

## 1.0 Introduction

1.1 Motion has been instructed by Great Wolf Resorts (the parent company of Great Wolf Lodge) to advise on highways and transport matters associated with development proposals for a new family resort at a site in Chesterton near Bicester.

1.2 A planning application was submitted to Cherwell District Council (CDC) in November 2019 (Planning Ref: 19/02550/F) for:

*"Redevelopment of part of golf course to provide new leisure resort (sui generis) incorporating waterpark, family entertainment centre, hotel, conferencing facilities and restaurants with associated access, parking and landscaping."*

1.3 That planning application was refused at committee in March 2020 and the Decision Notice states the following three reasons for refusal which include matters relating to highways and transport:

- ▶ *Reason 2 - The proposed development would result in the creation of a substantial leisure and hospitality destination in a geographically unsustainable location on a site largely devoid of built structures and beyond the built limits of the nearest settlement. It has no access via public transport and would not reduce the need to travel or offer a genuine choice of alternative travel modes over the private motor vehicle. Given the predominant guest dynamic (families with children) the majority of trips are likely to be made via private motor vehicle, utilising minor rural roads. Furthermore, the proposal is for retail and leisure development in an out-of-centre location and no impact assessment has been provided as required by Policy SLE2. The Council do not consider that exceptional circumstances have been demonstrated to justify the development in this location, and as such the proposal is contrary to Policies SLE1, SLE2, SLE3, SLE4 and ESD1 of the Cherwell Local Plan 2011-2031 Part 1, Saved Policies T5, TR7 and C8 of the Cherwell Local Plan 1996 and Government guidance contained within the National Planning Policy Framework.*
- ▶ *Reason 3 - The proposed development fails to demonstrate that traffic impacts of the development are, or can be made acceptable, particularly in relation to additional congestion at the Middleton Stoney signalised junction of the B4030 and B430. As such the proposal is contrary to Policy SLE4 and ESD15 of the Cherwell Local Plan 2011-2031 Part 1, Saved Policy TR7 of the Cherwell Local Plan 2011-2031 Part 1, Policy 17 of the Oxfordshire Local Transport Plan 4 and Government guidance contained within the National Planning Policy Framework.*
- ▶ *Reason 4 - The development proposed, by virtue of its considerable size, scale and massing and its location in the open countryside beyond the built limits of the village of Chesterton, along with its institutional appearance, incongruous design, and associated levels of activity including regular comings and goings, will cause significant urbanisation and unacceptable harm to the character and appearance of the area, including the rural setting of the village and the amenities enjoyed by users of the public right of way, and would fail to reinforce local distinctiveness. The proposal is therefore contrary to Policies ESD13 and ESD15 of the Cherwell Local Plan (2011-2031) Part 1, Saved Policies C8 and C28 of the Cherwell Local Plan 1996 and Government guidance contained within the National Planning Policy Framework.*

1.4 The applicant has confirmed their intention to appeal the application decision in a letter to CDC dated 25<sup>th</sup> June 2020 and, as such, is seeking further information and clarification from Oxfordshire County Council (OCC) in relation to the three reasons for refusal identified above.

## 2.0 Reason for Refusal 2

- 2.1 Reason for refusal 2 relates to the location of the site, its sustainability and the accessibility of the site by non-car modes of transport.
- 2.2 The Proposed Development includes a comprehensive package of sustainable transport improvements and measures which have been discussed in detail and agreed between the applicant and OCC including:
- ▶ A package of pedestrian and cycle improvements in the vicinity of the site including a new foot/cycleway connecting from the site to Chesterton;
  - ▶ A contribution to cycle improvements between the application site and Bicester;
  - ▶ A S106 contribution of £1.6million to fund a new public bus service linking the site to Bicester town centre and railway stations, as per OCC consultation response dated 10<sup>th</sup> January 2020;
  - ▶ A dedicated shuttle bus service for the development;
  - ▶ A S106 contribution to improvements to the public bus stop in Chesterton;
  - ▶ A contribution to a coordinated signage strategy for the development;
  - ▶ On-site cycle parking;
  - ▶ Provision of electric vehicle charging facilities; and,
  - ▶ A Travel Plan.
- 2.3 It is understood that, on the basis of the package of sustainable transport improvements and measures proposed as part of the development, OCC have no objection to the Great Wolf development on the basis of accessibility or sustainability.
- 2.4 The applicant is seeking confirmation that OCC have no objection to the Great Wolf development on the basis of accessibility or sustainability, subject to the package of sustainable transport improvements and measures detailed.

### 3.0 Reason for Refusal 3

- 3.1 Reason for refusal 3 relates to the traffic impact of the development on the local highway network and, in particular, the B430/ B4030 crossroad junction in Middleton Stoney.
- 3.2 It is understood that the only junction for which OCC had an outstanding objection, at the time of determination of the planning application, is the B430/ B4030 Middleton Stoney junction and OCC are satisfied that the development will not have a material traffic impact on any other junction on the local highway network.
- 3.3 The applicant is seeking confirmation that the only junction for which OCC had an outstanding objection, at the time of determination of the planning application, is the B430/ B4030 Middleton Stoney junction and OCC are satisfied that the development will not have a material traffic impact on any other junction on the local highway network.

#### B430/ B4030 Middleton Stoney junction

- 3.4 At the time of refusal of planning permission discussions were ongoing between Motion and OCC in relation to the effect of the development proposals at the B430/B4030 Middleton Stoney junction and Motion had submitted proposals for a mitigation scheme at the junction in a Technical Note dated 27<sup>th</sup> February 2020 and subsequent email correspondence on the 6<sup>th</sup> and 12<sup>th</sup> March 2020.

#### Vehicle Trips and Distribution

- 3.5 Based on the analysis and routeing of vehicle presented in the submitted Transport Assessment the proposed development will result in an increase of 34 vehicle trips at this junction during the morning peak hour and 46 vehicles during the evening peak hour. This is equivalent to less than one additional vehicle movement per minute during the morning and evening peak hours. The change in traffic flow at the B430/B4030 junction as a result of the Proposed Development is imperceptible at just 1.6% in the morning peak hour and 2.5% in the evening peak hour. To this extent, Motion maintain that the position that the Great Wolf development proposals do not result in a material change in vehicle trips at the Middleton Stoney junction and will not result in a material impact on the operation of the junction.
- 3.6 The applicant has agreed to provide a contribution towards a coordinated signage strategy for the development with the level of the contribution to be determined subject to further details of the strategy (to be secured as part of a section 106 agreement). If OCC is concerned regarding the operation of the B430/B4030 crossroad in Middleton Stoney then the signage strategy can be developed in a manner that seeks to direct drivers away from the B430 corridor and utilise other routes to access the site. In this regard it is noteworthy that OCC has full control over the signage strategy associated with the proposed development.
- 3.7 The analysis presented in the Transport Assessment assumed that all vehicles approach the site from the M40 (north) and A43 will route via the B430 to access the site. Consideration has been given to potential alternative routes for vehicles between the application site and the M40 (north) and A43. One potential signage strategy will be to direct drivers approaching from the A43, along the B4100 southbound towards Bicester and then along the A4095 towards the site. This is currently the signed route to Bicester from the A43 and does not result in a material change in journey time between the A43 and the site in comparison with the B430 route. The routeing considered in the Transport Assessment and the potential alternative route are presented at [Figure 3.1](#).
- 3.8 Utilising this alternative signage strategy could result in 16 fewer two-way vehicle trips routeing through the B430/B4030 junction during the morning peak hour, 21 fewer two-way vehicle trips during the evening peak. Table 4.1 summarises the change in vehicle trips should vehicles route via the B4100.

	Traffic Movements at Middleton Stoney Signals		
	TA Flows	Adjusted Flows	Change in Flows
AM Peak	34	18	-16
PM Peak	46	25	-21

Table 4.1 Change in Vehicle Trips at Middleton Stoney

- 3.9 The analysis shows that this signage strategy could reduce vehicle movements on the B430 to 18 vehicles in the morning peak hour and 25 vehicles in the evening peak hour, equivalent to one vehicle every 3-4 minutes and one vehicle every 2-3 minutes respectively. It is evident that the signage strategy could be developed in a manner to seek to minimise the number of trips associated with the development using the B430 and that this could be achieved via the strategic signage strategy for which the applicant has committed to provide a S106 contribution.

#### *Junction Capacity - Middleton Stoney*

- 3.10 Notwithstanding the above position with regard to the immaterial impact of the development proposals at the Middleton Stoney junction, the application has proposed a highway mitigation scheme at the junction and this was presented in a Technical Note dated 27<sup>th</sup> February 2020 and subsequent email correspondence with OCC.
- 3.11 The proposed scheme of works has been prepared and is presented at Drawing 1803047-17, attached at [Appendix A](#). The proposed works will be in addition to those consented as part of the Heyford Park Phase 1 and can be accommodated within the existing adopted highway at the junction. The works comprise the provision of an additional northbound dedicated left turn lane at the junction along with minor changes to the south-eastern kerblines and road markings and adjustments to the signal timings at the junction.
- 3.12 It is noted that OCC provided some commentary on a previous iteration of the proposed highway mitigation works in email correspondence dated 10<sup>th</sup> March 2020. In response to those comments from OCC the proposed highway mitigation scheme has been updated and the following commentary is provided:
- ▶ OCC queried whether it is likely that all vehicles routing north will switch to the central ahead lane in advance of the stopline and some northbound traffic may remain in the nearside left turn lane and this could result in vehicles merging after the stopline. The mitigation works include changes to the road markings in advance of the northbound stopline. The amended road markings mean that the straight-ahead northbound lane is a continuous lane with the new turning lane towards the B4030 west filtering to the left. Vehicles continuing northbound on the B430 will not be required to change lanes and only the turning traffic (left and right) will be required to switch into the respective turning lanes. On that basis it is considered that the majority of vehicles will be utilising the correct lane at the stopline and it is unlikely that vehicles will be required to merge or change lanes after the stopline. Furthermore, it is considered that signage in the form of dedicated lane advance direction signs (as set out at Section 6 of Traffic Signs Manual Chapter 7) can be installed in advance of the junction to advise drivers the appropriate lane at the stopline and detail of signage will be provided at the detailed design stage;
  - ▶ OCC noted that queuing vehicles in the northbound straight-ahead lane could block vehicles entering the proposed new left turn lane. In response, it is highlighted that the junction capacity modelling has been undertaken using LinSig and this assesses the utilisation of the proposed flared left turn lane based on the proposed dimensions and adjusts the utilisation of that lane based on expected queuing in the central lane and the potential for queuing to block access to the left turn filter lane. On that basis, the junction modelling presented in this Note reflects the proposed layout and the likely utilisation of both ahead and the new left turning lane;
  - ▶ As requested by OCC, swept path analysis has been undertaken for HGVs and articulated vehicles routing from the B430 east to west and *vice versa* and this is shown at Drawing 1803047-TK62, attached at [Appendix B](#). The swept path analysis demonstrates that a 10 metre rigid vehicle and 16.5 metre articulated vehicle can manoeuvre appropriately from the B430 east to the B430 west and *vice versa* and will not conflict with the proposed pedestrian refuge; and,

- ▶ Given the distance from the application site, the Great Wolf development proposals will not result in a change in the number of pedestrian movements at the junction. The proposed new pedestrian crossing point and pedestrian refuge showing on Drawing 1803047-17 are a significant betterment over current pedestrian facilities at the junction. The existing pedestrian crossing is located to the south of the junction, which is not on the desire line for pedestrians crossing between the majority of local dwellings and local services, such as the local pub. At present, and under the consented Heyford Park Phase 1 mitigation scheme, pedestrians are required to cross the width of the B430 in a one movement with no refuge in the centre of the carriageway. Furthermore, the existing pedestrian crossing facility is positioned in advance of the northbound stopline such that pedestrians are currently required to walk in between queueing vehicles. The proposed pedestrian crossing arrangements, detailed at Drawing 1803047-17, provides a new pedestrian refuge allowing pedestrian to cross the B430 in two movements and wait safely in the centre of the carriageway. The arrangement also moves the pedestrian crossing point from a location in advance of the northbound stopline, to within the junction and this means that pedestrian are no longer required to cross in between queueing traffic and this is considered a safer arrangement. Furthermore, the proposed pedestrian crossing point and refuge provide the opportunity for pedestrians to cross the northbound and southbound carriageway of the B430 during traffic-free phases within the junction signal plan. For example, a pedestrian can cross the southbound carriageway of the B430 during the green phase for the B4030 Bicester Road and there will be no conflict between pedestrians and vehicle movements. Similarly, a pedestrian can cross the northbound carriageway during the green phase for the B4030 Heyford Road and there will be no conflict between pedestrians and vehicles. In comparison, under the current pedestrian crossing arrangements pedestrians crossing the B430 will always be in conflict traffic movements either on the B430 or turning from the B4030. In addition, the new pedestrian crossing point and refuge is located within the junction and this is on the desire line for pedestrians routeing between local dwellings and services and is therefore considered more convenient for pedestrians.

3.13 OCC requested that a Stage 1 and 2 Road Safety Audit were undertaken on the proposed highway mitigation works. It is not normal practice for a Stage 2 Road Safety Audit to be undertaken at the planning stage as this requires the detailed design of the highway works. The Stage 2 Road Safety Audit will therefore be undertaken as part of the detailed design of the highway works, should planning consent be granted.

3.14 Gateway TSP have undertaken a Stage 1 Road Safety Audit in relation to the works shown on Drawing 1803047-17 and this is attached at [Appendix C](#) and raises no material concerns with the proposed mitigation scheme and all comments raised in the Audit can be addressed as part of the detailed design of the mitigation works.

#### *Junction Capacity and Heyford Park Phase 2 Mitigation*

3.15 The assessment of the Middleton Stoney junction includes consideration of traffic associated with the Heyford Park Phase 2 development (Planning Ref: 18/00825/HYBRID). At the time of preparing the Transport Assessment for the Great Wolf application, the Heyford Park development had not proposed any highway mitigation works at the Middleton Stoney junction despite that development resulting in 329 additional vehicle trips at the junction during the morning peak hour and an additional 272 additional vehicles trips at the during the evening peak hour.

3.16 Since determination of the Great Wolf application, a Transport Assessment Addendum (TAA) has been submitted for the Heyford Park Phase 2 development which includes mitigation measures associated with the impact of that development B430/ B4030 Middleton Stoney junction. The mitigation measures proposed as part of the Heyford Park Phase 2 scheme include no changes to the highway arrangement at the Middleton Stoney junction, in comparison with a scheme of highway works consented as part of Heyford Park Phase 1 and instead comprise:

- ▶ The introduction of a bus gate of the B4030 west arm of the junction and associated changes in the priority of the B4030/Unnamed Road Junction (west of Middleton Stoney). The Heyford Park TAA includes two options from the bus gate; one that provides a full restriction and one that provides a southbound only restriction. It is understood that from the TAA and subsequent response from OCC that the full restriction is the preferred scenario;

- ▶ Introduction of a weight restriction on the B4030 east arm to reduce the number of HGVs using the junction; and,
- ▶ A package of sustainable transport improvements including improved bus services between Heyford Park and Bicester, a cycle route between Heyford Park and Bicester and a Travel Plan which result in modal shift away from car usage and reduce the vehicle trip generation of the Heyford Park development proposals.

3.17 Motion has reviewed the information provided within the Heyford Park TAA to ascertain the change in traffic movements as a result of the package of mitigation measures proposed. For consistency with the assessment as part of the Heyford Park TAA, Motion have extracted the 'With Development' scenario traffic flows from the Heyford Park TAA analysis. These traffic flows are shown at [Figure 3.2 and 3.3](#), attached, for the weekday morning and evening peak periods and form the baseline flows for the purpose of this assessment. These traffic flows include all traffic associated with the Heyford Park Phase 1 & 2 developments, along with any changes to traffic movements at the Middleton Stony as a result of the bus gate and restrictions proposed to be introduced by the Heyford Park development.

3.18 [Figures 3.4 and 3.5](#), attached show the vehicle movements associated with the proposed Great Wolf development during the weekday morning and evening peak periods. These have been added to baseline Heyford Park traffic flows at the Middleton Stony junction. [Figure 3.6 and 3.7](#), shown the expected vehicle movements at the Middleton Stony junction inclusive of the Heyford Park Phase 2 and Great Wolf developments during the weekday morning and evening peak period.

3.19 Table 5.1 shows the operation of the B430/B4030 signalised crossroads including the Heyford Park Phase 1 and Phase 2 developments. The assessment includes consideration of the highway improvements works at the Middleton Stony consented as part of the Heyford Park Phase 1 development and includes for the changes to traffic movements at the junction as a result of the mitigation works proposed for Heyford Park Phase 2. Full model output files are attached at [Appendix D](#).

Approach	AM Peak		PM Peak	
	DoS	MMQ	DoS	MMQ
B430 (south)	107.3%	107	92.7%	36
B4030 (east)	106.7%	52	92.1%	24
B430 (north)	75.0%	11	92.5%	27
B4030 (west)	86.7%	5	44.8%	2

Table 5.1 B430/B4030 Signalised Crossroad – 2026 Baseline with Heyford Park Phase 1 & 2

3.20 Table 5.1 demonstrates that the junction is likely to operate within theoretical capacity (under 100% DoS) during the evening peak hour but over theoretical capacity (in excess of 100% DoS) during the morning peak hour, in the baseline situation.

3.21 Table 5.2 summarises the operation of the B430/B4030 signalised crossroads in the 2026 'With Development' scenario. The analysis includes traffic associated with the proposed Heyford Park Phase 1 & 2 developments, along with the mitigation works associated with both Heyford Park Phase 1 & 2 development. The assessment includes consideration of vehicle trips associated with the Great Wolf development and the mitigation works shown at Drawing 1803047-17. Full model output files are attached at [Appendix D](#).

Approach	AM Peak		PM Peak	
	DoS	MMQ	DoS	MMQ
B430 (south)	108.7%	117	92.8%	37
B4030 (east)	107.8%	56	95.4%	26
B430 (north) (ahead, left)	37.5%	9	67.4%	20
B430 (north) (right)	75.0%	2	92.9%	8
B4030 (west)	86.7%	5	44.8%	2

Table 5.2 B430/B4030 Signalised Crossroads with Heyford Park Phase 1 & 2, Great Wolf and Mitigation

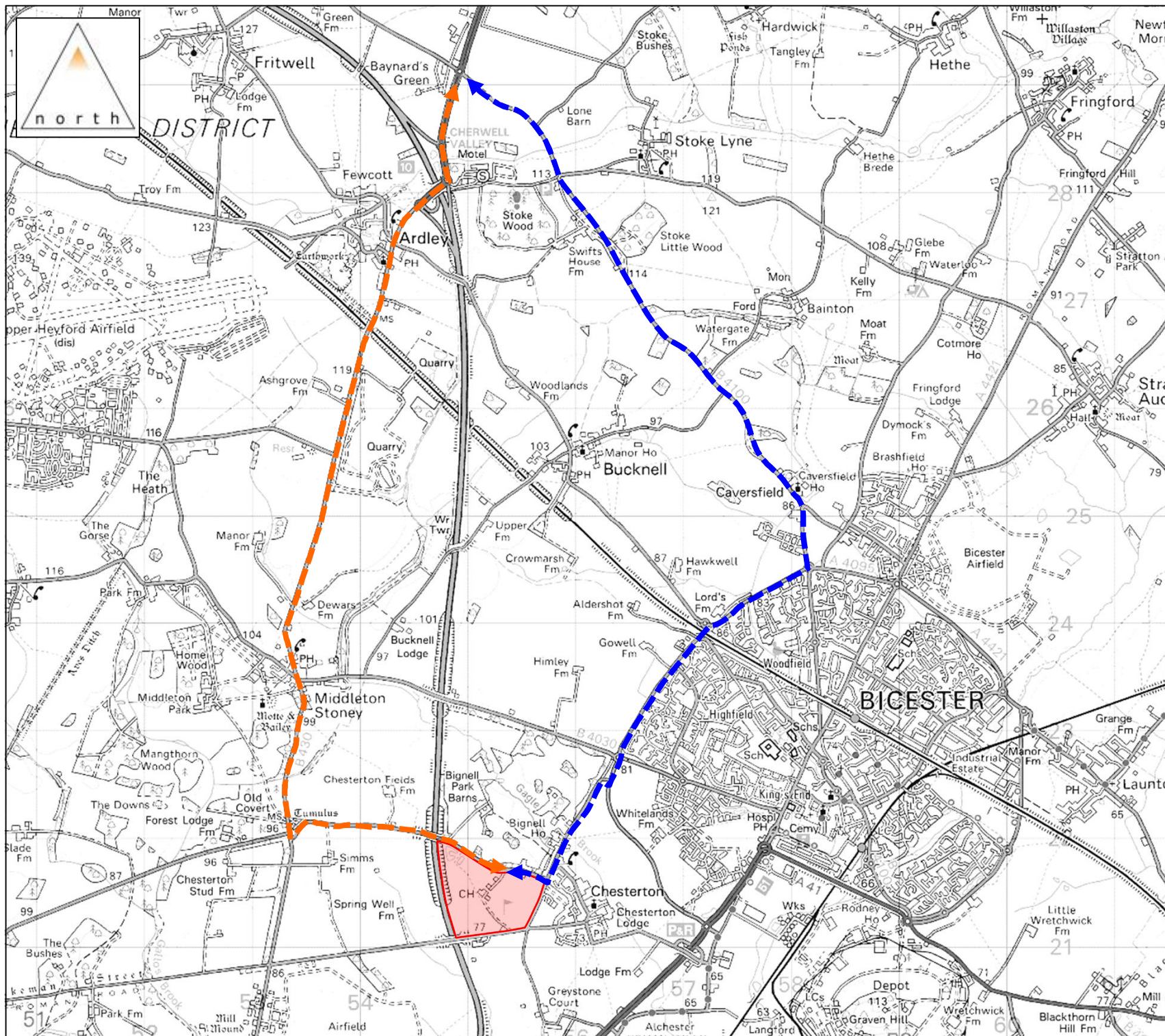
- 3.22 Table 5.2 demonstrates that with the traffic associated with the proposed Great Wolf development and associated mitigation, the junction will continue to operate within theoretical capacity during the evening peak hour. In the morning peak hour, the junction is shown to continue to operate in excess of theoretical capacity with the proposed Great Wolf development and mitigation in place.
- 3.23 The analysis demonstrates that, whilst the junction is expected to operate in excess of its theoretical capacity during the evening peak period, the proposed Great Wolf development will not have a material effect on the operation of the junction and, as such, no further analysis or additional mitigation measures over that proposed are considered necessary.
- 3.24 To this extent the applicant is seeking confirmation that, based on the proposed mitigation works at the B430/B4030 and the additional analysis presented in this Note, OCC are satisfied that the development will not have a material traffic impact on the operation of the junction and their previous objection on the grounds of traffic impact at this junction has been resolved.
- 3.25 The applicant is prepared to either implement the mitigation scheme shown on Drawing 1803047-17 in the event that the consented Heyford Park Phase 1 works at the junction are complete prior to occupation, or implement both the mitigation scheme shown on Drawing 1803047-17 and the consented Heyford Park Phase 1 works at the junction in the event that the Phase 1 works are not complete prior to occupation, or pay a contribution equivalent to the cost of the works. To this extent the applicant is seeking confirmation from OCC as to which approach they would prefer to adopt.

## 4.0 Summary and Conclusions

- 4.1 Motion has been instructed by Great Wolf Resorts (the parent company of Great Wolf Lodge) to advise on highways and transport matters associated with development proposals for a new family resort at a site in Chesterton near Bicester.
- 4.2 A planning application was submitted to Cherwell District Council (CDC) in November 2019 (Planning Ref: 19/02550/F). That planning application was refused at committee in March 2020 and the Decision Notice states the following three reasons for refusal which relate to highways and transport matters.
- 4.3 The applicant has confirmed their intention to appeal the application decision in a letter to CDC dated 25<sup>th</sup> June 2020 and, as such, is seeking further information and clarification from Oxfordshire County Council (OCC) in relation to the three reasons for refusal identified.
- 4.4 The Proposed Development includes a comprehensive package of sustainable transport improvements. It is understood that OCC have no objection to the Great Wolf development on the basis of accessibility or sustainability.
- 4.5 As part of the development a scheme of highway improvement works are proposed at the B430/B4030 Middleton Stoney junction. On the basis of the proposed mitigation scheme it is concluded that the Proposed development will not have a material effect on the operation of the junction.
- 4.6 The applicant is prepared to either implement the mitigation scheme shown on Drawing 1803047-17 in the event that the consented Phase 1 works are complete prior to occupation, or implement both the mitigation scheme shown on Drawing 1803047-17 and the consented Phase 1 works in the event that the Phase 1 works are not complete prior to occupation, or pay a contribution equivalent to the cost of the works. OCC can confirm which approach they would wish to adopt.
- 4.7 In summary, this Note seeks confirmation from OCC on the following matters:
- ▶ Confirmation that OCC have no objection to the Great Wolf development on the basis of accessibility or sustainability, subject to the package of sustainable transport improvements and measures detailed;
  - ▶ Confirmation that the only junction for which OCC had an outstanding objection, at the time of determination of the planning application, is the B430/ B4030 Middleton Stoney junction and that OCC are satisfied that the development will not have a material traffic impact on any other junction on the local highway network;
  - ▶ Confirmation that, based on the proposed mitigation works at the B430/B4030 and the additional analysis presented in this Note, OCC are satisfied that the development will not have a material traffic impact on the operation of the junction and their previous objection on the grounds of traffic impact at this junction has been resolved; and,
  - ▶ Confirmation from OCC as to which approach they would prefer to adopt with regarding implementation or contribution towards works at the B430/ B4030 Middleton Stoney junction.



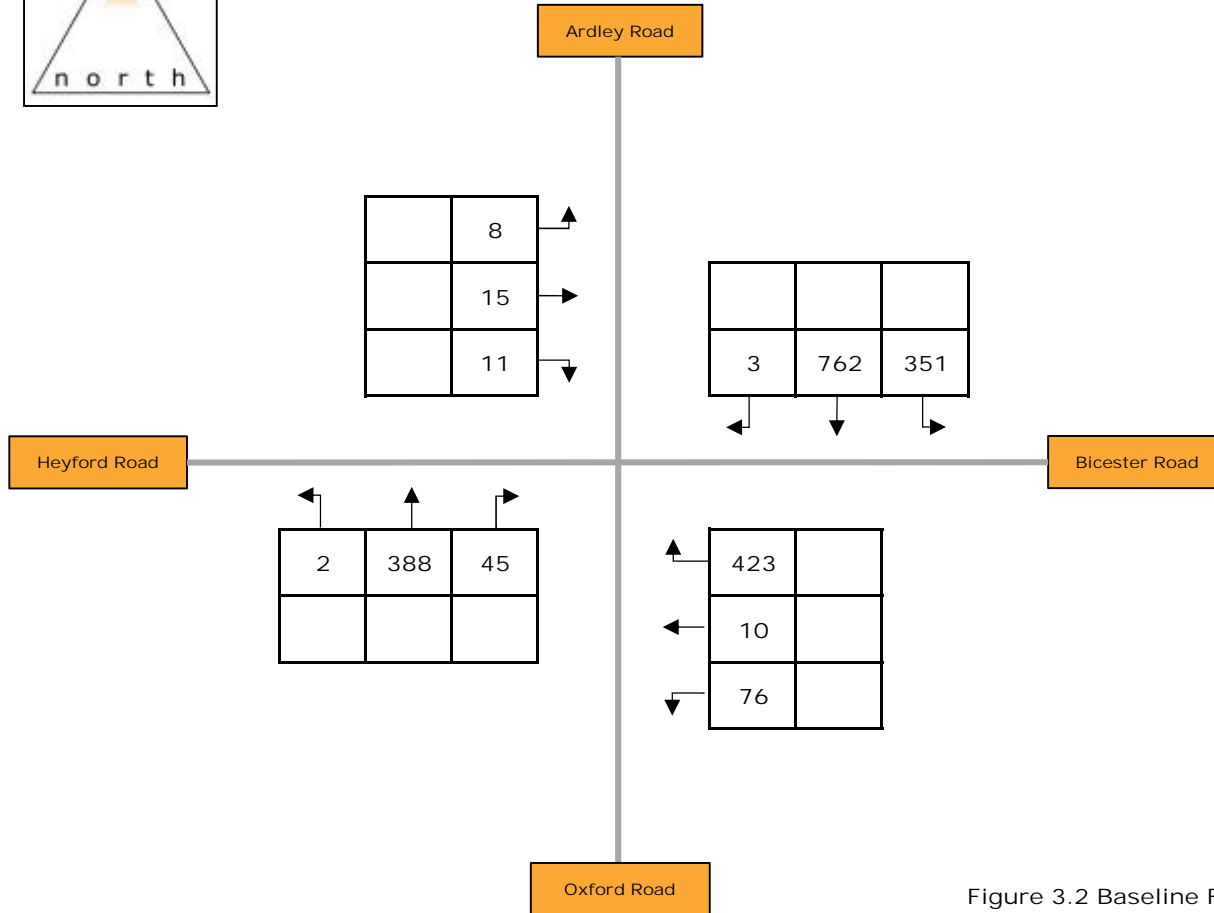
Figures



- Legend:**
- Site Location
  - Current 'Transport Assessment' Routing
  - Alternative Potential Routing

Great Wolf,  
Bicester  
Figure 3.1 Alternative Vehicle  
Routing  
Not to Scale

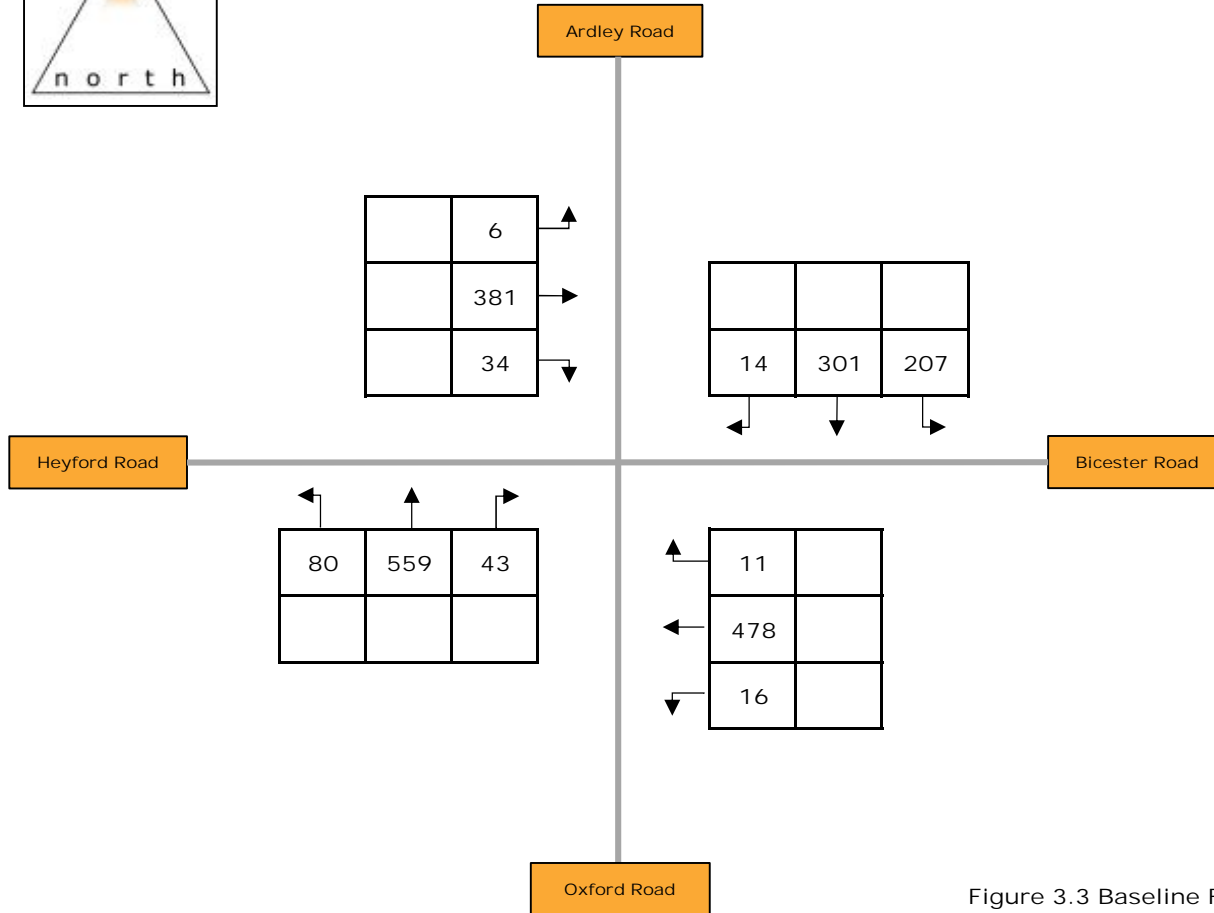




Great Wolf, Bicester

Figure 3.2 Baseline Flows from Heyford Park Phase 2 - AM Peak

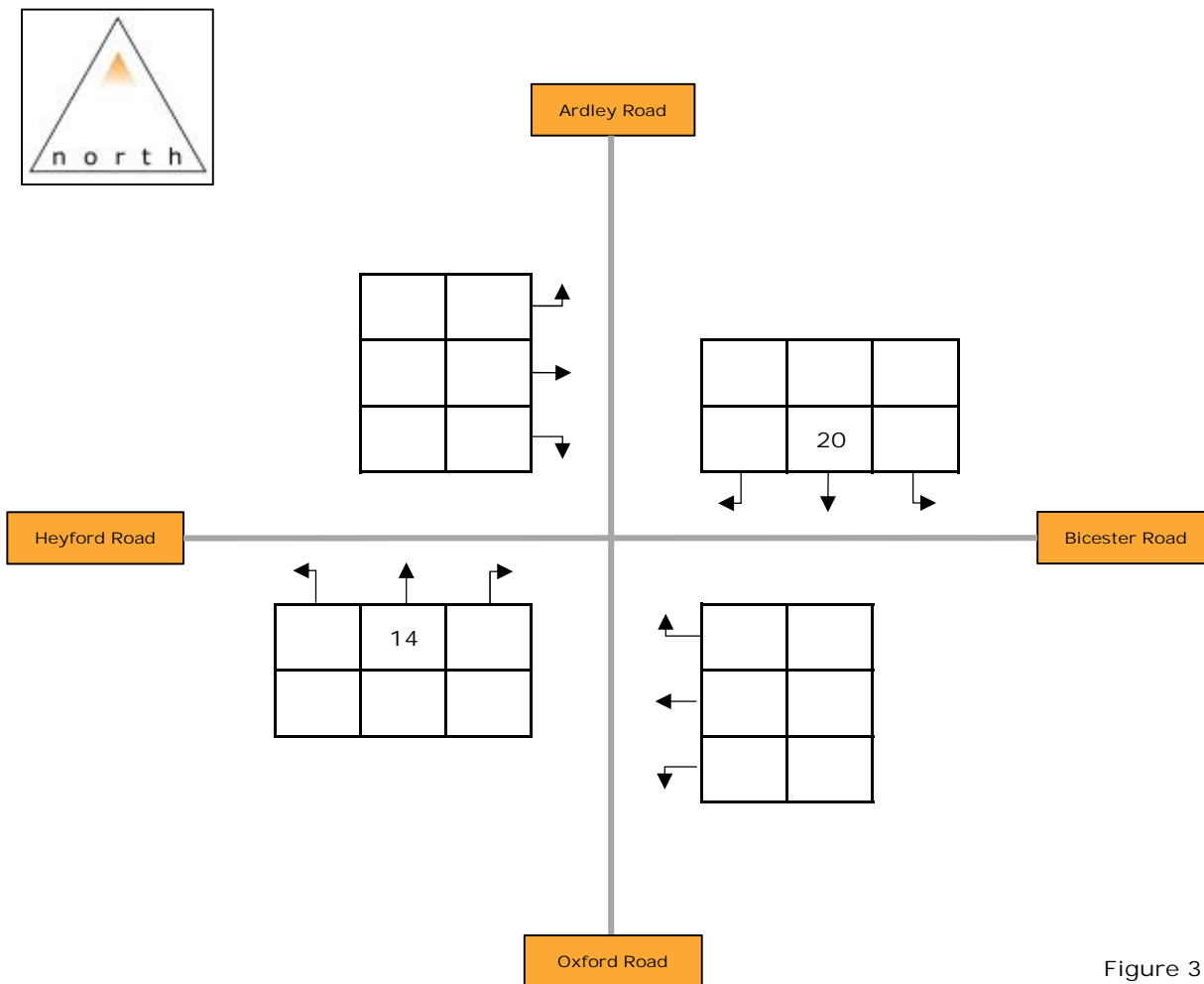




Great Wolf, Bicester

Figure 3.3 Baseline Flows from Heyford Park Phase 2 - PM Peak

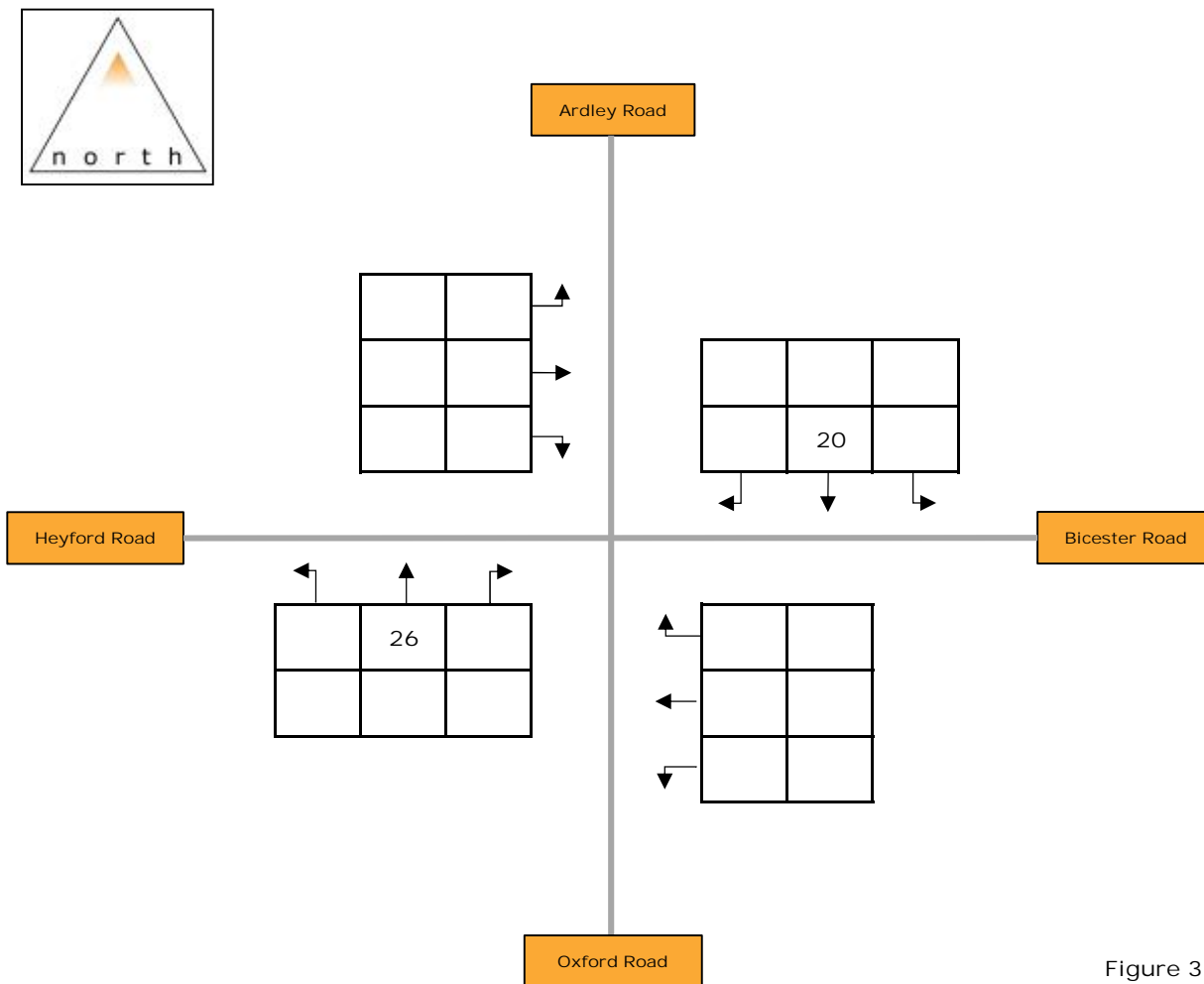




Great Wolf, Bicester

Figure 3.4 Great Wolf Development Trips - AM Peak

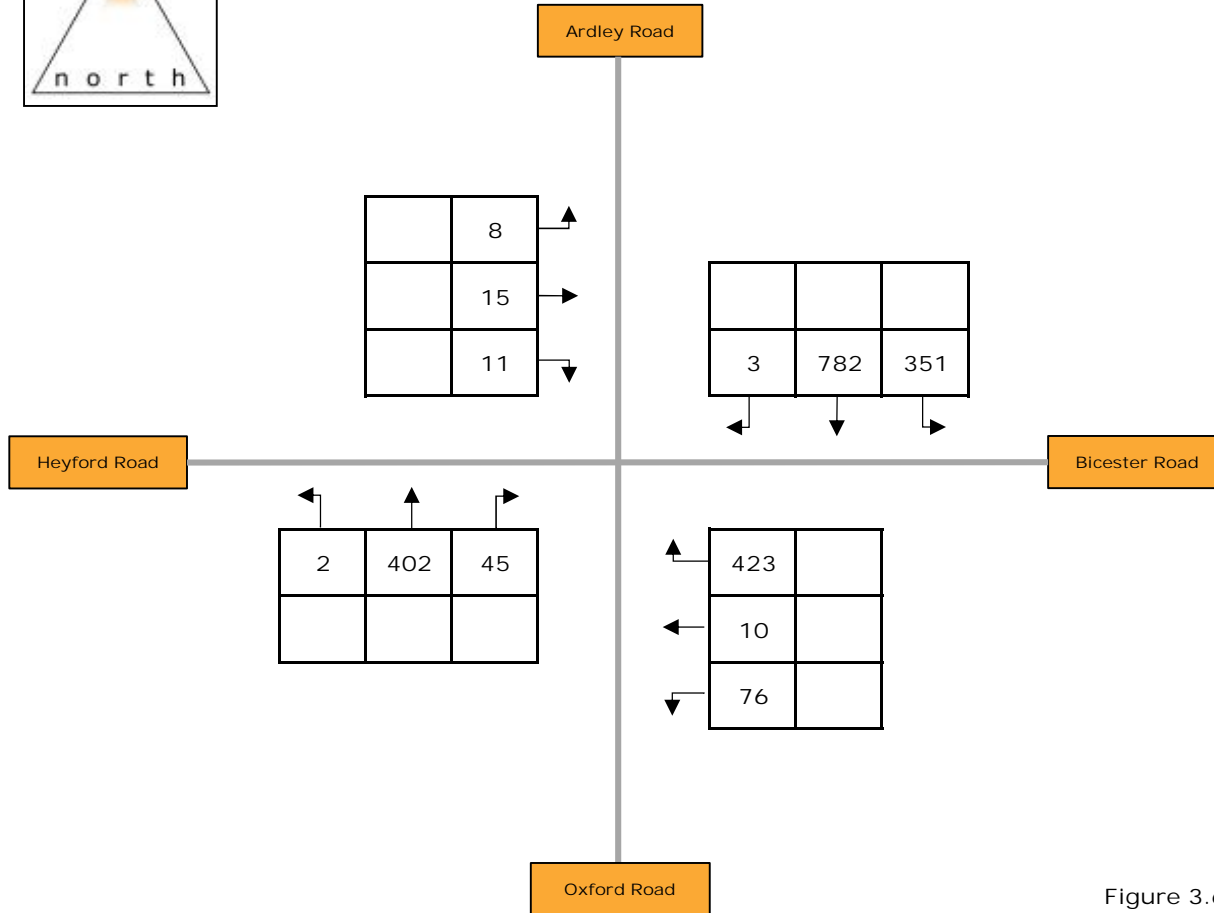




Great Wolf, Bicester

Figure 3.5 Great Wolf Development Trips - PM Peak

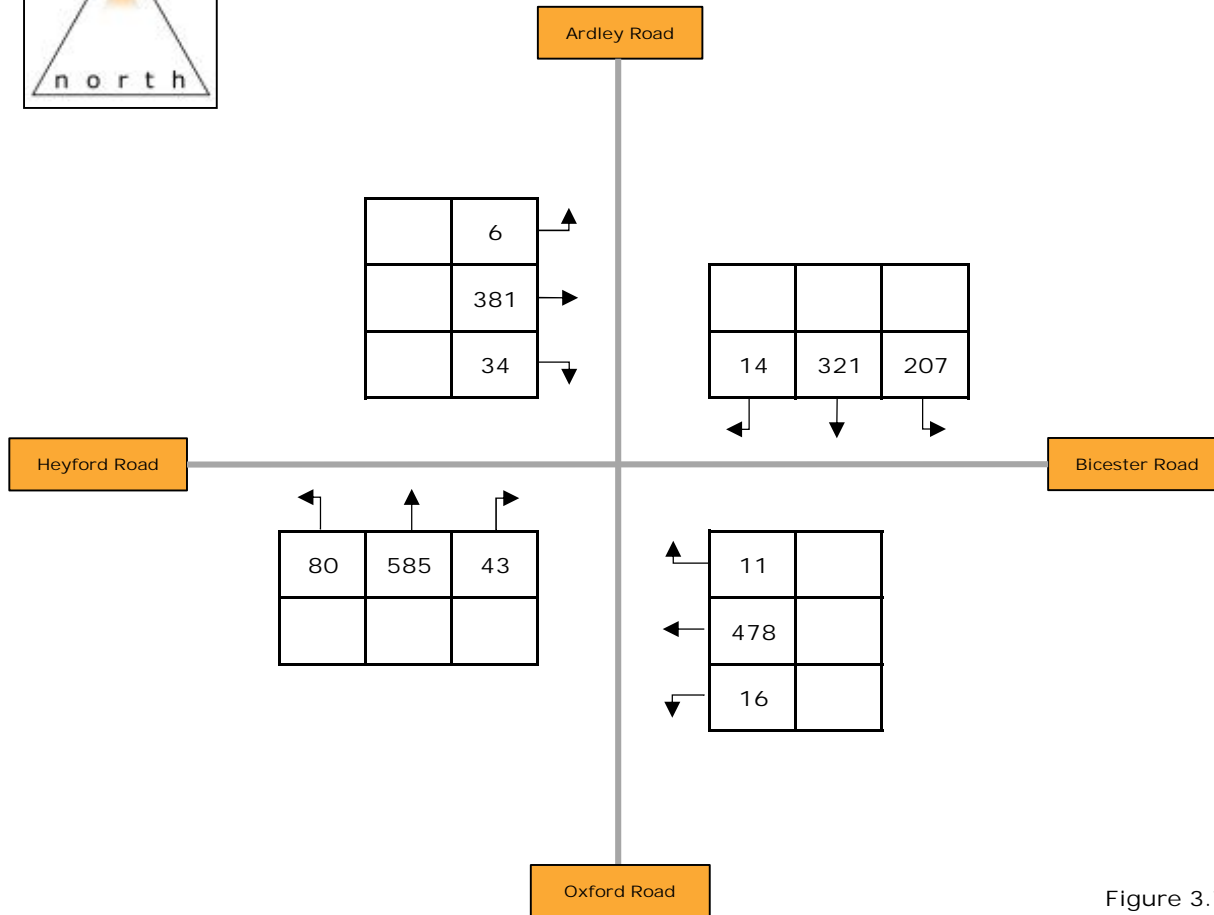




Great Wolf, Bicester

Figure 3.6 'With Great Wolf Development' - AM Peak





Great Wolf, Bicester

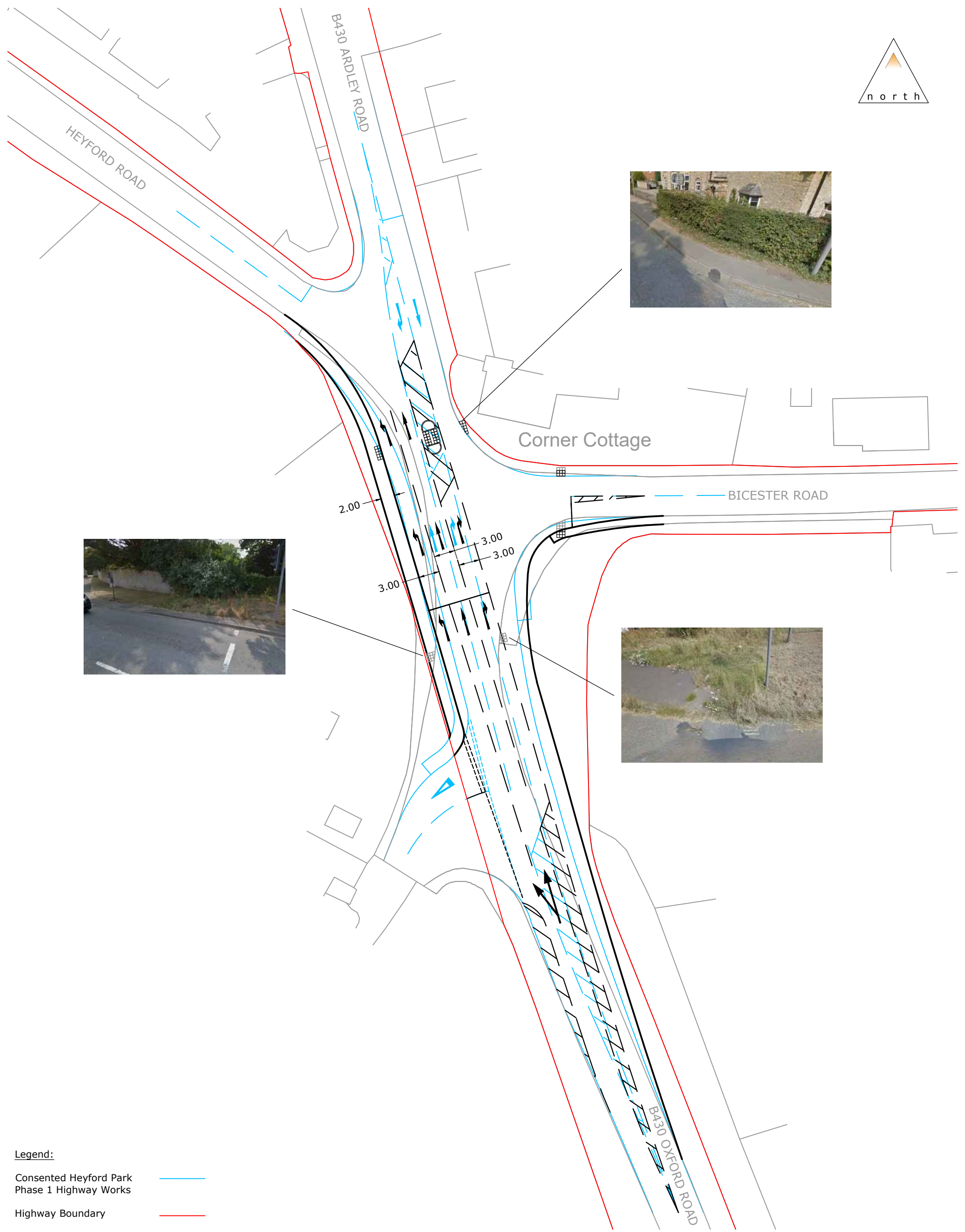
Figure 3.7 'With Great Wolf Development' - PM Peak





Appendix A

Drawing 1803047-17



**Legend:**

- Consented Heyford Park Phase 1 Highway Works —
- Highway Boundary —



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 Guildford  
 Surrey  
 GU1 4AU  
 T: 01483 531 300

Cargo Works  
 1-2 Hatfields  
 London  
 SE1 9PG  
 T: 020 8065 5208

www.motion.co.uk

Project:  
**Great Wolf Resort, Bicester**

Title:  
**Indicative Mitigation Works**

Scale: 1:500 (@ A3)

Notes:

Drawing:  
**1803047-17**

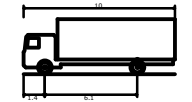
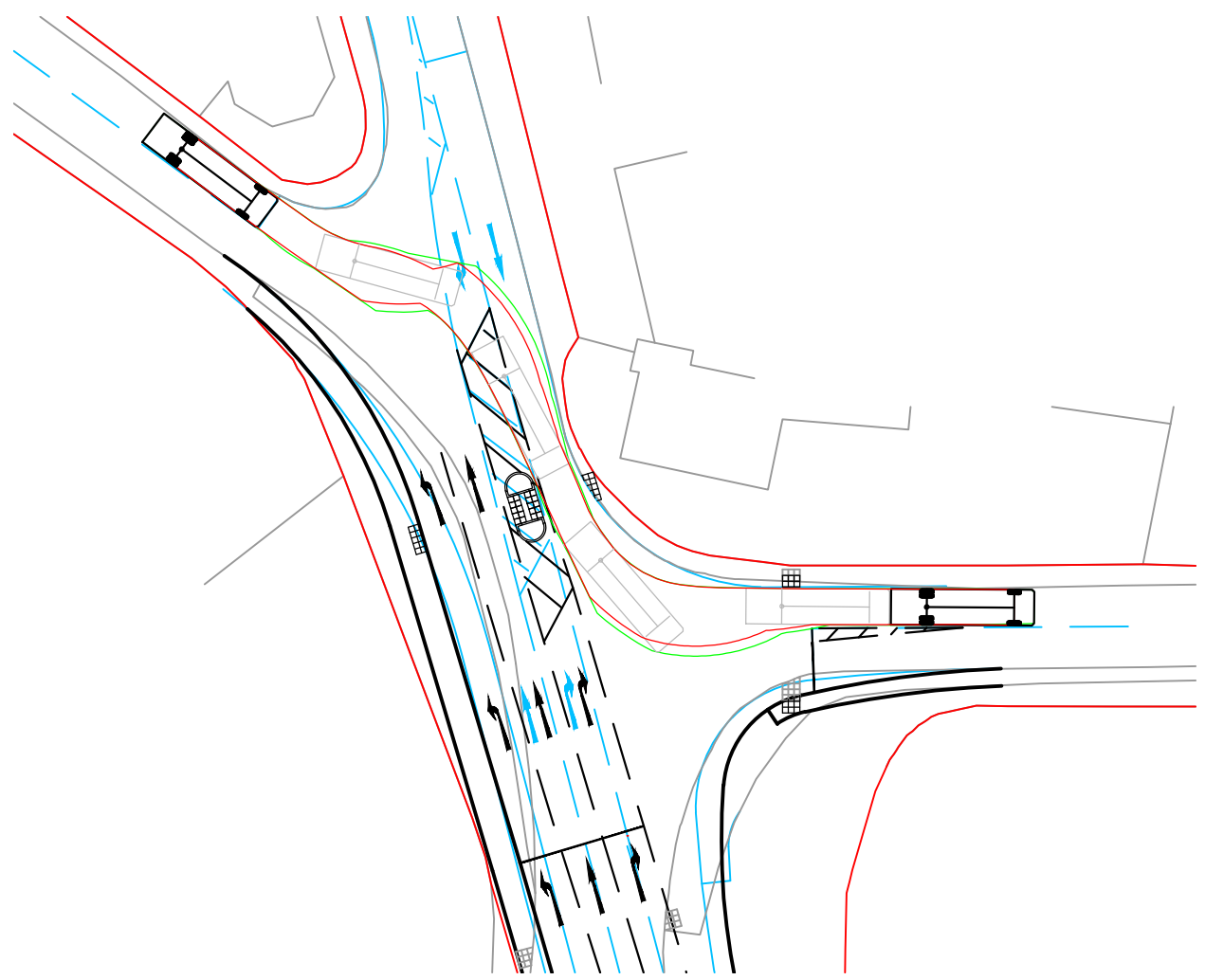
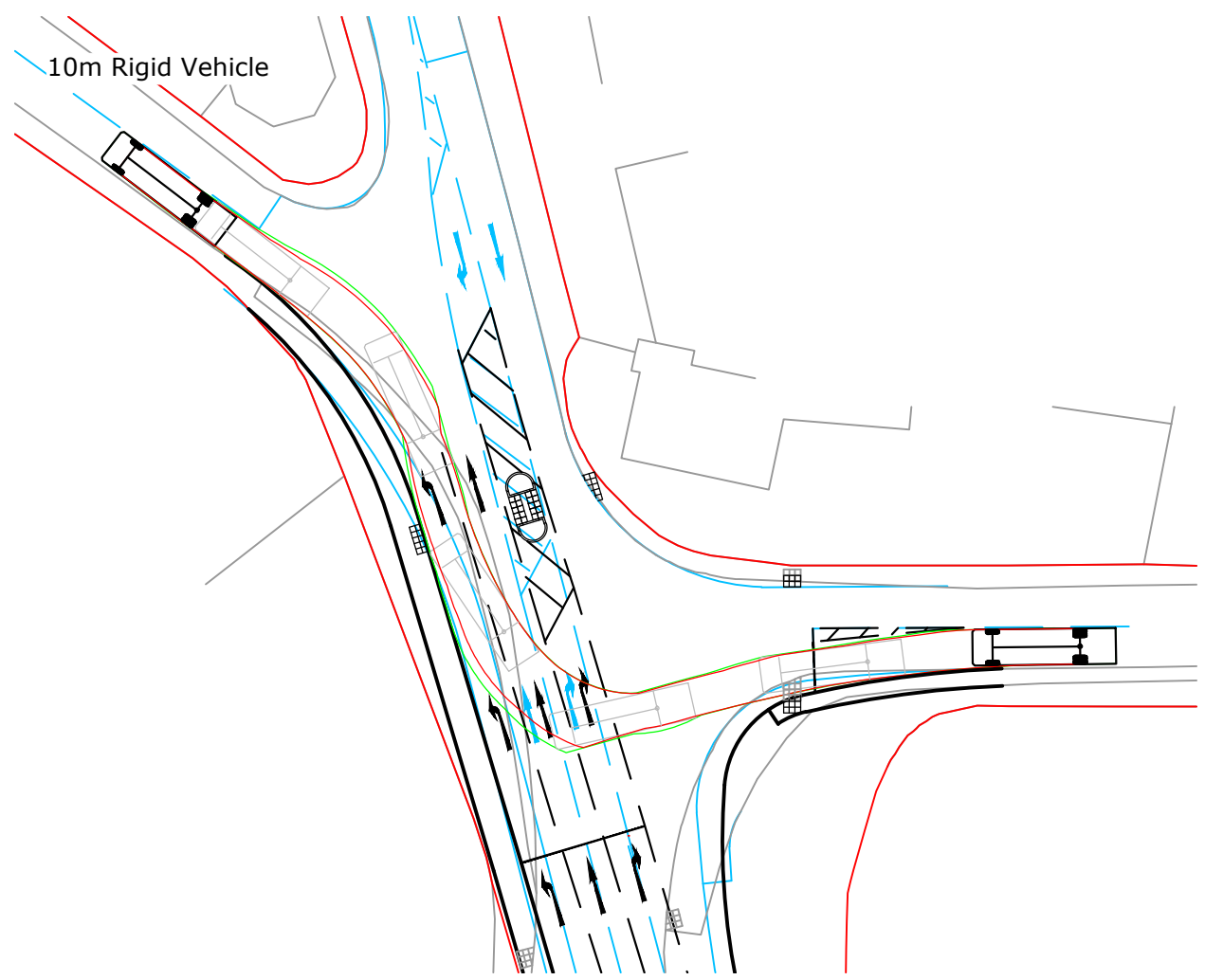
Revision:  
**B**

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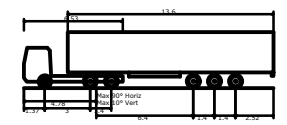
## Appendix B

### Swept Path Analysis

10m Rigid Vehicle

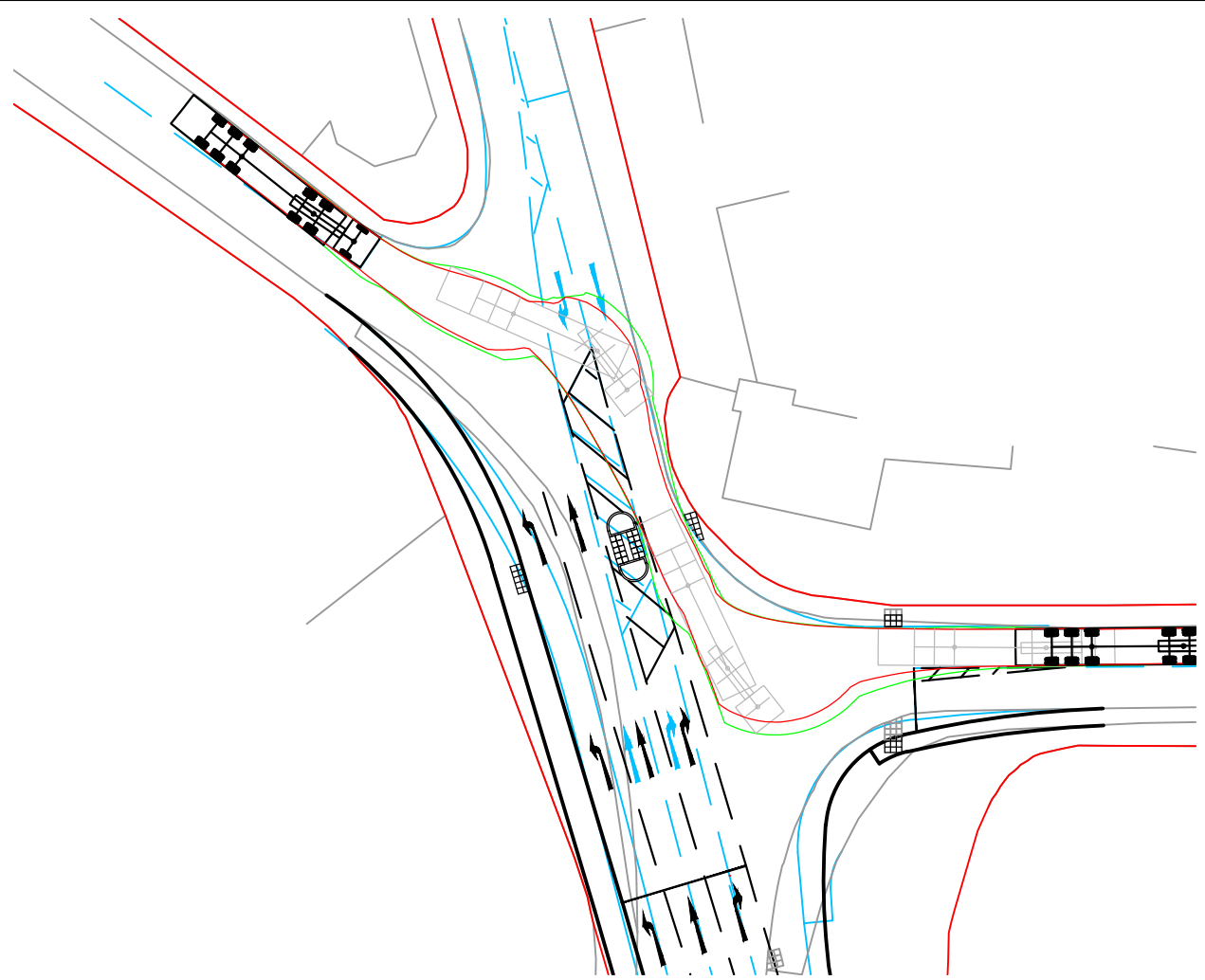
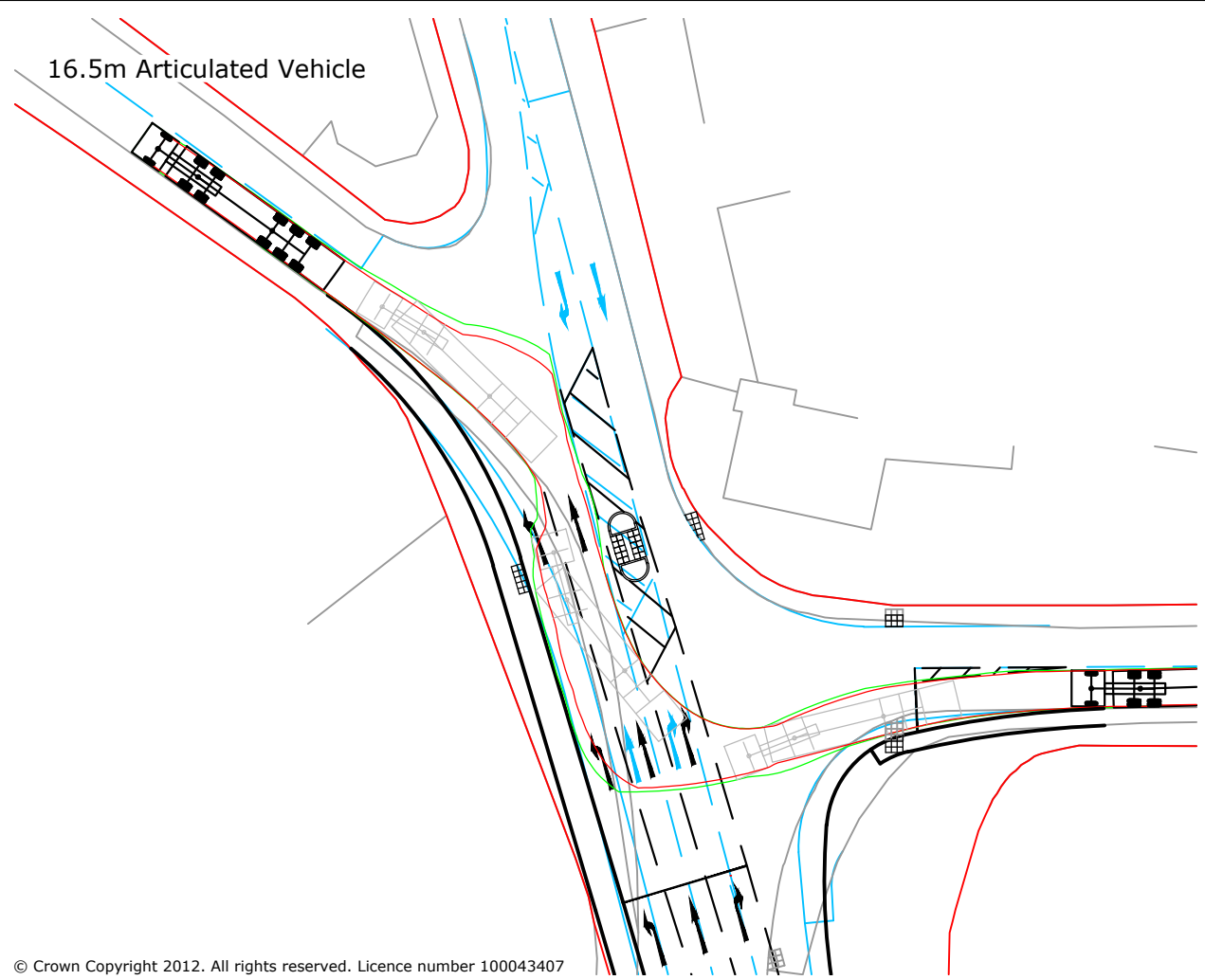


FTA Design HG Rigid Vehicle (1998)  
 Overall Length 10.000m  
 Overall Width 2.500m  
 Overall Body Height 3.645m  
 Min Body Ground Clearance 0.440m  
 Track Width 2.470m  
 Lock-to-lock time 3.00s  
 Curb to Curb Turning Radius 11.000m



Max Legal Length (UK) Articulated Vehicle (16.5m)  
 Overall Length 16.500m  
 Overall Width 2.500m  
 Overall Body Height 3.681m  
 Min Body Ground Clearance 0.411m  
 Max Track Width 2.500m  
 Lock-to-lock time 6.00s  
 Curb to Curb Turning Radius 6.530m

16.5m Articulated Vehicle



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 SE1 9PG

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Project:  
**Great Wolf Resort**

Title:  
**Swept Path Analysis  
 Heavy Goods Vehicles**

Scale: 1:500 (@ A3)

Drawing: **1803047-TK62** Revision: -

Appendix C  
Road Safety Audit



Road Safety Engineering

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Mr P Bell  
Motion  
84 North Street  
Guildford  
GU1 4AU

Our Ref: SGI/1803047  
Your Ref: PB/gwbice

12 March 2020

Dear Phil

GREAT WOLF RESORT, BICESTER - STAGE 1 RSA IN RESPECT OF JUNCTION IMPROVEMENT AT MIDDLETON STONEY

Please find enclosed, as requested, our report describing a Stage 1 Road Safety Audit of the proposed improvements at the B430 Ardley Road/Oxford Road junction with the B4030 Heyford Road/Bicester Road. As you can see, the Audit raises five problems and recommends appropriate road safety mitigation measures.

We would like to make the following additional road safety related comments:

#### Footway Width on Northeast Quadrant

We refer at paragraph 5.3 of the Audit report to the cutting back of verge overgrowth on the east side of the new pedestrian crossing; this could widen the footway from 0.85m to 1.25m. Cutting back the boundary hedge within the highway could potentially widen it further to approximately 1.4m. Whilst this remains below optimum (1.8-2.0m), the improvement to pedestrian safety and comfort, compared with the existing situation, would be substantial (whether the widening was to 1.25m or 1.4m). Please note that the Ordnance Survey mapping appears to show the highway boundary where the footway disappears beneath the verge overgrowth, whereas in reality the highway is wider (up to 1.4m, as described above).

#### Pedestrian Crossings

The existing informal crossings on Oxford Road, Bicester Road and Heyford Road are in a poor state of repair and appear largely unused, as evidenced by soil and vegetation overgrowth masking the tactile pavements. The Oxford Road crossing is situated upstream of the traffic signal stop line, which is hazardous for pedestrians because it encourages them to cross between queuing vehicles and appears not to serve any meaningful desire line. The apparently low usage suggests that it could be removed without detriment to pedestrian safety; indeed, the proposed replacement crossing to the north will provide the following benefits:

- It is more likely to be used by virtue of its location
- It is safer due to the provision of a central refuge island
- It does not encourage pedestrians to cross between queuing vehicles

Motion

Great Wolf Resort, Bicester - Stage 1 RSA in respect of Junction Improvement  
at Middleton Stoney

12 March 2020



- 
- It allows pedestrians to cross in two stages, negotiating different traffic streams separately and using gaps created by the signal stages
  - It affords greater visibility for pedestrians crossing east-west to the stop line of Bicester Road

The existing footway on the north side of the Bicester Road crossing is about one metre wide, measured to the face of a stone wall. The 'blue scheme' previously agreed with Oxfordshire County Council incorporates a slight widening at this point and we recommend that this is incorporated into the Motion scheme, as appears to be the case.

Similarly, the Heyford Road pedestrian crossing is between two narrow footways and the tactile paving on the southern side is overgrown. It is acknowledged that there is no opportunity to widen the northern footway but it is not made any worse in road safety terms by the proposed scheme. In contrast, the widening on the south side, continuing from the west side of Oxford Road and incorporating the new crossing thereof, provides a welcome improvement to pedestrian safety.

#### Pedestrian/Vehicle Inter-visibility

Pedestrians crossing Bicester Road at the existing uncontrolled crossing have limited visibility of vehicles turning left from Ardley Road; and vice-versa. Again, this is an existing situation that will not be made any worse as a result of the proposed improvements. Collision records for the last five years suggest that this is not a road safety problem in practice, most likely due to low traffic speeds.

Pedestrians using the proposed crossing (east to west) will benefit from the refuge island in the sense that they have full visibility to the north for the first stage of the movement and then gain visibility to the full width of the Bicester Road stop line from the refuge.

I trust that the above comments provide clarity to our thought processes when undertaking the Road Safety Audit. We would of course be pleased to discuss any road safety related of the scheme further.

Yours sincerely

A handwritten signature in black ink that reads "Steve Giles". The signature is written in a cursive, slightly slanted style.

Steve Giles  
Principal Road Safety Engineer

email

sgiles@gateway-tsp.co.uk

GREAT WOLF RESORT, BICESTER

Proposed Junction Improvement at Middleton Stoney

Stage 1 Road Safety Audit  
Requested by Motion

March 2020



*Road Safety Engineering*



Project: Great Wolf Resort, Bicester  
Proposed Junction Improvement at Middleton Stoney

Client: Motion

Overseeing Body: Oxfordshire County Council

Document: Stage 1 Road Safety Audit

Gateway TSP ref: SG/JS/1803047 RSA1 v1.0

Issue date: 12th March 2020

Status: v1.0

Authorised by: SG

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## CONTENTS

1	Introduction.....	1
2	Items Considered by this Road Safety Audit .....	3
3	Collision Data .....	4
4	Previous Road Safety Audit.....	5
5	Problems Identified by this Road Safety Audit .....	6
6	Audit Team Statement.....	9

## Appendices

- Appendix A: Location Plan(s)
- Appendix B: RSA Decision Log

## 1 INTRODUCTION

1.1 This report describes a Stage 1 Road Safety Audit (RSA) of proposed improvements to the junction between the B430 Oxford Road/Ardley Road and B4030 Bicester Road/Heyford Road, in Middleton Stoney. The Audit Brief was prepared by Motion and accepted by the Audit Team on 10<sup>th</sup> March 2020.

1.2 The highway works considered by this Audit comprise widening of the southern arm of Oxford Road and its radius into Heyford Road, to provide three lanes at the signal stop line (left/ahead/right) where there is presently only one, in common with the other three arms of the junction. The amended junction also includes an uncontrolled pedestrian crossing on the north side of the junction, replacing what appears to be an underused crossing on the south side, upstream of the northbound stop line. To accommodate the widening, the kerblines on both sides of Oxford Road will be realigned, together with the footway on the west side, which will also be widened.

1.3 It is acknowledged that Audit drawing 1803047-17 rev. B also shows (in light blue) an alternative scheme agreed between a developer and Oxfordshire County Council (OCC), which provides only two northbound approach lanes. In the interests of clarity, the Audit Team has considered only the scheme shown in black, i.e. as proposed by Motion. However, it is also noted that parts of the 'blue scheme' (on Ardley Road and Bicester Road) have been incorporated into the Motion scheme.

1.4 This Road Safety Audit was carried out by Steve Giles (BEng(Hons), IEng, FIHE, MICE, MCIHT, CMILT, MSoRSA, HE CertComp) and Julian Smith (BEng(Hons), MCIHT) and consisted of a desktop study and a site visit, which was carried out between 13:00 and 14:30 on Wednesday 11<sup>th</sup> March 2020, when the weather was fine and the road surface dry. Traffic flows were constant but the limited vehicle queues always discharged fully during a green signal. No pedestrian, cycle or equestrian movements were observed.

1.5 The terms of reference for this RSA are as described in the Design Manual for Roads and Bridges (DMRB) document GG119. The Audit Team is independent of the project design team and has not been involved in the design process in any other capacity. The audit considers only the potential road safety implications of the scheme and has not verified compliance of the design with any other criteria.

- 1.6 The Audit Team has not been made aware of any Departures from Standard. Whilst reference may be made to design standards, this report is not intended to provide a design check.
- 1.7 Recommendations are aimed at addressing the identified potential road safety problems. However, there may be other acceptable ways to overcome a problem, considering wider constraints and opportunities; the Auditors would be pleased to discuss such alternative solutions as appropriate. The recommendations contained herein do not absolve the Designer of his/her responsibilities.

2 ITEMS CONSIDERED BY THIS ROAD SAFETY AUDIT

Document ref.	Rev.	Originator	Title
1803047-17	B	Motion	Indicative Mitigation Works
1803047-TK62	A	Motion	Swept Path Analysis - HGVs

Additional/background information provided to the Audit Team

- Comments on the Audit drawing made by Oxfordshire County Council's Transport Planner, by email dated 10<sup>th</sup> March 2020

### 3 COLLISION DATA

- 3.1 'Crashmap' ([www.crashmap.co.uk](http://www.crashmap.co.uk)) was reviewed for personal injury collision (PIC) information for the latest available five-year period. No PICs occurred at or within 100 metres of the junction.

4 PREVIOUS ROAD SAFETY AUDIT

4.1 The Audit Team is not aware of any previous road safety audits for these proposals.

## 5 PROBLEMS IDENTIFIED BY THIS ROAD SAFETY AUDIT

### General Matters

- 5.1 The Audit Team raises no concerns at this Stage 1 RSA in respect of general matters.

### Local Alignment

- 5.2 The Audit Team raises no concerns at this Stage 1 RSA in respect of local alignment.

### Walking, Cycling and Horse Riding

#### 5.3 Problem

Footway width could lead to pedestrians being struck by vehicles

*Location: New uncontrolled crossing, east side*

The footway width at this location is presently reduced by verge overgrowth and, to a lesser extent, the boundary hedge. Pedestrians waiting to cross would therefore necessarily stand close to the kerb, potentially leaving them vulnerable to a collision with a passing vehicle.

#### Recommendation

Cut back the verge overgrowth at the back of footway on the east side of Ardley Road, particularly at the proposed uncontrolled crossing. Also trim back the boundary hedge within the highway as far as possible.

### Junctions

#### 5.4 Problem

Side impact collisions

*Location: Northbound approach to junction*

Northbound drivers approaching the junction may not be aware of the lane assignment and could make late lane changes, leading to side impact collisions.



### Recommendation

Provide a lane designation/destination sign on the northbound approach to the junction.

### Traffic Signs, Carriageway Markings and Lighting

#### 5.5 Problem

Risk of head-on collisions between right turning vehicles

*Location:* Right turn lane for Bicester Road Middleton Park the Church Throughout

Drivers turning right into Middleton Park may inadvertently stray into the right turn lane for Bicester Road, leading to heads-on collisions.

### Recommendation

On Oxford Road, provide additional road markings (e.g. arrows) and/or road studs between the southbound lane and the right turn lane to enhance legibility of road layout.

#### 5.6 Problem

Risk of collisions involving vehicles emerging from an uncontrolled access into the controlled area

*Location:* Private access to Turney Group

Drivers emerging from the private access may not know which traffic stream has priority (a green signal) and could collide with a vehicle passing through the junction.

### Recommendation

Provide a traffic signal head on the proposed pedestrian refuge, facing Ardley Road (southbound) but also visible to the drivers emerging from the private access.

#### 5.7 Problem

Risk of vehicles, cyclists and pedestrians colliding with street furniture

*Location:* Throughout

Street furniture and lighting details are not available to the Audit Team and it is acknowledged this will be a detailed design matter, for consideration at Stage 2 RSA. However, if street furniture is not mounted appropriately it could be struck by pedestrians, cyclists or vehicles.

#### Recommendation

At the detailed design stage, ensure that street furniture will be carefully located/mounted to minimise the risk of vehicle strikes and obstruction of pedestrians/cyclists.

6 AUDIT TEAM STATEMENT

6.1 We certify that this Road Safety Audit has been carried out in accordance with DMRB document GG119.

Audit Team Leader

Steve Giles  
BEng (Hons), IEng, FIHE, MCIHT, MICE, CMILT, MSoRSA, HE Cert Comp  
Director & Senior Road Safety Consultant

Signed: 

Date: 12<sup>th</sup> March 2020

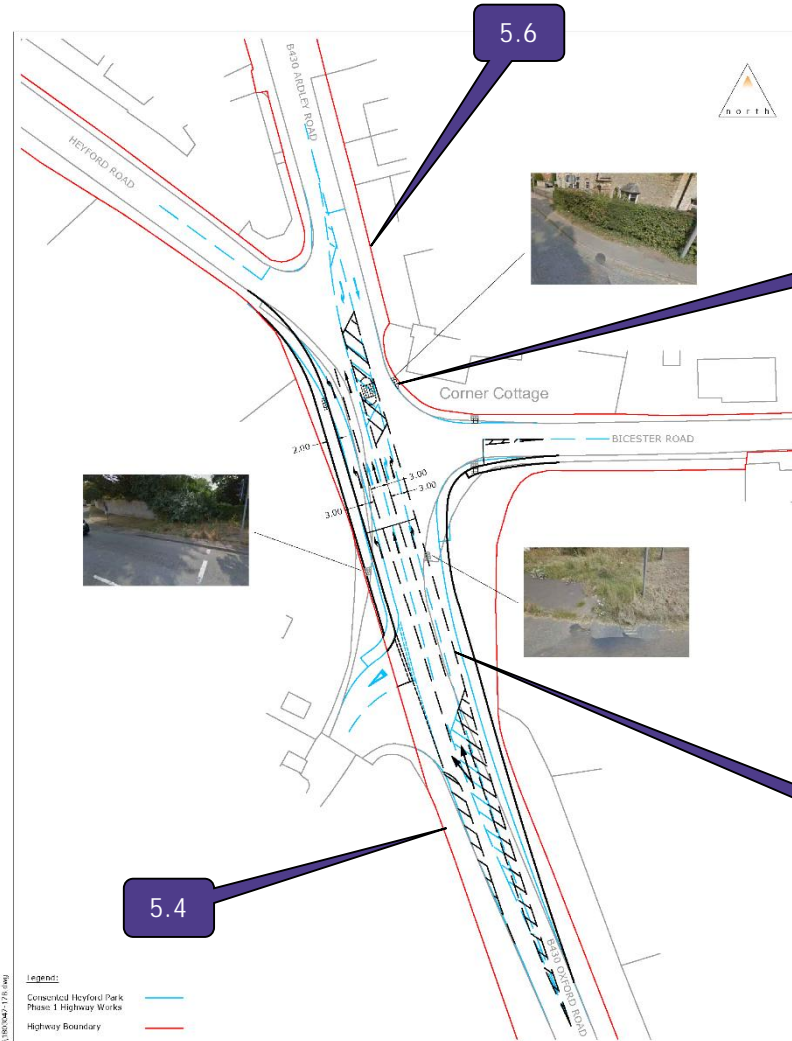
Audit Team Member(s)

Julian Smith  
BEng MCIHT  
Road Safety Engineer

Signed: 

Date: 12<sup>th</sup> March 2020

## APPENDIX A Location Plan(s)



Problem 5.7  
throughout scheme

R:\Projects\Gateway\1803047\Drawings\1803047-17B.dwg

**Legend:**  
 Commercial Heyford Park Phase 1 Highway Works   
 Highway Boundary 



Project Manager: **Chris Stone**  
 Designer: **Chris Stone**  
 Checker: **Chris Stone**  
 Date: **04/01/2024**  
 Scale: **1:500 (E/A3)**  
 Drawing: **1803047-17**  
 Revision: **B**

Project: **Great Wolf Resort, Bicester**  
 Title: **Indicative Mitigation Works**  
 Scale: **1:500 (E/A3)**  
 Notes:   
 Drawing: **1803047-17**  
 Revision: **B**

## APPENDIX B RSA Decision Log

Project: Great Wolf Resort, Bicester  
Proposed Junction Improvement at Middleton Stoney  
Client: Motion  
Document: Stage 1 Road Safety Audit  
Gateway TSP ref: SG/JS/1803047 RSA1 v1.0  
Status: v1.0  
Issue date: 12th March 2020

Item No.	Audit Team Recommendation	Designer Organisation Response	Overseeing Organisation Comments	Agreed RSA Action (design organisation and overseeing organisations agreed action to the problem)
5.1	n/a			
5.2	n/a			
5.3	Cut back the verge overgrowth at the back of footway on the east side of Ardley Road, particularly at the proposed uncontrolled crossing. Also trim back the boundary hedge within the highway.	The footway width is unchanged as part of the proposed highway works, but opportunity to cut back overgrowth and boundary hedges to improve clear footway width can be reviewed at the detailed design stage.		
5.4	Provide a lane designation/destination sign on the northbound approach to the junction.	Lane designation signage can be provided on approach to the junction and this can be included at the detailed design stage.		
5.5	On Oxford Road, provide additional road markings (e.g. arrows) and/or road studs between the southbound lane and	Additional road markings and/ or road studs can be provided and this can be included at the detailed design stage.		

Project: Great Wolf Resort, Bicester  
Proposed Junction Improvement at Middleton Stoney  
Client: Motion  
Document: Stage 1 Road Safety Audit  
Gateway TSP ref: SG/JS/1803047 RSA1 v1.0  
Status: v1.0  
Issue date: 12th March 2020

	the right turn lane to enhance legibility of road layout			
5.6	Provide a traffic signal head on the proposed pedestrian refuge, facing Ardley Road (southbound) but also visible to the drivers emerging from the private access	The positioning of signal heads will be designed at the detailed design stage but it is considered that one can be provided on the refuge island. Position of signal heads on traffic islands is commonplace and is shown, for example, at Figures 7.2.9N and 7.16Na of DMRB CD123.		
5.7	At the detailed design stage, ensure that street furniture will be carefully located/mounted to minimise the risk of vehicle strikes and obstruction of pedestrians/cyclists.	Noted. At the detailed design stage, the positioning of street furniture will consider this.		



Project: Great Wolf Resort, Bicester  
Proposed Junction Improvement at Middleton Stoney  
Client: Motion  
Document: Stage 1 Road Safety Audit  
Gateway TSP ref: SG/JS/1803047 RSA1 v1.0  
Status: v1.0  
Issue date: 12th March 2020

Design Organisation statement:

On behalf of the Design Organisation I certify that:

1. The RSA actions identified in response to the road safety audit problems in this road safety audit have been discussed and agreed with the Overseeing Organisation.

Name: David Lewis

Signed:



.....  
Position: Regional Director

Organisation: Motion

Date: 21/8/2020

Overseeing Organisation statement:

On behalf of the Overseeing Organisation I certify that:

1. The RSA actions identified in response to the road safety audit problems in this road safety audit have been discussed and agreed with the Design Organisation.
2. The agreed RSA actions will be progressed.

Name:

Signed:

.....  
Position:

Organisation:

Date:

## Appendix D

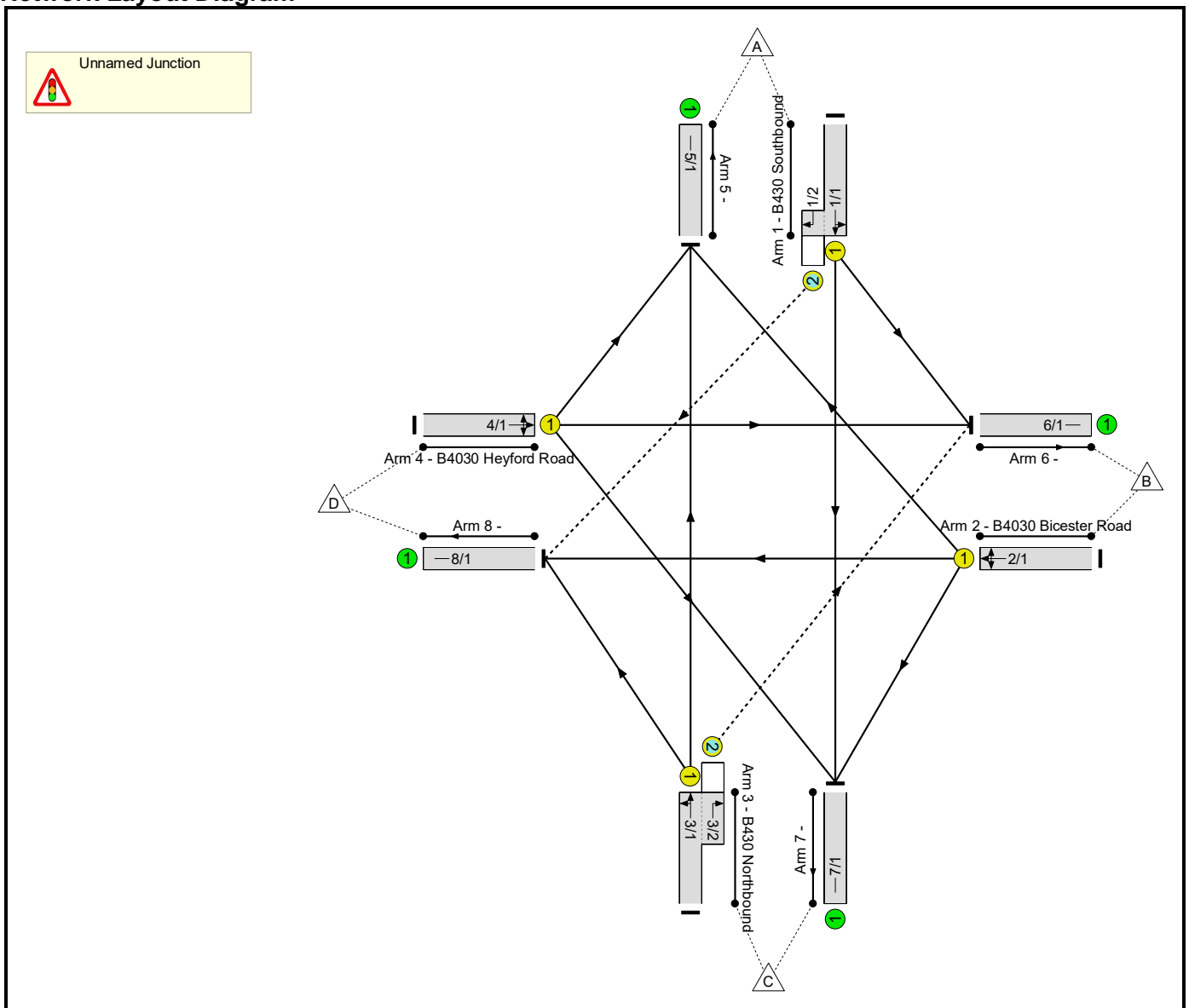
### Junction Model Output Files

Full Input Data And Results  
Full Input Data And Results

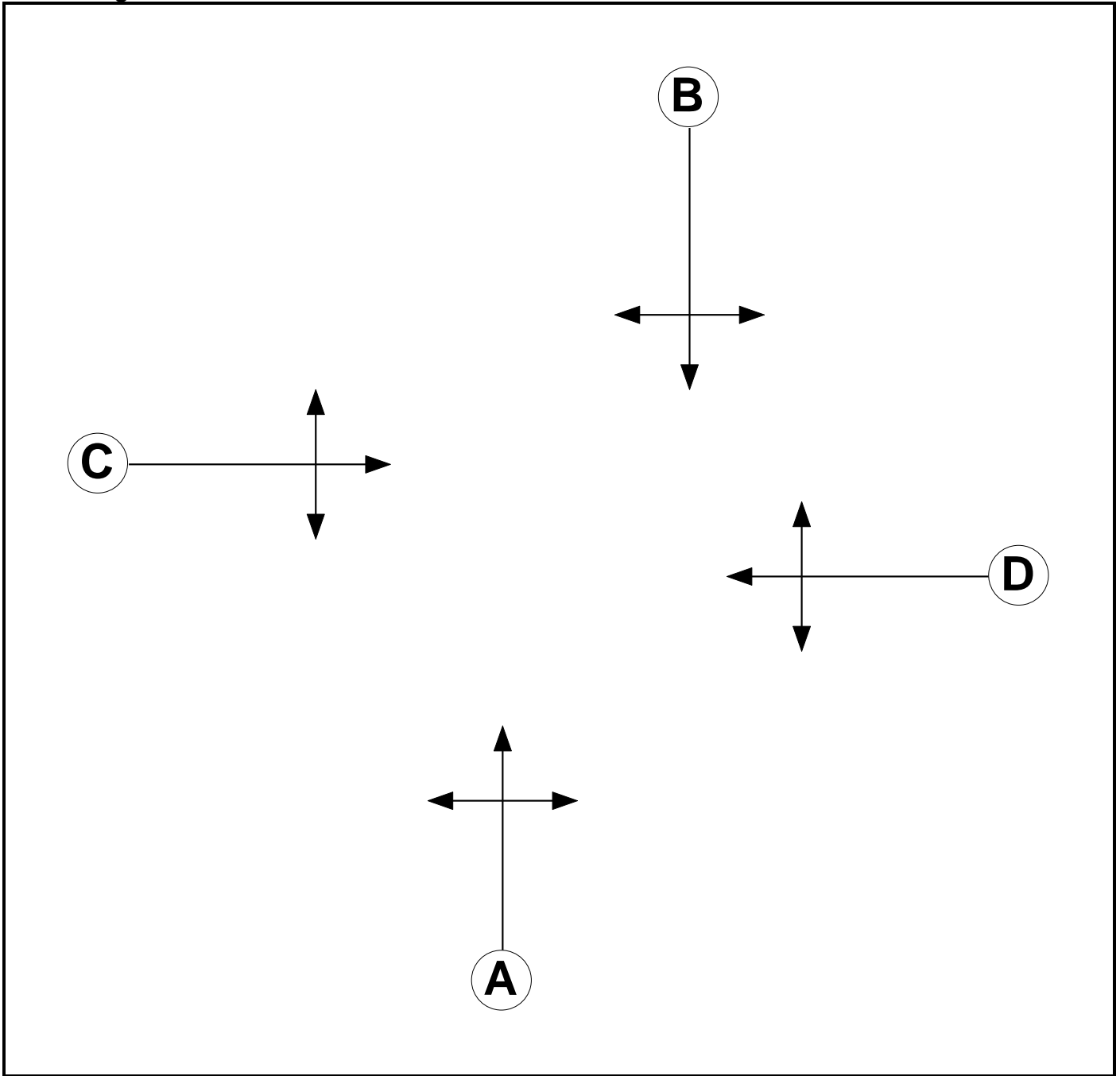
User and Project Details

Project:	Great Wolf, Chesterton
Title:	B430/B4030 Middleton Stoney
Location:	
Additional detail:	DL
File name:	Middleton Stoney - HP Baseline - 2020-09-03.lsg3x
Author:	Motion
Company:	
Address:	

Network Layout Diagram



**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

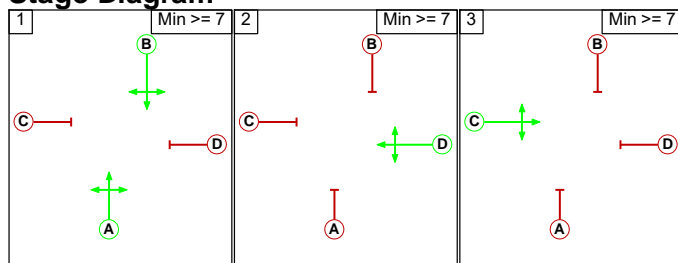
**Phase Intergrens Matrix**

		Starting Phase			
		A	B	C	D
Terminating Phase	A	-	-	9	9
	B	-	-	9	9
	C	7	7	-	7
	D	7	7	7	-

**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
There are no Phase Delays defined					

**Prohibited Stage Change**

		To Stage		
		1	2	3
From Stage	1	-	9	9
	2	7	-	7
	3	7	7	-

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)
1/2 (B430 Southbound)	8/1 (Right)	1439	0	3/1	1.09	To 5/1 (Ahead) To 8/1 (Left)	2.00	-	0.50	2	2.00
3/2 (B430 Northbound)	6/1 (Right)	1439	0	1/1	1.09	All	2.00	-	0.50	2	2.00

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 (B430 Southbound)	U	B	2	3	60.0	Geom	-	2.50	0.00	Y	Arm 6 Left	16.20
											Arm 7 Ahead	Inf
1/2 (B430 Southbound)	O	B	2	3	1.7	Geom	-	2.50	0.00	Y	Arm 8 Right	7.21
2/1 (B4030 Bicester Road)	U	D	2	3	60.0	Geom	-	3.00	0.00	Y	Arm 5 Right	16.20
											Arm 7 Left	15.60
											Arm 8 Ahead	16.50
3/1 (B430 Northbound)	U	A	2	3	60.0	Geom	-	2.50	0.00	Y	Arm 5 Ahead	Inf
											Arm 8 Left	34.50
3/2 (B430 Northbound)	O	A	2	3	3.5	Geom	-	2.50	0.00	Y	Arm 6 Right	15.28
4/1 (B4030 Heyford Road)	U	C	2	3	60.0	Geom	-	3.00	0.00	Y	Arm 5 Left	5.00
											Arm 6 Ahead	Inf
											Arm 7 Right	34.00
5/1	U		2	3	60.0	Inf	-	-	-	-	-	-
6/1	U		2	3	60.0	Inf	-	-	-	-	-	-
7/1	U		2	3	60.0	Inf	-	-	-	-	-	-
8/1	U		2	3	60.0	Inf	-	-	-	-	-	-

**Traffic Flow Groups**

Flow Group	Start Time	End Time	Duration	Formula
1: 'HP Base AM'	08:00	09:00	01:00	
2: 'HP Base PM'	17:00	18:00	01:00	

Full Input Data And Results

**Scenario 1: 'HP Base AM'** (FG1: 'HP Base AM', Plan 1: 'Network Control Plan 1')

**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: HP Base AM
<b>Junction: Unnamed Junction</b>	
1/1 (with short)	1116(In) 1113(Out)
1/2 (short)	3
2/1	509
3/1 (with short)	435(In) 390(Out)
3/2 (short)	45
4/1	34
5/1	819
6/1	411
7/1	849
8/1	15



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 (B430 Southbound)	2.50	0.00	Y	Arm 6 Left	16.20	31.5 %	1812	1812
				Arm 7 Ahead	Inf	68.5 %		
1/2 (B430 Southbound)	2.50	0.00	Y	Arm 8 Right	7.21	100.0 %	1544	1544
2/1 (B4030 Bicester Road)	3.00	0.00	Y	Arm 5 Right	16.20	83.1 %	1752	1752
				Arm 7 Left	15.60	14.9 %		
				Arm 8 Ahead	16.50	2.0 %		
3/1 (B430 Northbound)	2.50	0.00	Y	Arm 5 Ahead	Inf	99.5 %	1865	1865
				Arm 8 Left	34.50	0.5 %		
3/2 (B430 Northbound)	2.50	0.00	Y	Arm 6 Right	15.28	100.0 %	1698	1698
				Arm 5 Left	5.00	23.5 %		
4/1 (B4030 Heyford Road)	3.00	0.00	Y	Arm 6 Ahead	Inf	44.1 %	1765	1765
				Arm 7 Right	34.00	32.4 %		
5/1	Infinite Saturation Flow						Inf	Inf
6/1	Infinite Saturation Flow						Inf	Inf
7/1	Infinite Saturation Flow						Inf	Inf
8/1	Infinite Saturation Flow						Inf	Inf

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

**Traffic Flows, Desired**

**Desired Flow :**

Origin	Destination					
	A	B	C	D	Tot.	
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 2: HP Base PM
<b>Junction: Unnamed Junction</b>	
1/1 (with short)	862(In) 855(Out)
1/2 (short)	7
2/1	520
3/1 (with short)	734(In) 647(Out)
3/2 (short)	87
4/1	18
5/1	1111
6/1	617
7/1	378
8/1	28

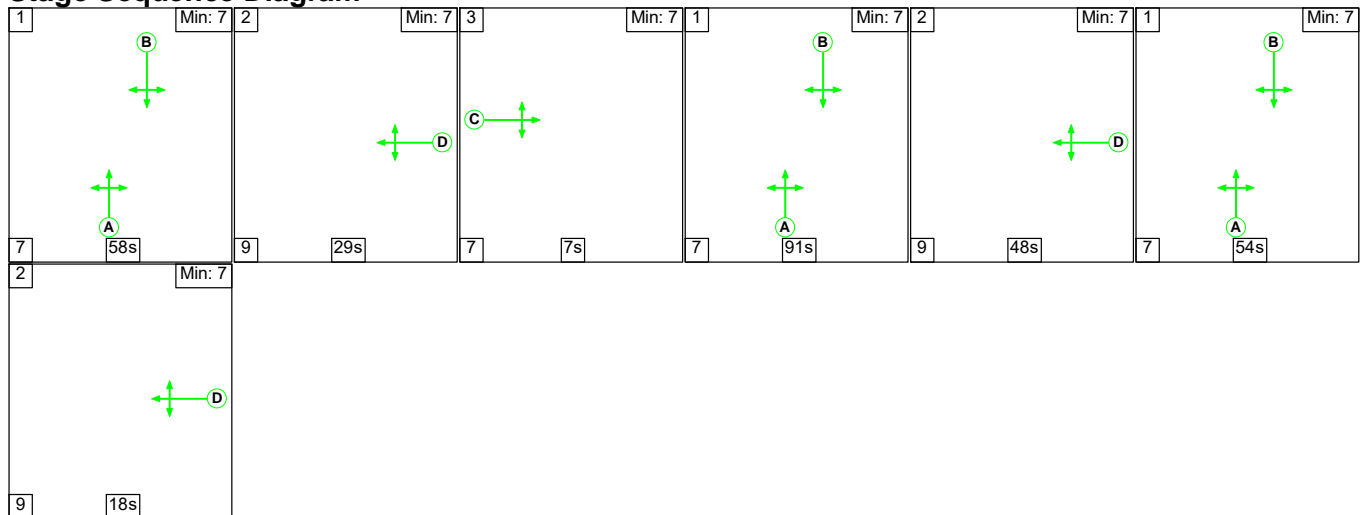
**Lane Saturation Flows**

<b>Junction: Unnamed Junction</b>								
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 (B430 Southbound)	2.50	0.00	Y	Arm 6 Left	16.20	60.7 %	1766	1766
				Arm 7 Ahead	Inf	39.3 %		
1/2 (B430 Southbound)	2.50	0.00	Y	Arm 8 Right	7.21	100.0 %	1544	1544
2/1 (B4030 Bicester Road)	3.00	0.00	Y	Arm 5 Right	16.20	89.6 %	1752	1752
				Arm 7 Left	15.60	7.3 %		
				Arm 8 Ahead	16.50	3.1 %		
3/1 (B430 Northbound)	2.50	0.00	Y	Arm 5 Ahead	Inf	99.2 %	1864	1864
				Arm 8 Left	34.50	0.8 %		
3/2 (B430 Northbound)	2.50	0.00	Y	Arm 6 Right	15.28	100.0 %	1698	1698
4/1 (B4030 Heyford Road)	3.00	0.00	Y	Arm 5 Left	5.00	16.7 %	1807	1807
				Arm 6 Ahead	Inf	61.1 %		
				Arm 7 Right	34.00	22.2 %		
5/1	Infinite Saturation Flow						Inf	Inf
6/1	Infinite Saturation Flow						Inf	Inf
7/1	Infinite Saturation Flow						Inf	Inf
8/1	Infinite Saturation Flow						Inf	Inf

## Full Input Data And Results

Scenario 1: 'HP Base AM' (FG1: 'HP Base AM', Plan 1: 'Network Control Plan 1')

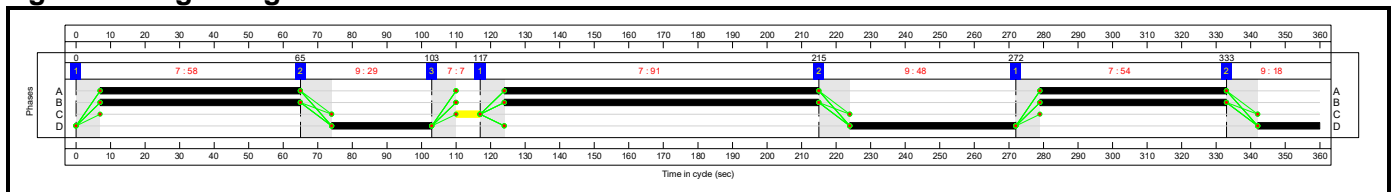
### Stage Sequence Diagram



### Stage Timings

Stage	1	2	3	1	2	1	2
Duration	58	29	7	91	48	54	18
Change Point	0	65	103	117	215	272	333

### Signal Timings Diagram

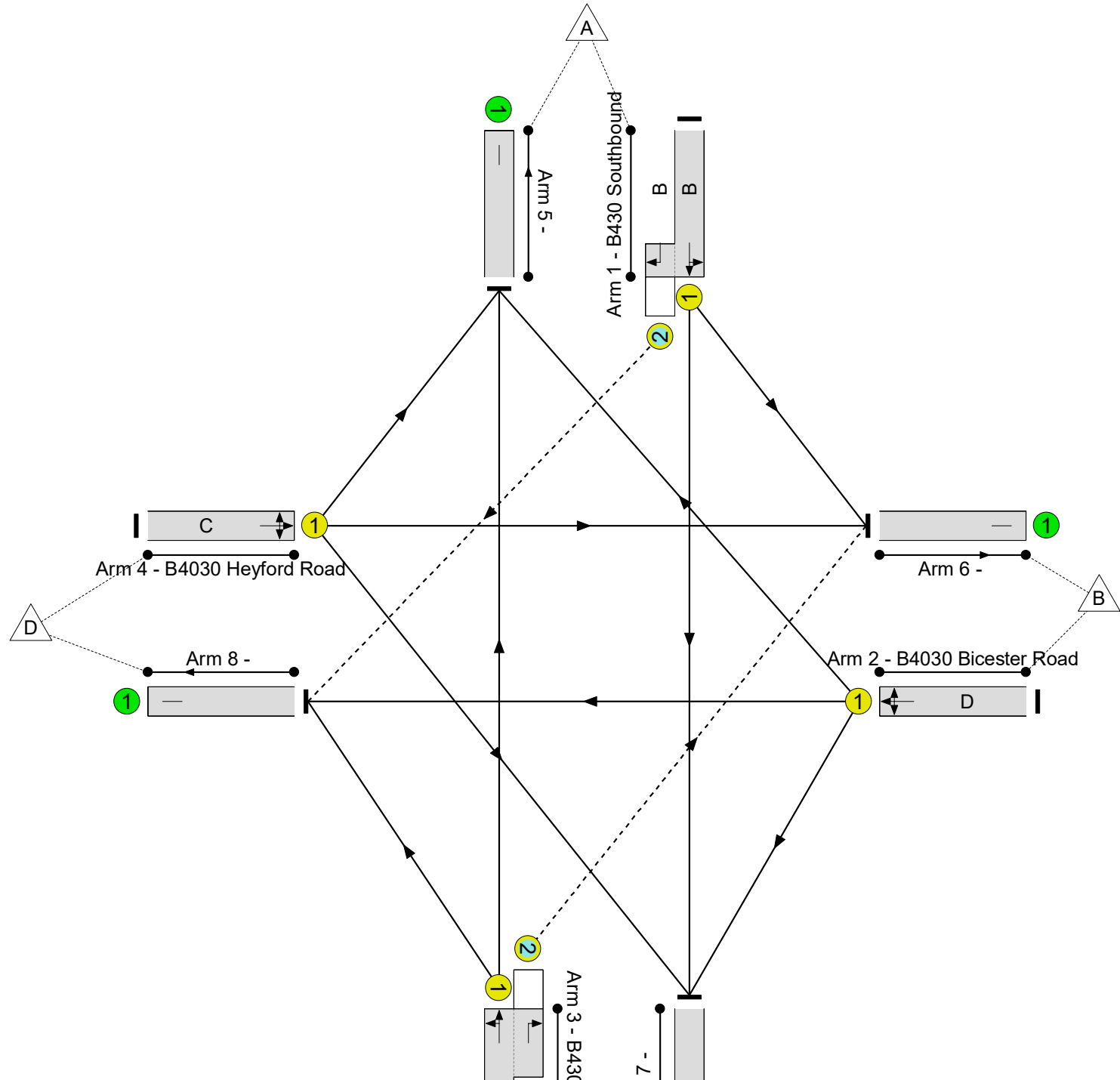


Full Input Data And Results  
**Network Layout Diagram**

# Full Input Data And Results



Unnamed Junction  
PRC: -19.3 %  
Total Traffic Delay: 111.8 pcuHr



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	-	-		-	-	-	-	-	-	107.3%
Unnamed Junction	-	-	N/A	-	-		-	-	-	-	-	-	107.3%
1/1+1/2	B430 Southbound Left Ahead Right	U+O	N/A	N/A	B		3	203	-	1116	1812:1544	1037+3	107.3 : 107.3%
2/1	B4030 Bicester Road Right Left Ahead	U	N/A	N/A	D		3	95	-	509	1752	477	106.7%
3/1+3/2	B430 Northbound Ahead Right Left	U+O	N/A	N/A	A		3	203	-	435	1865:1698	520+60	75.0 : 75.0%
4/1	B4030 Heyford Road Left Ahead Right	U	N/A	N/A	C		1	7	-	34	1765	39	86.7%
5/1		U	N/A	N/A	-		-	-	-	819	Inf	Inf	0.0%
6/1		U	N/A	N/A	-		-	-	-	411	Inf	Inf	0.0%
7/1		U	N/A	N/A	-		-	-	-	849	Inf	Inf	0.0%
8/1		U	N/A	N/A	-		-	-	-	15	Inf	Inf	0.0%

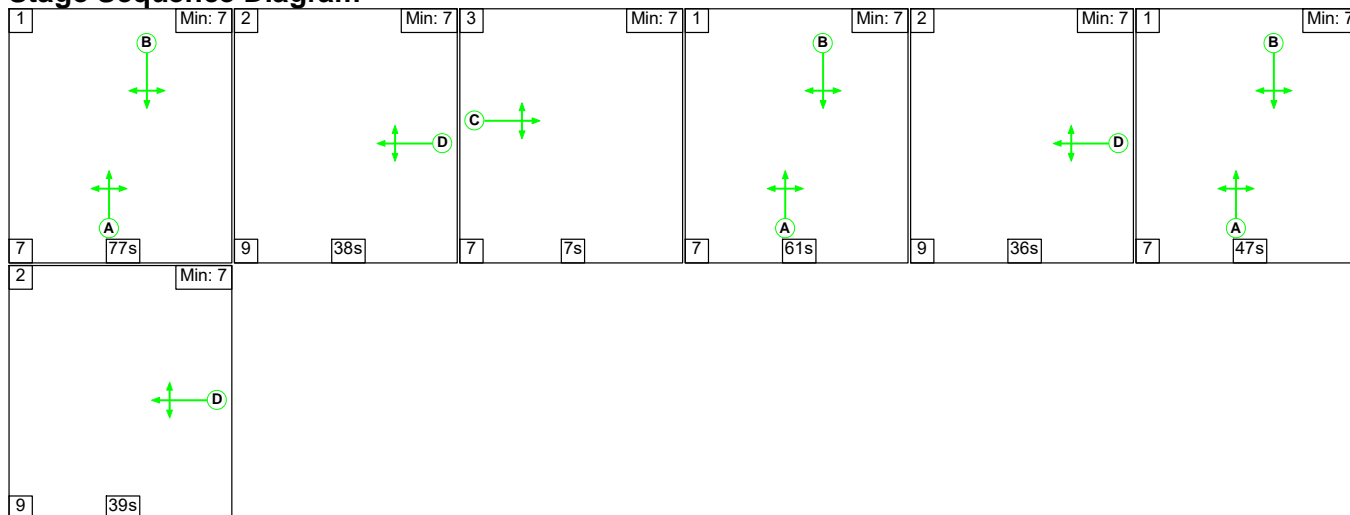
Full Input Data And Results

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	-	-	3	0	45	41.6	69.7	0.6	111.8	-	-	-	-
Unnamed Junction	-	-	3	0	45	41.6	69.7	0.6	111.8	-	-	-	-
1/1+1/2	1116	1040	3	0	0	25.0	44.4	0.0	69.4	223.9	62.1	44.4	106.5
2/1	509	477	-	-	-	13.2	21.9	-	35.0	247.6	30.3	21.9	52.2
3/1+3/2	435	435	0	0	45	1.8	1.5	0.6	3.9	32.1	9.3	1.5	10.7
4/1	34	34	-	-	-	1.7	1.9	-	3.5	375.5	3.4	1.9	5.3
5/1	792	792	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
6/1	387	387	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
7/1	792	792	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
8/1	14	14	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
<p>C1                      PRC for Signalled Lanes (%): -19.3                      Total Delay for Signalled Lanes (pcuHr): 111.85                      Cycle Time (s): 360</p> <p>                                 PRC Over All Lanes (%): -19.3                      Total Delay Over All Lanes(pcuHr): 111.85</p>													

Full Input Data And Results

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

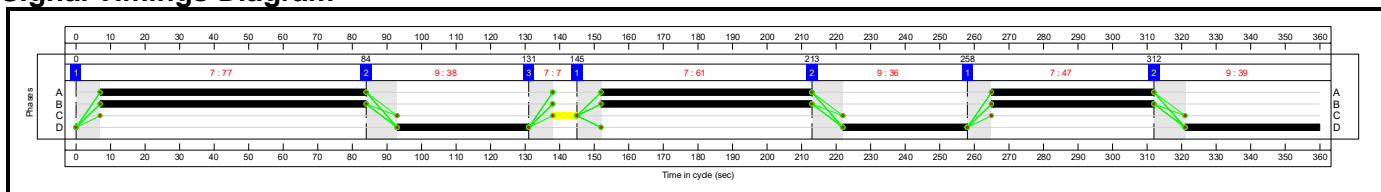
Stage Sequence Diagram



Stage Timings

Stage	1	2	3	1	2	1	2
Duration	77	38	7	61	36	47	39
Change Point	0	84	131	145	213	258	312

Signal Timings Diagram



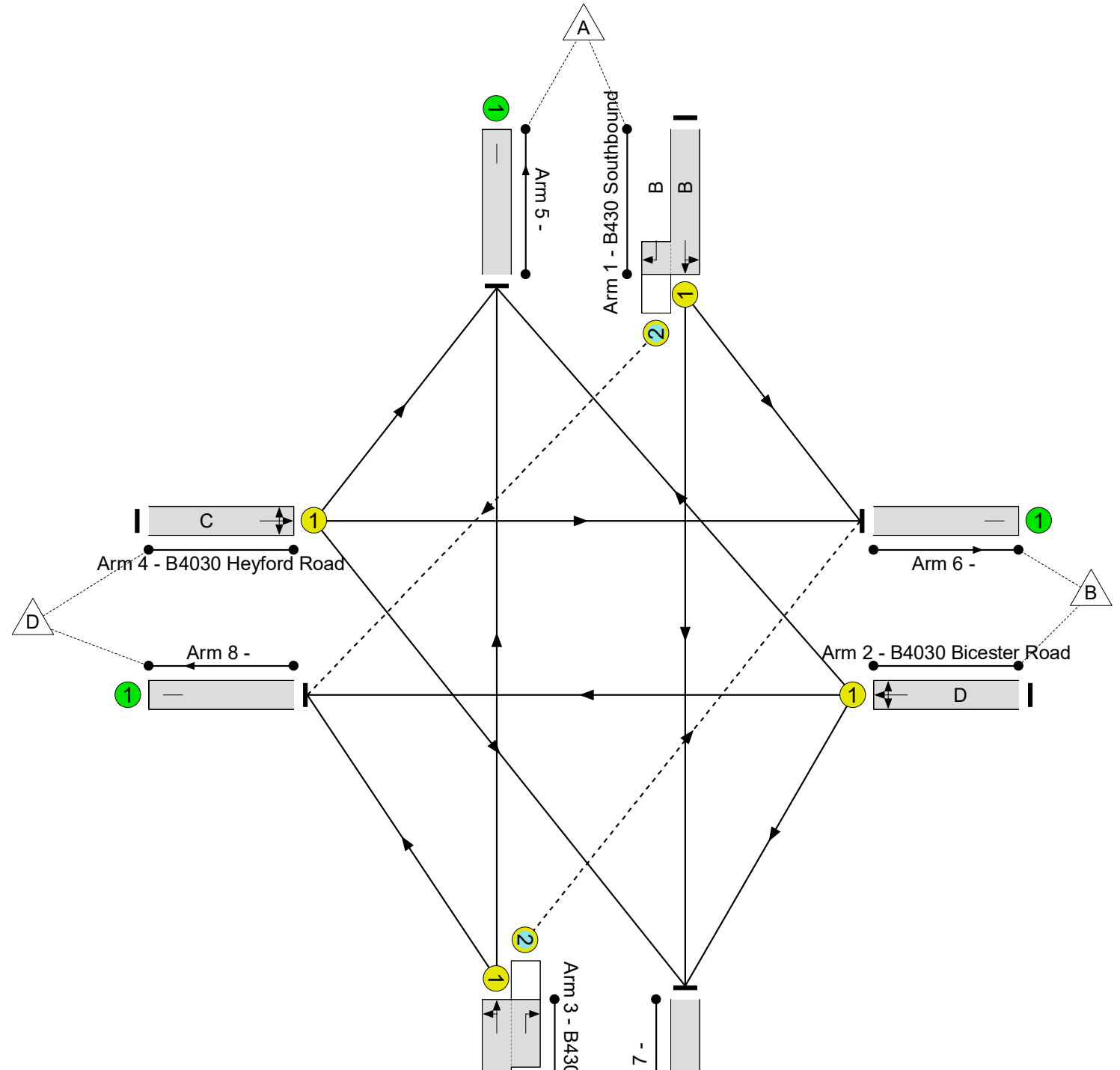


Full Input Data And Results  
**Network Layout Diagram**

# Full Input Data And Results



Unnamed Junction  
PRC: -3.0 %  
Total Traffic Delay: 35.5 pcuHr



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	-	-		-	-	-	-	-	-	92.7%
Unnamed Junction	-	-	N/A	-	-		-	-	-	-	-	-	92.7%
1/1+1/2	B430 Southbound Left Ahead Right	U+O	N/A	N/A	B		3	185	-	862	1766:1544	922+8	92.7 : 92.7%
2/1	B4030 Bicester Road Right Left Ahead	U	N/A	N/A	D		3	113	-	520	1752	565	92.1%
3/1+3/2	B430 Northbound Ahead Right Left	U+O	N/A	N/A	A		3	185	-	734	1864:1698	699+94	92.5 : 92.5%
4/1	B4030 Heyford Road Left Ahead Right	U	N/A	N/A	C		1	7	-	18	1807	40	44.8%
5/1		U	N/A	N/A	-		-	-	-	1111	Inf	Inf	0.0%
6/1		U	N/A	N/A	-		-	-	-	617	Inf	Inf	0.0%
7/1		U	N/A	N/A	-		-	-	-	378	Inf	Inf	0.0%
8/1		U	N/A	N/A	-		-	-	-	28	Inf	Inf	0.0%

Full Input Data And Results

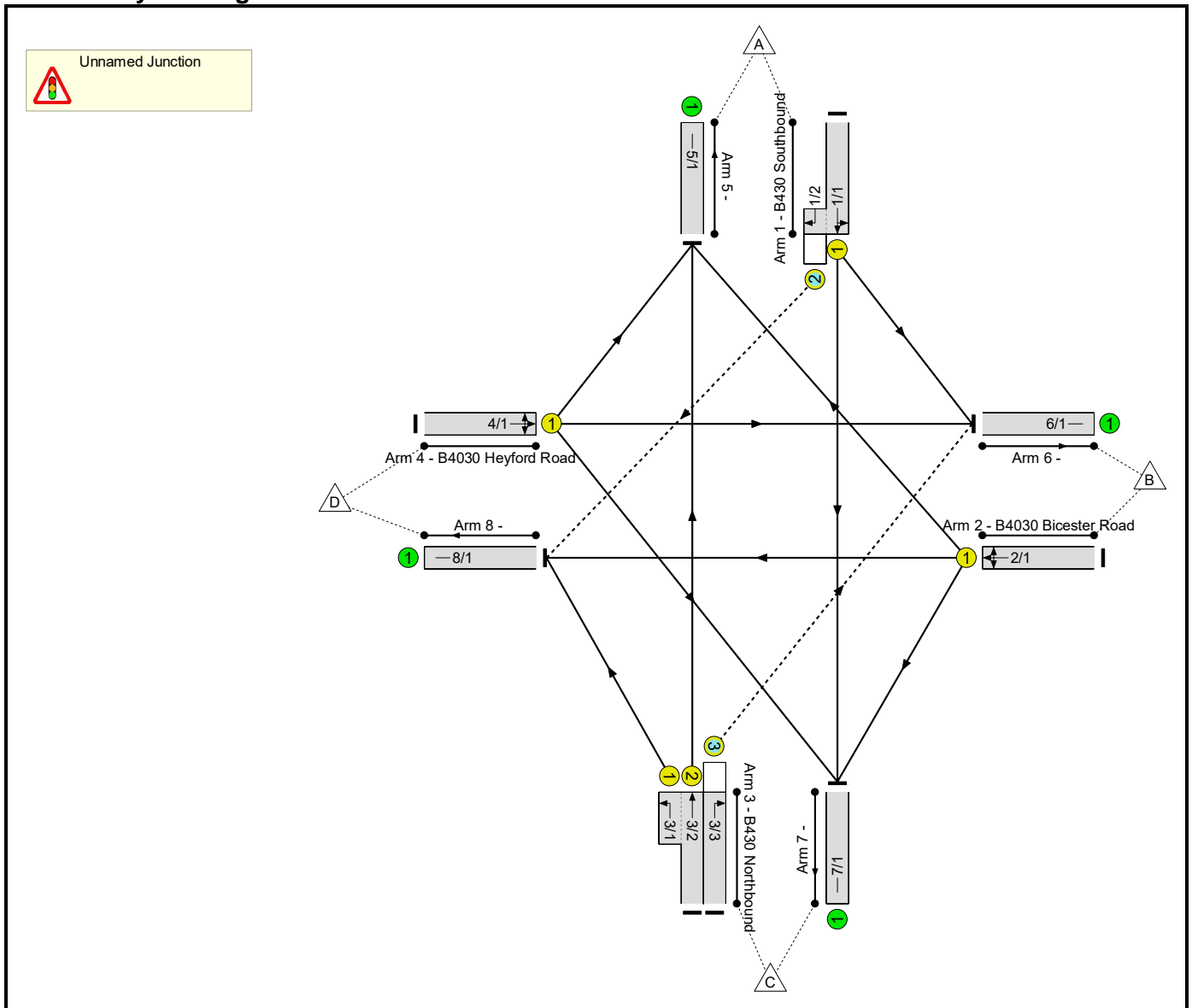
Item	Arriving (pcu)	Leaving (pcu)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Uniform Delay (pcuHr)	Rand + Oversat Delay (pcuHr)	Storage Area Uniform Delay (pcuHr)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Max. Back of Uniform Queue (pcu)	Rand + Oversat Queue (pcu)	Mean Max Queue (pcu)
<b>Network</b>	-	-	44	0	50	18.6	15.9	1.0	35.5	-	-	-	-
<b>Unnamed Junction</b>	-	-	44	0	50	18.6	15.9	1.0	35.5	-	-	-	-
1/1+1/2	862	862	7	0	0	6.6	5.5	0.0	12.1	50.4	30.9	5.5	36.3
2/1	520	520	-	-	-	5.9	4.8	-	10.7	74.1	18.8	4.8	23.6
3/1+3/2	734	734	37	0	50	5.3	5.3	0.9	11.5	56.3	21.8	5.3	27.0
4/1	18	18	-	-	-	0.9	0.4	-	1.3	252.3	1.8	0.4	2.2
5/1	1111	1111	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
6/1	617	617	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
7/1	378	378	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
8/1	28	28	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
C1			PRC for Signalled Lanes (%):		-3.0	Total Delay for Signalled Lanes (pcuHr):		35.51	Cycle Time (s): 360				
			PRC Over All Lanes (%):		-3.0	Total Delay Over All Lanes(pcuHr):		35.51					

Full Input Data And Results  
Full Input Data And Results

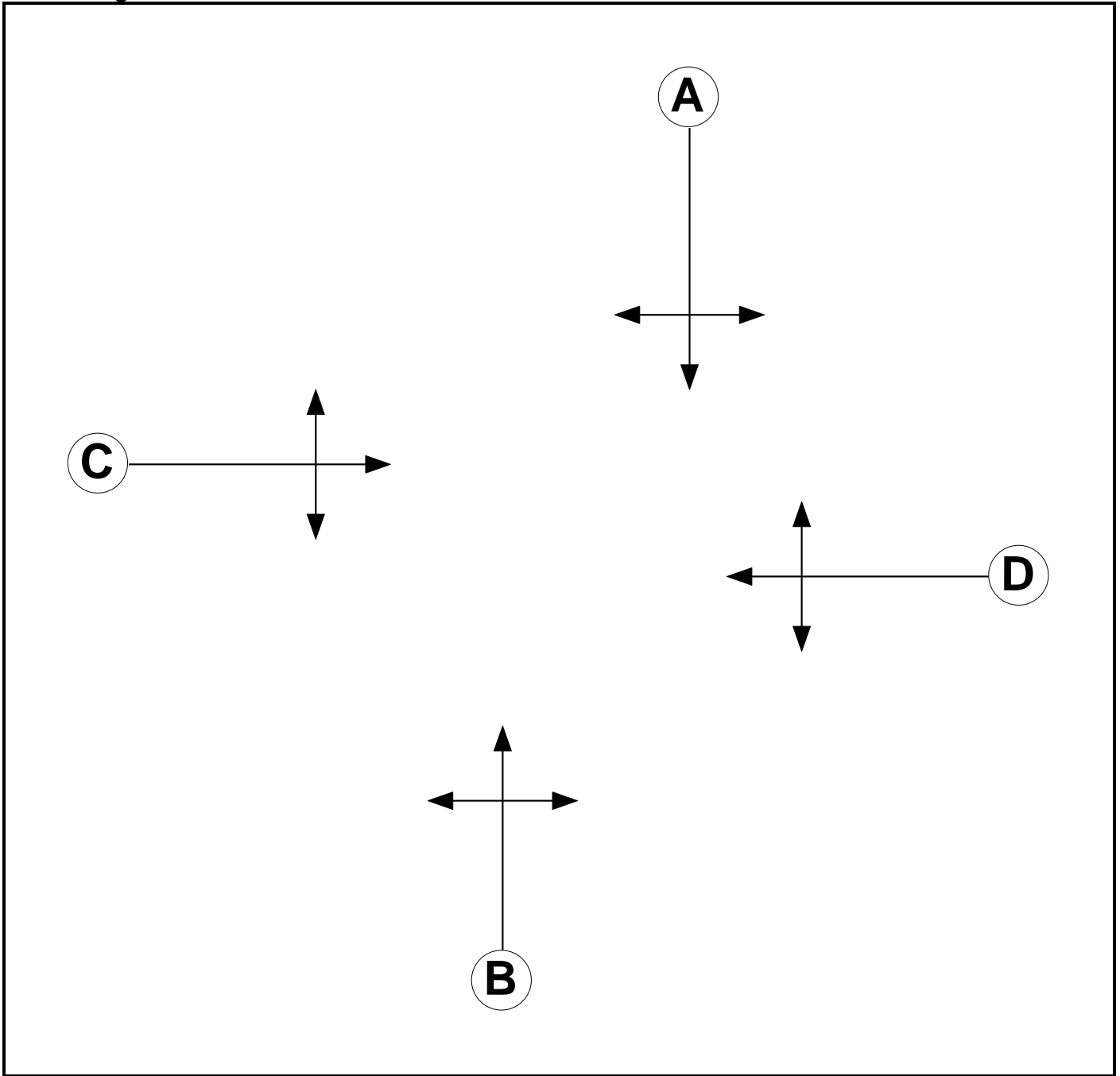
User and Project Details

Project:	Great Wolf, Chesterton
Title:	B430/B4030 Middleton Stoney
Location:	
Checked By:	DL
Additional detail:	
File name:	Middleton Stoney - GW Mitigation - 2020-09-03.lsg3x
Author:	Motion
Company:	
Address:	

Network Layout Diagram



**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

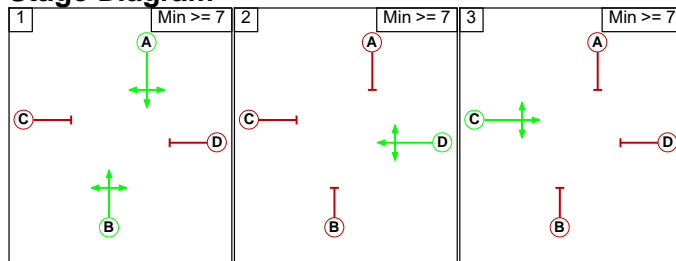
### Phase Intergrens Matrix

		Starting Phase			
		A	B	C	D
Terminating Phase	A	-	-	9	9
	B	-	-	9	9
	C	7	7	-	7
	D	7	7	7	-

### 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
There are no Phase Delays defined					

### Prohibited Stage Change

		To Stage		
		1	2	3
From Stage	1	-	9	9
	2	7	-	7
	3	7	7	-

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)
1/2 (B430 Southbound)	8/1 (Right)	1439	0	3/2	1.09	All	2.00	-	0.50	2	2.00
3/3 (B430 Northbound)	6/1 (Right)	1439	0	1/1	1.09	All	2.00	-	0.50	2	2.00



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 (B430 Southbound)	U	A	2	3	60.0	Geom	-	2.50	0.00	Y	Arm 6 Left	16.20
											Arm 7 Ahead	Inf
1/2 (B430 Southbound)	O	A	2	3	1.7	Geom	-	2.50	0.00	Y	Arm 8 Right	7.21
2/1 (B4030 Bicester Road)	U	D	2	3	60.0	Geom	-	3.00	0.00	Y	Arm 5 Right	16.20
											Arm 7 Left	15.60
											Arm 8 Ahead	16.50
3/1 (B430 Northbound)	U	B	2	3	3.5	Geom	-	2.50	0.00	Y	Arm 8 Left	34.50
3/2 (B430 Northbound)	U	B	2	3	60.0	Geom	-	2.50	0.00	Y	Arm 5 Ahead	Inf
3/3 (B430 Northbound)	O	B	2	3	60.0	Geom	-	2.50	0.00	Y	Arm 6 Right	15.28
4/1 (B4030 Heyford Road)	U	C	2	3	60.0	Geom	-	3.00	0.00	Y	Arm 5 Left	5.00
											Arm 6 Ahead	Inf
											Arm 7 Right	34.00
5/1	U		2	3	60.0	Inf	-	-	-	-	-	-
6/1	U		2	3	60.0	Inf	-	-	-	-	-	-
7/1	U		2	3	60.0	Inf	-	-	-	-	-	-
8/1	U		2	3	60.0	Inf	-	-	-	-	-	-

**Traffic Flow Groups**

Flow Group	Start Time	End Time	Duration	Formula
3: 'HP Base + GW AM'	08:00	09:00	01:00	
4: 'HP Base + GW PM'	17:00	18:00	01:00	

Full Input Data And Results

**Scenario 3: 'HP Base + GW AM'** (FG3: 'HP Base + GW AM', Plan 1: 'Network Control Plan 1')

**Traffic Flows, Desired**

**Desired Flow :**

Origin	Destination					
	A	B	C	D	Tot.	
A	0	351	782	3	1136	
B	423	0	76	10	509	
C	402	45	0	2	449	
D	8	15	11	0	34	
Tot.	833	411	869	15	2128	

**Traffic Lane Flows**

Lane	Scenario 3: HP Base + GW AM
<b>Junction: Unnamed Junction</b>	
1/1 (with short)	1136(In) 1133(Out)
1/2 (short)	3
2/1	509
3/1 (short)	2
3/2 (with short)	404(In) 402(Out)
3/3	45
4/1	34
5/1	833
6/1	411
7/1	869
8/1	15

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 (B430 Southbound)	2.50	0.00	Y	Arm 6 Left	16.20	31.0 %	1813	1813
				Arm 7 Ahead	Inf	69.0 %		
1/2 (B430 Southbound)	2.50	0.00	Y	Arm 8 Right	7.21	100.0 %	1544	1544
2/1 (B4030 Bicester Road)	3.00	0.00	Y	Arm 5 Right	16.20	83.1 %	1752	1752
				Arm 7 Left	15.60	14.9 %		
				Arm 8 Ahead	16.50	2.0 %		
3/1 (B430 Northbound)	2.50	0.00	Y	Arm 8 Left	34.50	100.0 %	1787	1787
3/2 (B430 Northbound)	2.50	0.00	Y	Arm 5 Ahead	Inf	100.0 %	1865	1865
3/3 (B430 Northbound)	2.50	0.00	Y	Arm 6 Right	15.28	100.0 %	1698	1698
				Arm 5 Left	5.00	23.5 %		
4/1 (B4030 Heyford Road)	3.00	0.00	Y	Arm 6 Ahead	Inf	44.1 %	1765	1765
				Arm 7 Right	34.00	32.4 %		
				Infinite Saturation Flow				
5/1				Infinite Saturation Flow			Inf	Inf
6/1				Infinite Saturation Flow			Inf	Inf
7/1				Infinite Saturation Flow			Inf	Inf
8/1				Infinite Saturation Flow			Inf	Inf

**Scenario 4: 'HP Base + GW PM'** (FG4: 'HP Base + GW PM', Plan 1: 'Network Control Plan 1')

**Traffic Flows, Desired**

**Desired Flow :**

Origin	Destination					Tot.
	A	B	C	D	Tot.	
A	0	519	356	7	882	
B	466	0	38	16	520	
C	668	87	0	5	760	
D	3	11	4	0	18	
Tot.	1137	617	398	28	2180	

Full Input Data And Results

**Traffic Lane Flows**

Scenario 4: HP Base + GW PM	
<b>Junction: Unnamed Junction</b>	
1/1 (with short)	882(In) 875(Out)
1/2 (short)	7
2/1	520
3/1 (short)	5
3/2 (with short)	673(In) 668(Out)
3/3	87
4/1	18
5/1	1137
6/1	617
7/1	398
8/1	28

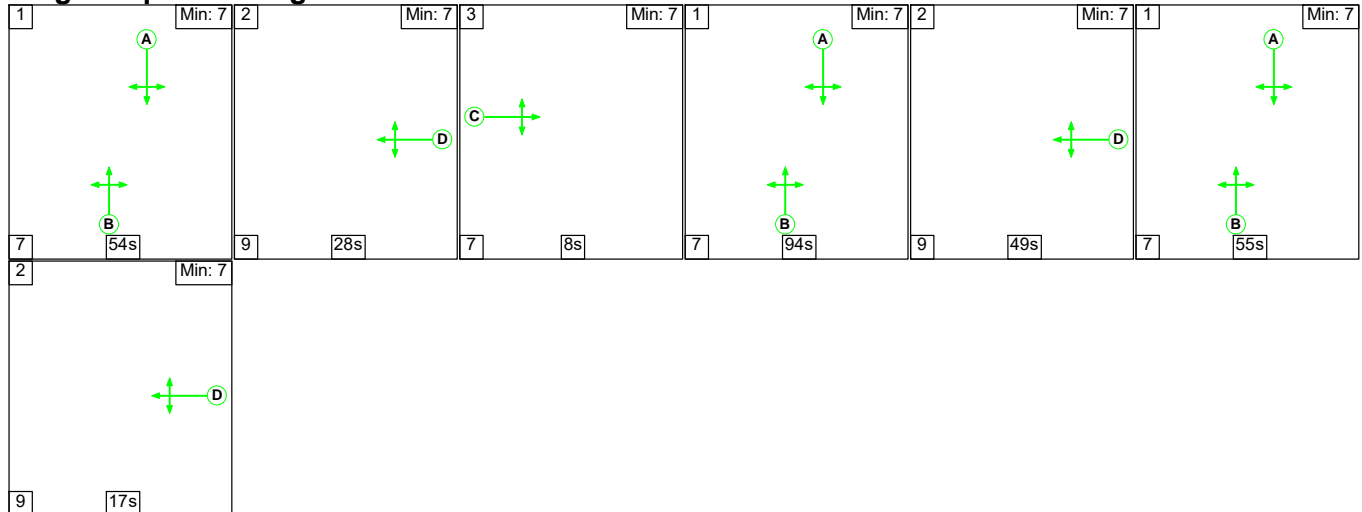
**Lane Saturation Flows**

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 (B430 Southbound)	2.50	0.00	Y	Arm 6 Left	16.20	59.3 %	1768	1768
				Arm 7 Ahead	Inf	40.7 %		
1/2 (B430 Southbound)	2.50	0.00	Y	Arm 8 Right	7.21	100.0 %	1544	1544
2/1 (B4030 Bicester Road)	3.00	0.00	Y	Arm 5 Right	16.20	89.6 %	1752	1752
				Arm 7 Left	15.60	7.3 %		
				Arm 8 Ahead	16.50	3.1 %		
3/1 (B430 Northbound)	2.50	0.00	Y	Arm 8 Left	34.50	100.0 %	1787	1787
3/2 (B430 Northbound)	2.50	0.00	Y	Arm 5 Ahead	Inf	100.0 %	1865	1865
3/3 (B430 Northbound)	2.50	0.00	Y	Arm 6 Right	15.28	100.0 %	1698	1698
				Arm 5 Left	5.00	16.7 %		
				Arm 6 Ahead	Inf	61.1 %		
				Arm 7 Right	34.00	22.2 %		
4/1 (B4030 Heyford Road)	3.00	0.00	Y				1807	1807
5/1	Infinite Saturation Flow						Inf	Inf
6/1	Infinite Saturation Flow						Inf	Inf
7/1	Infinite Saturation Flow						Inf	Inf
8/1	Infinite Saturation Flow						Inf	Inf

## Full Input Data And Results

Scenario 3: 'HP Base + GW AM' (FG3: 'HP Base + GW AM', Plan 1: 'Network Control Plan 1')

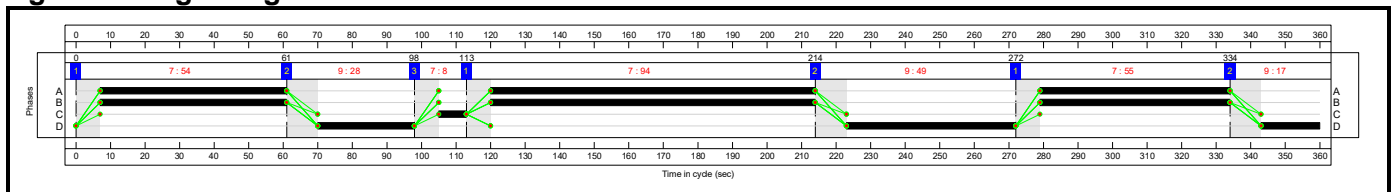
### Stage Sequence Diagram



### Stage Timings

Stage	1	2	3	1	2	1	2
Duration	54	28	8	94	49	55	17
Change Point	0	61	98	113	214	272	334

### Signal Timings Diagram

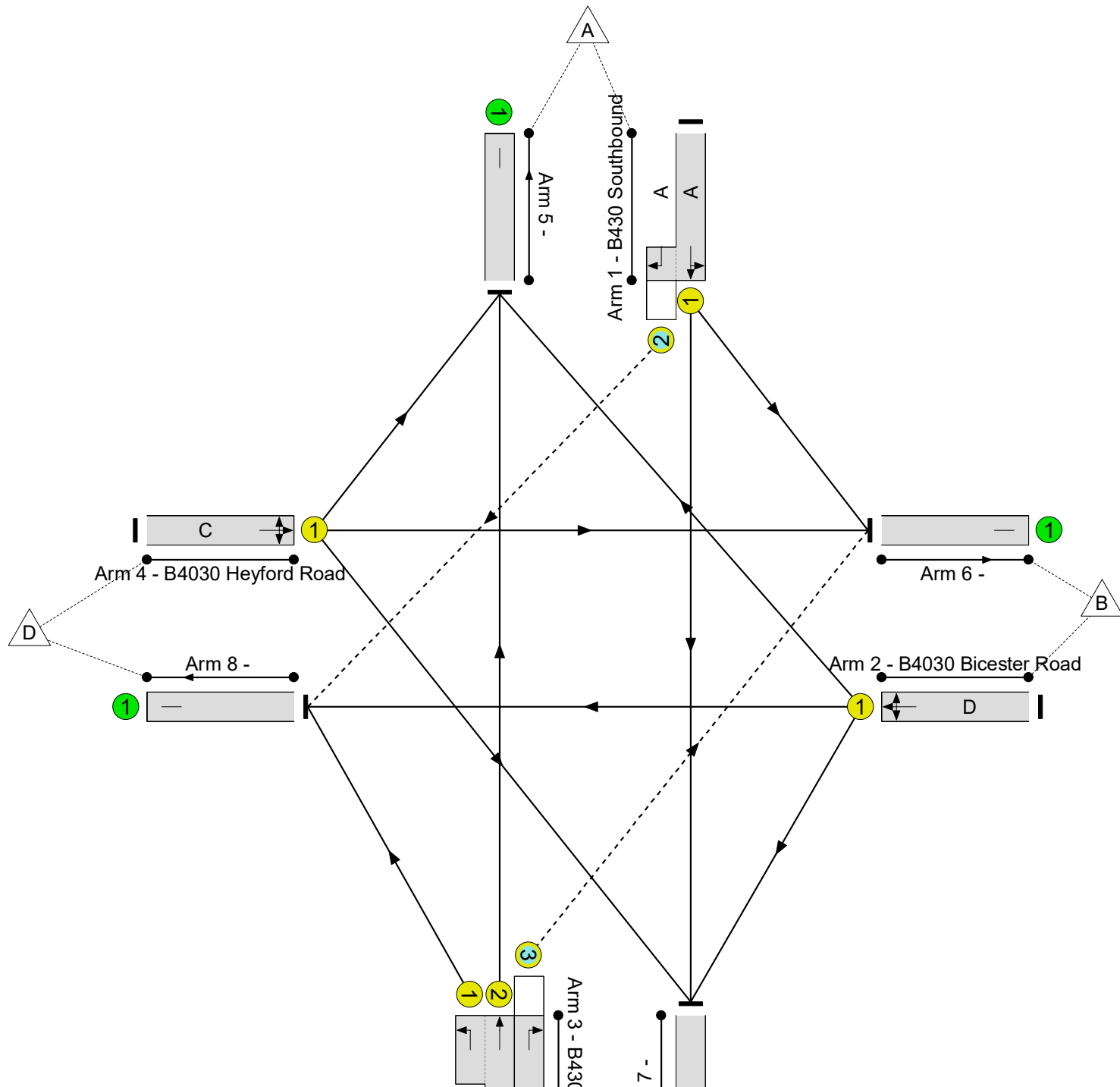


Full Input Data And Results  
**Network Layout Diagram**

# Full Input Data And Results



Unnamed Junction  
PRC: -21.3 %  
Total Traffic Delay: 127.7 pcuHr



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 (%)
<b>Network: B430/B4030 Middleton Stoney</b>	-	-	N/A	-	-		-	-	-	-	-	-	109.2%
<b>Unnamed Junction</b>	-	-	N/A	-	-		-	-	-	-	-	-	109.2%
1/1+1/2	B430 Southbound Left Ahead Right	U+O	N/A	N/A	A		3	203	-	1136	1813:1544	1037+3	109.2 : 109.2%
2/1	B4030 Bicester Road Right Left Ahead	U	N/A	N/A	D		3	94	-	509	1752	472	107.8%
3/2+3/1	B430 Northbound Ahead Left	U	N/A	N/A	B		3	203	-	404	1865:1787	1066+5	37.7 : 37.7%
3/3	B430 Northbound Right	O	N/A	N/A	B		3	203	-	45	1698	60	75.0%
4/1	B4030 Heyford Road Left Ahead Right	U	N/A	N/A	C		1	8	-	34	1765	44	77.1%
5/1		U	N/A	N/A	-		-	-	-	833	Inf	Inf	0.0%
6/1		U	N/A	N/A	-		-	-	-	411	Inf	Inf	0.0%
7/1		U	N/A	N/A	-		-	-	-	869	Inf	Inf	0.0%
8/1		U	N/A	N/A	-		-	-	-	15	Inf	Inf	0.0%



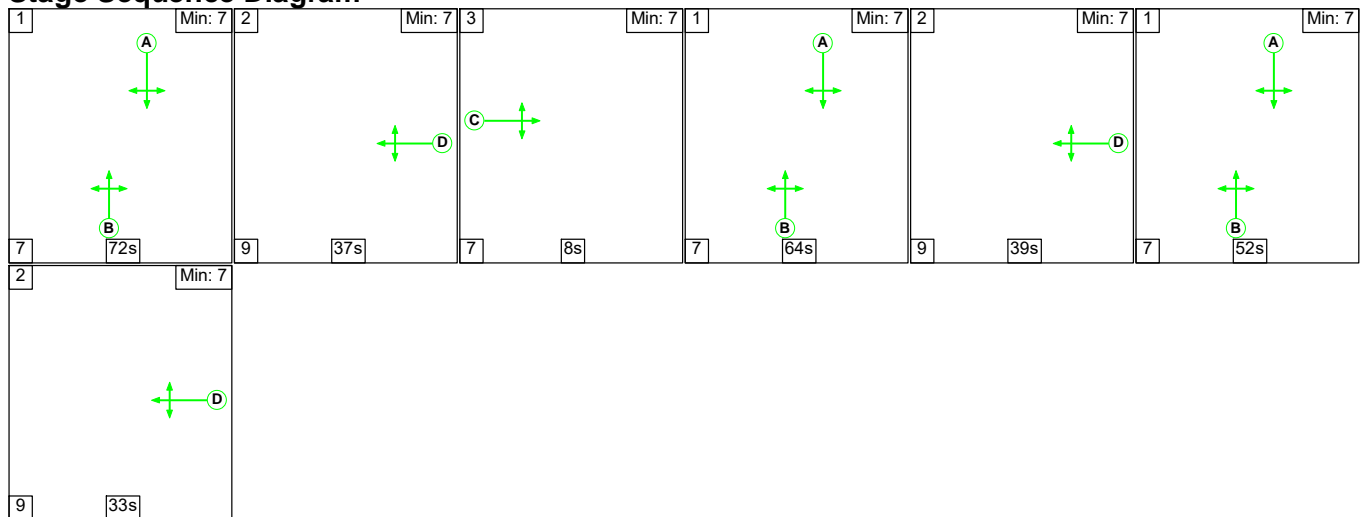
Full Input Data And Results

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)
<b>Network: B430/B4030 Middleton Stoney</b>	-	-	3	0	45	47.1	80.0	0.7	127.7	-	-	-	-
<b>Unnamed Junction</b>	-	-	3	0	45	47.1	80.0	0.7	127.7	-	-	-	-
1/1+1/2	1136	1040	3	0	0	29.2	53.2	0.0	82.4	261.3	67.8	53.2	121.0
2/1	509	472	-	-	-	14.4	23.8	-	38.2	270.1	32.0	23.8	55.8
3/2+3/1	404	404	-	-	-	1.7	0.3	-	2.0	17.7	9.1	0.3	9.4
3/3	45	45	0	0	45	0.2	1.3	0.7	2.1	167.2	0.8	1.3	2.1
4/1	34	34	-	-	-	1.6	1.3	-	3.0	315.3	3.4	1.3	4.7
5/1	802	802	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
6/1	381	381	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
7/1	798	798	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
8/1	14	14	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
C1			PRC for Signalled Lanes (%):	-21.3	Total Delay for Signalled Lanes (pcuHr):			127.69	Cycle Time (s): 360				
			PRC Over All Lanes (%):	-21.3	Total Delay Over All Lanes(pcuHr):			127.69					

Full Input Data And Results

Scenario 4: 'HP Base + GW PM' (FG4: 'HP Base + GW PM', Plan 1: 'Network Control Plan 1')

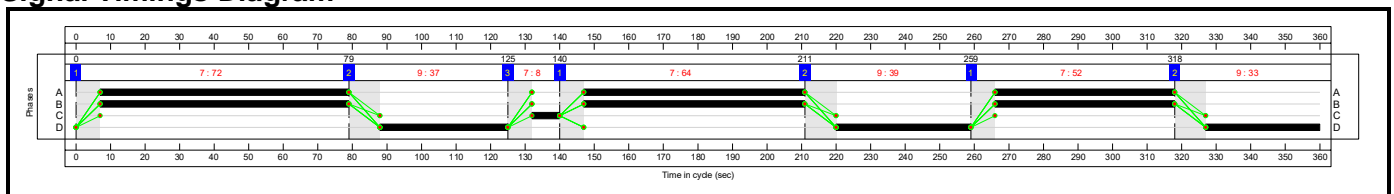
Stage Sequence Diagram



Stage Timings


Stage	1	2	3	1	2	1	2
Duration	72	37	8	64	39	52	33
Change Point	0	79	125	140	211	259	318

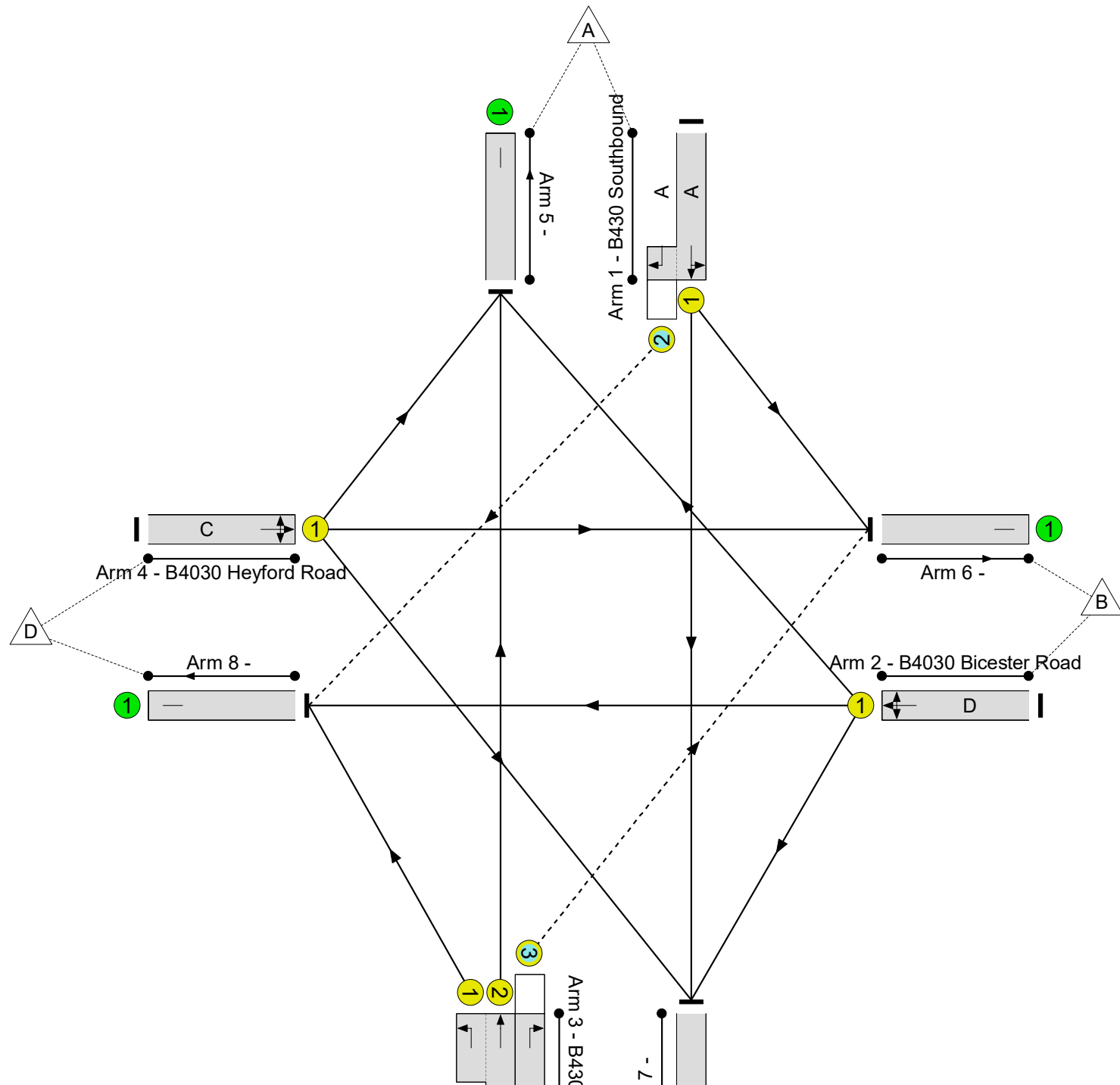
Signal Timings Diagram



Full Input Data And Results  
**Network Layout Diagram**

Full Input Data And Results


**Unnamed Junction**  
 PRC: -6.2 %  
 Total Traffic Delay: 37.5 pcuHr



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 (%)
<b>Network: B430/B4030 Middleton Stoney</b>	-	-	N/A	-	-		-	-	-	-	-	-	95.6%
<b>Unnamed Junction</b>	-	-	N/A	-	-		-	-	-	-	-	-	95.6%
1/1+1/2	B430 Southbound Left Ahead Right	U+O	N/A	N/A	A		3	188	-	882	1768:1544	938+8	93.3 : 93.3%
2/1	B4030 Bicester Road Right Left Ahead	U	N/A	N/A	D		3	109	-	520	1752	545	95.4%
3/2+3/1	B430 Northbound Ahead Left	U	N/A	N/A	B		3	188	-	673	1865:1787	987+7	67.7 : 67.7%
3/3	B430 Northbound Right	O	N/A	N/A	B		3	188	-	87	1698	91	95.6%
4/1	B4030 Heyford Road Left Ahead Right	U	N/A	N/A	C		1	8	-	18	1807	45	39.8%
5/1		U	N/A	N/A	-		-	-	-	1137	Inf	Inf	0.0%
6/1		U	N/A	N/A	-		-	-	-	617	Inf	Inf	0.0%
7/1		U	N/A	N/A	-		-	-	-	398	Inf	Inf	0.0%
8/1		U	N/A	N/A	-		-	-	-	28	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)
<b>Network: B430/B4030 Middleton Stoney</b>	-	-	41	0	53	18.7	17.7	1.0	37.5	-	-	-	-
<b>Unnamed Junction</b>	-	-	41	0	53	18.7	17.7	1.0	37.5	-	-	-	-
1/1+1/2	882	882	7	0	0	6.6	5.9	0.0	12.5	51.0	32.3	5.9	38.2
2/1	520	520	-	-	-	6.0	6.7	-	12.7	88.0	19.2	6.7	26.0
3/2+3/1	673	673	-	-	-	3.9	1.0	-	5.0	26.6	19.4	1.0	20.5
3/3	87	87	34	0	53	1.3	3.8	1.0	6.1	252.1	4.6	3.8	8.4
4/1	18	18	-	-	-	0.9	0.3	-	1.2	237.6	1.8	0.3	2.1
5/1	1137	1137	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
6/1	617	617	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
7/1	398	398	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
8/1	28	28	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
C1			PRC for Signalled Lanes (%):		-6.2	Total Delay for Signalled Lanes (pcuHr):		37.46	Cycle Time (s): 360				
			PRC Over All Lanes (%):		-6.2	Total Delay Over All Lanes(pcuHr):		37.46					