Uniform Delay (pcuHr)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Max. Back of Uniform Queue (pcu)	Rand + Oversat Queue (pcu)	Mean Max Queue (pcu)
Network: Middleton Stoney Junction	**-**	**-**	**22**	**15**	**5**	**32.8**	**82.9**	**0.2**	**115.9**	**-**	**-**	**-**	**-**
Unnamed Junction	**-**	**-**	**22**	**15**	**5**	**32.8**	**82.9**	**0.2**	**115.9**	**-**	**-**	**-**	**-**
1/1	343	317	-	-	-	5.9	17.8	-	23.7	248.8	12.3	17.8	30.1
2/1+2/2	620	620	0	15	5	5.6	2.4	0.1	8.1	47.1	18.3	2.4	20.7
3/1	553	515	-	-	-	9.3	24.7	-	34.0	221.3	20.5	24.7	45.2
4/1	809	744	22	0	0	12.0	38.0	0.1	50.1	223.0	29.1	38.0	67.2
5/1	604	604	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
6/1	673	673	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
7/1	610	610	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
8/1	309	309	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0

C1 PRC for Signalled Lanes (%): -20.9 Total Delay for Signalled Lanes (pcuHr): 115.93 Cycle Time (s): 120
PRC Over All Lanes (%): -20.9 Total Delay Over All Lanes(pcuHr): 115.93

Full Input Data And Results

Scenario 27: 'SATURN Modelling DM PM' (FG27: 'SATURN Modelling DM PM', Plan 1: 'Network Control Plan 1')

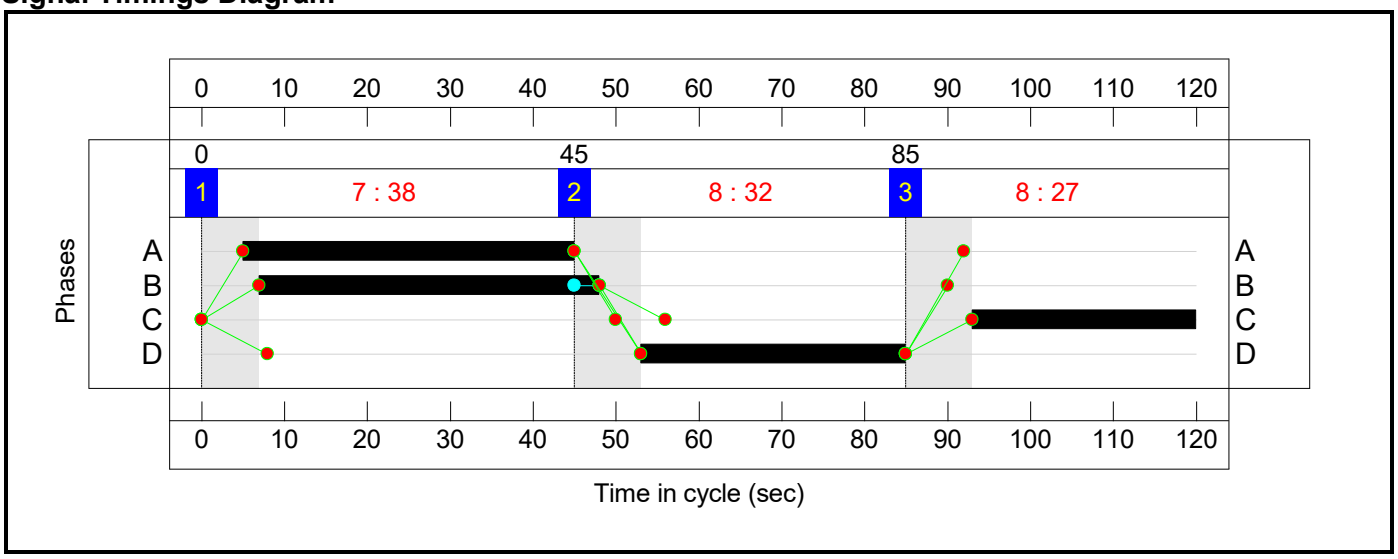
Stage Sequence Diagram



Stage Timings

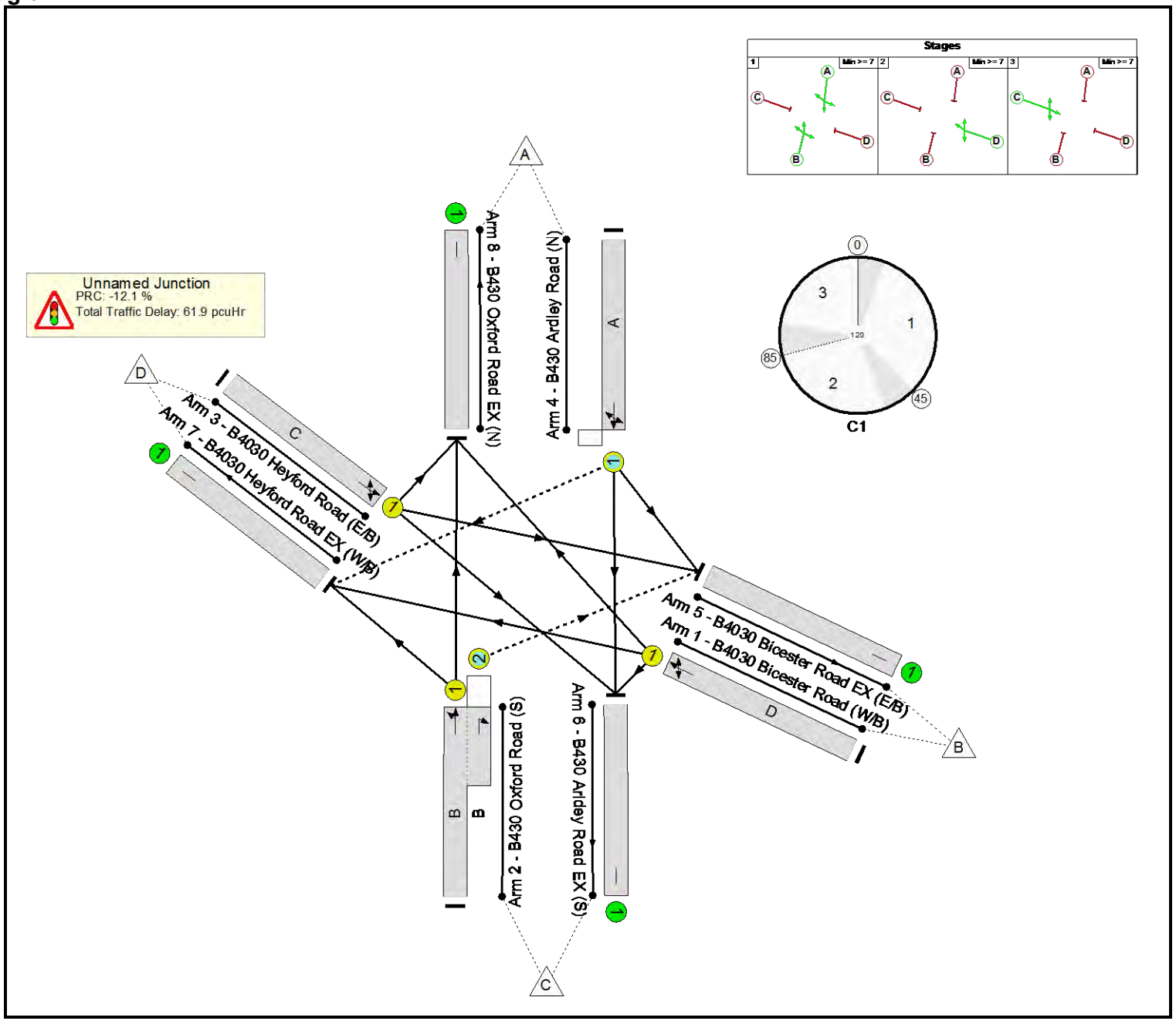
Stage	1	2	3
Duration	38	32	27
Change Point	0	45	85

Signal Timings Diagram



Full Input Data And Results

Network Layout Diagram



Full Input Data And Results

Network Results

Item	Lane Description	Lane Type	Controller Stream	Position In Filtered Route	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)
Network: Middleton Stoney Junction	-	-	**N/A**	-	-		-	-	-	-	-	-	**100.9%**
Unnamed Junction	-	-	**N/A**	-	-		-	-	-	-	-	-	**100.9%**
1/1	B4030 Bicester Road (W/B) Left Ahead Right	U	N/A	N/A	D		1	32	-	505	1820	501	100.9%
2/1+2/2	B430 Oxford Road (S) Right Left Ahead	U+O	N/A	N/A	B		1	41	-	682	1903:1787	681	100.1%
3/1	B4030 Heyford Road (E/B) Ahead Right Left	U	N/A	N/A	C		1	27	-	421	1820	425	99.1%
4/1	B430 Ardley Road (N) Left Ahead Right	O	N/A	N/A	A		1	40	-	522	1846	631	82.8%
5/1	B4030 Bicester Road EX (E/B)	U	N/A	N/A	-		-	-	-	631	Inf	Inf	0.0%
6/1	B430 Arldey Road EX (S)	U	N/A	N/A	-		-	-	-	351	Inf	Inf	0.0%
7/1	B4030 Heyford Road EX (W/B)	U	N/A	N/A	-		-	-	-	572	Inf	Inf	0.0%
8/1	B430 Oxford Road EX (N)	U	N/A	N/A	-		-	-	-	576	Inf	Inf	0.0%

Full Input Data And Results

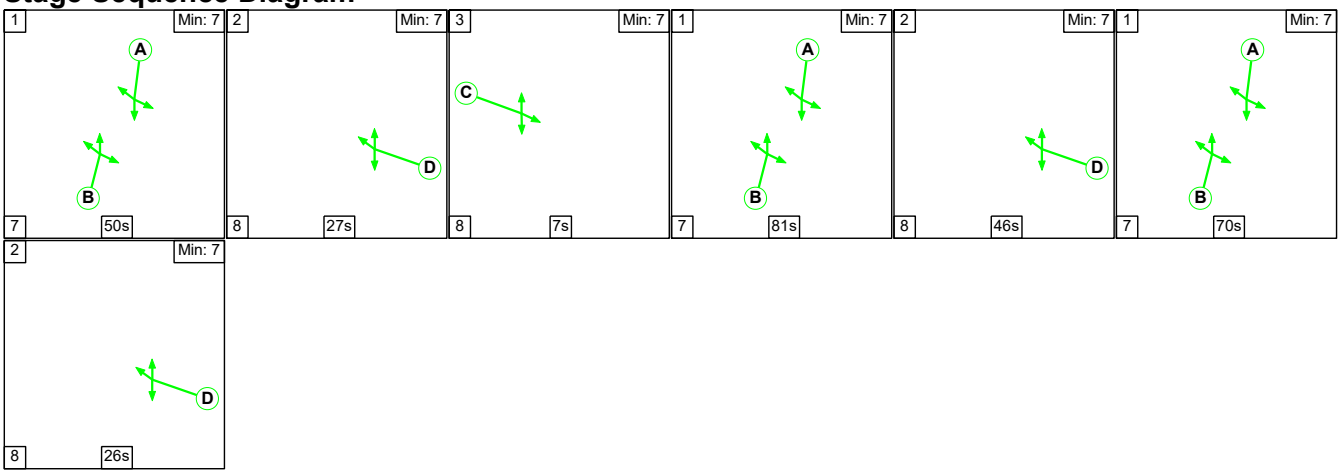
Item	Arriving (pcu)	Leaving (pcu)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Uniform Delay (pcuHr)	Rand + Oversat Delay (pcuHr)	Storage Area Uniform Delay (pcuHr)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Max. Back of Uniform Queue (pcu)	Rand + Oversat Queue (pcu)	Mean Max Queue (pcu)
Network: Middleton Stoney Junction	**-**	**-**	**40**	**1**	**16**	**24.3**	**37.3**	**0.3**	**61.9**	**-**	**-**	**-**	**-**
Unnamed Junction	**-**	**-**	**40**	**1**	**16**	**24.3**	**37.3**	**0.3**	**61.9**	**-**	**-**	**-**	**-**
1/1	505	501	-	-	-	6.3	12.4	-	18.7	133.5	17.0	12.4	29.4
2/1+2/2	682	681	40	1	2	7.4	13.2	0.2	20.8	109.6	22.4	13.2	35.7
3/1	421	421	-	-	-	5.4	9.4	-	14.7	126.1	13.9	9.4	23.3
4/1	522	522	0	0	14	5.3	2.3	0.1	7.7	52.9	15.9	2.3	18.3
5/1	631	631	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
6/1	351	351	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
7/1	568	568	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
8/1	575	575	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0

C1 PRC for Signalled Lanes (%): -12.1 Total Delay for Signalled Lanes (pcuHr): 61.91 Cycle Time (s): 120
PRC Over All Lanes (%): -12.1 Total Delay Over All Lanes(pcuHr): 61.91

Full Input Data And Results

Scenario 28: 'SATURN Run Modelling DS1 Mid Stoney Amend - Low TR - Extra Bus AM' (FG28: 'SATURN Run DS1 Mid Stoney Amend - Low TR - Extra BusAM', Plan 2: 'Bus Gate Heyford Road')

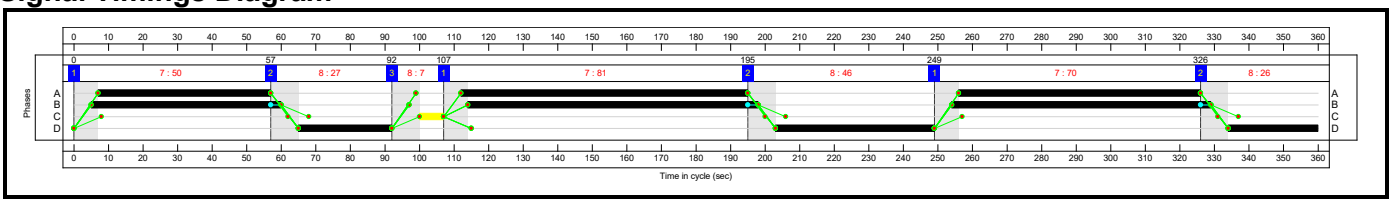
Stage Sequence Diagram



Stage Timings

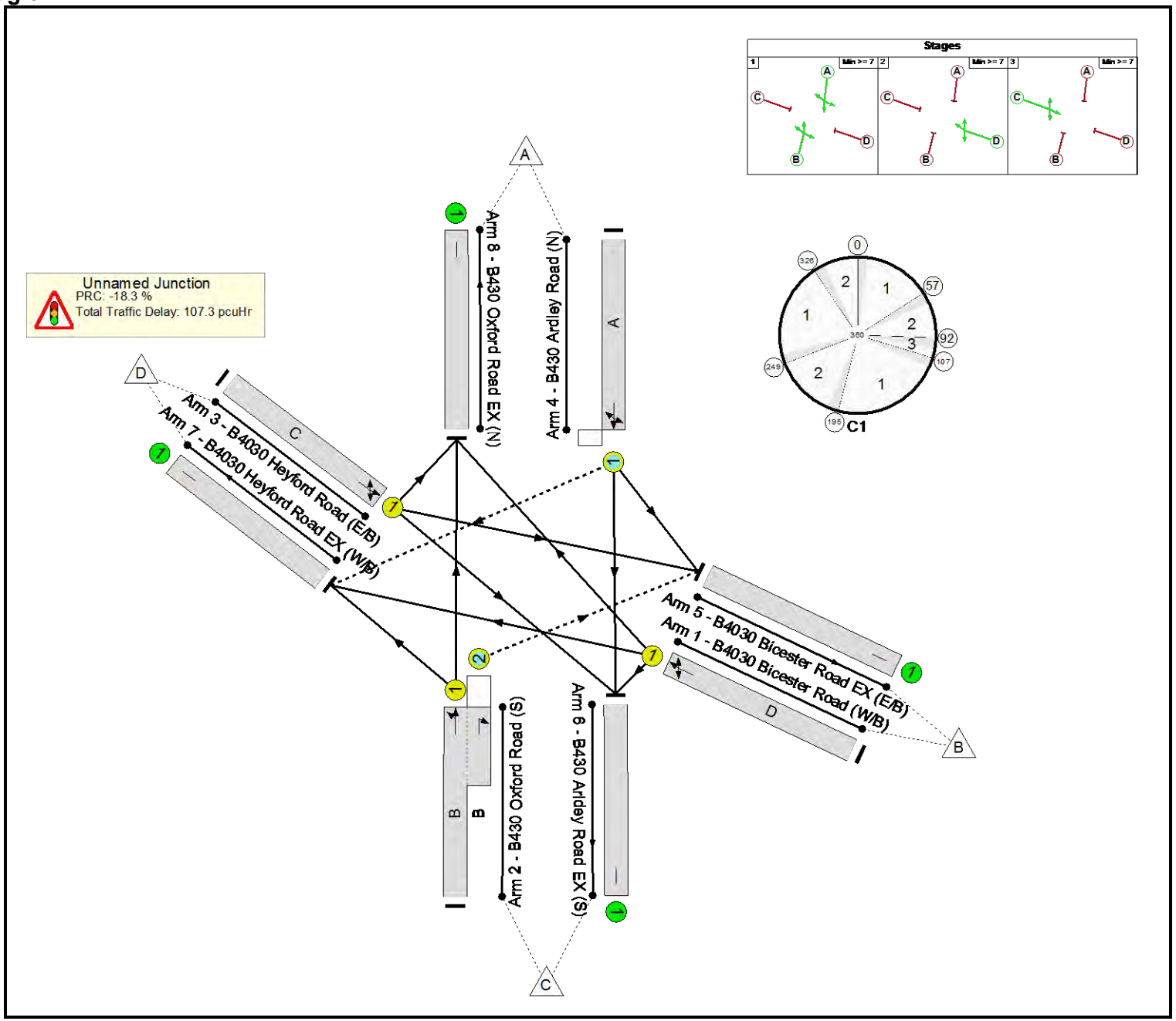
Stage	1	2	3	1	2	1	2
Duration	50	27	7	81	46	70	26
Change Point	0	57	92	107	195	249	326

Signal Timings Diagram



Full Input Data And Results

Network Layout Diagram



Full Input Data And Results

Network Results

Item	Lane Description	Lane Type	Controller Stream	Position In Filtered Route	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)
Network: Middleton Stoney Junction	-	-	**N/A**	-	-		-	-	-	-	-	-	**106.5%**
Unnamed Junction	-	-	**N/A**	-	-		-	-	-	-	-	-	**106.5%**
1/1	B4030 Bicester Road (W/B) Left Ahead Right	U	N/A	N/A	D		3	99	-	545	1808	512	106.4%
2/1+2/2	B430 Oxford Road (S) Right Left Ahead	U+O	N/A	N/A	B		3	214	-	429	1915:1787	572	75.0%
3/1	B4030 Heyford Road (E/B) Ahead Right Left	U	N/A	N/A	C		1	7	-	34	1759	39	87.0%
4/1	B430 Ardley Road (N) Left Ahead Right	O	N/A	N/A	A		3	203	-	1138	1868	1069	106.5%
5/1	B4030 Bicester Road EX (E/B)	U	N/A	N/A	-		-	-	-	444	Inf	Inf	0.0%
6/1	B430 Arldey Road EX (S)	U	N/A	N/A	-		-	-	-	838	Inf	Inf	0.0%
7/1	B4030 Heyford Road EX (W/B)	U	N/A	N/A	-		-	-	-	15	Inf	Inf	0.0%
8/1	B430 Oxford Road EX (N)	U	N/A	N/A	-		-	-	-	849	Inf	Inf	0.0%

Full Input Data And Results

Item	Arriving (pcu)	Leaving (pcu)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Uniform Delay (pcuHr)	Rand + Oversat Delay (pcuHr)	Storage Area Uniform Delay (pcuHr)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Max. Back of Uniform Queue (pcu)	Rand + Oversat Queue (pcu)	Mean Max Queue (pcu)
Network: Middleton Stoney Junction	**-**	**-**	**3**	**15**	**30**	**39.5**	**67.2**	**0.6**	**107.3**	**-**	**-**	**-**	**-**
Unnamed Junction	**-**	**-**	**3**	**15**	**30**	**39.5**	**67.2**	**0.6**	**107.3**	**-**	**-**	**-**	**-**
1/1	545	512	-	-	-	13.6	22.4	-	36.0	237.8	30.3	22.4	52.8
2/1+2/2	429	429	0	15	30	1.4	1.5	0.6	3.5	29.6	7.5	1.5	9.0
3/1	34	34	-	-	-	1.7	1.9	-	3.6	377.6	3.4	1.9	5.3
4/1	1138	1069	3	0	0	22.8	41.4	0.0	64.2	203.1	57.4	41.4	98.9
5/1	421	421	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
6/1	788	788	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
7/1	14	14	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
8/1	821	821	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0

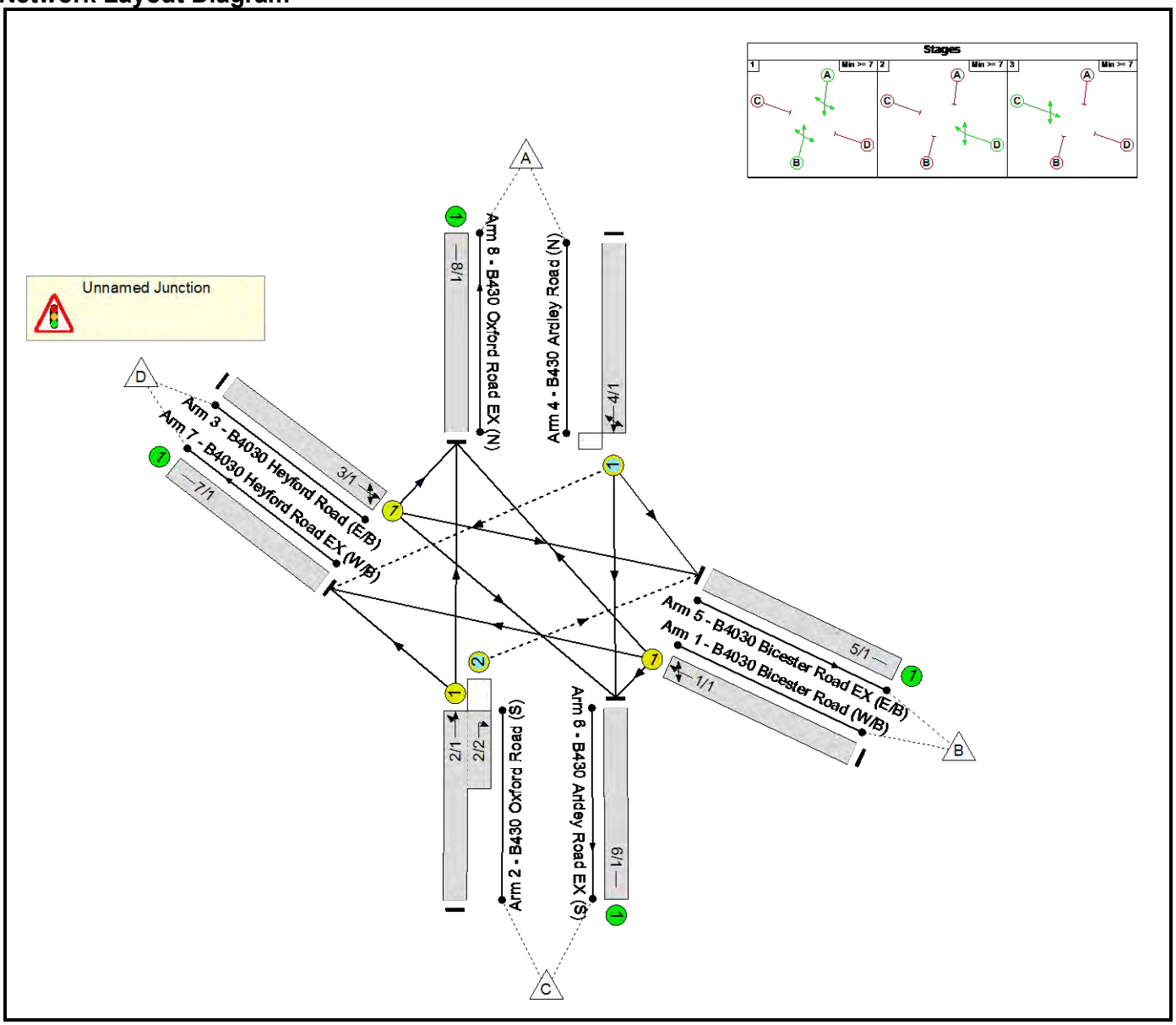
C1 PRC for Signalled Lanes (%): -18.3 Total Delay for Signalled Lanes (pcuHr): 107.31 Cycle Time (s): 360
PRC Over All Lanes (%): -18.3 Total Delay Over All Lanes(pcuHr): 107.31

Full Input Data And Results

User and Project Details

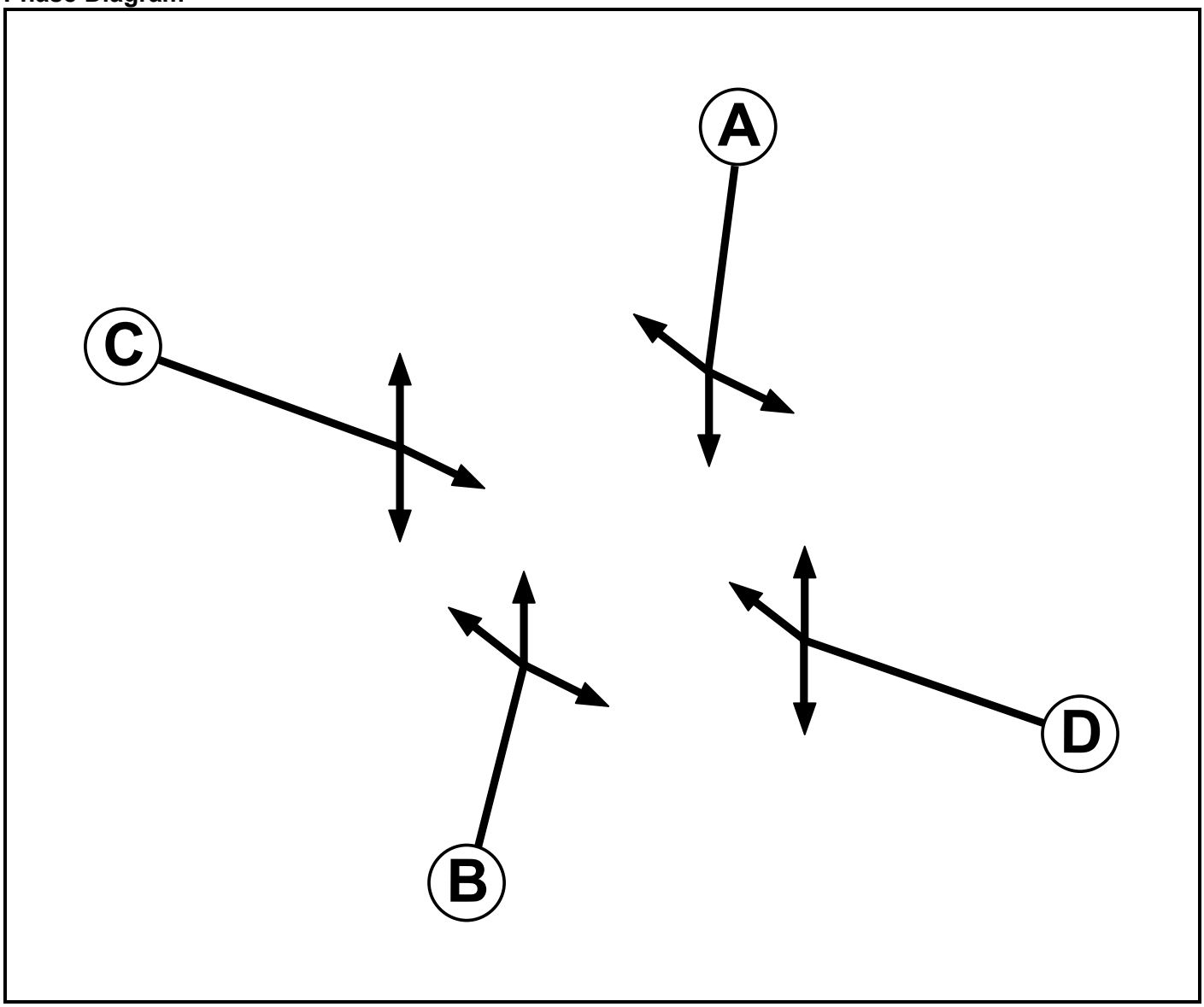
Project:	**Heyford Park**
Title:	**Middleton Stoney Junction**
Location:	
File name:	190517 Middleton Stoney Signalised Junction_Consented V5.lsg3x – HGV Restriction
Author:	ekeen
Company:	Peter Brett Associates
Address:	10 Queen Square
Notes:	Existing Layout

Network Layout Diagram



Full Input Data And Results

Phase Diagram



Phase Input Data

Phase Name	Phase Type	Assoc. Phase	Street Min	Cont Min
A	Traffic		7	7
B	Traffic		7	7
C	Traffic		7	7
D	Traffic		7	7

Full Input Data And Results

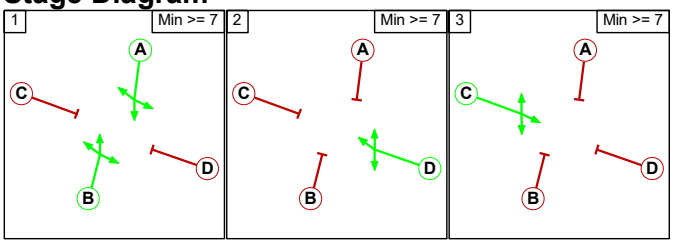
Phase Intergreens Matrix

Terminating Phase	Starting Phase				
		A	B	C	D
	A		-	5	8
	B	-		8	5
	C	5	7		8
	D	7	5	8	

Phases in Stage

Stage No.	Phases in Stage
1	A B
2	D
3	C

Stage Diagram



Phase Delays

Term. Stage	Start Stage	Phase	Type	Value	Cont value
1	2	B	Losing	3	3

Prohibited Stage Change

From Stage	To Stage			
		1	2	3
	1		8	8
	2	7		8
	3	7	8	

Full Input Data And Results

Give-Way Lane Input Data

Junction: Unnamed Junction											
Lane	**Movement**	**Max Flow when Giving Way (PCU/Hr)**	**Min Flow when Giving Way (PCU/Hr)**	**Opposing Lane**	**Opp. Lane Coeff.**	**Opp. Mvmnts.**	**Right Turn Storage (PCU)**	**Non-Blocking Storage (PCU)**	**RTF**	**Right Turn Move up (s)**	**Max Turns in Intergreen (PCU)**
2/2 (B430 Oxford Road (S))	5/1 (Right)	1439	0	4/1	1.09	To 5/1 (Left) To 6/1 (Ahead)	2.00	-	0.50	2	2.00
4/1 (B430 Ardley Road (N))	7/1 (Right)	1439	0	2/1	1.09	To 7/1 (Left) To 8/1 (Ahead)	1.00	1.00	0.50	1	1.00

Full Input Data And Results

Lane Input Data

Junction: Unnamed Junction												
Lane	**Lane Type**	**Phases**	**Start Disp.**	**End Disp.**	**Physical Length (PCU)**	**Sat Flow Type**	**Def User Saturation Flow (PCU/Hr)**	**Lane Width (m)**	**Gradient**	**Nearside Lane**	**Turns**	**Turning Radius (m)**
1/1 (B4030 Bicester Road (W/B))	U	D	2	3	60.0	Geom	-	3.00	0.00	Y	Arm 6 Left	13.00
											Arm 7 Ahead	30.00
											Arm 8 Right	30.00
2/1 (B430 Oxford Road (S))	U	B	2	3	60.0	Geom	-	3.00	0.00	Y	Arm 7 Left	30.00
											Arm 8 Ahead	Inf
2/2 (B430 Oxford Road (S))	O	B	2	3	5.0	Geom	-	3.00	0.00	N	Arm 5 Right	10.00
3/1 (B4030 Heyford Road (E/B))	U	C	2	3	60.0	Geom	-	3.00	0.00	Y	Arm 5 Ahead	30.00
											Arm 6 Right	30.00
											Arm 8 Left	7.00
4/1 (B430 Ardley Road (N))	O	A	2	3	60.0	Geom	-	3.32	0.00	Y	Arm 5 Left	12.00
											Arm 6 Ahead	Inf
											Arm 7 Right	8.00
5/1 (B4030 Bicester Road EX (E/B))	U		2	3	60.0	Inf	-	-	-	-	-	-
6/1 (B430 Arldey Road EX (S))	U		2	3	60.0	Inf	-	-	-	-	-	-
7/1 (B4030 Heyford Road EX (W/B))	U		2	3	60.0	Inf	-	-	-	-	-	-
8/1 (B430 Oxford Road EX (N))	U		2	3	60.0	Inf	-	-	-	-	-	-

Traffic Flow Groups

Flow Group	Start Time	End Time	Duration	Formula
1: 'SATURN Run DS1 Mid Stoney Amend - Low TR - Extra BusAM'	07:30	08:30	01:00	

Full Input Data And Results

Scenario 1: 'SATURN Run Modelling DS1 Mid Stoney Amend - Low TR - Extra Bus AM' (FG1: 'SATURN Run DS1 Mid Stoney Amend - Low TR - Extra BusAM', Plan 2: 'Bus Gate Heyford Road')

Traffic Flows, Desired

Desired Flow :

Origin	Destination					
		A	B	C	D	Tot.
	A	0	351	762	3	1116
	B	423	0	76	10	509
	C	388	45	0	2	435
	D	8	15	11	0	34
	Tot.	819	411	849	15	2094

Traffic Lane Flows

Lane	Scenario 1: SATURN Run Modelling DS1 Mid Stoney Amend - Low TR - Extra Bus AM
Junction: Unnamed Junction	
1/1	509
2/1 (with short)	435(In) 390(Out)
2/2 (short)	45
3/1	34
4/1	1116
5/1	411
6/1	849
7/1	15
8/1	819

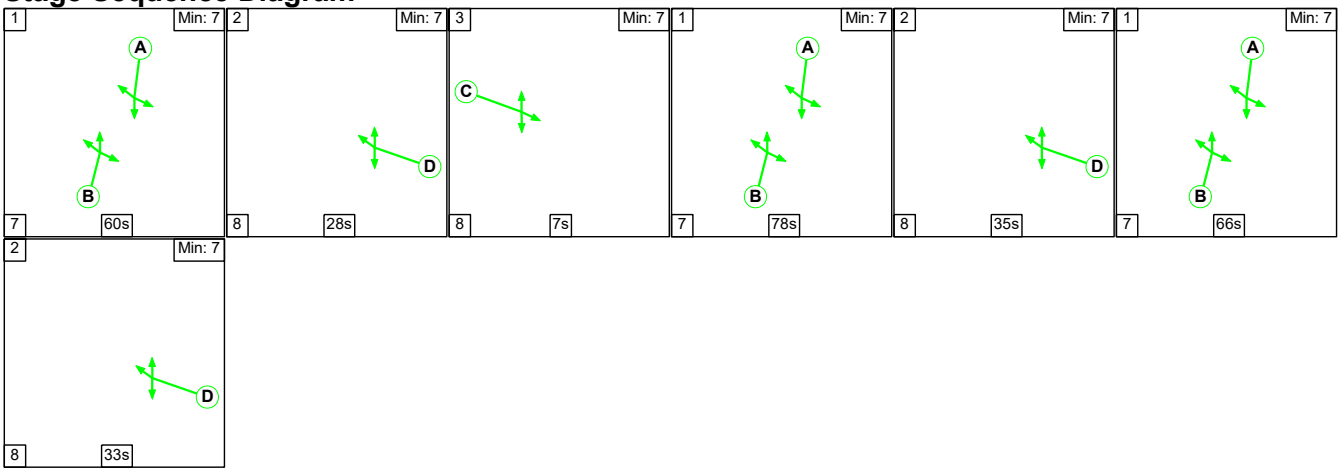
Full Input Data And Results

Lane Saturation Flows

Junction: Unnamed Junction								
Lane	**Lane Width (m)**	**Gradient**	**Nearside Lane**	**Allowed Turns**	**Turning Radius (m)**	**Turning Prop.**	**Sat Flow (PCU/Hr)**	**Flared Sat Flow (PCU/Hr)**
1/1 (B4030 Bicester Road (W/B))	3.00	0.00	Y	Arm 6 Left	13.00	14.9 %	1807	1807
				Arm 7 Ahead	30.00	2.0 %		
				Arm 8 Right	30.00	83.1 %		
2/1 (B430 Oxford Road (S))	3.00	0.00	Y	Arm 7 Left	30.00	0.5 %	1915	1915
				Arm 8 Ahead	Inf	99.5 %		
2/2 (B430 Oxford Road (S))	3.00	0.00	N	Arm 5 Right	10.00	100.0 %	1787	1787
3/1 (B4030 Heyford Road (E/B))	3.00	0.00	Y	Arm 5 Ahead	30.00	44.1 %	1759	1759
				Arm 6 Right	30.00	32.4 %		
				Arm 8 Left	7.00	23.5 %		
4/1 (B430 Ardley Road (N))	3.32	0.00	Y	Arm 5 Left	12.00	31.5 %	1872	1872
				Arm 6 Ahead	Inf	68.3 %		
				Arm 7 Right	8.00	0.3 %		
5/1 (B4030 Bicester Road EX (E/B) Lane 1)	Infinite Saturation Flow						Inf	Inf
6/1 (B430 Arldey Road EX (S) Lane 1)	Infinite Saturation Flow						Inf	Inf
7/1 (B4030 Heyford Road EX (W/B) Lane 1)	Infinite Saturation Flow						Inf	Inf
8/1 (B430 Oxford Road EX (N) Lane 1)	Infinite Saturation Flow						Inf	Inf

Scenario 1: 'SATURN Run Modelling DS1 Mid Stoney Amend - Low TR - Extra Bus AM' (FG1: 'SATURN Run DS1 Mid Stoney Amend - Low TR - Extra BusAM', Plan 2: 'Bus Gate Heyford Road')

Stage Sequence Diagram

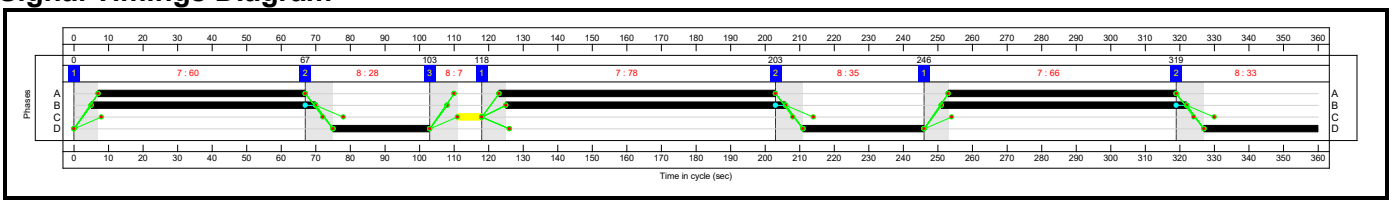


Full Input Data And Results

Stage Timings

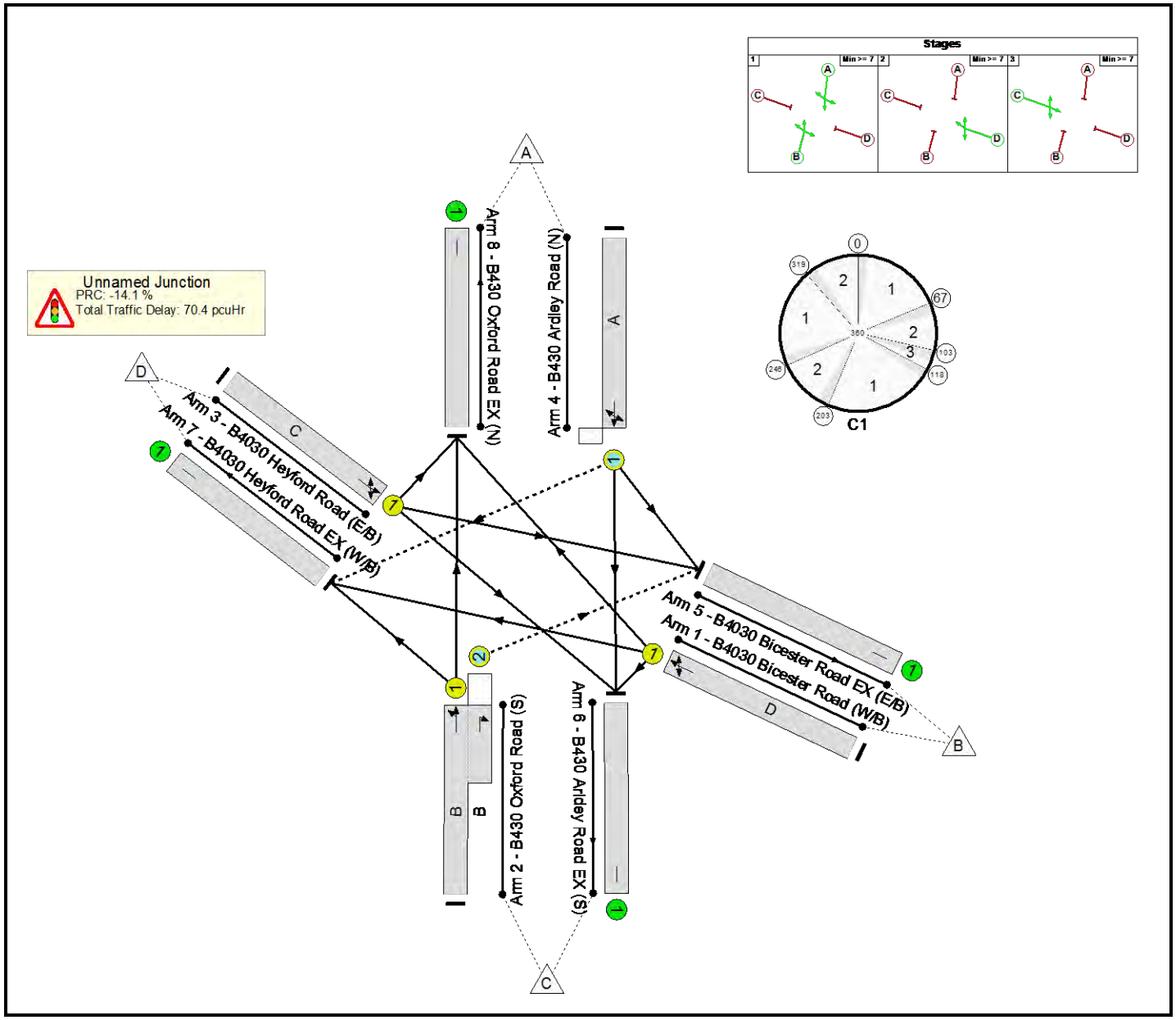
Stage	1	2	3	1	2	1	2
Duration	60	28	7	78	35	66	33
Change Point	0	67	103	118	203	246	319

Signal Timings Diagram



Full Input Data And Results

Network Layout Diagram



Full Input Data And Results

Network Results

Item	Lane Description	Lane Type	Controller Stream	Position In Filtered Route	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)
Network: Middleton Stoney Junction	-	-	**N/A**	-	-		-	-	-	-	-	-	**102.7%**
Unnamed Junction	-	-	**N/A**	-	-		-	-	-	-	-	-	**102.7%**
1/1	B4030 Bicester Road (W/B) Left Ahead Right	U	N/A	N/A	D		3	96	-	509	1807	497	102.4%
2/1+2/2	B430 Oxford Road (S) Right Left Ahead	U+O	N/A	N/A	B		3	217	-	435	1915:1787	580	75.0%
3/1	B4030 Heyford Road (E/B) Ahead Right Left	U	N/A	N/A	C		1	7	-	34	1759	39	87.0%
4/1	B430 Ardley Road (N) Left Ahead Right	O	N/A	N/A	A		3	206	-	1116	1872	1087	102.7%
5/1	B4030 Bicester Road EX (E/B)	U	N/A	N/A	-		-	-	-	411	Inf	Inf	0.0%
6/1	B430 Arldey Road EX (S)	U	N/A	N/A	-		-	-	-	849	Inf	Inf	0.0%
7/1	B4030 Heyford Road EX (W/B)	U	N/A	N/A	-		-	-	-	15	Inf	Inf	0.0%
8/1	B430 Oxford Road EX (N)	U	N/A	N/A	-		-	-	-	819	Inf	Inf	0.0%

Full Input Data And Results

Item	Arriving (pcu)	Leaving (pcu)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Uniform Delay (pcuHr)	Rand + Oversat Delay (pcuHr)	Storage Area Uniform Delay (pcuHr)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Max. Back of Uniform Queue (pcu)	Rand + Oversat Queue (pcu)	Mean Max Queue (pcu)
Network: Middleton Stoney Junction	**-**	**-**	**3**	**15**	**30**	**26.2**	**43.6**	**0.6**	**70.4**	**-**	**-**	**-**	**-**
Unnamed Junction	**-**	**-**	**3**	**15**	**30**	**26.2**	**43.6**	**0.6**	**70.4**	**-**	**-**	**-**	**-**
1/1	509	497	-	-	-	9.4	14.7	-	24.1	170.8	22.6	14.7	37.3
2/1+2/2	435	435	0	15	30	1.4	1.5	0.6	3.5	28.6	7.5	1.5	9.0
3/1	34	34	-	-	-	1.7	1.9	-	3.6	377.6	3.4	1.9	5.3
4/1	1116	1087	3	0	0	13.7	25.5	0.0	39.3	126.7	48.0	25.5	73.5
5/1	402	402	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
6/1	827	827	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
7/1	15	15	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
8/1	809	809	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0

C1 PRC for Signalled Lanes (%): -14.1 Total Delay for Signalled Lanes (pcuHr): 70.45 Cycle Time (s): 360
PRC Over All Lanes (%): -14.1 Total Delay Over All Lanes(pcuHr): 70.45

TECHNICAL NOTE

APPENDIX B

significant, correct sign and plausible variations in the values of time have been estimated. Compared to other findings with relatively simple tabulations, the model provided a significant advance. It should be noted that this model is estimated using the dataset in the above mentioned meta-analysis.

Based on the estimated model, the author provides illustrative figures for a range of circumstances for the money value of in vehicle time and weighting of walk time, wait time and headway. The walk time weighting is reported in Table 7.3, while other values are reported in the following sections of the chapter. It should be noted that Table 7.1 reports the average value in the database, while Table 7.3 reports the value implied by the model, which is estimated using the same database.

Table 7.3 Walk time weightings implied by the quantitative model (in units of in-vehicle time)

Time (mins)	*Distance (miles)*	*Car*	*Bus*	*Rail*	*Under-ground*
2	2	2.18	1.68	1.28	1.5
5		2.79	2.15	1.65	1.93
10		3.37	2.59	1.99	2.33
20		4.07	3.13	2.4	2.82
2	10	1.72	1.49	1.14	1.33
5		2.2	1.91	1.46	1.71
10		2.66	2.3	1.77	2.08
20		3.21	2.78	2.13	2.5
2	25	1.5	1.39	1.07	1.25
5		1.92	1.79	1.37	1.6
10		2.32	2.16	1.65	1.94
20		2.8	2.6	1.99	2.34
2	50	1.35	1.32	1.02	1.18
5		1.74	1.7	1.3	1.52
10		2.09	2.05	1.57	1.84
20		2.53	2.47	1.9	2.23
2	100	1.22	1.26	0.97	1.13
5		1.57	1.61	1.24	1.45
10		1.89	1.95	1.49	1.75
20		2.28	2.35	1.8	2.12
2	200	1.1	1.2	0.92	1.07
5		1.41	1.53	1.18	1.38
10		1.71	1.85	1.42	1.66
20		2.06	2.23	1.71	2.01

Source: Wardman (2001)

In the table, the first two columns refers to the assumed walk time and distance travelled. The next four columns report the walk time weighting by each user type in different mode (e.g. how bus users value walk time for bus mode). The most noticeable feature of the IVT values of walk is that they vary considerably. In part this is because of differences in the money value of IVT by user type and mode, but there are other strong influences at work. The increase in the IVT values of walk time as the levels of walk time increase is quite clear, as is the fall in the values as distance increases.

Wardman *et al.* (2001b) provide a valuation of walk time in relation to interchange facilities, based on stated preference analysis. The attribute weights held by users of different modes are shown in Table 7.4.

Table 7.4 Walk values in association with interchange attributes, Edinburgh

Attribute	*Users*	*Value (IVT mins / trip)*	*95% confidence interval*
Walk time at interchange	Bus	1.6	27%
Walk time to bus	Car	1.3	40%
Between stations walk time	Rail	3.7	32%

Source: Wardman et al. (2001b)

7.4 Effect of service intervals

The effect of service intervals can be measured in a number of ways: total vehicle kilometres or hours, frequency, headway/service interval, wait time and schedule delay. Evidence is a mixture of elasticity and attribute value measures.

7.4.1 Elasticity based evidence

The dominant indicator is vehicle kilometres. Table 7.5 indicates that bus demand is relatively insensitive to service change with a short-run elasticity of approximately 0.4 and a long run elasticity of 0.7.

Table 7.5 Service elasticities, with range and standard deviation according to average values – Bus

Run	*Elasticity*	*Range*	*Standard deviation*	*No of measure-ments*
Short run	0.38	0.10 to 0.74	0.135	27
Long run	0.66	0.22 to 1.04	0.275	23

Sources: Appendix to Chapter 7

Table 7.6 shows that urban rail may be more sensitive than bus to service change but the evidence is limited to a small number of short-run estimates.

Table 7.6 Service elasticity, with range and standard deviation according to average values - Rail

Run	*Elasticity*	*Range*	*Standard deviation*	*No of measure-ments*
Run not stated*	-0.49	-0.33 to -0.65	0.23	2
Short run	0.75	0.65 to 0.90	0.13	3

** Based on headway.*

Sources: Appendix to Chapter 7.

The importance of service quality to meeting the needs of public transport customers and decreasing reliance on the car is indicated by the findings of Arsenio's (2000) examination of railway demand in Spanish cities (Table 7.7)

TECHNICAL NOTE

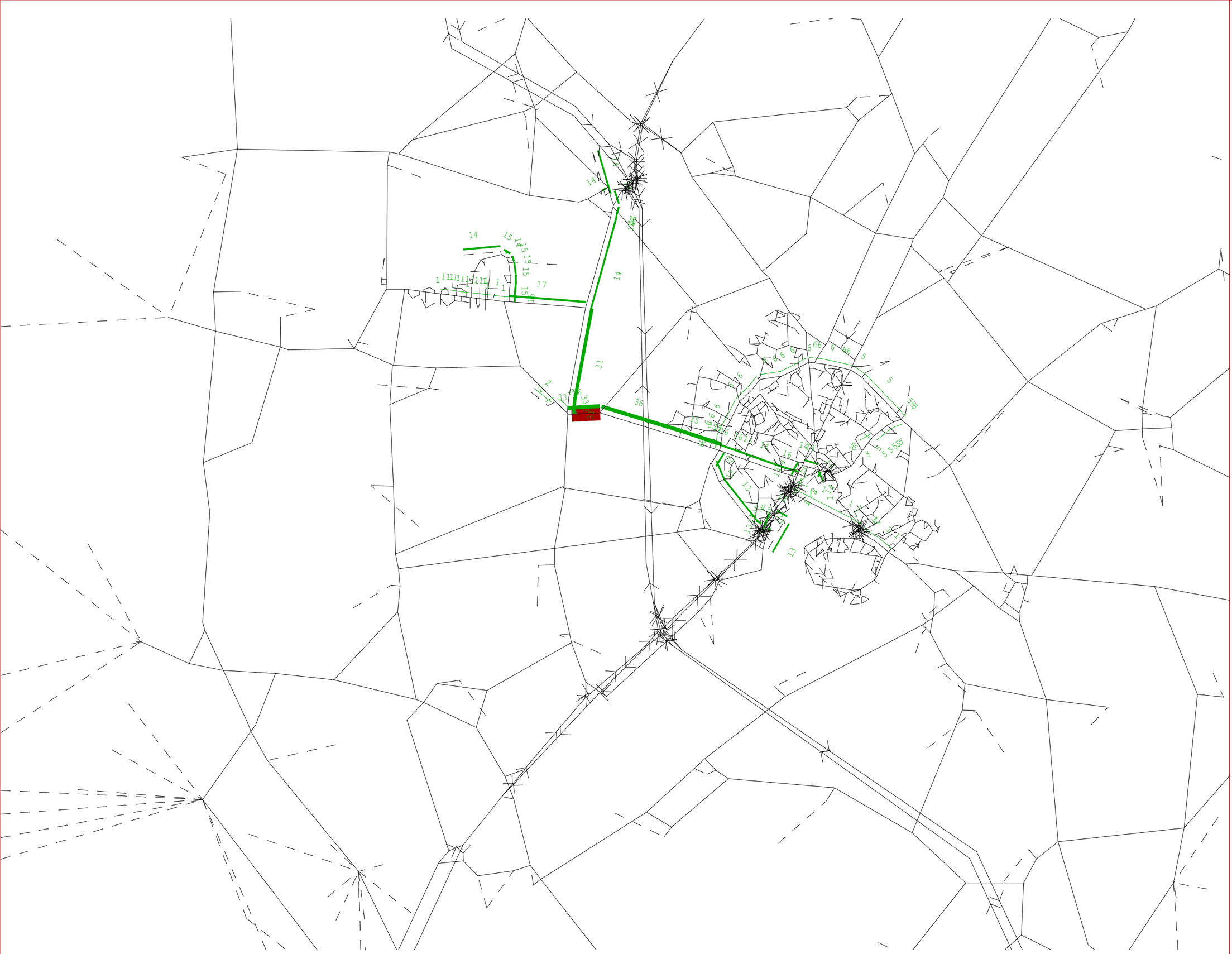
APPENDIX C

Heyford Bus Service Elasticity Calculation

The formula used is as follows:				
	D2	=	D1 x power (S2/S1, e)	
Where	D1	=	original demand with original service level, say =	100
	D2	=	new demand with new service level	?
	S1	=	original service level (3 buses per hour)	3
	S2	=	new service level (4 buses per hour)	4
	e	=	elasticity factor of 0.4	0.4
Substituting the values into the formula:				
	D2	=	100 x power (4/3, 0.4)	
		=	112.1955145	
		=	12% increase on D1	

TECHNICAL NOTE

APPENDIX D



SATURN

Atkins Ltd /

DVV / ITS

Network.UFS

2031_DS1_AM_

Scale 94944

Link Annot:

S.L.A.

Bandwidths =

50./mm

Selected

Link

Assignment

Thru links:

96030 40215

Total Demand

Flow = 36

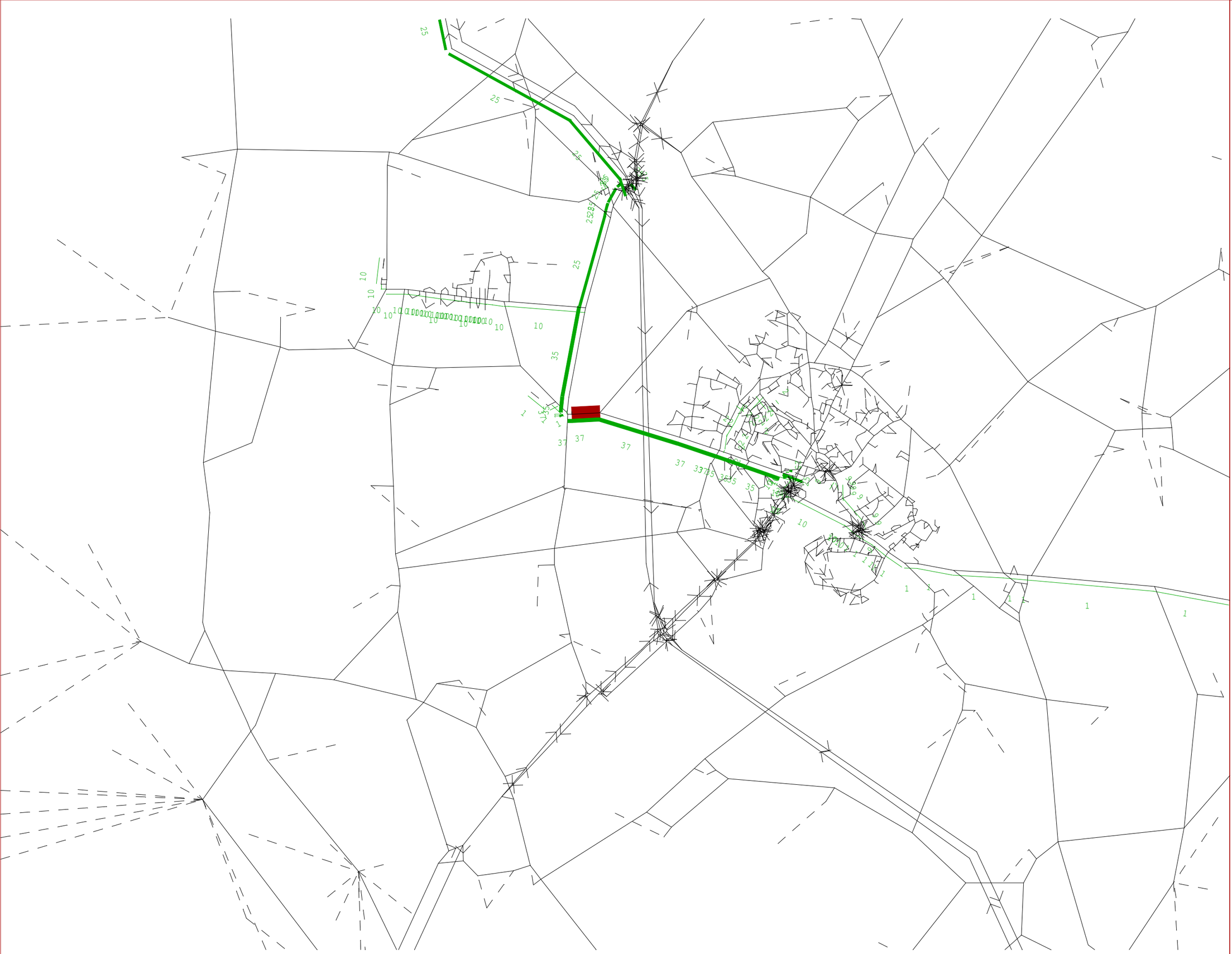
Network fixd

Flow = 20

User Cl. 6

25- 4-19

WHITE YOUNG



SATURN

Atkins Ltd /
DVV / ITS

Network.UFS
2031_DS1_AM_

Scale 94944

Link Annot:

S.L.A.

Bandwidths =
50./mm

Selected
Link
Assignment
Thru links:
40215 96030

Total Demand
Flow = 37

Network fixd
Flow = 9

User Cl. 6

25- 4-19
WHITE YOUNG