Pell Frischmann

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| Project | Northampton Gateway |
| Client | West Northamptonshire Council |
| Document Title or Subject | Transport Addendum Review |
| Document Reference | WNC-TA-160 |
| Revision Reference | C |
| Prepared by | A Carpenter |
| Date | 09/06/2025 |

# 1 Introduction

West Northamptonshire Council (WNC) has commissioned Pell Frischmann to undertake a technical review of the Transport Assessment Addendum (TAA) (Doc Ref: ADC3519-RP-B) submitted in support of an amendment to a DCO application (ref: S.I. 2019 No. 1358) for the Northampton Gateway SRFI scheme.

The subject of the review is the junction capacity assessments, geometric layout of the site access junction and the general submission in order to supplement WNC's review such as trip generation, assessment scenarios

The Consented DCO scheme was granted approval in October 2019 and comprises the following:

- An intermodal freight terminal including container and HGV parking, rail sidings to serve individual warehouses, and the provision of an aggregates facility as part of the intermodal freight terminal, with the capability to also provide a rapid rail freight facility.
- Up to 468,0000 sqm of warehousing and ancillary buildings, with additional floorspace provided in the form of mezzanines.
- A secure, dedicated, HGV parking area of approximately 120 spaces including driver welfare facilities to meet the needs of HGVs visiting the site or intermodal terminal.
- A new road infrastructure and works to the existing road network, including the provision of a new access and associated works to the A508, a new bypass to the village of Roade, improvements to Junction 15 and to J15A of the M1 motorway, the A45, and other highway improvements at junctions on the local highway network and related traffic management measures.
- Strategic landscaping and tree planting, including diverted public rights of way.
- Earthworks and demolition of existing structures on the SRFI site.

Appendix 6 of the application contains a series of Technical Notes and LinSig modelling assessments for the site access junction which was submitted in support of the scheme. The results of capacity assessments were presented in a Transport Assessment Addendum (Doc Ref: ADC3519-RP-B) dated 23/05/2024. This was then subject to a series of comments raised by national Highway (NH) in November 2024. The applicant provided a response along with revised modelling outputs in a letter dated 2nd December 2024. This review focuses on the latest LinSig modelling outputs following the NH review. The modelling outputs are contained in Appendix 2 of Appendix 6 – Transport Technical Note. The relevant outputs have been extracted from Appendix 2 and are contained in Appendix A of this Technical Note.

The structure of this TN is set out as follows:

- **Section 2** details the development proposals and the proposed mitigation strategy.
- **Section 3** sets out the existing junction layout and future design of the junction.
- **Section 4** details the scenarios which have been assessed and the traffic flows set out in the model.
- **Section 5** reviews the structure of the LinSig model including the coding of the geometric parameters.
- **Section 6** reviews the controller setup including phasing, staging and intergreens.
- **Section 7** provides a commentary on the results on the junction capacity assessments.

- **Section 8** details the reviews summary and conclusions.

# 2 Development Proposals

The amendment seeks to increase the amount of warehousing on the SRFI site to 111,480 sqm. This is to be done by increasing the mezzanine space onsite. To accommodate the additional trips associated with the increased warehousing space, the applicant is proposing to partial signalisation of the A508 / Site Access Junction. This includes increasing the length of the shared pedestrian / cycle footway along the eastern side of the A508 and relocating the eastern TOUCAN crossing further south closer to the junction and introduces a stop line in the northern circulatory lane. The western TOUCAN crossing will remain as existing.

# 3 Junction Layout and Design

The existing junction layout is shown in Figure 1 with the proposed junction layout shown in Figure 2.

**Figure 1 Existing Site Access Layout**

**Figure 2 Proposed Mitigation Strategy - Partially Signalised Roundabout**

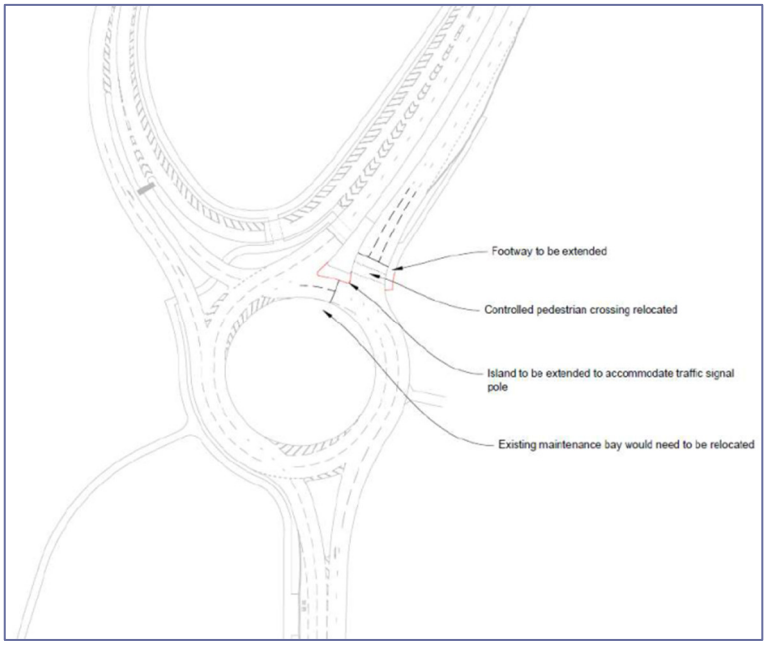


Figure 2 shows that the mitigation proposals are to partially signalise the roundabout at the northern point of the circulatory carriageway and the southbound entry arm.

A review of the geometric design of the junction mitigation has been undertaken along with the existing layout. The following drawings and reports has been reviewed:

- Drawings 3519 ZZ XX DR Z 0100,
- Drawing NGW-BWB-HGN-SM7A-DR-CH-0100
- Drawing NGW-BWB-HGN-SM7A-DR-CH-0130
- Road Safety Audit (RSA) stage 1 Report - NGW-BWB-GEN-RSA-RP-TR-0022_RSA1

The review has been based on the guidance found in DMRB CD 116: Geometric design of roundabouts and has been undertaken using desktop research only.

Assessment of the Existing Roundabout Design

- The raised landscaping on the central island appears to be causing visibility issues across the central island. For example, assuming amounting height of 1.2m the bottom of the advanced direction sign on the splitter islands opposite should be visible to drivers at eye height from 1.05m. An inspection on Google Street View indicates that these visibility requirements are not met (CD116 Paragraph 3.4.2 and 3.53).
- The inscribed circle diameter (ICD) of the roundabout is around 85m which is within the limits of the 100m maximum for a normal roundabout (CD116 Paragraph 3.5)
- There may be confusion for vehicles going the whole way around the roundabout. For example, the vehicles travelling from Roman Road on the inside lane, due to the positioning of the internal hatching on the northeast part of the roundabout, it is not clear whether they can stay in the internal lane or move to the middle lane.
- The central island has splay kerbs which is preferable in CD 116 to prevent kerb mounting and encourage lower speeds (CD116 Paragraph 3.7 .2).
- All four approaches flare into two or three-lane entries, which matches the typical layout for normal roundabouts in CD 116 to enhance capacity. Furthermore, having entry radii less than the maximum 100m there will therefore be entry deflection sufficient to slow vehicles down on entry (CD116 Paragraph 3.7.2 and 3.19.2).
- Minimum lane widths of 3.5m are maintained throughout (CD116 Paragraph 3.14.2).
- In several locations, the lane markings to diagram 1004 and lane guidance markings to diagram 1005 are not used universally. The proposed design does improve on this by adding the lane markings at to the north of the roundabout. However, it may be necessary to add additional 1005 markings from the southbound approach of Roman Road. (RSA problem 2.3)
- The absence of controlled crossing on the exit and entry points of Roman Road may impact pedestrian movements but is acceptable as the Annual Average Daily Traffic AADT is <16000. (CD116 Table 8.1.3)
- The existing shared pedestrian / cycleway on the southbound approach of the A508 is 2.5m. Guidance set out in LTN 1/20 states a minimum width of 3m is required for a shared pedestrian / cycleway. Therefore this does not comply with current guidance.

Assessment of the Proposed Design

- The repositioning of the maintenance layby is in the vicinity of the hatched markings. The proposed detailed design will therefore need to include their removal and relocation. (RSA problem 2.4)
- The location of the crossing in the circulatory signals may impede the flow of traffic on the roundabout causing traffic to block. The new signals on the roundabout only allow for 1 HGV to wait before the outer lane would become blocked. The RSA (problem 2.1) recommends the use of yellow box hatching; however, motorists may not comply with the hatching, meaning vehicle blocking could still be an issue.
- The existing junction has splay kerbs on the internal radius. Additional protection to the signals to prevent vehicles mounting the kerb may be required. Using kerbs that are shaped to prevent vehicle mounting, for example Half battered type 2 or Trief kerbs would be preferable.
- The raised landscaping on the central island may still cause some visibility issues across the central island. See comment in the assessment of the existing roundabout.
- The swept path analysis shows all movements can be accommodated for the max legal heavy goods vehicle.

- The tracking drawing NGW-BWB-HGN-SM7A-DR-CH-0130 mentions “HGVs are only permitted to exit onto roundabout in specific circumstances”. Whilst there is a height restriction barrier to restrict HGVs, it is noted that the carriageway appears to be designed to accommodate HGVs.

# 4 Scenarios and Traffic Flows

Assessed Network

The applicant has not provided an assessment of the site access without the mitigation in place. As no assessment has been presented for the existing layout, it is not possible to draw comparisons between the ‘with’ and ‘without’ mitigation scenarios and as such, it is not clear what scale of mitigation is required and whether the proposed mitigation is necessary to accommodate the additional trips associated with the increased floor area.

**It is recommended that the applicant undertake an assessment of the existing junction layout using Junction 10 software and present a comparison between the ‘with’ and ‘without’ mitigation scenarios.**

Traffic Flows

The following scenarios has been assessed:

- 2031 AM Peak Hour: background traffic + consented scheme trips + proposed extension trips.
- 2031 PM Peak Hour background traffic + consented scheme trips + proposed extension trips.

No assessment or comparison of the ‘consented scheme’ scenario and the consented scheme + proposed extension scenario has been undertaken. It is therefore unclear what impact the additional trips will have on the junction.

**It is recommended that the applicant provide an assessment and comparison between the consented scheme’ scenario and the ‘consented scheme + proposed extension’ scenario**

Background Traffic Flows

The TAA states that the background flows have been used in the assessment:

*‘The 2031 morning and evening peak hour future traffic flows with the SRFI and highway works in place (flow set J1d) have been extracted from the approved TA that was prepared to support the DCO. For the purposes of this TA Addendum these are the background traffic flows.’*

It is understood that the flows used in the assessments were from the Northamptonshire Strategic Transport Model (NSTM) which we were run in 2017. The NSTM has since been updated in 2024 and therefore the flows extracted from the 2017 model runs have been superseded. Initial runs of the 2024 NSTM model has shown that the traffic volumes near the application site are significantly lower in the peak periods (up to 760 and 616 two-way vehicle trips on the A508 in the AM and PM peak hours respectively). Although it could be argued that the use of higher baseline flows could be seen as a robust assessment, the forecast performance of the junction would be incorrect and it would not be possible to assess whether the proposed mitigation is justified. Note that the proposed mitigation strategy would carry ongoing maintenance costs for the LHA so it is important to understand if this is required.

**It is recommended that the applicant undertake the assessments using the updated 2024 NSTM model flows to understand the impact of the additional trips and determine the scale of mitigation, which may be required.**

Trip Generation

The trip generation has been determined by utilising the trip rates from the previously consented scheme TA and applying a 50% reduction to take account of the mezzanine floor space. These trip rates are based on the same trips rates submitted in the DCO application in 2018. Details of how these rates have been determined are contained in *TN2: Trip*

*Generation Technical Note* (Appendix 2 of the Transport Assessment) published in February 2017 and therefore are at least six years old. These rates are considered to be out of date especially as they were calculated before the Covid 19 pandemic. Accordingly the trip rates presented may not be suitable for determining the trip generation with the site.

It is also noted that no evidence has been applied to justify the 50% reduction in trip rates to account for the mezzanine floor space. Although it is recognised that the mezzanine floor space would not generate the same number of trips as conventional floor space, evidence should be provided to show why a 50% trip rate reduction is appropriate in this instance.

**It is recommended that a revised trip generation exercise be undertaken using more recently available data and that evidence be provided to how the associated reduction factors have been determined to confirm their suitability. This should be based on currently available data (e.g. surveys of existing comparable sites or more recently surveys TRICS sites). If no suitable dataset is available, then additional scenario testing should be undertaken. This should include no trip rate reduction and should utilise the lower baseline traffic flows from the 2024 NSTM runs.**

Trip Distribution and Assignment

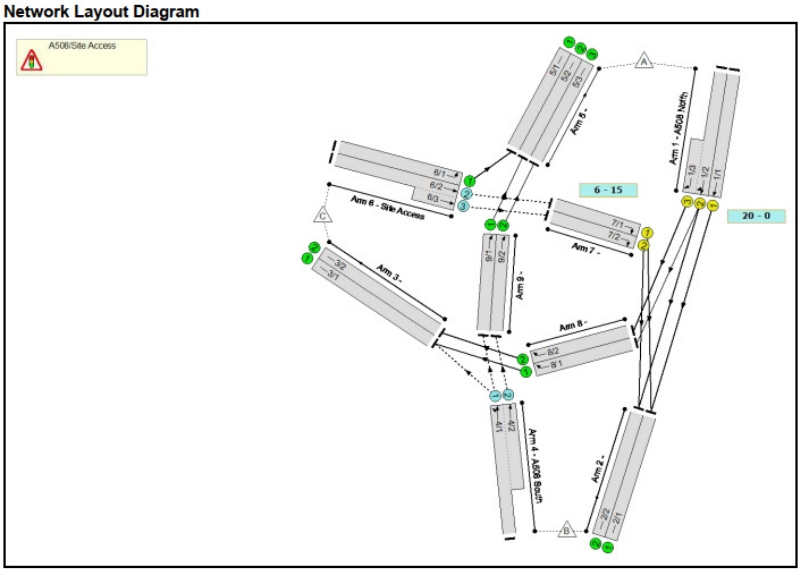
The vehicular trip distribution for the proposed extension has been based on the 2018 TA. As stated in the previous sections, the assessment work was based on the NSTM Model which likely used 2015 traffic data and therefore is ten years old. It is considered that this is not appropriate to use in the assessments as there may have been changes to model assumptions, the surrounding land uses and trip origins and destinations. **Therefore it is recommended that a revised assessment be undertaken using the updated NSTM Model.**

# 5 Model Build and Coding

Model Structure

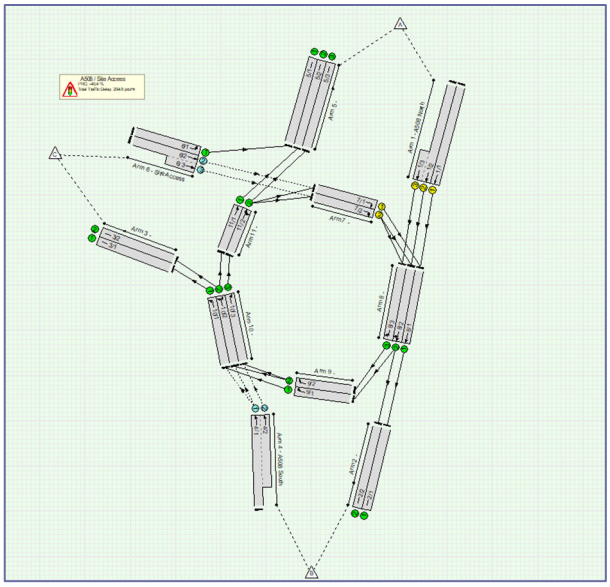
The model structure consists of three zones with three entry and three circulatory arms. The model structure is shown in Figure 3.

**Figure 3 Applicant Model Structure**




The internal circulatory arms within the model do not include entry or exit arms and as such the model will not register the potential impact of link connectors. For example a link connector from Arm 1 and 7 joining arms 4 and 8. Although this is unlikely to have a material impact on the capacity assessment it would usually be considered good practice to structure a signalised roundabout as shown in Figure 4.

**Figure 4 Recommended Model Structure**



**It is recommended that the model be updated to include internal exit arms.**

The is no provision in the model for the western TOUCAN crossing. Although it is recognised that demand for this is currently unknown, it is likely that following the build out of the wider SRFI site that the crossing will be called during peak periods.

**It is recommended that the model be updated to include the western TOUCAN crossing.**

Model Geometry

The geometry coded in the LinSig model has been reviewed. The applicant did not provide a plan showing the model geometry and therefore it has not been possible to determine the accuracy of such measurements used in the model. However, as the geometry of the roundabout will not materially change, Google Earth has been used to measure the lane lengths, widths etc.

**It is recommended that the applicant provides a plan showing the LinSig measurements so detailed review can be undertaken**.

The review found the following.

- Lane 1/1 – No comment, geometric parameters appear appropriate.
- Lane 1/2 – No comment, geometric parameters appear appropriate.
- Lane 1/3 – No comment, geometric parameters appear appropriate.
- Lane 2/1 – No comment, geometric parameters appear appropriate.
- Lane 2/2 – No comment, geometric parameters appear appropriate.
- Lane 3/1 – No comment, geometric parameters appear appropriate.
- Lane 3/2 – No comment, geometric parameters appear appropriate.
- Lane 4/1 – Usually a max flow would be set to 715 and co-efficient should be 0.22 applied. However, it is understood that the values from the baseline ARCADY mode has been used.
- Lane 4/2 – Usually a max flow would be set to 715 and co-efficient should be 0.22 applied. However, it is understood that the values from the baseline ARCADY mode has been used.
- Lane 5/1 – No comment, geometric parameters appear appropriate.
- Lane 5/2 – No comment, geometric parameters appear appropriate.
- Lane 5/3 – No comment, geometric parameters appear appropriate.
- Lane 6/1 – No comment, geometric parameters appear appropriate.

- Lane 6/2 – No lane width entered. These should be entered as they are entry lanes Usually a max flow would be set to 715 and co-efficient should be 0.22 applied. However, it is understood that the values from the baseline ARCADY mode has been used.
- Lane 6/3 – No lane width entered. These should be entered as they are entry lanes – Usually a max flow would be set to 715 and co-efficient should be 0.22 applied. However, it is understood that the values from the baseline ARCADY mode has been used.
- Lane 7/1 – Lane length coded as 6.1PCU which would equate to circa 35m. The lane is 12.5m (based on Google Earth measurements). It is recommended this be coded as 3PCU.
- Lane 7/2 – Lane length coded as 6.1PCU which would equate to circa 35m. The lane is 12.5m (based on Google Earth measurements). It is recommended this be coded as 3PCU. Lane has been coded as a nearside lane. This should be revised to an offside lane.
- Lane 8/1 – This has been coded as 17.4PCU suggesting a length of 100m. The lanes are approximately 61.6m so this should be coded as 11PCU.
- Lane 8/2 - This has been coded as 17.4PCU suggesting a length of 100m. The lanes are approximately 61.6m so this should be coded as 11PCU Lane.
- Lane 9/1 – This has been coded as 14.8PCU. The lanes are approximately 61.6m so should be coded as 11PCU.
- Lane 9/1 – This has been coded as 14.8PCU. The lanes are approximately 61.6m so should be coded as 11PCU.

**It is recommended that the applicant update the LinSig assessments based on the above.**

# 6 Phasing, Staging and Minimum Green Times

Phasing

The model has a total of three phases as detailed below:

- **Phase A** – Traffic phase – Internally northern circular
- **Phase B** – Traffic phase – A508 North
- **Phase C** – Pedestrian phase - A508 North (eastern pedestrian crossing)

As stated in section 5, there is no provision within the model for the TOUCAN crossing on the northern arm exit. Therefore no phase is included in the model for this.

The minimum green times for each phase are set out below:

- **Phase A** – 7 seconds
- **Phase B** – 7 seconds
- **Phase C** – 6 seconds

The minimum green times for Phase A and B are appropriate. However, a minimum green time of **6 seconds** for Phase C seems inadequate and would not allow enough time for a pedestrian to cross the three traffic lanes. The determination of green time for pedestrian crossings should be based on guidance set out in the Chapter 6 of the Traffic Signs Manual. It states in paragraph 11.7.1 that:

***"A walking speed of 1.2 m/s is conventionally used to calculate timings for crossings. This results in timings that are suitable for the majority of crossings. The clearance period is key, as this is what allows people to clear the crossing if they step off the kerb as the green symbol goes out. If this is properly calculated, it will ensure there is sufficient crossing time."***

The TOUCAN crossing is at least 10.95m wide based on the three 3.65m lanes and therefore the minimum green time should be adjusted to the following:

**10.95 / 1.2m walking speed = Green time of 10 seconds (rounded up to nearest second).**

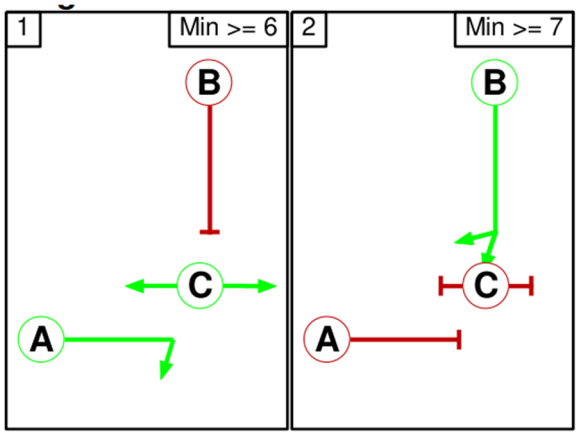
The increased green time for the crossing (Phase C) would result in less green time being allocated to the southbound movement on the A508 (Phase B). The results contained in the LinSig outputs in the TAA show that the A508 arm of the junction is forecast to have a DoS of 84.9% with a MMQ of 16.2PCU in the AM peak hour and a DoS of 82.9% and MMQ of 14.9PCU in the PM peak hour. Although it is recognised that the DoS are within the junction theoretical capacity, the changes in the green time allocations would likely result in an increase in the DoS and queuing on the A508 northern arm.

**It is recommended that the green time allocated to the TOUCAN crossing be increased from 6 seconds to 10 seconds.**

Stage Setup

The model utilises a simple two stage arrangement as shown in the staging diagram in Figure 5.

**Figure 5 Staging Diagram**




The staging is appropriate for this type of junction; however, it is recommended that the TOUCAN crossing on the western arm be incorporated into the model. The exclusion of this crossing means that any potential queuing or blocking back onto the junction cannot be measured. Although it is recognised that the applicant has confirmed that the omission of the crossing is due to the assumption of it having low demand, it is noted that sustainable travel options will be encouraged and the crossing provide direct access to a bus stop and a segregated cycle facility. Accordingly, the model should be updated to include this crossing with it potentially being run every second or third cycle to simulate the pedestrian demand.

**It is recommended that the TOUCAN crossing on the western arm be incorporated into the model.**

Intergreen Times

The intergreen times for the proposed layout are shown in Figure 6.

**Figure 6 Phase Intergreens**

**Phase Intergreens Matrix**

| Terminating Phase \ Starting Phase | A | B | C |
|---|---|---|---|
| A | | 5 | - |
| B | 6 | | 6 |
| C | - | 8 | |

The applicant has not provided a plan showing the measures and how these have been calculated. However, the intergeens between traffic phases appear to be appropriate.

The intergreen times for phase B terminating and stage C commencing is 6 seconds. This seems to be appropriate, however it is not possible to determine the accuracy of this without a plan showing the distance between the stop line and the southern studs of the pedestrian crossing.

The intergreen for phase C terminating and Phase A starting is 8 seconds. This is lower than what would be expected based guidance in Chapter 6 of the Traffic Signs Manual. It states in paragraph 6.7.2 that:

***"Rather than an 'x' distance, this intergreen period is based on the length of the crossing from kerb to kerb, and the pedestrian walking speed. This length of crossing should be divided by the chosen walking speed (1.0 m/s or 1.2 m/s, see 11.7.2) to give the required crossing time. An additional 2 s should be added as a safety buffer, rounding up to the nearest whole second if the result is not a whole number."***

Based on the above, the required intergreen time would be 12 seconds. As with the minimum green time on the TOUCAN crossing, the lower intergreen times will impact on the capacity of the junction. The increase in intergreen times will lead to a decrease in green time allocated to the northern arm and therefore would likely increase queuing and the DoS on the A508. Note that this is based on a 60 second cycle time.

**It is recommended that the intergreen time be increased to 12 seconds.**

# 7 Assessment of Traffic Impacts

Until the above issues with the traffic flows and model coding have been resolved, it is not possible to determine whether the reported traffic impacts associated with the proposals are correct or whether the proposed mitigation that has been put forward is suitable or required. The applicant should refine the modelling and provide updated outputs so that the traffic impacts and mitigation strategy can be assessed.

# 8 Summary and Conclusion

West Northamptonshire Council (WNC) has commissioned Pell Frischmann to undertake a technical review of the Transport Assessment Addendum (TAA) (Doc Ref: ADC3519-RP-B) submitted in support of an amendment to a DCO application (ref: S.I. 2019 No. 1358) for the Northampton Gateway SRFI scheme.

The subject of the review is the junction capacity assessments, geometric layout of the site access junction and the general submission in order to supplement WNC's review such as trip generation, assessment scenarios

Following the review, Pell Frischmann recommend the following:

- The geometric review of the roundabout has recommended that:
  - The detailed design will need to include the removal and relocation of the maintenance layby in the vicinity of the hatched markings/
  - The existing splay kerbs on the internal radius be upgraded to prevent vehicles mounting the kerb.
- It is recommended that the model be updated to include the western TOUCAN crossing.
- The applicant undertake an assessment of the existing junction layout using Junction 10 software so that a comparison between the 'with' and 'without' mitigation scenarios can be undertake.
- The applicant provide an assessment and comparison between the consented scheme' scenario and the 'consented scheme + proposed extension' scenario
- The applicant undertake the assessments using the updated NSTM flows to understand the impact of the additional trips and determine what mitigation, if any is required.
- The trip rates presented in the TAA are considered to be out of date as there are at least six years old. It is recommended that a revised trip generation exercise be undertaken using more recently available data and that evidence should be provided to how the associated reduction factors have been determined to confirm their suitability. Should appropriate data be unavailable, then it is recommended that additional scenario testing be

undertaken. This should include no trip reduction and the background traffic flows should be extracted from the 2024 NSTM model (2031 scenario).

- A revised assessment of the trip distribution and assignment should be undertaken using the updated NSTM Model.
- The model be updated to include internal exit arms.
- A plan showing the LinSig measurements used in the model.
- The coding of the model geometry updated accordingly .
- Minimum pedestrian green time for Phase C be updated to 10 seconds.
- Phase C terminating intergreen time be updated to 12 second.

In conclusion, due to the above discrepancies, it is not possible to understand the impacts of the additional trips generated by the development. In part, this is due to the use of older NSTM flows which are significantly higher than the more recent NSTM flows. Therefore, it is not possible to have confidence in the results of the junction capacity assessments presented in the Transport Assessment Addendum and to understand how the site access will function. **Accordingly, the LHA are unable to ascertain the suitability of the mitigation strategy and cannot determine if mitigation is justified.**

# Northampton Gateway
# Transport Addendum Review



| | |
|---|---|
| **Report Ref.** | **WNC - TA - 160 Northampton Gateway SRFI Linsig Model Review** |
| **File Path** | \\BIR-FILE-01\data\Data\107553 - Northants TA-TP Audit\01 - WIP\Documents\Reports\WNC-TA-160 - Northampton Gateway SRFI\WNC - TA - 160 Northampton Gateway SRFI LinSig Model Review.docx |

| Rev | Suit | Description | Date | Originator | Checker | Approver |
|---|---|---|---|---|---|---|
| A | - | TAA Review – First draft | 09/06/2025 | A Carpenter | A Oates | A Oates |
| B | | TAA Review - Second draft | 13/06/2025 | A Carpenter | A Oates | A Oates |
| C | | TAA Review – Final draft | 13/06/2025 | A Carpenter | A Oates | A Oates |
| | | | | | | |

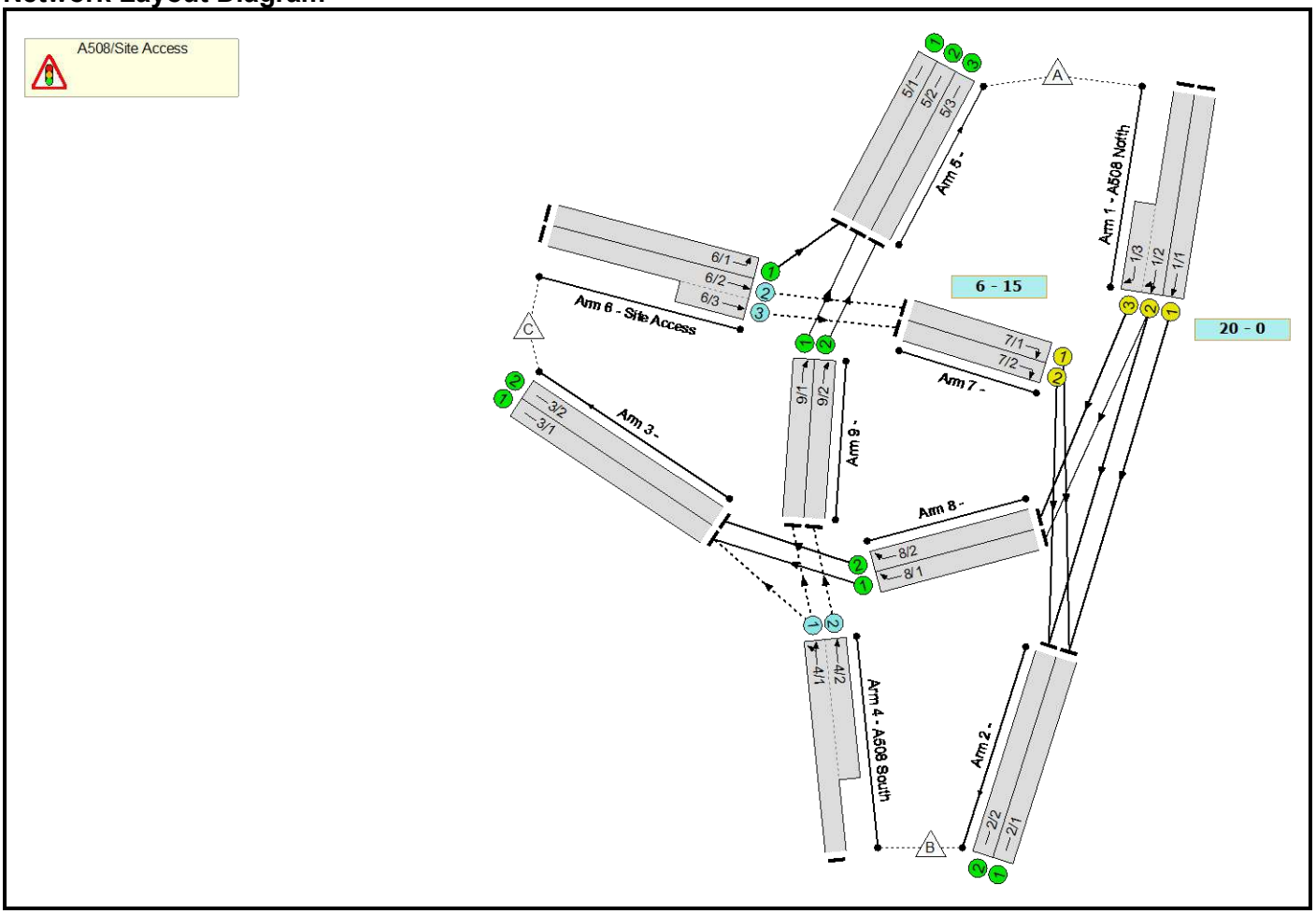
# Appendix A Linsig Model Outputs

## Full Input Data And Results

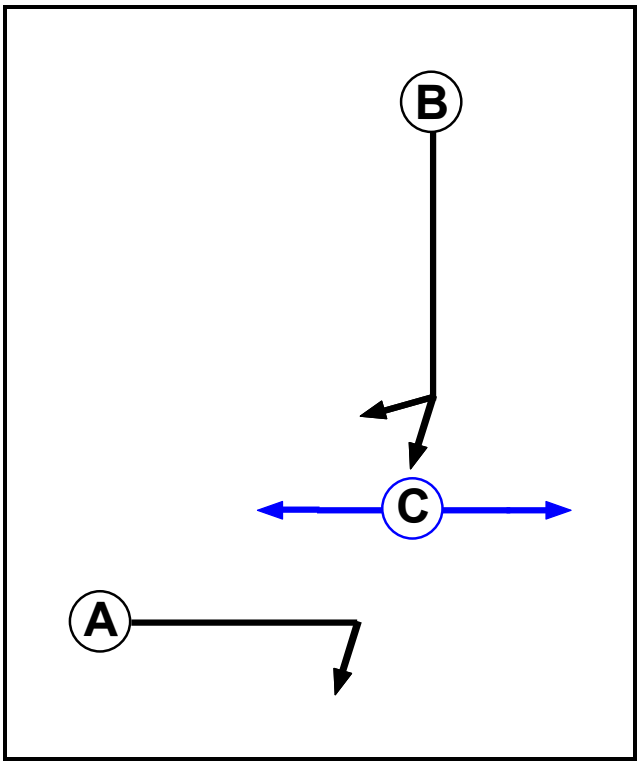
### User and Project Details

| | |
|---|---|
| **Project:** | **A508 site access junction mitigation** |
| **Title:** | |
| **Location:** | |
| **Client:** | Segro |
| **Additional detail:** | Amended following National Highways comments |
| **File name:** | 241129 site access gyratory - proposed mitigation.lsg3x |
| **Author:** | Mark Higgins |
| **Company:** | ADC Infrastructure Ltd |
| **Address:** | Nottingham |

### Network Layout Diagram



## Phase Diagram




## Phase Input Data

| Phase Name | Phase Type | Stage Stream | Assoc. Phase | Street Min | Cont Min |
|---|---|---|---|---|---|
| A | Traffic | 1 | | 7 | 4 |
| B | Traffic | 1 | | 7 | 7 |
| C | Pedestrian | 1 | | 6 | 6 |

## Phase Intergreens Matrix

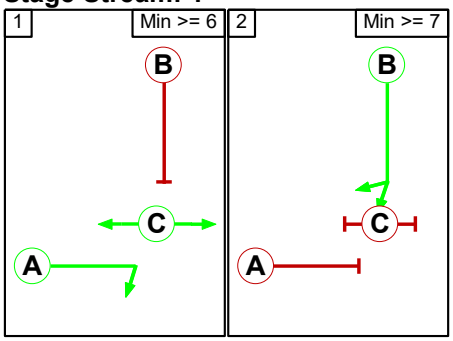
| | | Starting Phase | | |
|---|---|---|---|---|
| | | A | B | C |
| Terminating Phase | A | | 5 | - |
| | B | 6 | | 6 |
| | C | - | 8 | |

## Phases in Stage

| Stream | Stage No. | Phases in Stage |
|---|---|---|
| 1 | 1 | A C |
| 1 | 2 | B |

## Stage Diagram

### Stage Stream: 1




## Phase Delays

### Stage Stream: 1

| Term. Stage | Start Stage | Phase | Type | Value | Cont value |
|---|---|---|---|---|---|
| 1 | 2 | A | Losing | 3 | 3 |

## Prohibited Stage Change

### Stage Stream: 1

| From Stage | To Stage 1 | To Stage 2 |
|---|---|---|
| 1 | | 8 |
| 2 | 6 | |

## Give-Way Lane Input Data

| Junction: A508/Site Access | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **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)** |
| 4/1 (A508 South) | 3/1 (Left) | 1106 | 0 | 8/1 | 0.25 | All | - | - | - | - | - |
| | | | | 8/2 | 0.25 | All | | | | | |
| | 9/1 (Ahead) | 1106 | 0 | 8/1 | 0.25 | All | | | | | |
| | | | | 8/2 | 0.25 | All | | | | | |
| 4/2 (A508 South) | 9/2 (Ahead) | 1106 | 0 | 8/1 | 0.25 | All | - | - | - | - | - |
| | | | | 8/2 | 0.25 | All | | | | | |
| 6/2 (Site Access) | 7/1 (Ahead) | 1000 | 0 | 9/1 | 0.33 | All | - | - | - | - | - |
| | | | | 9/2 | 0.33 | All | | | | | |
| 6/3 (Site Access) | 7/2 (Ahead) | 1000 | 0 | 9/1 | 0.33 | All | - | - | - | - | - |
| | | | | 9/2 | 0.33 | All | | | | | |

## Lane Input Data

| Junction: A508/Site Access | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **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 (A508 Notth) | U | B | 2 | 3 | 60.0 | Geom | - | 3.65 | 0.00 | Y | Arm 2 Ahead | 22.00 |
| 1/2 (A508 Notth) | U | B | 2 | 3 | 60.0 | Geom | - | 3.65 | 0.00 | N | Arm 2 Ahead | 25.00 |
| | | | | | | | | | | | Arm 8 Right | 25.00 |
| 1/3 (A508 Notth) | U | B | 2 | 3 | 6.3 | Geom | - | 3.65 | 0.00 | N | Arm 8 Right | 28.00 |
| 2/1 | U | | 2 | 3 | 60.0 | Inf | - | - | - | - | - | - |
| 2/2 | U | | 2 | 3 | 60.0 | Inf | - | - | - | - | - | - |
| 3/1 | U | | 2 | 3 | 60.0 | Inf | - | - | - | - | - | - |
| 3/2 | U | | 2 | 3 | 60.0 | Inf | - | - | - | - | - | - |
| 4/1 (A508 South) | O | | 2 | 3 | 60.0 | Geom | - | 3.50 | 0.00 | Y | Arm 3 Left | 30.00 |
| | | | | | | | | | | | Arm 9 Ahead | Inf |
| 4/2 (A508 South) | O | | 2 | 3 | 10.0 | Geom | - | 3.50 | 0.00 | N | Arm 9 Ahead | Inf |
| 5/1 | U | | 2 | 3 | 60.0 | Inf | - | - | - | - | - | - |
| 5/2 | U | | 2 | 3 | 60.0 | Inf | - | - | - | - | - | - |
| 5/3 | U | | 2 | 3 | 60.0 | Inf | - | - | - | - | - | - |
| 6/1 (Site Access) | U | | 2 | 3 | 60.0 | Geom | - | 3.50 | 0.00 | Y | Arm 5 Left | 30.00 |
| 6/2 (Site Access) | O | | 2 | 3 | 60.0 | Inf | - | - | - | - | - | - |
| 6/3 (Site Access) | O | | 2 | 3 | 5.0 | Inf | - | - | - | - | - | - |
| 7/1 | U | A | 2 | 3 | 6.1 | Geom | - | 4.00 | 0.00 | Y | Arm 2 Right | 30.00 |
| 7/2 | U | A | 2 | 3 | 6.1 | Geom | - | 4.00 | 0.00 | Y | Arm 2 Right | 30.00 |
| 8/1 | U | | 2 | 3 | 17.4 | Inf | - | - | - | - | - | - |
| 8/2 | U | | 2 | 3 | 17.4 | Inf | - | - | - | - | - | - |
| 9/1 | U | | 2 | 3 | 14.8 | Inf | - | - | - | - | - | - |
| 9/2 | U | | 2 | 3 | 14.8 | Inf | - | - | - | - | - | - |

## Traffic Flow Groups

| Flow Group | Start Time | End Time | Duration | Formula |
|---|---|---|---|---|
| 1: '2031 with additional mez - AM' | 08:00 | 09:00 | 01:00 | |
| 2: '2031 with additional mez - PM' | 17:00 | 18:00 | 01:00 | |

**Scenario 1: '2031 with additional mez - AM'** (FG1: '2031 with additional mez - AM', Plan 1: 'Network Control Plan 1')

## Traffic Flows, Desired

**Desired Flow :**

| | | Destination | | | |
|---|---|---|---|---|---|
| | | A | B | C | Tot. |
| Origin | A | 0 | 1575 | 935 | 2510 |
| | B | 1293 | 0 | 187 | 1480 |
| | C | 414 | 11 | 0 | 425 |
| | Tot. | 1707 | 1586 | 1122 | 4415 |

## Traffic Lane Flows

| Lane | Scenario 1: 2031 with additional mez - AM |
|---|---|
| **Junction: A508/Site Access** | |
| 1/1 | 1075 |
| 1/2 (with short) | 1435(In)<br>750(Out) |
| 1/3 (short) | 685 |
| 2/1 | 1080 |
| 2/2 | 506 |
| 3/1 | 437 |
| 3/2 | 685 |
| 4/1 (with short) | 1480(In)<br>740(Out) |
| 4/2 (short) | 740 |
| 5/1 | 414 |
| 5/2 | 553 |
| 5/3 | 740 |
| 6/1 | 414 |
| 6/2 (with short) | 11(In)<br>5(Out) |
| 6/3 (short) | 6 |
| 7/1 | 5 |
| 7/2 | 6 |
| 8/1 | 250 |
| 8/2 | 685 |
| 9/1 | 553 |
| 9/2 | 740 |

## Lane Saturation Flows

**Junction: A508/Site Access**

| 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 (A508 Notth) | 3.65 | 0.00 | Y | Arm 2 Ahead | 22.00 | 100.0 % | 1854 | 1854 |
| 1/2 (A508 Notth) | 3.65 | 0.00 | N | Arm 2 Ahead | 25.00 | 66.7 % | 2000 | 2000 |
| | | | | Arm 8 Right | 25.00 | 33.3 % | | |
| 1/3 (A508 Notth) | 3.65 | 0.00 | N | Arm 8 Right | 28.00 | 100.0 % | 2012 | 2012 |
| 2/1 | Infinite Saturation Flow | | | | | | Inf | Inf |
| 2/2 | Infinite Saturation Flow | | | | | | Inf | Inf |
| 3/1 | Infinite Saturation Flow | | | | | | Inf | Inf |
| 3/2 | Infinite Saturation Flow | | | | | | Inf | Inf |
| 4/1 (A508 South) | 3.50 | 0.00 | Y | Arm 3 Left | 30.00 | 25.3 % | 1940 | 1940 |
| | | | | Arm 9 Ahead | Inf | 74.7 % | | |
| 4/2 (A508 South) | 3.50 | 0.00 | N | Arm 9 Ahead | Inf | 100.0 % | 2105 | 2105 |
| 5/1 | Infinite Saturation Flow | | | | | | Inf | Inf |
| 5/2 | Infinite Saturation Flow | | | | | | Inf | Inf |
| 5/3 | Infinite Saturation Flow | | | | | | Inf | Inf |
| 6/1 (Site Access) | 3.50 | 0.00 | Y | Arm 5 Left | 30.00 | 100.0 % | 1871 | 1871 |
| 6/2 (Site Access Lane 2) | Infinite Saturation Flow | | | | | | Inf | Inf |
| 6/3 (Site Access Lane 3) | Infinite Saturation Flow | | | | | | Inf | Inf |
| 7/1 | 4.00 | 0.00 | Y | Arm 2 Right | 30.00 | 100.0 % | 1919 | 1919 |
| 7/2 | 4.00 | 0.00 | Y | Arm 2 Right | 30.00 | 100.0 % | 1919 | 1919 |
| 8/1 | Infinite Saturation Flow | | | | | | Inf | Inf |
| 8/2 | Infinite Saturation Flow | | | | | | Inf | Inf |
| 9/1 | Infinite Saturation Flow | | | | | | Inf | Inf |
| 9/2 | Infinite Saturation Flow | | | | | | Inf | Inf |

**Scenario 2: '2031 with additional mez - PM '** (FG2: '2031 with additional mez - PM', Plan 1: 'Network Control Plan 1')

## Traffic Flows, Desired

**Desired Flow :**

| | | Destination | | | |
|---|---|---|---|---|---|
| | | A | B | C | Tot. |
| Origin | A | 0 | 1651 | 499 | 2150 |
| | B | 1311 | 0 | 101 | 1412 |
| | C | 1130 | 81 | 0 | 1211 |
| | Tot. | 2441 | 1732 | 600 | 4773 |

## Traffic Lane Flows

| Lane | Scenario 2: 2031 with additional mez - PM |
|---|---|
| **Junction: A508/Site Access** | |
| 1/1 | 1050 |
| 1/2 (with short) | 1100(In) 751(Out) |
| 1/3 (short) | 349 |
| 2/1 | 1090 |
| 2/2 | 642 |
| 3/1 | 251 |
| 3/2 | 349 |
| 4/1 (with short) | 1412(In) 708(Out) |
| 4/2 (short) | 704 |
| 5/1 | 1130 |
| 5/2 | 607 |
| 5/3 | 704 |
| 6/1 | 1130 |
| 6/2 (with short) | 81(In) 40(Out) |
| 6/3 (short) | 41 |
| 7/1 | 40 |
| 7/2 | 41 |
| 8/1 | 150 |
| 8/2 | 349 |
| 9/1 | 607 |
| 9/2 | 704 |

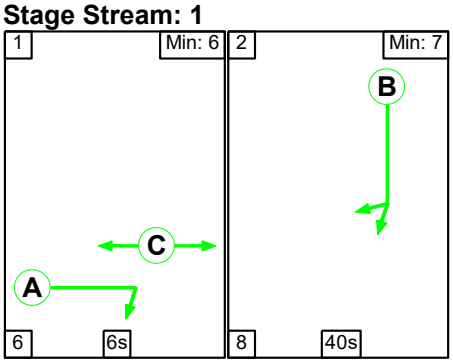
## Lane Saturation Flows

| Junction: A508/Site Access | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **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 (A508 Notth) | 3.65 | 0.00 | Y | Arm 2 Ahead | 22.00 | 100.0 % | 1854 | 1854 |
| 1/2 (A508 Notth) | 3.65 | 0.00 | N | Arm 2 Ahead | 25.00 | 80.0 % | 2000 | 2000 |
| | | | | Arm 8 Right | 25.00 | 20.0 % | | |
| 1/3 (A508 Notth) | 3.65 | 0.00 | N | Arm 8 Right | 28.00 | 100.0 % | 2012 | 2012 |
| 2/1 | Infinite Saturation Flow | | | | | | Inf | Inf |
| 2/2 | Infinite Saturation Flow | | | | | | Inf | Inf |
| 3/1 | Infinite Saturation Flow | | | | | | Inf | Inf |
| 3/2 | Infinite Saturation Flow | | | | | | Inf | Inf |
| 4/1 (A508 South) | 3.50 | 0.00 | Y | Arm 3 Left | 30.00 | 14.3 % | 1951 | 1951 |
| | | | | Arm 9 Ahead | Inf | 85.7 % | | |
| 4/2 (A508 South) | 3.50 | 0.00 | N | Arm 9 Ahead | Inf | 100.0 % | 2105 | 2105 |
| 5/1 | Infinite Saturation Flow | | | | | | Inf | Inf |
| 5/2 | Infinite Saturation Flow | | | | | | Inf | Inf |
| 5/3 | Infinite Saturation Flow | | | | | | Inf | Inf |
| 6/1 (Site Access) | 3.50 | 0.00 | Y | Arm 5 Left | 30.00 | 100.0 % | 1871 | 1871 |
| 6/2 (Site Access Lane 2) | Infinite Saturation Flow | | | | | | Inf | Inf |
| 6/3 (Site Access Lane 3) | Infinite Saturation Flow | | | | | | Inf | Inf |
| 7/1 | 4.00 | 0.00 | Y | Arm 2 Right | 30.00 | 100.0 % | 1919 | 1919 |
| 7/2 | 4.00 | 0.00 | Y | Arm 2 Right | 30.00 | 100.0 % | 1919 | 1919 |
| 8/1 | Infinite Saturation Flow | | | | | | Inf | Inf |
| 8/2 | Infinite Saturation Flow | | | | | | Inf | Inf |
| 9/1 | Infinite Saturation Flow | | | | | | Inf | Inf |
| 9/2 | Infinite Saturation Flow | | | | | | Inf | Inf |

**Scenario 1: '2031 with additional mez - AM'** (FG1: '2031 with additional mez - AM', Plan 1: 'Network Control Plan 1')

## Stage Sequence Diagram

**Stage Stream: 1**

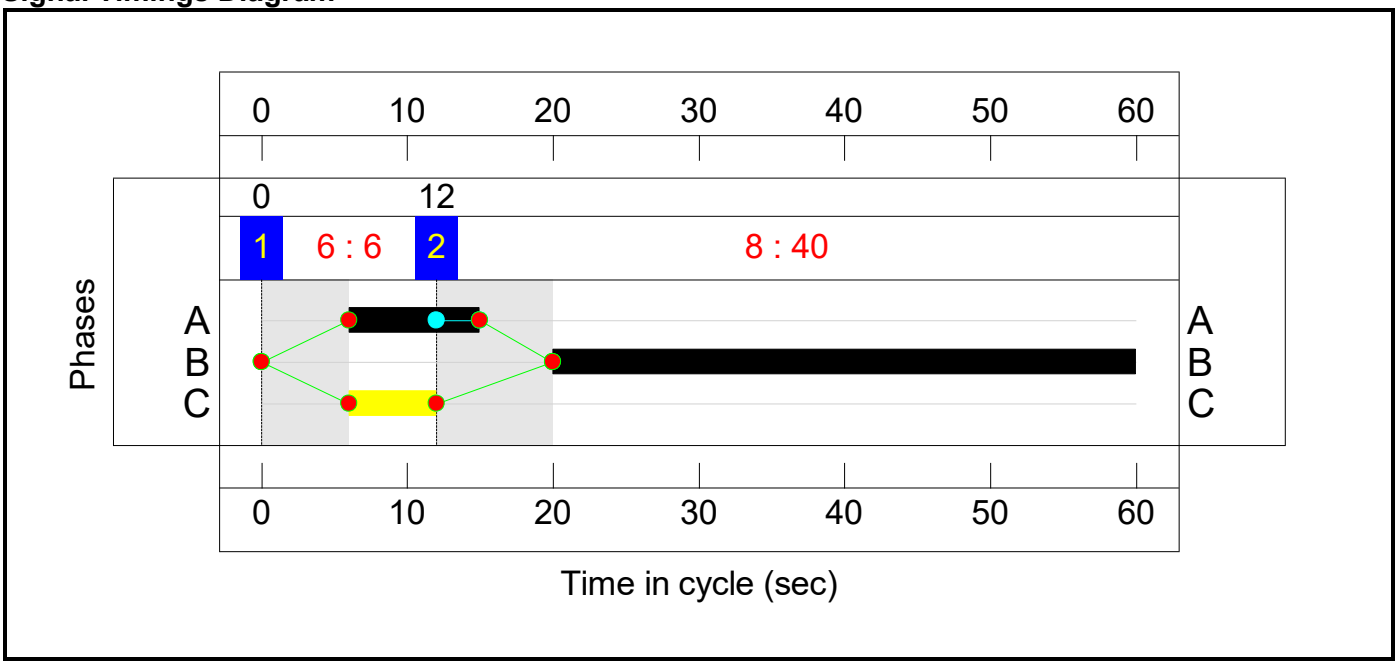


## Stage Timings

**Stage Stream: 1**

| Stage | 1 | 2 |
|---|---|---|
| Duration | 6 | 40 |
| Change Point | 0 | 12 |

## Signal Timings Diagram



## 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** | - | - | | - | - | - | - | - | - | **84.9%** |
| **A508/Site Access** | - | - | **N/A** | - | - | | - | - | - | - | - | - | **84.9%** |
| 1/1 | A508 Notth Ahead | U | 1 | N/A | B | | 1 | 40 | - | 1075 | 1854 | 1267 | 84.9% |
| 1/2+1/3 | A508 Notth Ahead Right | U | 1 | N/A | B | | 1 | 40 | - | 1435 | 2000:2012 | 899+821 | 83.4 : 83.4% |
| 4/1+4/2 | A508 South Left Ahead | O | N/A | N/A | - | | - | - | - | 1480 | 1940:2105 | 872+872 | 84.8 : 84.8% |
| 6/1 | Site Access Left | U | N/A | N/A | - | | - | - | - | 414 | 1871 | 1871 | 22.1% |
| 6/2+6/3 | Site Access Ahead | O | N/A | N/A | - | | - | - | - | 11 | Inf : Inf | 536+573 | 0.9 : 1.0% |
| 7/1 | Right | U | 1 | N/A | A | | 1 | 9 | - | 5 | 1919 | 320 | 1.6% |
| 7/2 | Right | U | 1 | N/A | A | | 1 | 9 | - | 6 | 1919 | 320 | 1.9% |

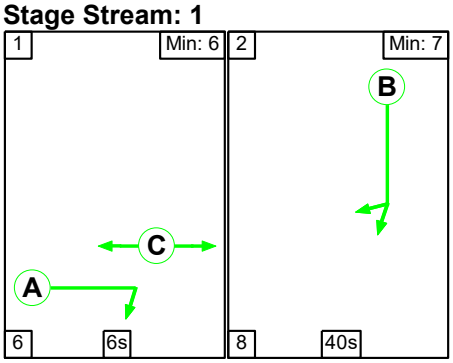
| Item | Arriving (pcu) | Leaving (pcu) | Turners In Gaps (pcu) | Turners When Unopposed (pcu) | Turners In Intergreen (pcu) | Uniform Delay (pcuHr) | Rand + Oversat Delay (pcuHr) | Storage Area Uniform Delay (pcuHr) | Total Delay (pcuHr) | Av. Delay Per PCU (s/pcu) | Max. Back of Uniform Queue (pcu) | Rand + Oversat Queue (pcu) | Mean Max Queue (pcu) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Network** | - | - | **2982** | **0** | **0** | **4.4** | **8.1** | **0.0** | **12.5** | - | - | - | - |
| **A508/Site Access** | - | - | **2982** | **0** | **0** | **4.4** | **8.1** | **0.0** | **12.5** | - | - | - | - |
| 1/1 | 1075 | 1075 | - | - | - | 2.1 | 2.7 | - | 4.9 | 16.3 | 13.4 | 2.7 | 16.2 |
| 1/2+1/3 | 1435 | 1435 | - | - | - | 1.9 | 2.5 | - | 4.3 | 10.9 | 6.7 | 2.5 | 9.2 |
| 4/1+4/2 | 1480 | 1480 | 2960 | 0 | 0 | 0.3 | 2.7 | - | 3.0 | 7.4 | 6.0 | 2.7 | 8.7 |
| 6/1 | 414 | 414 | - | - | - | 0.0 | 0.1 | - | 0.1 | 1.2 | 0.0 | 0.1 | 0.1 |
| 6/2+6/3 | 11 | 11 | 22 | 0 | 0 | 0.0 | 0.0 | - | 0.0 | 1.6 | 0.0 | 0.0 | 0.0 |
| 7/1 | 5 | 5 | - | - | - | 0.0 | 0.0 | - | 0.0 | 27.0 | 0.1 | 0.0 | 0.1 |
| 7/2 | 6 | 6 | - | - | - | 0.0 | 0.0 | - | 0.0 | 27.0 | 0.1 | 0.0 | 0.1 |

C1 Stream: 1 PRC for Signalled Lanes (%): 6.1 Total Delay for Signalled Lanes (pcuHr): 9.29 Cycle Time (s): 60
PRC Over All Lanes (%): 6.1 Total Delay Over All Lanes(pcuHr): 12.48

**Scenario 2: '2031 with additional mez - PM '** (FG2: '2031 with additional mez - PM', Plan 1: 'Network Control Plan 1')

## Stage Sequence Diagram

### Stage Stream: 1

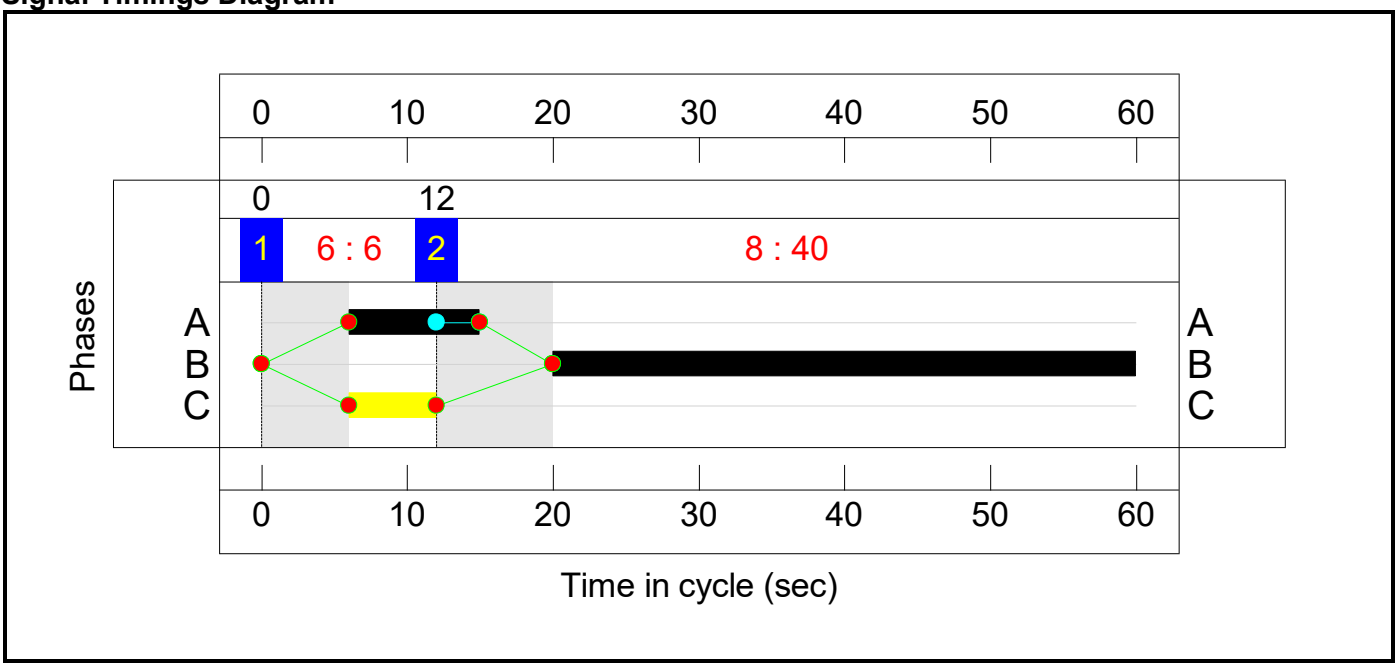



## Stage Timings

### Stage Stream: 1

| Stage | 1 | 2 |
|---|---|---|
| Duration | 6 | 40 |
| Change Point | 0 | 12 |

## Signal Timings Diagram



## 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** | - | - | | - | - | - | - | - | - | **82.9%** |
| **A508/Site Access** | - | - | **N/A** | - | - | | - | - | - | - | - | - | **82.9%** |
| 1/1 | A508 Notth Ahead | U | 1 | N/A | B | | 1 | 40 | - | 1050 | 1854 | 1267 | 82.9% |
| 1/2+1/3 | A508 Notth Ahead Right | U | 1 | N/A | B | | 1 | 40 | - | 1100 | 2000:2012 | 1057+491 | 71.1 : 71.1% |
| 4/1+4/2 | A508 South Left Ahead | O | N/A | N/A | - | | - | - | - | 1412 | 1951:2105 | 981+981 | 72.2 : 71.8% |
| 6/1 | Site Access Left | U | N/A | N/A | - | | - | - | - | 1130 | 1871 | 1871 | 60.4% |
| 6/2+6/3 | Site Access Ahead | O | N/A | N/A | - | | - | - | - | 81 | Inf : Inf | 567+567 | 7.1 : 7.2% |
| 7/1 | Right | U | 1 | N/A | A | | 1 | 9 | - | 40 | 1919 | 320 | 12.5% |
| 7/2 | Right | U | 1 | N/A | A | | 1 | 9 | - | 41 | 1919 | 320 | 12.8% |

| 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** | - | - | **2986** | **0** | **0** | **3.9** | **5.8** | **0.0** | **9.7** | - | - | - | - |
| **A508/Site Access** | - | - | **2986** | **0** | **0** | **3.9** | **5.8** | **0.0** | **9.7** | - | - | - | - |
| 1/1 | 1050 | 1050 | - | - | - | 2.0 | 2.4 | - | 4.4 | 15.1 | 12.5 | 2.4 | 14.9 |
| 1/2+1/3 | 1100 | 1100 | - | - | - | 1.4 | 1.2 | - | 2.6 | 8.4 | 6.6 | 1.2 | 7.8 |
| 4/1+4/2 | 1412 | 1412 | 2824 | 0 | 0 | 0.0 | 1.3 | - | 1.3 | 3.3 | 0.6 | 1.3 | 1.9 |
| 6/1 | 1130 | 1130 | - | - | - | 0.0 | 0.8 | - | 0.8 | 2.4 | 0.0 | 0.8 | 0.8 |
| 6/2+6/3 | 81 | 81 | 162 | 0 | 0 | 0.0 | 0.0 | - | 0.0 | 1.7 | 0.0 | 0.0 | 0.0 |
| 7/1 | 40 | 40 | - | - | - | 0.2 | 0.1 | - | 0.3 | 27.7 | 0.6 | 0.1 | 0.6 |
| 7/2 | 41 | 41 | - | - | - | 0.2 | 0.1 | - | 0.3 | 27.8 | 0.6 | 0.1 | 0.7 |

C1 Stream: 1 PRC for Signalled Lanes (%): 8.6 Total Delay for Signalled Lanes (pcuHr): 7.60 Cycle Time (s): 60
PRC Over All Lanes (%): 8.6 Total Delay Over All Lanes(pcuHr): 9.67