



J000370-HTN05
November 2023

Upper Brook Street, Masterplan
(Williams Motor Co (Holdings) / Alliance
UBS Limited)

Planning Ref: 137401/FO/2023

Full planning application for the demolition of existing buildings and erection of three ground floor + 12/14/29 storey buildings to be used for Purpose Built Student Accommodation (Use Sui Generis), comprising 983 bedrooms in total and 506sqm of ground floor ancillary uses (café/ commercial and convenience store - Use Classes E (a)/(b)/(c)), three buildings comprising ground floor + 5/7/9 storeys for Science and Innovation uses (Use Class E (g)(i) & (ii)) and 834sqm ground floor community uses (retail/ cafés and medical facility (Use Classes E (a)/(b) and (e)), and the provision of new public realm, two new public squares, new access and parking, and associated works.

**Improvements to Junction of
Upper Brook Street / Booth
Street East / Inchley Road**

**Highways Technical
Note 05**

Prepared on behalf of:

PROPERTY ALLIANCE GROUP
MODA LIVING
WILLIAMS MOTOR CO (HOLDINGS)

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1.0 INTRODUCTION & CONTEXT

- 1.1 This Highways Technical Note (HTN) has been prepared by Focus Transport Planning (Focus TP) on behalf of Property Alliance Group / Moda Living / Williams Motor Co (Holdings) to set out details of proposed amendments to development related highways works at the junction of Upper Brook Street / Booth Street East / Inchley Road to support the mixed use regeneration of land at Upper Brook Street, Manchester (Planning Application Ref: 137401/FO/2023). The amendments set out in this report have been prepared to take on board comments received from stakeholders during the planning application consultation period and the results of a subsequent Independent Stage 1 Road Safety Audit. Incorporation of these technical comments has allowed for the identification of an updated 'preferred' layout junction scheme that maximises pedestrian / cycle accessibility in line with prevailing government policy.

Planning Application Principles

- 1.2 The prevailing planning application (Ref: 137401/FO/2023) seeks the comprehensive redevelopment of land at Upper Brook Street to deliver a mixed-use regeneration scheme, including Purpose Built Student Accommodation (PBSA) & Life Sciences based employment development, along with ancillary commercial & community uses, on-site landscaping and public open space. The proposals envisage car-free development and include for a package of supporting local highways and transport works to enhance site permeability and overall accessibility by sustainable / active travel modes. These supporting works include for the closure of Inchley Road to general traffic to deliver a new public square and associated changes to the local highway network to maintain necessary vehicle connections to the application site and wider Brunswick residential estate, such as one-way operation of Kincardine Road and changes to layout arrangements at the junction of Upper Brook Street / Booth Street East / Inchley Road.
- 1.3 Details of key elements of these supporting highway works were set out in the formal Transport Assessment (TA) report, prepared by Focus TP (Doc Ref: J000370-TA01c, June 2023) and submitted as part of the suite of planning application

documents. The June 2023 TA report identified that the closure of Inchley Road and creation of the new public square would require the following changes to the existing junction of Upper Brook Street / Booth Street East / Inchley Road (paragraphs 6.2.2 & 6.2.3):

- Closure and removal of the Inchley Road side road arm connection.
- New right turn flare lane from Upper Brook Street (N) to Booth Street East.
- Amendments to Upper Brook Street approach lane designations to both north and south of junction.
- Improved pedestrian and cycle crossing arrangements of Upper Brook Street.
- Amendments to Booth Street East approach to deliver wide island and re-marking of lanes to allow for double right turn exit.

1.4 In addition to the above changes at the Upper Brook Street / Booth Street East junction, the closure of Inchley Road to through traffic would also require local amendments to Kincardine Road, to remove the existing mini-roundabout junction with Inchley Road and the extension of one-way operation of Kincardine Road, between Whitekirk Close and Grosvenor Street, to deliver full one-way northbound controls between Brunswick Street & Grosvenor Street.

1.5 In parallel to the above identified works, changes were also proposed to the existing northern bus stop arrangement to the application site's Upper Brook Street frontage, i.e. removal of the existing bus lay-by feature.

1.6 Details of the nature of these proposed local highways improvements were presented in plan format in the June 2023 TA report as Figures TA16 & TA17 (Bus stop amendments and Upper Brook Street / Booth Street East / Inchley Road junction layout) and Appendix TA7 (Kincardine Road).

Development of Proposed Amendments

- 1.7 Following submission of the planning application, Focus TP have undertaken further consultation with local technical stakeholders (representatives of Manchester City Council Highways Department (MCC Highways), Transport for Greater Manchester (TfGM) and Active Travel England (ATE)), including a design workshop session, to identify potential amendments to the core improvement layouts illustrated in the TA, primarily to deliver additional pedestrian / cycle user enhancements. These improvements do not change the core principles of the proposed supporting highways works package, but rather respond to detailed technical comments from stakeholder groups and to allow for the incorporation of emerging best practice, where appropriate and practical
- 1.8 As part of these consultation discussions, MCC Highways requested that any updated highways drawings be subject to an Independent Stage 1 Road Safety Audit (RSA1) review, in order to confirm the general suitability of the proposed works. Undertaking an RSA1 represents the first stage in the standard four-stage Road Safety Audit process and is typically undertaken prior to planning consent, in order to validate key scheme principles and provide a reference point for detailed construction design. To allow ease of review, MCC highways requested that separate RSA1 exercises were undertaken to consider:
- A. Proposed arrangements at the junction of Upper Brook Street / Booth Street East / Inchley Road, including proposed changes to the bus lay-by to northern site frontage to Upper Brook Street.
 - B. Proposed one-way arrangements for the Kincardine Road corridor from the terminal connections of Brunswick Street and Grosvenor Street.
- 1.9 This HTN report considers those matters associated with the proposed amendments to the Upper Brook Street / Booth Street East / Inchley Road junction works, along with proposed changes to the northern frontage bus stop arrangements to Upper Brook Street. The remainder of the report includes for the presentation of the following matters:

- A review of the main amendments to the proposed junction layout as developed during the stakeholder consultation process.
- Details of updated LINSIG capacity modelling undertaken for the amended layout.
- Details of the Independent RSA1 review of the amended scheme.
- Details of the Designers Response Report prepared following review of the RSA1 and any subsequent amendments to the scheme to respond to specific recommendations.
- Presentation of final post audit 'preferred' scheme layout plans.

Implication of Proposed Changes to the Wider Planning Application

1.10 It is noted that proposed changes to the wider Upper Brook Street mixed-use application scheme were submitted to Manchester City Council Planning Department during early November 2023. These proposed changes were as follows:

- Block A1 reduced in height from GF + 41 storeys to GF + 29 storeys with change to the massing (removal of stepped form).
- Block A1 to incorporate a mezzanine (included within the ground storey).
- The total quantum of PBSA beds within Blocks A1/A2 reduced to 763 beds (down by 117), beds within Block A3 remain unchanged. The revised scheme provides 983 student beds across the three proposed PBSA buildings.
- Changes to elements of building cladding and gable end materiality.
- Revisions to supporting elements to reflect the reduction in PBSA bed numbers.
- Minor change to the northwestern elevation of proposed Life Science Building B2, resulting in reduction of 34sqm (14,045sqm from 14,079sqm).

1.11 The implications of these proposed changes on the core highways and transport impact case set out in the June 2023 TA report are directly considered in TA Addendum report J000370-TA02a. This addendum report concludes that, in practice, the proposed changes would give rise to a strictly marginal scale change in development related traffic when compared to that set out in the June 2023 TA, and therefore would not result in discernible changes to the 'with application scheme' network conditions identified. No amendments to the core supporting

local highway improvement strategy (i.e. closure of Inchley Road, one-way operation of Kincardine Road, change to Upper Brook Street / Booth Street East / Inchley Road junction layout) are required in response to the proposed wider scheme changes.

- 1.12 The technical amendments set out in this HTN are therefore unrelated to the proposed changes to the wider planning application and represent an evolution of the originally presented scheme designs, in order to directly respond to specific points of technical detail identified via stakeholder and RSA1 review of the core highway works packages.

2.0 REVIEW OF PROPOSED CORE LAYOUT AMENDMENTS

2.1 Details of Proposed Layout Amendments

2.1.1 This section of the HTN sets out the nature of the layout amendments proposed at the Upper Brook Street / Booth Street East / Inchley Road junction and the northern site frontage bus stop to Upper Brook Street. These layout changes have been identified through the review of comments provided by technical stakeholders and consideration of junction operational options explored at a Design Workshop session with representatives of TfGM (Urban Traffic Control (UTC) & Bus Stop Relocation teams) and ATE reference consultant.

2.1.2 A plan of the proposed amended junction layout (Wilde CE Drawing Ref: 766-042-WCL-017-P01) is included as **Appendix HTN1** to this report, along with additional supporting plans illustrating the improvements in the context of the wider Upper Brook Street regeneration scheme. This plan represents the scheme details supplied to the independent RSA1 audit team for formal review (see section 3 to this note). Key layout changes when compared to the scheme details included in the June 2023 TA report are as follows (**Appendix HTN1** also includes for a supporting numbered reference plan based on the bullet points below, to assist review):

Upper Brook Street / Booth Street East / Inchley Road Traffic Signal Junction

1. Widened central pedestrian / cycle refuge island to Booth Street East, to allow improved pedestrian / cycle crossing arrangements and larger waiting area within the refuge island. Associated minor relocation of the proposed crossing point of Upper Brook Street.
2. Widening of shared footway / pedal cycle zones around the junction to deliver minimum of 3m operating width, including widening of adopted section of site-side Upper Brook Street 'adopted' footway / cycleway. *NB - only exception being short section of 2.7m width adjacent to Upper Brook Street (N) stopline.*

3. Amendments to the Booth Street East junction arm to deliver separate right turn and left turn traffic lanes with central pedestrian / cycle refuge island. Exit lane arrangements towards Oxford Road are based broadly on the current layout, with kerblines tying-in to existing central island feature.
4. Reduced traffic signal island with (1.8m) for traffic signal equipment islands to Upper Brook Street approaches, to discourage use of these islands by pedestrians.
5. Amended traffic lane widths on Upper Brook Street junction approaches (3.2m through lane widths and 2.9m right turn lane width).
6. Shared / footway cycleway build-out on Upper Brook Street (S) approach to enhance pedestrian / cycle shared use area and to provide consistent lane widths through the junction for northbound traffic.
7. Revised traffic signal staging (see section 2.2 below).

Upper Brook Street Northern Frontage Bus Stop

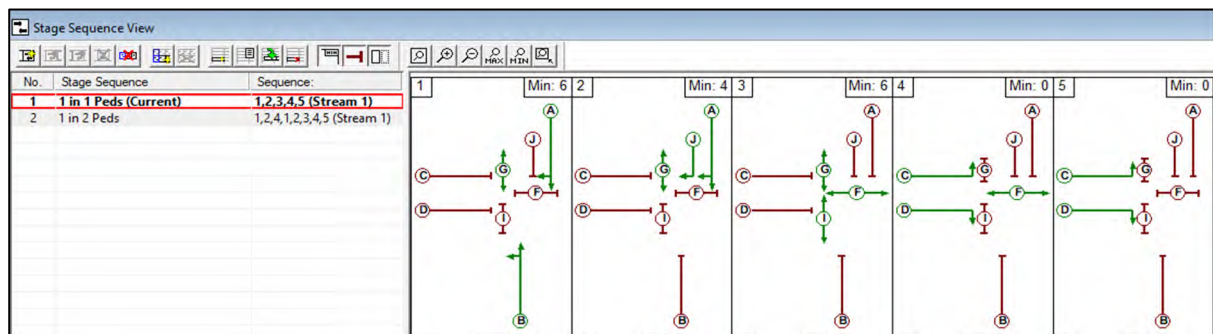
8. Provision of bus shelter, based on existing design, set within an expanded section of adopted footway. Final location of shelter to be sited to allow easy passage of through pedestrian movements.

2.2 Updated LINSIG Junction Operational Assessment

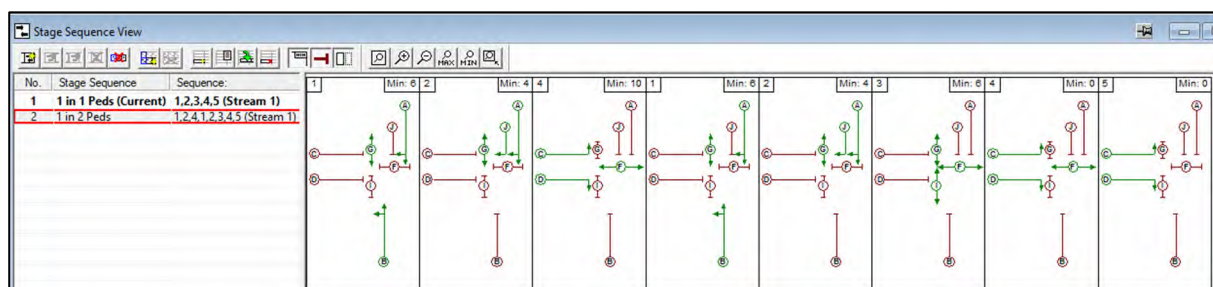
- 2.2.1 The proposed amendments to the junction layout provide the potential to explore alternative traffic signal staging at the junction, to better reflect the pedestrian / cycle crossing opportunities provided by the enhanced crossing arrangements. Focus TP have therefore worked directly with officers of TfGM UTC to identify optimum signal staging that seeks a balance between pedestrian / cycle crossing requirements, whilst maintaining an appropriate level of operational capacity that reflects the distributor road function of Upper Brook Street.

2.2.2 The paragraphs below set out the results of LINSIG traffic signal capacity analysis of the amended Upper Brook Street / Booth Street East junction scheme, including for updated traffic signal staging as developed by TfGM UTC. To provide a comprehensive review of anticipated junction operation, TfGM have prepared two traffic staging options, viz;

- ‘Worst case’ option - demonstrating junction operation for a scenario where all pedestrian stages are called during every traffic signal cycle, including an ‘all-red’ stage to allow pedestrians to cross the southern section of Booth Street East. This is based on the traffic signal staging sequence illustrated below (single cycle):



- ‘More Realistic’ option - demonstrating junction operation for a scenario where the ‘all-red’ pedestrian stage is only required to be called every other traffic signal cycle, as per the staging sequence illustrated below (showing two consecutive cycles)



2.2.3 LINSIG analysis runs have also been undertaken for two stage time options, viz:

- *An 80 second cycle time*, which is based on current operation at the junction and which would maximise pedestrian / cycle accessibility, by minimising the amount of time that pedestrian / cycle users would potentially be required to wait to receive a green signal at a crossing.
- *An 88 second cycle time*, which provides a greater balance between pedestrian / traffic capacity at the junction, as it offers the potential for slightly longer traffic signal stages, thereby helping to manage vehicle demand and queuing on key approaches.

2.2.4 LINSIG model results covering the full range of potential traffic signal operational scenarios for future year ‘With Application Scheme’ conditions are set out in the summary tables as part of **Appendix HTN2** to this report. **Appendix HTN2** also includes for detailed LINSIG model output for each assessment run. It should be noted when reviewing these model results, that LINSIG can only model fixed time traffic signal staging across the modelled period, whereas the Upper Brook Street / Booth Street East junction would ultimately operate under a dynamic SCOOT (Split Cycle Offset Optimisation Technique) based signal controller. Dynamic signal operation allows for continuous ‘real time’ adjustments to junction stage times in response to prevailing traffic conditions and therefore typically provides for optimised junction performance when compared to LINSIG results. TfGM recognise that SCOOT based junction operation has the potential to improve traffic performance by up to 15%, when compared to fixed staged operation. It should also be acknowledged that the traffic forecasts informing the LINSIG analysis presented in this note, are based on a robust methodology that does not include for any reductions in traffic demand to / from the regional centre anticipated to occur as a result of the delivery of the GMTS 2040 strategy.

2.2.5 Review of ‘With Application Scheme’ LINSIG model runs suggest that ‘worst case’ (all-red phase called every signal cycle) traffic signal operation based on an 80 second cycle time would effectively result in practical ‘at-capacity’ junction operating conditions, as reflected by predicted junction PRC values of -12.1% for the AM peak and -15.2% for the PM peak. Maximum link degree of saturation (DoS)

could be expected to be of the order of 103.7% on the Booth Street East right turn exit lane during PM peak conditions, with a significant predicted queuing. Adoption of a more balanced signal timings (88 seconds) to respond to the regular calling of the 'all-red' phase, however, is predicted to provide improved overall junction performance, with all junction approach arms predicted to operate at under 100% degree of saturation and significant reductions in overall queuing levels, when compared to 80 second cycle time results. This is reflected by reduced predicted junction PRC values of -5.9% in the AM peak and -7.2% in the PM peak.

2.2.6 By way of comparison, predicted operation of the junction under potentially more realistic signal stage demand (i.e. all-red stage required to be called every other signal cycle) demonstrates further improved junction performance. Even under the more pedestrian / cycle user orientated 80 second cycle time, the junction is predicted to operate with PRC's of +5.2% and +9.0%, for AM & PM peak periods respectively, with all junction approach arm degrees showing less than 90% DoS. Queuing on key approach links such as A34 Upper Brook Street would be typically less than 15 vehicles per lane and with much improved conditions on Booth Street East. 88 second cycle time operation under this more realistic signal staging provides further, albeit marginal, overall junction performance benefits.

2.2.7 Additional sensitivity testing has been undertaken for identified 'With Cumulative Development' future traffic forecasts (see **Appendix HTN3** to this note), including for the expected net traffic effects associated with the re-development of adjacent additional Upper Brook Street land parcels - which are the subject of a parallel mixed use / car free regeneration proposal by McLaren / Kadans. This cumulative development traffic exercise demonstrates similar junction capacity results to those set out above, reflecting that there is little predicted substantive change in traffic volumes between 'With Application Site' and 'With Cumulative Development' conditions (reflecting prevailing use of the adjacent site for public car parking). Indeed, slightly improved junction performance is predicted under PM peak cumulative development conditions, due to the net reduction in adjacent site traffic levels anticipated at this time.

- 2.2.8 Overall, it is considered that the LINSIG testing at Upper Brook Street / Booth Street East continues to demonstrate that the proposed traffic signal layout has the potential to provide suitable levels of operational performance and flexibility, particularly in the context of dynamic operation under SCOOT control, whilst delivering significant enhancements in pedestrian / traffic signal accessibility.

3.0 INDEPENDENT STAGE 1 ROAD SAFETY AUDIT

3.1 Principles of Road Safety Audit

3.1.1 A Road Safety Audit (RSA) is a procedure adopted that allows the independent overview of the road safety implications of proposed highway improvements or new road schemes. The objective of the process is to minimise potential future road collision occurrence and severity once the scheme has been built and the proposals come into operation. RSA's take into account the requirements of all road users, particularly vulnerable users such as pedestrians and pedal cyclists. Having identified potential road safety problems, the audit includes for practical recommendations for layout amendment / improvement. It should be stressed, however, that an RSA does not represent a technical design check.

3.1.2 The RSA process also includes for response by the designer / contractor (see chapter 4 to this HTN) allowing identification as to how the issues identified by the audit might be resolved going forward or will be highlighted to necessary elements of the design / contractor team.

3.1.3 RSA reviews are carried out at a number of key stages of the project design / delivery process, viz:

- Stage 1 (RSA1) - Preliminary Design
- Stage 2 (RSA2) - Detailed Design
- Stage 3 (RSA3) - Completion of Construction
- Stage 4 (RSA4) - Post Opening Monitoring (if required)

3.1.4 A RSA1 is undertaken at the completion of the preliminary scheme design, prior to granting of planning consent, and includes for the consideration of general road safety matters and in particular those issues that could impact on land take or practical scheme deliverability.

3.1.5 The RSA1 for the Upper Brook Street / Booth Street East / Inchley Road junction and northern bus stop at Upper Brook Street was undertaken by independent

consultancy 'Highway Associates'. The audit was undertaken based on the supplied scheme layout presented in **Appendix HTN2** to this report (Wilde CE Drawing Ref: 766-042-WCL-017-P01) and informed by audit team review of other relevant supplied plans and documentation, including historical road safety information, and the undertaking of a detailed site visit during early November 2023.

3.2 RSA1 Findings & Recommendations

3.2.1 A copy of the RSA1 report for the proposed Upper Brook Street / Booth Street East junction arrangements and northern Upper Brook Street bus stop is included as **Appendix HTN4** to this note. The key findings and recommendations set out in this report are summarised as follows:

- 3.1.1 - Alignment of approach lanes to central splitter island to Booth Street East could result in conflicts with right turn lane and opposing entry traffic.
- 3.1.2 - Narrowing alignment of A34 Upper Brook Street northbound lanes could result in risk of side-swipe incidents.
- 3.1.3 - Query regarding capacity effect of removing northbound through lane.
- 3.1.4 - Query regarding proposed lane widths
- 3.2.1 - Query regarding pedestrian / cycle crossing width of Upper Brook Street and measures to minimise conflicts with traffic phases.
- 3.2.2 - Concern regarding potential for unintentional incursion of ATUs into the Upper Brook Street carriageway when approaching from public square area.

4.0 RESPONSE TO ROAD SAFETY AUDIT

4.1 Designers Response Report

4.1.1 The formal Designers Response (DR) Report, prepared by Wilde CE in response to the matters highlighted in the RSA1, is included as **Appendix HTN5** to this note. The DR sets out a commentary as to additional design amendments and recommendations to be incorporated into updated layouts and to be considered during any subsequent construction design stage. The details of these matters are set out below:

- Amendment of lane approach and central splitter island alignment, along with inclusion of additional hatching to reduce potential conflicts between traffic streams, by increasing physical and visual separation.
- Re-alignment of Upper Brook Street northbound approach lanes to extend the taper narrowing section and provide an increased section of 'straight' alignment on the approach to the traffic signal stopline.
- Recommendation to revisit traffic signal staging at implementation stage to maximise separation between active Upper Brook Street crossing phases and subsequent traffic phases.
- Additional width 'landing' area to Upper Brook Street side of crossing, in combination with physical planting feature to the rear of this landing zone.

4.2 Identification of Final 'Preferred' Scheme Layout

4.2.1 The above design amendment to address matters raised in the RSA1 have been incorporated into the final 'preferred' scheme layout included as **Appendix HTN6** to this note (Wilde CE Drawing: 766-042-WCL-017-PO2). **Appendix HTN6** also includes for updated supporting plans illustrating the junction scheme layout in the context of the wider Upper Brook Street mixed use proposals, including the new public square feature and parallel highway improvements (one way operation)

on Kincardine Road ((Wilde CE Drawings: 766-042-WCL-09to012-PO3). The works relating to Kincardine Road are the subject of a separate RSA1 and HTN review (**Focus TP Doc Ref: J000370-HTN06**).

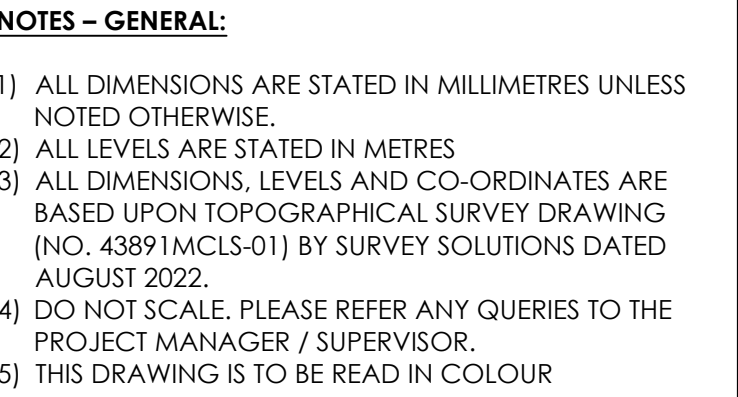
5.0 SUMMARY AND CONCLUSIONS

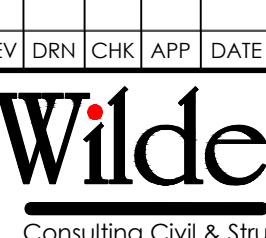
- 5.1 This Highways Technical Note (HTN) has been prepared to set out details of amendments to the development related highways works at the junction of Upper Brook Street / Booth Street East / Inchley Road proposed to support the mixed use regeneration of land at Upper Brook Street, Manchester (Planning Application Ref: 137401/FO/2023). The amendments set out in this report have been prepared to take on board comments on the initial scheme drawings presented in the June 2023 Transport Assessment (TA) report, as received from stakeholders during the planning application consultation period and the results of a subsequent Independent Stage 1 Road Safety Audit. Incorporation of these technical comments has allowed for the identification of an updated ‘preferred’ junction scheme that maximises pedestrian / cycle accessibility, in line with prevailing government policy.
- 5.2 Initial suggested layout changes were identified through the review of comments provided by technical stakeholders and the consideration of alternative layout options explored at a Design Workshop session. These changes represent an evolution of the originally presented scheme designs set out in the June 2023 TA, and respond to specific points of technical detail. They do not alter the key principles of the highway strategy supporting the Upper Brook Street redevelopment proposals and are unaffected by the proposed changes to the wider regeneration scheme. The nature of the proposed amendments to the Upper Brook Street / Inchley Road junction include for changes to crossing island and kerb dimensions to deliver enhanced pedestrian / cycle waiting areas and alterations to road markings and vehicle carriageway widths. A replacement passenger shelter is also now proposed to be included at the Upper Brooks Street northern bus stop, at the request of TfGM.
- 5.3 The proposed junction amendments offer the potential to explore alternative traffic signal staging. Focus TP have therefore worked directly with TfGM UTC to identify signal staging that can deliver a balance between pedestrian / cycle crossing requirements, whilst maintaining a suitable level of operational capacity. A range of traffic signal options have been tested, with the results of this analysis

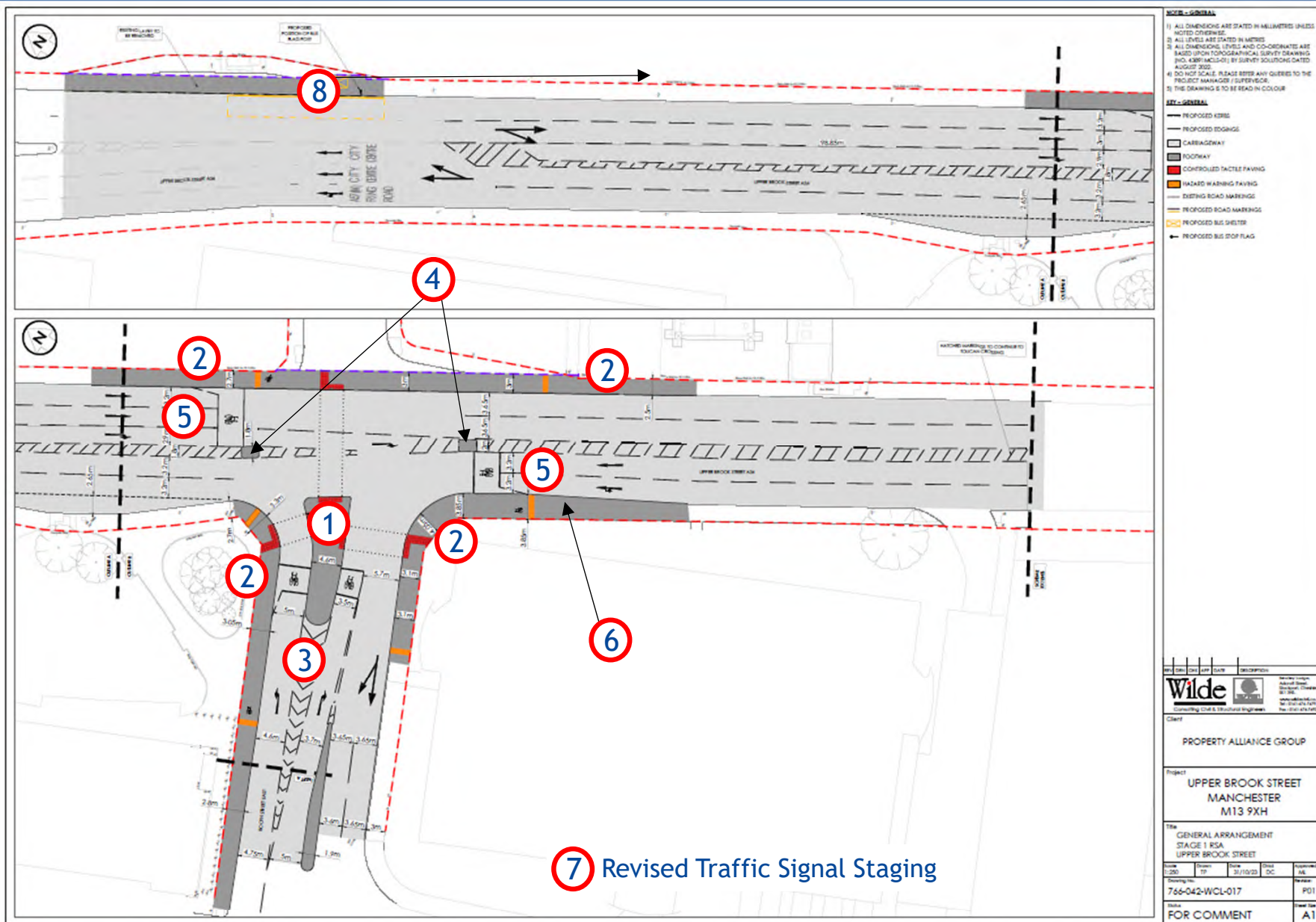
demonstrating that the amended junction design has the potential to provide suitable levels of operational performance and flexibility, particularly in the context of dynamic operation under SCOOT control, whilst delivering significant enhancements in pedestrian / traffic signal accessibility.

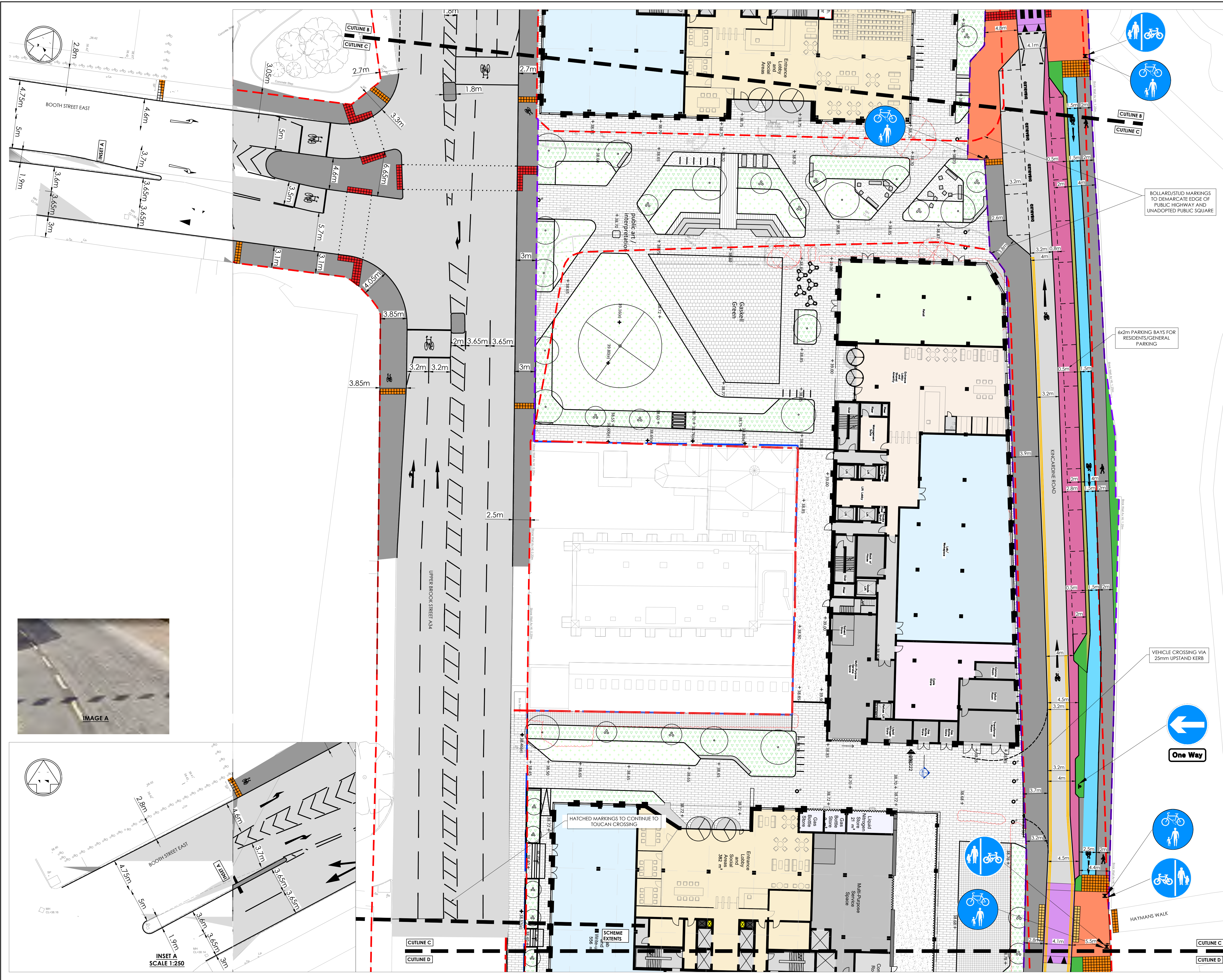
- 5.4 The proposed scheme amendments were agreed in principle with key highways stakeholders, subject to Independent Stage 1 Road Safety Audit review. The comments and recommendations identified as part of the RSA1 exercise have been incorporated into final 'preferred scheme' layouts, which are presented in this note for final review and agreement with the Council.





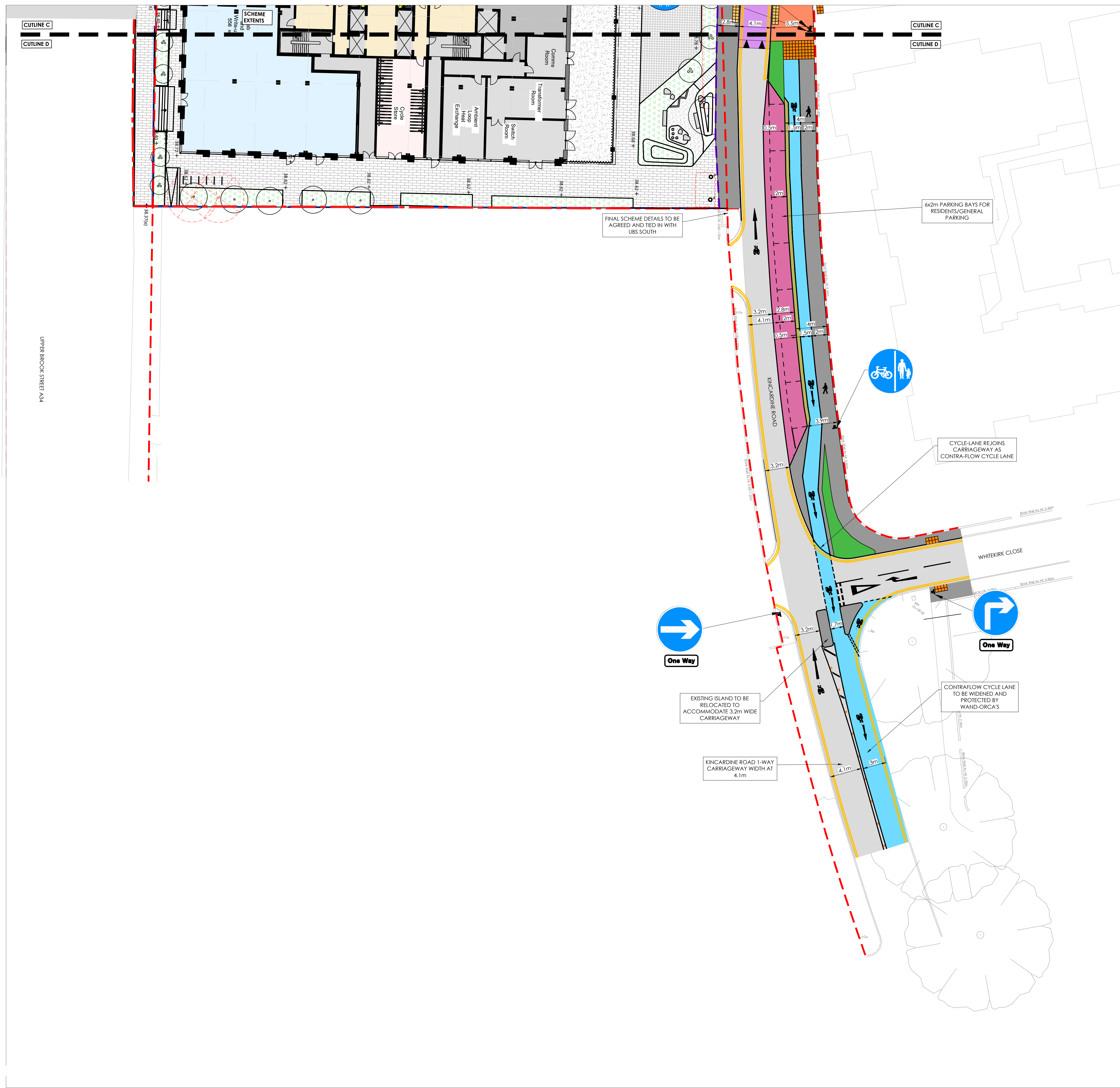
EV	DRN	CHK	APP	DATE	DESCRIPTION
  Brindley Lodge, Adcroft Street, Stockport, Cheshire, SK1 3BS www.wildescivil.co.uk Tel : 0161-474-7479 Fax : 0161-474-7492					
Client					
PROPERTY ALLIANCE GROUP					
Project					
UPPER BROOK STREET MANCHESTER M13 9XH					
file					
GENERAL ARRANGEMENT STAGE 1 RSA UPPER BROOK STREET					
Scale 1:250	Drawn TP	Date 31/10/23	Chkd DC	Approved ML	
Drawing No. 766-042-WCL-017				Revision P01	
Status				Sheet Size	
FOR COMMENT				A1	





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 - 2) ALL LEVELS ARE STATED IN METRES
 - 3) ALL DIMENSIONS, LEVELS AND CO-ORDINATES ARE BASED UPON TOPOGRAPHICAL SURVEY DRAWING (NO. 43891MCLS-01) BY SURVEY SOLUTIONS DATED AUGUST 2022.
 - 4) DO NOT SCALE. PLEASE REFER ANY QUERIES TO THE PROJECT MANAGER / SUPERVISOR.
 - 5) THIS DRAWING IS TO BE READ IN COLOUR
- KEY – GENERAL**
- EXISTING HIGHWAY BOUNDARY
 - NEW HIGHWAY BOUNDARY
 - CARRIAGEWAY
 - RAISED OVERRUN STRIP
 - FOOTWAY
 - SHARED USE FACILITY
 - CYCLE TRACK
 - 0.5m BUFFER ZONE BETWEEN CYCLE TRACK AND CAR PARKING BAY
 - RAISED PLATEAU
 - CONTROLLED TACTILE PAVING
 - UNCONTROLLED TACTILE PAVING
 - HAZARD WARNING PAVING
 - SUDS/PLANTING AREA
 - EXISTING ROAD MARKINGS
 - PROPOSED ROAD MARKINGS
 - TRAFFIC SIGN
 - CYCLE LANE LIGHT SEGREGATION - TRAFFIC WAND
 - BUS SHELTER

P02	TP	DC	ML	31/10/23	AMENDED FOLLOWING REVIEW
REV	DRN	CHK	APP	DATE	DESCRIPTION
					Wilde Consulting Civil & Structural Engineers
					Brindley Lodge, Adcroft Street, Stockport, Cheshire, SK1 3HS. www.wilddecivil.co.uk Tel: 0161-474-7479 Fax: 0161-474-7492
Client					
PROPERTY ALLIANCE GROUP					
Project					
UPPER BROOK STREET MANCHESTER M13 9XH					
Title					
GENERAL ARRANGEMENT (OPTION 3) SHEET 3 OF 4					
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Drawing No.	766-042-WCL-011	Chkd	DC	Approved	ML
Status	FOR COMMENT	Revision			P02
				Sheet Size	A1



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- EXISTING HIGHWAY BOUNDARY
- NEW HIGHWAY BOUNDARY
- CARRIAGEWAY
- RAISED OVERRUN STRIP
- FOOTWAY
- SHARED USE FACILITY
- CYCLE TRACK
- 0.5m BUFFER ZONE BETWEEN CYCLE TRACK AND CAR PARKING BAY
- RAISED PLATEAU
- CONTROLLED TACTILE PAVING
- UNCONTROLLED TACTILE PAVING
- HAZARD WARNING PAVING
- SUDS/PLANTING AREA
- EXISTING ROAD MARKINGS
- PROPOSED ROAD MARKINGS
- TRAFFIC SIGN
- CYCLE LANE LIGHT SEGREGATION - TRAFFIC WAND
- BUS SHELTER

TP	DC	ML	31/10/23	AMENDED FOLLOWING REVIEW	
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Consulting Civil & Structural Engineers					
Client					
PROPERTY ALLIANCE GROUP					
Project					
UPPER BROOK STREET MANCHESTER M13 9XH					
Title					
GENERAL ARRANGEMENT (OPTION 3) SHEET 4 OF 4					
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Drawing No. 766-042-WCL-0012				Revision P02	
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**Baseline + Development 'With Application Scheme' Junction Capacity Modelling Results
(UTC Model)**

Key

	0-89% DoS (within capacity conditions)
	90-99% DoS (variable operating conditions)
	100%+ DoS (over capacity conditions)

A34 / Booth Street East - Proposed Junction (80 Second Cycle Time)

	Lane Description	AM Peak			PM Peak		
		Flow	Deg of Sat	MMQ	Flow	Deg of Sat	MMQ
		-	100.9%	-	-	103.7%	-
1/1	A34(S) - Left & Ahead	622	96.7%	21.7	462	90.1%	13.7
1/2	A34(S) - Ahead	760	97.7%	26.4	572	91.9%	17.0
2/1	Booth Street East - Left	74	18.9%	1.5	101	17.6%	1.7
2/2	Booth Street East - Right	343	100.9%	17.7	554	103.7%	30.4
3/1+3/2	A34(N) - Ahead	691	40.1% : 40.1%	5.2	975	63.6% : 63.6%	9.8
3/3	A34(N) - Right	233	94.5%	8.0	247	100.1%	11.8
Cycle Time		80s			80s		
Stage timings		34s, 9s, 16s, 12s, 9s			28s, 7s, 16s, 20s, 9s		
Junction PRC		-12.1%			-15.2%		
Total delay over all lanes (pcuHr)		51.58			56.85		

A34 / Booth Street East - Proposed Junction (88 Second Cycle Time)

	Lane Description	AM Peak			PM Peak		
		Flow	Deg of Sat	MMQ	Flow	Deg of Sat	MMQ
		-	95.3%	-	-	96.5%	-
1/1	A34(S) - Left & Ahead	618	93.9%	20.4	462	84.9%	13.2
1/2	A34(S) - Ahead	764	94.8%	24.8	572	86.6%	16.1
2/1	Booth Street East - Left	74	17.7%	1.5	101	16.7%	1.8
2/2	Booth Street East - Right	343	91.4%	12.4	554	96.5%	21.0
3/1+3/2	A34(N) - Ahead	328	41.1% : 41.1%	5.6	975	66.0% : 66.0%	10.7
3/3	A34(N) - Right	233	95.3%	8.5	247	87.5%	8.8
Cycle Time		88s			88s		
Stage timings		38s, 10s, 16s, 15s, 9s			32s, 7s, 16s, 24s, 9s		
Junction PRC		-5.9%			-7.2%		
Total delay over all lanes (pcuHr)		41.62			39.35		

**Baseline + Development 'With Application Scheme' Junction Capacity Modelling Results
(UTC Model)**

Key

	0-89% DoS (within capacity conditions)
	90-99% DoS (variable operating conditions)
	100%+ DoS (over capacity conditions)

A34 / Booth Street East - Proposed Junction with ped stage on alternate cycles (2*80 Second Cycle Time)

	Lane Description	AM Peak			PM Peak		
		Flow	Deg of Sat	MMQ	Flow	Deg of Sat	MMQ
		-	85.6%	-	-	82.5%	-
1/1	A34(S) - Left & Ahead	613	81.8%	14.3	456	79.1%	12.0
1/2	A34(S) - Ahead	769	84.7%	18.3	578	82.5%	15.3
2/1	Booth Street East - Left	74	17.4%	1.5	101	14.6%	1.7
2/2	Booth Street East - Right	343	85.6%	10.9	554	81.5%	14.3
3/1+3/2	A34(N) - Ahead	691	36.7% : 36.7%	4.9	975	61.0% : 61.0%	10.3
3/3	A34(N) - Right	233	83.2%	5.1	247	78.4%	7.7
Cycle Time		160s			160s		
Stage timings		48s, 14s, 17s, 39s, 7s, 16s, 10s, 9s			35s, 7s, 27s, 36s, 7s, 16s, 23s, 9s		
Junction PRC		5.2%			9.0%		
Total delay over all lanes (pcuHr)		25.47			27.29		

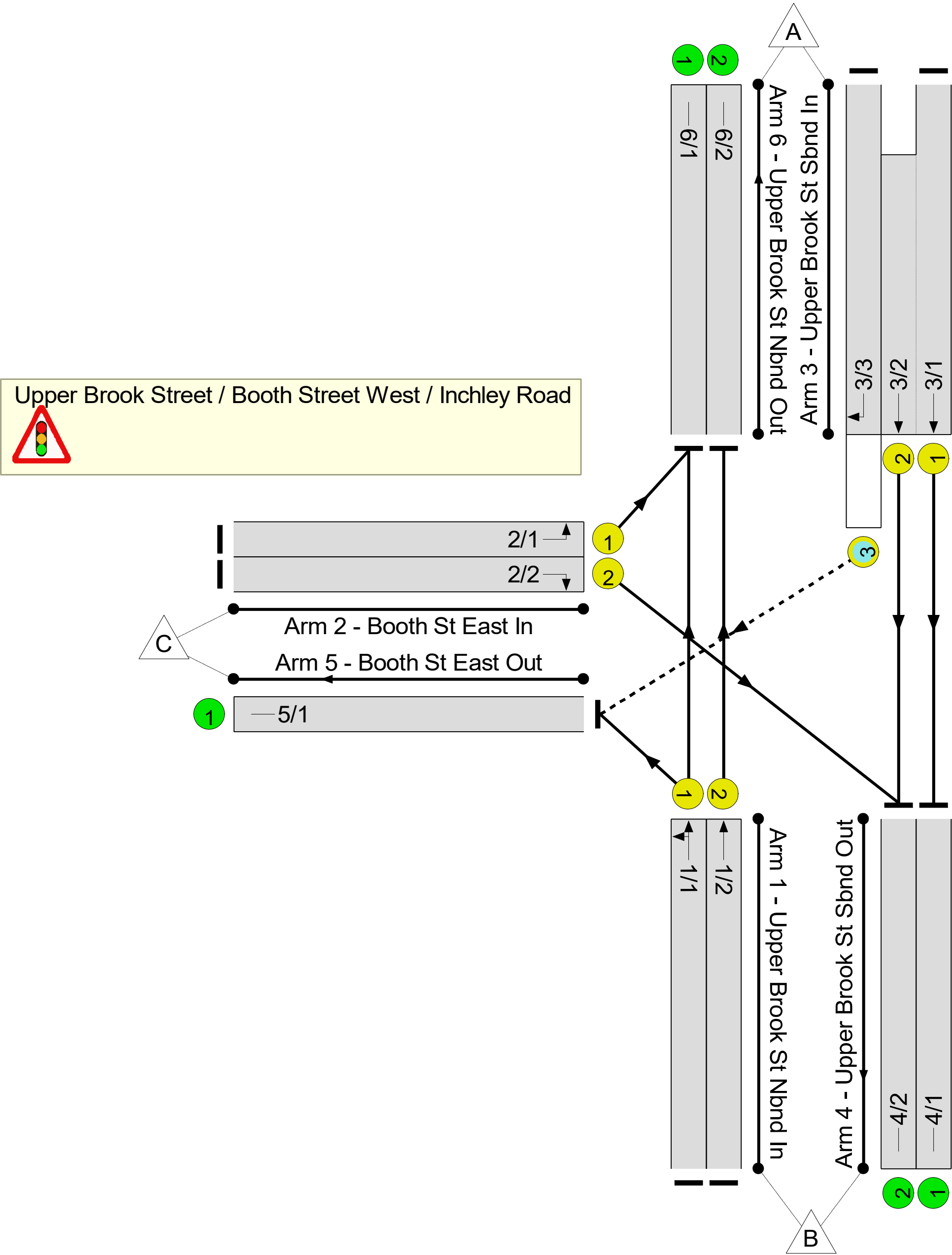
A34 / Booth Street East - Proposed Junction with ped stage on alternate cycles (2*88 Second Cycle Time)

	Lane Description	AM Peak			PM Peak		
		Flow	Deg of Sat	MMQ	Flow	Deg of Sat	MMQ
		-	83.6%	-	-	82.3%	-
1/1	A34(S) - Left & Ahead	613	80.8%	15.5	456	72.3%	11.4
1/2	A34(S) - Ahead	769	83.6%	19.8	578	75.4%	14.5
2/1	Booth Street East - Left	74	16.9%	1.6	101	14.9%	1.8
2/2	Booth Street East - Right	343	81.8%	10.5	554	82.3%	15.0
3/1+3/2	A34(N) - Ahead	691	37.6% : 37.6%	5.4	975	61.7% : 61.7%	10.3
3/3	A34(N) - Right	233	81.8%	5.3	247	81.5%	8.6
Cycle Time		176s			176s		
Stage timings		44s, 16s, 18s, 51s, 8s, 16s, 14s, 9s			43s, 7s, 32s, 39s, 7s, 16s, 23s, 9s		
Junction PRC		7.6%			9.4%		
Total delay over all lanes (pcuHr)		25.27			26.99		

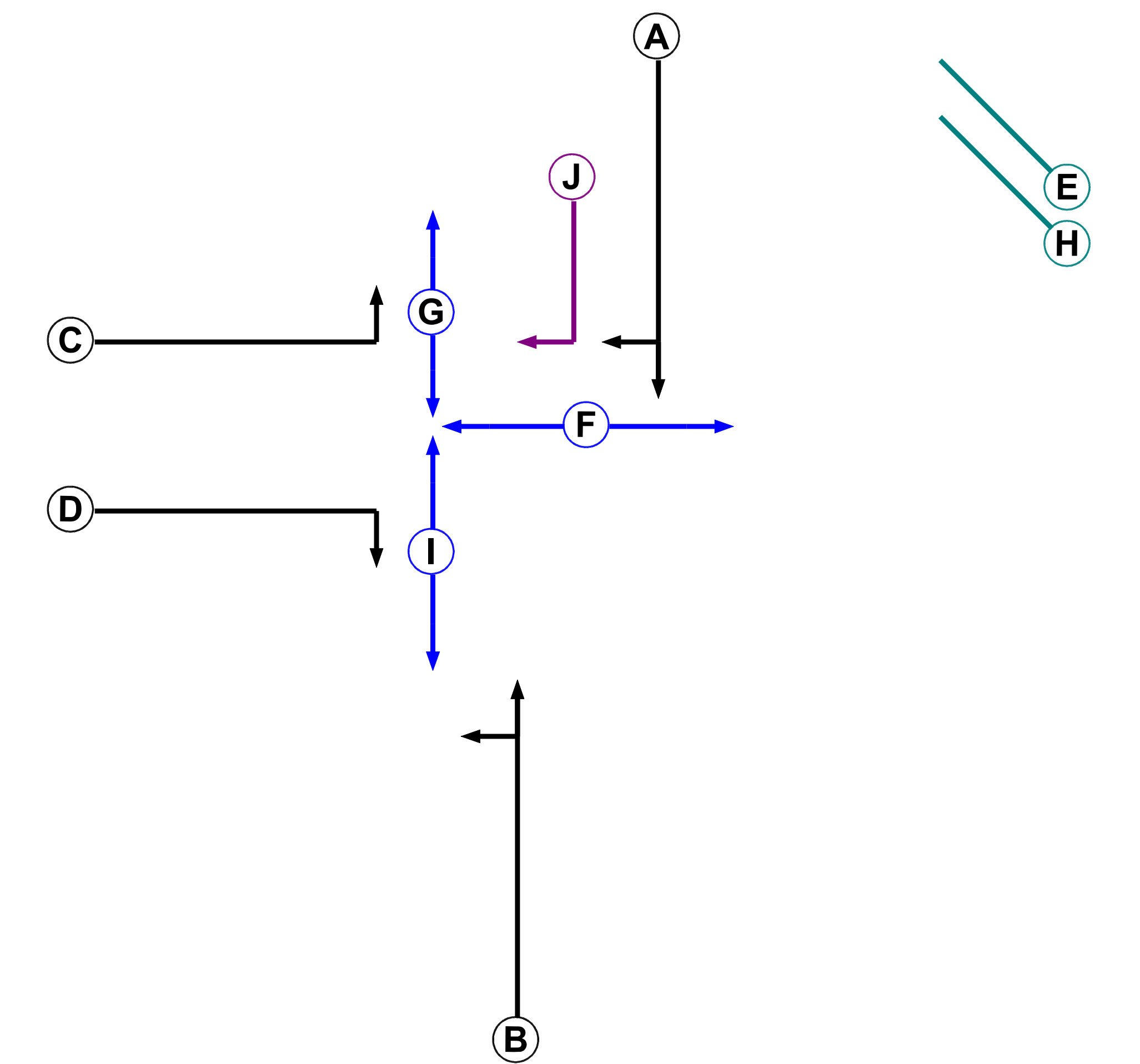
User and Project Details

Project:	A34_ Booth Street East
Title:	Upper Brook Street / Booth Street West / Inchley Road
Location:	Upper Brook Street / Booth Street West / Inchley Road
Client:	FOCUS Transport Planning
Site Ref(s):	131
Design Layout Ref:	Proposed
Date Started:	10.11.23
Date Completed:	13.11.23
Model Purpose:	To simulate the proposed condition.
Additional detail:	This model has been reviewed and adjusted by TfGM. General Comments: The model has been checked assuming the proposed design. Traffic flows have not been checked - this is for HFAS at TfGM to validate. Phase Minimums The phase minimum for F has been increased to 10 seconds from 8. The phase minimum for I has been increased to 6 seconds from 5. Stage Sequence The stage sequence has been adjusted to improve the performance of the junction. Intergreens A -> D has been increased to 6 seconds from 5. A -> I has been increased to 10 seconds from 9. B -> I has been increased to 8 seconds from 7. F -> A, F -> B, and F -> J have all been reduced to 14 seconds from 16. G -> C has been reduced to 5 seconds from 6. J -> B has been increased to 7 seconds from 5. J -> D has been increased to 6 seconds from 5. J -> I has been increased to 10 seconds from 9. Phase Delays Phase delays have been adjusted to improve the performance of the junction. Optimisation All scenarios have been optimised. Cycle Times A cycle time of 80 seconds mirrors the current maximum cycle time.
File name:	FTP_131_Proposed_TM_101123.lsg3x
Author:	TM
Company:	TfGM
Address:	2 Piccadilly Place

Network Layout Diagram



Phase Diagram



Phase Input Data

Phase Name	Phase Type	Stage Stream	Assoc. Phase	Street Min	Cont Min
A	Traffic	1		-9999	7
B	Traffic	1		-9999	7
C	Traffic	1		-9999	7
D	Traffic	1		-9999	7
E	Dummy			-9999	7
F	Pedestrian	1		-9999	10
G	Pedestrian	1		-9999	5
H	Dummy			-9999	7
I	Pedestrian	1		-9999	6
J	Ind. Arrow	1	A	-9999	4

Phase Intergreens Matrix

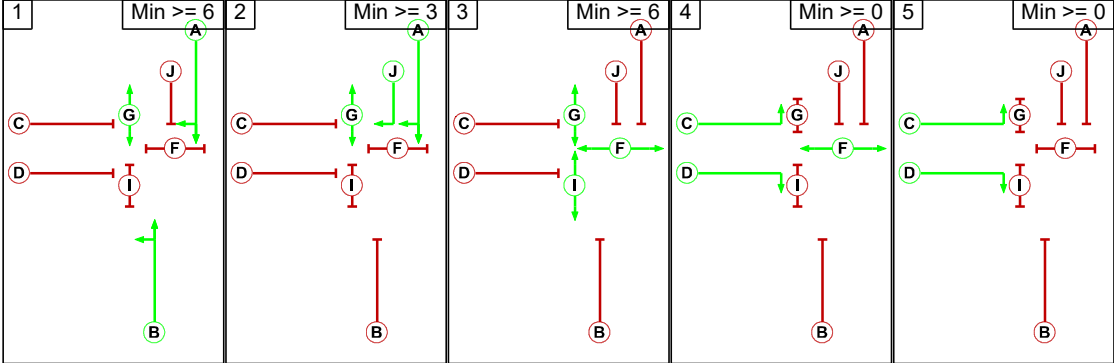
Terminating Phase	Starting Phase										
		A	B	C	D	E	F	G	H	I	J
	A		-	-	6	-	7	-	-	10	-
	B	-		7	5	-	8	-	-	8	3
	C	-	5		-	-	-	6	-	-	-
	D	5	5	-		-	-	-	-	6	5
	E	-	-	-	-		-	-	-	-	-
	F	14	14	-	-	-		-	-	-	14
	G	-	-	5	-	-	-		-	-	-
	H	-	-	-	-	-	-	-		-	-
	I	8	8	-	8	-	-	-	-		8
	J	-	6	-	6	-	7	-	-	10	

Phases in Stage

Stream	Stage No.	Phases in Stage
1	1	A B G
1	2	A G J
1	3	F G I
1	4	C D F
1	5	C D

Stage Diagram

Stage Stream: 1



Phase Delays

Stage Stream: 1

Term. Stage	Start Stage	Phase	Type	Value	Cont value
1	4	G	Losing	2	2
1	5	G	Losing	2	2
3	1	I	Losing	6	6
3	2	I	Losing	6	6
3	5	F	Losing	8	8
4	1	C	Losing	9	9
4	1	D	Losing	9	9
4	2	C	Losing	8	8
4	2	D	Losing	9	9

Prohibited Stage Change

Stage Stream: 1

From Stage	To Stage					
		1	2	3	4	5
	1		3	10	8	7
	2	6		10	7	6
	3	14	14		8	8
	4	15	14	6		0
	5	6	6	6	0	

Full Input Data And Results

Give-Way Lane Input Data

Junction: Upper Brook Street / Booth Street West / Inchley Road											
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)
3/3 (Upper Brook St Sbnd In)	5/1 (Right)	1439	0	1/1	1.09	All	4.00	-	0.50	4	4.00
				1/2	1.09	All					

Lane Input Data

Junction: Upper Brook Street / Booth Street West / Inchley Road												
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 (Upper Brook St Nbnd In)	U	B	2	3	49.7	Geom	-	3.20	0.00	Y	Arm 5 Left	10.00
											Arm 6 Ahead	Inf
1/2 (Upper Brook St Nbnd In)	U	B	2	3	49.7	Geom	-	3.20	0.00	N	Arm 6 Ahead	Inf
2/1 (Booth St East In)	U	C	2	3	8.3	Geom	-	5.00	0.00	Y	Arm 6 Left	10.00
2/2 (Booth St East In)	U	D	2	3	8.3	Geom	-	3.50	0.00	N	Arm 4 Right	18.00
3/1 (Upper Brook St Sbnd In)	U	A	2	3	33.4	Geom	-	3.20	0.00	Y	Arm 4 Ahead	Inf
3/2 (Upper Brook St Sbnd In)	U	A	2	3	17.2	Geom	-	3.00	0.00	N	Arm 4 Ahead	Inf
3/3 (Upper Brook St Sbnd In)	O	A J	2	3	33.4	Geom	-	2.90	0.00	N	Arm 5 Right	10.00
4/1 (Upper Brook St Sbnd Out)	U		2	3	60.0	Inf	-	-	-	-	-	-
4/2 (Upper Brook St Sbnd Out)	U		2	3	60.0	Inf	-	-	-	-	-	-
5/1 (Booth St East Out)	U		2	3	60.0	Inf	-	-	-	-	-	-
6/1 (Upper Brook St Nbnd Out)	U		2	3	60.0	Inf	-	-	-	-	-	-
6/2 (Upper Brook St Nbnd Out)	U		2	3	60.0	Inf	-	-	-	-	-	-

Traffic Flow Groups

Flow Group	Start Time	End Time	Duration	Formula
1: 'Application Scheme AM Peak'	08:15	09:15	01:00	

Scenario 1: 'Proposed Layout' (FG1: 'Application Scheme AM Peak', Plan 1: '1 in 1 Peds')

Traffic Flows, Desired

Desired Flow :

Origin	Destination				
		A	B	C	Tot.
	A	0	691	233	924
	B	851	0	531	1382
	C	74	343	0	417
	Tot.	925	1034	764	2723

Traffic Lane Flows

Lane	Scenario 1: Proposed Layout
Junction: Upper Brook Street / Booth Street West / Inchley Road	
1/1	622
1/2	760
2/1	74
2/2	343
3/1 (with short)	691(In) 335(Out)
3/2 (short)	356
3/3	233
4/1	335
4/2	699
5/1	764
6/1	165
6/2	760

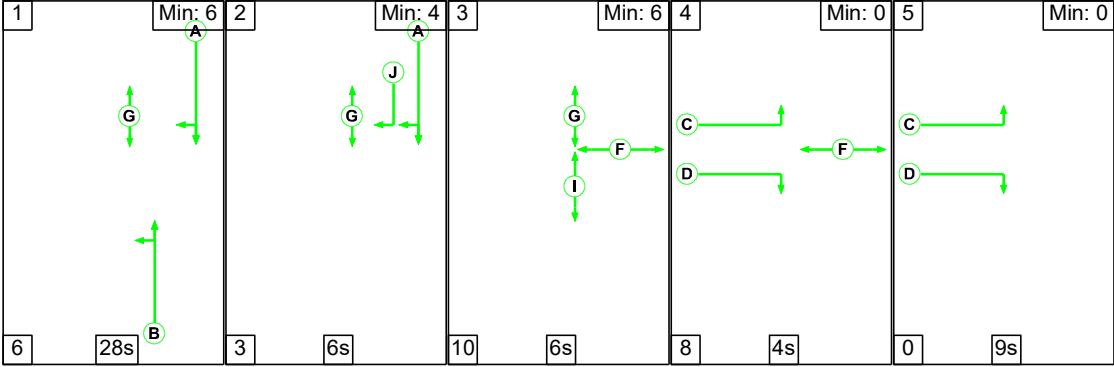
Lane Saturation Flows

Junction: Upper Brook Street / Booth Street West / Inchley Road								
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 (Upper Brook St Nbnd In)	3.20	0.00	Y	Arm 5 Left	10.00	85.4 %	1715	1715
				Arm 6 Ahead	Inf	14.6 %		
1/2 (Upper Brook St Nbnd In)	3.20	0.00	N	Arm 6 Ahead	Inf	100.0 %	2075	2075
2/1 (Booth St East In)	5.00	0.00	Y	Arm 6 Left	10.00	100.0 %	1839	1839
2/2 (Booth St East In)	3.50	0.00	N	Arm 4 Right	18.00	100.0 %	1943	1943
3/1 (Upper Brook St Sbnd In)	3.20	0.00	Y	Arm 4 Ahead	Inf	100.0 %	1935	1935
3/2 (Upper Brook St Sbnd In)	3.00	0.00	N	Arm 4 Ahead	Inf	100.0 %	2055	2055
3/3 (Upper Brook St Sbnd In)	2.90	0.00	N	Arm 5 Right	10.00	100.0 %	1778	1778
4/1 (Upper Brook St Sbnd Out Lane 1)	Infinite Saturation Flow						Inf	Inf
4/2 (Upper Brook St Sbnd Out Lane 2)	Infinite Saturation Flow						Inf	Inf
5/1 (Booth St East Out Lane 1)	Infinite Saturation Flow						Inf	Inf
6/1 (Upper Brook St Nbnd Out Lane 1)	Infinite Saturation Flow						Inf	Inf
6/2 (Upper Brook St Nbnd Out Lane 2)	Infinite Saturation Flow						Inf	Inf

Scenario 1: 'Proposed Layout' (FG1: 'Application Scheme AM Peak', Plan 1: '1 in 1 Peds')

Stage Sequence Diagram

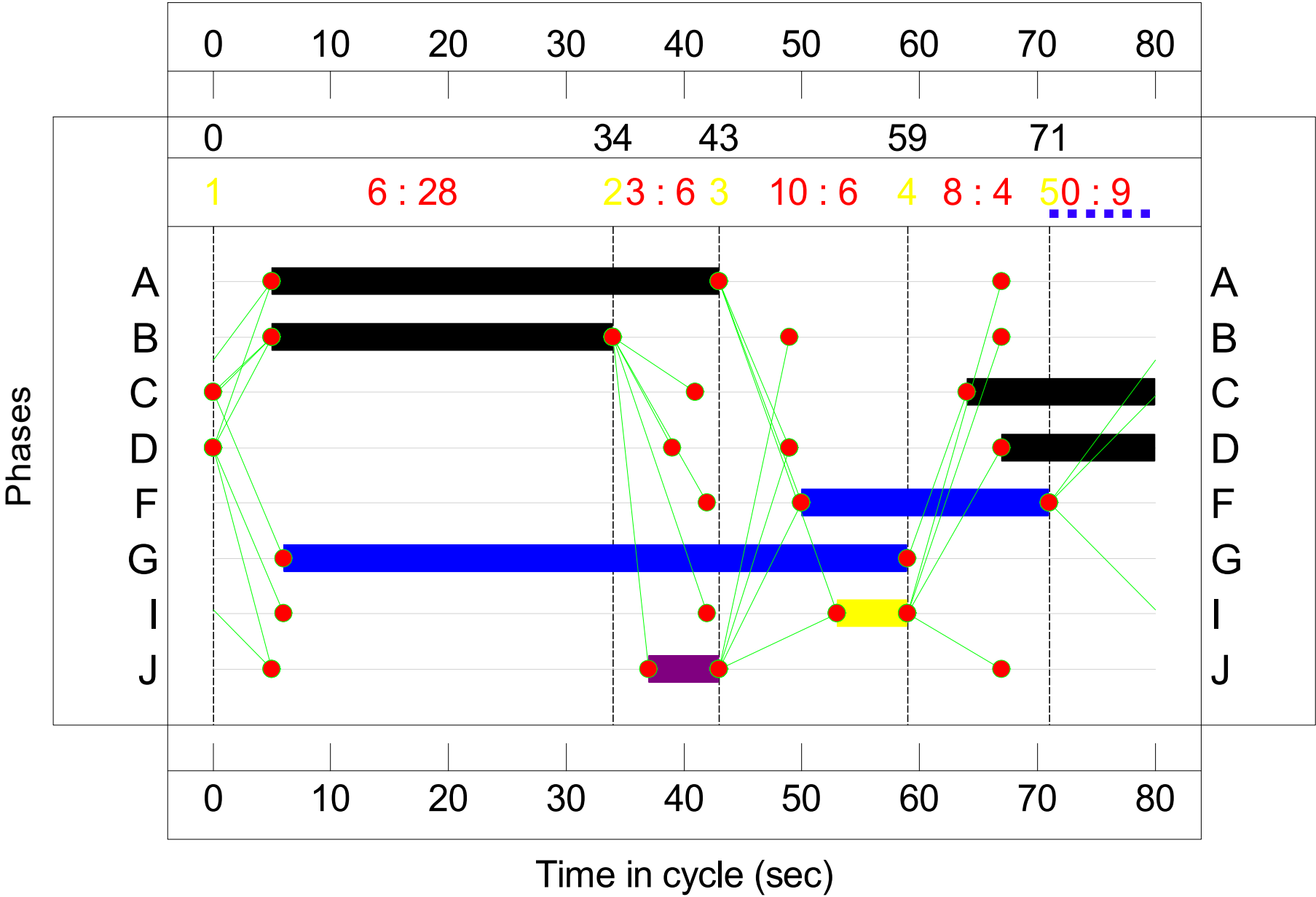
Stage Stream: 1



Stage Timings
Stage Stream: 1

Stage	1	2	3	4	5
Duration	28	6	6	4	9
Change Point	0	34	43	59	71

Signal Timings Diagram

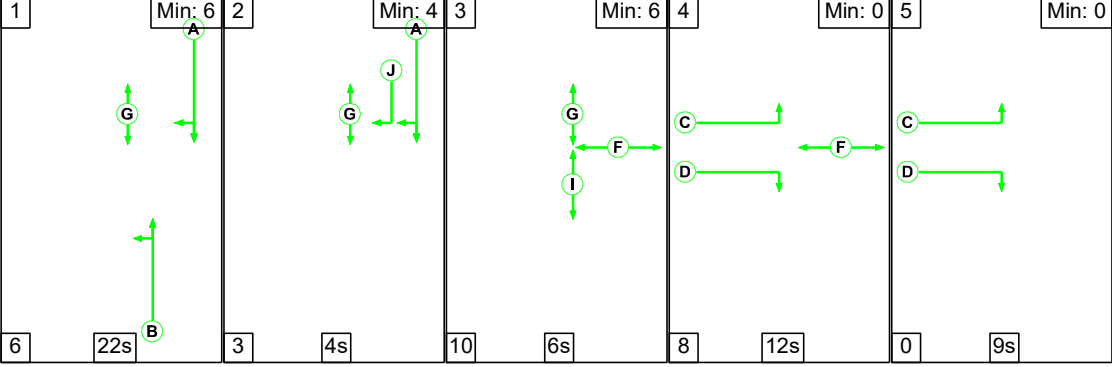


Network Results

C1 - 131	Stream: 1 PRC for Signalled Lanes (%):	-12.1	Total Delay for Signalled Lanes (pcuHr):	51.58	Cycle Time (s):	80
	PRC Over All Lanes (%):	-12.1	Total Delay Over All Lanes(pcuHr):	51.58		

Full Input Data And Results
Scenario 2: 'Proposed Layout' (FG2: 'Application Scheme PM Peak', Plan 1: '1 in 1 Peds')
Stage Sequence Diagram

Stage Stream: 1

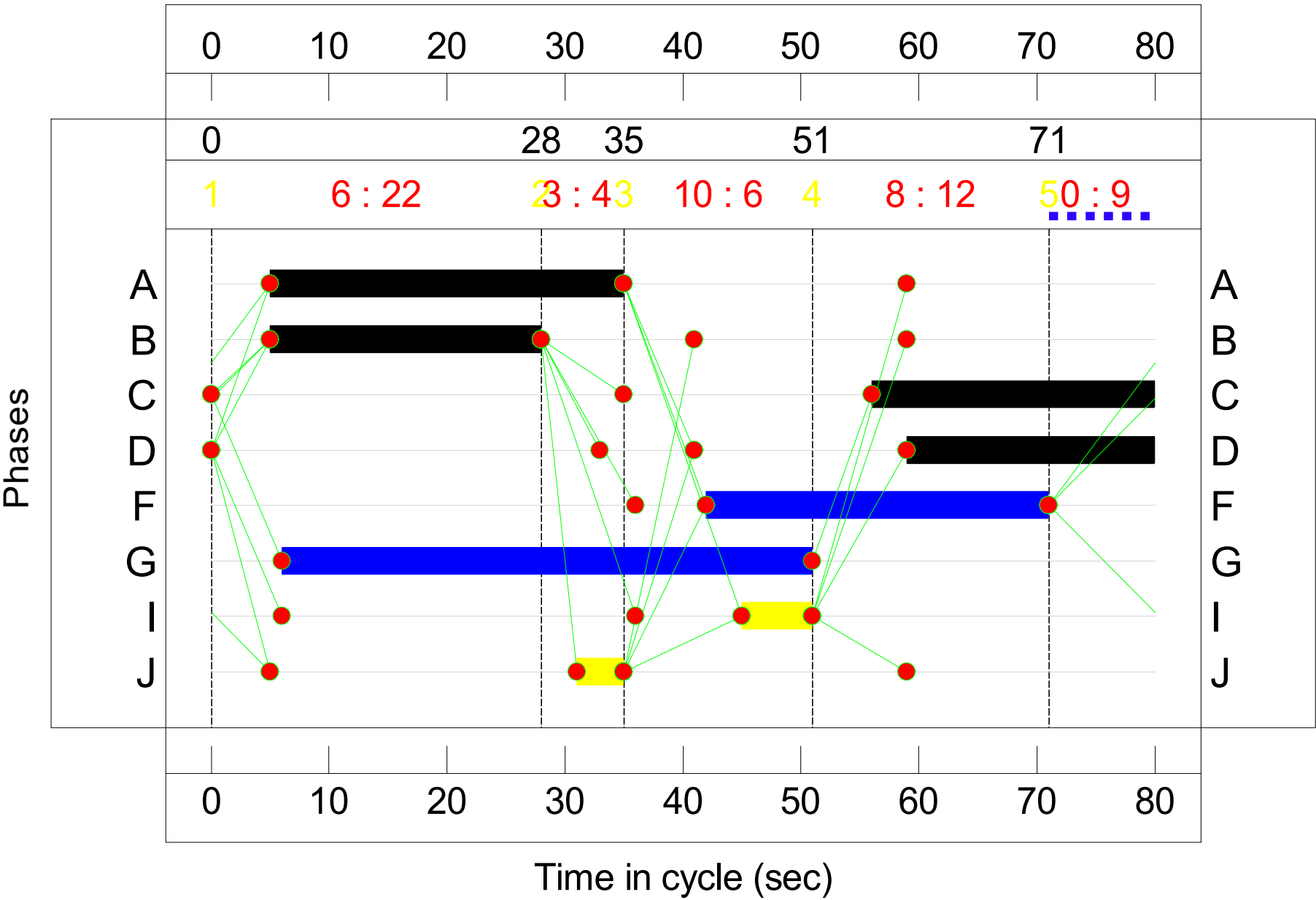


Stage Timings

Stage Stream: 1

Stage	1	2	3	4	5
Duration	22	4	6	12	9
Change Point	0	28	35	51	71

Signal Timings Diagram

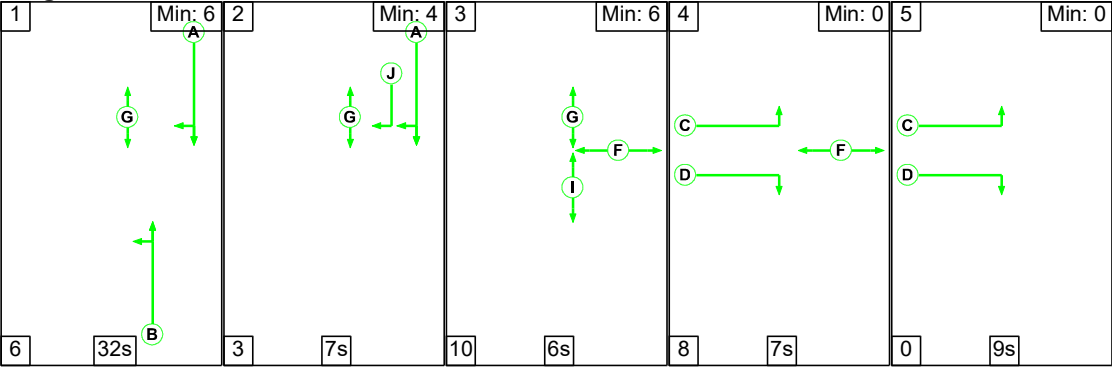


Network Results

C1 - 131	Stream: 1 PRC for Signalled Lanes (%):	-15.2	Total Delay for Signalled Lanes (pcuHr):	56.85	Cycle Time (s):	80
	PRC Over All Lanes (%):	-15.2	Total Delay Over All Lanes(pcuHr):	56.85		

Full Input Data And Results
Scenario 9: 'Copy of Proposed Layout' (FG1: 'Application Scheme AM Peak', Plan 1: '1 in 1 Peds')
Stage Sequence Diagram

Stage Stream: 1

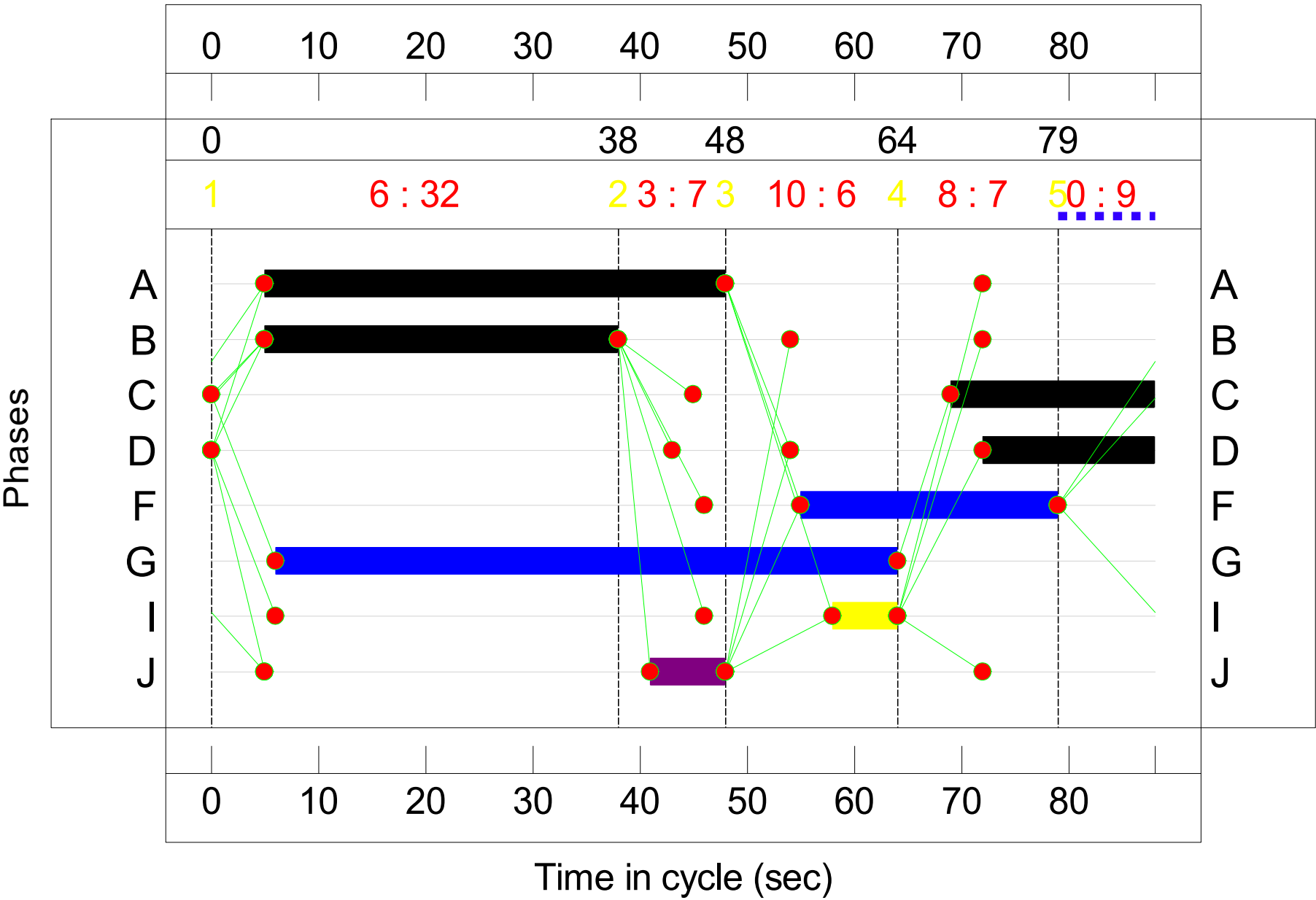


Stage Timings

Stage Stream: 1

Stage	1	2	3	4	5
Duration	32	7	6	7	9
Change Point	0	38	48	64	79

Signal Timings Diagram

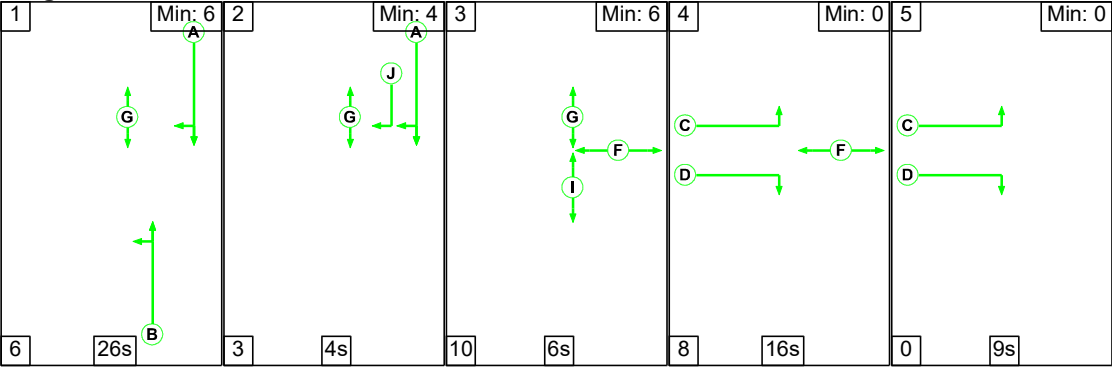


Network Results

C1 - 131	Stream: 1 PRC for Signalled Lanes (%):	-5.9	Total Delay for Signalled Lanes (pcuHr):	41.62	Cycle Time (s):	88
	PRC Over All Lanes (%):	-5.9	Total Delay Over All Lanes(pcuHr):	41.62		

Full Input Data And Results
Scenario 10: 'Copy of Proposed Layout' (FG2: 'Application Scheme PM Peak', Plan 1: '1 in 1 Peds')
Stage Sequence Diagram

Stage Stream: 1

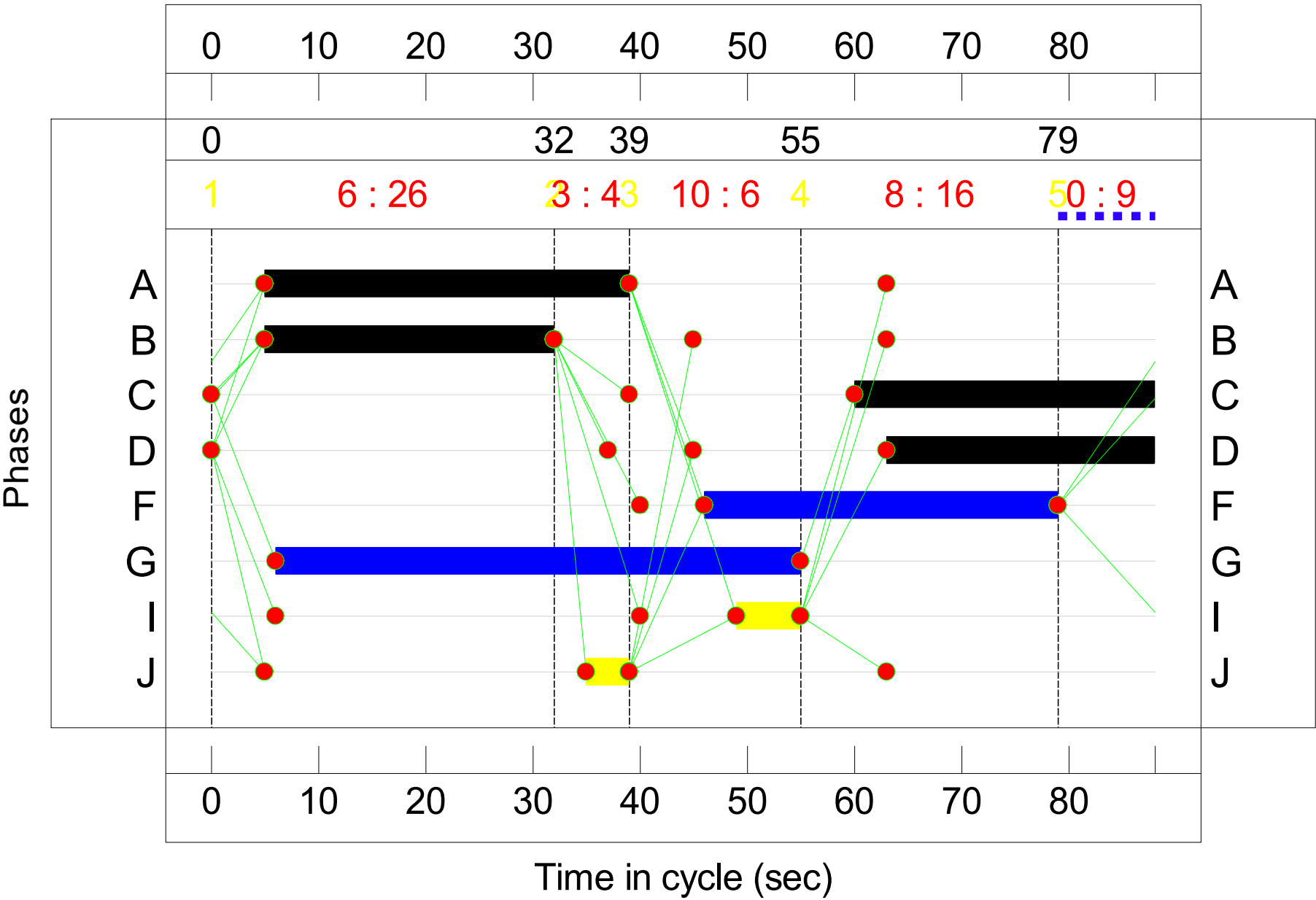


Stage Timings

Stage Stream: 1

Stage	1	2	3	4	5
Duration	26	4	6	16	9
Change Point	0	32	39	55	79

Signal Timings Diagram



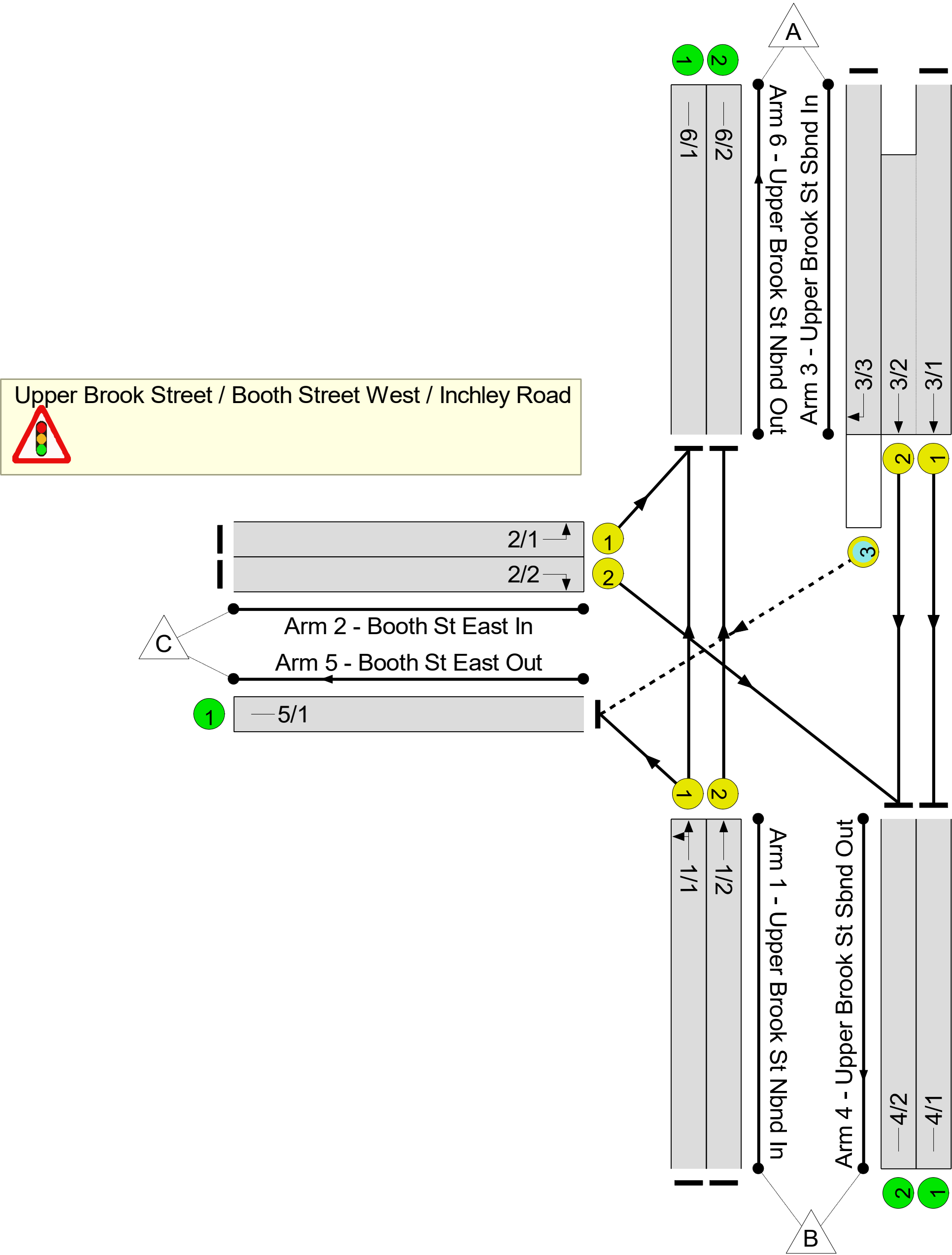
Network Results

C1 - 131	Stream: 1 PRC for Signalled Lanes (%):	-7.2	Total Delay for Signalled Lanes (pcuHr):	39.35	Cycle Time (s):	88
	PRC Over All Lanes (%):	-7.2	Total Delay Over All Lanes (pcuHr):	39.35		

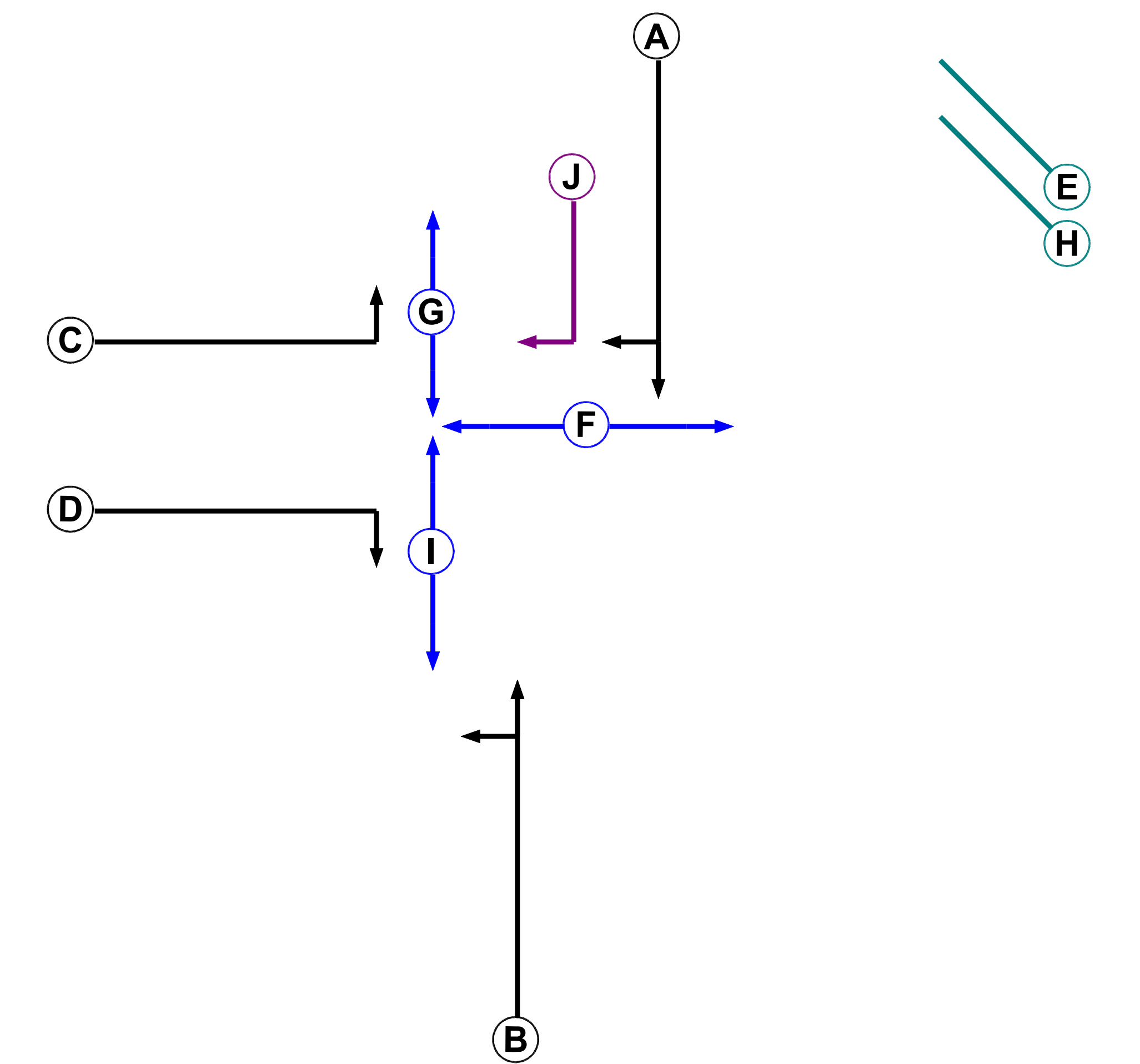
User and Project Details

Project:	A34_ Booth Street East
Title:	Upper Brook Street / Booth Street West / Inchley Road
Location:	Upper Brook Street / Booth Street West / Inchley Road
Client:	FOCUS Transport Planning
Site Ref(s):	131
Design Layout Ref:	Proposed
Date Started:	10.11.23
Date Completed:	13.11.23
Model Purpose:	To simulate the proposed condition.
Additional detail:	This model has been reviewed and adjusted by TfGM. General Comments: The model has been checked assuming the proposed design. Traffic flows have not been checked - this is for HFAS at TfGM to validate. Phase Minimums The phase minimum for F has been increased to 10 seconds from 8. The phase minimum for I has been increased to 6 seconds from 5. Stage Sequence The stage sequence has been adjusted to improve the performance of the junction. Intergreens A -> D has been increased to 6 seconds from 5. A -> I has been increased to 10 seconds from 9. B -> I has been increased to 8 seconds from 7. F -> A, F -> B, and F -> J have all been reduced to 14 seconds from 16. G -> C has been reduced to 5 seconds from 6. J -> B has been increased to 7 seconds from 5. J -> D has been increased to 6 seconds from 5. J -> I has been increased to 10 seconds from 9. Phase Delays Phase delays have been adjusted to improve the performance of the junction. Optimisation All scenarios have been optimised. Cycle Times A cycle time of 80 seconds mirrors the current maximum cycle time.
File name:	FTP_131_Proposed_TM_101123.lsg3x
Author:	TM
Company:	TfGM
Address:	2 Piccadilly Place

Network Layout Diagram



Phase Diagram



Phase Input Data

Phase Name	Phase Type	Stage Stream	Assoc. Phase	Street Min	Cont Min
A	Traffic	1		-9999	7
B	Traffic	1		-9999	7
C	Traffic	1		-9999	7
D	Traffic	1		-9999	7
E	Dummy			-9999	7
F	Pedestrian	1		-9999	10
G	Pedestrian	1		-9999	5
H	Dummy			-9999	7
I	Pedestrian	1		-9999	6
J	Ind. Arrow	1	A	-9999	4

Phase Intergreens Matrix

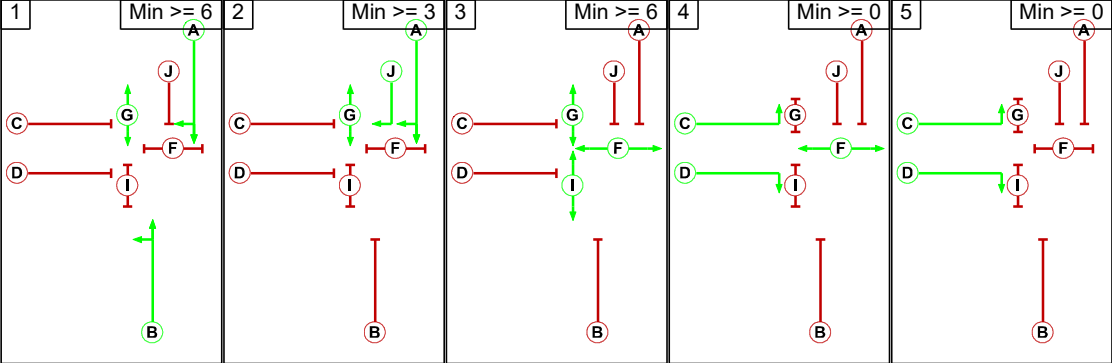
Terminating Phase	Starting Phase										
		A	B	C	D	E	F	G	H	I	J
	A		-	-	6	-	7	-	-	10	-
	B	-		7	5	-	8	-	-	8	3
	C	-	5		-	-	-	6	-	-	-
	D	5	5	-		-	-	-	-	6	5
	E	-	-	-	-		-	-	-	-	-
	F	14	14	-	-	-		-	-	-	14
	G	-	-	5	-	-	-		-	-	-
	H	-	-	-	-	-	-	-		-	-
	I	8	8	-	8	-	-	-	-		8
	J	-	6	-	6	-	7	-	-	10	

Phases in Stage

Stream	Stage No.	Phases in Stage
1	1	A B G
1	2	A G J
1	3	F G I
1	4	C D F
1	5	C D

Stage Diagram

Stage Stream: 1



Phase Delays

Stage Stream: 1

Term. Stage	Start Stage	Phase	Type	Value	Cont value
1	4	G	Losing	2	2
1	5	G	Losing	2	2
3	1	I	Losing	6	6
3	2	I	Losing	6	6
3	5	F	Losing	8	8
4	1	C	Losing	9	9
4	1	D	Losing	9	9
4	2	C	Losing	8	8
4	2	D	Losing	9	9

Prohibited Stage Change

Stage Stream: 1

From Stage	To Stage					
		1	2	3	4	5
	1		3	10	8	7
	2	6		10	7	6
	3	14	14		8	8
	4	15	14	6		0
	5	6	6	6	0	

Full Input Data And Results

Give-Way Lane Input Data

Junction: Upper Brook Street / Booth Street West / Inchley Road											
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)
3/3 (Upper Brook St Sbnd In)	5/1 (Right)	1439	0	1/1	1.09	All	4.00	-	0.50	4	4.00
				1/2	1.09	All					

Lane Input Data

Junction: Upper Brook Street / Booth Street West / Inchley Road												
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 (Upper Brook St Nwnd In)	U	B	2	3	49.7	Geom	-	3.20	0.00	Y	Arm 5 Left	10.00
											Arm 6 Ahead	Inf
1/2 (Upper Brook St Nwnd In)	U	B	2	3	49.7	Geom	-	3.20	0.00	N	Arm 6 Ahead	Inf
2/1 (Booth St East In)	U	C	2	3	8.3	Geom	-	5.00	0.00	Y	Arm 6 Left	10.00
2/2 (Booth St East In)	U	D	2	3	8.3	Geom	-	3.50	0.00	N	Arm 4 Right	18.00
3/1 (Upper Brook St Swnd In)	U	A	2	3	33.4	Geom	-	3.20	0.00	Y	Arm 4 Ahead	Inf
3/2 (Upper Brook St Swnd In)	U	A	2	3	17.2	Geom	-	3.00	0.00	N	Arm 4 Ahead	Inf
3/3 (Upper Brook St Swnd In)	O	A J	2	3	33.4	Geom	-	2.90	0.00	N	Arm 5 Right	10.00
4/1 (Upper Brook St Swnd Out)	U		2	3	60.0	Inf	-	-	-	-	-	-
4/2 (Upper Brook St Swnd Out)	U		2	3	60.0	Inf	-	-	-	-	-	-
5/1 (Booth St East Out)	U		2	3	60.0	Inf	-	-	-	-	-	-
6/1 (Upper Brook St Nwnd Out)	U		2	3	60.0	Inf	-	-	-	-	-	-
6/2 (Upper Brook St Nwnd Out)	U		2	3	60.0	Inf	-	-	-	-	-	-

Traffic Flow Groups

Flow Group	Start Time	End Time	Duration	Formula
1: 'Application Scheme AM Peak'	08:15	09:15	01:00	

Scenario 5: 'Proposed Layout' (FG1: 'Application Scheme AM Peak', Plan 2: '1 in 2 Peds')

Traffic Flows, Desired

Desired Flow :

Origin	Destination				
		A	B	C	Tot.
	A	0	691	233	924
	B	851	0	531	1382
	C	74	343	0	417
	Tot.	925	1034	764	2723

Traffic Lane Flows

Lane	Scenario 5: Proposed Layout
Junction: Upper Brook Street / Booth Street West / Inchley Road	
1/1	613
1/2	769
2/1	74
2/2	343
3/1 (with short)	691(In) 335(Out)
3/2 (short)	356
3/3	233
4/1	335
4/2	699
5/1	764
6/1	156
6/2	769

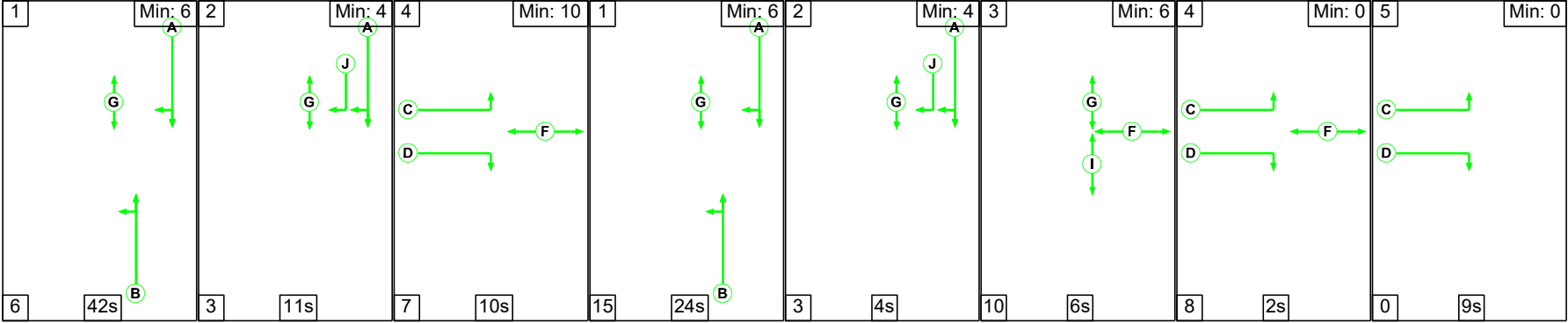
Lane Saturation Flows

Junction: Upper Brook Street / Booth Street West / Inchley Road								
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 (Upper Brook St Nbnd In)	3.20	0.00	Y	Arm 5 Left	10.00	86.6 %	1712	1712
				Arm 6 Ahead	Inf	13.4 %		
1/2 (Upper Brook St Nbnd In)	3.20	0.00	N	Arm 6 Ahead	Inf	100.0 %	2075	2075
2/1 (Booth St East In)	5.00	0.00	Y	Arm 6 Left	10.00	100.0 %	1839	1839
2/2 (Booth St East In)	3.50	0.00	N	Arm 4 Right	18.00	100.0 %	1943	1943
3/1 (Upper Brook St Sbnd In)	3.20	0.00	Y	Arm 4 Ahead	Inf	100.0 %	1935	1935
3/2 (Upper Brook St Sbnd In)	3.00	0.00	N	Arm 4 Ahead	Inf	100.0 %	2055	2055
3/3 (Upper Brook St Sbnd In)	2.90	0.00	N	Arm 5 Right	10.00	100.0 %	1778	1778
4/1 (Upper Brook St Sbnd Out Lane 1)	Infinite Saturation Flow						Inf	Inf
4/2 (Upper Brook St Sbnd Out Lane 2)	Infinite Saturation Flow						Inf	Inf
5/1 (Booth St East Out Lane 1)	Infinite Saturation Flow						Inf	Inf
6/1 (Upper Brook St Nbnd Out Lane 1)	Infinite Saturation Flow						Inf	Inf
6/2 (Upper Brook St Nbnd Out Lane 2)	Infinite Saturation Flow						Inf	Inf

Scenario 5: 'Proposed Layout' (FG1: 'Application Scheme AM Peak', Plan 2: '1 in 2 Peds')

Stage Sequence Diagram

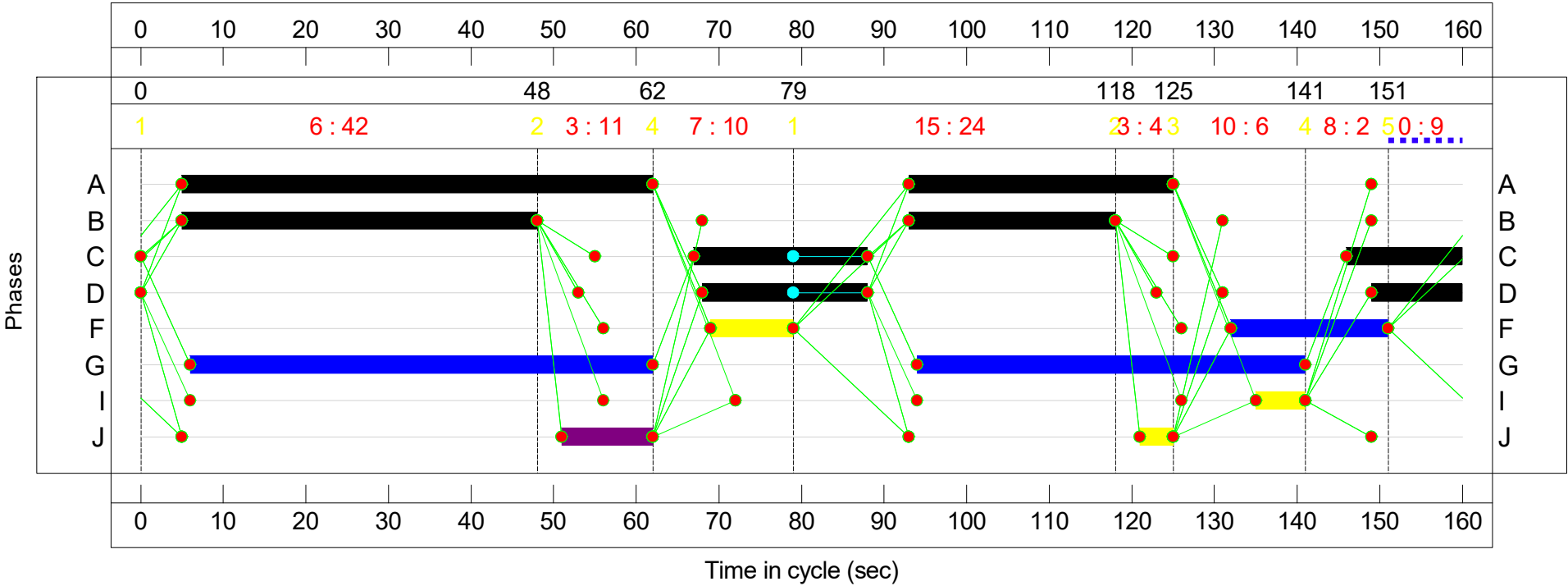
Stage Stream: 1



Stage Timings
Stage Stream: 1

Stage	1	2	4	1	2	3	4	5
Duration	42	11	10	24	4	6	2	9
Change Point	0	48	62	79	118	125	141	151

Signal Timings Diagram

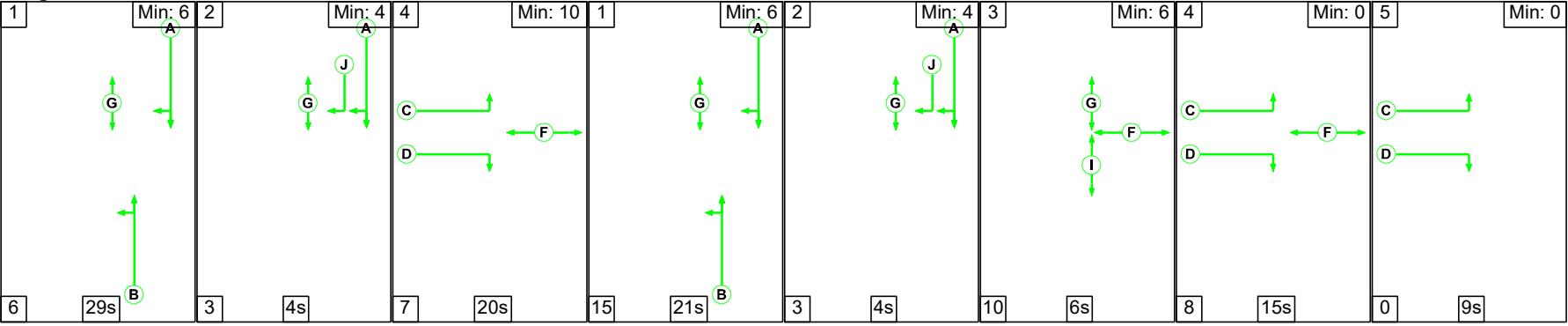


Network Results

C1 - 131	Stream: 1 PRC for Signalled Lanes (%):	5.2	Total Delay for Signalled Lanes (pcuHr):	25.47	Cycle Time (s): 160
	PRC Over All Lanes (%):	5.2	Total Delay Over All Lanes(pcuHr):	25.47	

Stage Sequence Diagram

Stage Stream: 1

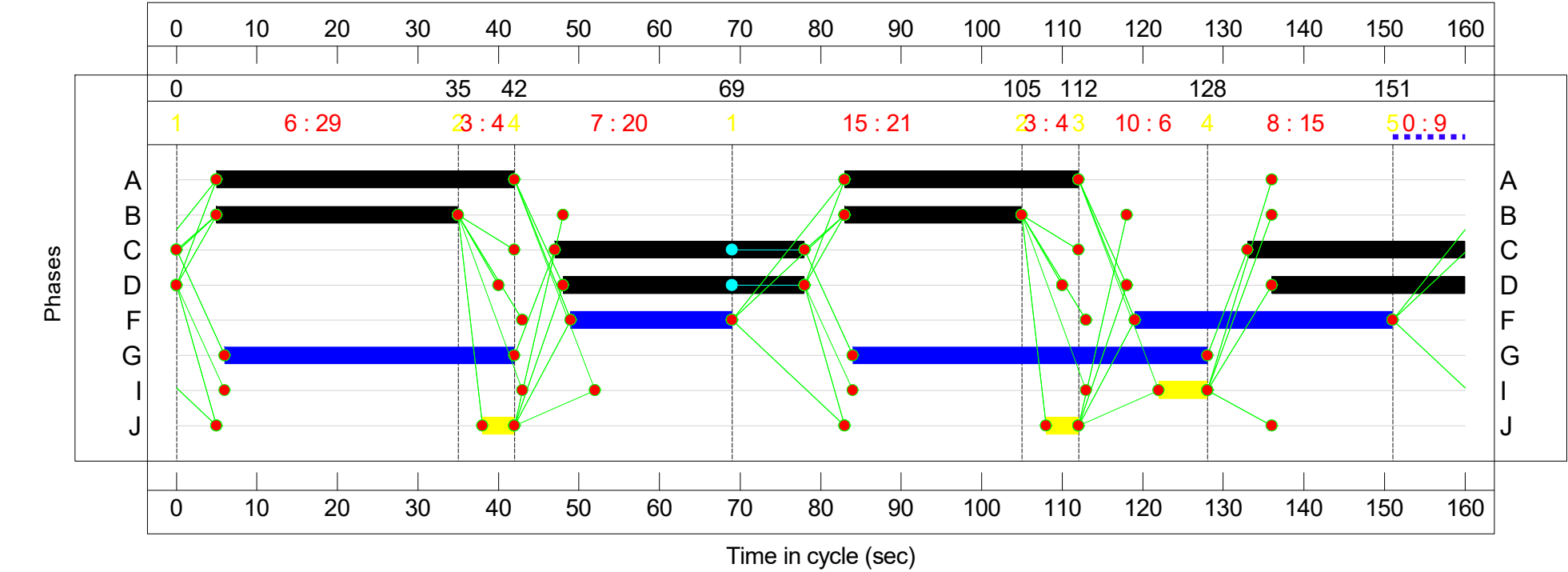


Stage Timings

Stage Stream: 1

Stage	1	2	4	1	2	3	4	5
Duration	29	4	20	21	4	6	15	9
Change Point	0	35	42	69	105	112	128	151

Signal Timings Diagram

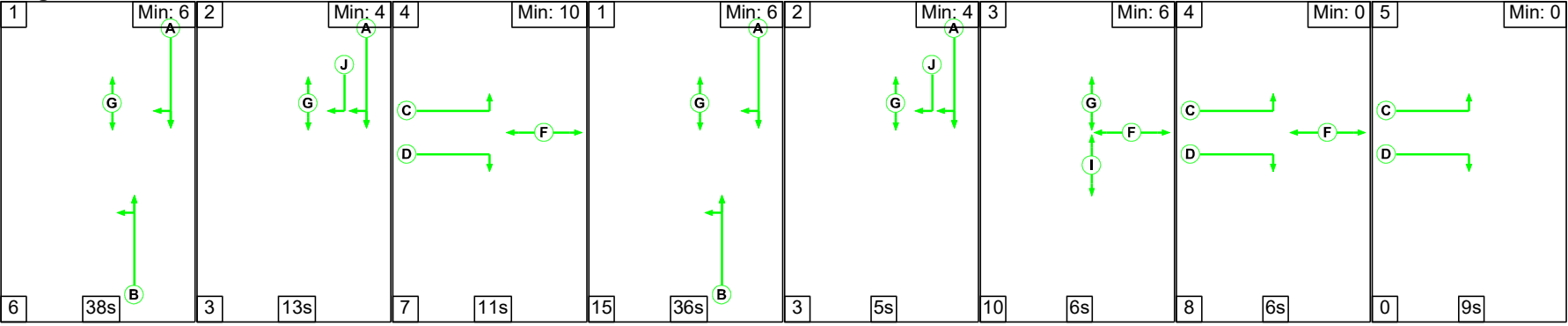


Network Results

C1 - 131	Stream: 1 PRC for Signalled Lanes (%):	9.0	Total Delay for Signalled Lanes (pcuHr):	27.29	Cycle Time (s): 160
	PRC Over All Lanes (%):	9.0	Total Delay Over All Lanes(pcuHr):	27.29	

Full Input Data And Results
Scenario 13: 'Copy of Proposed Layout' (FG1: 'Application Scheme AM Peak', Plan 2: '1 in 2 Peds')
Stage Sequence Diagram

Stage Stream: 1

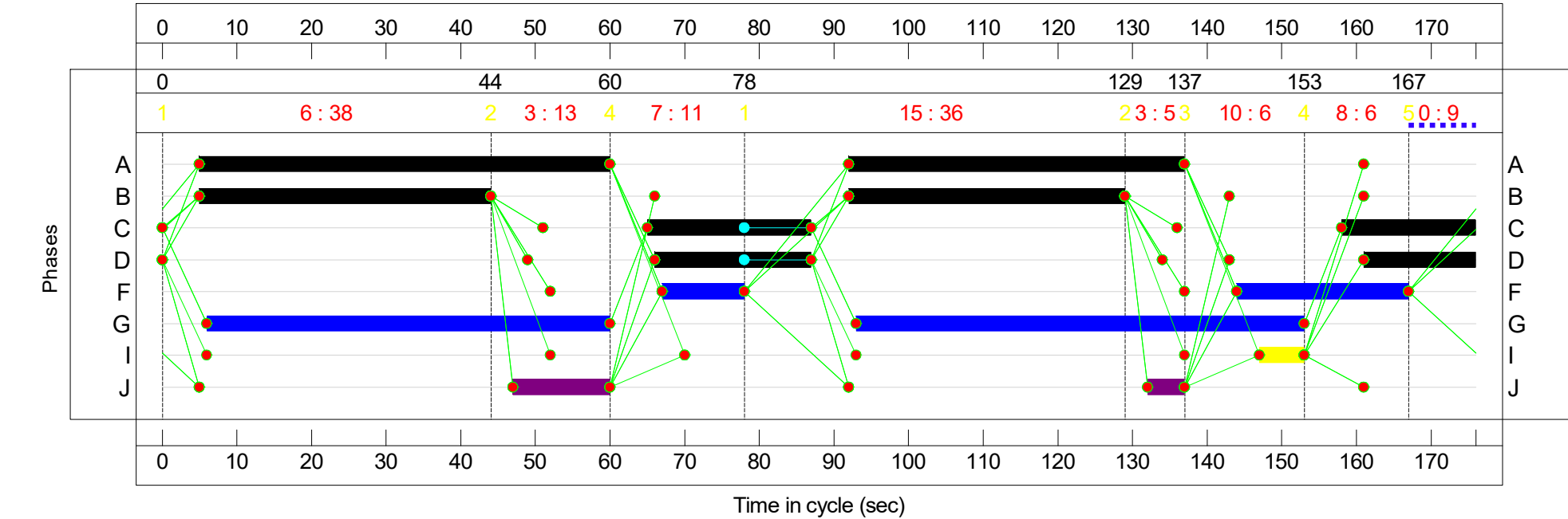


Stage Timings

Stage Stream: 1

Stage	1	2	4	1	2	3	4	5
Duration	38	13	11	36	5	6	6	9
Change Point	0	44	60	78	129	137	153	167

Signal Timings Diagram

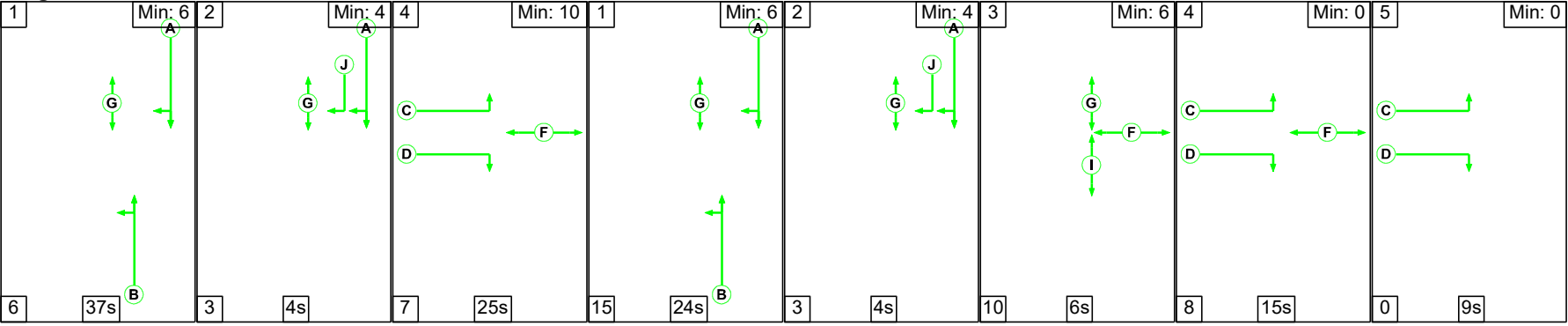


Network Results

C1 - 131	Stream: 1 PRC for Signalled Lanes (%):	7.6	Total Delay for Signalled Lanes (pcuHr):	25.27	Cycle Time (s): 176
	PRC Over All Lanes (%):	7.6	Total Delay Over All Lanes(pcuHr):	25.27	

Full Input Data And Results
Scenario 14: 'Copy of Proposed Layout' (FG2: 'Application Scheme PM Peak', Plan 2: '1 in 2 Peds')
Stage Sequence Diagram

Stage Stream: 1

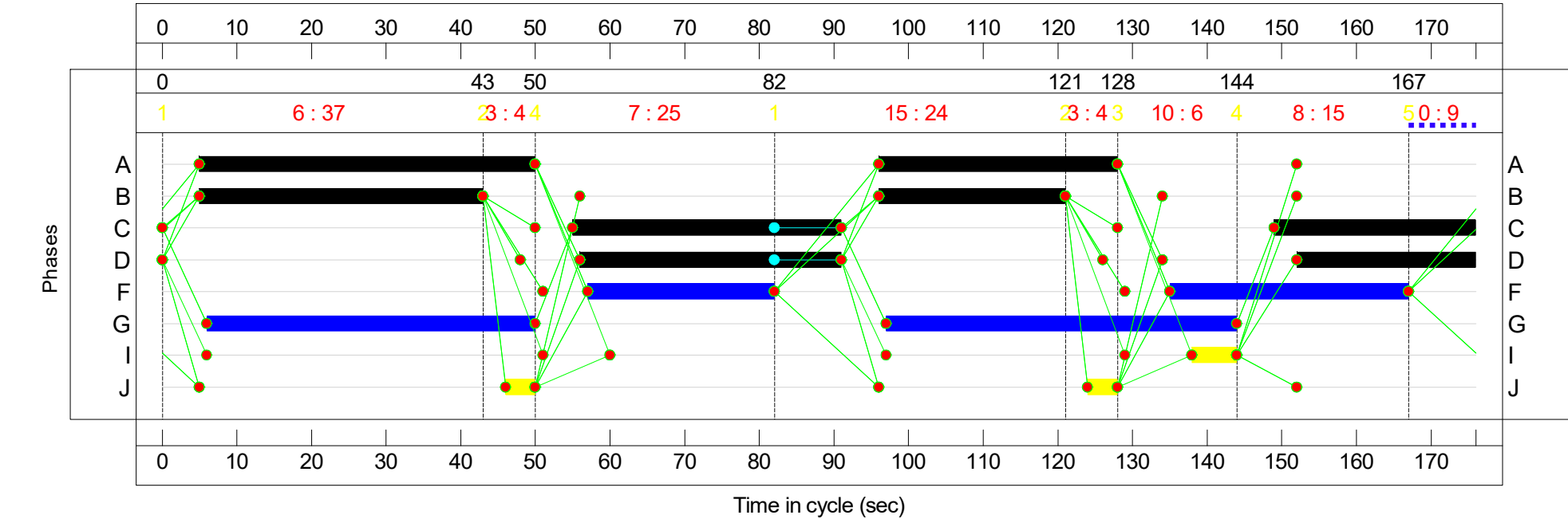


Stage Timings

Stage Stream: 1

Stage	1	2	4	1	2	3	4	5
Duration	37	4	25	24	4	6	15	9
Change Point	0	43	50	82	121	128	144	167

Signal Timings Diagram



Network Results

C1 - 131	Stream: 1 PRC for Signalled Lanes (%):	9.4	Total Delay for Signalled Lanes (pcuHr):	26.99	Cycle Time (s): 176
	PRC Over All Lanes (%):	9.4	Total Delay Over All Lanes(pcuHr):	26.99	



Baseline + Cumulative Development at Upper Brook Street 'With Cumulative Development'
Junction Capacity Modelling Results (UTC Model)

Key

	0-89% DoS (within capacity conditions)
	90-99% DoS (variable operating conditions)
	100%+ DoS (over capacity conditions)

A34 / Booth Street East - Proposed Junction (80 Second Cycle Time)

	Lane Description	AM Peak			PM Peak		
		Flow	Deg of Sat	MMQ	Flow	Deg of Sat	MMQ
		-	100.3%	-	-	102.0%	-
1/1	A34(S) - Left & Ahead	630	98.1%	23.7	466	94.8%	16.2
1/2	A34(S) - Ahead	770	99.0%	28.9	573	96.1%	19.9
2/1	Booth Street East - Left	78	20.0%	1.5	109	18.2%	1.8
2/2	Booth Street East - Right	341	100.3%	17.1	546	97.7%	20.9
3/1+3/2	A34(N) - Ahead	700	40.6% : 40.6%	5.3	969	64.8% : 64.8%	10.1
3/3	A34(N) - Right	240	97.3%	9.4	229	102.0%	12.5
Cycle Time		80s			80s		
Stage timings		34s, 9s, 16s, 12s, 9s			27s, 7s, 16s, 21s, 9s		
Junction PRC		-11.4%			-13.4%		
Total delay over all lanes (pcuHr)		56.17			53.31		

A34 / Booth Street East - Proposed Junction (88 Second Cycle Time)

	Lane Description	AM Peak			PM Peak		
		Flow	Deg of Sat	MMQ	Flow	Deg of Sat	MMQ
		-	96.5%	-	-	93.7%	-
1/1	A34(S) - Left & Ahead	630	95.2%	21.8	466	88.8%	14.3
1/2	A34(S) - Ahead	770	96.0%	26.2	573	90.0%	17.4
2/1	Booth Street East - Left	78	19.6%	1.7	109	17.4%	2.0
2/2	Booth Street East - Right	341	96.5%	14.9	546	91.6%	17.3
3/1+3/2	A34(N) - Ahead	700	41.1% : 41.1%	5.6	969	66.6% : 66.6%	10.8
3/3	A34(N) - Right	240	90.7%	7.0	229	93.7%	8.5
Cycle Time		88s			88s		
Stage timings		38s, 1s, 16s, 14s, 9s			31s, 7s, 16s, 25s, 9s		
Junction PRC		-7.3%			1.7%		
Total delay over all lanes (pcuHr)		44.98			33.99		

Baseline + Cumulative Development at Upper Brook Street 'With Cumulative Development'
Junction Capacity Modelling Results (UTC Model)

Key

	0-89% DoS (within capacity conditions)
	90-99% DoS (variable operating conditions)
	100%+ DoS (over capacity conditions)

A34 / Booth Street East - Proposed Junction with ped stage on alternate cycles (2*80 Second Cycle Time)

	Lane Description	AM Peak			PM Peak		
		Flow	Deg of Sat	MMQ	Flow	Deg of Sat	MMQ
		-	85.8%	-	-	81.7%	-
1/1	A34(S) - Left & Ahead	621	83.0%	14.8	458	78.1%	11.5
1/2	A34(S) - Ahead	779	85.8%	18.7	581	81.5%	14.9
2/1	Booth Street East - Left	78	18.3%	1.6	109	16.1%	1.9
2/2	Booth Street East - Right	341	85.1%	10.7	546	81.7%	14.3
3/1+3/2	A34(N) - Ahead	700	37.2% : 37.2%	5.0	969	60.1% : 60.1%	9.9
3/3	A34(N) - Right	240	85.7%	5.6	229	72.4%	4.9
Cycle Time		160s			160s		
Stage timings		47s, 14s, 17s, 40s, 7s, 16s, 10s, 9s			35s, 7s, 28s, 37s, 7s, 16s, 21s, 9s		
Junction PRC		4.9%			10.1%		
Total delay over all lanes (pcuHr)		26.46			26.13		

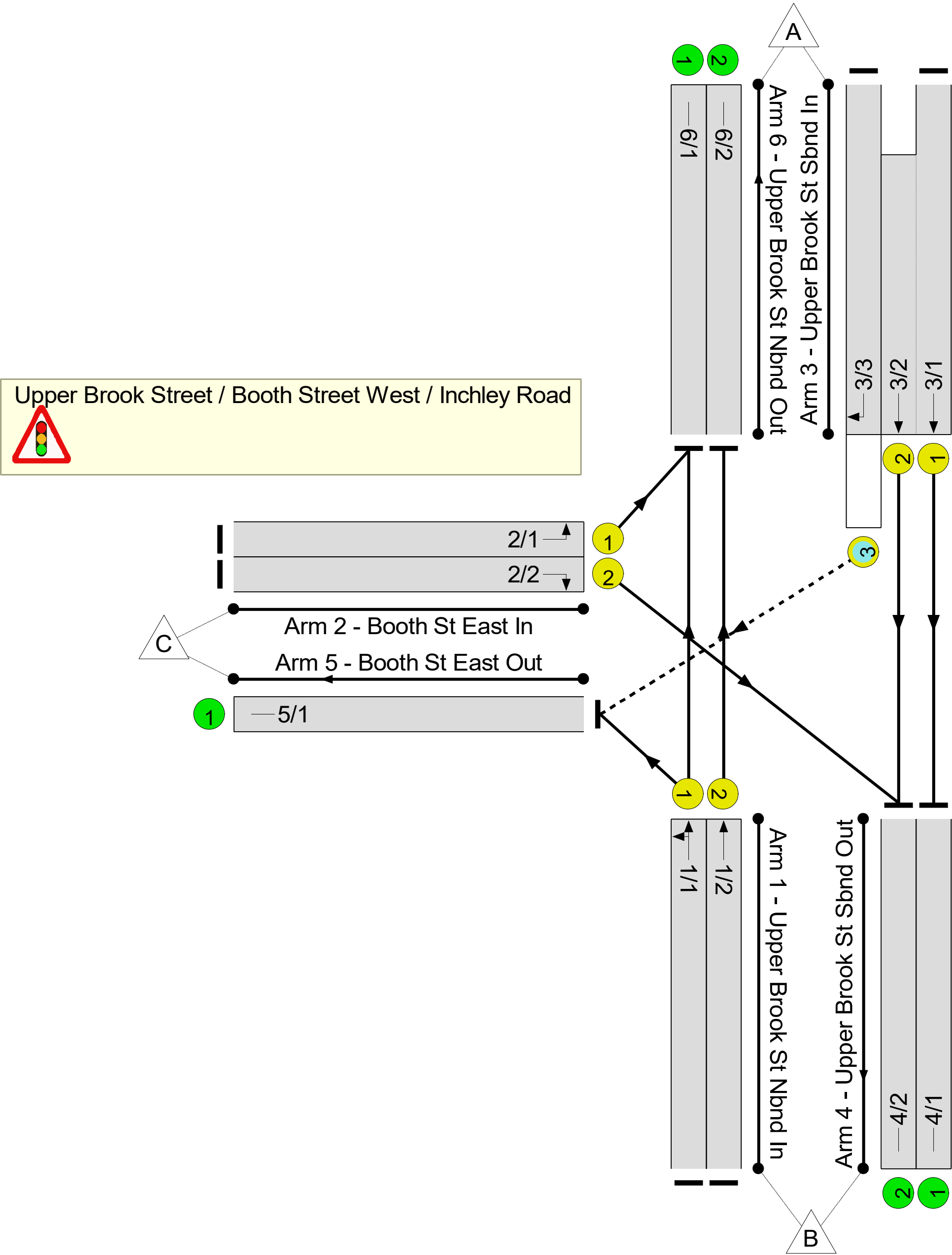
A34 / Booth Street East - Proposed Junction with ped stage on alternate cycles (2*88 Second Cycle Time)

	Lane Description	AM Peak			PM Peak		
		Flow	Deg of Sat	MMQ	Flow	Deg of Sat	MMQ
		-	84.3%	-	-	78.5%	-
1/1	A34(S) - Left & Ahead	621	80.9%	16.0	458	75.0%	11.6
1/2	A34(S) - Ahead	779	83.6%	20.4	581	78.2%	14.8
2/1	Booth Street East - Left	78	18.2%	1.7	109	15.6%	1.9
2/2	Booth Street East - Right	341	83.5%	10.8	546	78.5%	14.4
3/1+3/2	A34(N) - Ahead	700	37.9% : 37.9%	5.5	969	62.3% : 62.3%	10.2
3/3	A34(N) - Right	240	84.3%	5.7	229	76.9%	5.3
Cycle Time		176s			176s		
Stage timings		45s, 15s, 17s, 51s, 9s, 16s, 14s, 9s			41s, 7s, 34s, 39s, 7s, 16s, 23s, 9s		
Junction PRC		6.8%			14.6%		
Total delay over all lanes (pcuHr)		26.05			26.56		

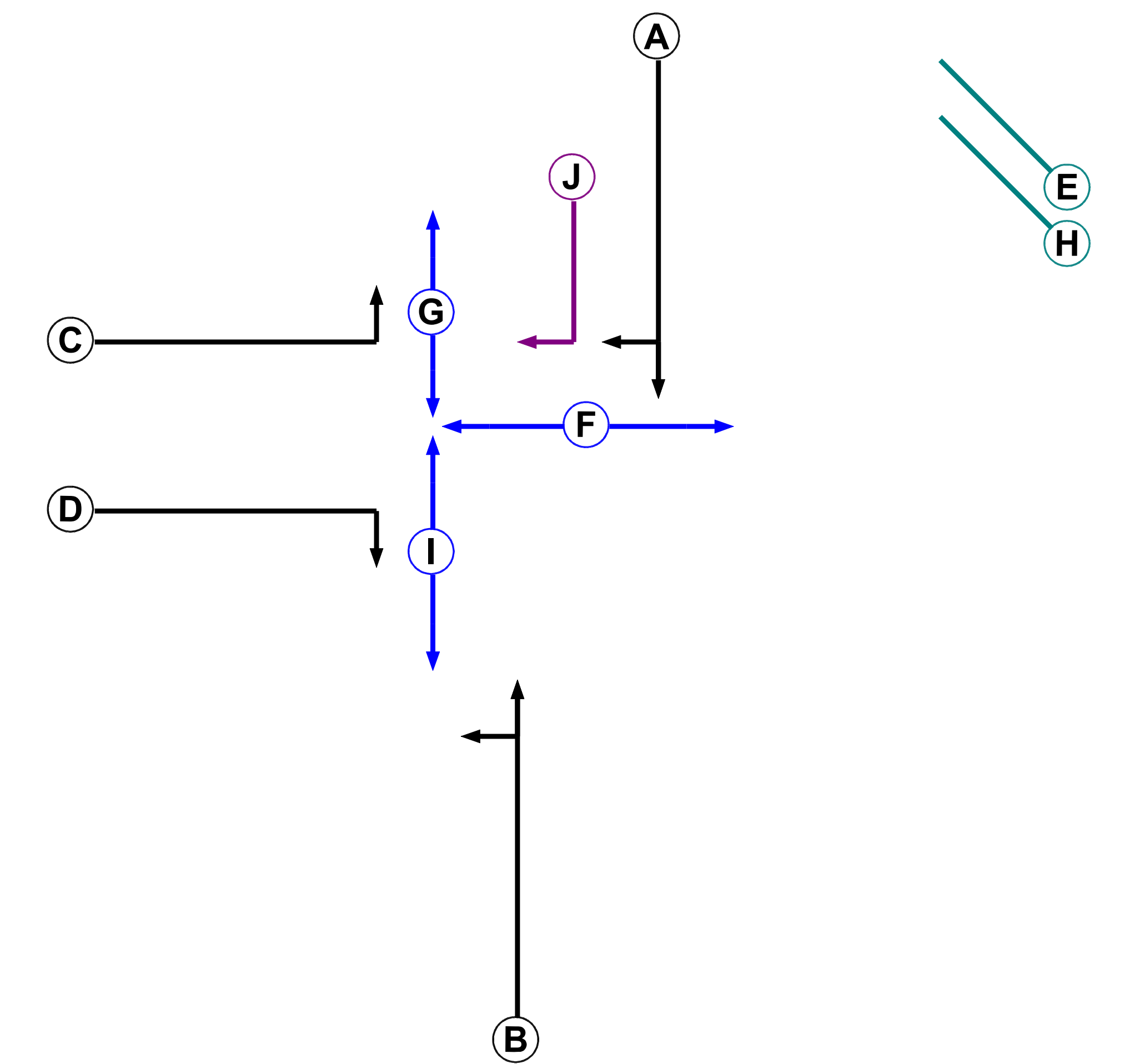
User and Project Details

Project:	A34_ Booth Street East
Title:	Upper Brook Street / Booth Street West / Inchley Road
Location:	Upper Brook Street / Booth Street West / Inchley Road
Client:	FOCUS Transport Planning
Site Ref(s):	131
Design Layout Ref:	Proposed
Date Started:	10.11.23
Date Completed:	13.11.23
Model Purpose:	To simulate the proposed condition.
Additional detail:	This model has been reviewed and adjusted by TfGM. General Comments: The model has been checked assuming the proposed design. Traffic flows have not been checked - this is for HFAS at TfGM to validate. Phase Minimums The phase minimum for F has been increased to 10 seconds from 8. The phase minimum for I has been increased to 6 seconds from 5. Stage Sequence The stage sequence has been adjusted to improve the performance of the junction. Intergreens A -> D has been increased to 6 seconds from 5. A -> I has been increased to 10 seconds from 9. B -> I has been increased to 8 seconds from 7. F -> A, F -> B, and F -> J have all been reduced to 14 seconds from 16. G -> C has been reduced to 5 seconds from 6. J -> B has been increased to 7 seconds from 5. J -> D has been increased to 6 seconds from 5. J -> I has been increased to 10 seconds from 9. Phase Delays Phase delays have been adjusted to improve the performance of the junction. Optimisation All scenarios have been optimised. Cycle Times A cycle time of 80 seconds mirrors the current maximum cycle time.
File name:	FTP_131_Proposed_TM_101123.lsg3x
Author:	TM
Company:	TfGM
Address:	2 Piccadilly Place

Network Layout Diagram



Phase Diagram



Phase Input Data

Phase Name	Phase Type	Stage Stream	Assoc. Phase	Street Min	Cont Min
A	Traffic	1		-9999	7
B	Traffic	1		-9999	7
C	Traffic	1		-9999	7
D	Traffic	1		-9999	7
E	Dummy			-9999	7
F	Pedestrian	1		-9999	10
G	Pedestrian	1		-9999	5
H	Dummy			-9999	7
I	Pedestrian	1		-9999	6
J	Ind. Arrow	1	A	-9999	4

Phase Intergreens Matrix

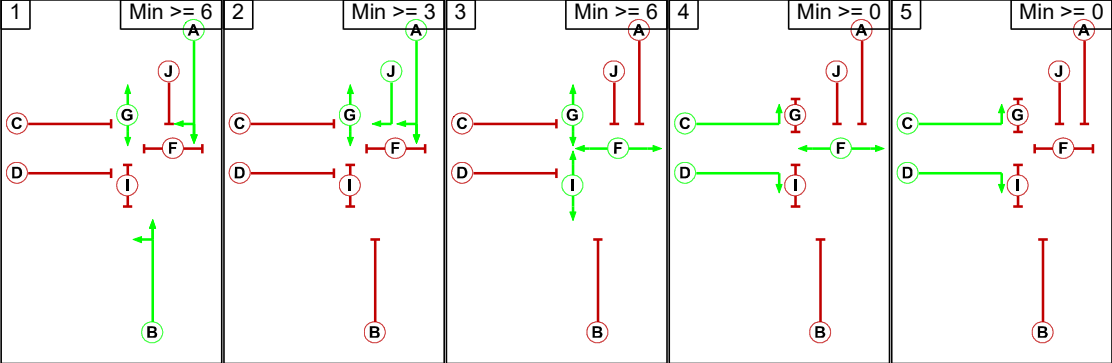
Terminating Phase	Starting Phase										
		A	B	C	D	E	F	G	H	I	J
	A		-	-	6	-	7	-	-	10	-
	B	-		7	5	-	8	-	-	8	3
	C	-	5		-	-	-	6	-	-	-
	D	5	5	-		-	-	-	-	6	5
	E	-	-	-	-		-	-	-	-	-
	F	14	14	-	-	-		-	-	-	14
	G	-	-	5	-	-	-		-	-	-
	H	-	-	-	-	-	-	-		-	-
	I	8	8	-	8	-	-	-	-		8
	J	-	6	-	6	-	7	-	-	10	

Phases in Stage

Stream	Stage No.	Phases in Stage
1	1	A B G
1	2	A G J
1	3	F G I
1	4	C D F
1	5	C D

Stage Diagram

Stage Stream: 1



Phase Delays

Stage Stream: 1

Term. Stage	Start Stage	Phase	Type	Value	Cont value
1	4	G	Losing	2	2
1	5	G	Losing	2	2
3	1	I	Losing	6	6
3	2	I	Losing	6	6
3	5	F	Losing	8	8
4	1	C	Losing	9	9
4	1	D	Losing	9	9
4	2	C	Losing	8	8
4	2	D	Losing	9	9

Prohibited Stage Change

Stage Stream: 1

From Stage	To Stage					
		1	2	3	4	5
	1		3	10	8	7
	2	6		10	7	6
	3	14	14		8	8
	4	15	14	6		0
	5	6	6	6	0	

Full Input Data And Results

Give-Way Lane Input Data

Junction: Upper Brook Street / Booth Street West / Inchley Road											
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)
3/3 (Upper Brook St Sbnd In)	5/1 (Right)	1439	0	1/1	1.09	All	4.00	-	0.50	4	4.00
				1/2	1.09	All					

Lane Input Data

Junction: Upper Brook Street / Booth Street West / Inchley Road												
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 (Upper Brook St Nbnd In)	U	B	2	3	49.7	Geom	-	3.20	0.00	Y	Arm 5 Left	10.00
											Arm 6 Ahead	Inf
1/2 (Upper Brook St Nbnd In)	U	B	2	3	49.7	Geom	-	3.20	0.00	N	Arm 6 Ahead	Inf
2/1 (Booth St East In)	U	C	2	3	8.3	Geom	-	5.00	0.00	Y	Arm 6 Left	10.00
2/2 (Booth St East In)	U	D	2	3	8.3	Geom	-	3.50	0.00	N	Arm 4 Right	18.00
3/1 (Upper Brook St Sbnd In)	U	A	2	3	33.4	Geom	-	3.20	0.00	Y	Arm 4 Ahead	Inf
3/2 (Upper Brook St Sbnd In)	U	A	2	3	17.2	Geom	-	3.00	0.00	N	Arm 4 Ahead	Inf
3/3 (Upper Brook St Sbnd In)	O	A J	2	3	33.4	Geom	-	2.90	0.00	N	Arm 5 Right	10.00
4/1 (Upper Brook St Sbnd Out)	U		2	3	60.0	Inf	-	-	-	-	-	-
4/2 (Upper Brook St Sbnd Out)	U		2	3	60.0	Inf	-	-	-	-	-	-
5/1 (Booth St East Out)	U		2	3	60.0	Inf	-	-	-	-	-	-
6/1 (Upper Brook St Nbnd Out)	U		2	3	60.0	Inf	-	-	-	-	-	-
6/2 (Upper Brook St Nbnd Out)	U		2	3	60.0	Inf	-	-	-	-	-	-

Traffic Flow Groups

Flow Group	Start Time	End Time	Duration	Formula
3: 'Cumulative Scheme AM Peak'	08:15	09:15	01:00	

Scenario 3: 'Proposed Layout' (FG3: 'Cumulative Scheme AM Peak', Plan 1: '1 in 1 Peds')

Traffic Flows, Desired

Desired Flow :

Origin	Destination				
		A	B	C	Tot.
	A	0	700	240	940
	B	856	0	544	1400
	C	78	341	0	419
	Tot.	934	1041	784	2759

Traffic Lane Flows

Lane	Scenario 3: Proposed Layout
Junction: Upper Brook Street / Booth Street West / Inchley Road	
1/1	630
1/2	770
2/1	78
2/2	341
3/1 (with short)	700(In) 339(Out)
3/2 (short)	361
3/3	240
4/1	339
4/2	702
5/1	784
6/1	164
6/2	770

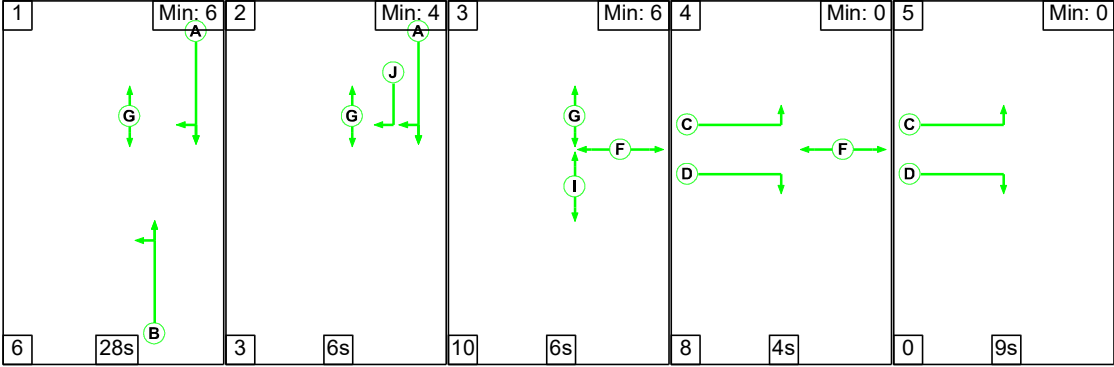
Lane Saturation Flows

Junction: Upper Brook Street / Booth Street West / Inchley Road								
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 (Upper Brook St Nbnd In)	3.20	0.00	Y	Arm 5 Left	10.00	86.3 %	1713	1713
				Arm 6 Ahead	Inf	13.7 %		
1/2 (Upper Brook St Nbnd In)	3.20	0.00	N	Arm 6 Ahead	Inf	100.0 %	2075	2075
2/1 (Booth St East In)	5.00	0.00	Y	Arm 6 Left	10.00	100.0 %	1839	1839
2/2 (Booth St East In)	3.50	0.00	N	Arm 4 Right	18.00	100.0 %	1943	1943
3/1 (Upper Brook St Sbnd In)	3.20	0.00	Y	Arm 4 Ahead	Inf	100.0 %	1935	1935
3/2 (Upper Brook St Sbnd In)	3.00	0.00	N	Arm 4 Ahead	Inf	100.0 %	2055	2055
3/3 (Upper Brook St Sbnd In)	2.90	0.00	N	Arm 5 Right	10.00	100.0 %	1778	1778
4/1 (Upper Brook St Sbnd Out Lane 1)	Infinite Saturation Flow						Inf	Inf
4/2 (Upper Brook St Sbnd Out Lane 2)	Infinite Saturation Flow						Inf	Inf
5/1 (Booth St East Out Lane 1)	Infinite Saturation Flow						Inf	Inf
6/1 (Upper Brook St Nbnd Out Lane 1)	Infinite Saturation Flow						Inf	Inf
6/2 (Upper Brook St Nbnd Out Lane 2)	Infinite Saturation Flow						Inf	Inf

Scenario 3: 'Proposed Layout' (FG3: 'Cumulative Scheme AM Peak', Plan 1: '1 in 1 Peds')

Stage Sequence Diagram

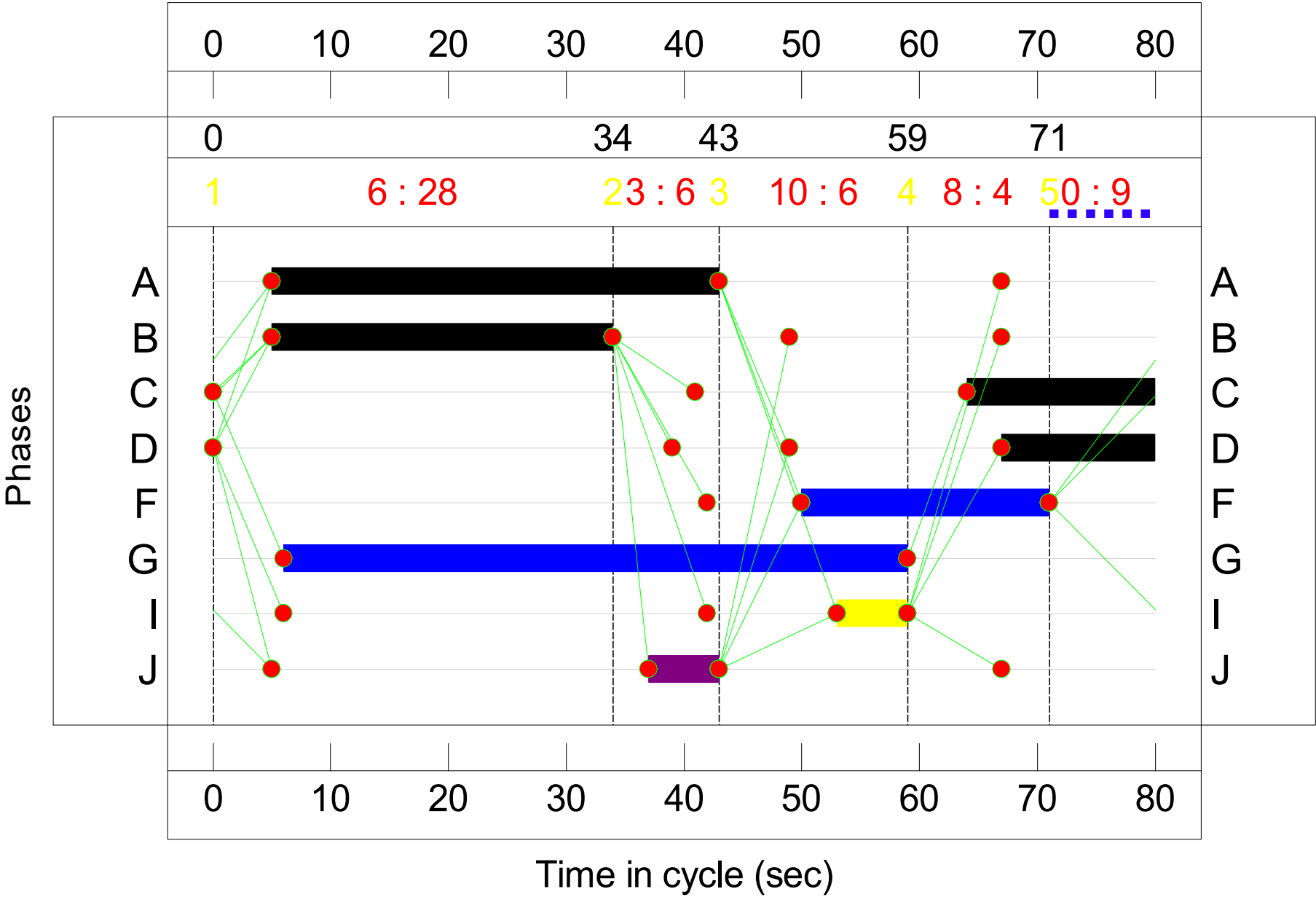
Stage Stream: 1



Stage Timings
Stage Stream: 1

Stage	1	2	3	4	5
Duration	28	6	6	4	9
Change Point	0	34	43	59	71

Signal Timings Diagram

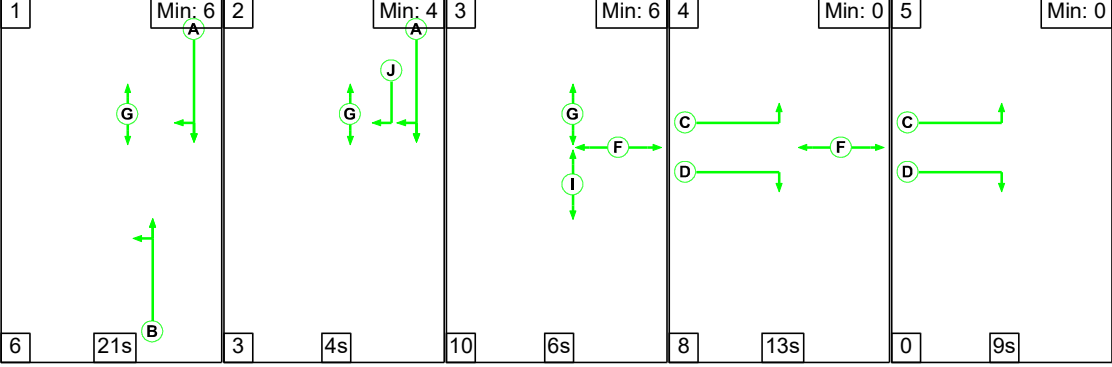


Network Results

C1 - 131	Stream: 1 PRC for Signalled Lanes (%):	-11.4	Total Delay for Signalled Lanes (pcuHr):	56.17	Cycle Time (s):	80
	PRC Over All Lanes (%):	-11.4	Total Delay Over All Lanes(pcuHr):	56.17		

Full Input Data And Results
Scenario 4: 'Proposed Layout' (FG4: 'Cumulative Scheme PM Peak', Plan 1: '1 in 1 Peds')
Stage Sequence Diagram

Stage Stream: 1

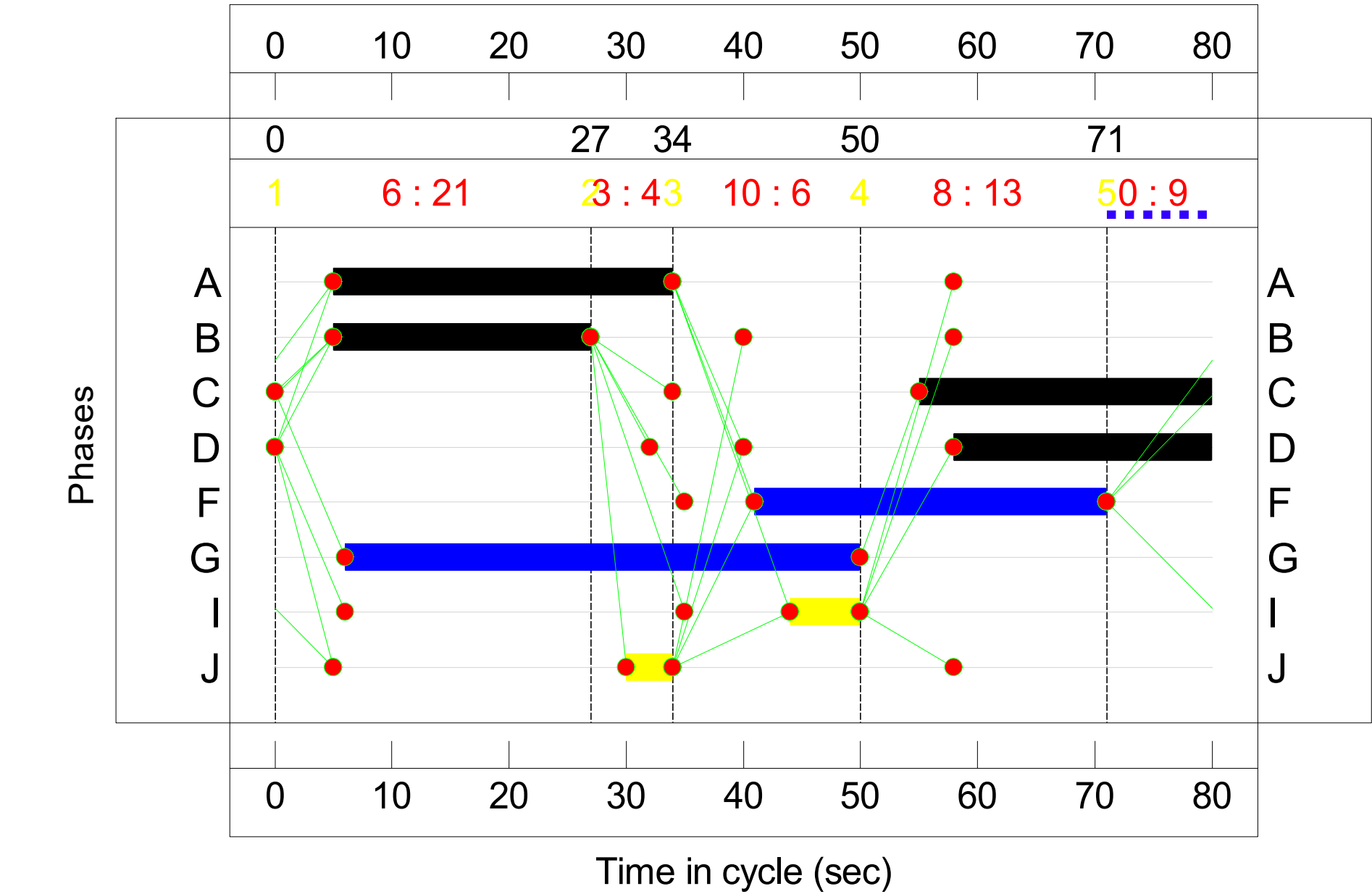


Stage Timings

Stage Stream: 1

Stage	1	2	3	4	5
Duration	21	4	6	13	9
Change Point	0	27	34	50	71

Signal Timings Diagram

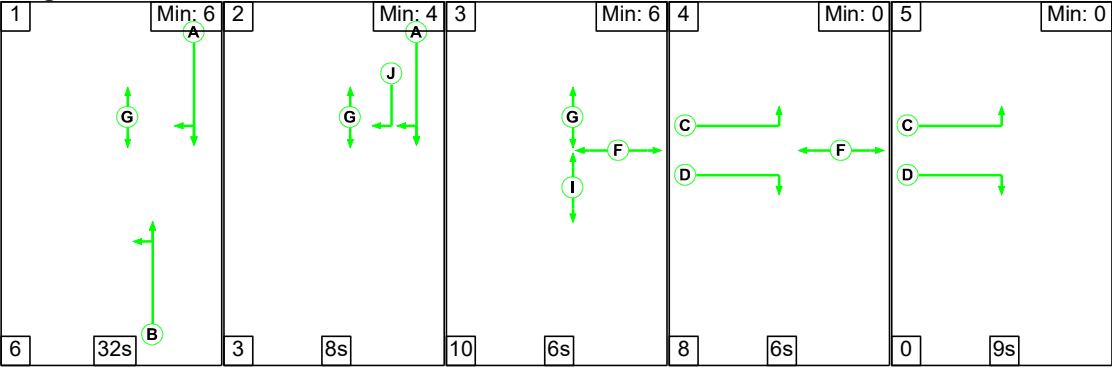


Network Results

C1 - 131	Stream: 1 PRC for Signalled Lanes (%):	-13.4	Total Delay for Signalled Lanes (pcuHr):	53.31	Cycle Time (s):	80
	PRC Over All Lanes (%):	-13.4	Total Delay Over All Lanes(pcuHr):	53.31		

Full Input Data And Results
Scenario 11: 'Copy of Proposed Layout' (FG3: 'Cumulative Scheme AM Peak', Plan 1: '1 in 1 Peds')
Stage Sequence Diagram

Stage Stream: 1

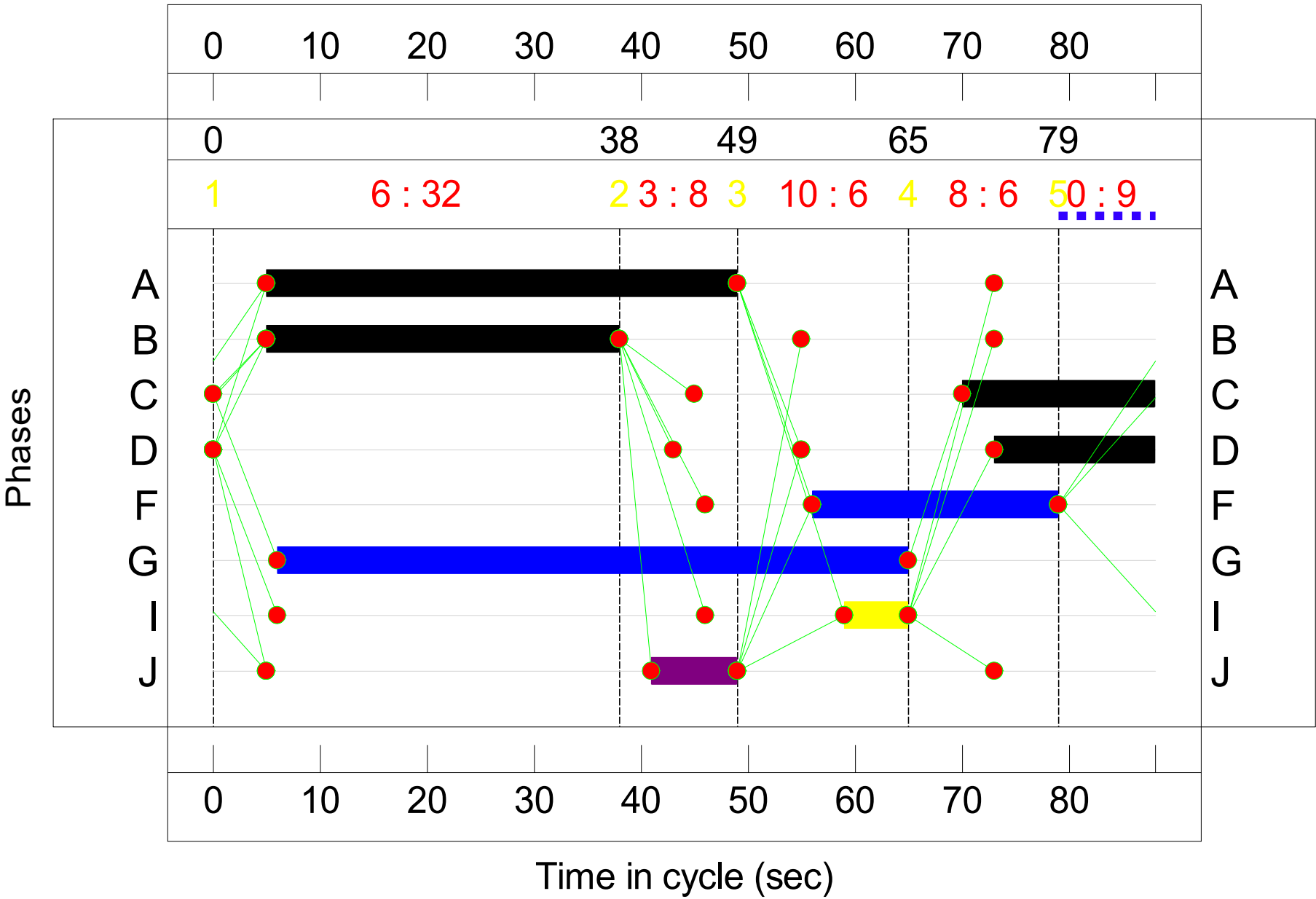


Stage Timings

Stage Stream: 1

Stage	1	2	3	4	5
Duration	32	8	6	6	9
Change Point	0	38	49	65	79

Signal Timings Diagram

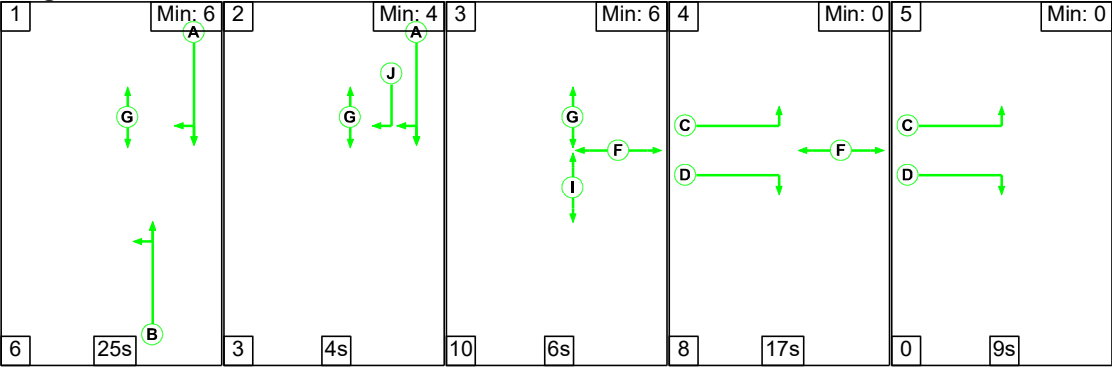


Network Results

C1 - 131	Stream: 1 PRC for Signalled Lanes (%):	-7.3	Total Delay for Signalled Lanes (pcuHr):	44.98	Cycle Time (s):	88
	PRC Over All Lanes (%):	-7.3	Total Delay Over All Lanes(pcuHr):	44.98		

Full Input Data And Results
Scenario 12: 'Copy of Proposed Layout' (FG4: 'Cumulative Scheme PM Peak', Plan 1: '1 in 1 Peds')
Stage Sequence Diagram

Stage Stream: 1

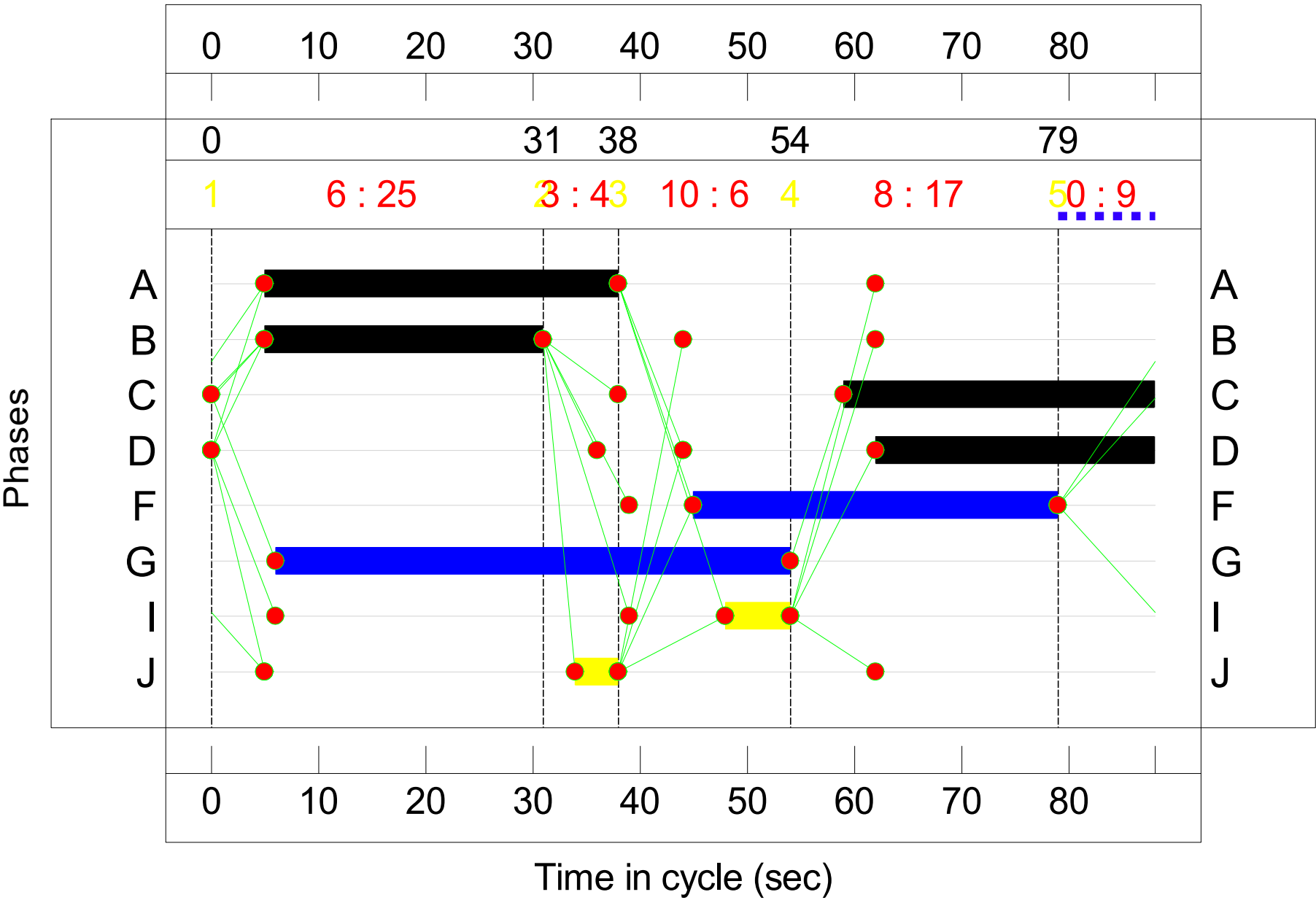


Stage Timings

Stage Stream: 1

Stage	1	2	3	4	5
Duration	25	4	6	17	9
Change Point	0	31	38	54	79

Signal Timings Diagram



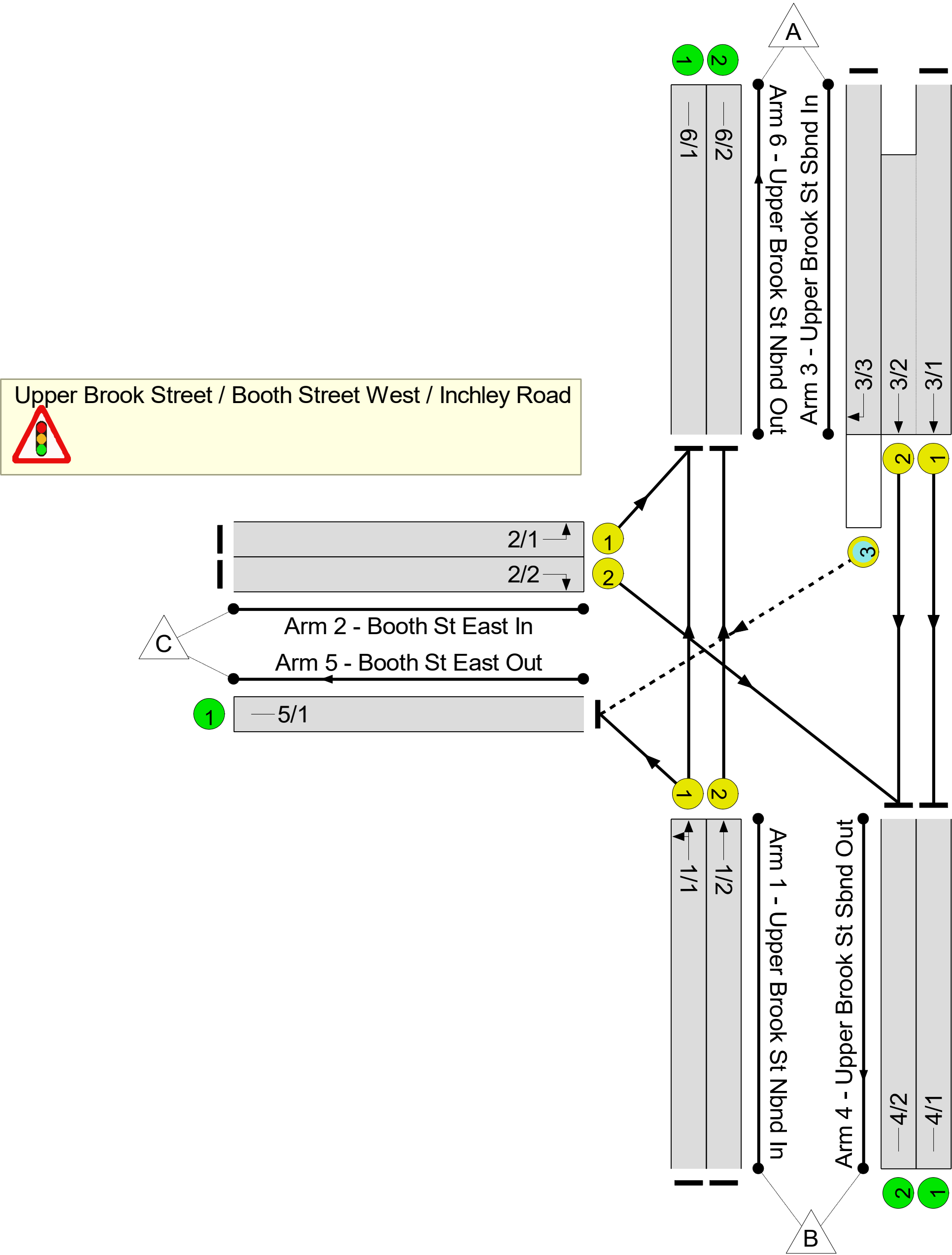
Network Results

C1 - 131	Stream: 1 PRC for Signalled Lanes (%):	-4.1	Total Delay for Signalled Lanes (pcuHr):	39.80	Cycle Time (s):	88
	PRC Over All Lanes (%):	-4.1	Total Delay Over All Lanes(pcuHr):	39.80		

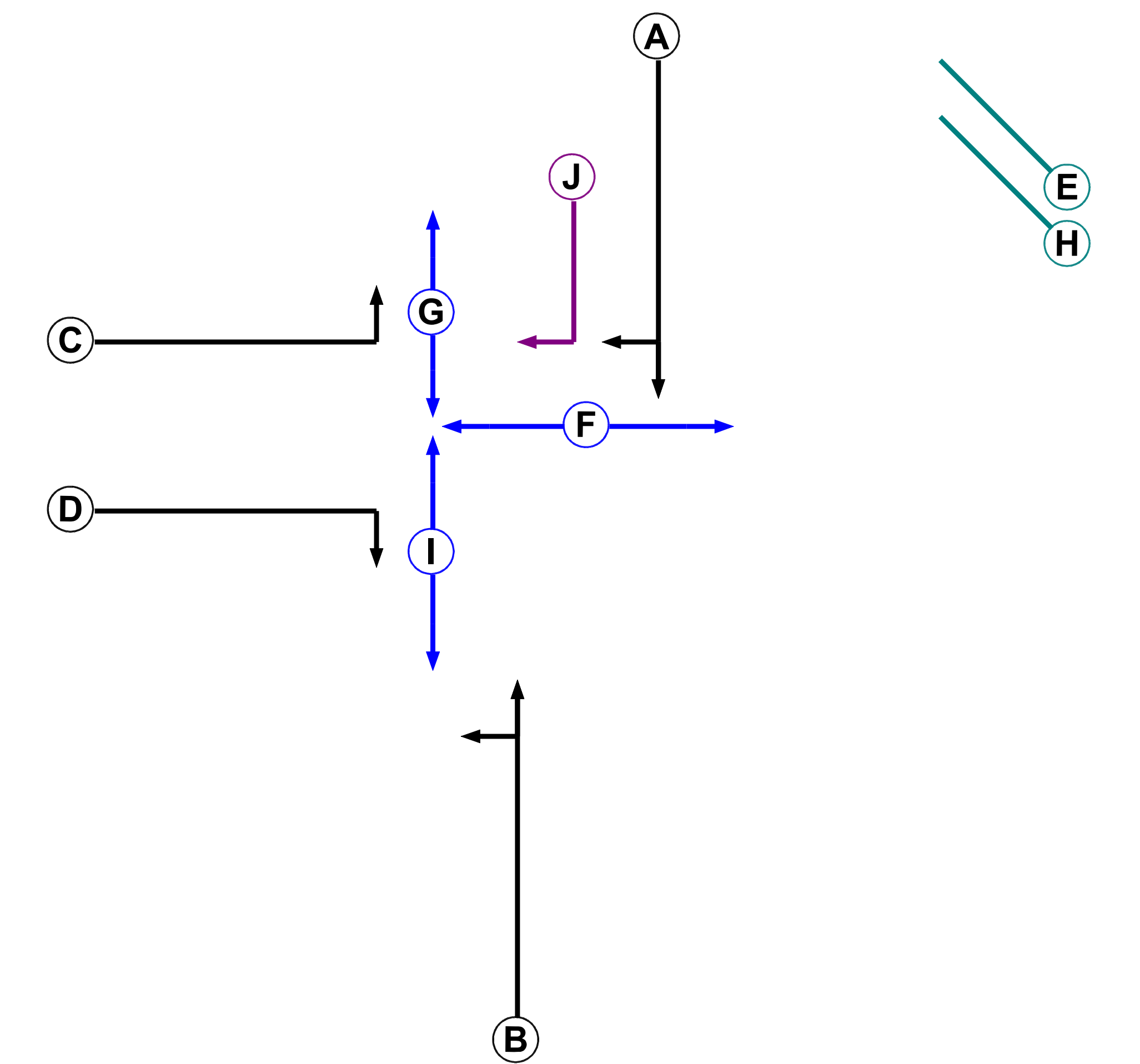
User and Project Details

Project:	A34_ Booth Street East
Title:	Upper Brook Street / Booth Street West / Inchley Road
Location:	Upper Brook Street / Booth Street West / Inchley Road
Client:	FOCUS Transport Planning
Site Ref(s):	131
Design Layout Ref:	Proposed
Date Started:	10.11.23
Date Completed:	13.11.23
Model Purpose:	To simulate the proposed condition.
Additional detail:	This model has been reviewed and adjusted by TfGM. General Comments: The model has been checked assuming the proposed design. Traffic flows have not been checked - this is for HFAS at TfGM to validate. Phase Minimums The phase minimum for F has been increased to 10 seconds from 8. The phase minimum for I has been increased to 6 seconds from 5. Stage Sequence The stage sequence has been adjusted to improve the performance of the junction. Intergreens A -> D has been increased to 6 seconds from 5. A -> I has been increased to 10 seconds from 9. B -> I has been increased to 8 seconds from 7. F -> A, F -> B, and F -> J have all been reduced to 14 seconds from 16. G -> C has been reduced to 5 seconds from 6. J -> B has been increased to 7 seconds from 5. J -> D has been increased to 6 seconds from 5. J -> I has been increased to 10 seconds from 9. Phase Delays Phase delays have been adjusted to improve the performance of the junction. Optimisation All scenarios have been optimised. Cycle Times A cycle time of 80 seconds mirrors the current maximum cycle time.
File name:	FTP_131_Proposed_TM_101123.lsg3x
Author:	TM
Company:	TfGM
Address:	2 Piccadilly Place

Network Layout Diagram



Phase Diagram



Phase Input Data

Phase Name	Phase Type	Stage Stream	Assoc. Phase	Street Min	Cont Min
A	Traffic	1		-9999	7
B	Traffic	1		-9999	7
C	Traffic	1		-9999	7
D	Traffic	1		-9999	7
E	Dummy			-9999	7
F	Pedestrian	1		-9999	10
G	Pedestrian	1		-9999	5
H	Dummy			-9999	7
I	Pedestrian	1		-9999	6
J	Ind. Arrow	1	A	-9999	4

Phase Intergreens Matrix

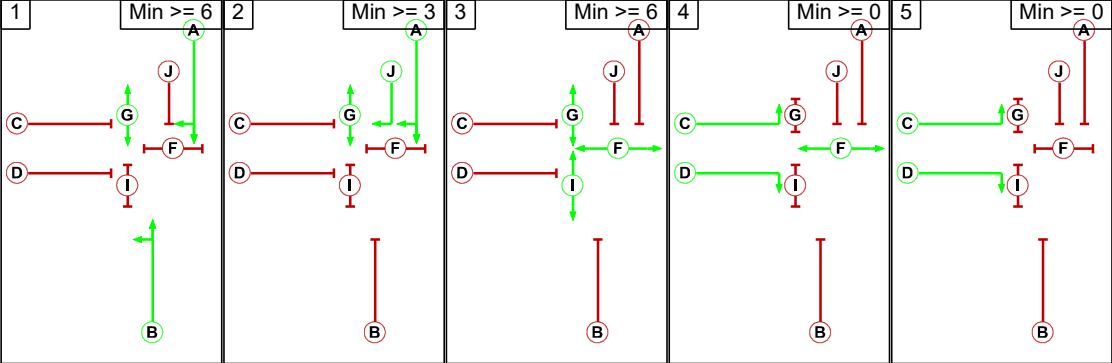
Terminating Phase	Starting Phase										
		A	B	C	D	E	F	G	H	I	J
	A		-	-	6	-	7	-	-	10	-
	B	-		7	5	-	8	-	-	8	3
	C	-	5		-	-	-	6	-	-	-
	D	5	5	-		-	-	-	-	6	5
	E	-	-	-	-		-	-	-	-	-
	F	14	14	-	-	-		-	-	-	14
	G	-	-	5	-	-	-		-	-	-
	H	-	-	-	-	-	-	-		-	-
	I	8	8	-	8	-	-	-	-		8
	J	-	6	-	6	-	7	-	-	10	

Phases in Stage

Stream	Stage No.	Phases in Stage
1	1	A B G
1	2	A G J
1	3	F G I
1	4	C D F
1	5	C D

Stage Diagram

Stage Stream: 1



Phase Delays

Stage Stream: 1

Term. Stage	Start Stage	Phase	Type	Value	Cont value
1	4	G	Losing	2	2
1	5	G	Losing	2	2
3	1	I	Losing	6	6
3	2	I	Losing	6	6
3	5	F	Losing	8	8
4	1	C	Losing	9	9
4	1	D	Losing	9	9
4	2	C	Losing	8	8
4	2	D	Losing	9	9

Prohibited Stage Change

Stage Stream: 1

From Stage	To Stage					
		1	2	3	4	5
	1		3	10	8	7
	2	6		10	7	6
	3	14	14		8	8
	4	15	14	6		0
	5	6	6	6	0	

Full Input Data And Results

Give-Way Lane Input Data

Junction: Upper Brook Street / Booth Street West / Inchley Road											
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)
3/3 (Upper Brook St Sbnd In)	5/1 (Right)	1439	0	1/1	1.09	All	4.00	-	0.50	4	4.00
				1/2	1.09	All					

Full Input Data And Results

Lane Input Data

Junction: Upper Brook Street / Booth Street West / Inchley Road												
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 (Upper Brook St Nbnd In)	U	B	2	3	49.7	Geom	-	3.20	0.00	Y	Arm 5 Left	10.00
											Arm 6 Ahead	Inf
1/2 (Upper Brook St Nbnd In)	U	B	2	3	49.7	Geom	-	3.20	0.00	N	Arm 6 Ahead	Inf
2/1 (Booth St East In)	U	C	2	3	8.3	Geom	-	5.00	0.00	Y	Arm 6 Left	10.00
2/2 (Booth St East In)	U	D	2	3	8.3	Geom	-	3.50	0.00	N	Arm 4 Right	18.00
3/1 (Upper Brook St Sbnd In)	U	A	2	3	33.4	Geom	-	3.20	0.00	Y	Arm 4 Ahead	Inf
3/2 (Upper Brook St Sbnd In)	U	A	2	3	17.2	Geom	-	3.00	0.00	N	Arm 4 Ahead	Inf
3/3 (Upper Brook St Sbnd In)	O	A J	2	3	33.4	Geom	-	2.90	0.00	N	Arm 5 Right	10.00
4/1 (Upper Brook St Sbnd Out)	U		2	3	60.0	Inf	-	-	-	-	-	-
4/2 (Upper Brook St Sbnd Out)	U		2	3	60.0	Inf	-	-	-	-	-	-
5/1 (Booth St East Out)	U		2	3	60.0	Inf	-	-	-	-	-	-
6/1 (Upper Brook St Nbnd Out)	U		2	3	60.0	Inf	-	-	-	-	-	-
6/2 (Upper Brook St Nbnd Out)	U		2	3	60.0	Inf	-	-	-	-	-	-

Traffic Flow Groups

Flow Group	Start Time	End Time	Duration	Formula
3: 'Cumulative Scheme AM Peak'	08:15	09:15	01:00	

Scenario 7: 'Proposed Layout' (FG3: 'Cumulative Scheme AM Peak', Plan 2: '1 in 2 Peds')

Traffic Flows, Desired

Desired Flow :

Origin	Destination				
		A	B	C	Tot.
	A	0	700	240	940
	B	856	0	544	1400
	C	78	341	0	419
	Tot.	934	1041	784	2759

Traffic Lane Flows

Lane	Scenario 7: Proposed Layout
Junction: Upper Brook Street / Booth Street West / Inchley Road	
1/1	621
1/2	779
2/1	78
2/2	341
3/1 (with short)	700(In) 339(Out)
3/2 (short)	361
3/3	240
4/1	339
4/2	702
5/1	784
6/1	155
6/2	779

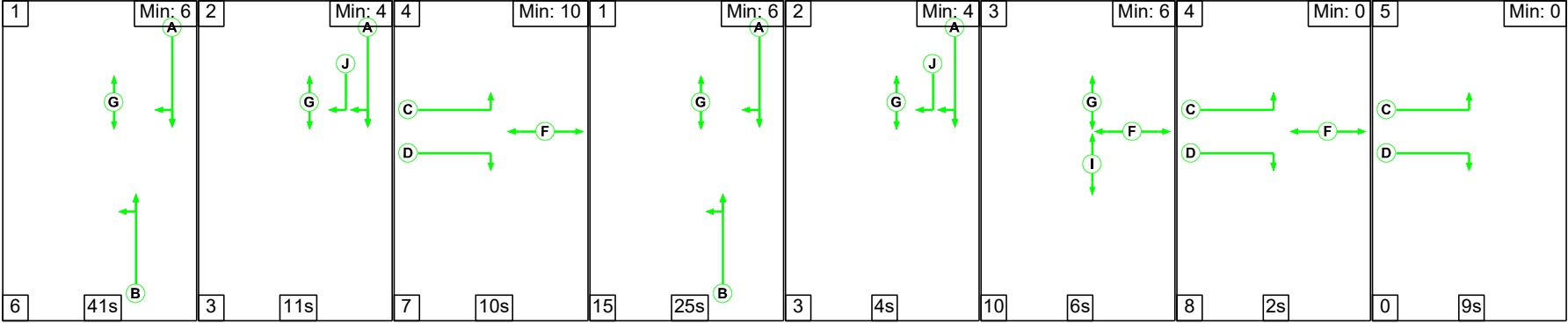
Lane Saturation Flows

Junction: Upper Brook Street / Booth Street West / Inchley Road								
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 (Upper Brook St Nbnd In)	3.20	0.00	Y	Arm 5 Left	10.00	87.6 %	1710	1710
				Arm 6 Ahead	Inf	12.4 %		
1/2 (Upper Brook St Nbnd In)	3.20	0.00	N	Arm 6 Ahead	Inf	100.0 %	2075	2075
2/1 (Booth St East In)	5.00	0.00	Y	Arm 6 Left	10.00	100.0 %	1839	1839
2/2 (Booth St East In)	3.50	0.00	N	Arm 4 Right	18.00	100.0 %	1943	1943
3/1 (Upper Brook St Sbnd In)	3.20	0.00	Y	Arm 4 Ahead	Inf	100.0 %	1935	1935
3/2 (Upper Brook St Sbnd In)	3.00	0.00	N	Arm 4 Ahead	Inf	100.0 %	2055	2055
3/3 (Upper Brook St Sbnd In)	2.90	0.00	N	Arm 5 Right	10.00	100.0 %	1778	1778
4/1 (Upper Brook St Sbnd Out Lane 1)	Infinite Saturation Flow						Inf	Inf
4/2 (Upper Brook St Sbnd Out Lane 2)	Infinite Saturation Flow						Inf	Inf
5/1 (Booth St East Out Lane 1)	Infinite Saturation Flow						Inf	Inf
6/1 (Upper Brook St Nbnd Out Lane 1)	Infinite Saturation Flow						Inf	Inf
6/2 (Upper Brook St Nbnd Out Lane 2)	Infinite Saturation Flow						Inf	Inf

Scenario 7: 'Proposed Layout' (FG3: 'Cumulative Scheme AM Peak', Plan 2: '1 in 2 Peds')

Stage Sequence Diagram

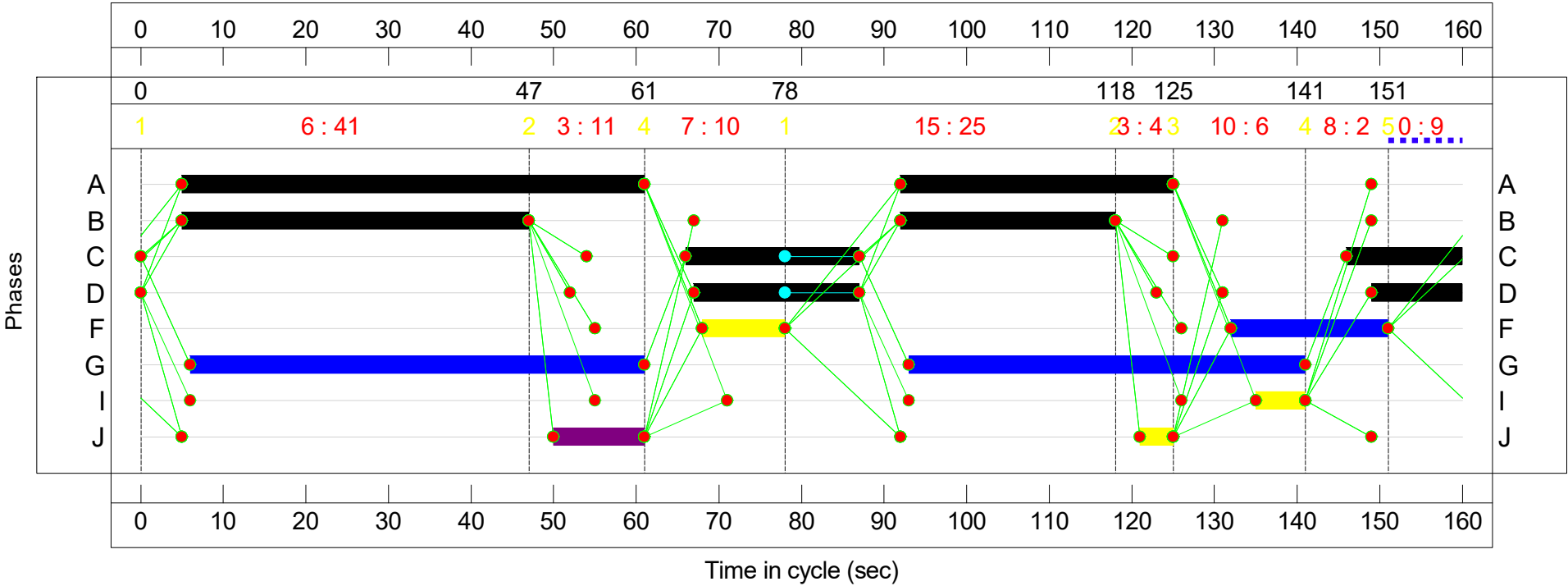
Stage Stream: 1



Stage Timings
Stage Stream: 1

Stage	1	2	4	1	2	3	4	5
Duration	41	11	10	25	4	6	2	9
Change Point	0	47	61	78	118	125	141	151

Signal Timings Diagram

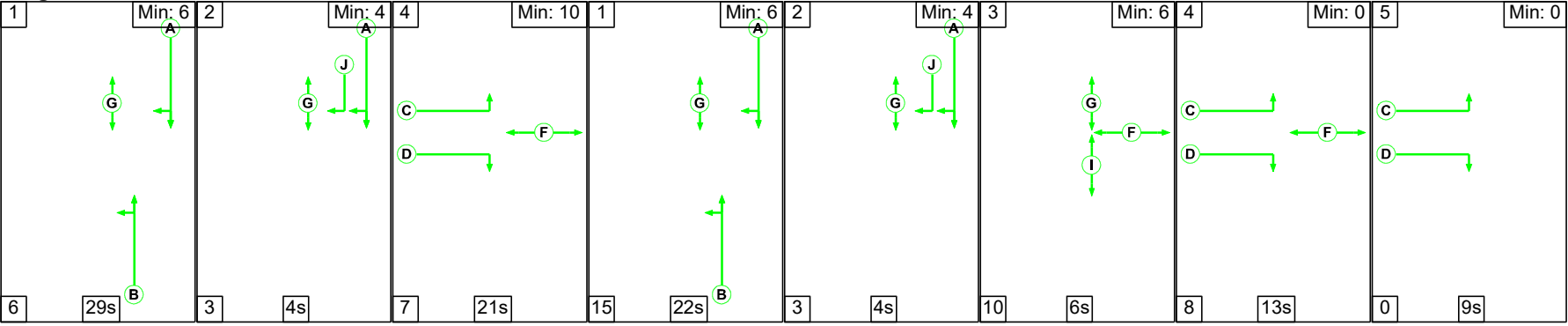


Network Results

C1 - 131	Stream: 1 PRC for Signalled Lanes (%):	4.9	Total Delay for Signalled Lanes (pcuHr):	26.46	Cycle Time (s): 160
	PRC Over All Lanes (%):	4.9	Total Delay Over All Lanes(pcuHr):	26.46	

Full Input Data And Results
Scenario 8: 'Proposed Layout' (FG4: 'Cumulative Scheme PM Peak', Plan 2: '1 in 2 Peds')
Stage Sequence Diagram

Stage Stream: 1

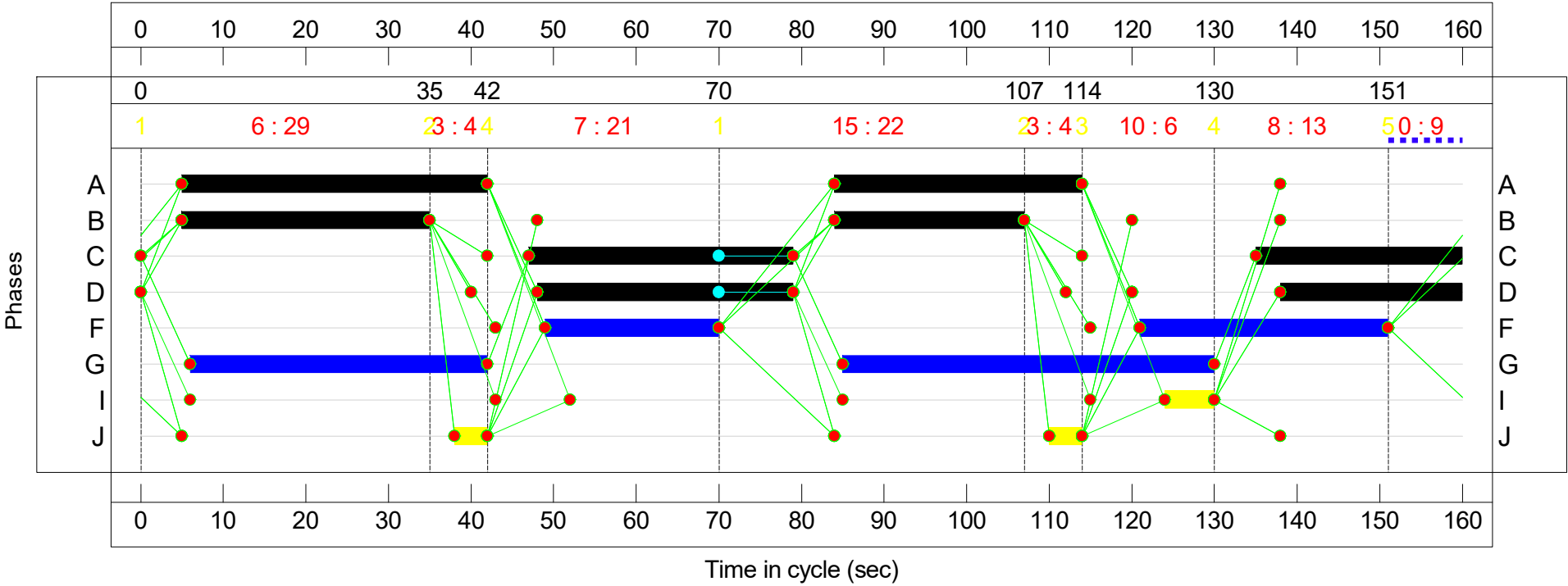


Stage Timings

Stage Stream: 1

Stage	1	2	4	1	2	3	4	5
Duration	29	4	21	22	4	6	13	9
Change Point	0	35	42	70	107	114	130	151

Signal Timings Diagram

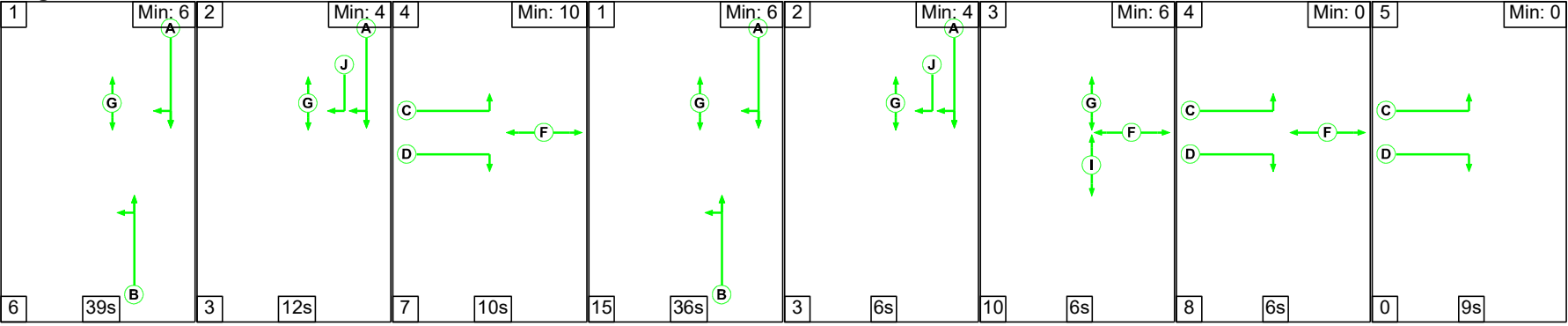


Network Results

C1 - 131	Stream: 1 PRC for Signalled Lanes (%):	10.1	Total Delay for Signalled Lanes (pcuHr):	26.13	Cycle Time (s): 160
	PRC Over All Lanes (%):	10.1	Total Delay Over All Lanes(pcuHr):	26.13	

Full Input Data And Results
Scenario 15: 'Copy of Proposed Layout' (FG3: 'Cumulative Scheme AM Peak', Plan 2: '1 in 2 Peds')
Stage Sequence Diagram

Stage Stream: 1

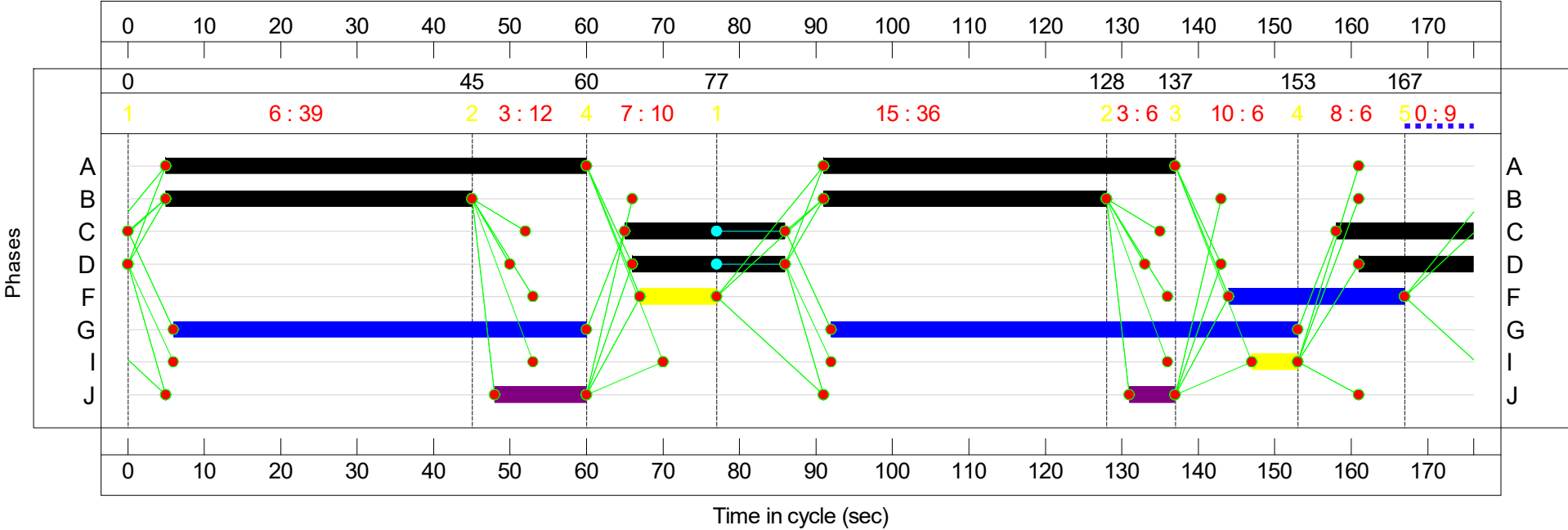


Stage Timings

Stage Stream: 1

Stage	1	2	4	1	2	3	4	5
Duration	39	12	10	36	6	6	6	9
Change Point	0	45	60	77	128	137	153	167

Signal Timings Diagram

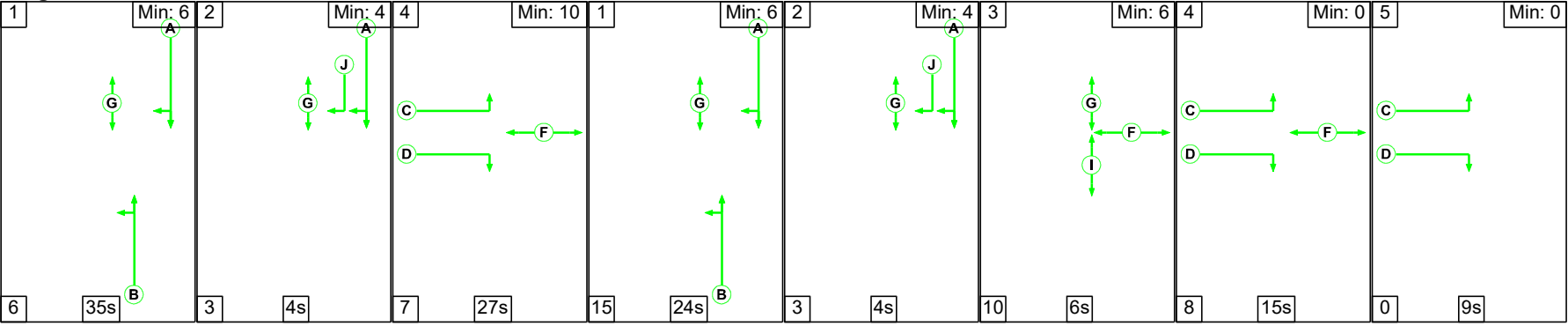


Network Results

C1 - 131	Stream: 1 PRC for Signalled Lanes (%):	6.8	Total Delay for Signalled Lanes (pcuHr):	26.05	Cycle Time (s): 176
	PRC Over All Lanes (%):	6.8	Total Delay Over All Lanes(pcuHr):	26.05	

Full Input Data And Results
Scenario 16: 'Copy of Proposed Layout' (FG4: 'Cumulative Scheme PM Peak', Plan 2: '1 in 2 Peds')
Stage Sequence Diagram

Stage Stream: 1

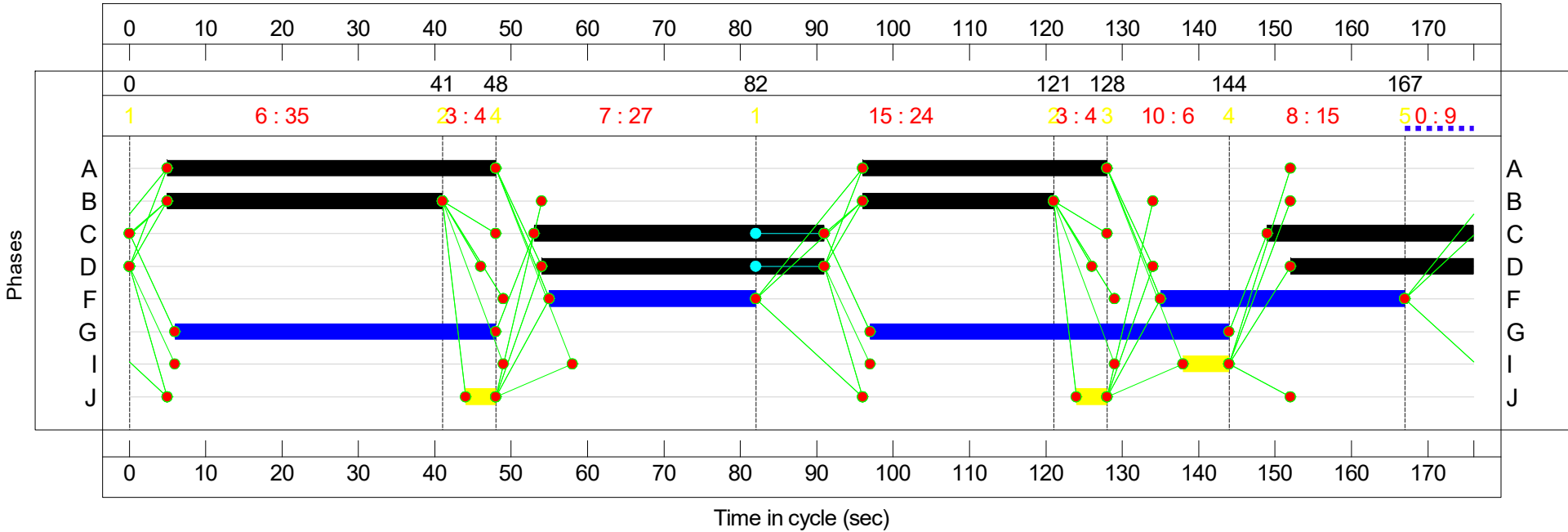


Stage Timings

Stage Stream: 1

Stage	1	2	4	1	2	3	4	5
Duration	35	4	27	24	4	6	15	9
Change Point	0	41	48	82	121	128	144	167

Signal Timings Diagram



Network Results

C1 - 131	Stream: 1 PRC for Signalled Lanes (%):	14.6	Total Delay for Signalled Lanes (pcuHr):	26.56	Cycle Time (s): 176
	PRC Over All Lanes (%):	14.6	Total Delay Over All Lanes(pcuHr):	26.56	



Booth Street East junction with A34 Upper Brook Street Proposed Highway Works Stage 1 Road Safety Audit

Prepared by



Distribution List

1. Andrew Bell - Focus
2. File Copy

REPORT NUMBER 2023/F/2023

CONTACT

Naresh Madhavan
Highway Associates
International House
Aviation Park
Flint Road
Chester
CH4 0GZ

Tel: 07715109788

Email: Naresh@HighwayAssociates.co.uk
Web: www.HighwayAssociates.co.uk

Issue and revision record

Revision	Date	Originator	Checker	Approver	Description
FINAL	16/11/23	N Madhavan	R Sawczyn	T Madhavan	For Issue

CONTENTS

1	INTRODUCTION	1
2	ITEMS RAISED BY PREVIOUS AUDITS AND REPORTS.....	3
3	ITEMS RAISED BY THIS AUDIT	4
4	AUDIT TEAM STATEMENT.....	7

Appendix A: Drawings and documents provided

Appendix B: Plan of items raised by this audit

This document is issued for the party which commissioned it and for specific purposes connected with the above-captioned project only. It should not be relied upon by any other party or used for any other purpose.

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This document contains confidential information and proprietary intellectual property. It should not be shown to other parties without consent from us and from the party which commissioned it.

1 INTRODUCTION

1.1 This report results from a Stage 1 Road Safety Audit carried out relating to the proposed highway works in the form of junction remodelling works at the junction between Booth Street East and A34 Upper Brook Street, Manchester. The audit was carried out during November 2023.

1.2 The audit team consisted of:

Team Leader: Naresh Madhavan MCIHT, MSoRSA EU RSA Cert. Comp
Director
Highway Associates

Team Member: Robin Sawczyn BEng MCIHT MSoRSA
Senior Road Safety Engineer
Highway Associates

1.3 The audit took place at the offices of Highway Associates, Chester. The Road Safety Audit was undertaken in accordance with the Road Safety Audit Brief provided by Andrew Bell of Focus. The Road Safety Audit comprised an examination of the documents provided and these are listed in Appendix A.

The site was visited by the audit team at the following times/conditions:

Day/Date	Time	Weather Con	Traffic Flow
Mon 6 th Nov 2023	10:30 – 11:10hrs	Damp/Drizzle	Ave

1.4 The terms of reference for this audit are as given in GG119, Design Manual for Roads and Bridges. The scheme has been examined and this report compiled only with regard to the safety implications for road users of the scheme as presented. It has not been examined or verified for compliance with any other standards or criteria. However, in order to clearly explain a safety problem or the recommendation to resolve a problem, the Audit Team may on occasion have referred to a design standard for information only. Any audit comments should not be construed as implying that a technical audit has been undertaken in any respect.

- 1.5 If relevant within this report the generic term “pedestrians” can include walking pedestrians, wheelchair users, dismounted cyclists, the blind, partially sighted, mobility impaired and people with prams or pushchairs. Highway Maintenance Operatives are also included within this term. Where a problem is specific to one or more of these vulnerable groups then appropriate reference will be made in the report.
- 1.6 Any recommendations included within this report should not be regarded as being prescriptive design solutions to the problems identified. They are intended only to indicate a proportionate and viable means of eliminating or mitigating the identified problem, in accordance with GG119, and in no way imply that a formal design process has been undertaken. There may be alternative methods of addressing a problem which would be equally acceptable in achieving the desired elimination or mitigation and these should be considered when responding to this report.
- 1.7 This Road Safety Audit makes allowance for the fact that strategic decisions on matters such as route choice, junction type, standard of provision and approved Departures from Standards already reflect an appropriate balance of a number of factors including road safety.
- 1.8 The Audit Team have not been made aware of any possible geometric departures or relaxations from standards.
- 1.9 The reader is reminded that a Road Safety Audit is not limited to the new works alone where there are features that are considered by the Audit Team to affect the general safety in the area. Section 3 of this report lists ‘Problems’ identified from the drawings and as a result of the site visit relating to the proposed changes to the highway layout that are directly, or indirectly, related to the area (e.g. features/matters within the proposed works or immediate surrounds which the Audit Team feel should be brought to the attention of the Designer or other organisations even though they might not pose an immediate risk associated with the proposed works), and which are considered by the Audit Team to warrant attention under the subject proposals, generally by the maintaining authority. On occasions there are more sensitive issues or issues that fall outside the audit brief but which are of such a nature that Auditors feel should be specifically brought to the attention of the authorities - such issues, if they arise, are usually dealt with in detail in separate correspondence.

2 ITEMS RAISED BY PREVIOUS AUDITS AND REPORTS

- 2.1 It is understood that no previous road safety audits have been undertaken in relation to this scheme.

3 ITEMS RAISED BY THIS AUDIT

3.1 General

3.1.1 PROBLEM

LOCATION: Booth Street East

SUMMARY: Alignment could result in conflicts

It is proposed to realign the approach arrangement to the junction whereby forming a large splitter island between the left and right turns but omitting the existing offside splitter island which currently segregates north and southbound traffic. Concern is expressed that the proposed alignment is unusual in its formation whereby traffic turning right out of Booth Street East have a nearside island but nothing to protect on the offside from traffic turning into the side road as is the current situation. Not only is there a risk of driver confusion as to the proposed road layout, such an arrangement increases the risk of head-on type conflicts between traffic turning right out of the side road and traffic turning into it.

RECOMMENDATION

An alternative layout should be investigated, for example repositioning the splitter island to the offside of the right turn lane and keeping the left and right turn traffic lanes together.

3.1.2 PROBLEM

LOCATION: A34 northbound through the junction

SUMMARY: Through alignments could result in conflicts

The northbound through alignment is such that lane 1 traffic is deflected to the offside due to the cycle facility widening and a similar point, lane 2 traffic is deflected to the nearside to accommodate the opposing right turn pocket. This arrangement could increase the potential for side swipe type conflicts between lane 1 and lane 2 traffic within the junction.

RECOMMENDATION

The alignments should be adjusted as not to cause conflict between lane 1 and lane 2.

3.1.3 PROBLEM

LOCATION: A34 northbound

SUMMARY: Insufficient capacity could result in conflicts

It is unclear as to whether removing one of the existing 3 northbound through lanes will significantly affect junction or link capacity causing congestion and increasing the potential for sudden braking or weaving type conflicts throughout the scheme.

RECOMMENDATION

A review of the traffic model should be undertaken to ensure that the junction and link operate within capacity.

3.1.4 PROBLEM

LOCATION: A34 approaches

SUMMARY: Insufficient through lane widths

3m-3.2m wide traffic lanes have been proposed for the through traffic lanes. Given this is a bus route and used by large HGVs, concern is expressed that 3m-3.2m wide traffic lanes are insufficient and could encourage encroachment into the adjacent traffic lanes lane risking conflicts with adjacent vehicles.

RECOMMENDATION

Through traffic lane widths should be suitably increased.

3.2 **Non Motorised Road User Provision**

3.2.1 PROBLEM

LOCATION: A34 toucan crossing

SUMMARY: Excessive crossing width could increase the potential for VRU to vehicular conflict

The proposed controlled inline pedestrian/cycle crossing facility across the junction measures over 16 metres wide. This is deemed to be excessive and may increase the likelihood of pedestrians, particularly those who are less mobile, becoming stranded midway within the crossing or attempt to take refuge within the hatched area, increasing the potential for pedestrian to vehicular conflict within the junction. Furthermore, given the distance, crossing pedestrians will not have suitable visibility of the green man due to the crossing width exacerbating the issue.

RECOMMENDATION

A suitable splitter/refuge island should be installed within the junction paying particular attention to swept path analysis.

3.2.2 PROBLEM

LOCATION: A34 toucan crossing – East side

SUMMARY: Risk of errant VRU carriageway incursion

Whilst provisional details relating to the proposed public realm scheme along Inchley Road have been supplied, they are not subject to audit at this time. Concern is therefore expressed that should an inline approach to the toucan crossing be advocated, that there could be an increased risk of VRUs such as pedestrians and cyclists unintentionally walking or riding into the mainline carriageway, potentially at speed resulting in conflicts with passing vehicular traffic.

RECOMMENDATION

It should be ensured that a form of deflection should be installed on the approach to the crossing from Inchley Road.

3.3 Road Signs and Markings

No comments at this stage

3.4 Lighting and Signals

No comments at this stage

3.5 Landscaping

No comments at this stage

3.6 Protective Aids

No comments at this stage

3.7 Surface Characteristics and Drainage

No comments at this stage

4 AUDIT TEAM STATEMENT

We certify that this Audit has been carried out in accordance with the guidelines in GG119.

AUDIT TEAM LEADER

Naresh Madhavan MCIHT MSoRSA EU RSA Cert. Comp
Director
Highway Associates
International House
Aviation Park
Flint Road
Chester
CH4 0GZ

Signed:



Date:

16/11/23

AUDIT TEAM MEMBER

Robin Sawczyn BEng MCIHT MSoRSA
Senior Road Safety Engineer
Highway Associates
International House
Aviation Park
Flint Road
Chester
CH4 0GZ

Signed:



Date:

16/11/23

APPENDIX A

DRAWINGS AND DOCUMENTS PROVIDED

- 766-042/WCI-009 - 012 (PD1) General Arrangement (Option 3)
- 766-042/WCI-017 - (PD1) Upper Brook Street General Arrangement for Stage 1 RSA
- 766-042/WCI-018 - 020 (PD1) General Arrangement for Stage 1 RSA (Option 3)
- 766-042/WCI-021 (PD1) Upper Brook Street Backing

APPENDIX B

PLAN OF ITEMS RAISED BY THIS AUDIT





Civil, Structural, Rail and Transportation Engineers

PROPERTY ALLIANCE GROUP, MODA LIVING & WILLIAMS MOTOR
CO (HOLDINGS)

UPPER BROOK STREET, MANCHESTER

SECTION 278 AGREEMENT

UPPER BROOK STREET/BOOTH STREET EAST JUNCTION

766-042-DOC-001 [P01]

ROAD SAFETY AUDIT STAGE 1 – RESPONSE REPORT

Stockport
Brindley Lodge
Adcroft Street
Stockport
Cheshire
SK1 3HS
T: 0161 474 7479

REPORT CONTROL SHEET

Version	Date	Status	Prepared By	Checked By	Approved By
P01	22/11/23	FINAL	D Campbell	M Lundy	M Lundy

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1.0 INTRODUCTION / SCOPE

Wilde Consulting Engineers have been appointed by Focus Transport Planning for a project involving associated highways and public realm improvements for the proposed development on Upper Brook Street, Manchester.

This report provides the responses against the Road Safety Audit Stage 1 report prepared by Highway Associates. A copy of the report and supporting addendum is available within **Appendix 1** of this document.

Supporting sketches referenced within the design organisation's response have been included within **Appendix 2** of this document, where applicable.

2.0 ROAD SAFETY AUDIT RESPONSE

2.1 Project Details

Table 2.1.A – Project details

Report title	Road Safety Audit Stage 1 – Response Report
Date	22/11/23
Document reference and revision	766-042-WCL-DOC-001
Prepared by	Wilde Consultants Ltd
On behalf of	Focus Transport Planning

Table 2.1.B – Authorisation sheet

Project	Upper Brook Street, Manchester
Report title	Road Safety Audit Stage 1 – Response Report
Prepared by	
Name	Daniel Campbell
Position	Assistant Engineer
Signed	
Organisation	Wilde Consultants Ltd
Date	21/11/23
Approved by	
Name	Mark Lundy
Position	Associate Director
Signed	
Organisation	Wilde Consultants Ltd
Date	21/11/23

2.2 Introduction

Scheme summary

Proposed improvements including:

1. Modifications to Booth Street East junction with Upper Brooks Street, to incorporate a right turn into Booth Street East and closure of Inchley Road. Include both northerly and southerly approaches and tie into existing lane markings.
2. Closure of Inchley Road for vehicular traffic.

2.3 Key Personnel

Table 2.3.A – Key personnel

Overseeing Organisation	Manchester City Council
RSA team	Highway Associates
Design organisation	Wilde Consultants Ltd



2.4 Road safety audit decision log

RSA problem		RSA recommendation	Design organisation response	Overseeing Organisation response	Agreed RSA action
3.1.1	<u>LOCATION:</u> Booth Street East <u>SUMMARY:</u> Alignment could result in conflicts It is proposed to realign the approach arrangement to the junction whereby forming a large splitter island between the left and right turns but omitting the existing offside splitter island which currently segregates north and southbound traffic. Concern is expressed that the proposed alignment is unusual in its formation whereby traffic turning right out of Booth Street East have a nearside island but nothing to protect on the offside from traffic turning into the side road as is the current situation. Not only is there a risk of driver confusion as to the proposed road layout, such an arrangement increases the risk of head-on type conflicts between traffic turning right out of the side road and traffic turning into it	An alternative layout should be investigated, for example repositioning the splitter island to the offside of the right turn lane and keeping the left and right turn traffic lanes together.	Response: Partially Accepted Given available highway constraints to the junction it is not possible to incorporate an additional splitter island on Booth Street East of sufficient size to safely accommodate an active travel user (ATU) refuge. A range of junction options were considered at a stakeholder design workshop session and the principles of the current arrangement were identified as providing the best opportunity to deliver enhanced ATU crossing facilities within junction land constraints. The layout of adjacent opposing traffic streams at a side road approach to a junction is similar in nature to other recently delivered schemes elsewhere within the city centre as part of ATU related improvement works. Variations considered at the workshop stage did include for the potential to reduce the size of the central splitter in order to reduce the extent of 'deflection' around the island for approaching traffic and potentially allow for the provision of a narrow traffic signal island (at circa 1.8m) between the opposing traffic streams. Such an option was ultimately rejected on the grounds that:	MCC/TfGM Response	



		• It could reduce the central splitter width to 3.5m, therefore materially reducing the circulation space for ATUs. • A 1.8m traffic signal island is not of sufficient size to act as safe pedestrian / cycle user refuge, however, its presence could encourage ATUs to use this island as waiting space between traffic signal stages, with associated potential conflicts with passing traffic. • Reducing the width of the central island and parallel introduction of an additional 1.8m splitter island could further increase the effective crossing length of this section of Booth Street East, which operates under an all-red phase. This would therefore introduce further lost-time into the junction traffic signal staging and reduce overall traffic operating capacity. • Positioning of any additional splitter island would be extremely challenging to avoid conflicts with large HGV left turn movements from Upper Brook Street (S) to Booth Street East. The design team would query the extent of perceived risk in relation to risk of head-on conflicts between traffic streams, as side road (BSE) and main road (UBS) traffic streams will not operate at the same time. Vehicle swept path analysis demonstrates that the junction layout provides appropriate geometry to avoid conflicts between opposing traffic streams on BSE. Notwithstanding the above, in recognition of the audit team comments, the design team have revisited the Booth Street approach and have prepared an updated layout which delivers		
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			the following amendments (see 766-042-WCL-009 - 012 (P03) General Arrangement (Option 3)): - Slight narrowing and re-shaping of the central splitter island to reduce perceived extent of deflection for the right turn lane around the island and to better align this lane in relation to the entry lane from Upper Brook Street. - Introduction of additional road markings to deliver an area of hatched segregation between the two lanes and to guide turning traffic into Booth Street East to follow a suitable alignment. Vehicle swept path testing of the layout as illustrated in drawing 766-042-WCL-024 (P02) demonstrates that all vehicle turning movements can be wholly accommodated within the amended marked Booth Street East entry lane with the articulated lorry showing the worst case swept path. In practice the Nov 2022 traffic surveys identified that large HGV traffic (OGV2) represented only 0.3% of all left turn traffic movements from Upper Brook Street to Booth Street East for the core daytime 12hr period (07:00-19:00).		
3.1.2	<u>LOCATION</u>: A34 northbound through the junction <u>SUMMARY</u>: Through alignments could result in conflicts The northbound through alignment is	The alignments should be adjusted as not to cause conflict between lane 1 and lane 2.	Response: Accepted The comments from the audit team are accepted. The design team have reviewed the layout of the Upper Brook Street northbound approach and have revised the alignment through	MCC/TfGM Response	



	such that lane 1 traffic is deflected to the offside due to the cycle facility widening and a similar point, lane 2 traffic is deflected to the nearside to accommodate the opposing right turn pocket. This arrangement could increase the potential for side swipe type conflicts between lane 1 and lane 2 traffic within the junction.		the junction as illustrated in drawings (766-042-WCL-009 - 012 (P03) General Arrangement (Option 3)) This amended alignment involves the extension of the proposed section of footway widening to the westbound side of upper Brook Street (S) to provide a longer, straighter 2 * 3.2m lane approach to the junction stopline. This arrangement addresses the identified issue of consecutive nearside and offside lane deflection and therefore reduces the potential for side-swipe incidents. Additional road markings to Diagram 1005 have also been provided along the centre line of the northbound carriageway to guide vehicles across the junction more effectively. Revised swept path assessment illustrating relevant through vehicle & turning movements is included in drawing 766-042-WCL-024 (P02).		
3.1.3	<u>LOCATION:</u> A34 northbound <u>SUMMARY:</u> Insufficient capacity could result in conflicts It is unclear as to whether removing one of the existing 3 northbound through lanes will significantly affect junction or link capacity causing congestion and increasing the potential for sudden braking or weaving type conflicts throughout	A review of the traffic model should be undertaken to ensure that the junction and link operate within capacity	Response: Accepted The removal of one of the three northbound lanes to UBS is not predicted to result in capacity or congestion issues. In practice, the part of the approach section of Upper Brook Street to the south of the junction already operates as a two-lane approach and only widens to three lanes approximately 130m to the south. Removal of this additional lane will therefore not result in additional weaving issues as there will be no requirement to change lanes as a result of the new arrangements.	MCC/TfGM Response	



	the scheme.		The existing third northbound (outside) lane is observed to be poorly utilised, as it has the potential to be regularly blocked by any vehicle waiting to turn right into Inchley Road – no safe right turn off-line vehicle pocket is available at this junction. Indeed, weaving is considered to be more likely to be associated with the existing arrangement, as vehicles often swap lanes to undertake such waiting right turn movements. The limited usage of the existing third lane is reflected by recorded queuing on the A34 Upper Brook Street (S) approach during the November 2022 surveys and presented in the Transport Assessment report to support the Upper Brook Street development application. This exercise highlighted combined peak hour queuing across all three lanes of the order of 15 – 25 vehicles, but with the majority of this approach queuing concentrated on the inside lane (ahead and left) and with queuing in the outer two lanes noted to be generally less than 5 vehicles. Removal of the outer lane to the Upper brook Street (S) approach to the junction is therefore not expected to result in material capacity issues at the junction, which is reflected by the results of the LINSIG testing of the proposed junction arrangements.		
3.1.4	<u>LOCATION:</u> A34 approaches <u>SUMMARY:</u> Insufficient through lane widths 3m-3.2m wide traffic lanes have	Through traffic lane widths should be suitably increased.	Response: Rejected The proposed lane widths to Upper Brook Street are based on the lane dimensions currently in day-to-day use at the junction.	MCC/TfGM Response	



	been proposed for the through traffic lanes. Given this is a bus route and used by large HGVs, concern is expressed that 3m-3.2m wide traffic lanes are insufficient and could encourage encroachment into the adjacent traffic lanes lane risking conflicts with adjacent vehicles.		The proposed arrangements do not result in any material reduction in road space. Due the surrounding land constraints it is not possible to deliver a practical increase in junction dimensions. By way of demonstration, drawing 766-042-WCL-SK-001 Existing Lane Widths, to this report illustrates existing Upper Brook Street approach lane dimensions. This exercise illustrates the following prevailing road widths: Upper Brook Street (N) Approach: 2 * 3.1m lanes Upper Brook Street (S) Approach: 2 * 3.1m lanes, 1 * 2.85m lane. The proposed junction scheme identifies the following provision: Upper Brook Street (N) Approach: 1 * 3.2m lane, 1 * 3.0m lane, 1 * 2.9m lane Upper Brook Street (S) Approach: 2 * 3.2m lanes. To reflect potential for greater use by bus / HGV traffic, the proposed junction improvement scheme includes for 3.2m lane widths to the nearside lanes to both Upper Brook Street approaches. It is ultimately concluded that the proposed lane width dimensions are realistic and appropriate for the location, based on prevailing conditions.	
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3.2.1	LOCATION: A34 toucan crossing SUMMARY: Excessive crossing width could increase the potential for VRU to vehicular conflict The proposed controlled inline pedestrian/cycle crossing facility across the junction measures over 16 metres wide. This is deemed to be excessive and may increase the likelihood of pedestrians, particularly those who are less mobile, becoming stranded midway within the crossing or attempt to take refuge within the hatched area, increasing the potential for pedestrian to vehicular conflict within the junction. Furthermore, given the distance, crossing pedestrians will not have suitable visibility of the green man due to the crossing width exacerbating the issue.	A suitable splitter/refuge island should be installed within the junction paying particular attention to swept path analysis.	Response: Partially Accepted Given available highway constraints to the junction, it is not possible to incorporate an additional splitter island on Upper Brook Street of sufficient size to safely accommodate active travel user (ATU) refuge, whilst delivering the necessary right turn feature for Upper Brook Street (N) traffic. A number of junction options were considered at a stakeholder design workshop session and it was concluded that a crossing of Upper Brook Street, including central splitter island is not feasible in this location, unless part of staggered arrangements to the south of the junction. Such a facility would be located some way off ATU 'desire lines' and therefore was concluded would likely lead to ATUs seeking to cross Upper Brook Street at other inappropriate and unsafe locations. Furthermore, it was identified that whilst the existing junction arrangements provide for an intermediate island at the Upper Brook Street approach, this island is not of adequate width and is unsuitable to act as an effective pedestrian refuge. This is reflected in the fact that the current junction operates a full pedestrian stage of length sufficient to avoid the need for pedestrians to regularly have to wait on this island. Focus TP, the traffic consultant for the project, have confirmed that the proposed crossing of Upper Brook Street has been designed, by virtue of its location, to allow for operation alongside both the Booth Street East side road traffic phase and	MCC/TfGM Response	
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			the additional 'all red' phase to allow pedestrians to cross the southern Booth Street East entry and exit lanes. This ensures a long time period for ATUs to undertake their crossing movements, i.e. in excess of phase minimum + safe inter-green period. This will reduce the potential for conflicts between ATU movements and the subsequent traffic phase. Indeed, the proposed TfGM traffic signal staging under 'all-red' stage sequencing potentially allows for additional separation between the end of the crossing green / intergreen periods and the commencement of the next opposing traffic stage, without impacting on junction operational performance, should this matter ultimately be identified to be of practical concern.		
3.2.2	<u>LOCATION:</u> A34 toucan crossing – East side <u>SUMMARY:</u> Risk of errant VRU carriageway incursion Whilst provisional details relating to the proposed public realm scheme along Inchley Road have been supplied, they are not subject to audit at this time. Concern is therefore expressed that should an inline approach to the toucan crossing be advocated, that there could be an increased risk of VRUs such as pedestrians and cyclists unintentionally walking or riding into the mainline carriageway, potentially at speed resulting in conflicts with	It should be ensured that a form of deflection should be installed on the approach to the crossing from Inchley Road.	Response: Accepted Drawings 766-042-WCL-009 - 012 (P03) General Arrangement (Option 3) illustrates the location of the Upper Brook Street crossing landing point with respect to the emerging landscaping strategy for the adjacent public square. This demonstrates that the crossing will effectively be located at a position whereby a landscaping area be located to the rear of this landing zone. This landscaping area will act as a suitable deflection area to discourage ATUs from proceeding directly from the public square onto the crossing facility without taking due care and attention of their surroundings. It is proposed that the immediate footway area to the rear of this landscaping zone, incorporating the crossing landing area,	MCC/TfGM Response	



	passing vehicular traffic.		would be increased to at least 4m, to provide for an effective ATU waiting area, without potentially blocking north / south through pedestrians using the Upper Brook Street shared footway / cycleway.		
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2.5 Design organisation and Overseeing Organisation statements

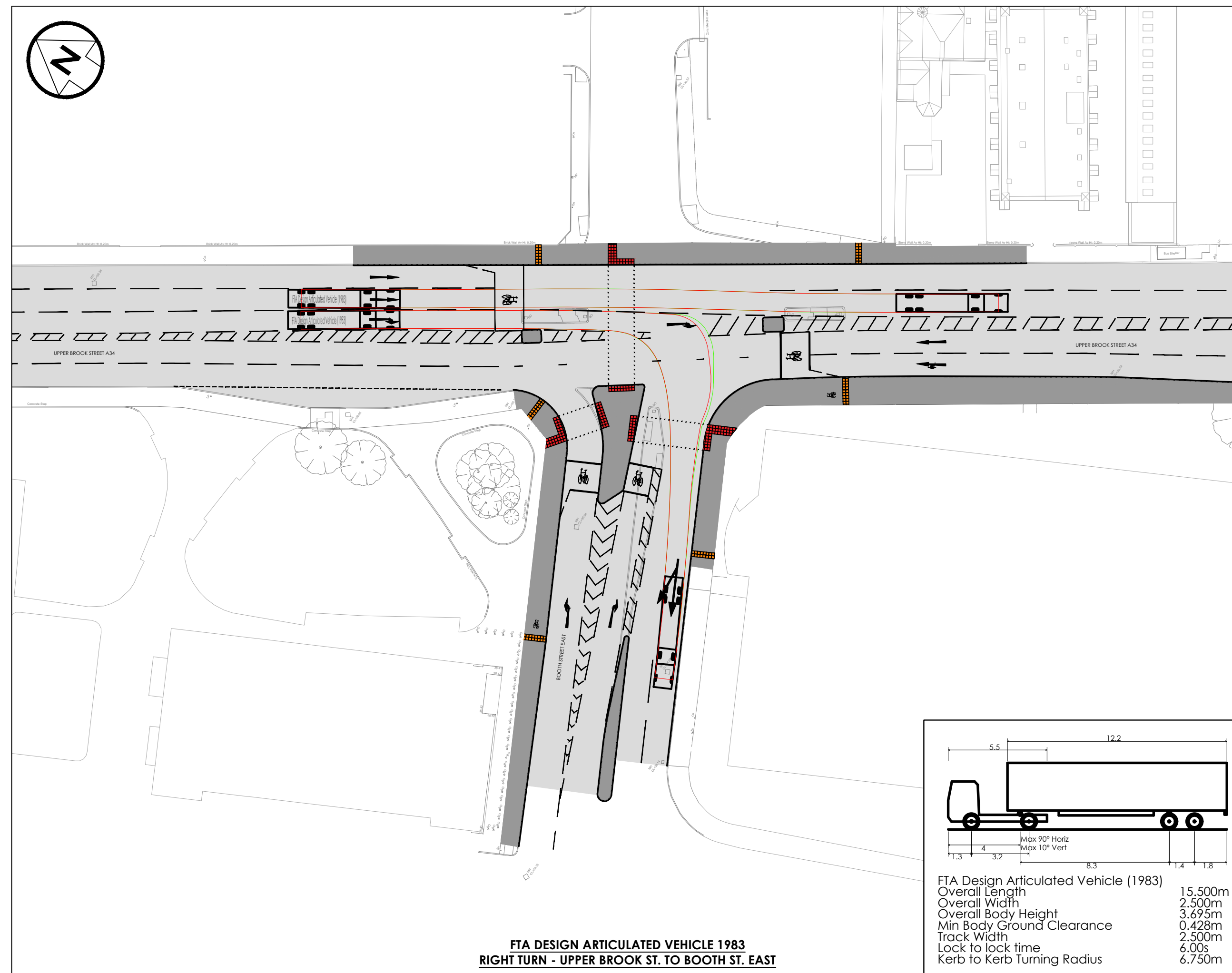
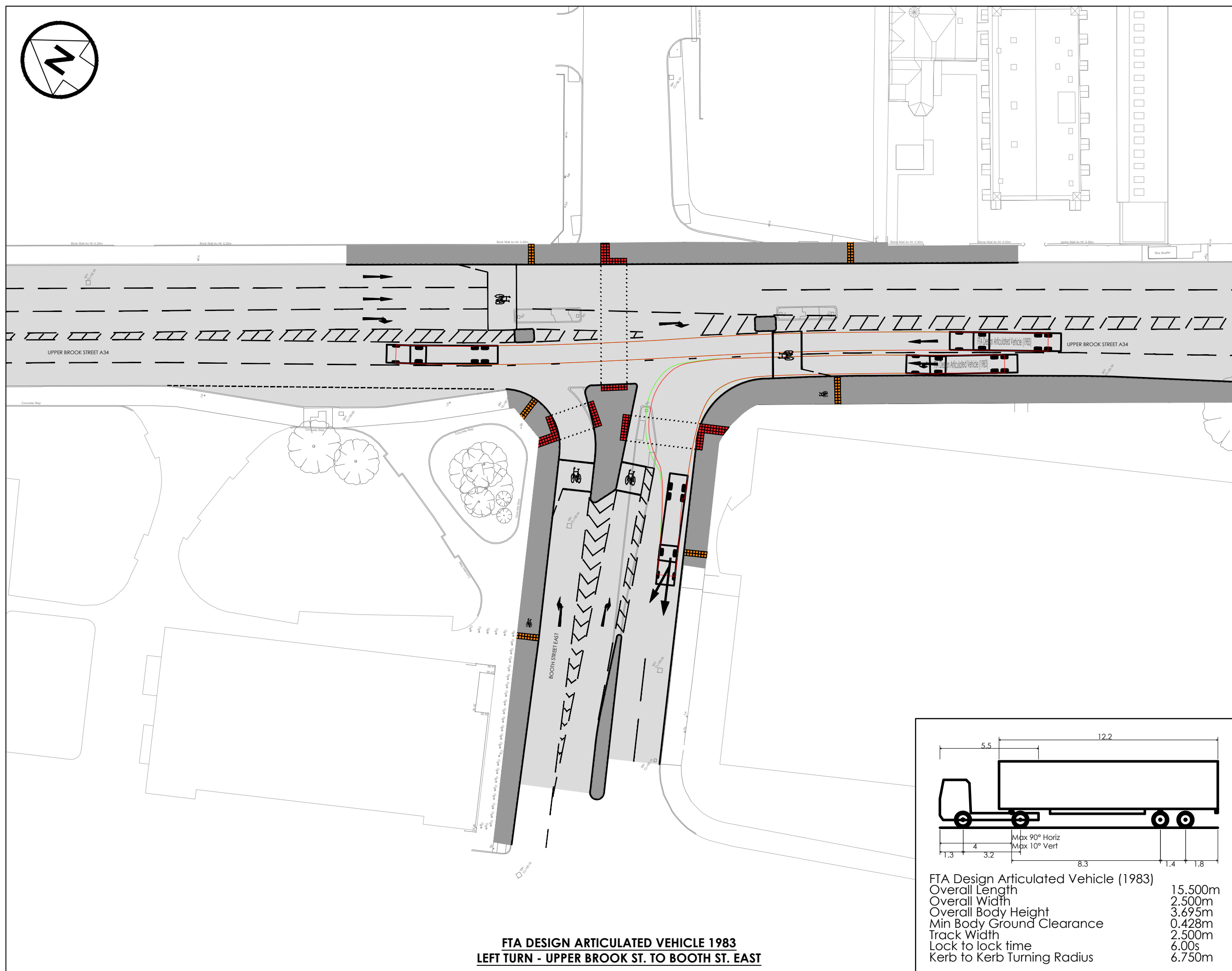
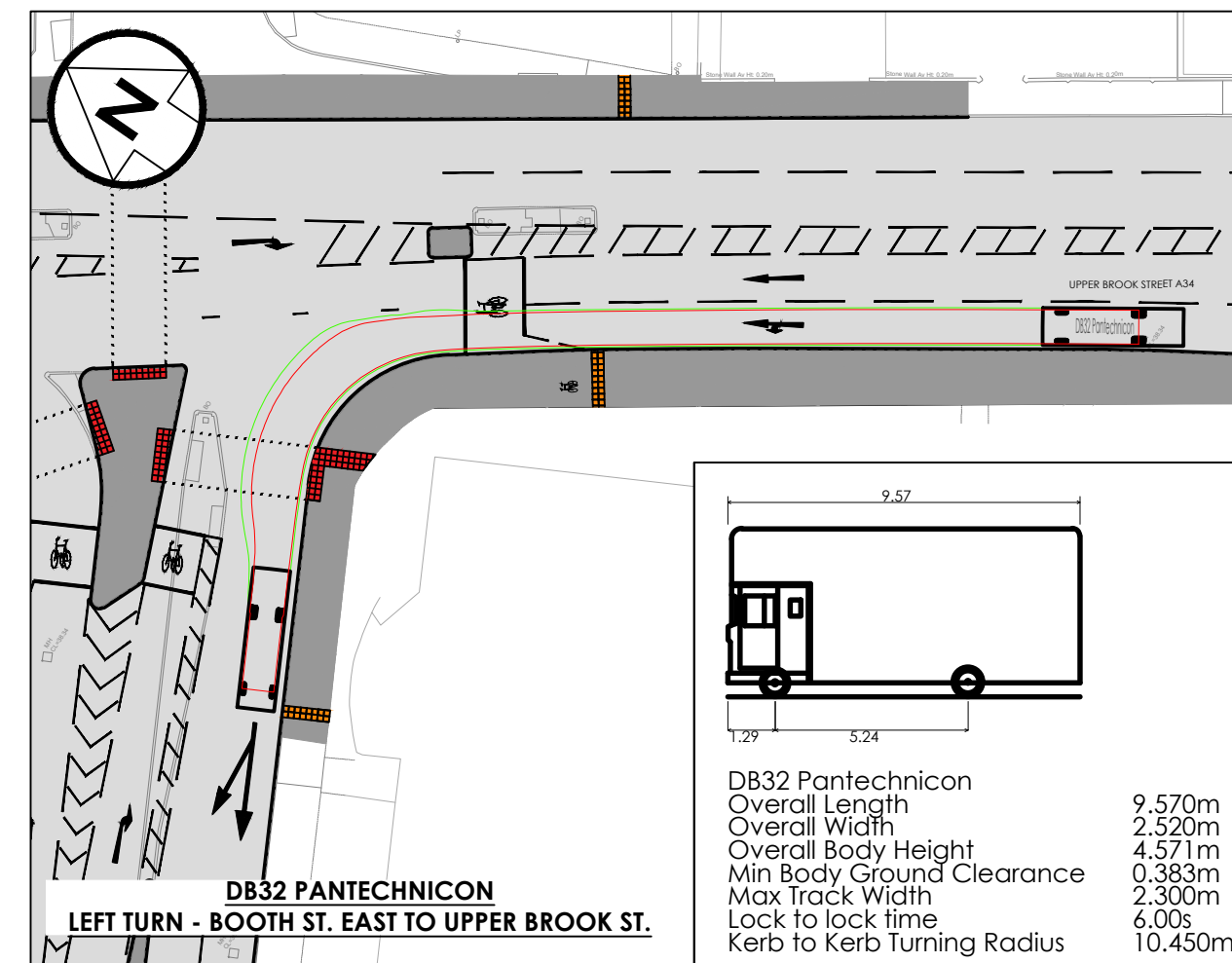
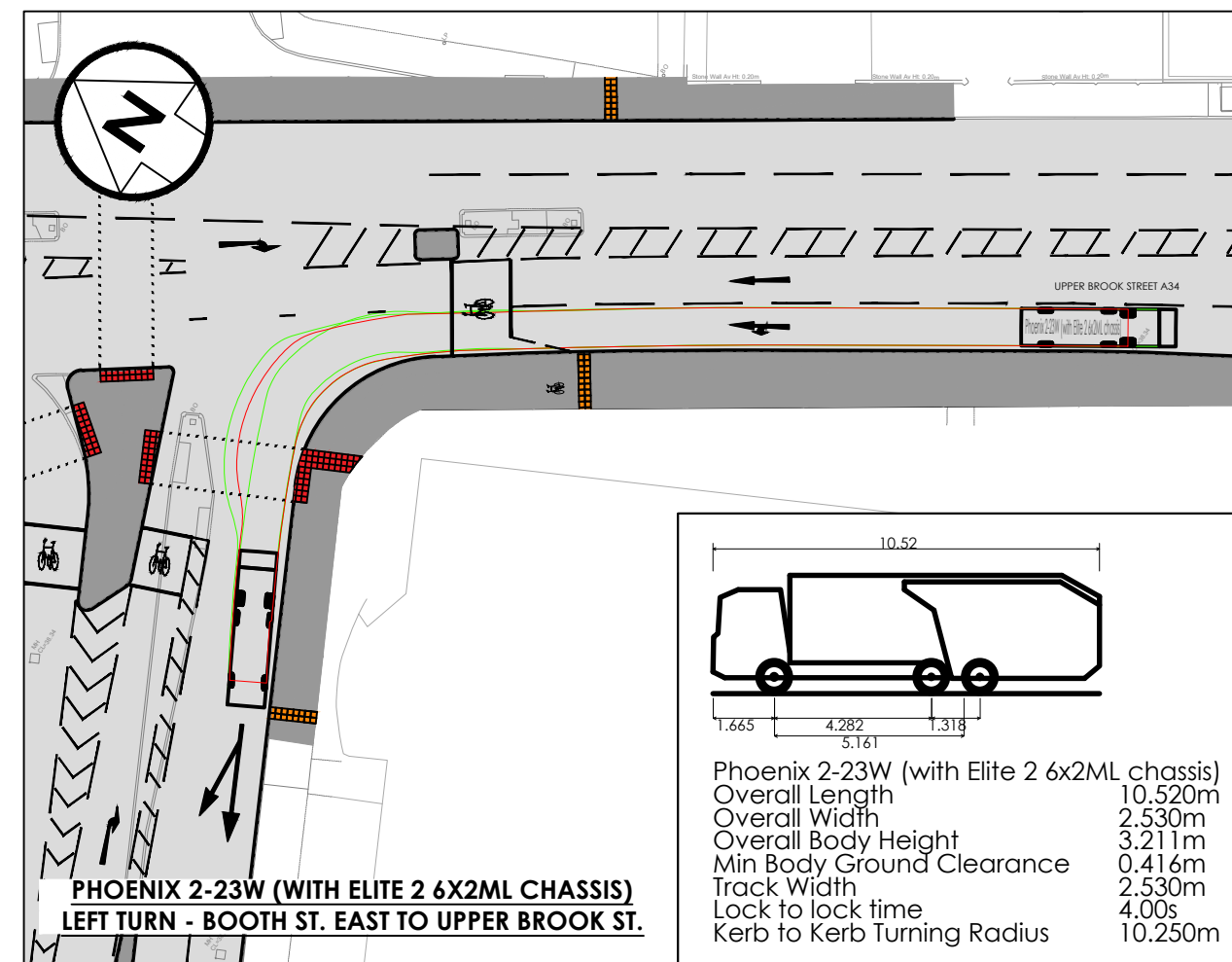
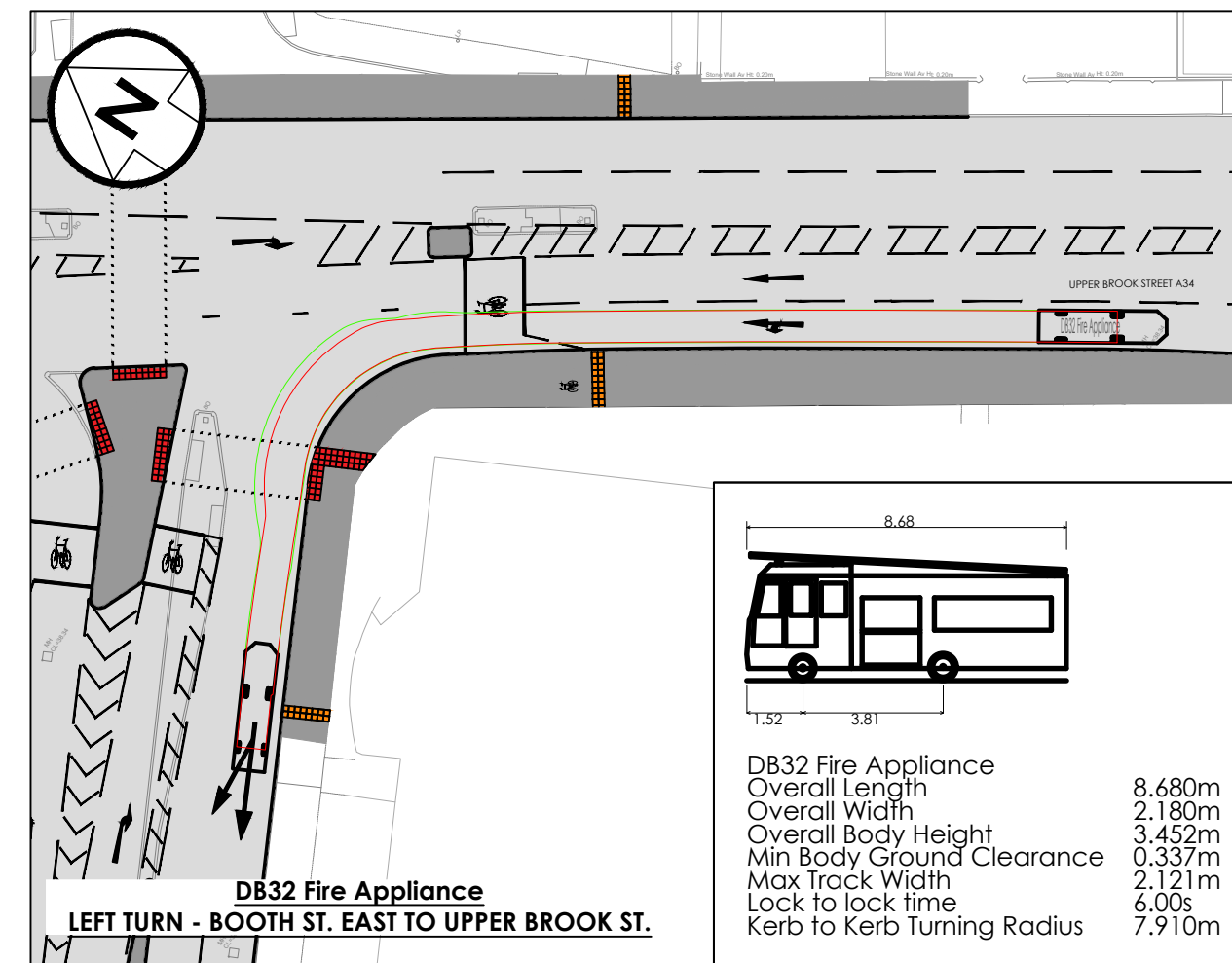
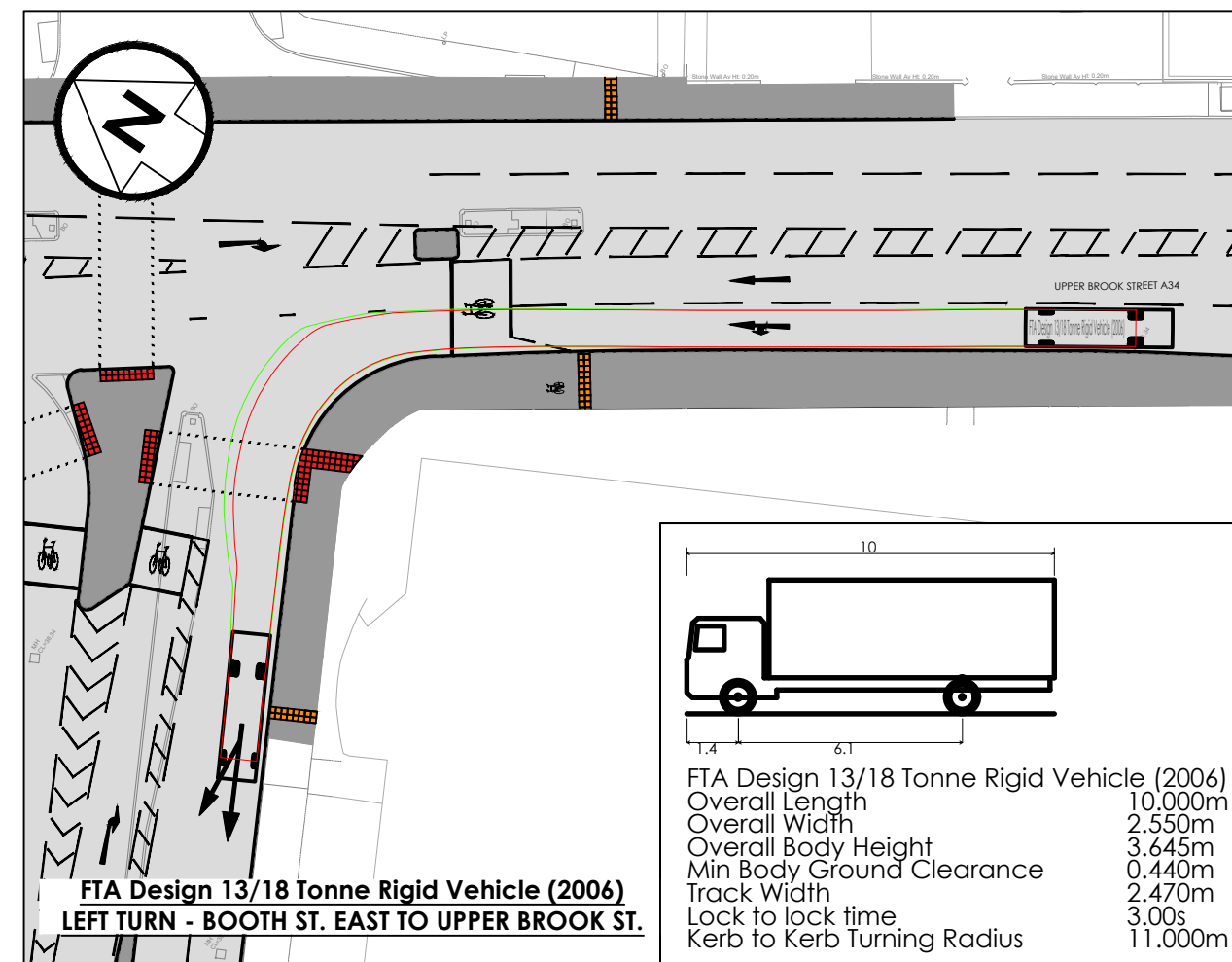
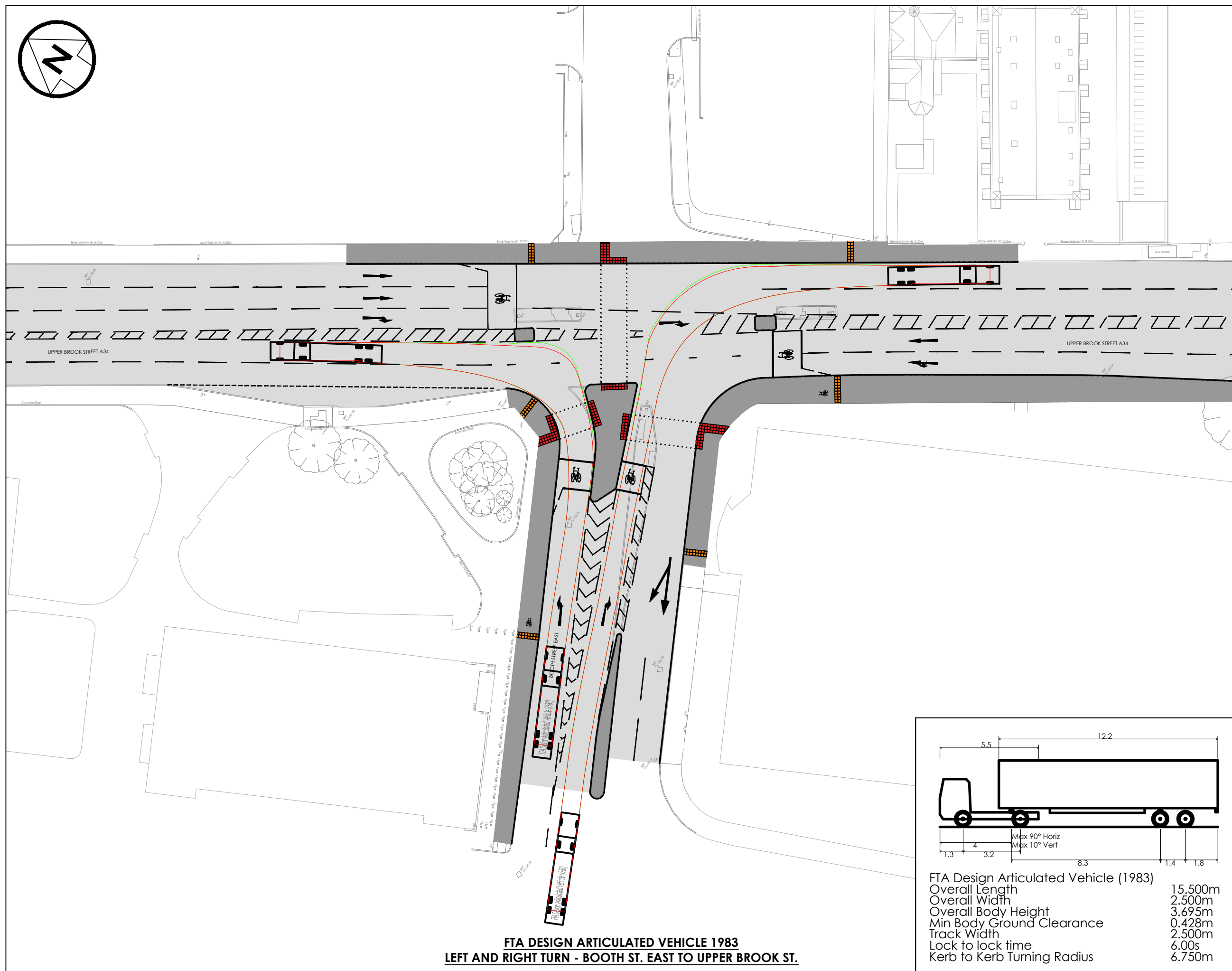
The following joint authorisations indicate both parts are in agreement with the RSA actions detailed within the above RSA decision log.

Table 2.5.A – 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	Mark Lundy
Position	Associate Director
Signed	
Organisation	Wilde Consultants Ltd
Date	

Table 2.5.B – 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; and	
2) the agreed RSA actions will be progressed	
Name	
Position	
Signed	
Organisation	
Date	



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KEY - GENERAL

- CARRIAGEWAY
- FOOTWAY
- CONTROLLED TACTILE PAVING
- HAZARD WARNING PAVING
- EXISTING ROAD MARKINGS
- PROPOSED ROAD MARKINGS

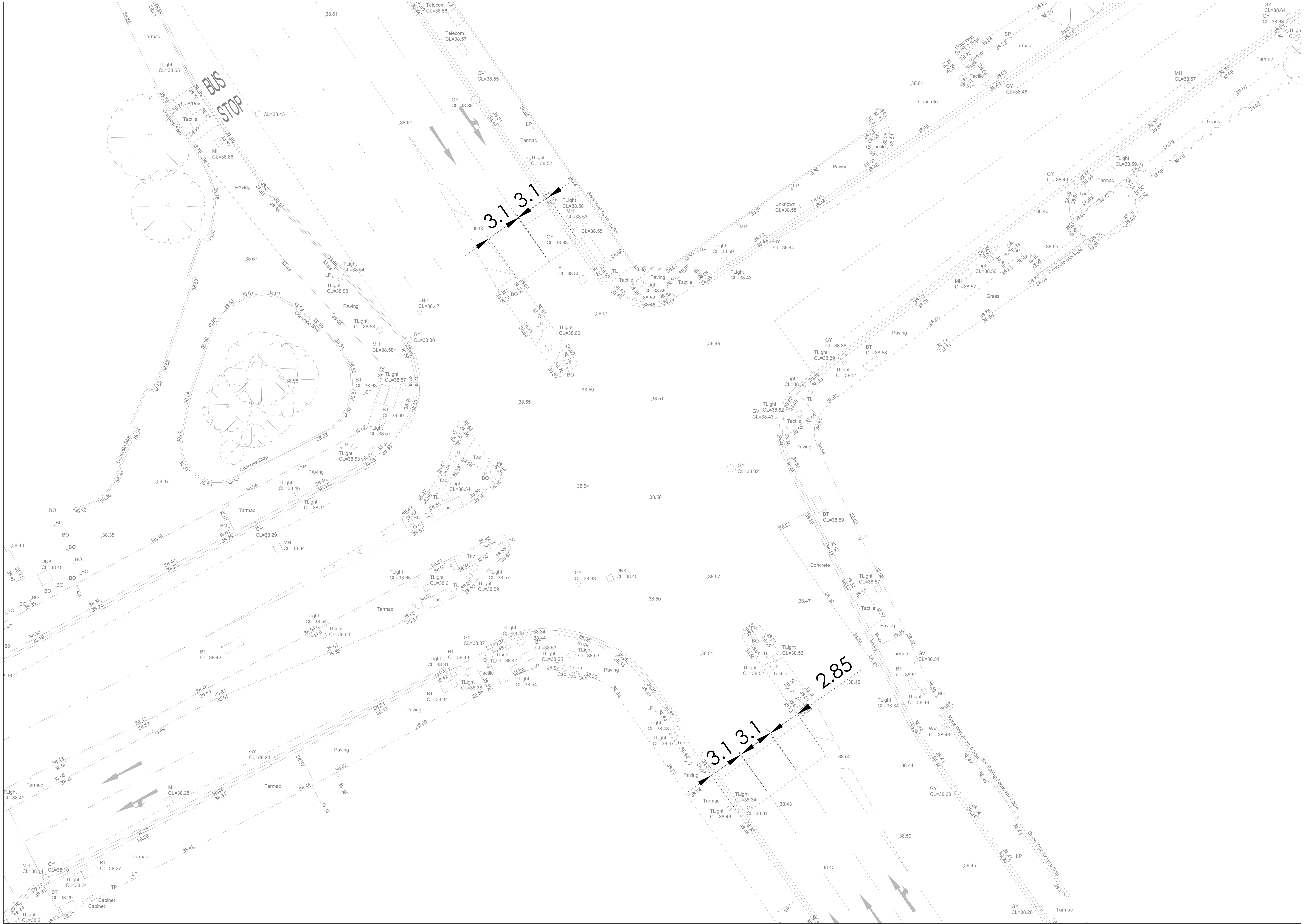
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					Wilde  Consulting Civil & Structural Engineers
					Brindley Lodge, Adcroft Street, Stockport, Cheshire, SK1 3HS. www.wildcivil.co.uk Tel: 0161-474-7479 Fax: 0161-474-7492

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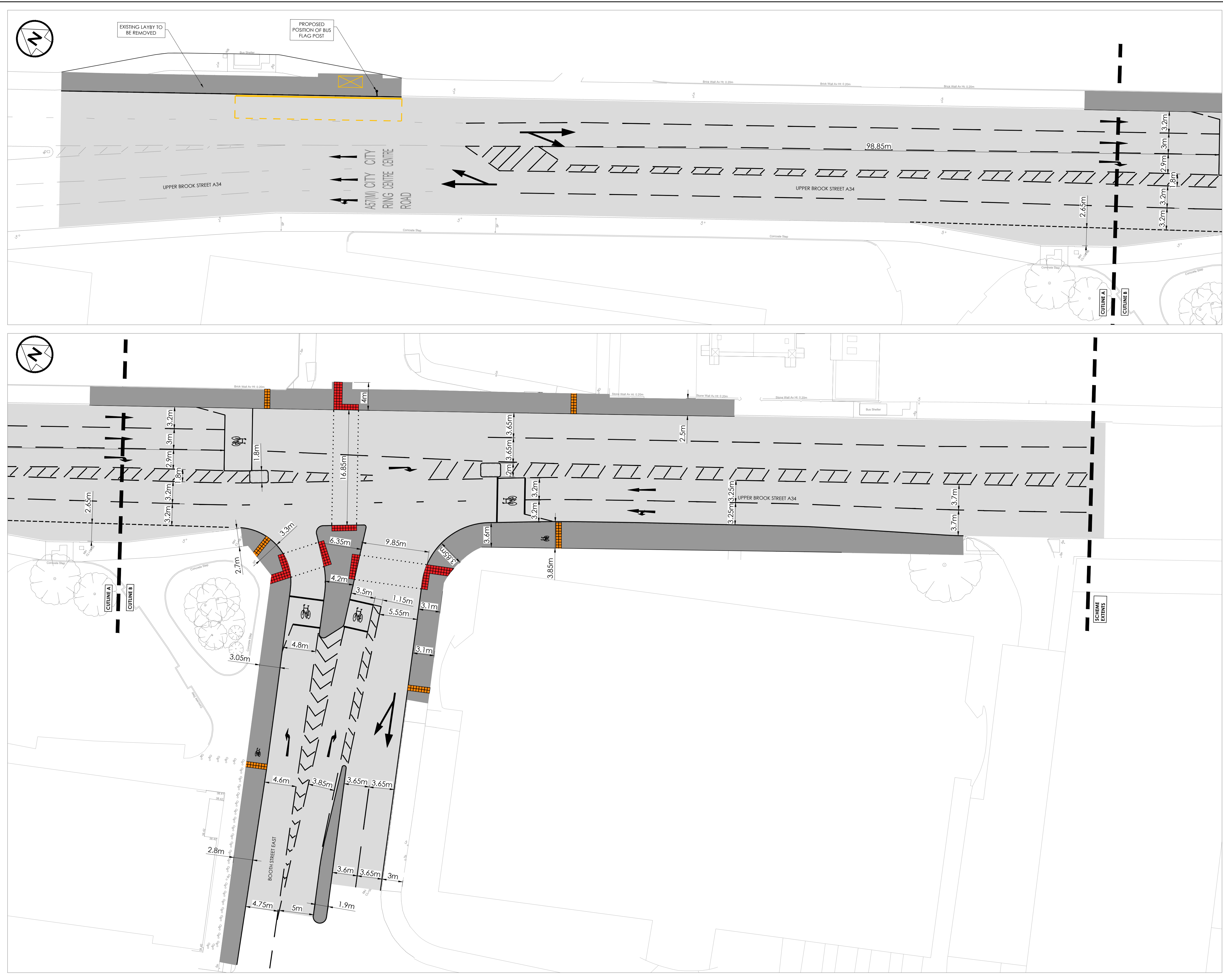
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UPPER BROOK STREET
MANCHESTER
M13 9XH

Title
SWEPT PATH ANALYSIS
UPPER BROOK STREET / BOOTH STREET
EAST JUNCTION

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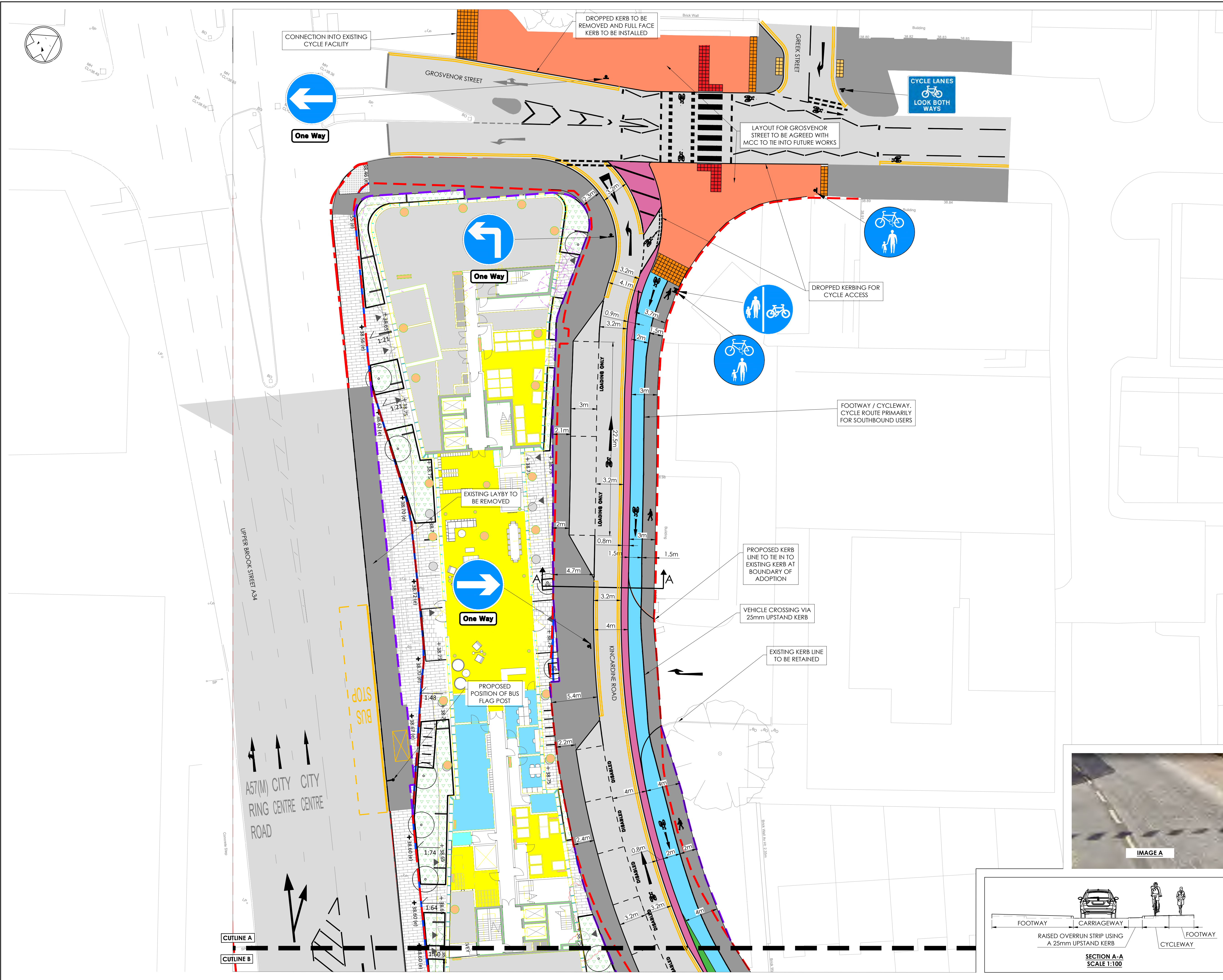




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- KEY – GENERAL**
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 - PROPOSED EDGINGS
 - CARRIAGEWAY
 - FOOTWAY
 - CONTROLLED TACTILE PAVING
 - HAZARD WARNING PAVING
 - EXISTING ROAD MARKINGS
 - PROPOSED ROAD MARKINGS
 - PROPOSED BUS SHELTER
 - PROPOSED BUS STOP FLAG

REV	DC	ML	ML	21/11/23	AMENDED AS PER RSA1 COMMENTS
DRN	CHK	APP		DATE	DESCRIPTION
Wilde Consulting Civil & Structural Engineers					 Brindley Lodge, Adcroft Street, Stockport, Cheshire, SK1 3HS. www.wildecivil.co.uk Tel: 0161-474-7479 Fax: 0161-474-7492
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Project					
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Title					
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 - CARRIAGEWAY
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 - FOOTWAY
 - SHARED USE FACILITY
 - CYCLE TRACK
 - 0.5m BUFFER ZONE BETWEEN CYCLE TRACK AND CAR PARKING BAY
 - RAISED PLATEAU
 - CONTROLLED TACTILE PAVING
 - UNCONTROLLED TACTILE PAVING
 - HAZARD WARNING PAVING
 - SUDS/PLANTING AREA
 - EXISTING ROAD MARKINGS
 - PROPOSED ROAD MARKINGS
 - TRAFFIC SIGN
 - CYCLE LANE LIGHT SEGREGATION - TRAFFIC WAND
 - BUS SHELTER

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P02	TP	DC	ML	31/10/23	AMENDED FOLLOWING REVIEW
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					 Consulting Civil & Structural Engineers
					 Brindley Lodge, Adcroft Street, Stockport, Cheshire, SK1 3HS. www.wildecivil.co.uk Tel: 0161-474-7479 Fax: 0161-474-7492

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Project
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MANCHESTER
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Title
GENERAL ARRANGEMENT (OPTION 3)
SHEET 1 OF 4

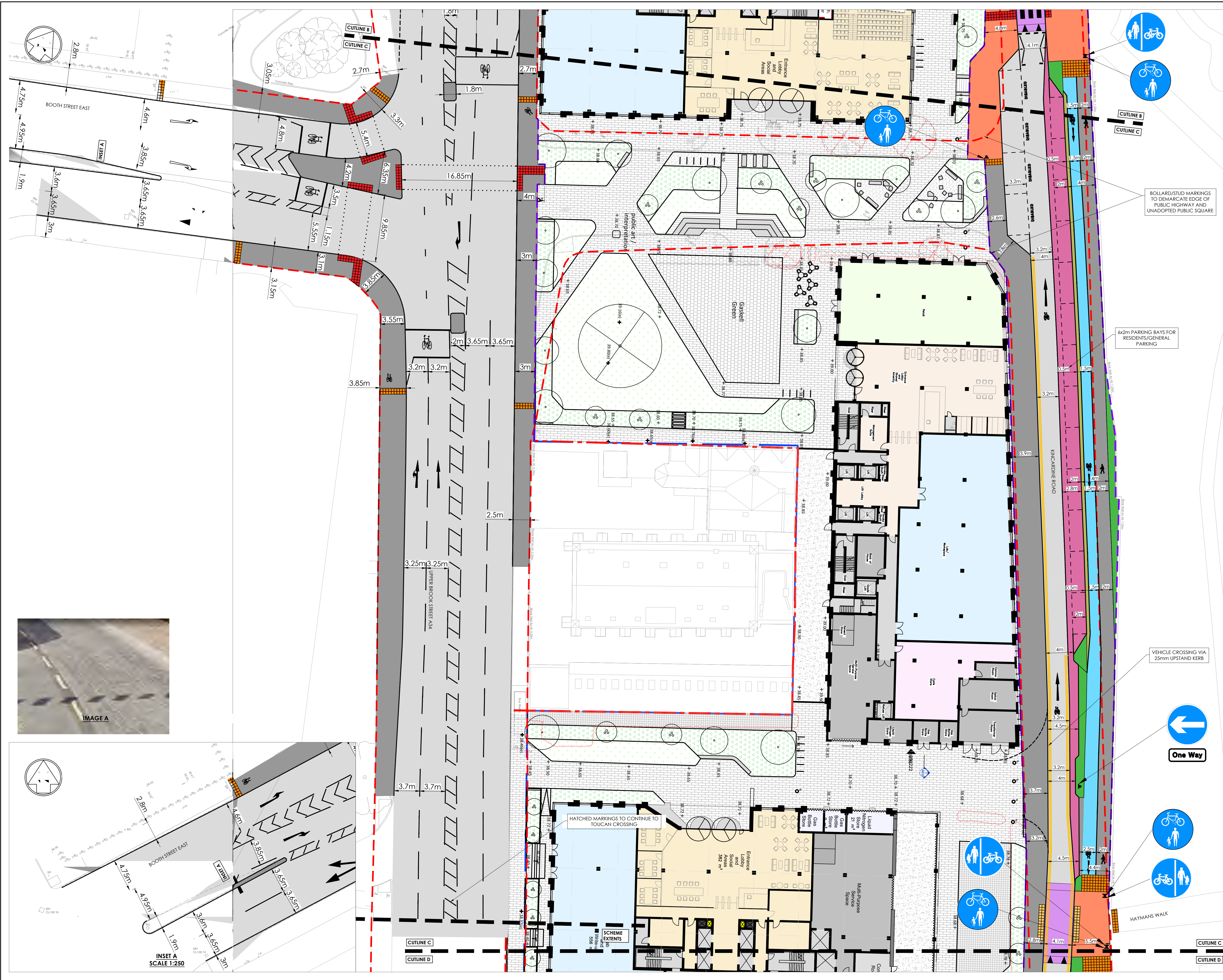
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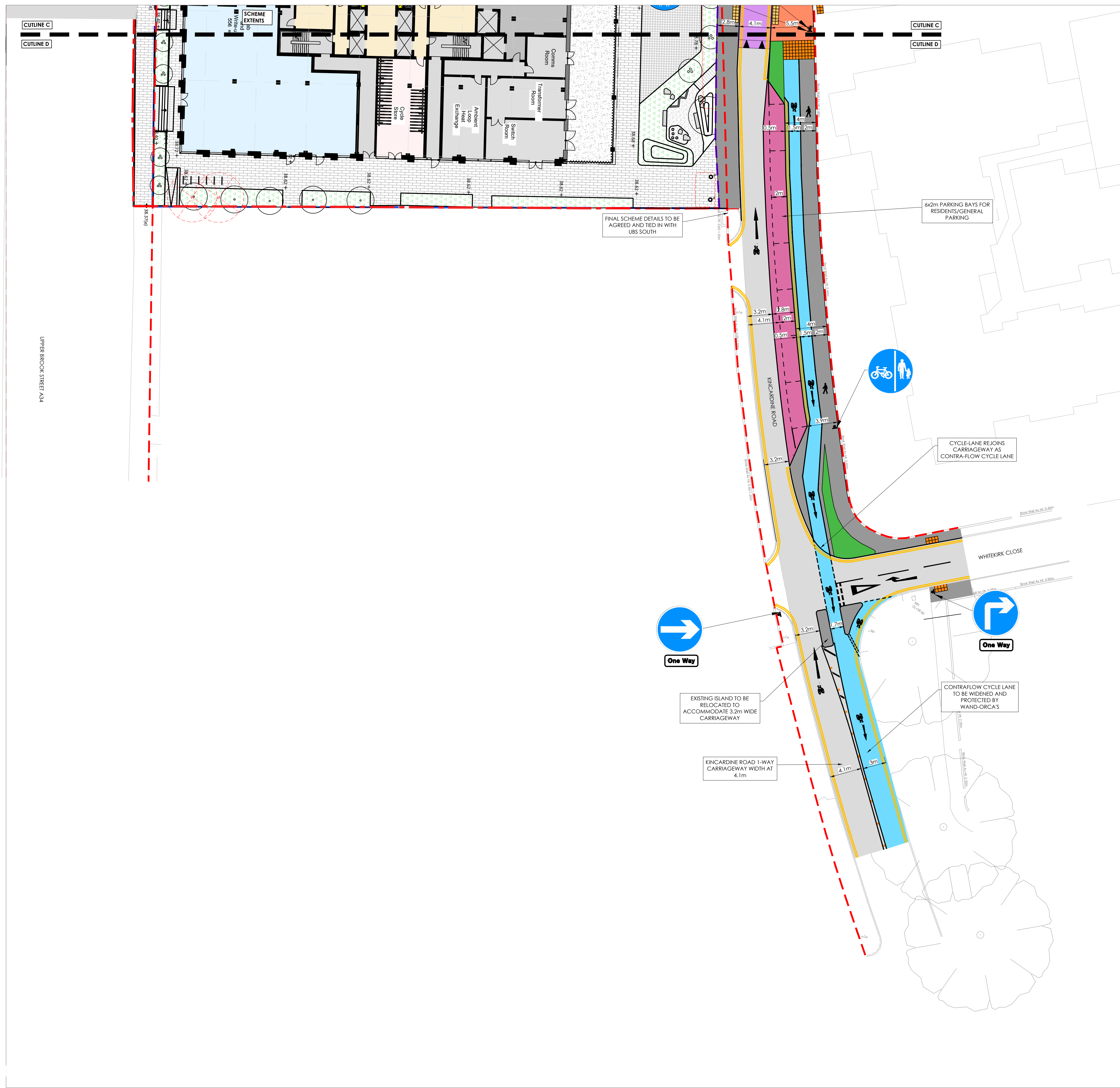
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- 1) ALL DIMENSIONS ARE STATED IN MILLIMETRES UNLESS NOTED OTHERWISE.
- 2) ALL LEVELS ARE STATED IN METRES
- 3) ALL DIMENSIONS, LEVELS AND CO-ORDINATES ARE BASED UPON TOPOGRAPHICAL SURVEY DRAWING (NO. 43891MCLS-01) BY SURVEY SOLUTIONS DATED AUGUST 2022.
- 4) DO NOT SCALE. PLEASE REFER ANY QUERIES TO THE PROJECT MANAGER / SUPERVISOR.
- 5) THIS DRAWING IS TO BE READ IN COLOUR

- EXISTING HIGHWAY BOUNDARY
- NEW HIGHWAY BOUNDARY
- CARRIAGEWAY
- RAISED OVERRUN STRIP
- FOOTWAY
- SHARED USE FACILITY
- CYCLE TRACK
- 0.5m BUFFER ZONE BETWEEN CYCLE TRACK AND CAR PARKING BAY
- RAISED PLATEAU
- CONTROLLED TACTILE PAVING
- UNCONTROLLED TACTILE PAVING
- HAZARD WARNING PAVING
- SUDS/PLANTING AREA
- EXISTING ROAD MARKINGS
- PROPOSED ROAD MARKINGS
- TRAFFIC SIGN
- CYCLE LANE LIGHT SEGREGATION - TRAFFIC WAND
- BUS SHELTER

Wilde
Consulting Civil & Structural Engineers

 **ISO 9001**
Registered

Brindley Lodge,
Adcroft Street,
Stockport, Cheshire
SK1 3HS.

www.wildcivil.co.uk
Tel : 0161-474-7479
Fax : 0161-474-7492

Project

UPPER BROOK STREET
MANCHESTER
M13 9XH

Scale 1/200	Drawn TP	Date 13/10/23	Chkd DC	Approved ML
Drawing No. 766-042-WCL-0012				Revision P03
Status FOR COMMENT				Sheet Size A1