AECOM

North Norfolk Local Plan Examination

Hearing Statement

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Quality information

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1. Introduction

1.1 This Hearing Statement has been prepared by AECOM Transport Planning team on behalf of ESCO Developments Ltd, Flagship Housing Partnerships Limited and Lovell (hereafter 'the Consortium') to inform representations made to the North Norfolk Local Plan. By way of background, the Consortium are promoting land North West of North Walsham (Site NW62/A) for a residential-led development of approximately 1,800 dwellings, 7ha of employment land and associated facilities and infrastructure.

1.2 This Statement provides the Consortium's response to Matter 1, Issue 1.1 (iii) (Duty to co-operate) and Matter 5 (Places and Housing Sites), Issue 5.6 (North Walsham) of the Inspectors' Matters Issues and Questions.

1.3 North Norfolk District Council (NNDC) are the planning Authority putting forward Site NW62/A under the proposed Local Plan. Norfolk County Council (NCC) are the highway authority responsible for transport matters in Norfolk, and Broadland District Council (BDC) are a neighbouring planning authority who are stakeholders consulted in relation to the proposed North Norfolk Local Plan.

2. Matter 1, Issue 1.1 – North Walsham

2.1 Question 1.1 (iii) - Duty to Co-operate: Specifically, prior to submission of the Plan, did the Council (NNDC) engage constructively, actively and on an on-going basis with Norfolk County Council and Broadland District Council regarding the transport effects of the proposed growth of North Walsham, and in particular the potential effect on the radial routes into Norwich? What is the evidence for this engagement and what were its results (as at the time of submission, because the duty to co-operate must have been met prior to submission and cannot be rectified afterwards).

2.1.1 Prior to AECOM's involvement, NCC, together with NNDC, commissioned a study to assess the impacts of the proposed Local Plan allocations in North Walsham to understand likely infrastructure needs. This study was:

- WSP 'North Walsham Link Road Feasibility Study', November 2020.

2.1.2 Further to feedback from BDC, a further study was commissioned by NCC and NNDC to assess likely impacts on Coltishall:

- WSP 'Addendum to Stage 1 Feasibility Report – North Walsham Link Road Feasibility Study', September 2021.

2.1.3 Further work was then commissioned to investigate the potential extension of the North Walsham Link Road between Cromer Road and Cornish Way (in the industrial estate):

- WSP 'North Walsham Link Road Stage 2 Feasibility Study', December 2021.

2.1.4 AECOM was engaged by the Consortium in May 2022 to develop the transport evidence undertaken to date to further understand the impacts of the proposed allocation. In Autumn 2022 a meeting was held with BDC to set out the scope of work underway. Specific feedback was received from BDC which informed the scope of the Transport Assessment, and associated modelling and traffic surveys.

2.1.5 Following detailed technical analysis over a period of time and once the initial findings were available, meetings were held with NCC, BDC, and NNDC to provide progress updates, and to seek feedback to be taken into account as the mitigation strategy and assessment work were completed. A series of meetings were held with BDC, their members, and the public to share information. These meetings were as follows:

- August 3rd, 2023, Meeting with BDC, NCC, NNDC to update on transport evidence progress and findings. Feedback was received in writing and considered in our work which was ongoing at that time.
- August 7th, 2023, Coltishall & Broadland Member Briefing to update on transport evidence progress and findings and to take on board feedback in finalising the assessment and mitigation identified.
- September 29th, 2023, Coltishall & Broadland Member Briefing regarding Transport Assessment Work.
- November 27th, 2023, Coltishall & Broadland Stakeholder Briefing regarding Transport Assessment Work.
- December 6th, 2023, Public exhibition to share Development Brief and Transport proposals.
- December 19th, 2023 - Coltishall & Broadland Stakeholder Briefing regarding Consultation feedback, Policy Wording changes and Statement of Common Ground.

2.1.6 As well as these meetings, local transport concerns were shared by BDC with AECOM which were taken into account in the Transport evidence. Furthermore, the Draft Transport Assessment and associated data were shared with BDC, and they distributed this to their key stakeholders.

2.1.7 This information is provided as evidence to inform NNDC's response to this question.

3. Matter 5, Issue 5.6 – North Walsham

3.1 Question 5.6.4(e) - Are the components of the proposal (number of dwellings, units of elderly care accommodation, amount of public open space etc) in the first sentence of the policy for the site justified?

3.1.1 The Consortium is working with NNDC, NCC, and BDC to prepare a revised policy wording that all parties agree to, and it is hoped that this will be reflected in Statements of Common Ground that will be submitted to the Inspector prior to the relevant Hearing Sessions taking place. However, in the interim, the Consortium's position is set out below.

3.1.2 The first sentence of the policy requires the site to provide approximately 1,800 dwellings, 7 hectares of employment land, green infrastructure, community facilities and <u>a road linking Norwich Road, Cromer Road and the industrial estate.</u>

3.1.3 Bidwells have prepared a separate Hearing Statement on behalf of the Consortium which addresses this question, and AECOM are responding here specifically in relation to the policy wording underlined above relating to the new road link.

3.1.4 The policy requirement to provide a road linking Norwich Road (B1150) in the south to Cromer Road (A149) in the north, referred to as the Western Link Road (WLR) is considered to be justified. The need for this has been established through evidence prepared by both NCC (WSP report 'North Walsham Link Road Feasibility Study', November 2020), and AECOM on behalf of the Consortium (AECOM Draft Transport Assessment, December 2023, provided in Appendix B).

3.1.5 The work undertaken by WSP on behalf of NCC and NNDC (North Walsham Link Road Feasibility Study, November 2020) considered the distributional impacts of the Link Road and those effects on key junctions in the town. The study further considered options for a southern extension east to the A149, a northern extension from Bradfield Road through the industrial area to the B1145 and the combination of both. Based on that technical work NCC as Highway Authority advised NNDC that the most likely scenario to address transport impacts was the scenario with a northern extension to the B1145. This work was acknowledged to be a high-level assessment and based on the most appropriate available data at the point in time, which utilised aged and limited local traffic count data for North Walsham, as the study was completed during the Covid pandemic.

3.1.6 In the WSP work, the estimated cost of a northern extension to the WLR is identified to be up to £19,839,420 if a new bridge over the railway was delivered. This cost excludes consideration of land or utility implications. The preferred alignment of this northern extension is included in WSP report, North Walsham Link Road Stage 2 Feasibility Study, December 2021, within drawings: 3598-WSP-ZZ-ZZ-DR-CV-0111 Rev P01, 3598-WSP-ZZ-ZZ-DR-CV-0112 Rev P02, 3598-WSP-ZZ-ZZ-DR-CV-0113 Rev P01, and 3598-WSP-ZZ-ZZ-DR-CV-0114 Rev P02. The alignment diverts from Bradfield Road through greenfield and connects to the existing Cornish Way, within the Lyngate / Folgate Road industrial estate.

3.1.7 The land required to deliver the northern extension to the WLR, between Bradfield Road and the industrial estate is not included within the allocation boundary for NW62/A. Cornish Way, onto which the proposed alignment connects, is also not adopted highway, or under the control of the Local Highway Authority. There is no current source of funding to support delivery of the northern extension. These facts and the evidence set out in the WSP North Walsham Link Road Stage 2 Feasibility Study highlights significant risks which are outside the control of the allocation land.

3.1.8 The obvious reasonable alternative is not to provide a link through to the industrial estate, which is the scenario that has been assessed in the evidence prepared by AECOM to inform the proposed allocation.

3.1.9 AECOM completed a comprehensive modelling exercise utilising extensive survey data gathered in 2022 in North Walsham. A WebTAG compliant VISSIM model of North Walsham was developed and validated to 2022 traffic conditions for both the AM (08:00-09:00) and PM (16:30-17:30) peak hours. This work was undertaken through consultation with NCC. This model covered the majority of North Walsham town and all local roads within the model extents. The VISSIM model was used as the foundation for a comprehensive 'Draft Transport Assessment', provided as Appendix B to this Hearing Statement. The model tested the highway impacts of the proposed allocation NW62/A, including a new link road between

Norwich Road (B1150) and Cromer Road (A149), referred to as the Western Link Road (WLR). No provision of a new road link between Cromer Road and the industrial estate was included in the modelling work because the land required to deliver an extension north to the Lyngate / Folgate Road industrial estate is not within the control of the Consortium promoting the allocation.

3.1.10 The Draft Transport Assessment illustrates that with the WLR provided between Norwich Road (B1150) and Cromer Road (A149), and without the extension north to the industrial estate, the impacts of the proposed development can be mitigated. Specifically, paragraph 9.13 of AECOM's Draft Transport Assessment states that with the proposed development built and the WLR in place, the average network delay in the most critical peak period, the PM peak, (16:30-17:30) is brought below future forecast levels without the proposed development in place. Residual queueing is predicted at the A149 / B1150 signalised junction but is not considered to be severe, particularly when considered alongside the comprehensive package of sustainable transport improvements identified to promote pedestrian and cycle safety and movements and the conservative traffic forecasting assumptions adopted for the purposes of the assessment.

3.1.11 Without the northern extension the WLR will allow existing HGV traffic to be removed from unsuitable narrow streets such as Station Road or Millfield Road and will provide more direct access between the B1150 and A149 designated HGV routes, where bridge heights under the railway vary, and routing options to the bridges connecting east and west North Walsham are required. Volumes of local traffic forecast to re-route along the WLR, and the volume of rerouted HGVs during peak hours are set out in Table 3.1.

Table 3.1 -2036 peak hour traffic rerouting along WLR

	AM Peak		PM Peak	
WLR Section	Two-Way Vehicular Trips	HGV Volume	Two-Way vehicular Trips	HGV Volume
Between B1150 (Norwich Road) and B1145 (Aylsham Road)	70	7	129	4
Between B1145 (Aylsham Road) and A149 (Cromer Road)	325	22	367	6

Source: AECOM 2036 VISSIM Forecasting Models for North Walsham, Dec 2023

3.1.12 In the '2036 Do Something with Mitigation' Scenarios, traffic volumes are forecast to reduce on many of the local roads from future predicted baseline (2036 Do Minimum Scenario) levels, through the closure of through routes and the provision of the WLR, despite the provision of the new development.

Table 3.2 Forecast change in vehicle numbers in 2036: With Development-Without Development

AM Peak		PM Peak	
Road	Two-Way Vehicles	Road	Two-Way Vehicles
Greens Road	-289	Greens Road	-300
Station Road	-59	Station Road	-65
Millfield Road	4	Millfield Road	-21
Tungate Road	-22	Tungate Road	-13
A149 North Walsham Relief Rd	-14	A149 North Walsham Relief Rd	18
Skeyton Road	-112	Skeyton Road	25

Source: AECOM 2036 VISSIM Forecasting Models for North Walsham, Dec 2023

3.1.13 This data confirms the benefits the proposed WLR will bring, without a northern extension, in addition to mitigating the impacts of the proposed development.

3.1.14 Following review of the AECOM Draft Transport Assessment dated Dec 2023 for the NW62/A allocation land, NCC state in their position statement (provided in Appendix A to this hearing statement) the following:

A link road from the B1150 to the A149 Cromer Road is required to manage the transport impacts of the proposed allocation. The evidence in the TA does not promote the need for a northern extension to the B1145. The evidence does not support the current policy requirement (point 11) for the delivery of a link over the railway for access to the Lyngate/Folgate Rd industrial estate. However, the allocation should be brought forward in such a way that does not preclude delivery of an extension of the Link Road to Folgate Road at some point in the future should it be required.

3.1.15 The following extract from the Draft Development Brief [EX010] prepared on behalf of the Consortium for the proposed allocation states on page 66: *'The existing section of Bradfield Road between Cromer Road and the edge of the allocation boundary will be upgraded to provide suitable access for the site and the development area will be designed to accommodate a future northern extension to the North Walsham Industrial Area in line with the allocation aspiration.'*

3.1.16 This position is reflected in the Draft Development Brief [EX010] plans and this approach ensures that future provision of a northern link will not be precluded, should it become either necessary or desirable.

3.1.17 The requirement for the Link Road to continue to the industrial estate is not justified to mitigate the impacts of the proposed development. We suggest the following change to the first sentence of Policy NW62/A:

Land to the west of North Walsham to provide a mixed-use sustainable urban extension amounting to 108 hectares, as defined on the Policies Map, is allocated for approximately 1,800 dwellings, 7 hectares of employment land, green infrastructure, community facilities and a road linking Norwich Road~~,~~ and Cromer Road. ~~and the industrial estate.~~

3.1.18 Note that the text is blue is text to be added, text in red is text to be omitted.

3.2 Question 5.6.6 - What is the vision for the western link road? Would it function as a town by-pass taking heavy goods vehicles away from the town centre? Given expected traffic flows, would suitable environment and connectivity between the housing on each side and the town centre be achieved? Would it include a northern extension over the railway to connect to Cornish Way, or a southern extension to the A149 south. Are these essential to the effectiveness of the road, and if so, would they be a requirement of developing the allocation? If not, how might they be funded?

3.2.1 For clarity we have responded to each part of this question separately.

What is the vision for the western link road?

3.2.2 The primary function of the western link road (WLR) is to provide access to the housing and other complementary land uses that will be delivered on the site. It is intended to be an attractive street, with frontage development on both sides and a safe and attractive route for active travel users with segregated pedestrian and cycle facilities and crossing points along its length.

3.2.3 Within the Masterplanning work undertaken as part of the Draft Development Brief [EX010] the horizontal alignment has been designed to avoid straight sections, to support lower vehicle speeds. A 30mph design speed has been adopted along the length of the route, except for by the school frontage near the local centre where a 20mph design speed is proposed. At junctions along the Link Road and where Public Rights of Ways (PRoW) intersect, pedestrians and cyclists will be afforded priority where possible.

3.2.4 The road has been designed to sufficient scale to fulfil the secondary function as a “B classification” highway, distributing local traffic, providing greater network resilience through an alternative route for traffic around North Walsham. It will also deliver a more appropriate route for HGV traffic, which currently uses narrow residential areas such as Station Road and Millfield Road, to access the HGV routes into North Walsham along Cromer Road, Aylsham Road, and Norwich Road. The road has also been designed to accommodate buses along its length to facilitate public transport accessibility and to offer travel choice.

3.2.5 The Draft Development Brief [EX010] provides the typical cross sections to be expected and the Draft Transport Assessment includes greater detail regarding design parameters, both of which support the overall design ethos.

Would it function as a town by-pass taking heavy goods vehicles away from the town centre?

3.2.6 The purpose is not to function as a town bypass, but it will deliver significant benefits in terms of providing network resilience and providing alternative routes for some HGV traffic.

3.2.7 In Appendix C of the Draft Transport Assessment (Appendix B), traffic flow diagrams set out that the WLR is forecast to carry 706 and 761 peak hours two-way trips, which includes local traffic from existing routes. Between 0.07% and 2.0% of this traffic is predicted to comprise HGVs. This is a relatively low volume of traffic compared to the B1150 (carrying 1,168 - 1,234 peak hour trips, up to 2.5% HGVs) or the A149 Cromer Road (carrying 1,150 – 1,235 peak hour trips, up to 3% HGVs).

3.2.8 The WLR will allow HGV traffic to be removed from unsuitable narrow streets such as Station Road or Millfield Road and will provide more direct access between the B1150 and A149 designated HGV routes, where bridge heights under the railway vary. Volumes of local traffic forecast to re-route along the WLR, and the volume of rerouted HGVs during peak hours are set out in Table 3.1. Furthermore, forecast reduction in total traffic volumes on local roads with the WLR and development in place are set out in Table 3.2. This data confirms the benefits the proposed WLR will bring to the existing highway network in North Walsham, easing congestion, removing HGVs from unsuitable residential streets, helping facilitate efficient routing for public transport services, in addition to mitigating the impacts of the proposed development.

Given expected traffic flows, would suitable environment and connectivity between the housing on each side and the town centre be achieved?

3.2.9 As highlighted in para 3.2.7 of this Statement, traffic volumes are expected to be relatively modest. Along the length of the new road there will be crossing points at key focal points such as the junctions with Aylsham Road, Skeyton Road, at the local centre and school. Where PRoW intersect there will be clear safe pedestrian and cycle crossing points provided. With suitable pedestrian and cycle facilities, and low design speed, this volume of traffic will not represent a significant barrier between the parts of the development on either side.

3.2.10 Typical cross sections provided within the Draft Development Brief [EX010], demonstrate how whilst the Link Road will provide a relatively wide highway corridor, this will be softened with landscaping, and swales, including the provision of street trees, to ensure that a suitable environment is created, and that the road does not form a barrier to pedestrian movement.

3.2.11 The low design speeds of 30mph, reduced to 20mph in the vicinity of the school and local centre, delivered through the horizontal curvature of the road, the active frontage, and the junctions along it, will reduce the "barrier" presented by the traffic. NCC has accepted the design ethos for the proposed Link Road (ref. NCC Position Statement, Appendix A):

In principle the proposed cross section meets the need to create an attractive street that promotes walking and cycling and is of sufficient scale to fulfil a distribution function.

3.2.12 The presence of segregated pedestrian and cycle facilities along the Link Road, and multiple priority crossing points along the route will ensure the environment is permeable and attractive to pedestrians and cyclists. This is reflected in the Draft Development Brief [EX010] cross sections and the design ethos set out in the Draft Transport Assessment [Appendix A]. The Development Brief demonstrates how six crossing points, which will comprise a mixture of crossings, can be located along the WLR. The crossing facilities would be expected to include:

- Signalised crossings on all arms of the Aylsham Road / WLR junction;
- Tiger crossing at Weavers Way;
- Tiger crossing at Skeyton Road;
- Zebra or uncontrolled crossings between the Local Centre and school; and,
- A crossing where the PROW meets the link road.

3.2.13 The final detail will be agreed as part of a planning application in the future.

Would it include a northern extension over the railway to connect to Cornish Way, or a southern extension to the A149 south. Are these essential to the effectiveness of the road, and if so, would they be a requirement of developing the allocation? If not, how might they be funded?

3.2.14 The new Link Road will route between the B1150 Norwich Road in the south, and the A149 Cromer Road in the north. For reasons detailed above it will not extend south to the A149, nor will it connect to Cornish Way to the north, as it has been demonstrated in the Draft Transport Assessment that these connections are not required to mitigate the impacts of the proposed development. Consequently, these extensions are not a requirement of the allocation, and alternative sources of funding have not been considered by the Consortium, as they are not required. However, the new road will be designed to ensure that it does not prejudice the ability to deliver northern and southern extensions in the future. It is suggested that the Supporting Text to policy NW62/A should be amended to reflect this.

3.2.15 It is important to note that given the residential nature of the allocation land plots north of the Bradfield Road railway bridge, and the relatively low numbers of units to be provided there, whilst specific access improvements and enhancements to Bradfield Road along the frontage of the two plots will be required, no significant works to the Bradfield Road railway bridge will be needed to provide access.

3.3 Question 5.6.7 - What would be the impact of traffic generation on the wider area, for example through the village of Coltishall, what improvements or traffic management might be required if needed to mitigate the effects of the scheme, are these costed and deliverable and has any effect on viability been taken into account?

3.3.1 The Consortium is working with NNDC, NCC and BDC to prepare a revised policy wording that all parties agree to, and it is hoped that this will be reflected in Statements of Common Ground that will be submitted to the Inspector prior to the relevant Hearing Sessions taking place. However, in the interim, the Consortium's position is set out below.

3.3.2 The scope of the Draft Transport Assessment was developed in collaboration with NCC, with input from BDC and NNDC.

3.3.3 NCC confirm this in their position statement (ref. Appendix A):

The Promoters consultant, AECOM, has sought the views of the Highway Authority in developing their TA which has provided the County Council the opportunity to shape the scope of the assessment.

3.3.4 The scope focussed on assessing the suitability of the access proposals in the first instance, and then impact of the proposed allocation on the local road network in North Walsham. The VISSIM model developed covered the majority of the highway network in North Walsham, and this was deemed necessary to understand impacts of re-routing effects particularly the context of North Walsham, given the scale of the development proposals.

3.3.5 The distribution of the development trips was then calculated using Census data. As the distance from the development area increases, impacts are diluted and dissipate across the road network of A and B roads designed to cater for changes in demand. The vehicular trip distribution of the development trips is set out in Table 49 of the Draft Transport Assessment and is as follows:

- Internal to North Walsham 24%
- B1145 Aylsham Road 8%
- A149 Cromer Road 14%
- B1145 Lyngate Road 2%
- Skeyton Road 0%
- B1150 Norwich Road 37%
- A149 Yarmouth Road 12%
- Happisburgh Road 2%

3.3.6 Due to network vulnerabilities in Coltishall highlighted by BDC and NCC, and the findings of our trip distribution estimating that 37% of the trips from the proposed development would use the B1150, further examination of impacts in Coltishall and Horstead was deemed to be appropriate.

3.3.7 A VISSIM model of Coltishall and Horstead was developed, informed by extensive survey data gathered in 2022. The Draft Transport Assessment scope was also expanded to include these areas in terms of highway safety.

3.3.8 The Draft Transport Assessment, including the VISSIM network modelling, identified a series of measures to be delivered in North Walsham and Coltishall to mitigate the proposed development and create a balanced transport strategy. These are set out in Chapter 10 of the Draft Transport Assessment and the measures identified for Coltishall and Horstead include:

- Sustainable transport measures in North Walsham promoting active modes to access local jobs, services and the public transport network reducing potential for car trips on the B1150;
- A Public Transport Strategy to integrate the development area with the existing high quality public transport services, and to encourage public transport usage, particularly for the dominant commuter route to Norwich;
- Investigation and delivery of pedestrian safety improvements at three locations across Coltishall and Horstead, specifically Ling Road, High Street and at the Recruiting Seargeant;

- Provision of a bus stop at the War Memorial, High Street, Coltishall, to support safe bus access and prevent obstructive parking;
- Provision of a right turn lane at the junction of B1150 / B1354 in Coltishall;
- Speed reduction measures on entry to Horstead from the south;
- Provision of “Keep Clear” markings on the B1150 across access to Frettenham Road in Horstead; and
- Investigate the potential for and need for delivery of highway capacity requirements at the B1150 / Rectory Road junction, Horstead at planning stage.

3.3.9 Where deemed necessary to illustrate deliverability, designs have been developed, informed by topographical surveys and highway boundary information. These designs have been subject to a Road Safety Audit with the Designers Responses accepted.

3.3.10 The NCC position statement (ref. Appendix A) makes the following points which are relevant to this question:

As the work is to support allocation of a site in the emerging North Norfolk Local Plan it is not expected that the work identifies in detail all the mitigation measures required but provides sufficient information to enable a view to be drawn on the soundness of the allocation.

Impacts in Coltishall have been considered in detail and the impacts of growth of 2000 homes in North Walsham has been modelled. The draft TA has recognised that there will be impacts on the B1150 and mitigation of these is required. Two specific interventions have been identified, the provision of a right turn lane from the B1150 to the B1354 just north of the bridge and formalised marking out of a bus stop on the B1150 adjacent to the war memorial in the Norwich bound direction.

The evidence shows that appropriate schemes can be delivered to mitigate the impacts of the allocation on the B1150 through Coltishall. To test deliverability these measures have been looked at in detail and proposed solutions have been subject to safety audit.

Because of the importance of the need to bring forward improvement in Coltishall to cater for additional traffic, the highway authority would want to see policy NW62/A amended to specifically require the identified highway mitigation. Furthermore, it is recognised that as a result of the increased traffic through the village improvements need to be made for pedestrians including delivery of a crossing point. At this time there is no specific scheme promoted but given that this is an allocation it is not considered that a scheme needs to be tabled at this time as it is reasonable to conclude that a suitable scheme can be delivered. To ensure that this issue is properly tackled, and a scheme brought forward as part of any planning application, the allocation policy needs to include a specific requirement to provide pedestrian enhancements and a crossing facility of the B1150 in the centre of the village of Coltishall.

The Highway Authority wishes to continue to work with North Norfolk District Council, the site promoter, and Broadland District Council to secure the highway requirements in policy NW62/A and prepare a statement of common ground for presentation at the forthcoming examination in public of the North Norfolk Local Plan.

3.3.11 In response to feedback from NCC regarding the Draft Transport Assessment, AECOM has prepared a document outlining the intended phasing for the transport mitigation measures, (ref. ‘AECOM North Walsham WUE – Indicative Transport Phasing Strategy’, Dec 2023, provided in Appendix C) which sets out the order logic and intended delivery strategy for the transport measures which support the proposed allocation. This has informed the Viability Assessment and been shared with NCC. NCC has confirmed that this reflects their concerns. More precise details of the phasing will be developed at planning stage and will be informed by to further analysis.

3.3.12 A Viability Appraisal has been completed by Savills which reflects the mitigation strategy identified, and the proposed phasing of the transport mitigation measures. This has illustrated that the delivery of the WLR does not have a negative impact on viability.

3.3.13 We suggest the following change to the replacement text under 'Sustainable Transport' of Policy NW62/A which has been derived through discussions with NNDC, NCC and BDC:

Sustainable Transport

8. A Transport Assessment, the scope of which is to be agreed with the Local Highway Authority, will be undertaken to identify appropriate off-site highway mitigation measures. These should include, but are not limited to:

- *Traffic management measures and capacity improvements on the B1150 at Coltishall and Horstead;*
- *Pedestrian safety improvements at Coltishall and Horstead to be agreed with the Highway Authority, which may include works at Ling Way, High Street, and the B1150/ Mill Road/ B1354 junction.*
- *Improvements to the signalised junction at Norwich Road, North Walsham;*
- *Measures to discourage the use of Aylsham Road and Skeyton Road, North Walsham by motor vehicles.*

9. The agreed off-site highway mitigation measures will be delivered in accordance with a Phasing and Delivery Plan that will be agreed as part of the first planning application for the site. Any mitigation measures required at Coltishall and Horstead will be delivered at the earliest possible opportunity to mitigate construction impacts.

10. Delivery of a new road designed as an attractive main street through the development with mixed-use frontage usages and segregated cycle paths and footways. This new road should be suitable for HGV traffic (including high sided vehicles) and will connect Norwich Road to Cromer Road. It should be delivered at the earliest opportunity, in accordance with a Phasing and Delivery Plan agreed as part of the first Planning Application;

11. Prior to any development to the north of the railway line, assessment of the impacts of this development on the railway bridge, will be required, and any mitigation measures identified and delivered as appropriate;

12. Provision of a network of interconnected streets, squares, green corridors, and public spaces which prioritise moving around on foot and by cycle over the use of private motor vehicles;

13. Delivery of appropriate public transport measures providing facilities and regular services to/from the town and key services;

14. Provision of off-site pedestrian and cycle route improvements to the town centre, key services, and railway station;

3.4 Question 5.6.9 - How would the development of the site be phased, and would the traffic effects within the town be acceptable during each phase? How does the cost of the western link road affect the viability and deliverability of development?

3.4.1 In answer to the first part of this question, based on the current anticipated phasing strategy for the proposed allocation prepared by the Consortium of promoters, AECOM has developed an indicative phasing strategy for the transport mitigation measures in response to feedback from NCC regarding the Draft Transport Assessment. AECOM report 'North Walsham WUE – Indicative Transport Phasing Strategy', Dec 2023, provided in Appendix C, sets out the order, logic and intended delivery strategy for the transport measures which support the proposed allocation. This has informed the Viability Appraisal (prepared by Savills Dec 2023) and has been shared with NCC. NCC has confirmed that this strategy reflects their concerns. More precise details of the phasing will be developed at planning stage and will be informed by further analysis.

3.4.2 Items that have been identified as important influences on any future phasing plan include:

- The need to avoid HGV and construction traffic using unsuitable routes such as Millfield Road;
- The requirement to deliver early mitigation in Coltishall to mitigate construction impacts;
- The need to prevent any increase in demand or traffic on Aylsham Road under the railway bridge in North Walsham due to the constrained 20 mph section with no footways;
- The need to deliver pedestrian cycle and public transport facilities to each parcel of development as it comes forward to support promotion of sustainable travel patterns from the outset;
- Potential need to support delivery of the A149/B1150 traffic signal scheme in advance of the Link Road; and
- Early delivery of the road linking B1150 Norwich Road to A149 Cromer Road to mitigate development impacts on the network in North Walsham, particularly on the local residential routes along Station Road, Millfield Road, and Aylsham Road.

3.4.3 At this stage, each individual phase has not been assessed separately as this was thought to be excessive given where we are in the planning process. However, early forecasting looked at a scenario with 350 homes delivered by 2029 split across the Norwich Road (B1150) frontage and the Cromer Road (A149) frontage, without the full Link Road in place. This identified that without the A149 / B1150 traffic signal capacity improvements, which are committed as part of other developments, the network will reach average delays similar to the 2036 without the development scenario. The key issue will be how the Link Road is phased, and the priority should be on delivering the connection from B1150 to Aylsham Road in the first instance, as reflected in the draft policy, to prevent development and construction traffic using Millfield Road and Station Road. It has also been recommended that in the earlier phases, before the full Link Road is available, a haul route through the site should be delivered to accommodate construction traffic and ensure that early phases of the development do not adversely impact the town centre. As set out above, the precise phasing of the development will be agreed at planning application stage.

3.4.4 In NCCs position statement (ref. Appendix A) they make specific reference to phasing of the identified off-site measures. These points have been reflected in the Indicative Transport Phasing Strategy and within the Viability appraisal.

3.4.5 The Viability appraisal prepared by Savills confirms that the delivery of a Link Road between the B1150 Norwich Road and the A149 Cromer Road will not have a negative impact on development viability.

Appendix A – NCC Statement of Position

Richard Doleman NW TA Position Statement
Richard Doleman B1150 Coltishall Position Statement

Carey, Bevin

From:	Richard Doleman [redacted]>
Sent:	13 December 2023 09:26
To:	Mark Ashwell
Cc:	David Cumming; David Wilson - ETD; Liz Poole; Carey, Bevin; Sarah Hornbrook; Kevin Allen; Timothy Young
Subject:	B1150 Coltishall

Mark

Further to our discussions regarding the proposed allocation in North Walsham as set out in policy NW62/A, below is a position statement from the Highway Authority on the current status of the B1150 through Coltishall.

The B1150 is Main Distributor Route in the Norfolk Route hierarchy connecting Norwich to the market town of North Walsham, Main Distributors form important cross county links for all traffic types. The B1150 also provides a strategic link from Local Access Routes that serve surrounding parishes. The traffic survey on the B1150 at High Street, Coltishall taken for the Transport Assessment indicated a 2-way average traffic flow of around 10,000 vehicles/day of which around 3% were Heavy Goods Vehicles. The traffic volume and HGV mix on the B1150 is in line with other B roads in Norfolk that serve similar strategic function. The B1150 is also an important seasonal corridor connecting the strategic road network to North Norfolk and the Broads National Park. It also offers an alternative route to long vehicles that need to avoid the humped back River Bure bridge on the A1151 at Wroxham.

Four personal injury accidents have been recorded over the 2.3km length of the B1150 passing through the parish of Coltishall in the last 3 years (1 fatal, 2 serious, 1 slight). Two occurred within the built-up village and two (including the fatality) on the 60mph section of the B1150 to the northeast. The fatality involved a pedal cyclist colliding with the rear of a stopped vehicle. There are no ‘accident cluster sites’ within Coltishall and given the traffic flow on the B1150, accidents are not at a level where Norfolk County Council would look to intervene with a Local Safety Scheme.

Nine personal injury accidents have been recorded on the 3.5km section of the B1150 passing through Horstead with Stanninghall Parish (2 serious, 7 slight). Four slight accidents occurred in the built-up village. Two serious and 3 slight accidents occurred in the more rural 50 and 60mph sections south to Crostwick. Accidents are generally scattered with no accident ‘cluster sites’ warranting further investigation.

Norfolk County Council will continue to monitor the accident record at Coltishall and Horstead and will take further action as required.

Coltishall Parish Council have recently commissioned a pedestrian crossing assessment on the B1150 at High Street, Coltishall to investigate whether improvements to pedestrian crossing facilities are viable. The study is anticipated to be completed in early 2024. There is also local concern about the speed of traffic entering the village from the north on the B1150. Several speed management measures have been installed in the past, including village gateway signing and vehicle activated signs. A future development proposal is conditioned to provide a pedestrian refuge island and further speed management measures to calm traffic and aid pedestrian crossing movements.

Regards

Richard

Richard Doleman, Strategic Transport
Growth and Investment
[redacted]
County Hall, Martineau Lane, Norwich, NR1 2DH
Norfolk County Council

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Carey, Bevin

From: Richard Doleman [redacted]
Sent: 01 December 2023 15:40
To: Mark Ashwell
Cc: David Cumming; David Wilson - ETD; Liz Poole; Carey, Bevin; Sarah Hornbrook
Subject: North Walsham Draft TA and Policy NW62/A

Follow Up Flag: Follow up
Flag Status: Flagged

Dear Mark

Below is a position statement from the Highway Authority on the proposed allocation in North Walsham as set out in policy NW62/A. It is an officer view based on the technical evidence reviewed to date and cannot prejudice any formal decisions of the Highway Authority.

NCC as Highway Authority has considered the draft TA in the context of evidence to support the proposed allocation of 1800 homes and 7 ha of employment land in North Walsham as set out in policy NW62/A. This response also sets out where the draft allocation policy can be strengthened and clarified in respect of the highway and transport requirements.

The assessment has considered the impacts of the growth and associated link road on traffic patterns in North Walsham and considered the key mitigation required to be delivered alongside the allocation. The TA has also considered impacts on the wider network, identifying the impacts on the B1150 through Coltishall as requiring more detailed analysis and development of mitigation.

As the work is to support allocation of a site in the emerging North Norfolk Local Plan it is not expected that the work identifies in detail all the mitigation measures required but provides sufficient information to enable a view to be drawn on the soundness of the allocation.

The Promoters consultant, AECOM, has sought the views of the highway authority in developing their TA which has provided the County Council the opportunity to shape the scope of the assessment.

The draft TA does not address phasing, and further work will need to be done on this. In this response The Highway Authority's view on the principles for phasing of transport infrastructure are set out.

North Walsham Assessment

The Link Road

A high-level study commissioned jointly between NCC and NNDC looked at the traffic impacts of a link road associated with the proposed allocation. That work considered a link road from the B1150 Norwich Road passing through the proposed allocation to the southwest of North Walsham and ending at the A149, Cromer Road. The study considered the distributional impacts of the link road and those effects on key junctions in the town.   The study further considered options of a southern extension east to the A149, a northern extension through the employment area to the B1145 and the combination of both.

Based on that work NCC as Highway Authority advised that the most likely scenario to address transport impacts was the link road with a northern extension to the B1145.

The draft TA is a more up to date and in-depth consideration of the transport impacts of the proposed allocation and link road in North Walsham based on recent traffic counts and area wide traffic modelling . The key findings of the TA are.

A link road from the B1150 to the A149 Cromer Road is required to manage the transport impacts of the proposed allocation. The evidence in the TA does not support the need for a northern extension to the B1145. The evidence does not support the current policy requirement (point 11) for the delivery of a link over the railway for access to the Lyngate/Folgate Rd industrial estate. However, the allocation should be brought forward in such a way that does not preclude delivery of an extension of the Link Road to Folgate Road at some point in the future should it be required.

In principle the proposed cross section meets the need to create an attractive street that promotes walking and cycling and is of sufficient scale to fulfil a distribution function.

Alongside the link road the draft TA evidence shows that other network improvements are required in North Walsham.

Specific improvements identified are;

The B1150/A149 Norwich Road signalised junction
Improvements at the Aylsham Road railway bridge

Proposals have been developed for these and it has been shown that appropriate schemes can be delivered to mitigate the impacts of the allocation. These specific improvements should be explicitly referenced in the allocation policy as a requirement of the proposed allocation.

The B1150/A149 Norwich Road signalised junction

Other development in North Walsham has contributed towards an improvement at the junction. It is required that improvements are delivered alongside development of the allocation so the improvements should be a specific requirement set in policy. As the proposal provides vehicle capacity and active travel enhancements , the improvement should be delivered in the early stages of development prior to occupation.

Improvements at the Aylsham Road railway bridge

Given current network conditions and the issues the schemes are seeking to mitigate the highway authority would wish to see the Aylsham Road proposals phased to be delivered before Aylsham Road is connected to the wider network by the link road and before any significant traffic generating development on Aylsham Road is commenced.

The draft TA has considered walking, cycling and public transport.

Opportunities for improvements have been identified for the walking and cycling and public transport networks. It is expected that the exact nature or the improvements to be delivered will be determined though the subsequent planning application process. As opportunities exist and no fundamental obstacles to delivery of improvements have been identified, the Highway Authority considers that for this stage sufficient examination of the issues have been carried out. Points 8, 9 and 10 of the draft allocation policy are considered sufficient to require the necessary exploration at the planning application stage.

North Walsham is on one of the routes identified in Norfolk County Council's Bus Service Improvement Plan. The proposals will be expected to improve service provision in line with BSIP requirements and this will need to be conditioned at the application stage.

Coltishall Assessment

The early link road work was also used to gain an understanding of wider network effects of growth. Given the high-level nature of the link road work and its reliance on pre-covid and lockdown traffic data it was concluded that whilst it could identify areas of interest it could not provide any quantative data. This addendum to the original link road options work identified that further analysis was required of the B1150 through Coltishall.

The highway authority has required that the draft TA considers the impacts of the proposals on the B1150 through Coltishall, identified as the most significant impact on a sensitive part of the network.

Impacts in Coltishall have been considered in detail and the impacts of growth of 2000 homes in North Walsham has been modelled . The draft TA has recognised that there will be impacts on the B1150 and mitigation of these is required. Two specific interventions have been identified, the provision of a right turn lane from the B1150 to the B1354 just north of the bridge and formalised marking out of a bus stop on the B1150 adjacent to the war memorial in the Norwich bound direction.

The evidence shows that appropriate schemes can be delivered to mitigate the impacts of the allocation on the B1150 through Coltishall. To test deliverability these measures have been looked at in detail and proposed solutions have been subject to safety audit.

Because of the importance of the need to bring forward improvement in Coltishall to cater for additional traffic, the highway authority would want to see policy NW62/A amended to specifically require the identified highway mitigation. Furthermore, it is recognised that as a result of the increased traffic through the village improvements need to be made for pedestrians including delivery of a crossing point. At this time there is no specific scheme promoted but given that this is an allocation it is not considered that a scheme needs to be tabled at this time as it is reasonable to conclude that a suitable scheme can be delivered. To ensure that this issue is properly tackled, and a scheme brought forward as part of any planning application, the allocation policy needs to include a specific requirement to provide pedestrian enhancements and a crossing facility of the B1150 in the centre of the village of Coltishall.

Given the sensitive nature of this part of the network and to consider the impacts of construction traffic associated with the proposed allocation, the highway mitigation measures in Coltishall should be delivered prior to commencement of development on the allocation.

The highway authority wishes to continue to work with North Norfolk District Council, the site promoter, and Broadland District Council to secure the highway requirements in policy NW62/A and prepare a statement of common ground for presentation at the forthcoming examination in public of the North Norfolk Local Plan.

Regards

Richard

Richard Doleman, Strategic Transport
Growth and Investment
[redacted]
County Hall, Martineau Lane, Norwich, NR1 2DH

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Appendix B – AECOM DRAFT Transport Assessment

North Walsham Western Urban Extension

DRAFT Transport Assessment

ESCO Developments Limited, Lovell Partnerships Limited, Flagship Housing Group

Project number: 60685223

December 2023

Delivering a better world

Quality information

Prepared by	Checked by	Verified by	Approved by
T Jones Senior Consultant & B Stock Graduate Consultant	C Brooks Associate Director	B Carey Regional Director	C Brooks Associate Director

Revision History

Revision	Revision date	Details	Authorized	Name	Position
1	19/10/2023	Draft to NCC & Client for Comment	BC	Bevin Carey	Regional Director
2	10/11/2023	Draft to NNDC & BDC for Comment	BC	Bevin Carey	Regional Director
3	22/12/2023	Final for EiP submission	BC	Bevin Carey	Regional Director
4					

Distribution List

# Hard Copies	PDF Required	Association / Company Name

Prepared for:

ESCO Developments Limited, Lovell Partnerships Limited and Flagship Housing Group

Prepared by:

AECOM Limited
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St Crispins Road
Norwich, NR3 1YE

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Figures

Tables

1. Introduction

Introduction

1.1 AECOM has been appointed by ESCO Developments, Lovell Partnerships, and Flagship Housing Group hereby referred to as the 'Client Consortium' to provide transport planning advice to accompany a land allocation submission for the provision of a mixed-use development on land to the west of North Walsham, Norfolk for the North Norfolk District Council (NNDC) Local Plan 2016-2036.

1.2 The allocation, identified in the Regulation 19 version of the NNDC Local Plan 2016-2036 as 'Land West of North Walsham (NW62/A), is expected to deliver:

- Approximately 1,800 dwellings.
- 7ha of serviced employment land.
- Green infrastructure.
- Community facilities, including a new primary school.
- A road linking Norwich Road, Cromer Road, and the industrial estate.
- Other required infrastructure, improvements and mitigation including, but not limited to, health services, drainage, and power.

1.3 The allocation is located on the western side of North Walsham as shown in **Figure 1** and is approximately 1.1km to 1.6km from the town centre and 600m to 1.6km from the train station.

Figure 1 – Allocation Location

1.4 Generally, the allocation comprises of agricultural land with a small amount of former industrial land in the most northerly section where the railway line bisects the allocation land. As the allocation runs in a north-south direction, several roads bisect the allocation including A149 Cromer Road, Bradfield Road, B1145 Aylsham Road, and Skeyton Road whilst the B1150 Norwich Road forms the south-eastern boundary.

1.5 The allocation is bounded by residential developments to the east, whilst the north, south, and west is bounded predominantly by agricultural land. There are also a variety of leisure, commercial, and industrial uses scattered through and adjacent to the allocation.

Assessment of Allocation

1.6 Whilst the development proposals are not yet at planning application stage, a Transport Assessment (TA) has been prepared to inform the Regulation 19 submission of the NNDC Local Plan 2016-2036 of the impacts of the allocation in terms of transport on the sustainable transport and highway networks, and how those impacts can be addressed. This TA has been prepared in accordance with the Government's Planning Practice Guidance on the Planning Portal as well as extensive scoping discussions with Norfolk County Council (NCC), as highway authority.

1.7 The scope of the assessment and findings of the assessment have been developed in parallel with regular discussions with NCC as the highway authority. This has included consultation with the Public Rights of Way (PRoW) and Local Cycling and Walking Infrastructure Plan (LCWIP) teams to discuss the masterplan for the development and its impact on the existing and future sustainable transport network within North Walsham. A site visit and discussions have also been carried out with NCC's Road Safety Team to discuss potential improvements on the external sustainable and highway networks which have subsequently been audited by the team for compliance with Design Manual for Roads and Bridges (DMRB) Road Safety Audit (RSA) guidance.

1.8 In addition, two public consultation events, relating to a Development Brief for the proposed allocation site, as well as briefings with Council members at both NNDC and Broadland District Council (BDC) have been undertaken. The feedback from each of the events has been reviewed and taken into consideration as appropriate within the TA for this stage in the planning process.

1.9 This TA focuses on the existing transport situation for all modes, the allocation proposals, and the transport impact of the allocation. The aim of this report is to assess the allocation's impact on the surrounding sustainable transport and highway network and where necessary identify how those impacts can be mitigated.

1.10 Although the allocation is in North Walsham, it was made clear during scoping discussions that the impact of the allocation would also need to be assessed within Coltishall and Horstead which sit within the BDC area.

1.11 Previous modelling had been carried out by NCC in North Walsham using SATURN. However, this was not considered appropriate to be reutilised for this assessment as it did not provide the level of detail required, was not based on up-to-date traffic data, nor did it cover the full area to be assessed. It was therefore agreed that it would be most appropriate to assess impacts using a VISSIM microsimulation model for North Walsham and a separate model for Coltishall and Horstead. The VISSIM models would provide sufficient evidence at the level of detail required for the assessment on how the existing and future highway network would operate without and with the allocation in place. Further detail relating to this is provided in the TA.

Structure of Report

1.12 The remainder of this TA is structured as follows:

- **Chapter Two** provides a review of the national and local policies of relevance to the allocation.
- **Chapter Three** sets out the existing transport conditions, accessibility, and a review of the highway network for North Walsham, as well as a review of the highway network in Coltishall and Horstead.
- **Chapter Four** sets out the proposals for the allocation.
- **Chapter Five** sets out the sustainable transport strategy for the allocation which examines the existing conditions and identifies proposed improvements.
- **Chapter Six** sets out the access strategy for the allocation for both sustainable modes and vehicular access.
- **Chapter Seven** sets out the multi modal trip generation for the allocation, and the vehicular trip distribution.
- **Chapter Eight** sets out the highway network scope and allocation impact on the highway network.
- **Chapter Nine** sets out the highway network assessment.

- **Chapter Ten** sets out a summary of the mitigation proposals.
- **Chapter Eleven** sets out construction traffic management requirements.
- **Chapter Twelve** provides a summary and conclusion for the report.

2. Policy

Introduction

2.1 This section reviews the relevant policy and guidance for this TA, in the context of the allocation.

National Policy

National Planning Policy Framework (2023)

2.2 The National Planning Policy Framework (NPPF) sets out the Government's planning policies for England and how these should be applied. It provides a framework within which locally prepared plans for housing and other development can be produced.

2.3 At the heart of the framework is a presumption in favour of sustainable development. This means that plans need to seek opportunities to meet the development needs of their area and be sufficiently flexible to adapt to rapid change. Sustainable development must contribute to the economic, social, and environmental aspects of a community.

2.4 The use of sustainable transport modes for the movement of goods and people is widely encouraged. Sustainable transport modes are defined in the NPPF as 'Any efficient, safe and accessible means of transport with overall low impact on the environment, including walking and cycling, ultra-low and zero-emission vehicles, car sharing and public transport'.

2.5 Section 9 of the NPPF entitled 'Promoting Sustainable Transport' outlines the transport considerations for plan-making and development proposals. Paragraphs of relevance include:

- Paragraph 104 - outlines how transport issues should be considered in plan-making.
- Paragraphs 105-109 - outline how planning policy should encourage sustainable travel.
- Paragraph 110 - outlines the key considerations when allocating sites.
- Paragraphs 111-112 - outline the transport considerations for developments.
- Paragraph 113 - outlines when a TA, Travel Plan (TP) or Transport Statement (TS) are required.

National Planning Practice Guidance (2014)

2.6 The Government has undertaken a review of the planning guidance that supports the delivery of the NPPF and published an updated National Planning Practice Guidance (NPPG) online at http://planningguidance.planningportal.gov.uk/. The updated planning practice guidance includes guidance on TPs, TAs, and TSs.

2.7 The Planning Practice Guidance on TPs, TAs, and TSs sets out:

- When TPs, TAs, and TSs are required.
- How the scope of the plans and assessment should be defined.
- What should be included within the documents.

2.8 The allocation is compliant with the NPPF and the NPPG as it is conveniently located in terms of essential facilities which can be accessed by sustainable modes of transport, minimising the need to travel by car. This TA has been prepared in accordance with the guidance set out in NPPG.

Local Policy

North Norfolk Local Plan 2008-2021

2.9 The existing NNDC Local Plan guides development decisions up to 2021, however, NNDC have submitted a new Local Plan to the Planning Inspectorate for consideration and approval.

Core Strategy

2.10 The core strategy document sets out the key elements of the planning framework for North Norfolk that will be used for planning proposals, covering the period up to 2021. It provides the overarching approach to development in the district.

2.11 The relevant core aims that will aim to achieve the overall strategy of the Local Plan are outlined as follows:

- Core Aim 2: To provide for sustainable development and mitigate and adapt to climate change.

  This aim will be achieved by concentrating development in the settlements that have the greatest potential to become more self-contained and strengthen their role as centres for employment, retail, and services. The allocation is suitably located in North Walsham and delivery of a large-scale urban extension creates the opportunity to provide development which is sustainably connected to existing and future facilities, and which can deliver meaningful infrastructure needed to support the growth. The increase in population will support the growth of local businesses.

- Core Aim 6: To improve access for all jobs, services, leisure, and cultural activities.

  This aim will be achieved by protecting and improving existing infrastructure, and to improve access to key services by public transport and facilitate increased walking and cycling. This allocation will improve access to key services by public transport by promoting bus-based travel, with the provision of bus stops and a transport hub within the allocation. Walking and cycling access to jobs and facilities will be facilitated through the sustainable transport strategy outlined within this TA.

2.12 The relevant policies that will achieve the core aims set out above that are related to transport and access for this site from the North Norfolk Local Plan 2008-2021 are as follows:

- Policy CT 5: The Transport Impact of New Development

  The allocation will be designed to reduce the need to travel and promote and maximise the use of sustainable modes of transport to reduce the transport impact of the allocation in terms of highways. Off-site mitigation will be identified to improve both the sustainable transport network and the highway network.

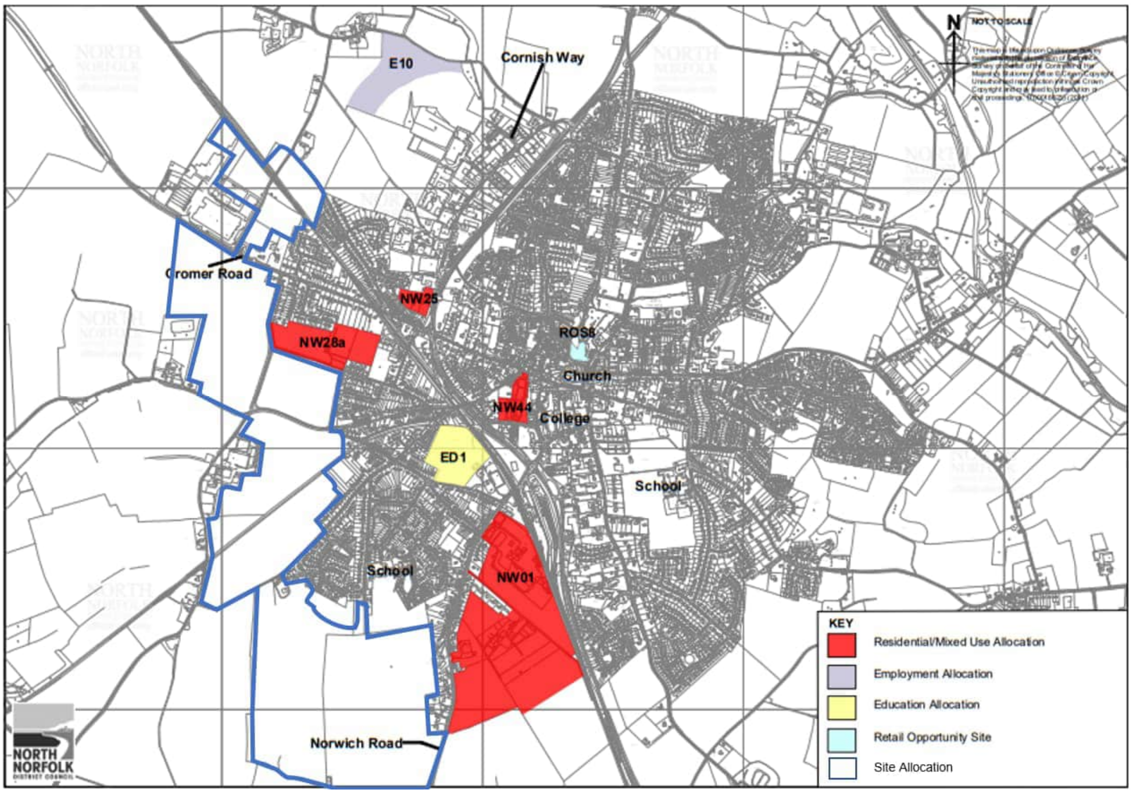
- Policy CT 6: Parking Provision

  Adequate vehicle parking facilities will be provided by developers to serve the allocation, in line with NCC parking standards at the time of a planning application.

Site Allocations

2.13 The site allocation map for the current Local Plan is shown in **Figure 2** below.

Figure 2 – Current Local Plan Site Allocation Policy Map (© NNDC)



2.14 The blue line identified in the figure above represents the boundary of the allocation. This confirms that there are no existing Local Plan allocations within the boundary.

Proposed North Norfolk Local Plan 2016-2036

2.15 NNDC have submitted a new Local Plan to the Planning Inspectorate for consideration and approval. This will guide development decisions in North Norfolk up to 2036. The plan details where new developments will be created to meet the needs of the district, with this development forming an allocated site in the new Local Plan.

Local Plan Proposed Submission Version

2.16 The relevant policies relating to transport and access for this site from the Proposed North Norfolk Local Plan 2016-2036 (Regulation 19) are as follows:

- Policy CC 1: Delivering Climate Resilient Sustainable Growth

  Policy CC 1 sets out the guiding principles that all development proposals should address to ensure that any new development positively contributes to sustainable growth and mitigating and adapting to climate change to address the challenges that are most relevant for North Norfolk.

  This suggests that large-scale developments, like the allocation should facilitate sustainable transport options through careful design and a balanced mix of uses that promote and support walking and cycling, as well as public transport. This is proposed through the sustainable transport strategy for the allocation.

- Policy CC 8: Electric Vehicle Charging

  Policy CC 8 sets out that in developments where vehicle parking is proposed, it must include appropriate provision for electric vehicle charging points. For major developments, details of how the required electric vehicle charging points will be allocated, located, and managed, including the mechanism/procedure for taking payments must be detailed in the TA. As the allocation comes forward electric vehicle charging points will be provided in accordance with the requirements of the NCC Parking Standards applicable at the time.

- Policy CC 9: Sustainable Transport

  Policy CC 9 sets out that developments will be well located and designed to minimise the need to travel and to maximise the use of sustainable transport and active travel for its location. The policy outlines that new developments must provide safe and convenient pedestrian and cycling facilities, suitable access to the highway network and the traffic generated by the development must not have a detrimental impact on the existing road network. If a development will generate significant traffic movements, then the proposal must be accompanied by a TP. As the allocation moves to a planning application, a TP will be provided.

- Policy HC 7: Parking Provision

  Policy HC 7 sets out that developments will need to provide adequate, safe, and secure vehicle and cycle parking facilities and must be in accordance with the latest NCC Parking Standards.

- Policy NW62/A: Land West of North Walsham

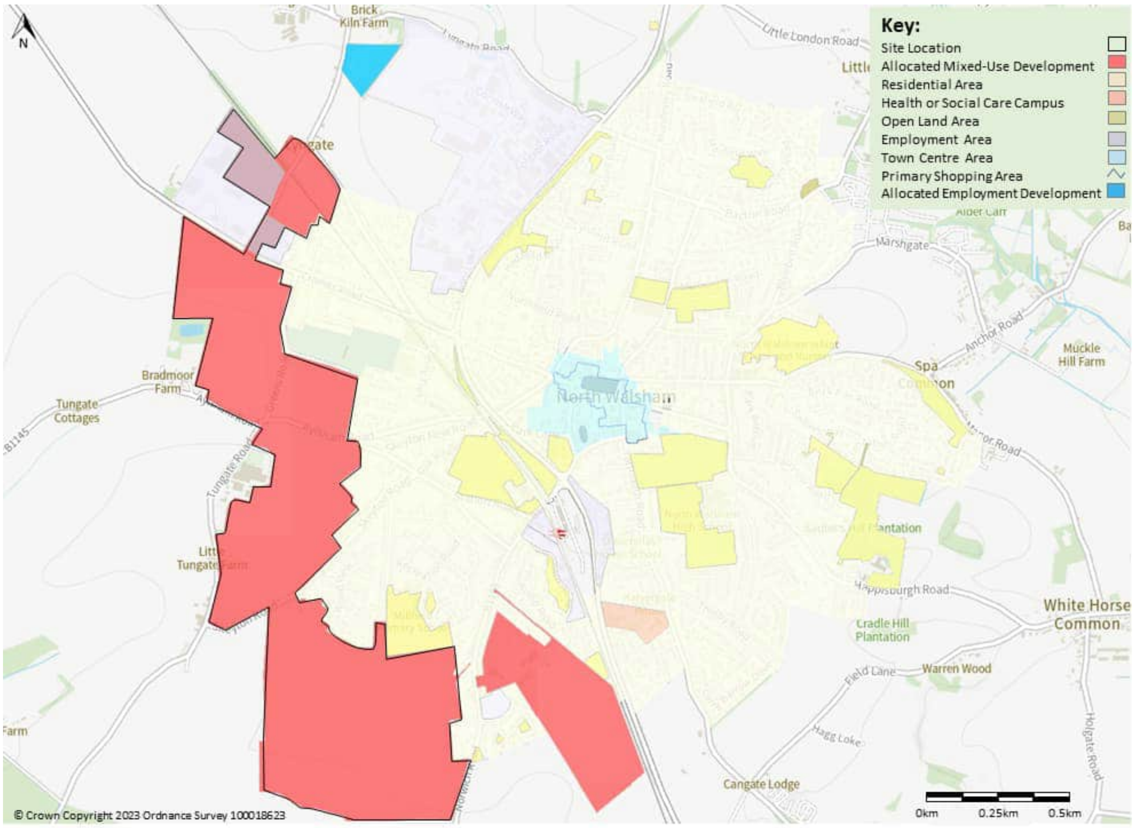
  Policy NW62/A, Land West of North Walsham, covers the allocation for which this TA has been prepared. The policy identifies that the site composition should include for approximately 1,800 dwellings, seven hectares of employment land, green infrastructure, community facilities (including a primary school), and a road linking Norwich Road, Cromer Road, and the industrial estate.

2.17 Any development proposals must explore the benefits of the western link road and the impacts (and any mitigation required) on the surrounding road network including the route to Norwich via Coltishall and Horstead, as well as including an assessment of the walking and cycling routes and a strategy to promote active travel and public transport. This TA has been prepared to assess the allocation in line with the requirements of the policy.

Policies Map

2.18 The site allocation policy map for North Walsham is included in **Figure 3** below.

Figure 3 – New Local Plan Site Allocation Policy Map (© NNDC)



2.19 Policy NW62/A states the following:

- Land to the west of North Walsham to provide a mixed-use sustainable urban extension amounting to 108 hectares, as defined on the Policies Map, is allocated for approximately 1,800 dwellings, seven hectares of employment land, green infrastructure, community facilities and a road linking Norwich Road, Cromer Road, and the industrial estate.
- Planning permission will be granted subject to compliance with the relevant policies of this Plan and the following site-specific requirements:

  4. Enhancement of the Weavers Way corridor acting as a green access spine through the development including improving biodiversity along the corridor. It will provide a pedestrian and cycle crossing point across the link road that prioritises these uses over vehicle traffic;

  8. Provision of a network of interconnected streets, squares, green corridors, and public spaces which prioritise moving around on foot and by cycle over the use of private motor vehicles;

  9. Delivery of appropriate public transport measures on site providing facilities and regular services to/from the town and key services;

  10. Provision of off-site pedestrian and cycle route improvements to the town centre, key services, and railway station;

  11. Delivery of a new road designed as an attractive main residential street through the development with mixed-use frontage usages and segregated cycle paths and footways. This new road should be suitable for HGV traffic (including high sided vehicles) and will connect Norwich Road to Cromer Road and provide a suitable route over the railway for access to the Lyngate/Folgate Rd industrial estate together with appropriate junctions. It should be delivered, in full, at the earliest opportunity;

  12. Off-site improvements to the highways and transport network including key junctions that require intervention and mitigation; and

  13. Delivery of appropriate restrictions on the amount of private traffic (including HGV vehicles) that can travel along the Aylsham Road and Skeyton Road.

2.20 Where possible these policy requirements are being incorporated into the Design Brief and emerging site proposals. Where measures are not included, justification is provided, specifically about the provision of a route over the railway to the Lyngate / Folgate Rd industrial estate.

Safe, Sustainable Development (2019)

2.21 The 'Safe, Sustainable Development' document is a set of aims and guidance notes provided by NCC that are intended to act as best practice for developers. The aims that are relevant to the allocation are set out in the following bullet points.

- Aim 1: (Transport Sustainability). Minimising travel to ensure people can access facilities they need by appropriate transport modes, encouraging walking, cycling and public transport use and reducing the use of private cars especially for shorter journeys.

  The allocation will provide a comprehensive level of facilities to encourage travel by sustainable modes of transport, as well as enhance existing facilities located within the allocation and the wider area connecting to the town centre, employment areas, education, and public transport infrastructure. On-site walking and cycling infrastructure will be LTN 1/20 compliant. A TP will also be prepared for the allocation at the application stage which will further promote sustainable and active travel and discourage the use of the private car.

- Aim 2: To encourage residents to explore active and healthier ways of travel.

  This will be facilitated through the promotion of the Weavers' Way route as an attractive leisure facility for pedestrians and cyclists. The allocation will also connect to North Walsham's existing infrastructure to enable residents to walk and cycle more easily around the town. Existing routes and routes within the allocation will follow natural desire lines where possible, with the infrastructure being attractive and comfortable to use.

- Aim 5: To keep commercial vehicles away from areas where their presence would result in danger/unacceptable disruption to the highway/or cause irreparable damage.

  The link road through the allocation will enable HGVs to navigate North Walsham more easily, without using the residential streets in the southeast of the town, which are not designed to accommodate regular HGV movements. The link road will be designed to accommodate the expected increase in HGV movements along the road.

- Aim 6: To ensure development conforms to parking policies and standards which consider strategic and local objectives.

  Parking provision will be provided in accordance with the NCC parking standards applicable at the time of the outline planning application and each subsequent Reserved Matters application.

- Aim 8: New development within Norfolk of regional/national importance shall promote the use of rail and water.

  It is a requirement that new development should be located to provide good access to rail/water facilities. The allocation is located within walking distance of the train station. Water travel is not appropriate for this allocation.

Transport Policy

Local Transport Plan 4 (2021)

2.22 The Local Transport Plan 4 was adopted by NCC in July 2022. The Plan describes NCC's strategy and policy framework delivery up to 2036.

2.23 The key issues identified include how NCC will achieve the policy aim to work towards carbon neutrality by 2030 as agreed in the environmental policy adopted by the county council; improve air quality in urban areas; meet the challenge of technology and innovation in the transport system and the ways in which people work; and support the economy of the county by ensuring that people can make the connections they need.

2.24 The document is used as a guide for transport investment and considered by other agencies when determining planning or delivery decisions. It identifies seven objectives for transport:

- Embracing the Future.
- Delivering a sustainable Norfolk.
- Enhancing connectivity.
- Enhancing Norfolk's Quality of Life.
- Increasing accessibility.
- Improving transport safety.
- A well-managed and maintained transport network.

2.25 To achieve the objectives above, a set of policies have been created. Those policies within the Local Transport Plan relevant to the allocation are outlined below:

- Policy 2: The priority for reducing emissions will be to support a shift to more sustainable modes and more efficient vehicles.

  This will be achieved through the promotion of sustainable transport facilities and connections, as well as providing sustainable transport infrastructure within the allocation and providing off-site works to increase the use of sustainable modes for journeys within the allocation and around North Walsham and the wider area.

- Policy 5: Ensure that new developments are well connected to maximise the use of sustainable and active transport options.

  The allocation is located on the western edge of North Walsham and is within reasonable walking and cycling distances of local facilities and amenities, as well as the provision of excellent on-site facilities and enhanced off-site connections. The allocation is well-connected to the existing bus network, however, will be provided within new bus stops and a transport hub to further enhance access and travel by sustainable modes of transport.

2.26 The allocation is in accordance with the policies as set out in the document through its increasing accessibility and improving transport safety objectives. The Weavers' Way and the other PRoW that are encompassed and adjacent to the allocation will act as green access spines, providing active travel access. The allocation will also provide off-site pedestrian and cycle route improvements to key amenities, including the town centre and train station. Regarding the highway network, the new link road will facilitate HGV traffic over the railway for access to the industrial estates in the north of the town.

Local Cycling and Walking Infrastructure Plan

2.27 LCWIPs are developed to identify and prioritise improvement schemes over short, medium, and long periods of time. LCWIPs are designed to play an important role in achieving the aim that half of all journeys by 2030 in towns and cities will be cycled or walked, with walking and cycling being the first natural choice.

2.28 NCC received funding of almost £1 million from Active Travel England (ATE) in January 2023 to encourage active travel. Of the £1 million, a grant of £319,871 has been designated for developing a county-wide LCWIP. NCC have already developed LCWIPs for the Greater Norwich area, Great Yarmouth, and King's Lynn.

2.29 The LCWIP will set out schemes of improvements that could be made to local walking and cycling infrastructure, including North Walsham. Consultations on the proposed schemes are in process. However, the funding for the LCWIP will not fund the schemes themselves; instead, the funding is used to develop the LCWIP. No details are available on potential improvements for North Walsham currently as consultation feedback review by NCC is still ongoing. Details are due to be made available in early 2024.

Active Travel England

2.30 Active Travel England is the government's executive agency responsible for making walking, wheeling, and cycling the preferred choice for everyone to get around in England.

2.31 The second cycling and walking investment strategy (CWIS2) outlines the government's ambition to make cycling and walking the natural choices for shorter journeys, or as part of a longer journey by 2040.

2.32 The aims and targets in the first strategy, alongside the vision set out in Gear change (2020), have informed their objectives, which are:

- Increase the percentage of short journeys in towns and cities that are walked or cycled;
- Increase walking;
- Double cycling; and
- Increase the percentage of children aged 5 to 10 who usually walk to school.

2.33 The allocation will provide good quality walking and cycling routes across the site to enable people to travel to their destinations on foot or by cycle safely and conveniently.

Transport East Transport Strategy 2023-2050

2.34 Transport East as the sub national transport body for Norfolk, Suffolk, Essex, Southend-on-Sea, and Thurrock brings together councils, business leaders and the Government to identify the transport investment needed to support sustainable economic growth in the region and improve people's quality of life. The priorities of Transport East are:

- Creating a net zero carbon transport network.
- Connecting our growing towns and cities.
- Energising our coastal and rural communities.
- Unlocking our global gateways.

2.35 Transport East will guide investment across the region to support these priorities. Of relevance to North Walsham are the Goals which Transport East are looking to deliver in partnership with stakeholders for this region:

- Goal 1: Reduce demand for carbon intensive trips through local living; making it easier for people to access jobs and services locally or by digital means;

- Goal 2: Shift modes by supporting people to switch from private car to active and passenger transport, and goods to more sustainable modes like rail;
- Goal 3: Switch fuels with all private, passenger transport, fleet and freight vehicles switching to net zero carbon fuels at the earliest opportunity;
- Goal 4: Zero carbon growth by supporting authorities and developers to plan, locate and design new development that reduces the need for people to make carbon-intensive trips;
- Goal 5: Improve connections and access within our urban centres through better walking, cycling and passenger transport, supporting sustainable access to services, education, training, jobs, and leisure;
- Goal 6: Deliver faster and more reliable connections between our growing places and to the rest of the UK, to support business growth, skills development, and employment;
- Goal 7: Fully integrate transport networks, services, and operations across the Transport East region, through a customer-focused approach, enabling seamless and safe end-to-end journeys by sustainable modes that are attractive to all; and
- Goal 8: Increase accessibility for rural communities to education, training, services, and jobs through; better ways of taking people to places sustainably, supporting more local trips through closer provision of goods and services, supporting regional partners and the digital sector to provide alternative options to travel.

2.36 The proposed allocation of a large-scale urban extension in North Walsham which is designed with sustainable travel as a guiding principle will support delivery of these goals and will also benefit from the initiatives being delivered by Transport East to achieve these aims, such as supporting the development and growth of the rail and broadband, and rural public transport networks.

Summary

2.37 In transport terms, the allocation accords with the policies set out above due to its sustainable location which provides an attractive location for residents of North Walsham and the surrounding area to travel to for employment and other purposes, as well as being well-located for those residing at the allocation to reach the amenities and facilities within North Walsham. The mixed-use nature of the allocation will also encourage trips between the uses such that, for example, trips at lunchtime or between residences and the school and local centre can be contained within the allocation and made by sustainable modes rather than have an impact on the surrounding highway network.

3. Existing Conditions

Introduction

3.1 This chapter reviews the accessibility of the allocation for all modes of transport. It provides a description of the allocation site and its location along with a review of the existing walking, cycling, and public transport facilities near the allocation and a description of the existing highway network.

Existing Site

3.2 North Walsham is a market town located in the district of North Norfolk and based on the 2021 Census has a population of 12,829. North Walsham is located approximately 24km north of Norwich and 16km southeast of Cromer.

3.3 The allocation is located on the western boundary of North Walsham and predominately comprises agricultural land, however, there is a small amount of former industrial land in the north of the allocation, adjacent to Bradfield Road. Undeveloped land and in part the A149 Cromer Road bound the site to the north, with residential properties and North Walsham Football Club being located along the eastern boundary. The B1150 Norwich Road bounds the site to the south and commercial uses, agricultural land, and Rossis Leisure form the western boundary. B1145 Aylsham Road and Skeyton Road both bisect the allocation in an east-to-west direction, whilst Greens Road which connects A149 and B1145 bisects the allocation in a north-to-south direction.

3.4 Depending on the starting point, North Walsham town centre is approximately 1.1 to 1.6km from the allocation whilst the railway station is approximately 600 metres to 1.5km from the allocation.

3.5 The allocation location is shown in **Figure 1** in Chapter 1.

Pedestrians

Accessibility

3.6 The Chartered Institute of Highways and Transport (CIHT) document ‘Providing for Journeys on Foot’ (2000) recommends a maximum walking distance of up to two kilometres for trips to work. **Figure 4** illustrates a 30-minute (two kilometres) walking catchment. The catchment is taken from the centre of the allocation and illustrates that the whole of North Walsham and its amenities and facilities, as well as some of the surrounding villages, are within the maximum recommended walking distance.

Figure 4 – 30-minute Walking Distance Isochrone

Source: https://traveltime.com/

3.7 The CIHT document discusses further the recommended walking distances to key destinations, and these are set out in **Table 1** below. It should however be noted that there are pedestrians who will travel more than the maximum distances and therefore it should be considered indicative.

Table 1 – Recommended Walking Distances to Destinations

	Town Centres	Commuting / School	Elsewhere
Desirable	200m	500m	400m
Acceptable	400m	1000m	800m
Maximum	800m	2000m	1200m

3.8 Key off-site destinations have been identified along with their walking time and distance from the closest part of the allocation. The times and routes have, where possible, been derived using Google Maps route planning software. The results have then been compared with the recommendations in **Table 1** and are set out in **Table 2**.

Table 2 – Times and Distances to Off-Site Facilities

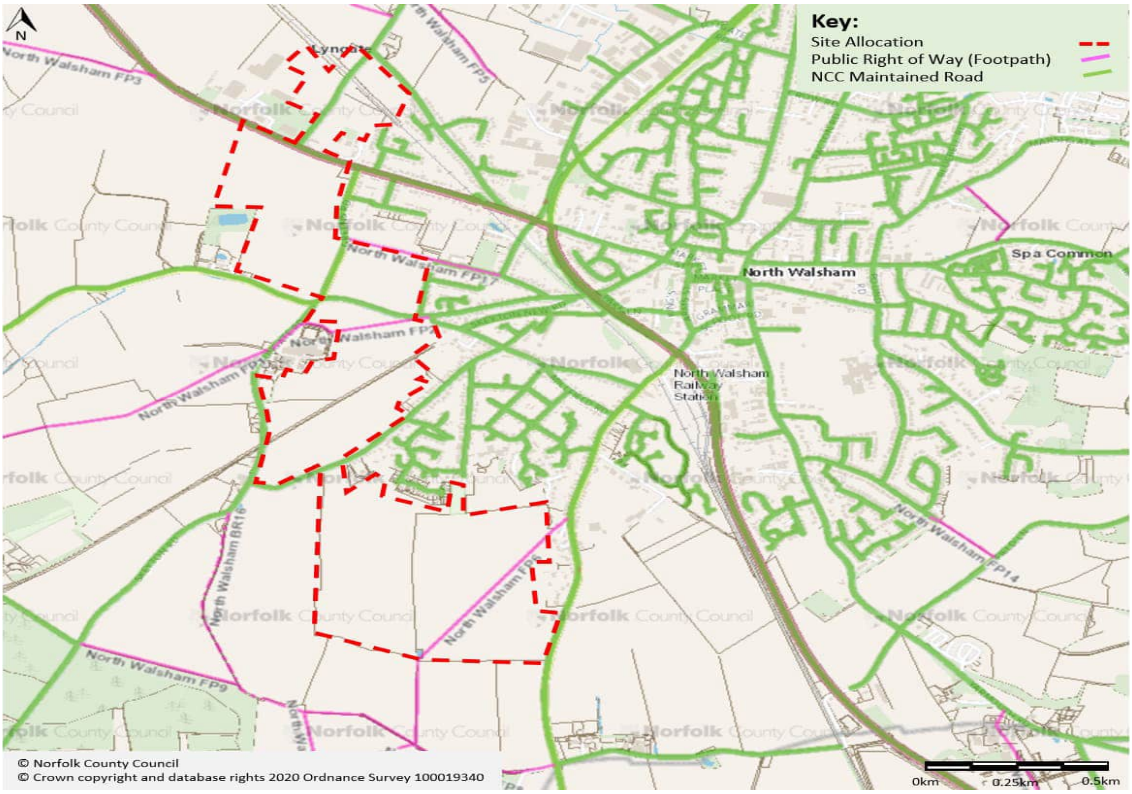
Location	Walking Distance (Kilometres) (Closest)	Recommended Desirable / Acceptable / Maximum Walking Distance	Time Walking (minutes) (Closest)
Train Station	0.7	Acceptable (commuting)	8
Travel Hub	1.2	Maximum (commuting) Acceptable (everything else)	15
Market Place (Town Centre)	1.0	Acceptable (commuting) Outside of maximum (town centre)	12
North Walsham Hospital	1.9	Preferred maximum (commuting) Outside of maximum (elsewhere)	24
North Walsham High School	1.7	Preferred maximum (school)	21
Paston College	0.85	Acceptable (maximum)	10
Folgate Road Industrial Estate	1.0	Acceptable (commuting)	13

3.9 This illustrates that the allocation is located within the recommended maximum walking distance of the key destinations identified and therefore would encourage trips by modes other than the private car. In addition, the distances identified by the CIHT are recommended maximums and with the provision of good facilities, travel on foot could be undertaken for greater distances for all journey purposes. Distance should not be seen as a barrier to travel.

Existing Infrastructure

3.10 Existing public footpaths and NCC-maintained roads around the allocation can be seen in **Figure 5**. This illustrates that there are currently many routes available for those living in or visiting the allocation connecting to places of work, education, leisure, retail, and public transport.

Figure 5 – Existing Public Footpaths and NCC Maintained Roads



3.11 Most roads nearest the allocation are provided with pedestrian facilities.

3.12 There is a footway on the northern side of the A149 Cromer Road from the town's western boundary to the junction with the A149. After this point, footways are provided along both sides of the carriageway with an underpass provided at the railway line. This footway provides connections between the allocation and the retail and employment area to the west, as well as the town centre, and Folgate Road Industrial Estate.

3.13 No footways are provided along the rural section of Aylsham Road; however, footways are provided east of the junction with Station Road where the surroundings become more residential in nature. Footway provision is however limited on the southern side as this stops opposite the junction with Howlett Close. The footway on the northern side is relatively wide however this also ends some 50 metres east of the junction with Howlett Close. At this point, pedestrians are required to utilise the carriageway for approximately 230 metres when the footway provision re-starts east of the junction with Cherry Tree Lane. The speed limit along this narrow section has been reduced to 20 mph, however pedestrians are still required to share the carriageway with all vehicles using Aylsham Road including high sided HGVs. There are alternative, less trafficked, routes for pedestrians travelling between Station Road and Aylsham town centre although those residing along this section of Aylsham Road are required to use this route.

3.14 Skeyton New Road sits along the desire line between the site, Aylsham Road, and the town centre. It provides limited dedicated facilities for pedestrians and cyclists but offers a lightly trafficked lane which runs parallel to and connects with Weavers Way. For 265m Weavers' Way provides a traffic free route, whilst the remaining 95m of Skeyton New Road provides a shared surface to connect with Aylsham Rd, immediately west of the railway bridge.

3.15 There is good pedestrian infrastructure along Skeyton Road within the residential area, with footways on both sides of the carriageway which continue as far as the Skeyton Road / Station Road / Oak Road crossroads. A few properties on Skeyton Road have no footway provision and are required to utilise the carriageway.

3.16 Pedestrian facilities are in place along the B1150 Norwich Road, from approximately 125 metres south of the Ewing Road / B1150 Norwich Road priority junction. Adjacent to the southbound carriageway to the north and south of the Ewing Road / B1150 Norwich Road priority junction, there is a shared pedestrian/cycle footway. The footway continues along B1150 Norwich Road to the B1150 Norwich Road / Norwich Road / A149 signalised junction and into the town centre.

3.17 There are currently no committed development schemes that will enhance the existing pedestrian infrastructure around the allocation, however, NCC's draft LCWIP for North Walsham has been prepared and identified several routes from the allocation to the facilities identified as being the main corridors for improvement.

Public Rights of Way (PROW)

3.18 There are three PROWs that are encompassed by, or adjacent to, the allocation.

- PROW FP17 is a 275-metre footpath that connects Queensway to B1145 Greens Road at the entrance to North Walsham Town Football Club.
- PROW FP2 runs from the Station Road / Aylsham Road priority junction in an east-to-west direction. This also provides a route to the Rossis Leisure Centre, before becoming FP1.
- PROW FP6 begins at B1150 Norwich Road, north of Foundry Court, running southwest until it joins PROW FP8.

Weavers' Way

3.19 The Weavers' Way is a 61-mile long-distance traffic free path connecting Great Yarmouth and Cromer, via North Walsham. Weavers' Way crosses the allocation between Tungate Road and Station Road using a disused railway line and continues towards the town centre parallel to Skeyton New Road. At Station Road, there is a car park to access the bridleway.

3.20 As Weavers' Way is a bridleway in this location, it is available for pedestrians, cyclists, horse riders, and wheelers. The route is lit where it passes through residential areas but is unlit where it crosses fields. The route is identified in the NCC LCWIP as an Active Travel Route for North Walsham.

Cyclists

Accessibility

3.21 It is generally considered that up to five kilometres is the recommended maximum distance for the average cyclist to travel to and from work. It would take an average cyclists 15 minutes to cycle five kilometres. It should however be noted that there are cyclists who will travel more than this distance/time and thus it should be considered indicative.

3.22 Using the centre of the allocation as a starting point, **Figure 6** below illustrates the locations which should be accessible by cycle in 15 minutes. This suggests that the entirety of North Walsham as well as Antingham, Bradfield, and Felmingham.

Figure 6 – 15-minute Cycling Distance Isochrone

Source: https://traveltime.com/

Infrastructure

3.23 There are limited facilities for cyclists within North Walsham. A shared foot/cycleway runs parallel to the A149 from the signalised junction with B1150 Norwich Road before connecting with Aylsham Road. This route although lit is narrow in places, and its surface, although compacted, is not asphalt and therefore can become slippery when wet, especially on the sections which lead down to Aylsham Road. Cyclists, at this point, if continuing along Aylsham Road need to utilise the carriageway.

3.24 A cycleway runs west on Weavers Way parallel to Skeyton New Road from Aylsham Road before ending at the Skeyton New Road / Station Road priority junction. From this point, cyclists are required to utilise the carriageway or Weavers' Way for onward journeys.

3.25 A shared foot/cycleway runs adjacent to the southbound carriageway of the B1150 Norwich Road for approximately 160 metres, to the north and south of the B1150 Norwich Road / Ewing Road priority junction. After this point, cyclists must join the carriageway to continue their journey.

3.26 In addition to the cycleways which are provided alongside carriageways, as stated previously, cyclists can utilise Weavers' Way for journeys. This is a traffic-free route and is promoted for use for cyclists.

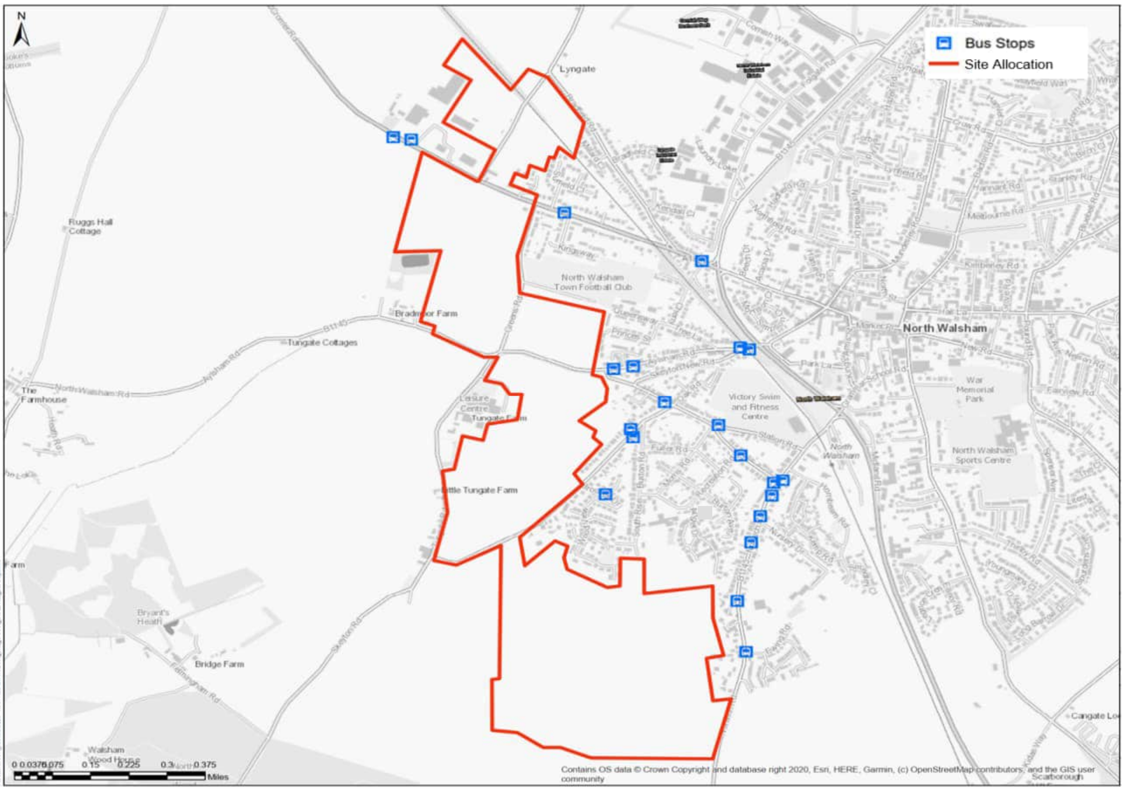
Public Transport

Bus

3.27 CIHT's 'Buses in Urban Developments' guidance suggests bus stops should be a maximum walking distance of 400 metres on single high-frequency routes or 300 metres on less frequent routes. The roads passing through the allocation are currently well served by buses, with 20 bus stops provided within 300-400 metres of the allocation.

3.28 The bus stops that are currently serviced and located within 400 metres of the allocation are illustrated in **Figure 7** below. In addition to those shown, there are two further stops located on A149 Cromer Road that are not currently in use.

Figure 7 – Bus Stop Locations Within 400m of the Allocation



3.29 All the stops within 400 metres of the allocation are located to the west of the railway line, except for one stop on A149 Cromer Road. At the stops, seven are provided with timetable information, whilst six are provided with shelters to protect from inclement weather. The remaining bus stops are flagged and therefore provide little for waiting passengers.

3.30 The services which serve the existing bus stops within 400 metres of the allocation are set out in **Table 3** below.

Table 3 – Bus Services Serving Stops Within 400m of the Allocation (Accessed October 2023)

Route No.	Route Description	Frequency Monday to Friday	Frequency Saturday	Frequency Sunday	Operator
1B/2/4A	North Walsham – Swanton Abbott – Worstead	1 per day	No service	No service	Feline Executive Travel
88	North Walsham – Aylsham High School	1 per day	No service	No service	Sanders Coaches
X55	North Walsham – Coltishall – Norwich	Every 30 minutes	Every 30 minutes	Every 1 hour	Sanders Coaches
210	North Walsham – Frettenham – Norwich	Every 1-4 hours	3 per day	1 per day	Sanders Coaches
6A	Cromer – Thorpe Market – North Walsham	Every 1-3 hours	Every 2 hours	No service	Sanders Coaches
18	North Walsham – Aylsham – Cromer	5 per day	2 per day	No service	Sanders Coaches
18A	North Walsham – Roughton	1 per day	No service	No service	Sanders Coaches
33	North Walsham – Northrepps – Cromer	Every 2-3 hours	No service	No service	Our Bus
33A	North Walsham Circular	3 per day	No service	No service	Our Bus

3.31 A travel hub, which opened in 2022, is located on New Road in North Walsham town centre, approximately 1.2km from the allocation. Waiting passengers are provided with public toilets, electronic information boards, shelters, and seating, as well as improved facilities to support visually impaired users. The travel hub provides additional services to those which are available within 400 metres of the allocation. These are set out in **Table 4**.

Table 4 – Bus Services Serving North Walsham Travel Hub (Accessed October 2023)

Route No.	Route Description	Frequency Monday to Friday	Frequency Saturday	Frequency Sunday	Operator
CH2	Cromer – Mundesley – North Walsham	Every 1 hour	Every 1 hour	Every 1-2 hours	Sanders Coaches
5	North Walsham – Cromer – Sheringham / Holt	1 per day (to Sheringham)	1 per day (to Holt)	No service	Sanders Coaches
34	North Walsham – Mundesley – Stalham	Every 1-3 hours	No service	No service	Sanders Coaches
6	North Walsham – Gorleston	2 per day	2 per day	No service	Sanders Coaches
X6	North Walsham – Stalham – Gt Yarmouth	Every 1-2 hours	Every 2 hours	No service	Sanders Coaches
NC3	North Walsham – Aylsham – Norwich City FC	NCFC Matchdays	NCFC Matchdays	NCFC Matchdays	Sanders Coaches
NC11	North Walsham – Wroxham – Norwich City FC	NCFC Matchdays	NCFC Matchdays	NCFC Matchdays	Sanders Coaches

3.32 **Table 4** above illustrates that there are many services that operate from the travel hub that serve the wider North Norfolk and Norwich area. Some of these services are school buses, which allow students visiting sixth form centres and colleges in the wider region to travel without recourse to the private car. There are also frequent services to Norwich through a range of bus services, as well as other settlements such as Aylsham, Great Yarmouth, Cromer, and Gorleston. In January 2023, some services from Sanders Coaches were improved, with new single-decker buses used instead of double-decker buses, which has reduced journey times by approximately 15 minutes to Norwich as the new buses can use B1150 Norwich Road, encouraging sustainable bus travel in this area.

3.33 The last X55 outbound service from North Walsham departs from the Travel Hub at 18:35 from Monday to Saturday. The last service on Sunday departs the Travel Hub at 17:35. In the reverse direction, the last X55 service from Norwich Bus Station departs at 19:25 and arrives at the North Walsham Travel Hub at 20:08 on Mondays to Saturdays. On Sundays the last service from Norwich departs at 18:30 and arrives at the NW Travel Hub at 19:20.

3.34 On Mondays to Saturdays, the X55 from North Walsham runs every half an hour until 16:45, at which points there are only two more services which depart at 17:30 and 18:35. In the reverse direction, the final half-hourly service departs from Norwich at 17:40, with the final two services of the day departing at 18:25 and 19:25. On Sundays the service runs hourly in both directions.

3.35 All other bus services which operate between North Walsham and Norwich have a final service earlier than the X55 and are generally much less frequent.

3.36 Although there are limited numbers of services outside of the peak hours, the allocation will bring further patronage which will support better service outside of the existing operation hours.

3.37 The existing bus stops and the wider connections at the travel hub are such that they should encourage residents and visitors to travel by bus. The enhancements to the bus facilities proposed within the allocation should further encourage travel by bus.

Rail

3.38 The nearest railway station is North Walsham which is located approximately 700 metres walking and cycling distance from the centre of the allocation. There are two bus stops located at the station allowing for interchange between modes, therefore, providing an alternative to active travel access from the allocation. The station is served by Greater Anglia trains.

3.39 Shelters and CCTV secure cycle storage is available, with 16 cycle spaces provided at North Walsham Station adjacent to the south bound platform. There are two unsheltered cycle stands on the northbound platform. There is also a car park adjacent to the southbound platform with 21 car spaces. A further car park controlled by NNDC is provided with circa 45 parking spaces off Hornbeam Rd, within a five-minute walk of North Walsham Station.

3.40 There is no pedestrian access between the platforms at North Walsham Station, instead passengers most walk along the footpath on B1150 to travel between platforms. Greater Anglia, have however, sought funding through Access for All from Central Government for a footbridge and lifts to create step free access across the station. This is being considered by the DfT however no funding decision will be made until April 2024 when the next industry round begins. It is understood from Greater Anglia that the scheme has support from NCC. If successful, the provision of a bridge and lift will significantly enhance access to the station and reduce the need for passengers to utilise the footway under the railway bridge.

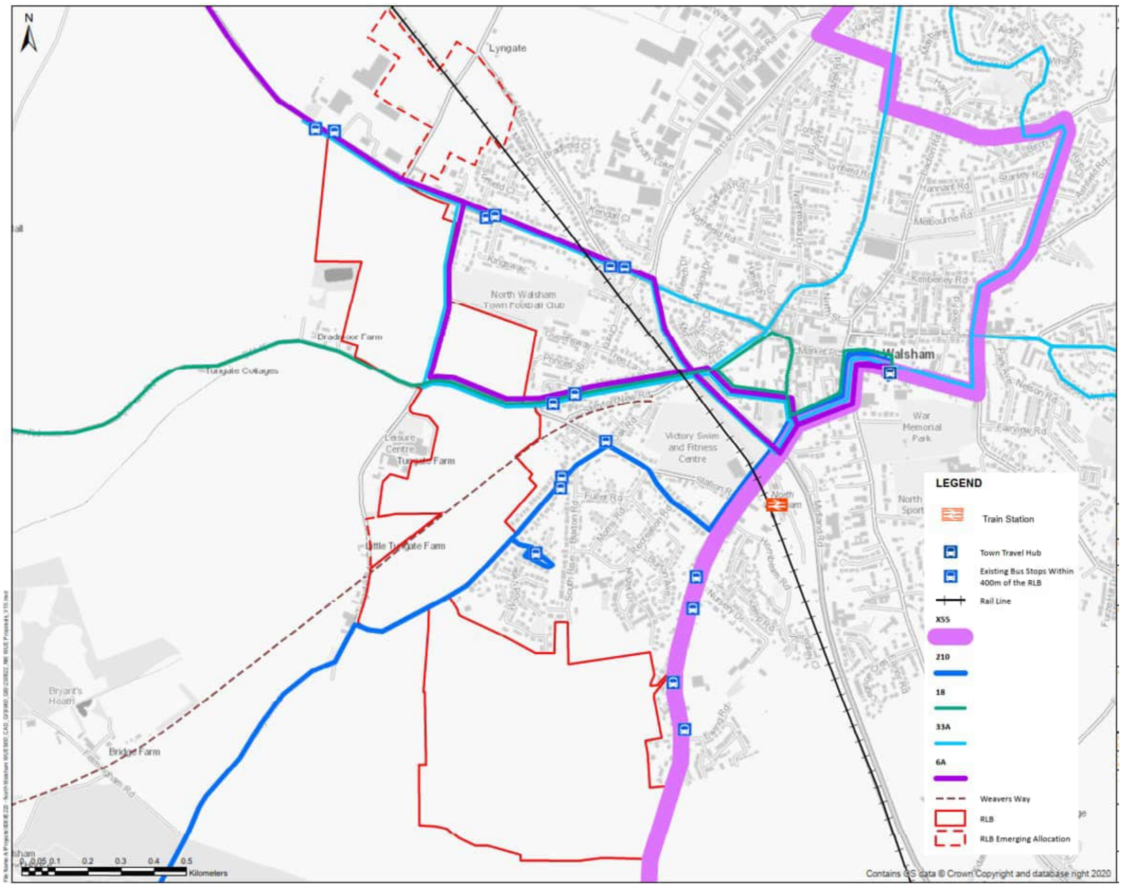
3.41 Greater Anglia operate an hourly service between Norwich and Sheringham, calling at Hoveton & Wroxham, Worstead, North Walsham, Cromer, and West Runton. This provides excellent access to employment and leisure locations. Journeys to Norwich take approximately 30 minutes whilst Sheringham can be reached in approximately 34 minutes. The connection with Norwich allows a wider geographical area to be reached, with services to London, Cambridge, and Liverpool.

3.42 North Walsham station is well used, with 221,032 passengers using the station between April 2021 and March 2022 (Office for Road and Rail).

3.43 The station provides an alternative mode of travel for longer journeys that would usually be taken by car and is accessible to the allocation by foot, cycle, and bus which should encourage existing and future residents and visitors to travel by train.

3.44 Public transport services are illustrated on **Figure 8** below with the most frequent routes highlighted with thicker lines.

Figure 8 – Public Transport Services within North Walsham



Summary

3.45 A review of the existing public transport facilities illustrates that there are several buses stops within reasonable walking distance of the site along with a railway station. These services provide high frequency services to key destinations such as Norwich which can reduce the reliance on the private car.

3.46 There is a slight shortfall in service provision outside of the peak hours in terms of bus services which can limit the use of buses for journeys that are required to be undertaken either early in the morning and later in the evening. Barriers to use of the rail network also exist with the inability to cross between platforms without utilising a relatively narrow footway alongside the B1150. There is also limited cycle parking at the station resulting in less chance for mixed mode journeys.

Existing Facilities and Amenities

3.47 There are several facilities and amenities in the general vicinity of the allocation. **Table 5** below outlines the different amenities and their walking and cycling distance and time. The Google Maps route planning tool has been used to derive the distances and times. It is assumed that accounting for topography, the average walking speed is approximately three miles per hour (mph) (4.83 kilometres per hour (km/h)) and the average cycling speed is approximately ten mph (16.09 km/h). However, the times and distances should be considered indicative.

3.48 The walking and cycling distances and times in **Table 5** are ranges as the allocation covers a large area and are therefore based on the closest and furthest point from each amenity. The times to reach these amenities is also included. It should be noted that the list is not exhaustive and there are other amenities and facilities within the town centre such as local independent retailers and cafes and restaurants.

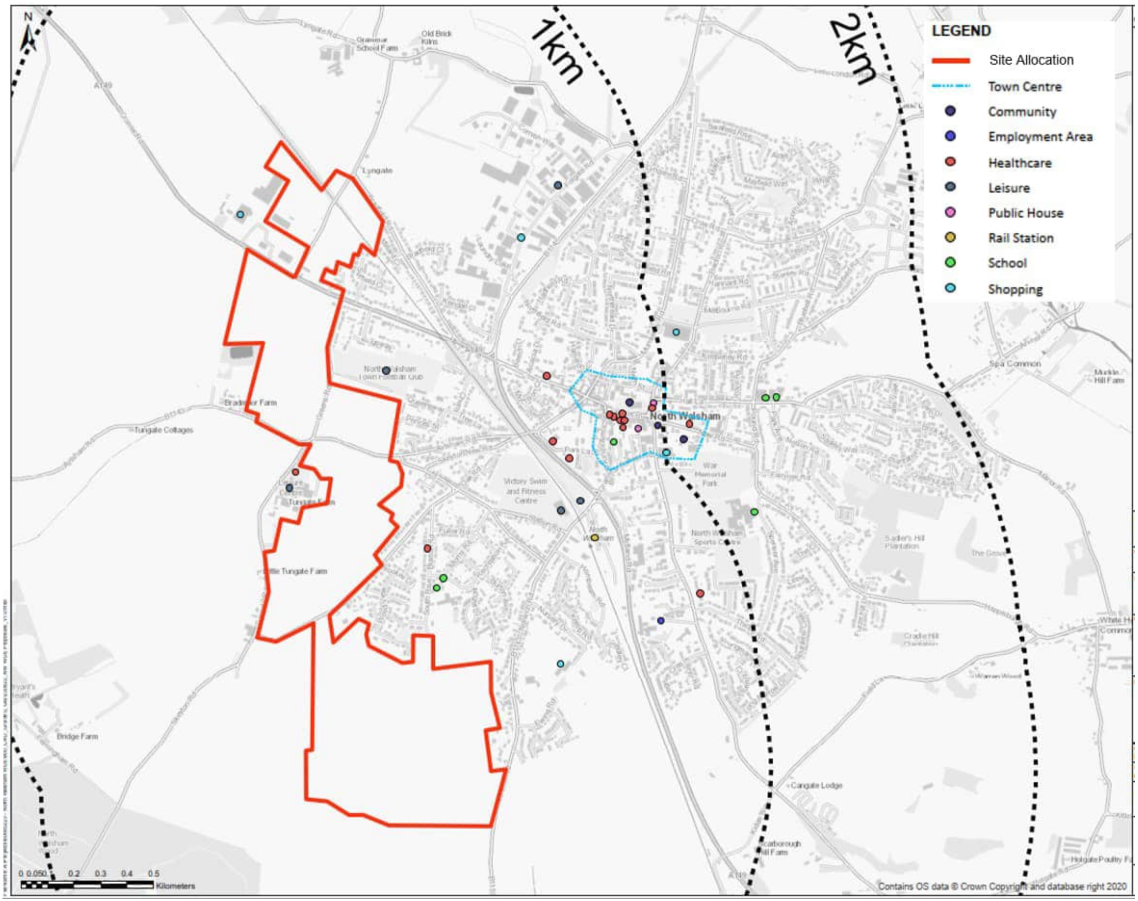
Table 5 – Existing Amenities Information and Access for Pedestrians and Cyclists

Type of Amenity	Name	Walking		Cycling	
		Distance (kilometres)	Time (minutes)	Distance (kilometres)	Time (minutes)
Rail Station	North Walsham Train Station	1.3 – 1.8	15 – 22	1.3 – 1.8	4 – 7
School	North Walsham Infant School & Nursery	1.8 – 2.1	23 – 26	1.9 – 2.2	7 – 8
School	Millfield Pre School	1.0 – 1.6	13 – 22	1.0 – 1.8	3 – 6
School	Millfield Primary School	1.0 – 1.6	13 – 22	1.0 – 1.8	3 – 6
School	North Walsham Junior School	1.7 – 2.3	22 – 28	1.8 – 2.4	7 – 9
School	North Walsham High School	1.9 – 2.5	25 – 31	2.0 – 2.5	9 – 10
School	Paston College	1.5 – 1.9	19 – 23	1.6 – 1.9	6 – 7
Public House	White Swan	1.2 – 1.9	15 – 23	1.2 – 2.0	5 – 7
Public House	Black Swan	1.1 – 1.9	15 – 23	1.2 – 1.9	5 – 7
Leisure	Victory Swim & Fitness Centre	0.65 – 1.8	8 – 23	0.65 – 1.8	2 – 6
Leisure	Gravity Skatepark	1.0 – 1.8	11 – 23	0.95 – 1.9	3 – 6
Leisure	Rossis Leisure	0.05 – 2.2	1 – 26	0.05 – 2.2	1 – 6
Leisure	Yendell's Health & Wellness Hub	1.4 – 2.4	17 – 29	1.4 – 2.5	4 – 9
Leisure	North Walsham Town FC	0.05 – 2.6	1 – 31	0.05 – 2.6	1 – 8
Community	North Walsham Community Centre & Library	1.5 – 2.0	19 – 25	1.5 – 2.0	6 – 8
Community	North Walsham Travel Hub	1.5 – 2.0	19 – 25	1.5 – 2.0	6 – 8
Community	North Walsham Post Office	1.4 – 1.9	17 – 23	1.4 – 1.9	6 – 8
Community	St Nicholas Church	1.3 – 1.8	16 – 22	1.3 – 1.8	5 – 6
Shopping	North Walsham Garden Centre	0.75 – 2.3	9 – 29	0.75 – 2.3	2 – 8
Shopping	Sainsbury's	1.5 – 2.0	18 – 24	1.5 – 2.0	5 – 7

Type of Amenity	Name	Walking		Cycling	
		Distance (kilometres)	Time (minutes)	Distance (kilometres)	Time (minutes)
Shopping	Waitrose & Partners	0.05 – 3.2	1 – 39	0.05 – 3.2	1 – 10
Shopping	Lidl	1.5 – 1.9	19 – 25	1.5 – 2.0	6 – 8
Employment Area	Folgate Road Industrial Estate	1.6 – 2.6	19 – 31	1.6 – 2.6	4 – 8
Healthcare	North Walsham Memorial Hospital	2.2 – 2.7	27 – 34	2.2 – 2.8	7 – 10
Healthcare	Birchwood Medical Practice	0.95 – 1.6	12 – 20	1.0 – 1.8	4 – 7
Healthcare	Paston Surgery	1.0 – 1.5	13 – 19	1.0 – 2.0	5 – 7
Healthcare	Grovefield Dental Surgery	1.9 – 2.4	24 – 31	2.0 – 2.5	7 – 9
Healthcare	The Rose Cottage Dental Practice	1.4 – 1.9	17 – 24	1.4 – 1.9	5 – 7
Healthcare	MyDentist	1.2 – 1.7	15 – 21	1.2 – 1.7	4 – 6
Healthcare	Bupa Dental Care	1.2 – 1.7	15 – 21	1.2 – 1.7	4 – 6
Healthcare	North Walsham Chiropractic Clinic	1.3 – 1.9	17 – 23	1.4 – 2.0	5 – 7
Healthcare	Active Health Norfolk	1.1 – 1.9	14 – 23	1.1 – 21	4 – 9
Healthcare	Reanimar Sports Massage	0.1 – 1.7	1 – 22	0.1 – 1.7	1 – 6
Healthcare	North Norfolk Physio	0.05 – 2.2	1 – 26	0.05 – 2.2	0 – 6
Healthcare	Well Pharmacy	1.3 – 1.8	15 – 21	1.3 – 1.8	5 – 6
Healthcare	Boots Pharmacy	1.3 – 1.8	15 – 21	1.3 – 1.8	5 – 6
Healthcare	North Walsham Pharmacy	0.9 – 1.4	11 – 17	0.9 – 1.4	4 – 6
Healthcare	Specsavers Opticians and Audiologists	1.3 – 1.8	15 – 21	1.3 – 1.8	5 – 6
Healthcare	R M Ling Optometrists	1.5 – 1.9	17 – 22	1.5 – 1.9	6 – 8

3.49 **Figure 9** below illustrates the locations of the existing local amenities and facilities listed in **Table 5** above.

Figure 9 – Local Facilities and Amenities



3.50 This illustrates that there are many amenities and facilities near to the allocation accessible by sustainable modes of transport, therefore reducing the reliance on private cars.

Highway Network

North Walsham

3.51 The existing highway network bounds and bisects the allocation at several points, including A149 Cromer Road, Bradfield Road, B1145 Greens Road, B1145 Aylsham Road, Skeyton Road, Tungate Road, and B1150 Norwich Road.

3.52 The A149 Cromer Road runs in a northwest-to-east direction and connects North Walsham town centre with Cromer. The B1145 Aylsham Road runs in a west-to-east direction and connects North Walsham town centre to the A140 at a priority junction, north of Aylsham. The B1150 runs north to south and connects North Walsham with Norwich running from the B1150 Norwich Road / Norwich Road / A149 signalised junction to the B1150 North Walsham Road / A1270 Broadland Northway roundabout.

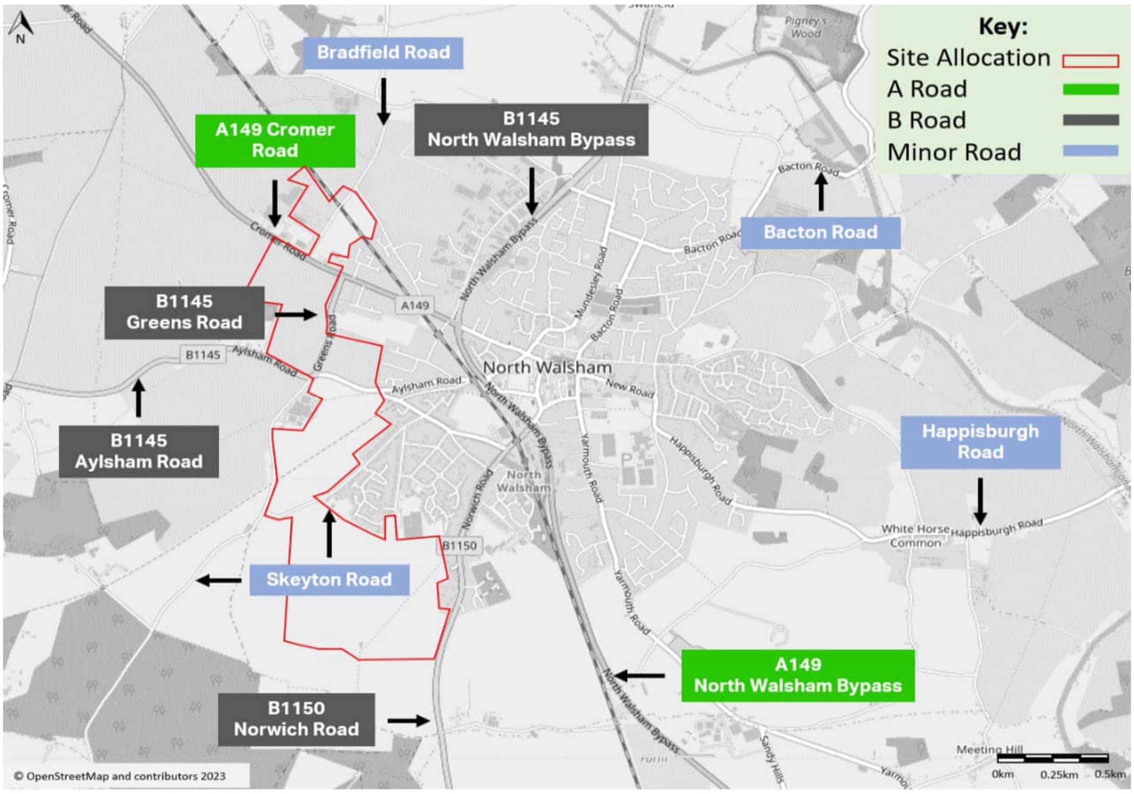
3.53 B1145 Greens Road is located within the allocation and runs north to south, connecting A149 Cromer Road and B1145 Aylsham Road at a priority junction at both points. The carriageway measures six metres wide, and there are no pedestrian facilities adjacent to the carriageway.

3.54 Tungate Road borders the allocation to the west. Tungate Road connects to the B1145 Aylsham Road, before becoming Skeyton Road after the Tungate Road / Skeyton Road priority junction to the west of the allocation. Tungate Road provides access to employment near the Skeyton Road / Tungate Road priority junction, as well as Rossis Leisure/JR's children play centre, located approximately 100 metres south of the B1145 Aylsham Road / Tungate Road priority junction.

3.55 Skeyton Road runs in a northeast-to-southwest direction, beginning at the Tungate Road / Skeyton Road priority junction and ending at the Skeyton Road / Oak Road / Station Road crossroads junction. Skeyton Road provides access to residential areas towards the crossroads junction, before becoming a 60mph speed limit countryside road with no pedestrian facilities. The road measures approximately three metres wide in the countryside, and six metres wide in the residential area.

3.56 The existing wider highway network is shown in **Figure 10** below.

Figure 10 – Highway Network



Traffic Surveys

3.57 To understand how the existing road network within North Walsham operates and to derive a baseline against which to carry out the assessment, traffic surveys were commissioned. Manual Classified Counts (MCC) and queue length surveys were undertaken on 12th, 13th, and 14th July 2022 and again on Thursday 10th November 2022. These were neutral weekdays in neutral months, as per the Transport Analysis Guidance (TAG) from the Department for Transport (DfT) and carried out between 07:00 hours and 10:00 hours and between 15:00 hours and 19:00 hours. These dates were agreed with NCC. The queue length surveys recorded queues every five minutes and the results were defined as vehicles per lane. The MCCs and queue length surveys were carried out at the 25 junctions which constitute the study area.

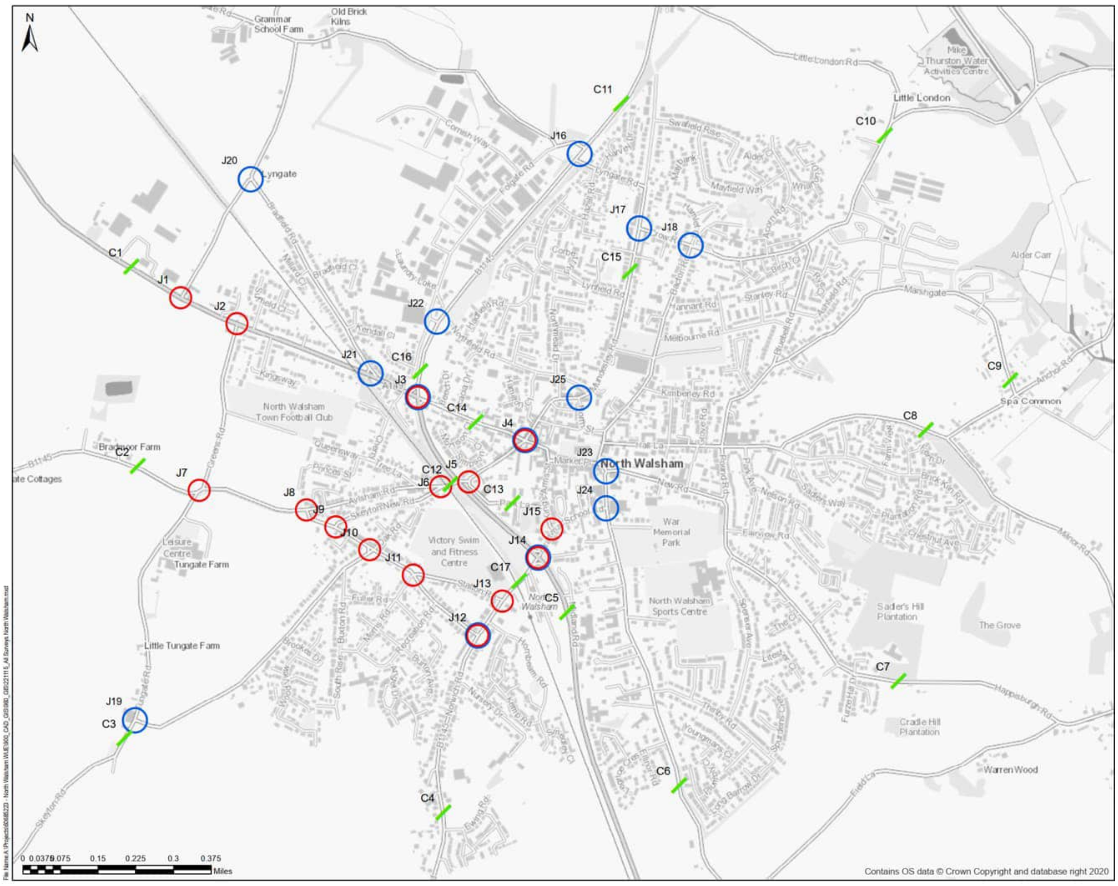
3.58 Automatic Number Plate Recognition (ANPR) surveys were also undertaken in North Walsham between 12th and 14th July. Automatic Traffic Counts (ATC) surveys were undertaken for 14-day periods in July and November. The July surveys were carried out between 8th July and 21st July 2022, whilst the November surveys were carried out between Thursday 10th and Thursday 24th November 2022, which includes the day the MCC was carried out. Queues were also recorded. The locations of the MCC surveys are listed below:

1. A149 Cromer Road / Bradfield Road – three-arm priority junction.
2. A149 Cromer Road / B1145 Greens Road – three-arm priority junction.
3. A149 / B1145 / Cromer Road – four-arm signalised junction.
4. Cromer Road / Aylsham Road / Market Street / Mundesley Road – four-arm signalised junction.
5. Aylsham Road / Park Lane – three-arm priority junction.
6. Aylsham Road / Skeyton New Road – three-arm priority junction.

7. Aylsham Road / Tungate Road / B1145 Greens Road – four-arm staggered crossroads.
8. Aylsham Road / Station Road – three-arm priority junction.
9. Station Road / Skeyton New Road – three-arm priority junction.
10. Station Road / Skeyton Road / Oak Road – four-arm crossroads.
11. Station Road / Morris Road / Millfield Road – four-arm mini-roundabout.
12. B1150 Norwich Road / Millfield Road – three-arm priority junction.
13. B1150 Norwich Road / Station Road – three-arm priority junction.
14. A149 / B1150 Norwich Road – four-arm signalised junction.
15. Norwich Road / Grammar School Road / King's Arms Street – three-arm mini-roundabout.
16. B1145 Lyngate Road / Lyngate Road / Folgate Road – four-arm staggered crossroads.
17. Crow Road / Mundesley Road – three-arm priority junction.
18. Bacton Road / Crow Road / Hamlet Close – four-arm priority junction.
19. Skeyton Road / Tungate Road – three-arm priority junction.
20. Bradfield Road / Bradfield Road – three-arm priority junction.
21. A149 Cromer Road / Bradfield Road – three-arm priority junction.
22. B1145 / Laundry Loke – three-arm priority junction.
23. Yarmouth Road / Market Place / New Road – three-arm priority junction.
24. Yarmouth Road / Grammar School Road – three-arm mini-roundabout.
25. North Street / Mundesley Road – three-arm priority junction.

3.59 The study area for North Walsham is illustrated in **Figure 11** below.

Figure 11 – North Walsham Study Area



Peak Hours

3.60 The peak hours for North Walsham have been derived from the traffic counts undertaken on the local road network, and are as follows:

- AM Peak – 08:00 hours to 09:00 hours.
- PM Peak – 16:30 hours to 17:30 hours.

3.61 Diagrams illustrating the peak hour traffic volumes and the HGV volumes during the AM and PM peak hours in North Walsham are provided in **Appendix A**, **Figures 1-4**.

Existing Traffic Patterns

3.62 In addition to the traffic surveys, a review has been undertaken of the existing traffic conditions available from Google Maps Traffic for a typical weekday (Wednesday) at 08:30 and 17:00 (mid-way points in the AM and PM peak hours). The Google Maps Traffic images can be viewed in **Figure 12** and **Figure 13**, and the key is as follows:

- Green: No traffic delays. Free flow traffic.
- Orange: Medium traffic speed.
- Red: Traffic delays. The darker the red the slower the speed of traffic on the roads.

Figure 12 – AM Peak (08:30) Traffic in North Walsham

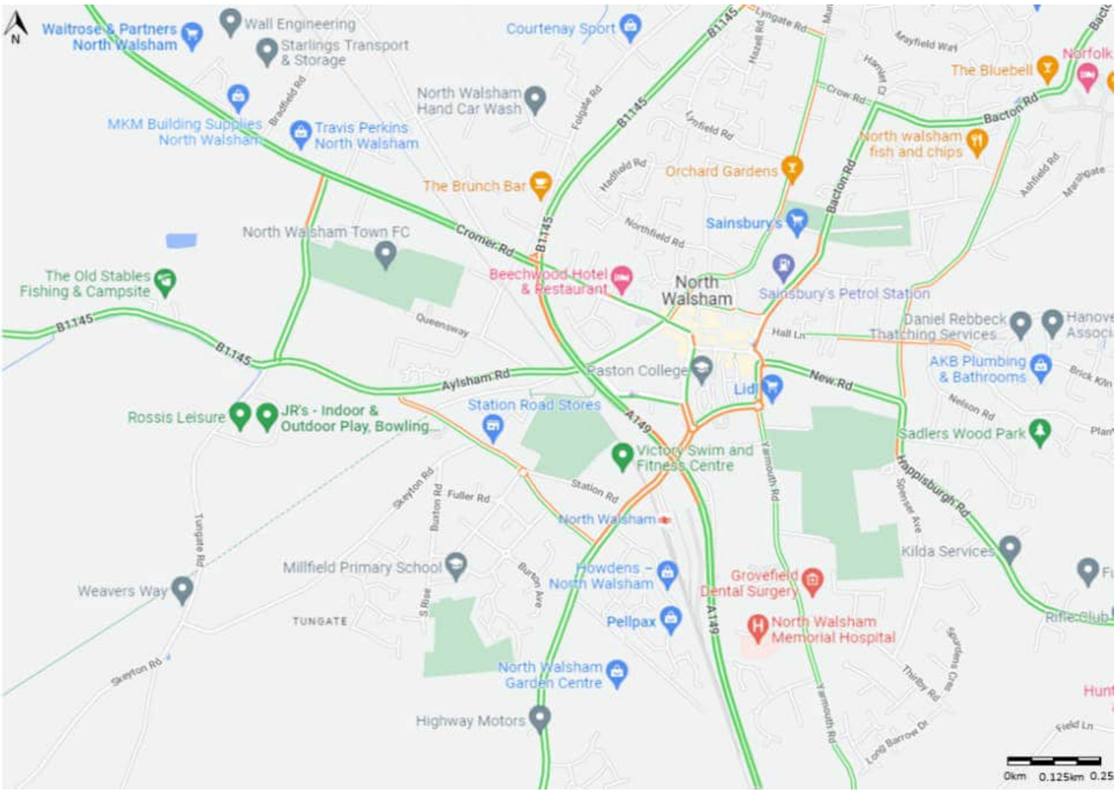
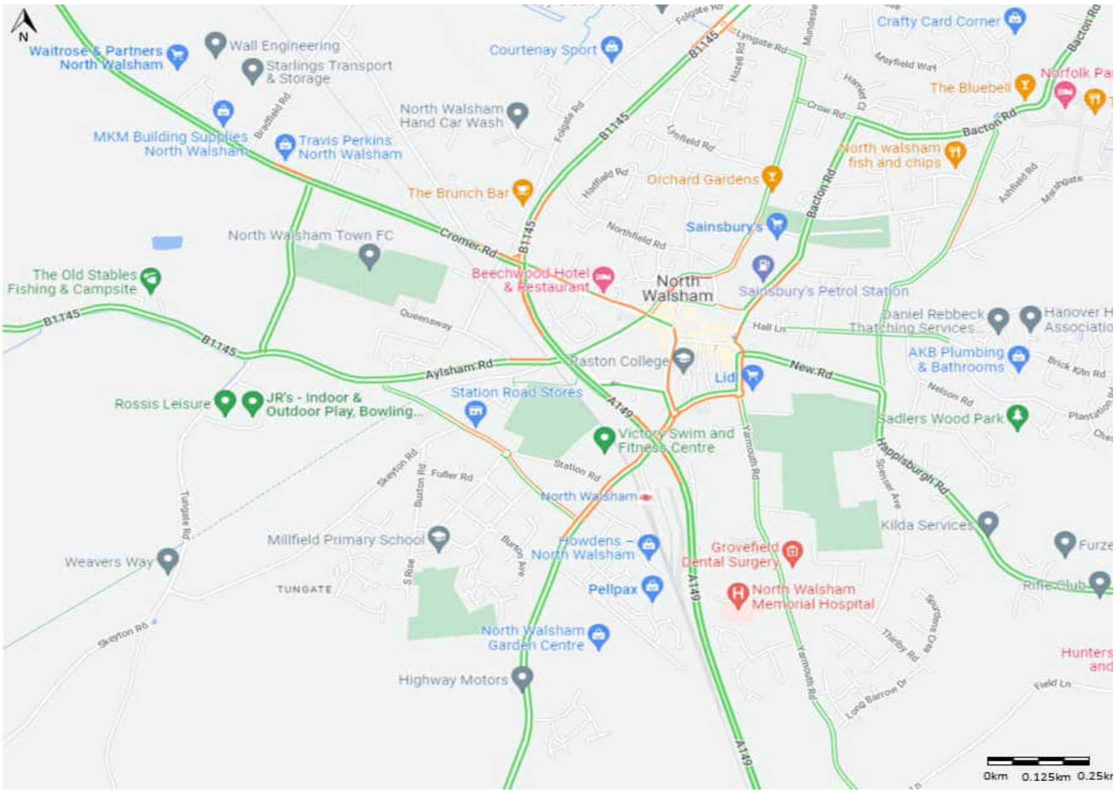


Figure 13 – PM Peak (17:00) Traffic in North Walsham



3.63 Traffic in the AM and PM peaks is generally free flowing. There are no locations experiencing regular traffic delays, though there are several areas, particularly on all arms of the A149 / B1150 Norwich Road signalised junction, where there is slower traffic speeds. Station Road towards the junction with B1150 Norwich Road also experiences medium traffic speed. The main roads around the town centre, such as King's Arms Street and Grammar School Road also experience medium traffic speed in the peaks. The A149 / B1145 / A149 Cromer Road signalised junction also experiences medium traffic speed.

Speed Analysis

3.64 The ATCs undertaken in North Walsham provided both volumetric and speed data. A review of the six ATCs undertaken on the western side of North Walsham identifies the vehicle speeds in the vicinity of the development site. The results are summarised in **Table 6** below.

Table 6 – ATC Speed Data North Walsham

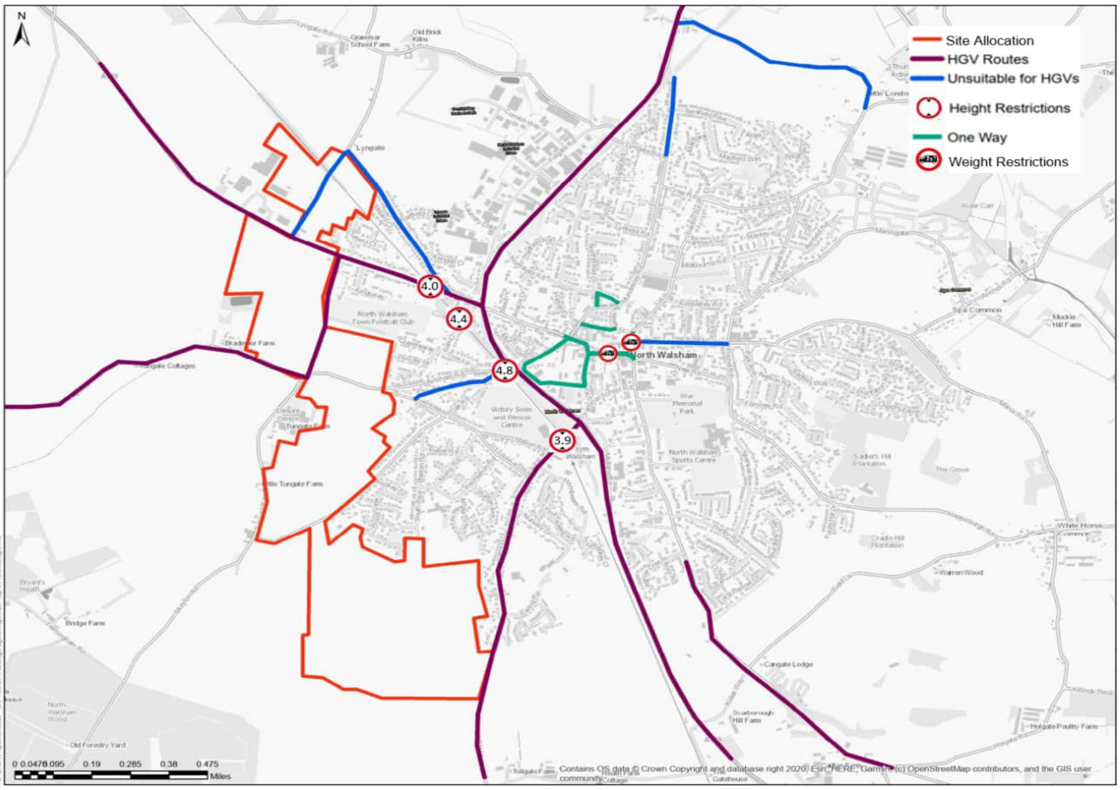
Ref	Site	Direction	Speed Limit	85% Speed	85% Speed > Limit	Mean Speed	Mean Speed>Limit
C1	A149 / Cromer Road	Eastbound	40	37.1	No	33.1	No
		Westbound		41.9	Yes	37.5	No
C2	B1145 / Aylsham Road	Eastbound	60	40.8	No	35.9	No
		Westbound		45.4	No	40.2	No
C3	Skeyton Road	Northbound	60	31.4	No	24.5	No
		Southbound		32.1	No	25.3	No
C4	B1150 / Norwich Road	Northbound	30	38.5	Yes	32.8	Yes
		Southbound		42.8	Yes	37.7	Yes
C12	Aylsham Road (Railway Bridge)	Eastbound	20	27.5	Yes	23.5	Yes
		Westbound		25.4	Yes	21.8	Yes
C17	B1150 / Norwich Road (Railway Bridge)	Northbound	30	25.0	No	20.0	No
		Southbound		27.5	No	23.8	No

3.65 This data illustrates that in most locations the 85th percentile speed and mean speed are close to the posted speed limit. The exceptions to this are along B1145 / Aylsham Rd and Skeyton Rd, where speeds are substantially below the speed limit on the outskirts of North Walsham, reflecting the design speed of the road. Also, on Aylsham Rd in the vicinity of the railway bridge, speeds are above the posted 20mph limit, suggesting that further intervention may be required in this area where pedestrians are particularly vulnerable. Along the B1150 along the southern edge of the settlement area speeds are more than the 30mph limit.

High-Sided Vehicles in North Walsham

3.66 There are several constraints for high-sided vehicles moving around North Walsham including weight and height restrictions. This increases journey times for the drivers and can inconvenience residents. NCC have identified the HGV routes in Norfolk and those relating to North Walsham are shown in **Figure 14** along with the constraints of North Walsham's highway network for high-sided vehicles.

Figure 14 – Restrictions for High-Sided Vehicles in North Walsham



3.67 This plan highlights that the B1150 and the A149 are they HGV routes promoted in North Walsham. It also highlights the bridge height restrictions which exist, with the highest clearance for HGVs between the east and west of North Walsham provided on Aylsham Road at 4.8m. Whilst Aylsham Road is not promoted as an HGV route, it is required as a route for vehicles higher than 4.0m to access North Walsham from the west.

3.68 Surveyed HGV volumes during the AM and PM peak hours in North Walsham are provided in **Appendix A** as **Figures 2 and 4**.

3.69 Video footage taken on 13th July 2022 was investigated during the AM and PM peak hours at three of the four locations with height restrictions, namely at Cromer Road, Aylsham Road, and Norwich Road. The aim was to ascertain the number of high-sided vehicles, defined as those higher than 2.9m in height, passing under each railway bridge and to better understand existing usage. The results are summarised in **Table 7**.

Table 7 – High-Sided Vehicle Observations at Railway Bridges

Railway Bridge location	AM Peak			PM Peak		
	Total High-sided vehicles	Total HGVs & PSVs	% High-sided vehicles	Total High-sided vehicles	Total HGVs & PSVs	% High-sided vehicles
Cromer Road	37	70	53%	20	38	53%
Aylsham Road	4	13	31%	6	7	86%
Norwich Road	8	34	24%	7	22	32%

3.70 Overall, the total HGV traffic was observed to be higher in the AM peak than in the PM peak. Overall, most high-sided vehicles use Cromer Road, followed by Norwich Road and Aylsham Road.

3.71 It is unsurprising that Cromer Road (A149), as the most strategic route entering North Walsham from the west of the railway line, accommodates the highest proportion of HGVs and high sided vehicles. Cromer Road leads traffic directly onto the North-South bypass of North Walsham Town. The percentage of high-sided vehicles is consistent for both time periods, at 53%.

3.72 Aylsham Road accommodates significantly fewer HGVs and high sided vehicles despite having the highest clearance height. HGV Traffic on Aylsham Road was only 13 vehicles in the AM peak, of which seven were buses, and seven in the PM peak, of which two were buses. The number of high-sided vehicles was six and four during the AM and PM peak hours respectively.

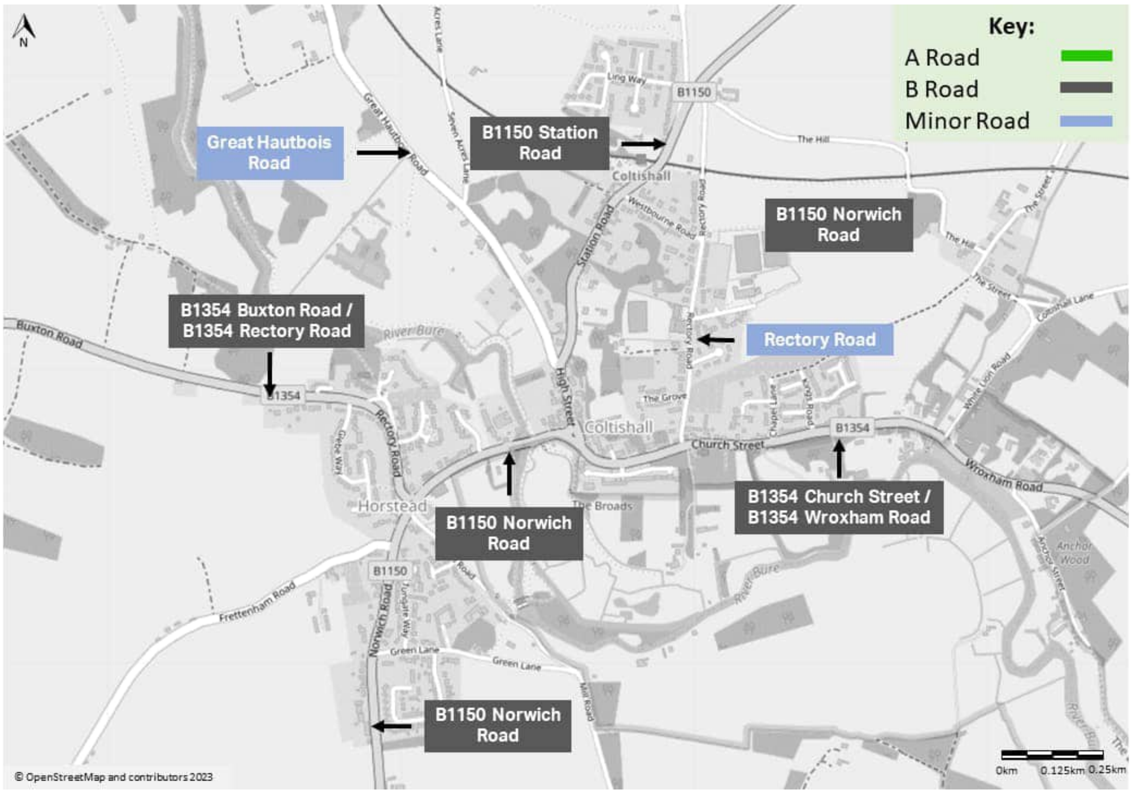
3.73 At Norwich Road, the number of high-sided vehicles was similar in both peak periods, with percentages ranging from 24% to 32% most likely limited by the lower bridge height. Approximately half of the total HGV traffic on Cromer Road and Aylsham Road consist of high-sided vehicles, however, Aylsham Road experiences much lower HGV volumes. Meanwhile, approximately a quarter of vehicles on Norwich Road during peak hours are high sided.

3.74 In the absence of an alternative route from the west across the railway line, there will continue to be a reliance on Aylsham Road as a route for HGVs higher than 4m in height. The volume of vehicles which fall in this category is shown to be very low. For the HGVs which are not 'high-sided' one can only assume that their destination sits within the town centre, requiring the use of Aylsham Road for access. Aylsham Road is also a valued route for buses in North Walsham as illustrated in **Figure 8**.

Coltishall and Horstead

3.75 One of the key routes from the allocation is via the B1150 Norwich Road which passes through the villages of Coltishall and Horstead, located some 12km south of North Walsham. The B1150 Norwich Road is a key route as it connects North Walsham with Norwich City and the A1270 Broadland Northway. Due to Coltishall and Horstead's positioning along this dominant desire line, the impact of the allocation on the villages has been raised as a concern. The Coltishall and Horstead highway network is illustrated in **Figure 15** and summarised in the following paragraphs.

Figure 15 – Coltishall and Horstead Highway Network



3.76 The B1150 passes through the centre of Coltishall forming part of the high street where on-street parking, bus stops and footways are provided. Here, it is subject to a 20mph speed limit. On-site observations and the traffic surveys have confirmed that there are occasions when vehicles are required to give-way to oncoming vehicles.

3.77 The B1150 continues towards Norwich crossing the River Bure. At the point where the road crosses the river, the bridge acts as a constraint due to being not being wide enough to accommodate a car and HGV passing. An informal give-way system when larger vehicles approach operates.

3.78 The main junction in the centre of Coltishall is the B1354 Church Street / B1150 Norwich Road / B1150 High Street / B1150 Church Street diverging priority junction. Due to the presence of a Petrol Filling Station (PFS) located in the centre of these junctions, it acts as a gyratory. No right lanes are present on the B1150 to aid vehicles and therefore blocking of through traffic can occur.

3.79 B1354 Buxton Road and B1354 Wroxham Road are located to the west and east of Coltishall respectively. B1354 Buxton Road connects Coltishall to Buxton, Scottow Enterprise Park (located at the former RAF Coltishall), and A140 Cromer Road. B1354 Wroxham Road connects Coltishall to Hoveton, Wroxham, A1151 Stalham Road, and A1062 Horning Road, which provides connections to Stalham and Horning respectively.

3.80 Great Hautbois Road runs north to south and provides another connection between Coltishall and Scottow Enterprise Park. Rectory Road is a minor road which runs north to south, connecting to the B1150 and B1354; the primary school and medical practice is accessed along this road.

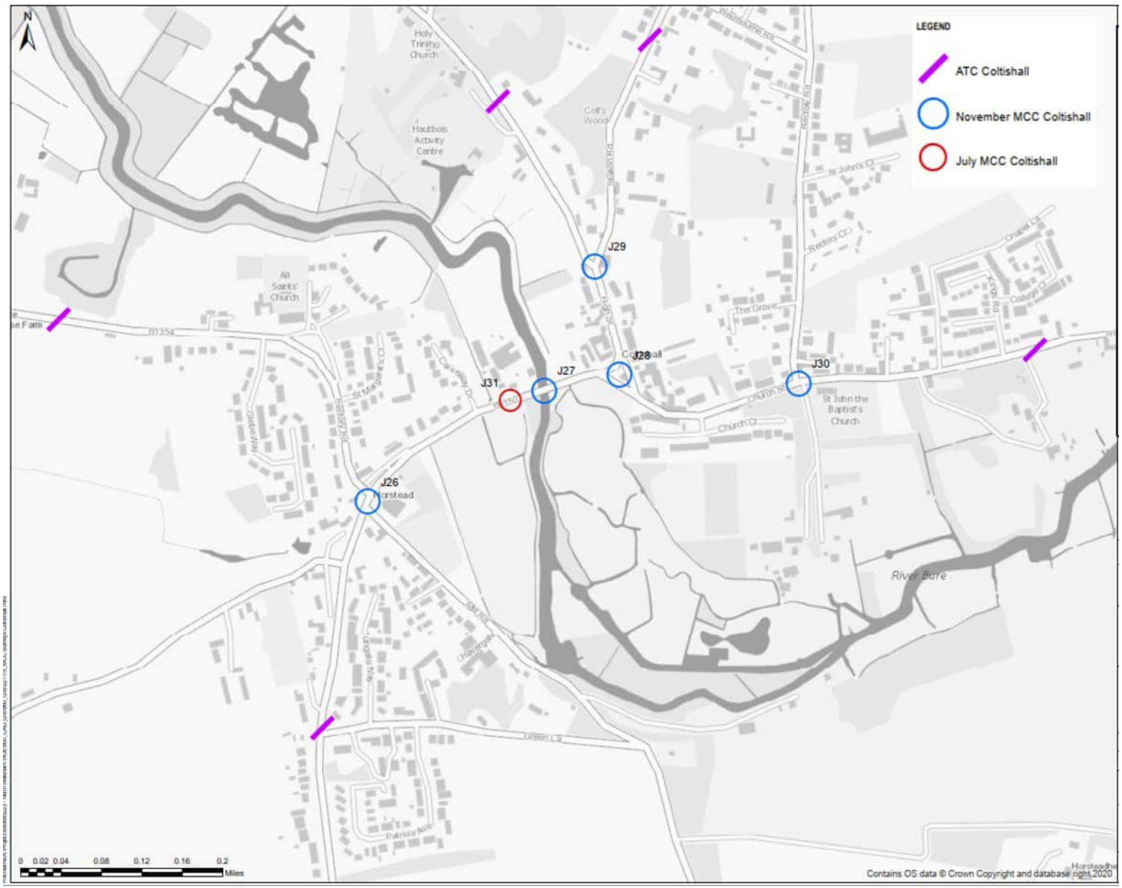
3.81 The B1150 continues south towards Norwich from the river crossing through the village of Horstead. The main junction within the centre of Horsford village is the B1150 Norwich Road / Rectory Road three-arm mini-roundabout.

Traffic Surveys

3.82 To inform the assessment and identify the baseline scenario, traffic surveys were undertaken in Coltishall and Horstead on the same days and times as those carried out in North Walsham at the locations identified below and illustrated in **Figure 16** below.

26. Combined B1354 Rectory Road / B1150 Norwich Road Mini-Roundabout and B1150 Norwich Road / Mill Road priority junction.
27. B1150 Norwich Road, on the Coltishall bridge.
28. B1354 Church Street / B1150 Norwich Road / B1150 High Street – three-arm diverging priority junction.
29. B1150 High Street / B1150 Station Road / Great Hautbois Road – three-arm priority junction.
30. B1354 Church Street / Rectory Road / Church Loke – four-arm crossroads; and
31. B1150 Norwich Road, west of the bridge.

Figure 16 – Coltishall and Horstead Study Area



Peak Hours

3.83 The peak hours for Coltishall and Horstead have been derived from the traffic surveys at Coltishall and Horstead, and are as follows:

- AM Peak – 07:45 hours to 08:45 hours.
- PM Peak – 16:30 hours to 17:30 hours.

3.84 Diagrams illustrating the traffic volumes recorded during peak hours and the HGV volumes are illustrated in Figures 31-34 in **Appendix A**.

Existing Traffic Patterns

3.85 The dominant route through Coltishall and Horstead is the B1150 which carries close to 10,000 vehicles on an average weekday, of which 2.9% comprise HGVs and Buses. This is the route that development traffic will be focussed on, en-route to Norwich and the Broadland Northway. **Table 8** below illustrates the daily traffic data results for the traffic counter positioned to the North of Coltishall along the B1150.

Table 8 – 2022 Annual average Daily Traffic B1150, North of Coltishall

ATC Site	AADT Two Way All Vehicles	Daily Two Way HGVs	% HGVs	Daily Two Way HGV + PSVs	% HGV + PSVs
B1150 North Walsham Road (north of Coltishall)	9779	281	2.9%	286	2.9%

3.86 This volume of traffic is quite typical for a B road and the quantum of HGVs is relatively low.

3.87 Google Maps has been reviewed to understand the existing traffic condition in terms of the flow of traffic. Using the same criteria as that set for North Walsham, the resulting Google Maps images are set out in **Figure 17** and **Figure 18**.

Figure 17 – AM Peak (08:15) Traffic Conditions in Coltishall and Horstead

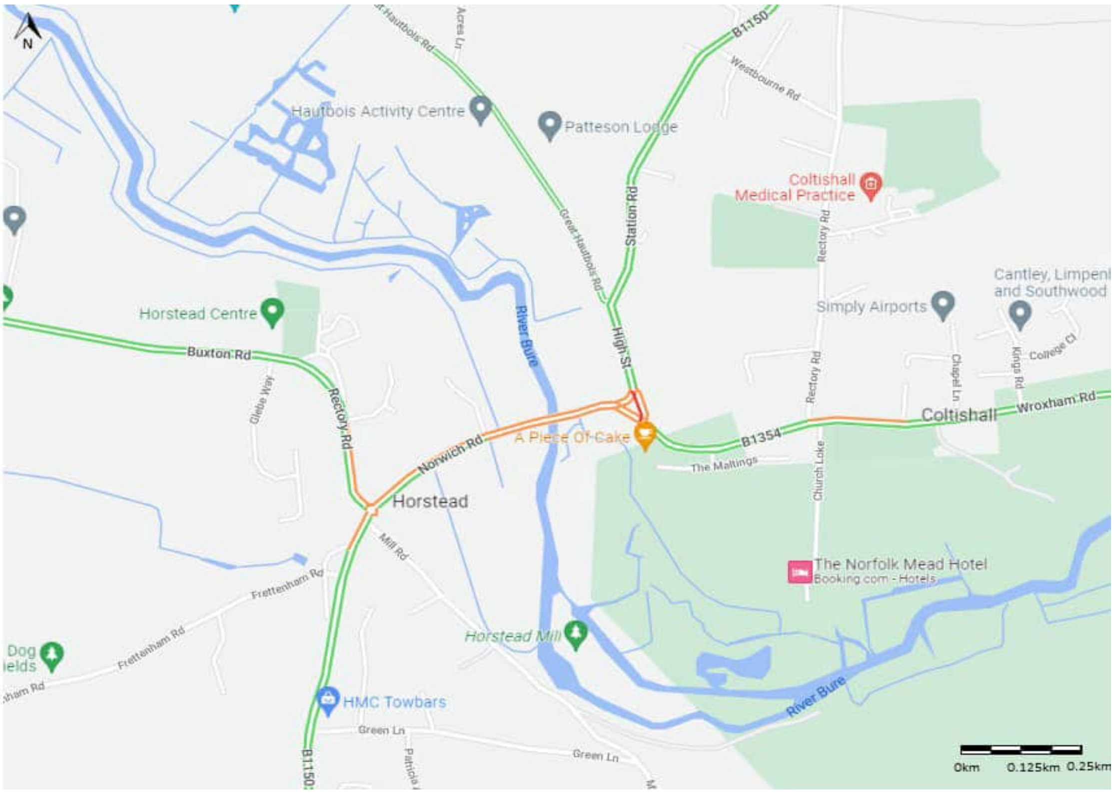
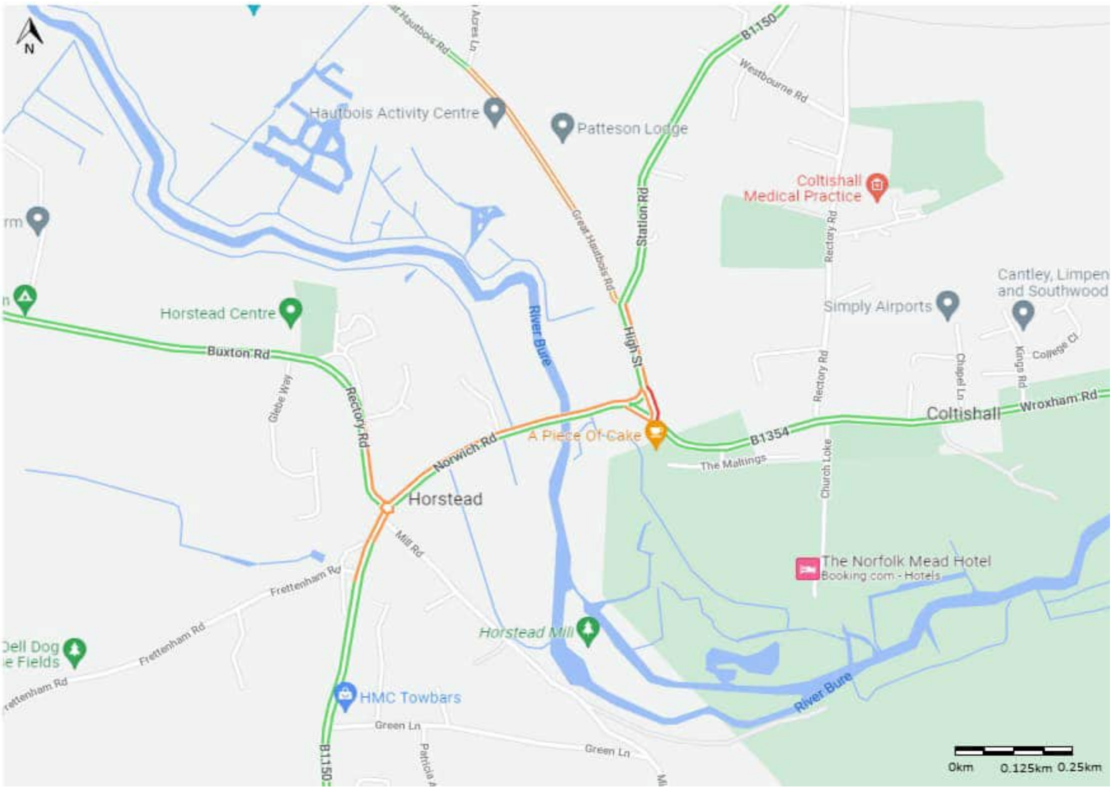


Figure 18 – PM Peak (17:00) Traffic Conditions in Coltishall and Horstead



3.88 Slower moving traffic is observed to occur on the B1150 High Street and Norwich Road in both the AM and PM however it is observed to cover a greater distance in the PM peak. This was observed to be caused by right-turning vehicles at the gyratory blocking northbound through traffic.

Speed Analysis

3.89 The ATCs undertaken in Coltishall and Horstead provided both volumetric and speed data. A review of the five ATCs undertaken in Coltishall and Horstead has been carried out and the results are summarised in **Table 9** below.

Table 9 – ATC Speed Data Coltishall and Horstead

Site	Direction	Speed Limit	85% Speed	85% Speed > Limit	Mean Speed	Mean Speed>Limit
B1150 North Walsham Road	Northbound	30	32.5	Yes	28.4	No
	Southbound		31.0	Yes	27.4	No
Great Hautbois Road	Northbound	40	38.5	No	32.5	No
	Southbound		39.5	No	33.0	No
B1354 Wroxham Road	Eastbound	30	35.6	Yes	29.9	No
	Westbound		31.9	Yes	26.1	No
B1150 Norwich Road (Horstead)	Northbound	30	35.1	Yes	30.5	Yes
	Southbound		35.8	Yes	30.9	Yes
Rectory Road	Eastbound	30	44.5	Yes	37.4	Yes
	Westbound		45.1	Yes	38.8	Yes

3.90 The results of the speed analysis indicate that generally traffic speeds within Coltishall and Horstead are close to the posted speed limit when the 85%tile speeds are considered. The mean speeds illustrate that generally speeds in Coltishall are below the posted speed limit. The mean speeds recorded at the two sites in Horstead however indicate that vehicles are, generally, travelling at speeds some 7mph to 8mph over the speed limit on Rectory Road whilst on the B1150 Norwich Road they are marginally faster than the posted speed limit. It is worth noting that the ATC site in Horstead was located close to the change in speed limit at the edge of the village.

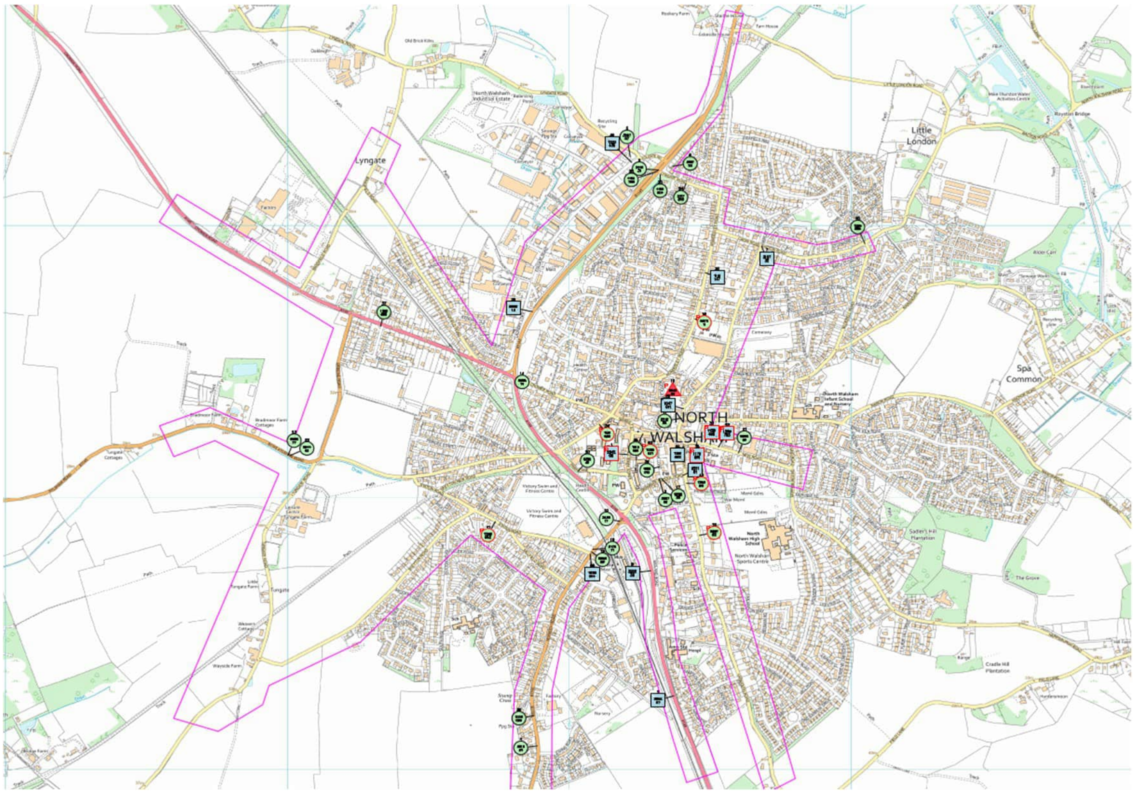
Personal Injury Accident Analysis

3.91 Personal Injury Accident (PIA) data has been obtained from NCC for the most recently available five-year period (1st April 2018 to 31st March 2023). The road network study area covers the west of North Walsham and the main roads and junctions that are being assessed in North Walsham and Coltishall and Horstead. It should be noted that the data provided by NCC reflects what is reported to Norfolk Police.

North Walsham

3.92 A plan showing the extent of the accident study area for North Walsham and the accidents within it is presented in **Figure 19** below. The purple boundary indicates the study area.

Figure 19 – PIA Locations – North Walsham. Source: NCC.



3.93 A summary of the PIAs by location and severity is provided below in **Table 10** below.

Table 10 – PIA Results – North Walsham

Type	Location	Slight	Serious	Fatal	Total Accidents
Link	Kings Arms Street	0	1	0	1
Link	A149	0	2	0	2
Junction	Grammar School Road / Bank Loke	2	0	0	2
Junction	B1145 / Folgate Road	1	0	0	1
Junction	Bacton Road / Crow Road	0	1	0	1
Junction	B1145 / Lyngate Road	2	0	0	2
Junction	A149 / B1150 Norwich Road	1	0	0	1
Junction	Church Street / Hall Lane	1	0	0	1
Junction	A149 Cromer Road / A149 / B1145 / Cromer Road	1	0	0	1
Junction	B1150 / Station Road	1	1	0	2
Link	North Street	0	0	1	1
Link	Mundesley Road	1	1	0	2
Junction	Grammar School Road / Yarmouth Road	0	1	0	1
Link	B1150 Norwich Road	2	0	0	2
Link	Park Lane	1	0	0	1
Link	New Road	1	0	0	1
Link	B1145 Aylsham Road	2	0	0	2
Link	Lyngate Road	2	0	0	2
Junction	B1145 / Laundry Loke	0	1	0	1
Link	Market Place	2	0	0	2
Junction	Church Street / Bacton Road	0	1	0	1

Type	Location	Slight	Serious	Fatal	Total Accidents
Link	Bank Loke	1	0	0	1
Link	New Road	0	3	0	3
Link	Aylsham Road	1	0	0	1
Junction	A149 Cromer Road / Kingsway	1	0	0	1
Link	Folgate Road	1	1	0	2
Junction	B1150 / Lammas Road	1	0	0	1
Link	Bluebell Road / Bacton Road	1	0	0	1
Link	Station Road	1	0	0	1
Link	Yarmouth Road	2	1	0	3
	Total	**29**	**14**	**1**	**44**

3.94 A total of 44 PIAs were recorded within the study area during the five-year period assessed. Of these, 14 PIAs resulted in serious injuries and 29 PIAs resulted in slight injuries. One of the accidents was classified as fatal. No one single location saw significantly more accidents than elsewhere, with low levels of accidents occurring at multiple locations across the study area.

3.95 One accident which resulted in a fatality occurred on North Street in the centre of North Walsham. The accident was a collision between a car and a pedestrian. Unfortunately, the pedestrian died and from the details provided it is unclear what the causation factors for the accident were.

3.96 There were two accidents which occurred within proximity of the allocation land. Both accidents occurred on the B1145 Aylsham Road, approximately 25 metres west of the junction with B1145 Greens Road. The accidents were classified as slight in terms of severity, and it is noted from the available data that they occurred a day after each other. One of the accidents occurred at night and involved a car swerving to avoid hitting a deer, resulting in the car hitting a metal post and ending up in a ditch. The other was caused by a brake failure on a vehicle travelling at speed on the bend, which resulted in the driver over-correcting, and the vehicle hitting the verge, before landing in a ditch. Neither accident is considered to have occurred because of highway design.

3.97 One accident occurred on Aylsham Road. It was slight in severity and involved a car and a pedestrian. The driver of a recently parked car exited their vehicle and was hit by a passing car who did not have sufficient time or space to avoid the collision (based on the police report). The accident was recorded as occurring in the narrow one-way section east of the railway line, approximately 75 metres from the junction with Market Street and Cromer Road. No other accidents were recorded on Aylsham Road.

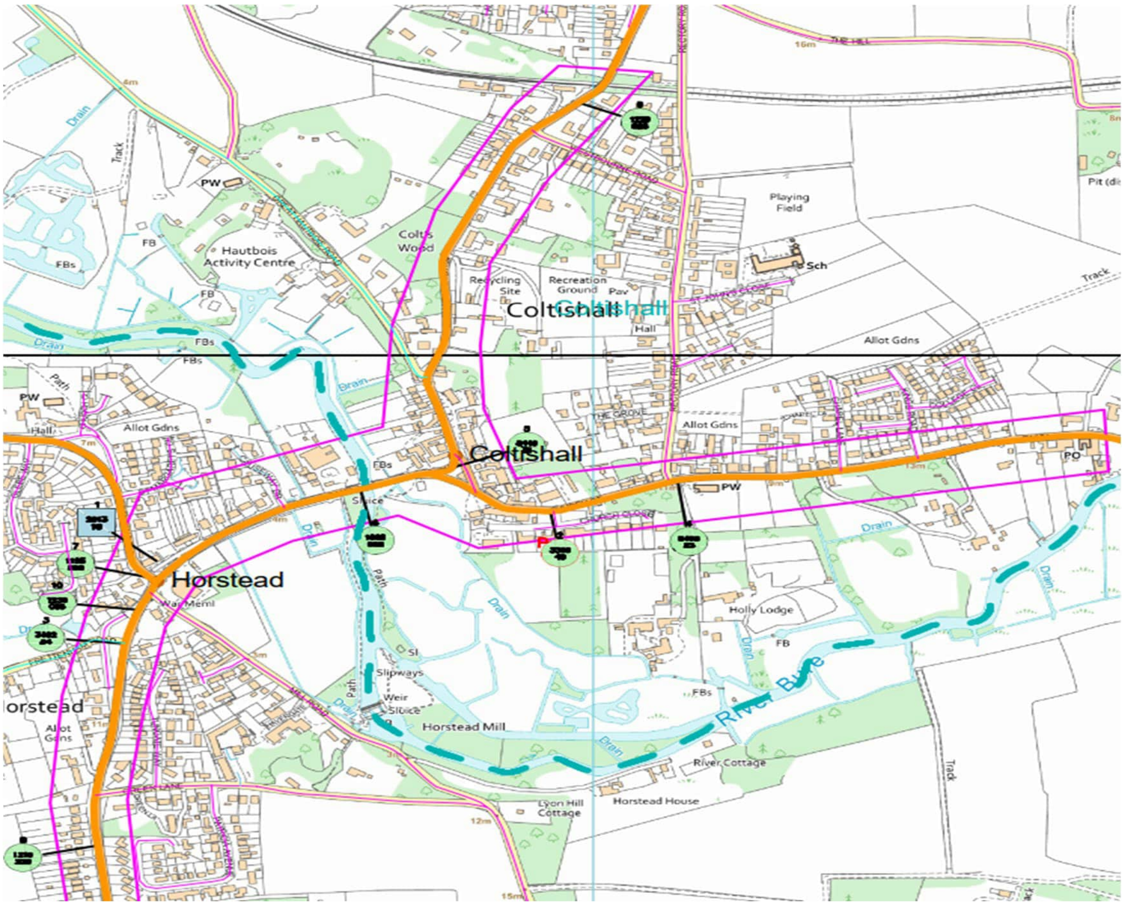
3.98 No accidents occurred at the locations of the new access junctions for the proposed link road or along the existing sections of carriageway which pass through the allocation site.

3.99 Overall, a total of 44 PIAs were recorded within the study area in the last five-year period, covering 29 slight, 14 serious, and one fatal accident. The analysis outlined above does not indicate any prevailing road safety issues in the area that need to be considered.

Coltishall and Horstead

3.100 A plan showing the extent of the accident study area for Coltishall and Horstead and the accidents within it is presented in **Figure 20** below. The purple boundary indicates the study area. Like North Walsham, the accident data was obtained from NCC and represents those accidents which have been reported to the Police during the most recent five-year period.

Figure 20 – PIA Locations – Coltishall and Horstead. Source: NCC



3.101 A summary of the PIAs by location and severity is provided below in **Table 11** below.

Table 11 – PIA Results – Coltishall and Horstead

Type	Location	Slight	Serious	Fatal	Total Accidents
Junction	B1354 Church Street / Church Close	1	0	0	1
Junction	B1150 Norwich Road / Frettenham Road	1	0	0	1
Link	B1354 Church Street / Rectory Road	1	0	0	1
Link	B1150 High Street, near PFS	1	0	0	1
Link	B1150 Norwich Road (Coltishall)	1	0	0	1
Link	Rectory Road (Horstead)	1	0	0	1
Link	B1150 North Walsham Road	1	0	0	1
Link	B1150 Norwich Road (Horstead)	2	0	0	2
	Total	**9**	**0**	**0**	**9**

3.102 All the accidents recorded within the study area illustrated in **Figure 20** were classified as slight in terms of their severity with no serious or fatal accidents recorded within the five-year period reviewed. One accident illustrated on the plan was classified as serious however a review of the detail for the accident confirms that it did not occur at the location identified but on Coltishall Road east of Coltishall, some 2.75km from the centre of Horstead. This accident, although shown on the figure, has been discounted from the analysis.

3.103 The recorded accidents are shown to spread across the study area with the greatest number occurring in Horstead with three occurring on the B1150 between its junctions with Frettenham Road and Rectory Road, approximately 115 metres.

3.104 One accident, classified as slight in terms of severity, occurred on the B1150 near to the PFS and close to where mitigation (described later in this TA) is proposed to be undertaken. The accident involved a vehicle which had overrun the centre line and its mirror had collided with the oncoming vehicle whose driver side window was open at the time of impact.

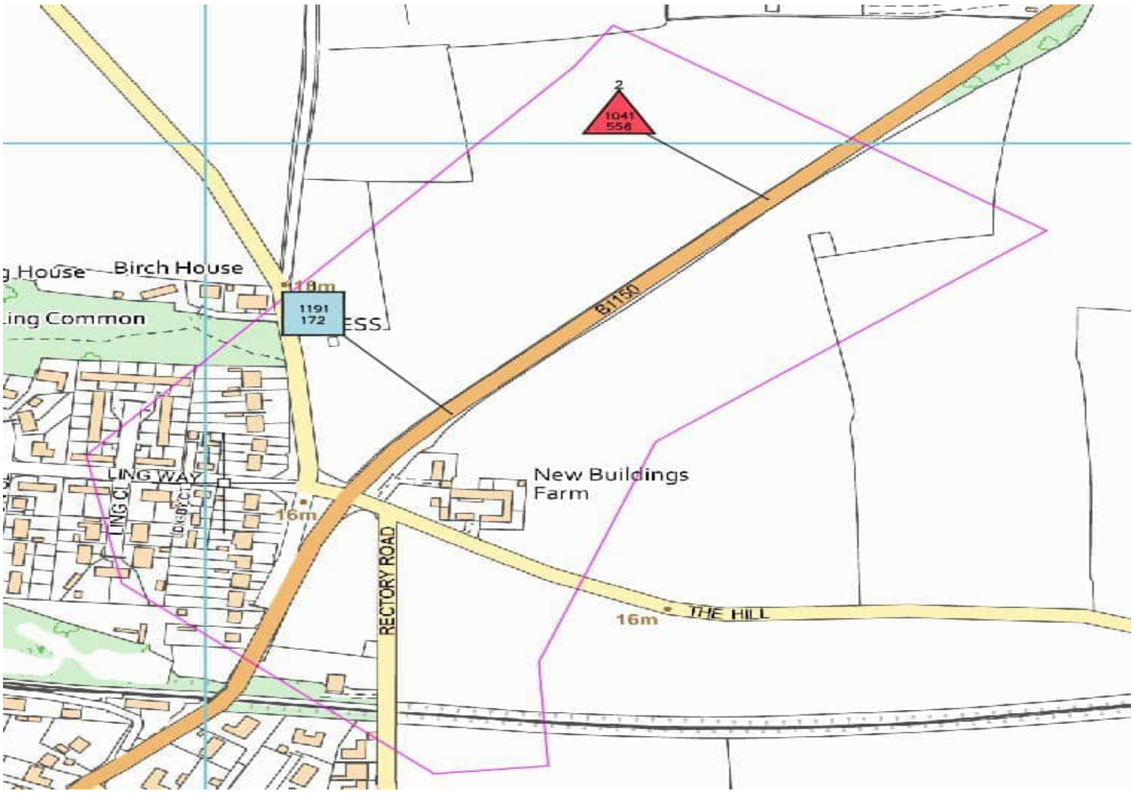
3.105 A single accident within the study area was recorded as involving a pedestrian. This occurred at the junction of B1354 Church Street and Church Close where a car collided with a pedestrian when trying to pass an obstruction in the carriageway. The accident was classified as slight in terms of severity.

3.106 The accident recorded occurring by the river bridge on the B1150 was classified as slight in terms of severity. The details state that an ambulance on an emergency call was utilising the full width of the carriageway resulting in an oncoming vehicle misjudging the width available and reversing into the following vehicle.

3.107 No accidents were recorded on High Street.

3.108 Following discussions with BDC and the representatives of Coltishall, an additional area has been reviewed. This area covers the section of highway to the north of the railway bridge and includes B1150 North Walsham Road and its junctions with Ling Way, The Hill, and Rectory Road. **Figure 21** below illustrates the accidents which have been reported to the Police in the last five-year period in this area.

Figure 21 – Additional PIA Locations – Coltishall. Source: NCC



3.109 This illustrates that two accidents were recorded, one was classified as serious and involved a motorcycle colliding with slowing traffic in a southbound direction whilst the second accident, unfortunately resulted in a fatality. The accident which is shown to have occurred on the B1150 North Walsham Road, approximately 450 metres north of the junction with Ling Way, involved a cyclist colliding with the rear of a stationary vehicle. No further accidents were recorded in this area.

Baseline Modelling

3.110 As part of early discussions with NCC, it was agreed that it would be more beneficial in identifying the impact of the allocation for a micro-simulation model be built for North Walsham using VISSIM software. A SATURN model had been built previously for North Walsham for high level work undertaken by NCC however this was not found to be acceptable for use for assessing the impact of the allocation given that it was high level, built for a strategic purpose, and based on information collated during the Covid-19 pandemic.

3.111 In addition to the VISSIM model for North Walsham, at the request of NCC and NNDC, a separate VISSIM model has been built for Coltishall and Horstead to allow identification of the impact of the allocation on the village. Although Coltishall and Horstead are circa 11km from the allocation site it is considered that the impact of the proposed allocation is such that mitigation may be required.

3.112 The existing conditions in North Walsham, and Coltishall and Horstead were replicated using the extensive data set and geometric information to reflect the existing road network conditions using VISSIM. VISSIM is a very useful tool to model accurately non-standard road layouts, such as in market towns like North Walsham and villages like Coltishall and Horstead. Equally it is a tool that can reflect behaviour across the road network, allowing traffic to redistribute depending on conditions, where route choice exists. It also allows for the interaction of traffic between junctions.

3.113 For each of the VISSIM models built, a Local Model Validation Report (LMVR) has been prepared. The LMVR documents the data collection and analysis, the development of the network and the base year demand along with the calibration / validation details. A copy of the LMVRs prepared for North Walsham and Coltishall and Horstead are included at **Appendix B**.

3.114 The LMVR for North Walsham concludes that:

- The town experiences some congestion around the signalised junctions and the town centre roads with queues often building up in these areas during the AM and PM peak times. However, these queues are not too extensive with vehicles usually progressing through signalised junctions in a single cycle, with minimum impacts on nearby junctions.
- The base models have been calibrated and validated against the observe traffic flow and journey time data in line with the required criteria set out in DfT TAG and best practice. The calibration / validation results exceed the requirements for turning counts and journey times and the models are therefore closely alignment with observed data. The models also replicate observed queuing patterns and specific behaviours observed from video footage.
- The base models therefore provide a close representation of the queues and delays in the North Walsham network as well as the observed driver behaviour and are fit for purpose of testing future traffic levels / patterns or potential changes to the road network.

3.115 The LMVR for Coltishall and Horstead concludes that:

- In the AM period, there is a small amount of congestion on the eastbound approach to the PFS due to the vehicles waiting to turn right into the B1354 whilst in the PM period parked vehicles on the B1150 High Street, adjacent to the war memorial were seen to cause a significant amount of queuing, particularly in the southbound direction due to the blocking of through traffic.
- The base models have been calibrated and validated against the observed data in line with the required criteria. The calibration / validation results exceed the requirements for turning counts and journey times and the models are therefore closely aligned with observed data. The models also replicate observed queuing and patterns well. The models are therefore validated to industry standard guidelines.
- The base models provide a close representation of the queues and delays in the networks as well as the observed driving behaviours in the area and are fit for the purpose of testing future traffic levels / patterns or potential changes to the road network.

3.116 Both models have also taken account of the on-street parking, courtesy/give-way behaviours, restrictions on route choice and narrowings to the carriageways to ensure that vehicular flow within North Walsham, and Coltishall and Horstead is as representative as it is daily.

3.117 The base models for North Walsham, and Coltishall and Horstead have therefore been taken forward and utilised in the assessment of the allocation’s impact on the road network in each location.

4. Development Proposals

Introduction

4.1 This chapter provides an outline of the allocation proposals, including access, and car and cycle parking.

Development Proposals

4.2 As set out in Chapter 1, the allocation is located on 108.3ha of land to the west of North Walsham, and predominantly used for agricultural purposes. The site location within North Walsham is illustrated in **Figure 1**.

4.3 The allocation as set out in the policy (NW62/A) would provide:

- Approximately 1,800 dwellings.
- 7ha of serviced employment land.
- Green infrastructure.
- Community facilities, including a new primary school.
- A road linking Norwich Road, Cromer Road, and the industrial estate.

4.4 The illustrative masterplan identifying land parcels and their uses is shown in **Figure 22** below and included as **Appendix C**.

Figure 22 – Illustrative Masterplan

Source: Bidwells

Phasing

4.5 The Housing Trajectory from the emerging NNDC Local Plan has been considered realistic in terms of the housing delivery rate for the allocation. It is based on two developers producing approximately 50 dwellings per annum, with the additional delivery of a 60-bed care facility in 2029/30, 2032/33, and 2035/36. The Housing Trajectory has been replicated in **Table 9** below. This has been utilised for determining the number of dwellings likely to come forward in the first assessment year however it is noted that the final number in each year is subject to change and further review by NNDC.

Table 12 – Housing Trajectory from Emerging NNDC Local Plan for Allocation NW62/A

	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34	2034/35	2035/36	2036+
Units	30	60	100	160	100	100	160	100	100	160	1,037
Cumulative Total	30	90	190	350	450	550	710	810	910	1,070	2,107

Link Road and Junctions

4.6 As part of the allocation proposals, several highway infrastructure improvements are proposed, these include:

- A new link road connecting A149 Cromer Road and B1150 Norwich Road;
- A new four arm roundabout on the A149 Cromer Road at the current junction with Bradfield Road, which will provide the fourth arm;
- A new three arm roundabout on the B1150 Norwich Road;
- A new staggered signalised junction where the link road connects with B1154 Aylsham Road with pedestrian and cyclists crossing facilities. This is aimed at breaking the through route along Aylsham Road to reduce through vehicle speeds, and to discourage through traffic from using Aylsham Road;
- Pedestrian and cyclist facilities will be provided along the length of the link road. These will be provided in accordance with LTN 1/20;
- Vehicular through traffic will be prohibited on Skeyton Road at the point where it crosses the link road. Pedestrian and cyclist access along Skeyton Road will be maintained. This is to discourage through traffic on Skeyton Road which serves as a local access road to existing residences;
- Greens Road will be maintained up to the boundary of the existing residential development, after this point the road will be stopped up;
- A new vehicular access to the Football Club would be provided from the link road reducing reliance on Greens Road and connecting the Football Club with the new Development area;
- Realignment of the carriageway at the B1154 Aylsham Road / Tungate Road junction to enable provision of the staggered signalised junction;
- Access for residential parcels north of the railway line provided along Bradfield Road; and
- Widening of Bradfield Road with HGV access available for the section between the new four-arm roundabout and the plot immediately southwest of the railway bridge to allow access to the employment area. HGV access beyond this point will be restricted, as at present. The carriageway width on Bradfield Road north over the railway bridge and along the allocation site frontage will remain as at present, with land provision for future widening if a northern extension of the link road to the North Walsham Industrial area comes forward to its existing width and signage as per that provided currently on Bradfield Road.

4.7 The design parameters for the link road have been based on the required technical design standards and feedback from NCC who were consulted as part of the development process. **Table 13** below sets out the design parameters established for the link road the proposed junctions at A149 Cromer Road, B1145 Aylsham Road, Skeyton Road, and B1150 Norwich Road.

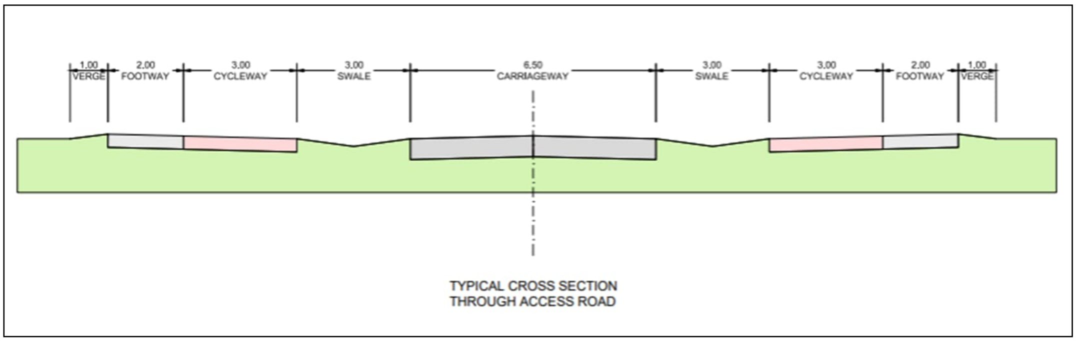
Table 13 – Design Parameters for the Link Road

Parameter	Design Brief	Achieved Design Parameter
Design Code	DMRB CD 109	DMRB CD 109 Table 2.10
Design Speed	30mph (70kph)	40mph (70kph), with speed reducing curves. Proposed speed limit set to 30mph, with 20mph zone in place in front of school and local centre
Road classification	'B' class road	
Road type	Single carriageway to DMRB Cycleway and footways to LTN 1/20	Single carriageway 6.5 wide 2 x 3m wide cycleways (1 each side) 2 x 2m wide footways (1 each side) 2 x 3m swales (1 each side) 2 x 1m grass verges (1 each side)
Roundabouts	Designed to DMRB CD 116 Geometric Design of Roundabouts	
A149 / Link Road		Designed to DMRB CD 116 50m ICD (subject to further modelling) 2 lane approaches on A149 east and west arms, link road south arm 1 approach on Bradfield Road
B1150 / Link Road		Designed to DMRB CD 116 50m ICD (subject to further modelling) 2 lane approaches on B1150 north and south arms, link road west road
Junctions	Designed to DMRB CD 123 Geometric design at-grade priority and signal-controlled junctions	
B1145 Aylsham Road / Link Road		Designed to DMRB CD 123 Signal controlled staggered crossroads junction (subject to further modelling) 2 land approaches on each arm
Pedestrian / Cycle Crossings	Designed to LTN 1/20 Cycle Infrastructure Design	Designed to LTN 1/20
Weavers Way / Link Road	Uncontrolled Parallel Crossing as requested by the PRoW team.	Parallel Crossing

4.8 This illustrates that the link road through the allocation would be provided in accordance with the requirements of DMRB and LTN 1/20. Further detailed design of the link road in accordance with the guidance will be undertaken as the project moves forward.

4.9 An indicative cross section for the proposed link road through the development site is illustrated in **Figure 23** below.

Figure 23 – Indicative Link Road Cross Section



Sustainable Transport Facilities

4.10 The new road will also be an attractive main residential street through the allocation, balancing the needs of traffic and active travel. The internal layout will be designed such that vehicles are directed to A149 Cromer Road to the north and B1150 Norwich Road to the south, ensuring the link road is the main pedestrian and cycle corridor.

4.11 The proposed link road is being designed to physically accommodate buses and HGVs, to ensure the site is permeable to public transport, and to provide a suitable HGV route for north south HGV traffic to the west of North Walsham.

4.12 Facilities for pedestrians and cyclists will be provided within the allocation in accordance with the requirements set out by LTN 1/20 as per **Table 13**. These include two-metre footways and three-metre cycleways provided along the link road and Tiger crossings provided along the access road where routes cross the link road. This will designate an active travel corridor, with allowance for pedestrians and cyclists, segregated from motorised traffic. The connections and improvements are set out in the Sustainable Access Strategy.

4.13 Bus stops and a bus interchange will be provided within the allocation to assist with bus-based travel whilst the pedestrian and cycle routes to the train station will be improved to encourage travel by train.

4.14 Further detail relating to the Sustainable Transport Strategy for the allocation is set out in **Chapter 5**.

Community Facilities

4.15 A new two-form entry primary school will be a core component of the masterplan. The school is broadly located at the centre of the site, alongside the local centre and allotments to create a hub of local services for the allocation. Further to this, additional facilities will be provided within the Local Centre which have not yet been confirmed.

4.16 Additionally, sports provision is proposed and is to be located adjacent to the existing North Walsham Town Football Club, in line with the site allocation policy.

4.17 Employment land has also been identified, focused on the northern section of the allocation.

Parking

Car Parking

4.18 Car parking provision for the allocation will be provided in accordance with the guidelines applicable at the time. The current parking standards are set out in NCC's 'Parking Guidelines for New Developments in Norfolk' (2022) document. The relevant car parking standards for the uses anticipated at the allocation are set out in **Table 14**.

Table 14 – NCC Car Parking Standards (2022)

Use Class	Car Parking Standard	Accessible Parking
Offices, Research & Light Industry	1 space per 30m^2	200 vehicle bays or less = 2 bays or 6% of total capacity Over 200 vehicle bays = 6 bays plus 2% of total capacity
General Industrial		
Storage and Distribution	1 space per 150m^2	
Residential 1 bedroom unit	1 space per dwelling	Individual merit
Residential 2- or 3-bedroom unit	2 spaces per dwelling	
Residential 4 or more-bedroom unit	3 spaces per dwelling	
Primary School	1 space per 1 full-time teaching staff + 1 space per classroom, plus provision for public/school transport	1 bay or 6% of total capacity, whichever is greater

4.19 The parking standards for residential development are minimums whilst other uses are recommended standards which should be applied. The guidance states that parking at destinations should be constrained to encourage greater use of more sustainable modes of transport whilst parking at origins should be provided to ensure that there is sufficient to cater for car ownership levels.

Electric Vehicle Provision

4.20 For the Government to reach its 'Road to Zero' goal involving the ending the sale of new petrol and diesel vehicles by 2035, new developments will require electric car chargers by law. The allocation will seek to maximise provision for electric vehicles with provision made for charging vehicles in all areas of the site. The exact nature of the provision will be identified at the time of any application but will be in line with at least the guidance current at the time.

Powered Two-Wheeler Parking

4.21 Powered Two-Wheeler (PTW) parking provision for the allocation will be provided in accordance with the guidelines applicable at the time of application. NCC's 'Parking Guidelines for New Developments in Norfolk' (2022) document is the current guidance document and the relevant PTW parking standards for the uses anticipated within the allocation are set out in **Table 15**.

Table 15 – NCC PTW Parking Guidelines (2022)

Use Class	PTW Parking Standard
Offices, Research & Light	1 space, + 1 per 20 car spaces (for 1st 100 car spaces) then 1 space per 30 car spaces (over 100 car spaces)
General Industrial	
Storage and Distribution	
Residential 1 bedroom unit	N/A
Residential 2- or 3- bedroom	
Residential 4 or more-	
Primary School	1 space + 1 per 20 car spaces (for 1st 100 car spaces), then 1 space per 30 car spaces (over 100 car spaces)

Cycle Parking

4.22 Cycle parking provision for the allocation will be provided in accordance with the guidelines applicable at the time of application. This is currently NCC's 'Parking Guidelines for New Developments in Norfolk' (2022) document. The relevant cycle parking standards for the uses anticipated at the allocation are set out in **Table 16**.

Table 16 – NCC Cycle Parking Guidance (2022)

Use Class	Cycle Parking Standard
Offices, Research & Light Industry	1 space per 100m^2 for staff plus 1 space per 200m^2 for visitors
General Industrial	
Storage and Distribution	1 space per 500m^2 for staff plus 1 space per 1000m^2 for visitors
Residential 1 bedroom unit	4.23 2 secure covered spaces per dwellings. None if garage of secure area is provided within curtilage of dwelling
Residential 2- or 3-bedroom unit	
Residential 4 or more-bedroom unit	
Primary School	1 space per 5 staff plus 1 space per 10 pupils

5. Sustainable Transport Strategy

Introduction

5.1 This section outlines the proposed sustainable transport strategy for the allocation, including a review of the existing facilities to key locations in North Walsham, identifying any deficiencies, and potential improvements which could be implemented to increase the use of active and sustainable travel for the allocation.

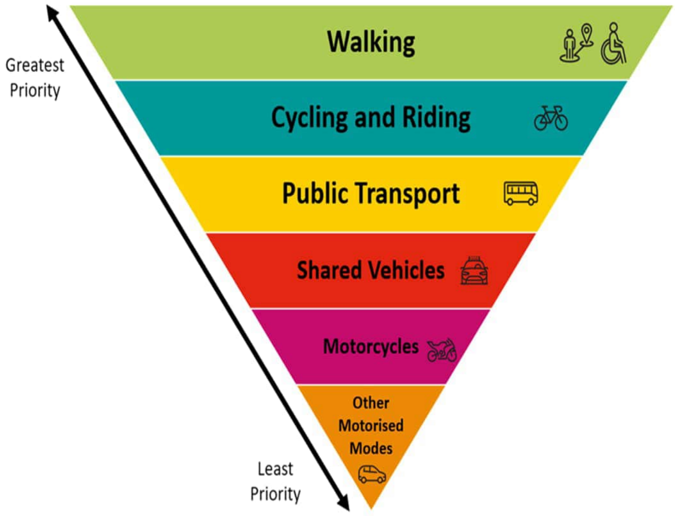
5.2 The existing baseline conditions for walking, cycling, and public transport have been discussed in detail in the **Existing Conditions** section.

5.3 The design ethos behind the transport strategy for the allocation aims:

- To enable safe, direct, and accessible movement for people throughout and, to and from, the allocation site.
- To provide options for travel in line with urban transport hierarchy for the private car.
- The design of all proposed infrastructure to correspond with the latest policy and guidance document (e.g., Manual for Streets, DMRB, LTN 1/20).

5.4 The urban transport hierarchy prioritises walking, cycling, and public transport over single occupancy private car trips. This is the guiding philosophy behind the transport strategy for the allocation. The hierarchy is illustrated on **Figure 24**.

Figure 24 – Mode of Transport Hierarchy



5.5 This has been considered, alongside the following three stage approach to identifying the transport strategy for the allocation:

- Stage 1 – Limit the need for Travel.
    - Create neighbourhoods.
    - Provide access to local services.
    - Provide for digital needs to minimise the need for travel.
- Stage 2 – Promote Sustainable Travel
    - Provide for sustainable travel for all trips.
    - Promote sustainable through a TP and Demand Management
- Stage 3 – Cater for the highway residual capacity needs to ensure safe operation of the road network.

5.6 The strategy set out in the following sections is a result of considering the transport hierarchy and three stage approach with respect to the existing conditions within North Walsham.

Walking and Cycling Strategy

Desire Lines

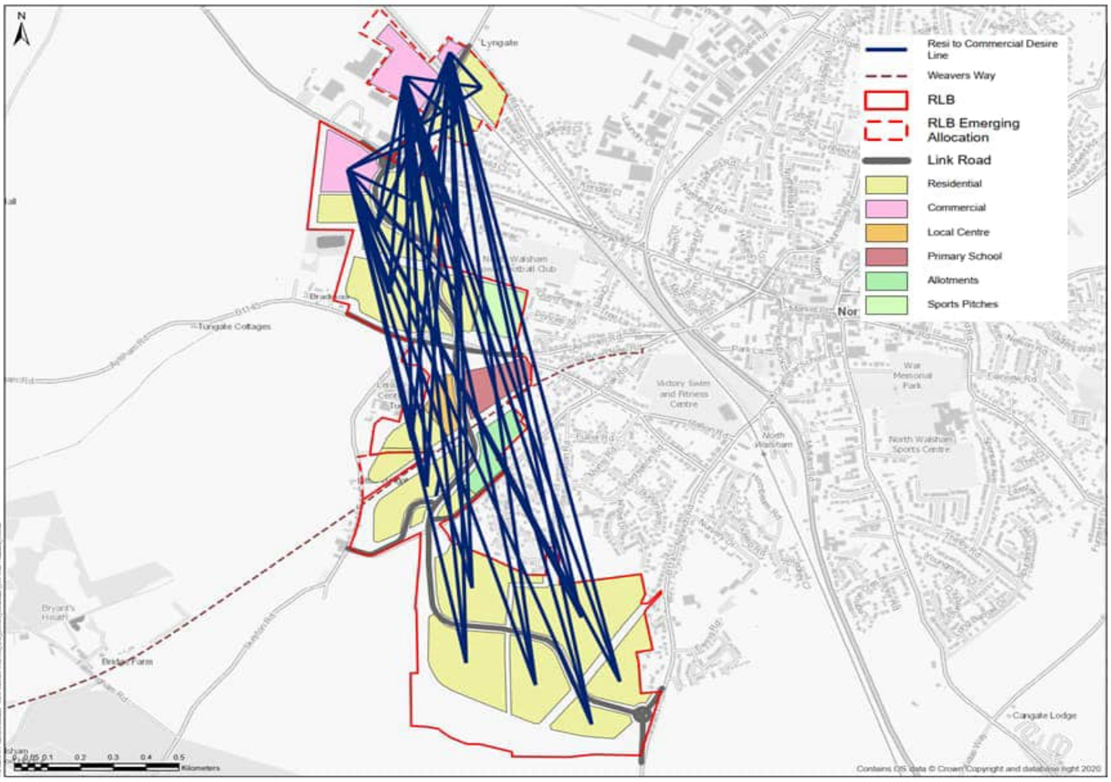
5.7 This section outlines the internal and external desire lines for movement from proposed allocation land to key destinations.

Internal

Residential to Commercial

5.8 The residential-to-commercial desire lines are shown in **Figure 25** below.

Figure 25 – Internal Desire Lines - Residential to Commercial



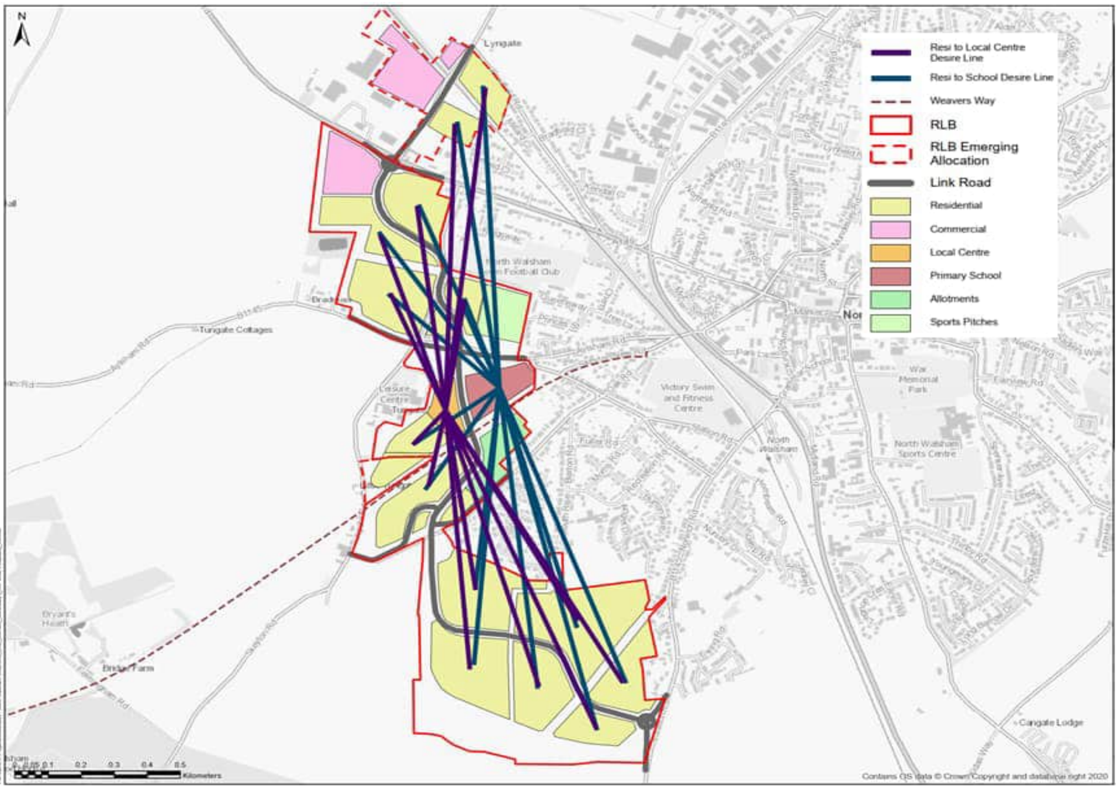
5.9 The onsite desire lines generally run in a north-south direction and follow the route of the link road.

5.10 Some of the residential parcels in the southern section of the allocation have a desire line through the existing residential area in the west of North Walsham, such as through South Rise, Skeyton Road, and Station Road. The indicative routes from these parcels would be through the potential connection onto South Rise, then Station Road, and Aylsham Road, connecting onto the link road to the employment areas.

Residential to Local Centre/School

5.11 The residential to local centre and school desire lines are shown in **Figure 26** below.

Figure 26 – Internal Desire Lines - Residential to Local Centre and School



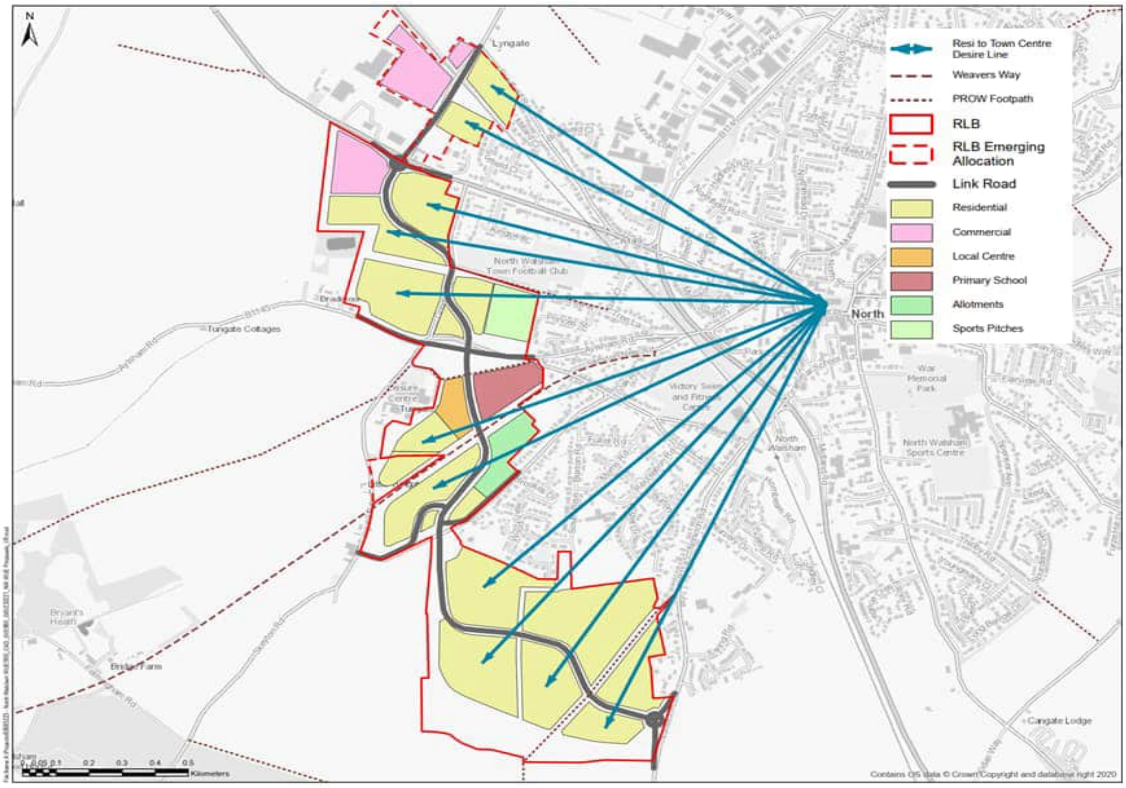
5.12 The desire lines broadly run in a north-south direction, except for the residential parcels in the central section which broadly run in an east-west direction. The residential parcels in the northern section of the development's desire lines run through Kingsway and North Walsham Town Football Club, with an alternative provided along the link road to the west. Some residential parcels in the southern section of the allocation's desire lines run through the residential area adjacent to the site. There is an alternative route along the link road to the west.

External

Residential to Town Centre

5.13 The residential to town centre desire lines are shown in **Figure 27** below.

Figure 27 – External Desire Lines - Residential to Town Centre



5.14 The desire lines from the residential parcels to the town centre vary across the allocation. In the southern section of the allocation, the desire lines run in a northeast-southwest direction, through the residential areas off Station Road, across the railway. Due to the railway line, the most direct route would be along B1150 Norwich Road and into the town centre along Grammar School Road.

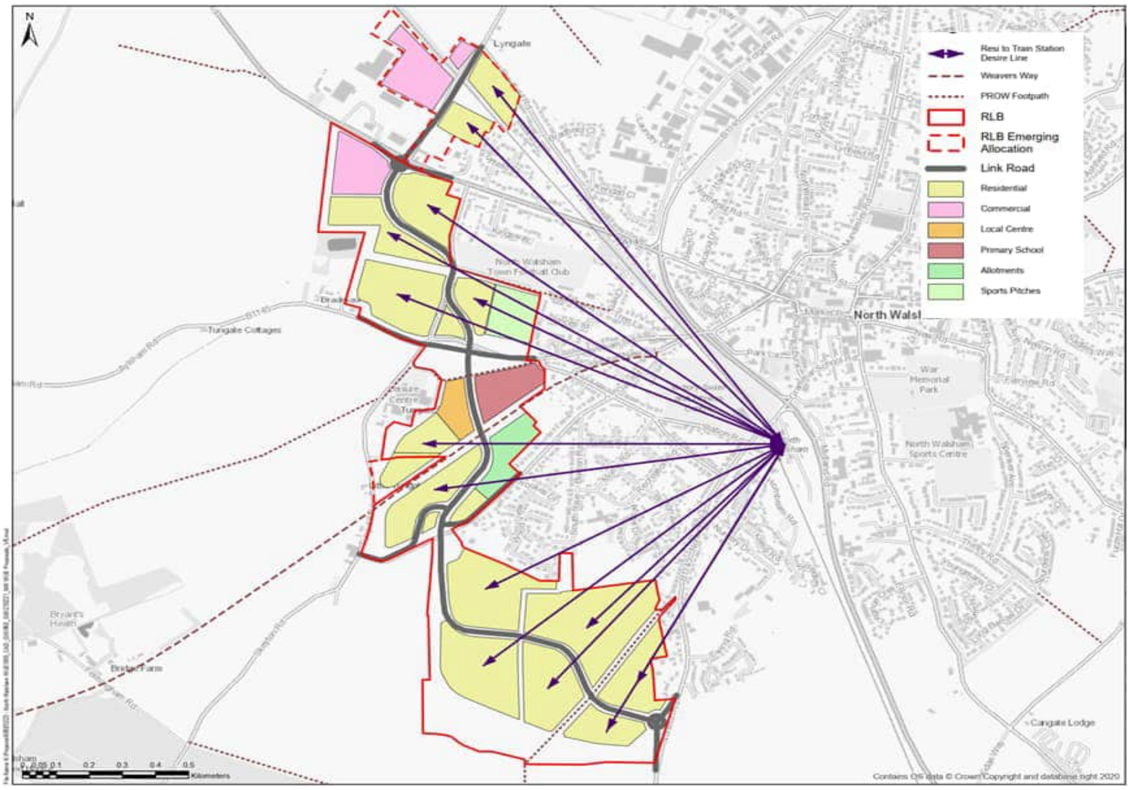
5.15 The desire lines for the central section of the allocation run generally in an east-west direction. The two residential parcels' desire lines run along Skeyton Road and Oak Road before crossing the railway line. Weavers Way runs directly along the desire line most central to the site.

5.16 The desire lines for the northern section of the allocation run almost parallel to A149 Cromer Road, with a suitable option being along Bradfield Road and A149 Cromer Road into the town centre.

Residential to Rail Station

5.17 The desire lines for movement between the residential areas to North Walsham rail station desire lines can be seen in **Figure 28** below.

Figure 28 – External Desire Lines - Residential to Train Station



5.18 The desire lines to the rail station from the residential parcels vary depending on the section of the allocation. The southern section's desire lines run in a northeast-southwest direction, with several of the desire lines running along B1150 Norwich Road, which is a potential route to the rail station. An alternative route for the residential parcels located in the west of the southern section could be along South Rise, Recreation Road, and Millfield Road.

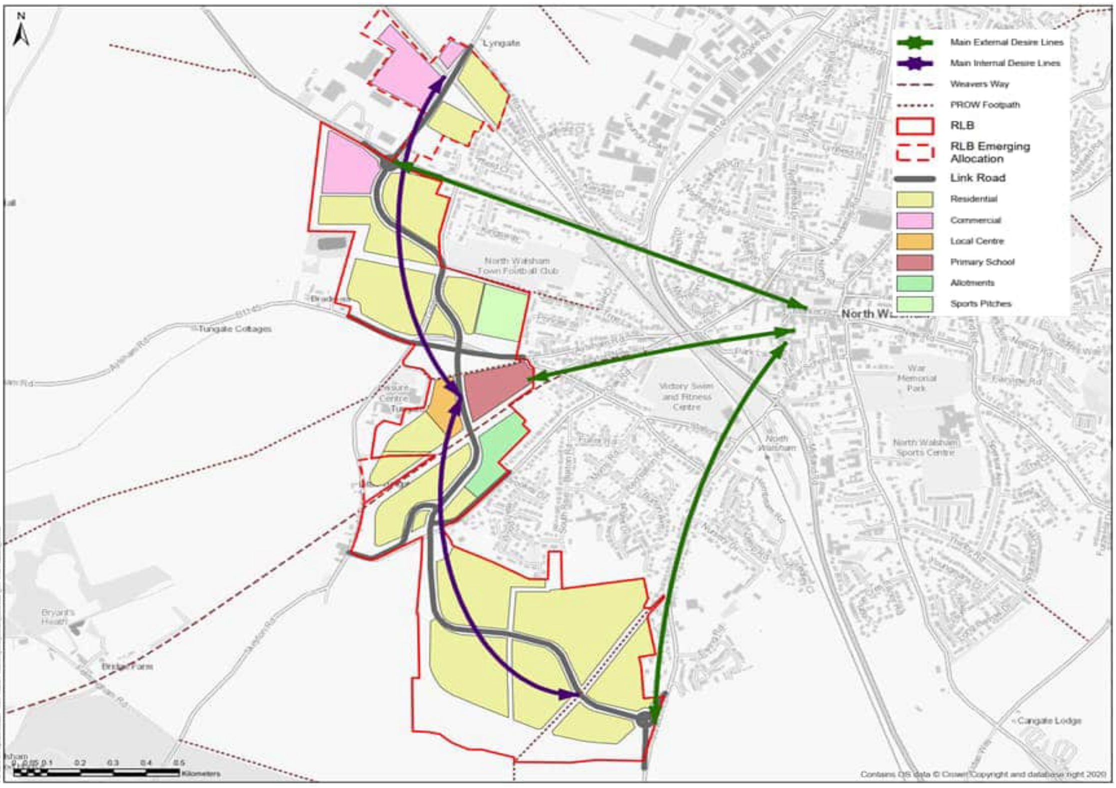
5.19 From the central section of the allocation, the desire lines run directly in an east-west direction, through the existing residential area to the east of the central section. There is no direct route along these desire lines, with the most suitable alternative being along Skeyton Rd, Skeyton New Road, Station Road, and B1150 Norwich Road. An alternative is also Weavers Way which connects to an existing north south route along the A149 North Walsham Bypass connecting to the station.

5.20 The northern section of the allocation has two desire lines to the train station. These desire lines run parallel to the railway line, with an almost unobstructed route along the footpath which runs adjacent to A149 North Walsham Bypass. This would be a suitable route to the train station.

Summary

5.21 In summary, the main pedestrian and cycle desire lines for the allocation site are shown below in **Figure 29**.

Figure 29 – Main Internal and External Desire Lines



5.22 From a review of the desire lines internal and external to the allocation, there are three defined corridors for journeys external to the allocation and one within the site. The desire line within the site generally follows the alignment of the link road whilst the three main external desire lines follow the corridors along the A149 Cromer Road, Aylsham Road, and B1150 Norwich Road.

Off-Site Walking and Cycling Strategy

Key Pedestrian Routes

5.23 The existing pedestrian routes to the town centre, train station, and high school, as three key destinations have been assessed with the aim of identifying any deficiencies which need to be addressed, opportunities for improvement or barriers preventing ta route from being suitable.

5.24 **Table 17** below identifies the opportunities for improvement along the key existing pedestrian routes. The key to **Table 17** is as follows:

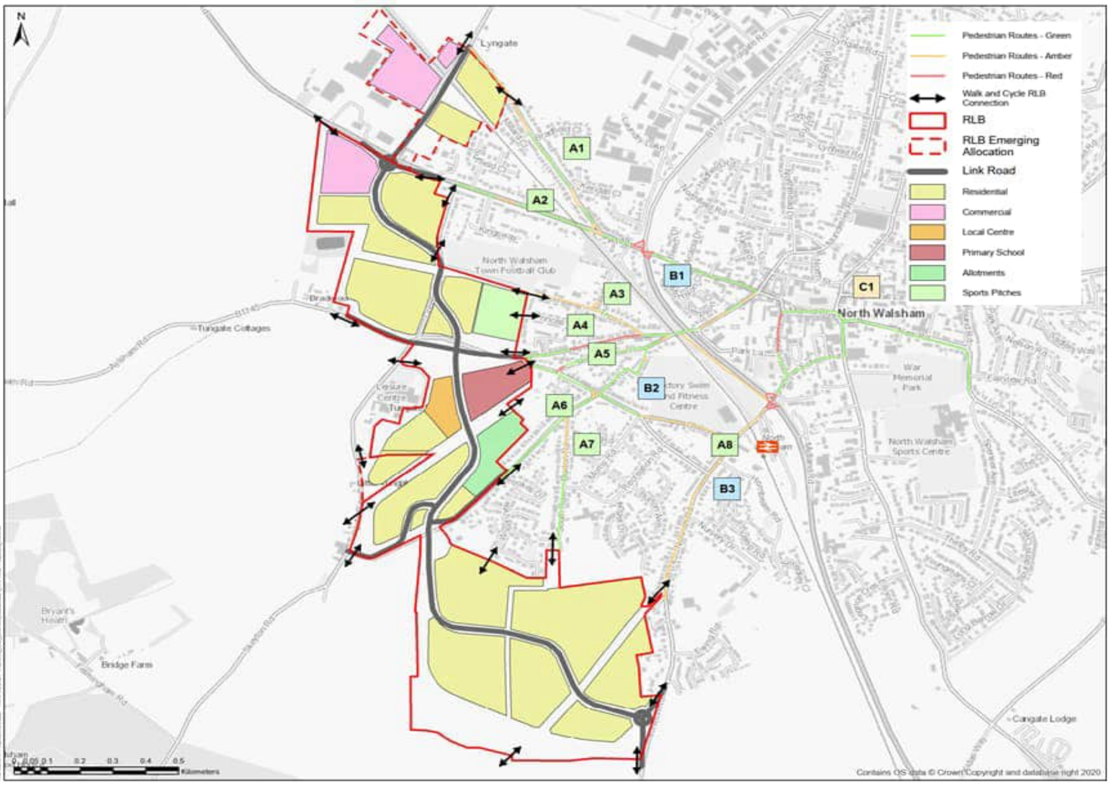
No Issue	**Moderate Issue**	**Significant Issue**

Table 17 – Existing Pedestrian Route Opportunities for Improvement

Destination	Route	Map Ref.	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6
Town Centre (Market Place)	Bradfield Road – Cromer Road	A1	Bradfield Road: Sections with missing footway on north and south sides of the highway.		Bradfield Road / Cromer Road junction: Unclear pedestrian crossing location.	Cromer Road / NW Bypass signalised junction: Pedestrians must cross in multiple sections. Only part of one of the crossings is signalised for pedestrians.		
	Cromer Road	A2	Cromer Road: Section of missing footway on south side of the highway.	Cromer Road: Pedestrians must cross the busy A149 – limited crossing facility.				
	Queensway – Cherry Tree Lane – Aylsham Road	A3	Queensway: Section of missing footway on north side of the highway.	Queensway / Cherry Tree Lane junction: Pedestrians must cross here – unclear crossing location and limited visibility.	Cherry Tree Lane: Section of missing footway on south side of the highway.		Aylsham Road: Sections with missing footway on south side of the highway.	Aylsham Road: Section with very narrow footway on north side of the highway.
	Aylsham Road	A4	Aylsham Road: Section of missing footway on both sides of the highway – pedestrians are required to walk on the carriageway.					
	Weavers Way – Skeyton New Road – Aylsham Road	A5	Weavers Way: narrow route, surface is not asphalt, not overlooked, shared with cycles.	Weavers Way at Station Road: No crossing facility to continue Weavers Way.		Skeyton New Road / Aylsham Road junction: Pedestrians must cross here - limited crossing facility and visibility.		
	Skeyton Road – Oak Road – Skeyton New Road – Aylsham Road	A6		Skeyton Road / Oak Road junction: Unclear crossing location.	Oak Road: section of missing footway at north end of route – pedestrians are required to walk on the carriageway (quiet road).			
	South Rise – Buxton Road – Skeyton Road – Oak Road – Skeyton New Road – Aylsham Road	A7	South Rise: Section of missing footway on west side of the highway.					
	Norwich Road – King's Arms Street	A8	Norwich Road: Vehicles parked on the footway in all years available on Google Street View, limiting or blocking pedestrian movement.	Norwich Road: Section of missing footway on west side of the highway.	Norwich Road / NW Bypass signalised junction: Pedestrians must cross in multiple sections. Only one crossing is signalised for pedestrians.	King's Arms Street: Section with no or very narrow footways on both sides of the highway. (An alternative route of a similar distance is however available via Grammar School Road and Bank Loke).		
Rail Station	Shared Facility on Bypass (join from Cromer Road or Aylsham Road)	B1	Cromer Road / NW Bypass signalised junction: Pedestrians must cross in multiple sections. Unsignalised for pedestrians making the crossing to / from the shared facility.	Shared facility alongside bypass: narrow route, unbound surface, not overlooked, shared with cycles.	Shared facility along bypass at Aylsham Road: Pedestrians must cross here – limited crossing facility and visibility.	Norwich Road / NW Bypass signalised junction: Pedestrians must cross in multiple sections. Unsignalised for pedestrians making the crossing to / from the rail station.		
	Station Road – Norwich Road (join from Aylsham Road, Weavers Way or Skeyton Road)	B2	Station Road: Sections with missing footway on one side of the highway.					
	Norwich Road	B3	Norwich Road: Parked cars on footway.	Norwich Road: Section of missing footway on west side of the highway.	Footway on Norwich Rd under railway bridge is narrow. No scope to widen. Station access constraints increase use of this footway.			
High School	New Road (join from Market Place or Yarmouth Road)	C1	N/A					

5.25 The opportunities for pedestrian improvements have been mapped to outline the locations where proposed improvements should be focussed. The locations where there are no, moderate, and significant issues can be seen in **Figure 30** below.

Figure 30 – Pedestrian Routes RAG



5.26 It should be noted that there are additional / alternative connections which can be made to the adjacent residential areas which will be reviewed in further detail. These connections will not just assist in connecting the development with the town but enable existing residents to utilise the facilities proposed on the allocation land such the school, local centre, and bus interchange.

Key Cycle Routes

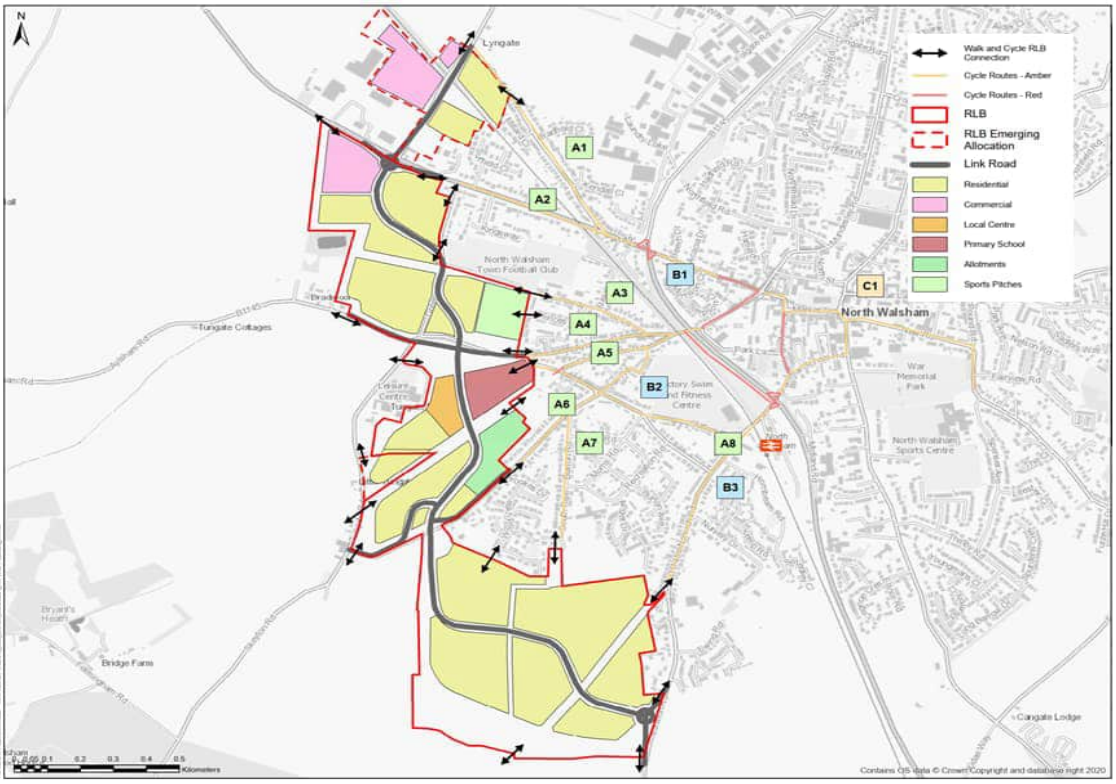
5.27 The key cycle routes to the town centre, train station, and high school from the indicative connection points from the allocation have also been assessed and **Table 18** below identifies the opportunities for improvement along these key existing cycle routes. The key is the same as that utilised for **Table 17**.

Table 18 – Existing Cycle Route Opportunities for Improvement

<table>
<tr><th>Destination</th><th>Route</th><th>Map Ref.</th><th>Issue 1</th><th>Issue 2</th><th>Issue 3</th><th>Issue 4</th><th>Issue 5</th><th>Issue 6</th></tr>
<tr><td rowspan="8">Town Centre (Market Place)</td><td>Bradfield Road – Cromer Road</td><td>A1</td><td>No dedicated cycle facilities on route.</td><td rowspan="2">Cromer Road near Market Street: One-way street – outbound direct route is not possible.</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Cromer Road</td><td>A2</td><td>No dedicated cycle facilities on route.</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Queensway – Cherry Tree Lane – Aylsham Road</td><td>A3</td><td>No dedicated cycle facilities on route.</td><td>Cherry Tree Lane / Aylsham Road junction: Junction with limited visibility.</td><td></td><td></td><td rowspan="5">Aylsham Road: Section under bridge may have oncoming vehicles in middle of road.</td><td rowspan="5">Aylsham Road near Market Street: One-way street – outbound direct route is not possible.</td></tr>
<tr><td>Aylsham Road</td><td>A4</td><td>No dedicated cycle facilities on route.</td><td>Aylsham Road: Section of missing footway on both sides of the highway – mix with pedestrians and vehicles.</td><td></td><td></td></tr>
<tr><td>Weavers Way – Skeyton New Road – Aylsham Road</td><td>A5</td><td>Weavers Way (shared facility): narrow route, unbound surface, not overlooked, shared with pedestrians.</td><td>Weavers Way at Station Road: barrier requiring dismounting, and no crossing facility.</td><td rowspan="3">Weavers Way / Skeyton New Road junction: Tie in with road is narrow, has a chicane, limited visibility.</td><td rowspan="3">Skeyton New Road / Aylsham Road junction: limited visibility.</td></tr>
<tr><td>Skeyton Road – Oak Road – Skeyton New Road – Aylsham Road</td><td>A6</td><td>No dedicated cycle facilities on most of the route.</td><td rowspan="2">Oak Road: Twisty route, potentially unclear.</td></tr>
<tr><td>South Rise – Buxton Road – Skeyton Road – Oak Road – Skeyton New Road – Aylsham Road</td><td>A7</td><td>No dedicated cycle facilities on most of the route.</td></tr>
<tr><td>Norwich Road – King's Arms Street</td><td>A8</td><td>No dedicated cycle facilities on route.</td><td>King's Arms Street: One-way street – inbound direct route is not possible.</td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="3">Rail Station</td><td>Shared Facility on Bypass (join from Cromer Road or Aylsham Road)</td><td>B1</td><td>Cromer Road / NW Bypass signalised junction: No facility at signalised junction to enable cycles to join the shared foot/cycleway from the road.</td><td>Shared facility alongside bypass: narrow route, unbound surface, not overlooked, shared with pedestrians.</td><td>Shared facility alongside bypass at Aylsham Road: Crossing is narrow, has a chicane, limited visibility.</td><td>Norwich Road / NW Bypass signalised junction: No facility at signalised junction to enable cycles to either join the shared foot/cycleway from the road or cross the junction.</td><td></td><td></td></tr>
<tr><td>Station Road – Norwich Road (join from Aylsham Road, Weavers Way or Skeyton Road)</td><td>B2</td><td>No dedicated cycle facilities on route.</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Norwich Road</td><td>B3</td><td>No dedicated cycle facilities on route.</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>High School</td><td>New Road (join from Market Place or Yarmouth Road)</td><td>C1</td><td>No dedicated cycle facilities on route.</td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

5.28 The opportunities for cyclist improvements have been mapped to outline the locations where proposed improvements should be focussed. The locations where there are no, moderate, and significant issues can be seen in **Figure 31** below.

Figure 31 – Opportunities for cyclist improvements



Mobility Corridors

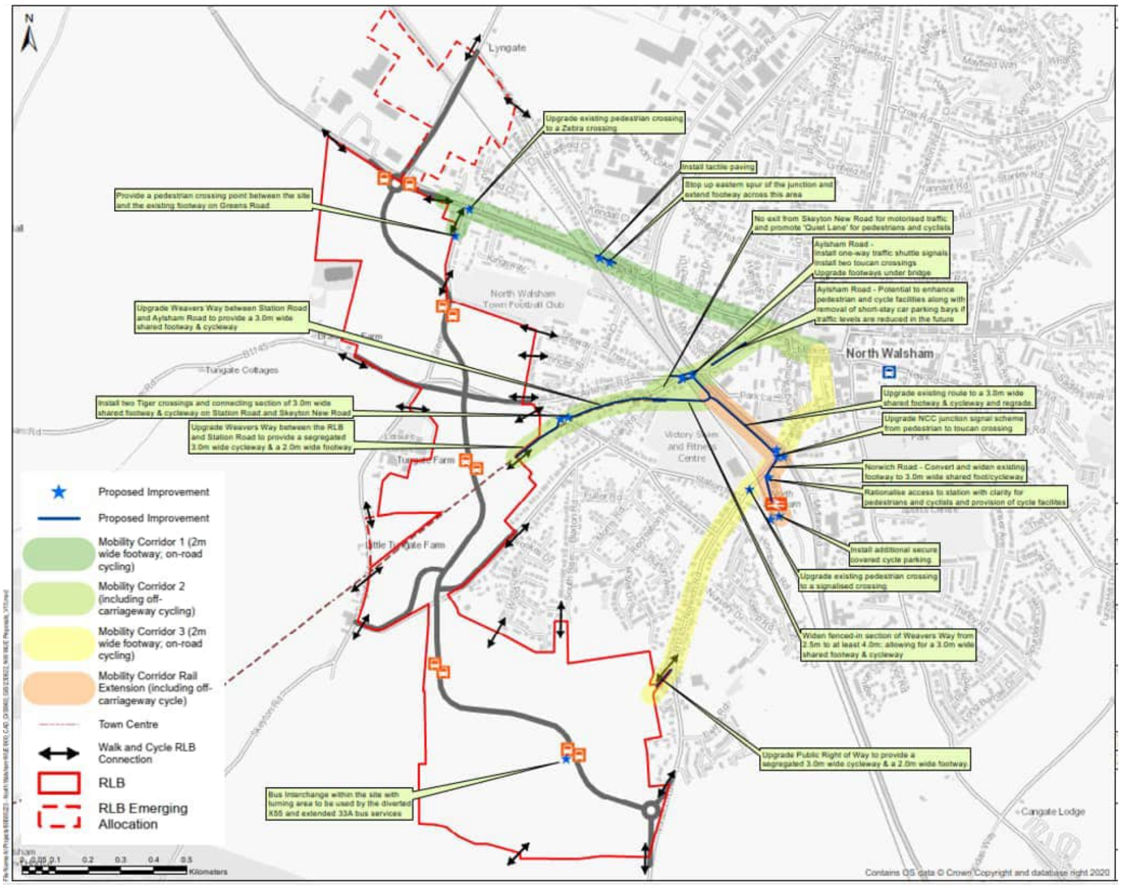
5.29 Taking account of existing constraints and opportunities, and the anticipated movements from the proposed development, three routes between the allocation and the town centre have been identified as key routes which are suitable to be promoted for pedestrians and cyclists and suitable for focused pedestrian and cycle infrastructure improvements. These improvements will enable pedestrians and cyclists to travel between the allocation and the amenities safely and effectively in the town centre. The routes proposed for improvements are routes A2 (A149 Cromer Road), A5 (Skeyton Road / Weavers Way), and A8 (B1150 Norwich Road). Each of the routes identified for improvements are designated as 'Mobility Corridors'.

5.30 The Mobility Corridors identified and the proposed improvements along them are shown in **Figure 32** below and outlined in the following sections. This figure is also found in **Appendix D.**

5.31 The aim of these corridors and the associated improvements identified is to support contiguous and safe pedestrian and cycle facilities to connect the proposed development with key destinations.

5.32 There are existing constraints which determine what can be achieved and it is not possible to deliver dedicated cycle facilities on each of the routes. The corridor with the strongest desire line is the central corridor along Weavers Way, Skeyton New Road, and Aylsham Road. This route offers the potential to provide a single, continuous, high-quality, cycle route between the allocation and the town centre/ station suitable for cyclists of all ages, abilities, and confidence levels. More confident cyclists will have the option to use the carriageway along Comer Road and Norwich Road, where off road facilities do not exist.

Figure 32 – Mobility Corridors



Mobility Corridor 1 Recommendations (Route A2)

1. Install a pedestrian crossing facility between the allocation land and the existing footway on Greens Road.

2. Upgrade the pedestrian crossing on A149 Cromer Road to a zebra crossing.

3. Install tactile paving to the crossing at the A149 Cromer Road / Bradfield Road priority junction.

4. Stop up the eastern spur of the A149 Cromer Road / Bradfield Road priority junction and widen the footway to 2.0m.

Mobility Corridor 2 Recommendations (Route A5)

5. Upgrade Weavers Way between the allocation and Station Road in line with LTN 1/20, with a segregated 3.0m wide cycleway and 2.0m footway. This should include lighting where sections are currently unlit.

6. Divert Weavers Way through the car park at Station Road and install a crossing facility on Station Road.

7. Upgrade Weavers Way between Station Road and Aylsham Road in line with LTN 1/20, as a shared 3.0m wide pedestrian and cycle facility. This should include lighting where sections are currently unlit. This includes the widening of the 50m length of the fenced-in section of Weavers Way next to 40 Oak Road from 2.5m to at least 4.0m to allow for a 3.0m wide pedestrian and cycle facility to be installed.

8. Provide a shuttle operation traffic signal control system under the Aylsham Road railway bridge to allow for the provision of a footways on the southern side of Aylsham Rd and widening of the existing footway on the Northern side. Crossing facilities should be included within the signals scheme to assist pedestrians and cyclists.

9. Provide a new crossing facility on Park Lane to assist pedestrians to cross at the point where footway stops.

Mobility Corridor 3 Recommendations (Route A8)

10. Upgrade PRoW within the allocation to Norwich Road in line with LTN 1/20, with a segregated 3.0m wide cycleway and 2.0m footway. This will be surfaced with asphalt and lighting will be added where sections are currently unlit.
11. Upgrade the existing pedestrian crossing on Norwich Road, immediately west of the railway bridge to a signal-controlled crossing to improve access to North Walsham Station.

Mobility Corridor Rail Extension Recommendations (Part of Route B1)

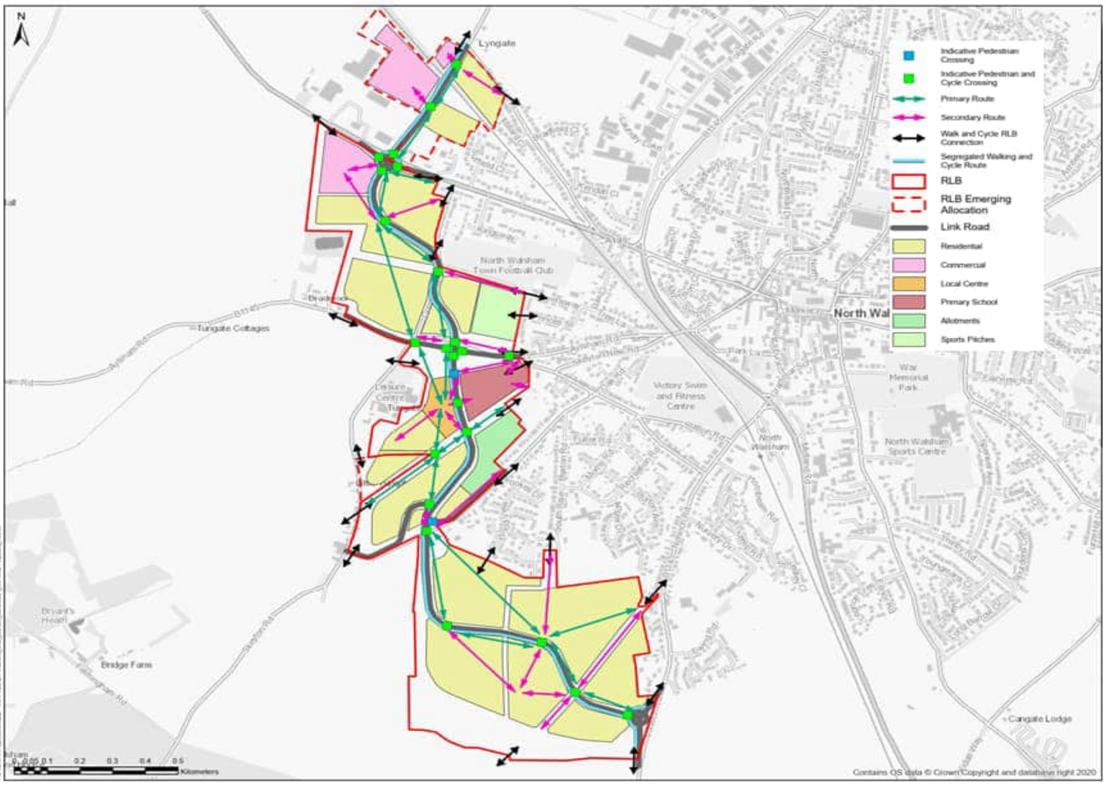
12. Upgrade the existing shared pedestrian and cycle route between Aylsham Road and Norwich Road along the A149 North Walsham Bypass in line with LTN 1/20, as a shared 3.0m wide pedestrian and cycle facility. This should be surfaced with asphalt.
13. Install a north-south pedestrian and cycle signalised crossing at the B1150 Norwich Road / A149 signalised junction to support improved access to the Town Centre and station.
14. Widen and convert the footway along the eastern side of Norwich Road between the A149 and the station entrance to a 3.0m wide shared pedestrian and cycle surface to allow for the access to the station to be rationalised.

On-Site Walking and Cycling Strategy

5.33 The key pedestrian and cycling route, as identified by the desire lines, will be provided along the link road. This will facilitate movement around the allocation, particularly to the local centre and school. In addition to the main route along the link road, further primary and secondary routes have been identified to provide connections and ensure that active travel is the primary mode of transport.

5.34 The indicative link road segregated route, primary and secondary routes, and crossing points can be seen in **Figure 33** below.

Figure 33 – On-Site Walking and Cycling Strategy



5.35 The main route along the link road will provide 3m cycleways and 2m footways along its length. This route will be provided to a high quality to encourage travel along its length and further afield to increase the number of trips by active travel modes and therefore reducing the reliance on the private car.

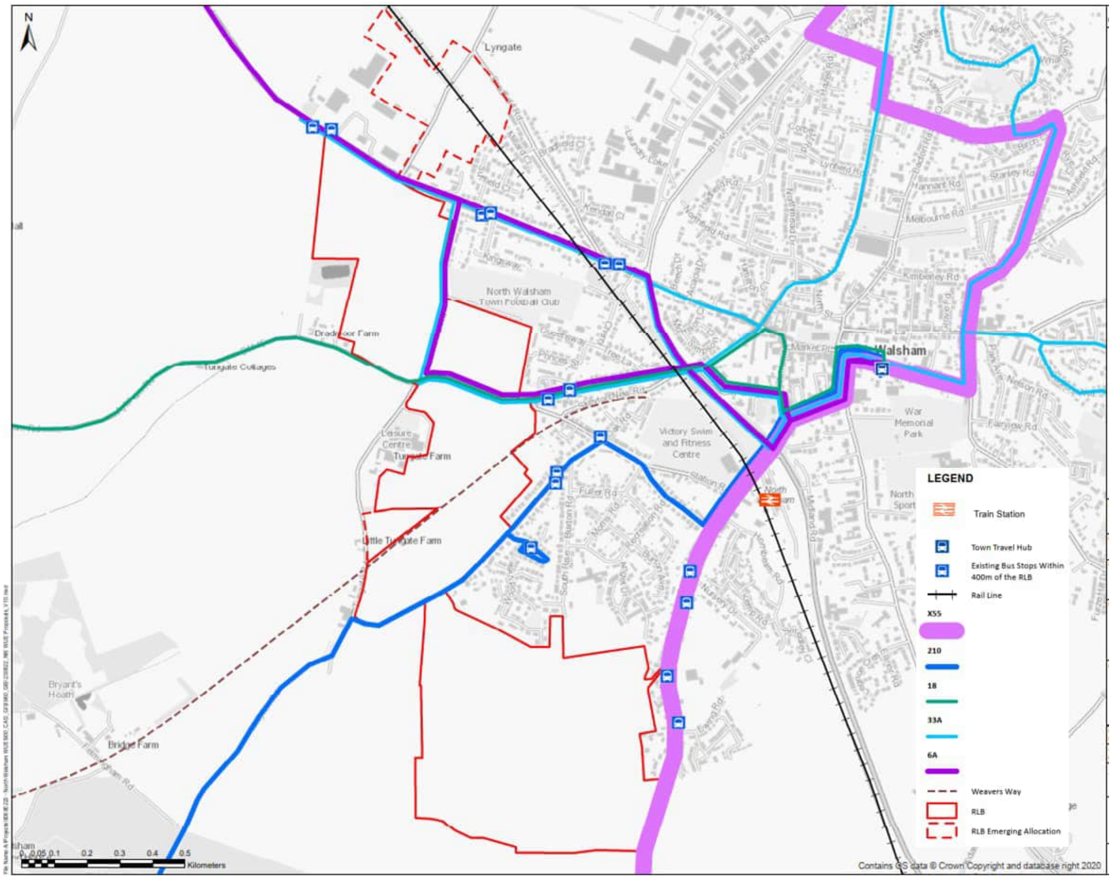
5.36 Primary and secondary routes will be provided within the land parcels connecting to the main route along the link road to ensure that a high level of connectivity is provided within the site and that distances for those walking and cycling is less than for those travelling by car.

5.37 Weavers Way, which bisects the allocation, will be a primary route and be upgraded in line with the requirements of LTN1/20, with a 3m cycleway and 2m footway provided where possible, and a minimum of 3m shared surface where this is not. The link road crosses Weavers Way, and a Tiger crossing will be provided to assist users, with gateways to slow cyclists on the approach to the link road to improve safety. **Figure 23** illustrates a cross section of the link road with the pedestrian and cyclist facilities.

Public Transport Strategy

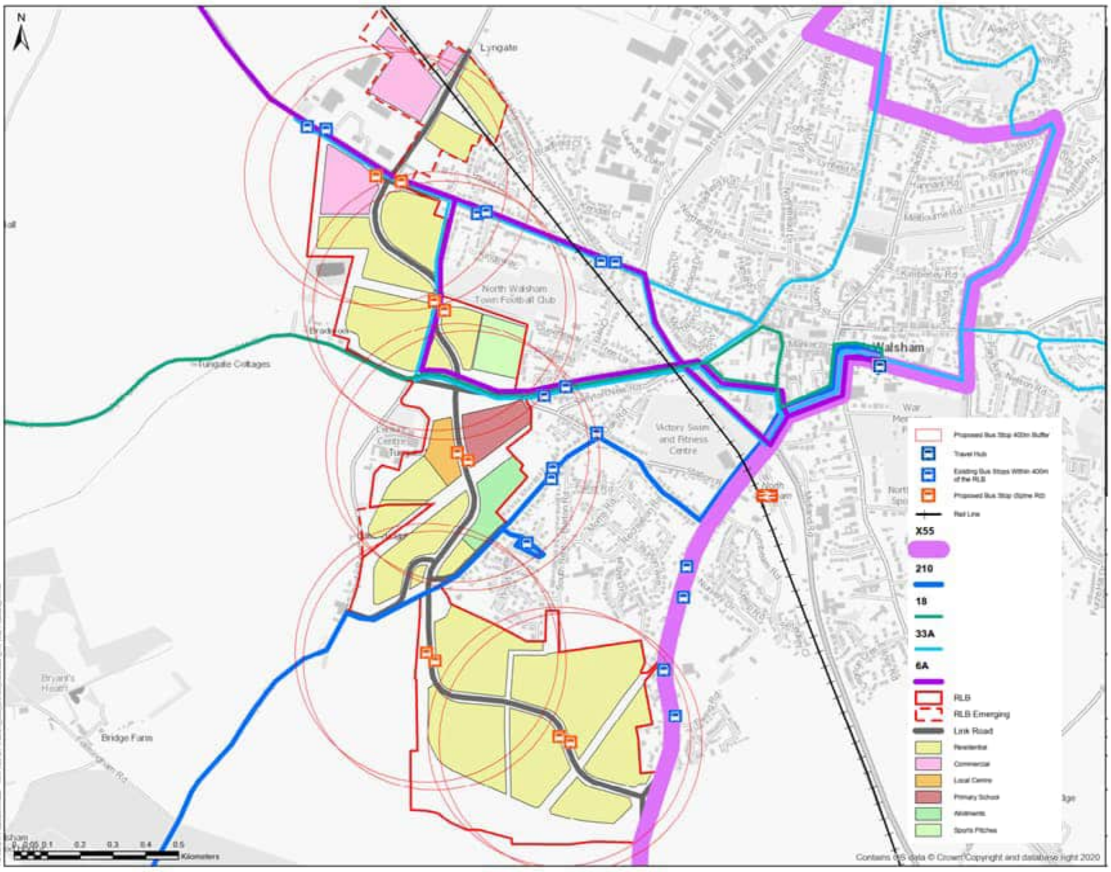
5.38 **Figure 34** illustrates the existing bus stops, routes of those services with a regular service of at least every three hours, and the location of the existing travel hub and train station within North Walsham. Also illustrated at the existing bus stops is the indicative 400m radius which suggests that a large proportion of the allocation is already within the recommended distance of a bus stop. It should be noted that more frequent and well-serviced bus routes have a thicker route line.

Figure 34 – Existing Public Transport Network



5.39 To enable the entire allocation to be within the recommended walking distance of 400 metres of a bus stop, new bus stops would be required. These would be provided along the link road, with stops provided at key locations such as the local centre, the employment area, and a bus interchange at the southern section of the allocation. The proposed new bus stops and the indicative 400 metres radius they would serve are shown in **Figure 35** below.

Figure 35 – Proposed Bus Stops and 400m Catchment Area



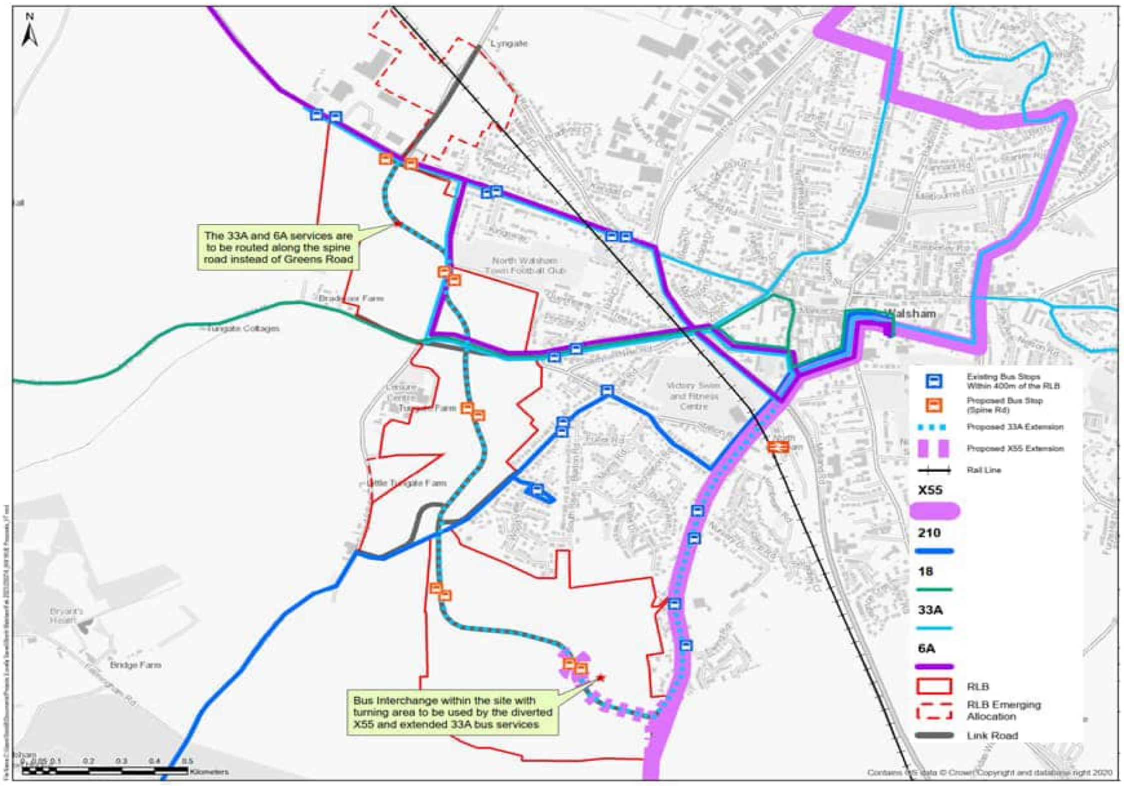
5.40 The following services are proposed to be rerouted/improved to service the new bus stops:

1. A bus interchange, which will allow a turning area for the diversion of the X55 service, as well as the extended 33A service.
2. The 33A and 6A services could be rerouted along the spine road rather than Greens Road.

5.41 The proposed bus stops and changes to bus services can be seen in **Figure 36** below.

5.42 Opportunities to increase service provision outside of peak times should be investigated through the TP for the proposed allocation.

Figure 36 – Proposed Bus Stops and Routes



5.43 Although there are no proposed improvements to train-based transport from North Walsham train station, a review is being undertaken to improve access between the Council owned car park and the Cromer bound platform to reduce the number of pedestrian movements needing to be made along the B1150. Greater Anglia have been contacted regarding what options, they, and Network Rail, have considered to improve connectivity between the platforms and to reduce the reliance on the footway under the railway bridge.

5.44 The use of the train as a sustainable mode of transport will, however, be promoted through the off-site walking and cycling strategy outlined above, with improvements to access to the route, crossings, and increased cycle parking.

Summary

5.45 As part of the Sustainable Transport Strategy, the internal and external desire lines were investigated. The internal desire lines included those between the proposed residential plots and the commercial areas and between the residential plots and the local neighbourhood centre and school. External attractions included the North Walsham town centre and North Walsham railway station. Based on these, one internal and three external corridors were defined. The main desire line within the site was found to generally follow the alignment of the link road, whilst the three external corridors follow the A149 Cromer Road, Skeyton Rd/ Weavers Way, and B1150 Norwich Road, respectively.

5.46 Additionally, the existing pedestrian routes to the town centre, train station, and high school were assessed, along with any opportunities for their improvement, based on whether they exhibit *no, moderate, or significant issues*. Similar analysis was conducted for the existing cycling routes, as well.

5.47 Moreover, three routes between the allocation and the town centre were recognised as key routes suitable for focused pedestrian and cycle infrastructure improvements and designated as “Mobility Corridors”. Namely, these are A2 (A149 Cromer Road), A5 (Skeyton Rd/ Weavers Way), and A8 (B1150 Norwich Road). Specific improvements were identified for each corridor.

5.48 Finally, the existing nearby bus stops and any routes that serve those bus stops at least every three hours were also summarised. Proposals were set out regarding new bus stops within the allocation site, focusing along the link road at key locations, such as the local centre, the employment area, and a bus interchange at the southern part of the allocation. Recommendations for changes to existing bus services were also presented.

5.49 The proposed strategy has identified measures to remove barriers to sustainable travel to local services by active modes and has identified a public transport strategy to integrate the proposed allocation site with the well-established public transport network in North Walsham.

6. Highway Access Strategy

Introduction

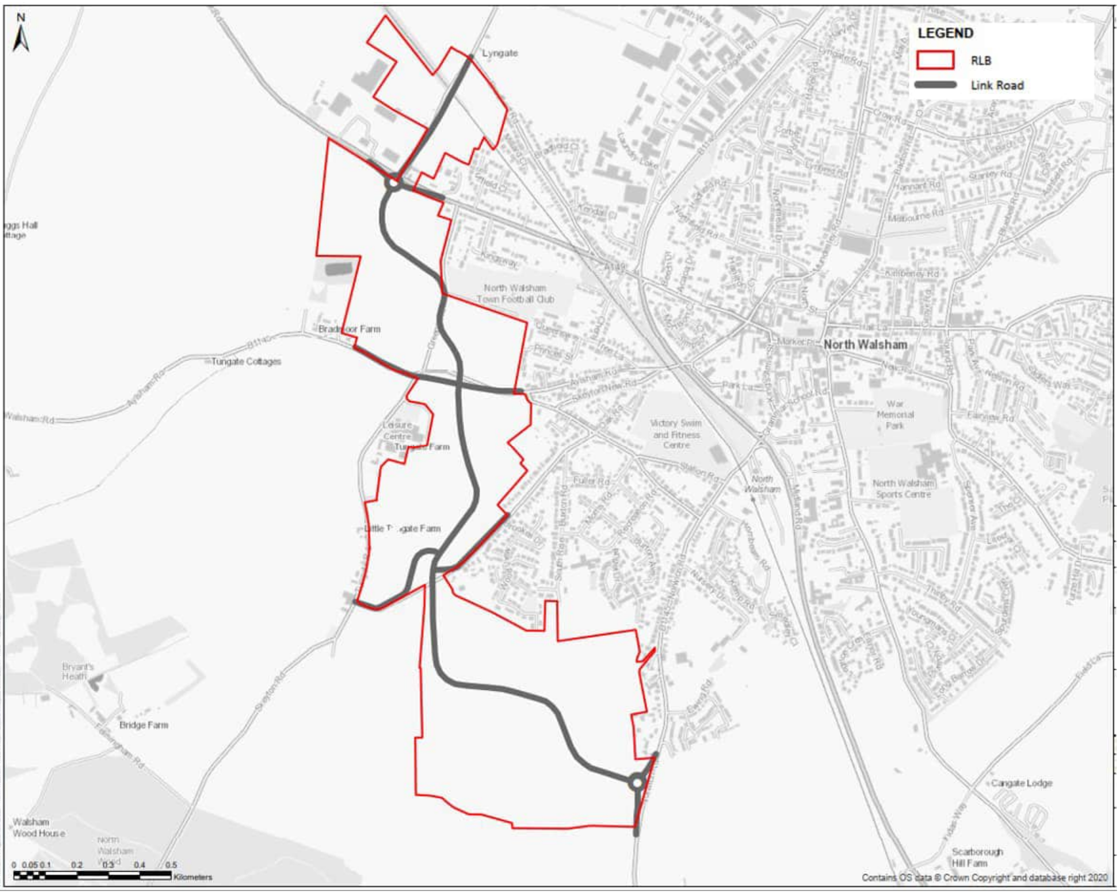
6.1 This chapter sets out the highway access strategy for the allocation.

Highway Access Strategy

6.2 The link road, which will run through the centre of the site in a north-south direction, will be a single carriageway route subject to a 30mph speed limit. It will connect to Bradfield Road in the northern section of the allocation, running to A149 Cromer Road, B1145 Aylsham Road, Skeyton Road, and B1150 Norwich Road. The link road is being designed to accord with the requirements of DMRB and will be able to accommodate HGV traffic which currently utilise Millfield Road and Greens Road. It is anticipated that all allocation parcels will be accessed from the link road.

6.3 The site will be accessed from several points on the existing highway network. The indicative access points to the allocation are shown in **Figure 37** below.

Figure 37 – Indicative Link Road and Junctions



6.4 An offline four-arm roundabout will be provided at the northern end of the link road connecting with A149 Cromer Road and Bradfield Road. The junctions will be provided with sufficient capacity to accommodate the future predicted traffic levels and to accord with the requirements of DMRB.

6.5 A four-arm staggered signalised junction will be provided at the point where a realigned B1145 Aylsham Road connects with the link road. Through traffic along Aylsham Road will be maintained and Greens Road at this point will be stopped up.

6.6 An offline three-arm roundabout will be provided at the southern end of the link road connecting with the B1150 Norwich Road. As per the roundabout at the northern end of the link road, the junction will be provided with sufficient capacity to accommodate the future predicted traffic levels and to accord with the requirements of DMRB.

6.7 Skeyton Road will be bisected by the link road and given the nature of Skeyton Rd and the low level of traffic it attracts it is proposed that the route is closed to vehicular through traffic. A through route for pedestrians and cyclists would be retained. Vehicular traffic wanting to travel between Tungate Road and Skeyton Road would need to use Aylsham Road.

6.8 The section of the B1145 Greens Road south of the existing residential boundary to North Walsham is proposed to be stopped up with a new access to the football club provided from the link road. This is because the proposed link road will deliver a more suitable route in parallel for through traffic.

6.9 The land accessed from Bradfield Road, north of Cromer Road but south of the railway line will be accessed from an upgrade section of Bradfield Road as it passes through the allocation land. North of the railway, two residential parcels will be accessed from Bradfield Road with improved road access delivered along the development frontage and access delivered primarily from the section of Bradfield Road which runs northeast to southwest, parallel to the railway line. The existing weight restriction on the Bradfield Road railway bridge will remain in place.

Northern Extension to Western Link Road

6.10 The policy wording for the proposed allocation includes reference to the provision of a northern extension to the Western Link Road from the allocation land, along Bradfield Road to the industrial estate located on Folgate Road. This is commonly known as the Northern Extension to the Western Link Road for North Walsham. This is a proposal which forms part of the Norfolk Strategic Infrastructure Delivery Plan 2022 and the reasoning behind delivery of this Northern Extension is to mitigate existing routeing problems for HGVs in North Walsham by providing a suitable route for HGVs over the railway line, and to increase accessibility by sustainable modes and active travel in North Walsham. The Bradfield Road railway bridge has been identified through previous studies to be a significant physical constraint. The engineering requirements and cost implications of delivering the Northern Extension are significant and require further investigation. Delivery of the Northern Link would also require third party unallocated land which sits outside of the control of the proposed allocation boundary. Certainty regarding deliverability of this link is required before funding can be secured.

6.11 Due to the uncertainty regarding the proposed link, and the fact that it is not within the control of the proposed allocation landowners to deliver, the Northern Link does not currently form part of the proposals and this assessment has been completed assessing the development impacts in the absence of a Northern Link. Transport justification for this position is set out in the AECOM Technical Note ‘Assessment of need for Northern Extension of Western Link Road to support the Western Urban Extension of North Walsham’.

6.12 Based on the analysis undertaken, it is considered that:

- Very low levels of development and background traffic would utilise the Northern Link as the route through to Folgate Road would not present a more direct route than Cromer Road offers for most traffic.
- The proposed development will lead to minimal increase in HGV traffic given the low level of employment use on site and the fact that it is predominantly residential in nature.
- Whilst the new link would provide an alternative route for high sided vehicles travelling between the west and east of North Walsham, allowing use of the existing railway bridges to be revisited, the volume of high sided vehicles and HGVs for which this would represent a more direct route is relatively low.
- Given the relatively low volumes the route would attract, the delivery costs of the current preferred route are difficult to justify, and further investigation is needed before a deliverable route which could secure funding can be identified.
- A new connection linking the B1150 to the industrial estate and the B1145 could attract more HGV movements through Coltishall and Horstead as the B1150 could become a more attractive route for journeys to and from A1270 Broadland Northway and Norwich. This could therefore have a negative impact on existing issues in Coltishall and Horstead and would require further consideration.
- Whilst the land required to provide the complete the Northern Link is not within the allocation boundary or the control of the consortium of landowners, it is possible for the allocation to deliver the main component of the Western Link Road, and to future proof the northern section of the allocation land to allow for future provision of the upgraded route should it come forward in the future.

7. Trip Generation and Distribution

Introduction

7.1 This chapter sets out the methodology applied in respect of calculating trip generation and distribution for the allocation. For information, the figures in the below tables may contain rounding errors.

Trip Generation

7.2 A first principles approach to trip generation has been used to derive bespoke multi-modal trips for the allocation. This has included the use of the:

- Trip Rate Information Computer System (TRICS) to derive person trip rates.
- Local 2011 Census mode share data to derive the modal split.
- National Travel Survey (NTS) to derive journey purpose as it is recognised that not all trips in the peaks are made by those travelling to work.

7.3 In TRICS, the multi-modal person trip rates have been filtered using sites in England (excluding Greater London). Similarly located and sized sites have been chosen. Sites with a population of over 250,000 people within five miles have been excluded. The indicative person trip rates as derived from TRICS are set out in **Table 19** below. It should be noted for the residential trip rates only sites located within Norfolk were chosen.

Table 19 – Indicative Person Trip Generation

Element	Trip Rate Used	Site Selection	Sites Available	Calculation Factor	08:00-09:00		16:30-17:30		Daily	
					Arr	Dep	Arr	Dep	Arr	Dep
Residential	RESIDENTIAL / HOUSES PRIVATELY OWNED	1000-2200 dwells	2	per dwelling	0.225	0.627	0.43	0.238	3.003	3.001
Commercial E(g)(i) use	EMPLOYMENT / OFFICE	Sites with GFA of up to 4,500m^2	3	100 sqm	3.511	0.18	0.221	1.951	12.557	12.689
Commercial E(g)(iii) & B2 uses	EMPLOYMENT / INDUSTRIAL ESTATE	Sites with GFA of 5,000-20,000m^2	2	100 sqm	0.892	0.351	0.42	0.751	6.439	6.685
Commercial B8 use	EMPLOYMENT / WAREHOUSING	Sites with GFA of 1,000-10,000m^2	1	100 sqm	0.564	0.061	0.015	0.473	2.592	2.621

7.4 It should be noted for the purposes of this TA, 2,000 dwellings have been assessed, an increase of 200 over that set out in the policy wording. This has been carried out to ensure a robust assessment of residential trips.

7.5 To establish the proportion of person trips by each mode, reference was made to the Census 2011 data for the Middle Super Output Area (MSOA) North Norfolk 010, which covers North Walsham. The only change made to this mode share is the removal of trips made by underground, metro, light rail, and tram, as there is no infrastructure in North Walsham to facilitate this mode; this mode share has been added to the train mode share. The mode share identified from the Census is shown in **Table 20** below and has been applied to all land uses except residential.

Table 20 – Mode Share for Those Living in North Norfolk 010 MSOA (2011 Census Journey to Work)

Mode	Mode Share
Work mainly at or from home	4%
Underground, metro, light rail, tram	0%
Train	2%
Bus, minibus, coach	2%
Taxi	1%
Motorcycle, scooter, moped	1%
Driving a car or van	65%
Passenger in a car or van	5%
Bicycle	4%
On foot	15%
Other method of travel to work	1%
Total	**100%**

7.6 To account for some modal shift, a mode shift of ten percentage points has been removed from the 'driving a car or van' mode and distributed proportionally across the other modes for the residential aspect of the trip generation only. This would normally be applied to all land uses, however, for robustness, it has only been applied to residential uses. The revised mode share for the residential element of the allocation is shown in **Table 21** below.

Table 21 – Revised Mode Share After Mode Shift

Mode	Mode Share
Work mainly at or from home	5%
Underground, metro, light rail, tram	0%
Train	3%
Bus, minibus, coach	2%
Taxi	1%
Motorcycle, scooter, moped	1%
Driving a car or van	55%
Passenger in a car or van	7%
Bicycle	5%
On foot	19%
Other method of travel to work	1%
Total	**100%**

Residential Trip Generation

7.7 As it is recognised that the not all journeys are work related, reference has been made to the DfT NTS which, within Table NTS0502, identifies the percentage of trips by journey purpose for each peak hour, i.e., those travelling to work, taking children to school, and visiting leisure and retail amenities.

7.8 Journey purpose proportions for 2015-2019 (to represent pre-Covid levels) have been identified for the AM and PM peak hours and are summarised in **Table 22**. It is assumed that the 'education' journey purpose refers to pupils only and 'education escort' refers to parents escorting their children only. Arrival and departure percentages are not included in NTS0502, so it has been assumed that there is the same percentage of arrivals and departures.

Table 22 – Journey Purpose Percentages – Based on NTS0502

Journey Purpose	AM Peak (0800-0900)		PM Peak (1630-1730)		Daily	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
Commuting	20%	20%	32%	32%	18%	18%
Business	3%	3%	3%	3%	4%	4%
Education	29%	29%	3%	3%	9%	9%
Education Escort	23%	23%	2%	2%	8%	8%
Shopping	4%	4%	12%	12%	17%	17%
Other Work / Other Escort / Personal Business	14%	14%	20%	20%	19%	19%
Visiting Friends / Entertainment / Sport	3%	3%	20%	20%	18%	18%
Holiday / Day Trip / Other	4%	4%	8%	8%	9%	9%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

7.9 Education trips have been split between trips to pre-school, primary school, secondary school and sixth form. Based on child yield figures from NCC's '*NCC Planning Obligations Standards February 2022'* for pre-school (0.10 pupils per dwelling), primary school (0.28 pupils per dwelling), secondary school (0.15 pupils per dwelling), and sixth form (0.02 pupils per dwelling), the person trips have been split 18% to pre-school, 52% to primary school, 27% to secondary school and 3% to sixth form across the day.

7.10 Similarly, education escort trips have been split between trips to pre-school, primary school, secondary school, and sixth form and have been based on the proportions for child yield figures mentioned above. Nevertheless, these proportions have been adjusted to reduce the secondary school and sixth form proportions by 30% and assigned to pre-school and primary. This is to account for the fact that parents are more likely to accompany pre- and primary-school-age children to school. The trips are therefore split 20% to pre-school, 59% to primary school, 19% to secondary school and 2% to sixth form.

7.11 It should be noted that the TRICS residential person trip rates in **Table 19** include for trips associated with a primary school. TRICS surveys look at external trips going in and out of a development and the underlying TRICS dataset used include a primary school on all sites. It is assumed that for the sites used within the underlying TRICS datasets, the trips relating to the primary school were picked up as part of the TRICS surveys.

7.12 As a primary school is proposed as part of the allocation, it has been assumed that all education and education escort trips to the primary school are internal to the allocation. The trips to pre-school, secondary school, and sixth form are all assumed to be external to the allocation.

7.13 The journey purpose percentages shown in **Table 22** have been amended to remove the percentages associated with the Primary School from within the Education and Education Escort trips. An updated journey purpose table is shown in **Table 23** below.

Table 23 – Amended Journey Purpose Percentages

Journey Purpose	AM Peak (0800-0900)		PM Peak (1630-1730)		Daily	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
Commuting / Business	32%	32%	37%	37%	24%	24%
Education (*excluding Primary School*)	19%	19%	1%	1%	5%	5%
Education Escort (*excluding Primary School*)	13%	13%	1%	1%	3%	3%
Shopping	6%	6%	12%	12%	18%	18%
Other Work / Other Escort / Personal Business	20%	20%	21%	21%	21%	21%
Visiting Friends / Entertainment / Sport / Holiday / Day Trip / Other	10%	10%	28%	28%	29%	29%
Total (*excluding Primary School*)	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

7.14 The percentages in **Table 23** were applied to the residential person trip generation in **Table 19** to calculate the residential person trip generation by journey purpose for trips external to the site.

7.15 The resultant residential person trips by journey purpose are shown in **Table 24** below.

Table 24 – Residential Person Trips by Journey Purpose (internal and external)

Journey Purpose	AM Peak (0800-0900)		PM Peak (1630-1730)		Daily	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
Commuting / Business	144	400	315	174	1427	1426
Education (*all*)	179	500	26	15	594	593
Education Escort (*all*)	144	400	19	11	499	498
Shopping	26	74	107	59	1108	1107
Other Work, Other Escort, Personal Business	89	249	177	98	1236	1236
Other	46	128	241	134	1746	1744
Total	**628**	**1751**	**885**	**490**	**6610**	**6605**

7.16 **Table 25** summarises the internal and external education and education escort residential trips separately.

Table 25 – Education and Education Escort Residential Person Trips (internal and external separated)

Journey Purpose	AM Peak (0800-0900)		PM Peak (1630-1730)		Daily	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
Education (*internal*)	94	261	14	8	310	310
Education (*external*)	86	239	13	7	284	283
Total Education	**179**	**500**	**26**	**15**	**594**	**593**
Education Escort (*internal*)	85	235	11	6	294	293
Education Escort (*external*)	59	165	8	4	205	205
Total Education Escort	**144**	**400**	**19**	**11**	**499**	**498**

7.17 **Table 24** and **Table 25** above illustrate the estimated number of person trips generated by journey purpose for the whole allocation (and a further 200 dwellings). The modal share split for each journey purpose is outlined in the following sections.

Commuting / Business

7.18 Applying the total residential person trips assigned to commuting / business in **Table 24** to the mode share in **Table 21** provides the multi-modal trip generation projected for this element of the allocation and is shown in **Table 26** below.

Table 26 – Residential – Commuting / Business Multi-Modal Total Trip Generation

Mode	AM Peak (0800-0900)		PM Peak (1630-1730)		Daily	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
Underground, metro, light rail, tram	0	0	0	0	0	0
Train	5	13	10	5	45	45
Bus, minibus, coach	3	9	7	4	31	31
Taxi	1	3	2	1	10	10
Motorcycle, scooter, moped	2	5	4	2	19	19
Driving a car or van	79	220	173	96	785	785
Passenger in a car or van	9	26	21	11	94	93
Bicycle	7	21	16	9	74	74
On foot	28	78	61	34	277	277
Other method of travel to work	2	4	3	2	16	16

Mode	AM Peak (0800-0900)		PM Peak (1630-1730)		Daily	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
Homeworking	8	22	17	9	77	77
Total	**144**	**400**	**315**	**174**	**1427**	**1426**

Education

7.19 As mentioned, education trips were split between trips to pre-school, primary school, secondary school and sixth form, based on child yield figures from NCC's '*NCC Planning Obligations Standards February 2022*'. The external trips were split to 38% pre-school, 56% secondary school, and 6% sixth form, while the internal trips were based on those in **Table 25**.

7.20 **Table 27** sets out the number of residential person trips attributed to pre-school, primary school, secondary school and sixth form.

Table 27 – Residential – Education Person Trips by School Level

School Level	AM Peak (0800-0900)		PM Peak (1630-1730)		Daily	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
Pre-School	32	90	5	3	107	107
Primary School	94	261	14	8	310	310
Secondary School	48	135	7	4	160	160
Sixth Form	5	14	1	0	17	17
Total	**179**	**500**	**26**	**15**	**594**	**593**

7.21 Mode share for the education trips has been based on the 2011 Census Journey to Work (JTW), with the mode share from driving a car or van, and motorcycle/scooter/moped being assigned to passenger in a car or van instead. Additionally, the number of responses from people who work mainly at or from home was removed and the respective mode shares were re-calculated. The resulting mode share after these changes can be seen in **Table 28** below.

Table 28 – Residential – Education Mode Share

Mode	Mode Share
Underground, metro, light rail, tram	0%
Train	3%
Bus, minibus, coach	2%
Taxi	1%
Motorcycle, scooter, moped	0%
Driving a car or van	0%
Passenger in a car or van	74%
Bicycle	4%
On foot	16%
Other method of travel to work	1%
Total	**100%**

7.22 Applying the mode share in **Table 28** above to the education journey purpose person trips in **Table 27** provides the total multi-modal trip generation for the education journey purpose in **Table 29** below.

Table 29 – Residential – Education Multi-Modal Trip Generation

Mode	AM Peak (0800-0900)		PM Peak (1630-1730)		Daily	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
Underground, metro, light rail, tram	0	0	0	0	0	0
Train	5	13	1	0	15	15
Bus, minibus, coach	3	9	0	0	10	10
Taxi	1	3	0	0	3	3
Motorcycle, scooter, moped	2	5	0	0	6	6
Driving a car or van	0	0	0	0	0	0
Passenger in a car or van	131	366	19	11	434	434
Bicycle	8	21	1	1	25	25
On foot	28	79	4	2	94	94
Other method of travel to work	2	4	0	0	5	5
Total	**179**	**500**	**26**	**15**	**594**	**593**

Education Escort

7.23 As mentioned, education escort trips have been split between trips to pre-school, primary school, secondary school, and sixth form and have been based on the proportions for child yield figures previously identified. Additionally, these proportions were adjusted to reduce the secondary school and sixth form proportions by 30% and assigned to pre-school and primary. The external trips were, therefore split, 49% to pre-school, 46% to primary school, and 5% to sixth form, while the internal trips were based on those in **Table 25**.

7.24 **Table 30** shows the number of residential person trips attributed to pre-school escort, primary school escort, secondary school escort and sixth form escort.

Table 30 – Residential – Education Escort Person Trips

School Level	AM Peak (0800-0900)		PM Peak (1630-1730)		Daily	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
Pre-School	29	81	4	2	101	101
Primary School	85	235	11	6	294	293
Secondary School	27	75	4	2	94	94
Sixth Form	3	8	0	0	10	10
Total	**144**	**400**	**19**	**11**	**499**	**498**

7.25 Mode share for the pre-school and primary school escort has been based on the 2011 Census JTW mode share set out in **Table 20**, with the only change being the removal of the work mainly at or from home mode share. The resulting mode share can be seen below in **Table 31**. This is also the same mode share used for the shopping and other journey purposes. Mode shares for the secondary school and sixth form have been based on first principles and it is assumed that education escort trips will be split 80:20 for secondary school and 50:50 for sixth form between walking and car driver.

Table 31 – Residential – Education Escort (Pre-School and Primary)

Mode	Mode Share
Underground, metro, light rail, tram	0%
Train	3%
Bus, minibus, coach	2%
Taxi	1%
Motorcycle, scooter, moped	1%
Driving a car or van	68%
Passenger in a car or van	5%

Mode	Mode Share
Bicycle	4%
On foot	16%
Other method of travel to work	1%
Total	**100%**

7.26 Total multi-modal trip generation for the education escort journey purpose in Table 32 below.

Table 32 – Residential – Education Escort Multi-Modal Trip Generation

Mode	AM Peak (0800-0900)		PM Peak (1630-1730)		Daily	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
Underground, metro, light rail, tram	0	0	0	0	0	0
Train	3	8	0	0	10	10
Bus, minibus, coach	2	6	0	0	7	7
Taxi	1	2	0	0	2	2
Motorcycle, scooter, moped	1	3	0	0	4	4
Driving a car or van	84	234	11	6	292	291
Passenger in a car or van	6	17	1	0	21	21
Bicycle	5	13	1	0	17	17
On foot	41	114	6	3	142	142
Other method of travel to work	1	3	0	0	4	4
Total	**144**	**400**	**19**	**11**	**499**	**499**

Shopping

7.27 **Table 33** shows the number of residential person trips attributed to the shopping journey purpose.

Table 33 – Residential – Shopping Person Trips

	AM Peak (0800-0900)		PM Peak (1630-1730)		Daily	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
Person Trips	26	74	107	59	1108	1107

7.28 The mode share for the shopping journey purpose is based on the 2011 Census JTW with the removal of the working at or mainly from home mode, as seen in **Table 31** above.

7.29 Applying the mode share in **Table 31** above to the shopping journey purpose person trips in **Table 33** provides the total multi-modal person trip generation for the shopping journey purpose in **Table 34** below.

Table 34 – Residential – Shopping Multi-Modal Trip Generation

Mode	AM Peak (0800-0900)		PM Peak (1630-1730)		Daily	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
Underground, metro, light rail, tram	0	0	0	0	0	0
Train	1	2	3	2	28	28
Bus, minibus, coach	0	1	2	1	19	19
Taxi	0	0	1	0	6	6
Motorcycle, scooter, moped	0	1	1	1	12	12
Driving a car or van	18	50	72	40	752	751
Passenger in a car or van	1	4	6	3	59	59
Bicycle	1	3	5	2	47	47
On foot	4	12	17	9	175	175
Other method of travel to work	0	1	1	1	10	10

Mode	AM Peak (0800-0900)		PM Peak (1630-1730)		Daily	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
Total	**26**	**74**	**107**	**59**	**1108**	**1107**

Other Work, Other Escort, and Personal Business

7.30 **Table 35** shows the number of residential person trips attributed to the other work, other escort, and personal business journey purpose.

Table 35 – Residential – Other Work, Other Escort, and Personal Business Person Trips

	AM Peak (0800-0900)		PM Peak (1630-1730)		Daily	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
Person Trips	89	249	177	98	1236	1236

7.31 The mode share for the other work, other escort, and personal business journey purpose is based on the 2011 Census JTW with the removal of the mainly from home mode, as seen in **Table 31** above.

7.32 Applying the mode share in **Table 31** above to the other work, other escort, and personal business journey purpose person trips in **Table 35** provides the total multi-modal person trip generation for the shopping journey purpose in **Table 36** below.

Table 36 – Residential – Other Work, Other Escort, and Personal Business Multi-Modal Trip Generation

Mode	AM Peak (0800-0900)		PM Peak (1630-1730)		Daily	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
Underground, metro, light rail, tram	0	0	0	0	0	0
Train	2	6	5	2	32	32
Bus, minibus, coach	2	4	3	2	22	22
Taxi	1	1	1	1	7	7
Motorcycle, scooter, moped	1	3	2	1	13	13
Driving a car or van	61	169	120	66	839	838
Passenger in a car or van	5	13	9	5	66	66
Bicycle	4	11	7	4	52	52
On foot	14	39	28	15	195	195
Other method of travel to work	1	2	2	1	11	11
Total	**89**	**249**	**177**	**98**	**1236**	**1236**

All Other Trips

7.33 **Table 37** shows the number of residential person trips attributed to the ‘all other’ trips journey purpose.

Table 37 – Residential – All Other Trips Person Trips

	AM Peak (0800-0900)		PM Peak (1630-1730)		Daily	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
Person Trips	46	128	241	134	1746	1744

7.34 The mode share for the ‘all other’ trips journey purpose is based on the 2011 Census JTW with the removal of the working at or mainly from home mode, as seen in **Table 31** above.

7.35 Applying the mode share in **Table 31** above to the ‘all other’ trips journey purpose person trips in **Table 35** provides the total multi-modal person trip generation for the all other trips journey purpose in **Table 38** below.

Table 38 – Residential – All Other Trips Multi-Modal Trip Generation

Mode	AM Peak (0800-0900)		PM Peak (1630-1730)		Daily	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
Underground, metro, light rail, tram	0	0	0	0	0	0
Train	1	3	6	3	45	45
Bus, minibus, coach	1	2	4	2	31	31
Taxi	0	1	1	1	10	10
Motorcycle, scooter, moped	0	1	3	1	19	19
Driving a car or van	31	87	164	91	1184	1184
Passenger in a car or van	2	7	13	7	93	93
Bicycle	2	5	10	6	74	74
On foot	7	20	38	21	275	275
Other method of travel to work	0	1	2	1	16	16
Total	**46**	**128**	**241**	**134**	**1746**	**1744**

Total Residential Trip Generation

7.36 The total combined person trip generation for the residential element of the allocation is shown in **Table 39** below. It should be noted that the trips derived for the residential element of the allocation are based on 2,000 dwellings and not 1,800 as per the policy. This ensures a robust assessment of residential related trips.

Table 39 – Total Residential Trip Generation by Mode

Mode	AM Peak (0800-0900)		PM Peak (1630-1730)		Daily	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
Underground, metro, light rail, tram	0	0	0	0	0	0
Train	16	45	24	13	175	174
Bus, minibus, coach	11	31	17	9	120	120
Taxi	4	10	5	3	39	39
Motorcycle, scooter, moped	7	19	10	6	73	73
Driving a car or van	273	760	541	299	3852	3849
Passenger in a car or van	155	433	69	38	767	766
Bicycle	27	74	40	22	289	289
On foot	123	342	154	85	1158	1157
Other method of travel to work	6	16	9	5	61	61
Homeworking	8	22	17	9	77	77
Total	**628**	**1751**	**885**	**490**	**6610**	**6605**

Employment Trip Generation

7.37 Of the proposed 7ha of employment use proposed, the proportional split for the three employment uses is outlined below as:

- Commercial E(g)(i) Office: 10%.
- Commercial E(g)(iii) & B2: 60%; and
- Commercial B8: 30%.

The 7ha was converted to m^2, which then required conversion to an estimated gross floor area, which was applied to the proportional splits above. The resulting gross developable floor area for each employment use is outlined below.

- Commercial E(g)(i) Office: 2,333m^2.

- Commercial E(g)(iii) & B2: 14,000m^2; and
- Commercial B8: 7,000m^2.

7.38 The TRICS database was utilised to derive person trip rates for the employment element of the allocation as seen in **Table 19**. Applying the trip rates from **Table 19** to the quantum of the allocation above provides the indicative person trips for the allocation, as seen in **Table 40** below.

Table 40 – Employment Person Trips

Person Trips	AM Peak (0800-0900)		PM Peak (1630-1730)		Daily	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
E(g)(i) Office	82	4	5	46	293	296
E(g)(iii) & B2 Industry	125	49	59	105	901	936
B8 Warehousing	39	4	5	23	181	183
Total	**246**	**58**	**69**	**174**	**1376**	**1415**

7.39 The 2011 Census JTW mode shares for those who work in the North Norfolk 010 MSOA has been used to derive the mode share for those who will be employed within the allocation. The resulting mode shares can be seen in **Table 41** below.

Table 41 – Mode Share for Those Working in North Norfolk 010 MSOA (2011 Census Journey to Work)

Mode	Mode Share
Underground, metro, light rail, tram	0%
Train	1%
Bus, minibus, coach	1%
Taxi	0%
Motorcycle, scooter, moped	1%
Driving a car or van	68%
Passenger in a car or van	5%
Bicycle	5%
On foot	18%
Other method of travel to work	1%
Total	**100%**

7.40 The mode share identified in **Table 41** has been applied to the person trips for the employment uses in **Table 40**. The resulting multi-modal person trip generation for the employment parcel of the allocation is outlined below in **Table 42**.

Table 42 – Employment Multi-Modal Trips

Mode	AM Peak (0800-0900)		PM Peak (1630-1730)		Daily	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
Underground, metro, light rail, tram	0	0	0	0	0	0
Train	3	1	1	2	17	18
Bus, minibus, coach	3	1	1	2	16	16
Taxi	1	0	0	1	6	6
Motorcycle, scooter, moped	2	1	1	2	13	14
Driving a car or van	166	39	46	118	930	957
Passenger in a car or van	12	3	3	9	70	72
Bicycle	13	3	4	9	75	77
On foot	44	10	12	31	248	255

Mode	AM Peak (0800-0900)		PM Peak (1630-1730)		Daily	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
Other method of travel to work	0	0	0	0	1	1
Total	**246**	**58**	**69**	**174**	**1376**	**1415**

Primary School Trip Generation

7.41 The only external trips to the primary school are from staff, of which there have been 42 assumed. The remaining pupil and escort trips have been identified in the residential – education and education escort trip generation.

7.42 It also been assumed that there is a temporal split for arrivals and departures, with the peak hours split shown in **Table 43** below.

Table 43 – Teacher Temporal Split at Peak Hours

Time	Arrivals	Departures
08:00-09:00	40%	0%
16:30-17:30	0%	30%

7.43 The mode share identified in **Table 41** has been applied to the 42 person trips for the staff working at the primary school. The resulting multi-modal person trip generation for the primary school parcel of the allocation is outlined below in **Table 44**.

Table 44 – Primary School Multi-Modal Trips

Mode	AM Peak (0800-0900)		PM Peak (1630-1730)		Daily	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
Underground, metro, light rail, tram	0	0	0	0	0	0
Train	0	0	0	0	1	1
Bus, minibus, coach	0	0	0	0	0	0
Taxi	0	0	0	0	0	0
Motorcycle, scooter, moped	0	0	0	0	0	0
Driving a car or van	11	0	0	9	28	28
Passenger in a car or van	1	0	0	1	2	2
Bicycle	1	0	0	1	2	2
On foot	3	0	0	2	8	8
Other method of travel to work	0	0	0	0	0	0
Total	**17**	**0**	**0**	**13**	**42**	**42**

Total Trip Generation

7.44 The trip generation by mode for each journey purpose element of the allocation have been combined to identify the number of trips which would be classified as internal and those which would be external, and therefore, occur on the highway and sustainable transport networks. The total number of trips generated, internal and external, is set out in **Table 45** below.

Table 45 – Total Trip Generation

Mode	AM Peak (0800-0900)		PM Peak (1700-1800)		Daily	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
Underground, metro, light rail, tram	0	0	0	0	0	0
Train	18	45	25	15	188	188
Bus, minibus, coach	13	31	17	11	133	134
Taxi	4	10	6	4	44	44
Motorcycle, scooter, moped	9	19	11	7	85	85
Driving a car or van	428	791	577	408	4732	4756
Passenger in a car or van	166	435	71	45	829	830
Bicycle	39	77	43	31	359	361
On foot	162	349	163	113	1386	1392
Other method of travel to work	5	16	8	5	61	61
Homeworking	8	22	17	9	77	77
Total	**853**	**1795**	**937**	**647**	**7893**	**7928**

7.45 The internalisation assumptions which have been applied are set out in **Table 46**.

Table 46 – Internalisation Assumptions

Land Use	Trip Purpose	Assumption
Residential	Commuting / Business	It has been proposed that 10% of trips originating from the allocation will remain internal to the site.
	Education	It is assumed that education primary school trips will be internal to the site, the remaining education trips are assumed to all be external.
	Education Escort	It is assumed that education escort primary school trips will be internal to the site, the remaining trips are assumed to all be external.
	Shopping	Assumed to all be external.
	Other Work, Other Escort, and Personal Business	Assumed to all be external.
	Other	Assumed to all be external.
Employment		It has been proposed that 10% of trips originating from the allocation will remain internal to the site data from the Census 2011 data.
Ancillary Retail		Assumed to all be internal as all trips will be either pass-by or diverted trips already on the network or by sustainable modes
Primary School		Pupil and parent escort trips assumed to be internal to the site. All staff trips assumed to be external.

Total External / Internal Trip Generation

7.46 Based on the internalisation assumptions set out above, the total multi-modal internal trip generation for the allocation is set out in **Table 47** below.

Table 47 – Total Allocation Multi-Modal Internal Trips

Mode	AM Peak (0800-0900)		PM Peak (1700-1800)		Daily	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
Underground, metro, light rail, tram	0	0	0	0	0	0
Train	5	14	2	1	20	20
Bus, minibus, coach	3	10	1	1	14	14
Taxi	1	3	0	0	4	4
Motorcycle, scooter, moped	2	6	1	0	8	8
Driving a car or van	65	182	25	14	278	278
Passenger in a car or van	74	206	13	7	252	252
Bicycle	8	23	3	1	33	33
On foot	31	86	10	6	123	123
Other method of travel to work	2	5	1	0	7	7
Homeworking	1	2	2	1	8	8
Total	**193**	**537**	**57**	**31**	**746**	**746**

7.47 The total multi-modal external trip generation for the allocation is set out in **Table 48** below.

Table 48 – Total Allocation Multi-Modal External Trips

Mode	AM Peak (0800-0900)		PM Peak (1700-1800)		Daily	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
Underground, metro, light rail, tram	0	0	0	0	0	0
Train	13	31	23	14	168	168
Bus, minibus, coach	10	22	16	10	120	120
Taxi	3	7	5	3	39	40
Motorcycle, scooter, moped	7	13	10	7	77	77
Driving a car or van	363	609	552	394	4454	4478
Passenger in a car or van	92	229	58	38	577	579
Bicycle	31	54	40	29	326	328
On foot	131	263	152	107	1263	1269
Other method of travel to work	4	11	8	4	54	54
Homeworking	7	19	15	8	69	69
Total	**661**	**1258**	**881**	**615**	**7146**	**7182**

Phasing

7.48 The assessment will assess future-year scenarios for full build out by 2036. The phasing will be examined in more detail at planning application stage where interim years can be fully assessed. The person trip rates identified in **Table 19** have been applied to the full build-out including for up to 2,000 dwellings, 23,333m^2 employment land, and a primary school.

Trip Distribution

7.49 The NOMIS website, a service provided by the Office of National Statistics (ONS), holds publicly available data from the Census and other up-to-date UK labour market statistics from official sources. This has been interrogated to obtain Journey to Work origin-destination data from the 2011 Census for MSOA North Norfolk 010. This is the MSOA which encompasses all North Walsham, including the allocation. It should be noted that no allowance has been made to routes where greater availability of access to more sustainable modes of transport, i.e., rail and bus for journeys to Norwich which could impact on the level of vehicular trips generated along these routes. The route between Norwich and North Walsham could therefore generate less car trips than has been identified. This is not reflected in the analysis and is therefore considered to be robust.

7.50 The vehicular trips derived for the different land uses have been distributed onto the existing network using a VISSIM model. Vehicular trips have been distributed and assigned onto the highway network as follows:

- The main trip generator destinations of those living in MSOA North Norfolk 010 have been identified. All residential peak hour trips related to the allocation have been distributed in accordance with the existing (2011) distribution of the main trip generator destinations from the MSOA.
- The proposed vehicular traffic to and from the allocation has been distributed at:
  - MSOA level to destinations within North Norfolk District.
  - MSOA level to destinations within Broadland District.
  - District level to destinations within the East of England; and
  - Regional level to all other destinations in England and Wales.
- Vehicular trips have been assigned logically on the key routes on the highway network serving the allocation.

7.51 **Table 49** below summarises the vehicular trip distribution, based on entry and exit points of the assessed local highway network.

Table 49 – Vehicular Trip Distribution

Network entry/exit	Distribution
Internal to North Walsham	24%
B1145 Aylsham Road	8%
Cromer Road	14%
B1145 Lyngate Road	2%
Skeyton Road	0%
B1150 Norwich Road	37%
A149	12%
Happisburgh Road	2%
Total	**100%**

7.52 The assumed internal trip distribution within North Walsham is outlined in **Table 50** below.

Table 50 – Internal to North Walsham Vehicular Trip Distribution

Location in North Walsham	Distribution
Bank Loke Car Park	10%
Vicarage Streetcar Park	10%
Train Station	6%
Folgate Road Industrial Estate	20%
Waitrose	10%
Employment North of Waitrose	2%
Sainsbury's	10%

Location in North Walsham	Distribution
North Walsham Junior School	1%
Travel Hub/Community Centre	7%
Lidl	6%
North Walsham High School	9%
North Walsham Hospital	3%
Hornbeam Road Industrial Estate	4%
Garden Centre	1%
Rossis Leisure	1%
Total	**100%**

7.53 The trip assignment to/from each MSOA has been identified based on the fastest route available using the Google Maps route planning tool on a neutral weekday (Wednesday) at 08:30 hours, which takes account of existing congestion experienced on the network and covers the AM peak hour identified for this assessment. Where there is more than one route option available, a weighting has been applied depending on the likelihood of each route being used based on distance and estimated journey time. The vehicular routes identified have been reversed for departing trips.

7.54 All vehicular trips will enter and exit the allocation from either A149 Cromer Road, B1145 Aylsham Road, or B1150 Norwich Road and have been distributed to and from these access points. This is the case for the residential areas and employment areas.

7.55 This enables the identification of the proportion of trips that would take a particular route through the study area, for both arriving and departing trips. The proposed trips as identified in the Trip Generation section can then be applied to the study area highway network to understand the vehicular impact of the development on the relevant junctions. Whilst the methodology is deemed appropriate, there are some points worth noting, as set out below:

- Trips have been distributed based on the existing fastest route as illustrated on the Google Maps route planning tool. People may take different routes and may not necessarily use the fastest route.
- No further distribution adjustments have been made for future scenarios because of any potential future changes in the housing or workplace distributions or changes in the performance of the network.
- Allowance has not been given to travel planning and sustainable measures that could be incorporated into the allocation to reduce car-based trips.

8. Highway Network Assessment Scope

Introduction

8.1 This chapter sets out the scope of the highway network assessment and the impact of the allocation on the highway network.

Assessment Scenarios

8.2 To assess the impact of the allocation on the local road network, three assessment scenarios have been considered. The assessment scenarios are set out in **Table 51** below.

Table 51 – Assessment Scenarios

Assessment	Definition	Year	Day / Time	Assumptions	Allocation Assumption
Base	Existing road network and observed traffic flows from traffic counts undertaken in July and November 2022.	2022	Weekday AM and PM peaks	Existing road network.	No allocation proposals or vehicular trips included.
Do Minimum	Base traffic flows + background traffic growth.	2036	Weekday AM and PM peaks	Background traffic growth derived from TEMPro added to the base traffic to derive future year flows. The improvements are the A149 / B1150 signalised junction have been included as a committed scheme.	No allocation proposals or vehicular trips included.
Do Something	Do Minimum traffic flows + allocation vehicular trips.	2036	Weekday AM and PM peaks	As Do Minimum	Vehicular trips associated with full allocation. Completion of link road and associated highway improvements.
Do Something with Mitigation	Do Something traffic flows + mitigation proposals.	2036	Weekday AM and PM peaks	As Do Something	As Do Something with highway mitigation proposals included.

8.3 The current assessment would focus on 2036, which coincides with the end of the Local Plan and in the assessment is when full build out would be expected to occur. At planning stage further phasing will be assessed separately such that trigger points for required infrastructure can be identified.

TEMPro Traffic Growth

8.4 Reference has been made to the DfT traffic growth software TEMPro 7.2c to derive baseline and future year traffic flows for 2036. Car driver traffic growth factors for the base year and opening year have been derived using dataset 72 (RTF 2018 Scenario 1), geographical area North Norfolk 010 and adjusted using the National Traffic Model for all road types.

8.5 During the undertaking of the assessment, a newer version of TEMPro was released, version 8.0 however, this version of TEMPro did not allow for the calculation of National Traffic Model (NTM) traffic growth figures. Although growth factors could not be derived, a review of the planning data was undertaken. The review confirmed changes to the base and future households and jobs. The changes have occurred as more up to data planning data has been utilised and taken from Local Plans and Planning Authority sources. The changes to base and future households and jobs is set in **Table 52** below.

Table 52 – Planning Data – Planning Changes

TEMPro Version	2022		2036	
	Base Households	Base Jobs	Future Households	Future Jobs
7.2	6628	5555	7801	5792
8.0	6170	5476	6536	5788
Difference	-458	-79	-1265	-96

8.6 This illustrates that fewer houses and jobs have, and are expected to, come forward in North Walsham based on the most up to date dataset.

8.7 The planning data included in TEMPro version 8 is considered more representative and therefore this has been reflected in version 7.2 in the alternative assumptions before the growth rates have been derived. The data has been reviewed to confirm that the full allocation of the Hopkins Homes development in North Walsham is included and that the full allowance for the permitted development Scottow Enterprise Park has been included also.

8.8 The resulting traffic factors are set out in **Table 53** below.

Table 53 – TEMPro Local Growth Figure

Year	AM Peak	PM Peak
2022-2036	1.083796	1.080236

8.9 The process undertaken is considered to provide greater certainty on the level of background growth than if the most recent version of TEMPro was applied.

8.10 One thing this data does not reflect is anticipated changes to car driver trips over time as people shift to more sustainable travel modes and patterns. The most recent TEMPro Guidance identifies alternative growth rates to allow for this to be assessed. This has not been reflected in the current assessment to present a robust assessment for the purposes of the Local Plan.

Percentage Impact Assessment

8.11 Following discussions with NCC, it was considered appropriate to model the highway network using VISSIM, a microsimulation traffic modelling tool, which allows for dynamic redistribution of traffic where route choice exists and can model a large area rather than follow the standard approach whereby each junction is modelled individually and therefore cannot take account of inter junction interaction and impacts elsewhere on the network.

8.12 A numerical and percentage change assessment has been carried out for the future year scenarios for both North Walsham, and Coltishall and Horstead using traffic data extracted from the calibrated VISSIM models. These compare the VISSIM model outputs for Do Something (Demand flows) against the Do Minimum traffic flows and illustrate the extent of change in traffic expected across the study area road network.

8.13 **Table 56** and **Table 57** below provides a summary of the numerical and percentage change in vehicular trips derived through the Vissim Modelling study network junctions in the peak hours for each of the scenarios assessed in North Walsham, and Coltishall and Horstead.

8.14 The full percentage change output tables for North Walsham and Coltishall and Horstead are included at **Appendix E** whilst the traffic flow diagrams illustrating the flows across the networks in the scenarios assessed are included at **Appendix A.**

8.15 This illustrates an increase in traffic volumes on each arm and across each of the key junctions assessed. From this data, in North Walsham, the increase in traffic on junction approaches is generally less than 60 vehicles per hour in all periods, except for B1150 Norwich Road where the residual % impact reaches 20%. This is largely because the proposed link road allows traffic to redistribute more efficiently and caters for the growth in traffic. On Norwich Road capacity improvements at the B1150/ A149 junction which are committed and under design by NCC provide for traffic growth and allow traffic to be attracted to this route.

8.16 In the '2036 Do Something with Mitigation' Scenarios, traffic volumes are predicted to reduce on the many local from future predicted baseline levels, through the closure of through routes and the provision of the new link road, despite the provision of the new development. **Table 54** below sets out the forecast reduction in traffic on local roads in North Walsham with the delivery of the proposed development and WLR.

Table 54 – Forecast change in vehicle numbers in 2036: With Development-Without Development

Road	Two-Way Vehicles	
	AM Peak	PM Peak
Greens Road	-289	-300
Station Road	-59	-65
Millfield Road	4	-21
Tungate Road	-22	-13
A159 North Walsham Relief Road	-14	18
Skeyton Road	-112	25

8.17 The proposed link road draws between 706 and 761 peak hour trips, which includes local traffic from existing routes. HGVs represent between 0.07and 2% of these traffic volumes in the PM and AM peaks respectively. The WLR will allow existing HGV traffic to be removed from unsuitable narrow streets such as Station Road or Millfield Road and will provide more direct access between the B1150 and A149 designated HGV routes, where bridge heights under the railway vary, and routing options to the bridges connecting east and west north Walsham are required. Volumes of local traffic forecast to re-route along the WLR, and the volume of rerouted HGVs during peak hours are set out in Table 55.

Table 55 – 2036 peak hour background traffic rerouting along WLR

WLR Section	AM Peak		PM Peak	
	Two-Way Vehicular Trips	HGV Volume	Two-Way Vehicular Trips	HGV Volume
Between B1150 (Norwich Road) and B1145 (Aylsham Road)	70	7	129	4
Between B1145 (Aylsham Road) and A149 (Cromer Road)	325	22	367	6

8.18 This data confirms the benefits the proposed WLR will bring, without a northern extension, in addition to mitigating the impacts of the proposed development.

8.19 What is noted is that despite the proposed traffic management measures on Skeyton New Road and on Aylsham Road at the railway bridge, there is a residual net increase in the eastbound direction of 37 vehicles in the PM peak hour. Aylsham Road has a short section with no footways where the 20-mph zone commences, and driveways open directly onto a narrow road which is particularly sensitive. Increasing traffic on this route should be avoided if possible and to help further discourage the use of Aylsham Road as a through route into North Walsham for general traffic, it is proposed that the Aylsham Road junction with the proposed new link road is provided as a staggered signalised junction to break the through route along Aylsham Road. This will reduce vehicle speeds on entry to Aylsham Road and make the use of this as a through route more difficult. It is also recommended that at planning stage further traffic management measures are explored to minimise the impact of traffic impacts, such as designating the route for access only, provision of additional signage and provision of horizontal deflection to impose speed reductions for traffic.

8.20 Furthermore, the promotion of active modes for local trips will be a priority through the investment in addressing gaps in the pedestrian and cycle network, and through delivering a highly accessible development area. Public transport permeability and enhanced facilities will help drive public transport usage.

Table 56 – North Walsham Percentage Impact Assessment

Ref	Junction	Arm	AM Peak				PM Peak			
			2036 Do Something		2036 Do Something with Mitigation		2036 Do Something		2036 Do Something with Mitigation	
			Veh Change	% Change	Veh Change	% Change	Veh Change	% Change	Veh Change	% Change
1	Bradfield Road / Cromer Road / Link Road	Bradfield Road (N)	53	5300%	53	5300%	62	886%	62	886%
		Cromer Road (W)	63	17%	63	17%	110	19%	110	19%
		Proposed Link Road	343	N/A	389	N/A	294	N/A	291	N/A
		Cromer Road (E)	1	0%	-21	-4%	-13	-3%	-10	-2%
		Total	**460**	**52%**	**484**	**55%**	**450**	**43%**	**456**	**43%**
2	Cromer Road / Greens Road	Cromer Road (W)	9	2%	36	10%	-1	0%	1	0%
		Greens Road (S)	-139	-100%	-139	-100%	-144	-100%	-144	-100%
		Cromer Road (E)	40	9%	18	4%	6	1%	9	2%
		Total	**-90**	**-9%**	**-85**	**-9%**	**-139**	**-12%**	**-134**	**-11%**
3	B1145 / A149 / A149 Cromer Road / Cromer Road	B1145 (N)	32	7%	32	7%	37	7%	37	7%
		Cromer Road (W)	55	17%	95	29%	37	7%	42	7%
		A149 (S)	15	3%	-21	-4%	-11	-2%	-10	-2%
		Cromer Road (E)	0	0%	0	0%	0	0%	0	0%
		Total	**102**	**7%**	**106**	**8%**	**63**	**4%**	**69**	**4%**
4	Cromer Road / Mundesley Road / Market Street / Aylsham Road	Mundesley Road (N)	0	0%	0	0%	0	0%	0	0%
		Cromer Road (W)	-3	-4%	15	20%	0	0%	0	0%
		Aylsham Road (S)	19	5%	-2	-1%	15	4%	15	4%
		Market Street (E)	0	0%	0	0%	0	0%	0	0%
		Total	**16**	**3%**	**13**	**2%**	**15**	**2%**	**15**	**2%**
5	Aylsham Road / Park Lane	Aylsham Road (E)	0	0%	0	0%	0	0%	0	0%

Ref	Junction	Arm	AM Peak 2036 Do Something Veh Change	AM Peak 2036 Do Something % Change	AM Peak 2036 Do Something with Mitigation Veh Change	AM Peak 2036 Do Something with Mitigation % Change	PM Peak 2036 Do Something Veh Change	PM Peak 2036 Do Something % Change	PM Peak 2036 Do Something with Mitigation Veh Change	PM Peak 2036 Do Something with Mitigation % Change
		Aylsham Road (W)	26	18%	-9	-6%	32	28%	17	15%
		Park Lane (S)	30	7%	35	8%	-13	-3%	-9	-2%
		Total	**56**	**10%**	**26**	**5%**	**19**	**3%**	**8**	**1%**
6	Aylsham Road / Skeyton New Road	Aylsham Road (E)	40	24%	30	18%	3	2%	-10	-7%
		Aylsham Road (W)	26	19%	1	1%	36	34%	37	35%
		Skeyton New Road (S)	0	0%	-13	-100%	0	0%	-22	-100%
		Total	**66**	**21%**	**18**	**6%**	**39**	**15%**	**5**	**2%**
7	B1145 Aylsham Road / Aylsham Road / Greens Road / Tungate Road	Greens Road (N)	-150	-100%	-150	-100%	-167	-100%	-167	-100%
		Aylsham Road (W)	23	13%	23	13%	45	28%	45	28%
		Tungate Road (S)	-5	-12%	-19	-44%	-7	-15%	-4	-9%
		Aylsham Road (E)	9	3%	12	5%	25	14%	22	12%
		Total	**-123**	**-20%**	**-134**	**-22%**	**-104**	**-19%**	**-104**	**-19%**
8	Aylsham Road / Station Road	Aylsham Road (E)	33	29%	22	20%	28	38%	14	19%
		Aylsham Road (W)	-24	-10%	-39	-16%	-37	-17%	-10	-5%
		Station Road (S)	-52	-25%	-29	-14%	-28	-15%	-34	-18%
		Total	**-43**	**-8%**	**-46**	**-8%**	**-37**	**-8%**	**-30**	**-6%**
9	Station Road / Skeyton New Road	Skeyton New Road (E)	-1	-2%	12	24%	1	2%	23	46%
		Station Road (N)	-36	-20%	-53	-30%	-53	-31%	-47	-27%
		Station Road (S)	-60	-28%	-58	-27%	-27	-13%	-51	-25%
		Total	**-97**	**-22%**	**-99**	**-22%**	**-79**	**-19%**	**-75**	**-18%**

Ref	Junction	Arm	AM Peak				PM Peak			
			2036 Do Something		2036 Do Something with Mitigation		2036 Do Something		2036 Do Something with Mitigation	
			Veh Change	% Change	Veh Change	% Change	Veh Change	% Change	Veh Change	% Change
10	Station Road / Oak Road / Skeyton Road	Oak Road (N)	0	0%	0	0%	0	0%	0	0%
		Station Road (W)	-46	-21%	-70	-32%	-53	-24%	-43	-20%
		Skeyton Road (S)	-54	-57%	-63	-67%	53	96%	32	58%
		Station Road (E)	-28	-13%	-17	-8%	-33	-16%	-39	-19%
		Total	**-128**	**-24%**	**-150**	**-28%**	**-33**	**-7%**	**-50**	**-10%**
11	Station Road / Millfield Road / Morris Road	Station Road (N)	-25	-12%	-42	-20%	1	1%	9	5%
		Morris Road (W)	11	13%	11	13%	0	0%	0	0%
		Millfield Road (S)	-45	-28%	-21	-13%	-34	-23%	-37	-25%
		Station Road (E)	12	N/A	8	N/A	5	12%	4	9%
		Total	**-47**	**-10%**	**-44**	**-10%**	**-28**	**-7%**	**-24**	**-6%**
12	B1150 Norwich Road / Millfield Road	Norwich Road (N)	20	4%	76	17%	106	20%	114	22%
		Millfield Road (W)	-25	-11%	-31	-14%	-1	-1%	7	6%
		Norwich Road (S)	41	9%	37	8%	-96	-17%	-94	-17%
		Total	**36**	**3%**	**82**	**7%**	**9**	**1%**	**27**	**2%**
13	B1150 Norwich Road / Station Road	Norwich Road (N)	26	6%	82	17%	108	19%	116	21%
		Station Road (W)	-10	-14%	-6	-8%	-1	-2%	0	0%
		Norwich Road (S)	98	22%	108	24%	-7	-1%	6	1%
		Total	**114**	**11%**	**184**	**18%**	**100**	**9%**	**122**	**11%**
14	B1150 Norwich Road / A149 / Norwich Road	Norwich Road (E)	10	2%	22	4%	68	15%	79	17%
		A149 (N)	27	6%	36	8%	29	5%	28	5%
		Norwich Road (W)	73	14%	88	17%	-11	-2%	2	0%

Ref	Junction	Arm	AM Peak 2036 Do Something Veh Change	AM Peak 2036 Do Something % Change	AM Peak 2036 Do Something with Mitigation Veh Change	AM Peak 2036 Do Something with Mitigation % Change	PM Peak 2036 Do Something Veh Change	PM Peak 2036 Do Something % Change	PM Peak 2036 Do Something with Mitigation Veh Change	PM Peak 2036 Do Something with Mitigation % Change
		A149 (S)	48	14%	49	14%	68	17%	68	17%
		Total	**158**	**9%**	**195**	**11%**	**154**	**8%**	**177**	**9%**
15	Grammar School Road / King's Arms Street	King's Arms Street (N)	9	10%	10	12%	22	22%	22	22%
		Grammar School Road (W)	55	10%	71	13%	6	1%	20	4%
		Grammar School Road (E)	40	7%	40	7%	63	11%	62	11%
		Total	**104**	**8%**	**121**	**10%**	**91**	**8%**	**104**	**9%**
22	B1145 / Laundry Loke	B1145 (S)	34	9%	36	10%	29	7%	29	7%
		Laundry Loke (W)	6	7%	6	7%	22	13%	22	13%
		B1145 (N)	27	7%	27	7%	16	4%	16	4%
		Total	**67**	**8%**	**69**	**8%**	**67**	**7%**	**67**	**7%**
16	B1145 / Lyngate Road / Folgate Road	B1145 (N)	14	5%	14	5%	7	4%	7	4%
		Lyngate Road (E)	10	4%	10	4%	4	2%	4	2%
		B1145 (S)	-16.8	5%	-16.8	5%	-16.8	7%	-16.8	7%
		Folgate Road (W)	0	0%	0	0%	-1	-1%	-1	-1%
		Total	**35**	**4%**	**35**	**4%**	**35**	**4%**	**35**	**4%**

Table 57 – Coltishall and Horstead Percentage Impact Assessment

Ref	Junction	Arm	AM Peak 2036 Do Something Veh change	AM Peak 2036 Do Something % change	AM Peak 2036 Do Something with Mitigation Veh change	AM Peak 2036 Do Something with Mitigation % change	PM Peak 2036 Do Something Veh change	PM Peak 2036 Do Something % change	PM Peak 2036 Do Something with Mitigation Veh change	PM Peak 2036 Do Something with Mitigation % change
1	Rectory Road / B1150 Norwich Road / Mill Road	Norwich Road (E)	180	23%	180	23%	67	9%	67	9%
		Millfield Road (S)	1	5%	1	5%	0	0%	0	0%
		Norwich Road (W)	60	9%	60	9%	133	17%	131	17%
		Rectory Road (N)	-1	0%	-1	0%	0	0%	0	0%
		Total	**240**	**14%**	**240**	**14%**	**200**	**12%**	**198**	**11%**
2	B1150 Norwich Road / B1354 Church Street / High Street / Petrol Station	High Street (N)	195	34%	197	34%	69	14%	67	14%
		B1354 (E)	-2	-1%	-2	-1%	1	0%	1	0%
		Petrol Station (S)	0	0%	0	0%	0	0%	0	0%
		Norwich Road (W)	55	7%	57	7%	159	20%	158	20%
		Total	**248**	**15%**	**252**	**15%**	**229**	**14%**	**226**	**14%**
3	High Street / Station Road	Station Road (N)	190	33%	190	33%	71	16%	71	16%
		High Street (S)	67	15%	68	16%	159	28%	159	28%
		Great Hautbois Road (N)	0	0%	0	0%	0	0%	0	0%
		Total	**257**	**25%**	**258**	**25%**	**230**	**22%**	**230**	**22%**
4	Church Loke / B1354 / Rectory Road	Rectory Road (N)	2	4%	2	4%	-2	-4%	-2	-4%
		B1354 (E)	-2	-1%	-2	-1%	17	5%	17	5%
		Church Loke (S)	1	17%	1	17%	1	17%	1	17%
		B1354 (W)	-4	-1%	-2	0%	15	5%	15	5%
		Total	**-3**	**0%**	**-1**	**0%**	**31**	**5%**	**31**	**5%**

8.21 In Coltishall and Horstead the volume of through traffic on the B1150 is predicted to increase by on average 250 vehicles (two way) in the peak hours which is significant. The impact of this on capacity is considered separately.

8.22 From the accident analysis there were no accident clusters or specific road safety issues identified within Coltishall and Horstead, that this traffic increase would exacerbate, although vehicle speeds on entry from the south into Horstead were slightly above the speed limit.

8.23 The issue of pedestrian safety is something which the Parish Council have already brought to the attention of NCC and the increase in traffic arising from the proposed development will make it more difficult for pedestrians to cross the B1150. A separate study is underway by NCC examining pedestrian crossing safety in Coltishall on High Street which will look for potential to deliver formal and improved crossing facilities.

8.24 The issue of pedestrians crossing the B1150 in Horstead, near the Recruiting Sergeant, and to the north of Coltishall at Ling Way, have been raised as a concern by the Parish Council and should be examined at planning stage.

8.25 It should be noted that the traffic volumes assessed are considered a worst-case scenario and test 10% higher development growth than proposed and assume very low levels of home working. Furthermore, the highest level of public transport service from North Walsham is focussed on the desire line of the B1150 through express bus services and the railway line, which has not been reflected in the traffic forecasting on this route. For these reasons, the level of forecast traffic is estimated to be at least 15% more than will be realised.

8.26 Bearing in mind the lack of alternative routes for traffic, measures to mitigate the impacts of this growth in Coltishall and Horstead have been identified:

- The impact on the B1150, and Coltishall and Horstead is best addressed firstly through minimising the traffic growth on this route. The use of public transport will be actively promoted at the development through the proposed public transport strategy, incorporating a bus interchange for express services, and improved active travel access to North Walsham Station and target led travel planning.
- At planning stage, the development will contribute towards and deliver proportionate mitigation to address highway impacts in Coltishall and Horstead on pedestrian crossing facilities on High Street, at Ling Way and at the Recruiting Sergeant. It has been agreed with NCC, that following the outcome of their safety study the proposed allocation will look to contribute towards measures identified to mitigate impacts.
- Creating greater awareness of the village entry and reduced speed limit on the approach to Horstead from the South would help reduce vehicle speeds. At planning stage additional signage should be identified.

8.27 Background traffic is also predicted to increase substantially by 2036 and any development growth increasing traffic on the B1150 should be looking at how it can assist NCC in mitigating any potential road safety impacts.

9. Highway Network Assessment

Introduction

9.1 This section sets out the results of the highway capacity assessment carried out for North Walsham and Coltishall and Horstead.

Forecast Modelling

9.2 The VISSIM models have assessed the 2036 future year scenarios to test the operation of the network without the development, with the development and further mitigation in place.

Proposed Network Changes

9.3 There are changes to the highway network which are either already committed, or which have been identified through this assessment of the proposed allocation, which are reflected in the future year VISSIM models.

Committed Improvements

9.4 There is a committed junction improvement scheme at the B1150 Norwich Road / A149 signalised junction which is currently being designed by NCC. The improvement scheme at this junction is coming forward because of the planning consents for the Hopkins Homes and Persimmon Homes developments off B1150 Norwich Road and provides additional capacity. The design improvements also include the provision of two additional signalised pedestrian and cycle crossings on the eastern and southern arms of the junction, which are yet unfunded. The design detail for this junction was provided by NCC for inclusion in the VISSIM model and is included in **Appendix D**. It has been assumed that the proposed allocation would provide funding towards the provision of the additional pedestrian and cycle crossings. The provision of the additional pedestrian and cycle crossings will improve access for pedestrians and cyclists at this key focal point however it should be acknowledged that they will impact on highway capacity at the junction.

Mitigation Measures

9.5 The proposed development mitigation package is described in further detail in the next Chapter but for the purposes of understanding the highway assessment findings we have also summarised the measures reflected in the future year modelling here:

North Walsham

- Proposed new link road: New road link between B1150 Norwich and A149 Cromer Road including roundabout junctions on either end, a staggered priority junction with Skeyton Road and a signalised junction with Aylsham Road. Road designed to accommodate HGVs and permit through traffic.
- Aylsham Road traffic management Scheme: Proposed signalised shuttle scheme on Aylsham Road at the railway bridge, incorporating toucan crossings on either end. Skeyton New Road is also closed to through traffic eastbound. This is aimed at allowing road space to be redirected to provided footways, and to discourage through traffic from using Aylsham Road.
- Closure of Green Lane as a through route.

9.6 The existing route available north of the railway line along Bradfield Road has been included in the model as an available route, reflecting existing capacity/ physical constraints.

Coltishall and Horstead

- Proposed Right Turn Lane from B1150 northbound into B1354.
- Proposed replacement of car parking with a Bus Cage at the War Memorial on High Street.

9.7 **Table 58** below summarises what is included in which scenario for clarity.

Table 58 – Future Year Highway Network Changes in VISSIM Modelling

Measures	2036 Do Minimum AM & PM	2036 Do Something AM & PM	2036 Do Minimum AM & PM
North Walsham			
Enhanced signalised junction with ped crossings on three arms at B1150/A149 junction	✓	✓	✓
Proposed new Link Rd from A149 to B1150, intersecting with Aylsham Rd and Skeyton Rd.		✓	✓
Aylsham Rd and Skeyton New Road traffic management & ped safety scheme.		✓	✓
Closure of Green Lane as a through route		✓	✓
Coltishall and Horstead			
Proposed Right Turn Lane from B1150 north bound into B1354		✓	✓
Proposed replacement of car parking with a Bus Cage at the War Memorial on High Street.		✓	✓

9.8 The 2036 future year traffic flows used for this assessment represent a very robust scenario for the following reasons:

- A total of 2,000 dwellings have been assessed rather than the 1,800 identified within the allocation policy, to allow a conservative estimate of development impacts to be tested;
- No allowance for mode shift in background traffic has been made, despite transport policy being focussed on supporting more sustainable travel patterns and modes;
- Future mode shares at the residential development have been assumed to reflect a reduction of car driver trips by ten percentage points from Census 2011 levels in North Walsham. Bearing in mind the improved level of local public transport provision since 2011 and increased reliance on home working, this is a conservative design case;
- No mode shift has been assumed for employment uses, and local internalisation is assumed to be minimal; and
- The most dominant route for highway traffic from the proposed development has been identified to be along the B1150 towards Norwich. This route also accommodates the most significant public transport services, and the likely higher taken up of public transport along this desire line has not been reflected in the analysis.

9.9 Taking all these factors into account, the forecast traffic flows are considered to have a safety factor of 15% incorporated (i.e., they are 15% higher than they should be in reality). The reason for this is that it is early in the process, and for Local Plan allocation a high-level understanding of the issues to be addressed needs to be fully understood to prove deliverability.

9.10 The results of the VISSIM modelling are summarised in the following sections, with the full results set out in the Forecast Reports included at **Appendix F**.

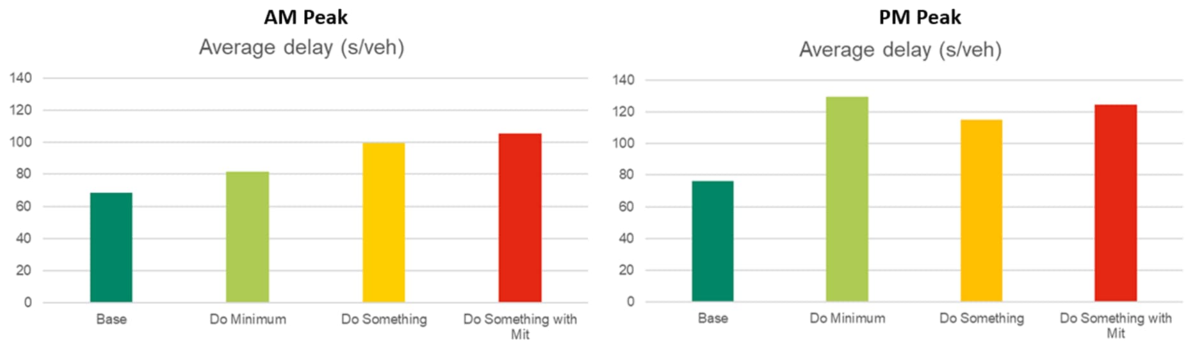
Overview of Results – North Walsham

Network Delay

9.11 To establish the impact of the allocation on the road network within North Walsham, the VISSIM model has been run for the 2036 Do Minimum and Do Something Development scenarios. This allows a comparison to be undertaken between how the road network would operate in 2036 without and with the development and its associated infrastructure coming forward.

9.12 From the VISSIM model, the overall network delay (in terms of seconds per vehicle) can be ascertained for each of the scenarios and peak hours assessed. The results are set out in **Figure 38** below. It should be noted that the Do Minimum, Do Something, and Do Something with Mitigation relates to predicted 2036 conditions. This is the best way to capture the overall highway network impacts, whilst individual junctions' impacts are reported more fully in the forecast VISSIM modelling reports.

Figure 38 – Network Average Delay, AM, and PM Peaks – North Walsham



9.13 The figures illustrate:

- The PM peak hour is the most critical scenario when delays are predicted to be greatest. During this time overall network delays are expected to increase from existing levels of 76 seconds per vehicle without the proposed development, to 129 seconds on average per vehicle. In the 'Do Something' scenario, where the proposed development and associated link road are added, overall network delays reduce to 115 seconds per vehicle.
- There is a slight increase in delay in the Do Something with Mitigation scenario caused by routing changes in the area due to the traffic management and pedestrian improvements measures on Aylsham Road and Skeyton New Road. Overall network conditions are predicted to be better in the future year with the proposed development and mitigation measures in place.
- In the AM peak, the average delay increases across the network with the proposed development and mitigation in place, however this is increase is predicted to be less than all future year PM scenarios and is not considered to be significant.
- Overall network impacts are mitigated by the proposed development.
- It is also reasonable to expect that the significant pedestrian, cycle, and public transport improvements proposed as part of the allocation will impact car driver mode shares for background traffic and development trips, further reducing predicted network delays.

Junction Impact

9.14 The modelling identified four locations within the study area which have been identified from the survey data / observations as having the most significant impact on network operation. The four key junctions are:

1 – Cromer Road / A149 / B1145 signalised crossroads.

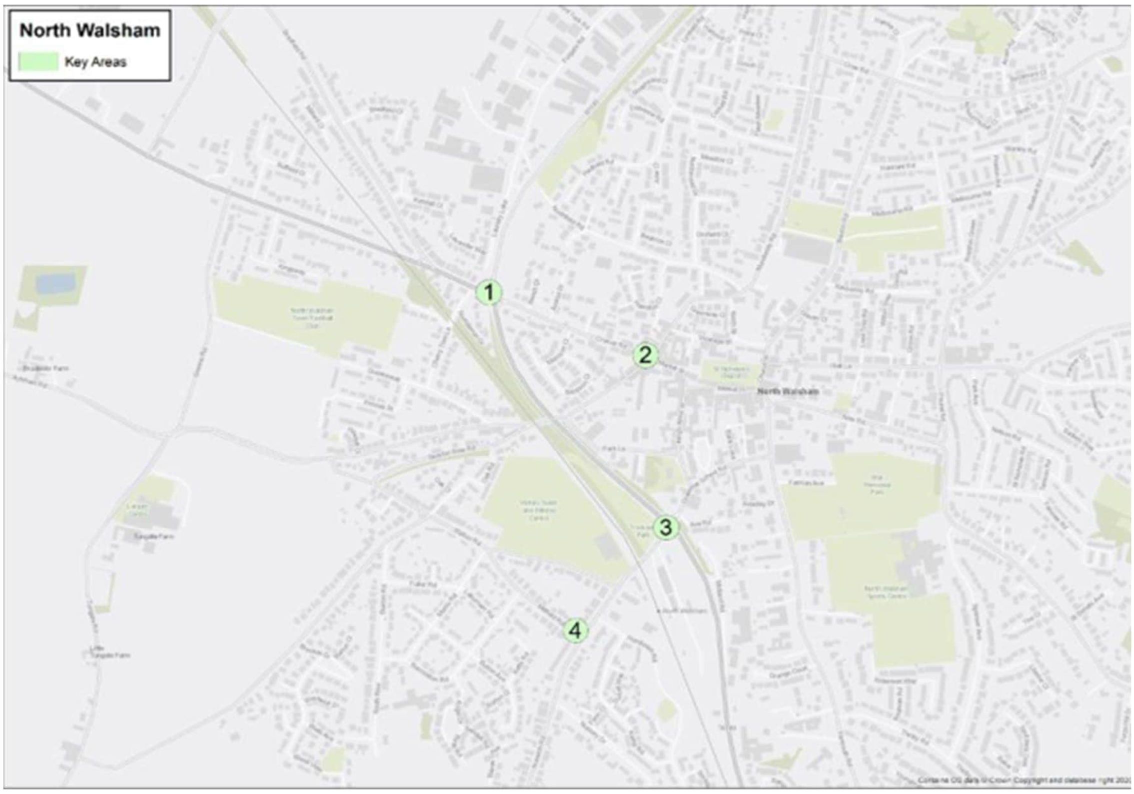
2 – Cromer Road / Aylsham Road / Mundesley Road signalised crossroads.

3 – B1150 Norwich Road / A149 / Grammar School Road signalised crossroads.

4 – Norwich Road / Millfield Road priority junction.

9.15 The junctions above are illustrated on **Figure 39** below.

Figure 39 – Key Junctions in North Walsham VISSIM Model



1 – Cromer Road / A149 / B1145

9.16 The percentage change assessment illustrates that there would be an increase in peak hour traffic flows of between 4% and 7% in 2036 at this junction once the allocation comes forward. The additional traffic is predicted to result in a small increase in queuing and delay when comparing the Do Minimum and Do Something scenarios. Queuing is shown to increase by a metre with delay increasing by two seconds.

9.17 Upon implementation of the mitigation on Aylsham Road, there would be a further slight increase in queues and delay when comparing the Do Minimum and Do Something with Mitigation scenarios. This increases to three metres in terms of queuing and four seconds in terms of delay.

9.18 The residual impact of the allocation on the Cromer Road / A149 / B1145 signalised junction is therefore considered to be negligible in both peak hours.

2 – Cromer Road / Aylsham Road / Mundesley Road

9.19 The percentage change assessment illustrates that there would be an increase in peak hour traffic flows of between 2% and 3% in 2036 at this junction once the allocation comes forward. The additional traffic would result in a negligible increase in queuing and delay when comparing the Do Minimum and Do Something scenarios. Queuing is shown to increase by a metre with delay increasing by one second.

9.20 Upon implementation of the mitigation on Aylsham Road, there would also be slight change queues and delay when comparing the Do Minimum and Do Something with Mitigation scenarios. Generally, there is no significant change in queues and delay with a one metre increase in queuing and one second increase in delay noted on Aylsham Road in the PM peak.

9.21 The residual impact of the allocation on the Cromer Road / Aylsham Road / Mundesley Road junction is therefore considered to be negligible in both peak hours.

3 – B1150 Norwich Road / A149

9.22 The percentage change assessment identifies that there would be a potential increase of between 9% and 11% in 2036 at this junction once the allocation comes forward.

9.23 This junction is predicted to experience delays in the future Do Minimum scenarios, with the proposed improvement scheme with pedestrian crossings in place. Those issues are further exacerbated through the provision of the proposed development and associated mitigation on Aylsham Road which causes traffic to reroute from Aylsham Rd and Millfield Road towards the B1150 Norwich Road. Capacity issues are predicted to be at their worst in the PM peak hour.

9.24 There is a predicted increase in delay of approximately 150 seconds in the AM peak when approaching from B1150 Norwich Road South between the Do Minimum and Do Something scenarios. The main capacity issue is the left-turn movement from B1150 Norwich Road to the A149 Northbound. This is creating extensive queuing on this approach blocking the left-turn flare.

9.25 As with the increase in delay, there is an increase in queues. The queues reported however are a moving queue created by not all vehicles clearing the junction during the green time. Although the queue length is shown within the model to increase over the peak hour assessed, by the end of the hour, vehicles waiting at the junction can all clear the junction and therefore the capacity issue is expected to be limited to the peak hours.

9.26 Further opportunities to increase highway capacity at this junction are limited to refinement of the traffic signal operation, which would be expected to deliver some benefits. The reported capacity issues are because of the capacity implications of providing pedestrian crossings and traffic management measures proposed for safety reasons and to promote sustainable travel, alongside traffic impacts arising from the proposed allocation, based on the worst-case traffic flows predicted.

9.27 Whilst highway capacity is not predicted to be mitigated in full at this junction, here are other factors to consider:

- The forecast traffic is overly robust (by an estimated 15%) and so impacts would be proportionally less in reality.
- The improvements identified by NCC at the A149/ B1150 junction as part of the consented scheme design will improve facilities for pedestrians and cyclists accessing North Walsham Town Centre and railway station but do impact capacity.
- The traffic management measures and pedestrian and cycle facilities on Aylsham Road will offer a wider benefit to both existing and new residents of North Walsham.
- The proposed link road will deliver network resilience which does not currently exist which will help cater for the short periods where congestion is expected to occur.
- Travel behaviour would be expected to alter to avoid these delays through peak hour spreading or travel by other means.

9.28 When all these issues are considered, it is considered that the reported delays are unlikely to materialise and the wider network benefits arising from the proposals will act to manage future traffic demand through the junction.

4 – B1150 Norwich Road / Millfield Road

9.29 The percentage change assessment illustrates that there would be a change of between -3% and 7% at the junction. Millfield Road, which is currently utilised as the main route from B1150 Norwich Road to A149 Cromer Road by HGVs avoiding the low bridges would see a change of between -11% and -1% when comparing the Do Minimum and Do Something scenarios. This represents a benefit of the link road within the allocation. Once the mitigation on Aylsham Road is implemented, the reduction in traffic on Millfield increases to -14% in the AM peak however there is a small 6% (seven vehicle) increased identified in the PM peak due to some network congestion.

9.30 The modelling illustrates negligible changes to the queues and delays at the junction when comparing the different scenarios however there is potential for the junction to be impacted upon by the queues generated at the B1150 Norwich Road / A149 signalised junction.

9.31 The impact of the allocation on the B1150 Norwich Road / Millfield Road junction is therefore considered to be negligible in both peak hours, and predicted decreases in traffic flows on Millfield Road, and removal of HGVs would be of significant benefit to safety for residents.

Summary & Residual Impacts

9.32 The impact of the allocation and associated mitigation is considered to have a positive impact on overall highway network delay with improvements in the more critical PM Peak, when comparing both Do Something scenarios with the Do Minimum scenario.

9.33 There are capacity issues forecast at the B1150/ A149 signalised junction, which are predicted to worsen with the proposed allocation and associated measures in place however it is expected that these predicted queues are unlikely to materialise because traffic forecasting has been highly conservative (approximately 15% higher than expected in practice). In addition, the development delivers overall betterment through:

- Delivery of a new link road bringing network resilience, and a more suitable route for north south traffic and HGVs on the west side of North Walsham;
- Removing traffic and HGVs from Station Road, Millfield Road, parts of Aylsham Road and Skeyton New Road; and
- Delivery of comprehensive pedestrian, cycle and traffic management measures which will not only improve road safety but will encourage more sustainable trips by existing and future residents in North Walsham.

9.34 It is important that impacts on the B1150/ A149 junction are minimised through demand management measures and through promoting sustainable travel.

9.35 The forecast increase in eastbound traffic on Aylsham Road in the Do Something with Mitigation scenario will be mitigated by discouraging the use of Aylsham Road as a through route into North Walsham for general traffic, by staggering the Aylsham Road junction with the proposed new link road. This will reduce vehicle speeds on entry to Aylsham Road and make the use of this as a through route more difficult. It is also recommended that at planning stage further traffic management measures are explored to minimise the impact of traffic impacts on the narrow 20 mph section, such as designating the route for access only, provision of additional signage and provision of horizontal deflection to impose speed reductions for traffic. No direct access to development land should be provided from Aylsham Road.

9.36 Traffic flows on Skeyton Road are low and are forecast to remain low, but it is a well-used route by pedestrians and cyclists. Given that this is a residential lane, to avoid rat running along it, it is proposed to prevent vehicular traffic access from the proposed link road, and only allowing pedestrian and cycle traffic to cross the Link Road from Skeyton Road.

9.37 Furthermore, the promotion of active modes for local trips will be a priority through the investment in addressing gaps in the pedestrian and cycle network, and through delivering a highly accessible development area. Public Transport permeability and enhanced facilities will help drive public transport usage.

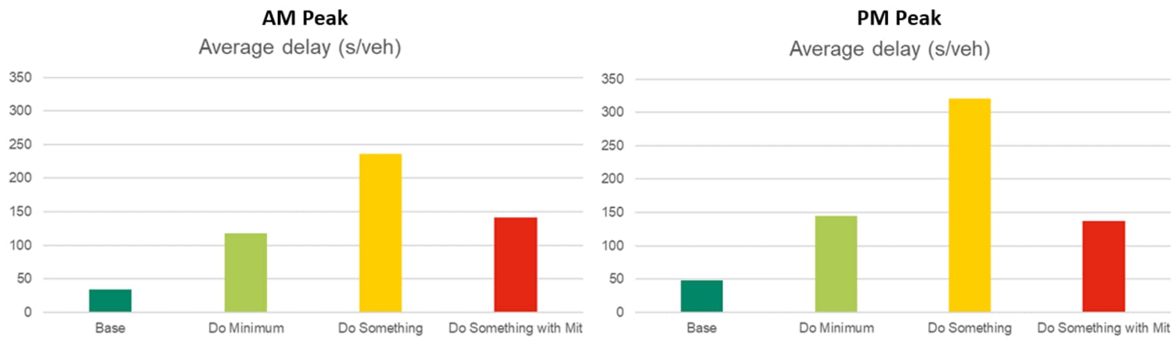
9.38 It is therefore considered that the allocation will on balance be capable of mitigating transport impacts and will deliver some overall betterment in North Walsham.

Results – Coltishall and Horstead

9.39 To establish the impact of the allocation on the road network within Coltishall and Horstead, the VISSIM model has been run for the 2036 Do Minimum and Do Something Development scenarios. This allows a comparison to be undertaken between how the road network would operate in 2036 without and with the development and its associated infrastructure coming forward.

9.40 From the VISSIM model, the overall network delay (as seconds per vehicle) can be ascertained for each of the scenarios and peak hours assessed. The results are set out in **Figure 40** below. It should be noted that the Do Minimum, Do Something, and Do Something with Mitigation relates to 2036 only.

Figure 40 – Network Average Delay, AM, and PM Peaks – Coltishall and Horstead



9.41 The figures illustrate:

- Overall network delays in Coltishall and Horstead are predicted to be slightly higher than average network delays predicted in North Walsham with the PM peak hour being the more critical period for the highway network.
- In the PM peak, existing levels of overall network delay are predicted to increase to almost 150 seconds per vehicle during the PM peak hour. It is however observed that the Do Minimum delay is greater than that identified for the Do Something with Mitigation scenario illustrates that whilst the allocation coming increases delay within Coltishall and Horstead, the mitigation proposed would result delay be reduced to a level slightly below experienced in the Do Minimum scenario. This illustrates that the mitigation proposed would mitigate the highway capacity impacts on the network within Coltishall and Horstead.
- In the AM peak, the average delay with the allocation and associated mitigation is higher than the AM Peak 'Do Minimum' scenario, however it is like the predicted residual delay in the PM Peak where impacts are less than the 'Do Minimum' scenario, without the allocation and mitigation in place.
- The conclusion is that whilst traffic growth will cause delays in Coltishall and Horstead, the development highway capacity impacts are generally mitigated by the proposed improvements.

Junction and Link Impact

9.42 The modelling identified four locations within the study area which have been identified from the survey data / observations as having the most significant impact on network operation. The four key junctions and links are:

1 – Rectory Road / B1150 Norwich Road three-arm roundabout.

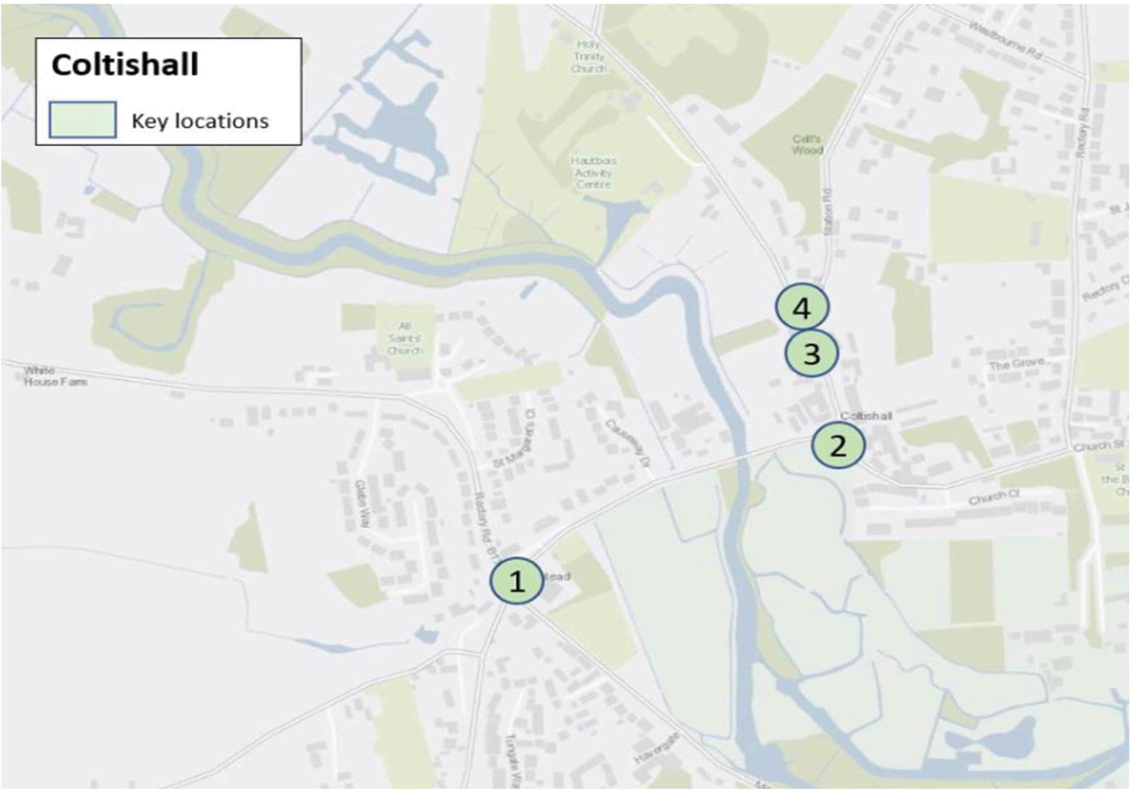
2 – B1150 Norwich Road / B1354 Church Street gyratory (PFS island).

3 – B1150 High Street.

4 – B1150 High Street / B1150 North Walsham Road / Great Hautbois Road priority junction.

9.43 The junctions and link above are illustrated on **Figure 41** below.

Figure 41 – Key Junctions in Coltishall and Horstead VISSIM Model



1 – Rectory Road / B1150 Norwich Road

9.44 The percentage change assessment for the junction indicates that there would be between a 9% and 17% increase in traffic at the junction between the Do Minimum and Do Something scenarios. This remains the same when the mitigation is considered as the improvements are located to the east of this junction and will not impact on traffic flows.

9.45 Queues on Rectory Road are shown to be negligible in both peaks in all scenarios with up to one PCU expected. The greatest increases are observed on B1150 Norwich Road where queues and delay are noted when comparing the scenarios. This is due to the main movement of traffic associated with the allocation being between the site and Norwich.

9.46 In the AM peak, queues would increase by some five PCUs in both directions whilst in the PM peak queues would increase by 17 PCUs towards Coltishall but only one PCU towards Norwich. In the AM peak the additional queuing would have little or no impact on adjoining roads except for Mill Road. The results for the Mill Road confirm little impact in the terms of queuing however there would be an increase in delay of up to 50 seconds, mainly for those turning right.

9.47 In the PM peak, queues are shown to increase such that they extend by up to 28 PCUs from the give way line at the junction along the B1150 Norwich Road. This would impact on the ability for vehicles to utilise the Frettenham Road junction. It is considered that any vehicles queueing would allow those vehicles waiting to turn into or out from the junction the opportunity to do so when there are gaps. A Keep Clear facility would allow vehicles to access Frettenham Road.

9.48 The proposed development is predicted to increase queueing at this junction by a maximum of 17 PCUs on the B1150 during peak periods. Whilst this queueing is a significant increase, queues dissipate within the peak hour. To provide additional highway capacity would require use of the adjacent land which operates as a car park for the Recruiting Sergeant pub and restaurant. Whilst the car park appears to be highway land, removal of the car park would lead to unregulated parking on the adjacent roads due to a lack of nearby alternative.

9.49 The level of peak hour queuing predicted is such that it can be accommodated on the road network for short periods of time. When considered on balance, as overall delays are not severe, and the assessment is based on traffic forecasts which are some 15% higher than is expected to be realised. Design highway mitigation to accommodate these robust traffic flows, would have a considerable impact on the existing businesses fronting the junction. The most appropriate way to mitigate impacts should be limit the demand in the first instance and ensure that there are no safety issues arising from the peak hour congestion. Provision of a Keep Clear across the access to Frettenham Road and examining the pedestrian facilities would assist in improving safety and mitigating impacts at this location. It is suggested that at planning stage, the need for capacity improvements within highway land is explored further if required.

2 – B1150 Norwich Road / B1354 Church Road gyratory (PFS Island)

9.50 The percentage change assessment illustrates that there would be an increase of between 14% and 15% in 2036 at this junction once the allocation comes forward. This remains the same when the mitigation is considered as the improvements are located to the east of this junction and will not impact on traffic flows.

9.51 The additional traffic associated with the allocation would result in an additional delay of approximately 80 seconds on the eastbound approach to the junction in the AM peak with queues extending to some 390 metres. This is a result of traffic wanting to turn right into B1354 Church Street blocking through traffic from travelling northbound whilst also having less gaps in which to turn due to an increase in through traffic travelling southbound.

9.52 A right turn lane has therefore been identified, as described in Chapter 10, for implementation at the junction which assist in alleviating the blocking of through traffic by those vehicles waiting to turn right. The queues and delays observed in the Do Something with Mitigation scenario are shown to be like the Do Minimum scenario in the AM peak and significantly better than the Do Minimum (without the North Walsham Development) in the PM Peak.

9.53 The mitigation identified would therefore result in a beneficial impact on the junction and wider network within Coltishall and Horstead by mitigating both the impact of the allocation and providing a small decrease in queuing and delay over what would occur without the allocation coming forward.

3 – B1150 High Street

9.54 The modelling results illustrate that in the AM peak there is negligible change in queues and delays on B1150 High Street in any of the scenarios.

9.55 Observations from the traffic surveys indicated on-street parking adjacent to the war memorial was impacting traffic flows along B1150 High Street. The carriageway adjacent to the war memorial is not marked as on-street parking and a bus stop is present although no cage is provided. Vehicles parking in this location create a narrowing of the carriageway which restrict vehicles to one-way movements and give-ways in place between drivers. Vehicles are observed to park here for long periods of time, but it does not front a residence and there is alternative parking available for nearby businesses.

9.56 In the PM Peak, due to this restriction, queues of between 21 metres and 117 metres occur in the Do Minimum scenario in the northbound and southbound directions respectively. The addition of traffic associated with the allocation increases these queues to 45 metres and 378 metres. This would impact on the Great Hautbois Road and access to residences whilst the northbound queue would impact on pedestrian crossing movements within the village centre.

9.57 To mitigate the impact of the allocation on B1150 High Street, it is proposed to provide a bus cage to formalise the existing bus stop and support bus access. This would remove the right to park immediately adjacent to the war memorial where there are no on-street parking bays. The existing marked on-street parking bays would not be impacted by the bus cage. The implementation of the bus cage would remove queuing and delay identified on B1150 High Street with the queuing and delay reduced to negligible levels.

9.58 The mitigation identified would therefore result in a beneficial impact on B1150 High Street and the wider network within Coltishall by mitigating both the impact of the allocation and the future increase in background traffic identified in the Do Minimum scenario.

4 – B1150 High Street / B1150 North Walsham Road / Great Hautbois Road

9.59 The percentage change assessment for the junction indicates that there would be between a 9% and 17% increase in traffic at the junction between the Do Minimum and Do Something scenarios. This remains the same when the mitigation is considered as the improvements are located to the east of this junction and will not impact on traffic flows.

9.60 The modelling illustrates negligible changes to the queues and delays at the junction when comparing the different scenarios with queues reaching a maximum of one PCU and delay increasing by up to seven seconds.

9.61 The impact of the allocation on the junction is therefore considered to be negligible in both peak hours.

Summary & Residual Impacts

9.62 In Coltishall and Horstead the volume of through traffic on the B1150 is predicted to increase by on average 250 vehicles (two way) in the peak hours which is significant.

9.63 With proposed mitigation measures in place on High Street and at the B1150/ B1354 Junction, the overall network delay decreases in the worst of the two peaks, the PM peak, when comparing both Do Something scenarios with the Do Minimum scenario. It is therefore considered that the allocation can be accommodated with the mitigation proposed for Coltishall and Horstead with a residual beneficial impact on the network delay.

9.64 The proposed development is predicted to increase queueing and delays at the Rectory Road / B1150 Norwich Road junction. Providing additional highway capacity would require use of the adjacent land which operates as a car park for the Recruiting Sergeant pub and restaurant. It should be noted that the traffic volumes assessed are considered a worst-case scenario and test 10% higher development growth than proposed and assume very low levels of home working. Furthermore, the highest level of public transport service from North Walsham is focussed on the desire line of the B1150 through express bus services and the railway line, which has not been reflected in the traffic forecasting on this route. For these reasons, the level of forecast traffic is estimated to be at least 15% more than will be realised.

9.65 As traffic forecasts are estimated to be 15% higher than is expected to be realised it is proposed that these impacts are best mitigated in the first instance by limiting the demand and ensure that there are no safety issues arising from the peak hour congestion.

9.66 Bearing in mind the lack of alternative routes for traffic measures to mitigate the impacts of this growth in Coltishall and Horstead have been identified:

- The impact on the B1150 and Coltishall and Horstead is best addressed firstly through minimising the traffic growth on this route. The use of public transport will be actively promoted at the development through the proposed public transport strategy, incorporating a bus interchange for express services, and improved active travel access to North Walsham Station and target led travel planning.
- At planning stage, the development will contribute towards and deliver proportionate mitigation to address highway impacts in Coltishall and Horstead on pedestrian crossing facilities on High Street, at Ling Way and at the Recruiting Sergeant.
- Creating greater awareness of the village entry and reduced speed limit on the approach to Horstead from the South would help reduce vehicle speeds. At planning stage additional signage should be identified.
- Provision of a Keep Clear across the access to Frettenham Road to enable access in the event of queueing on the B1150 during peak hours.
- Investigate the need for highway capacity improvements further at the B1150/ Rectory Road junction at planning stage.

9.67 Background traffic is also predicted to increase substantially by 2036 and any development growth increasing traffic on the B1150 should be looking at how it can assist NCC in mitigating any potential road safety impacts.

10. Mitigation Summary

Introduction

10.1 This chapter sets out the sustainable transport and highway mitigation measures identified as part of the TA of the proposed allocation at North Walsham. These measures support delivery of the proposed allocation in North Walsham and mitigate impacts. Given that the Local Plan allocations are yet to go through the examination process, these proposals are at various stages of detail. Where it was deemed necessary through liaison with the Highway Authority, to investigate some initiatives in further detail to test feasibility, this has been carried out. All proposals identified in this document will be taken forward for further development and implementation at planning stage.

Sustainable Transport Improvements

10.2 Given the scale of the allocation, along with ensuring that the proposed allocation provides a Primary School, amenity areas and a local centre on site to serve the needs of the development, it will also be important that this development has a meaningful TP in place to promote sustainable travel.

10.3 A **TP** for the development area will be prepared at planning stage identifying the bespoke measures to be adopted across the site to promote sustainable travel patterns. This will be prepared in line with the most recent NCC TP Guidance (July 2023), and implementation will be fully funded by the development.

10.4 To encourage the use of alternative modes to the private car for local trips in North Walsham and to access public transport, several improvements are proposed to the sustainable transport network both within the proposed allocation and off-site. These are detailed in Chapter 5 but in summary:

10.5 To deliver safe and convenient routes between the development area and North Walsham Town Centre and North Walsham Railway station focussed improvements where possible to the existing network along three **'Mobility Corridors'** have been identified:

- Provide new signalised toucan crossings on Aylsham Road for pedestrians and cyclists to connect with PRoW either side of the railway bridge.
- Provide a new zebra crossing on Park Lane to connect to the existing footway and medical centre.
- Provide a new footway on the southern side of Aylsham Road under the railway bridge to connect to the existing facilities whilst widening the northern shared footway/cycleway. This has been designed and subject to Road Safety Audit. Further details of this scheme are included in the following section.
- Upgrade the pedestrian crossing on A149 Cromer Road to a zebra crossing.
- Install tactile paving to the crossing at the A149 Cromer Road / Bradfield Road priority junction.
- Close the eastern spur of the A149 Cromer Road / Bradfield Road priority junction and widen the footway to 2.0m.
- Upgrade Weavers Way, where possible, between the allocation and Station Road in line with LTN 1/20.
- Improve access from Weavers Way across Station Road. Potential to divert Weavers Way through the car park at Station Road and install a crossing point on Station Road.
- Upgrade Weavers Way between Station Road and Aylsham Road in line with LTN 1/20, as a shared 3.0m wide pedestrian and cycle facility.
- Remove the 50m pinch point on Weavers Way at the fenced-in section of Weavers Way next to 40 Oak Road from 2.5m to at least 4.0m to allow for a 3.0m wide pedestrian and cycle facility to be installed.
- Upgrade PRoW from within the allocation to Norwich Road in line with LTN 1/20, with a segregated 3.0m wide cycleway and 2.0m footway. This will be surfaced with asphalt and lighting will be added where sections are currently unlit.

- Upgrade the existing pedestrian crossing on Norwich Road, south of the railway bridge, to a signal-controlled crossing.
- Upgrade the existing shared pedestrian and cycle route between Aylsham Road and Norwich Road in line with LTN 1/20, as a shared 3.0m wide pedestrian and cycle facility. This will be surfaced with asphalt and lighting will be added where sections are currently unlit.
- Install an east-west pedestrian and cycle signalised crossing at the B1150 Norwich Road / A149 signalised junction.
- Provide clear shared pedestrian and cycle route from the B1150/ A149 junction along the B1150 leading to the railway station. This has been designed and subject to Road Safety Audit. Further details of this scheme are included in the following section.
- LTN1/20 compliant pedestrian and cyclist facilities along the length of the link road and throughout the allocation land.
- Provision of a new crossing on the link road for Weavers Way.
- Closure of Skeyton Road, at the point where it crosses the link road for vehicular through traffic but maintaining access for pedestrians and cyclists.
- Install a pedestrian crossing point between the allocation and the existing footway on Greens Road.

10.6 These measures are illustrated on **Figure 32** in **Appendix D.**

10.7 A **Public Transport Strategy** has been identified which will include the following measures:

- Provide new bus stops, along with a bus interchange, within the allocation site.
- Divert services through the allocation land. A bus interchange, in the southern area of the allocation land will allow a turning area for the diversion of the X55 service, as well as the extended 33A service. The 33A and 6A services would be diverted along the new link road rather than Greens Road.
- Seek to increase public transport services outside of peak periods.
- Provide additional cycle spaces at the railway station near both platforms.
- Improved access to the railway station for active modes.
- Active promotion of public transport and engagement with the public transport operators through a TP.

10.8 Whilst **Coltishall and Horstead** sit outside of the walking and cycling catchment for the proposed allocation in North Walsham, it is on the bus route and as identified in this assessment the development will increase traffic levels making it more difficulty for residents to cross the B1150. This is being addressed in the following ways:

- Promoting sustainable travel at the proposed allocation to reduce demand from traffic on the road network generally, including the B1150 through Coltishall and Horstead. Of relevance are the TP and Public Transport Strategy which will ensure that the public transport network is easily accessible to the proposed site, and actively promoted.
- The existing bus stop at the War Memorial will be formalised, creating a safer stopping arrangement for buses at Coltishall.
- At planning stage, the development will contribute towards and deliver proportionate mitigation to address highway impacts in Coltishall and Horstead on pedestrian crossing facilities on High Street, at Ling Way and at the Recruiting Sergeant.
- Identify further signage and lining to reduce speeds on entry to Horstead from the South along the B1150 to reduce risks for crossing pedestrians.

10.9 The sustainable transport measures identified to serve the proposed allocation will not only benefit the proposed development but will also address existing shortfalls in facilities.

Highway Improvements

10.10 Improvements to the highway network in North Walsham and Coltishall and Horstead have been identified to address capacity and traffic management issues identified as part of this assessment. These have been tested within the VISSIM modelling set out in **Chapter 9** to ensure that they assist in mitigating the impacts of the allocation and are beneficial to North Walsham and Coltishall and Horstead. Where necessary these proposals have been designed and subject to Road Safety Audit.

10.11 The proposed improvements in North Walsham and Coltishall and Horstead are set out in the following sections.

Link Road and Associated Junctions

10.12 The new link road through the allocation will provide a new connection between B1150 Norwich Road and A149 Cromer Road. The design of the link road and associated junctions is set out in **Chapter 4**.

10.13 This route, although residential in nature, has been designed to accommodate HGVs, buses and through traffic. It will not accommodate on street parking with parking needs provided for within the plots. The proposed link road will provide a significantly better route than that utilised at present, along Millfield Road, Station Road, and Greens Road.

10.14 The modelling illustrates that in 2036, some 600 to 700 vehicles would utilise the link road in the peak hours. And that the provision of the link road would mitigate the highway impact of the allocation before traffic management and safety improvements set out in the following sections are implemented.

10.15 Delivery of the new link road will provide greater network resilience in North Walsham, and a more suitable route for north south traffic and HGVs on the west side of North Walsham.

Aylsham Road

10.16 Aylsham Road is a key route within North Walsham for the movement of HGVs due to the railway bridge being 4.8m high and therefore capable of accommodating the largest high sided vehicles that need to traverse the town. This route is also a key corridor for pedestrian and cyclist trips between the town centre and the residential areas to the west including the proposed allocation despite the lack of adequate facilities especially under the railway bridge, where pedestrians were observed walking in the carriageway. Aylsham Road includes a very constrained section west of the railway bridge, where residential properties opening directly onto the road and there are no footpaths.

10.17 Whilst Aylsham Road is required for access and as a through route for higher HGVs and buses, it is not suitable for accommodating high level of traffic. To discourage the use of Aylsham Road wherever possible and to enhance the safety and pedestrian facilities several measures have been identified.

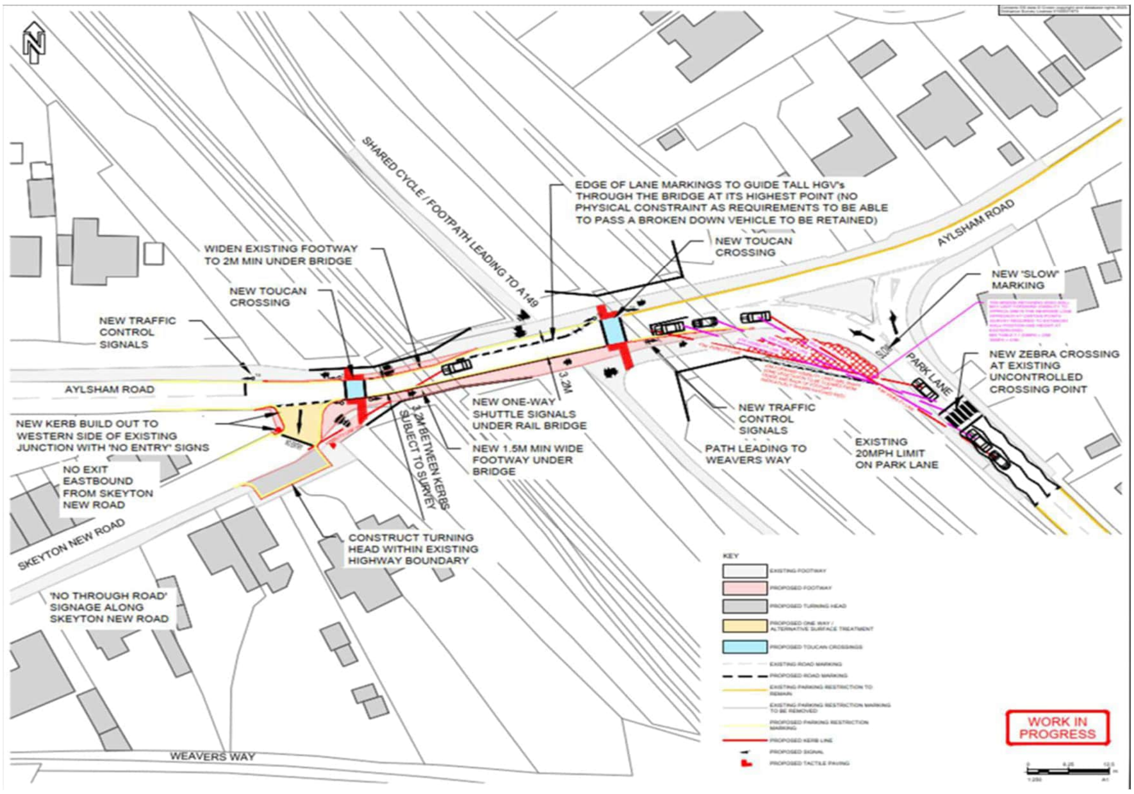
10.18 It is proposed to:

- Provide a signalised shuttle system at the railway bridge whereby one-way movements under the bridge are controlled by traffic signals.
- Enhance the facilities for pedestrians and cyclists through widening of the footway on the northern side to two metres and providing a new 1.5m wide (minimum) footway on the southern side.
- Reduce the width of the carriageway to 3.5 metres under the railway bridge, such that high-side vehicles can easily pass under the centre of the bridge, its highest clearance point and restrict passing of cyclists who would be using the carriageway.
- Provide two signalised crossings to assist pedestrians and cyclists to cross Aylsham Road, at either end of the shuttle system.
- Provide a Zebra crossing on Park Lane at the point where the footway ends to assist pedestrians in crossing and acting as speed calming measure.
- Cut back vegetation located within the visibility splay to assist vehicles travelling along Park Lane to see any queue relating to a red traffic signal.

- Change the access arrangements to Skeyton New Road at its junction with Aylsham Road to entry only, with all vehicles exiting Skeyton New Road via its junction with Station Road. The junction with Aylsham Road will be amended to slow vehicles with signage provided notifying drivers of the access arrangements. A new turning head will be provided on Skeyton New Road to assist larger vehicles in turning.

10.19 The proposed scheme is illustrated on **Figure 42** and included at **Appendix D**.

Figure 42 – Proposed Scheme – Shuttle System and Associated Improvements, Aylsham Road



10.20 The proposed design has been audited by NCC's Road Safety Team and updated to address problems raised. A copy of the Stage 1 Road Safety Audit (RSA) and the Designers Response is included at **Appendix G**. The Designers Response has been accepted by NCC.

10.21 The implementation of this scheme results in a slight increase in delay at the B1150 Norwich Road / A149 Norwich Road as vehicles divert to avoid Aylsham Road.

10.22 Furthermore, the proposed link road has been redesigned to discourage the use of Aylsham Road as a through route into North Walsham for general traffic, by staggering the proposed signal-controlled junction with the proposed new link road. This will reduce vehicle speeds on entry to Aylsham Road and make the use of this as a through route less attractive.

10.23 At planning stage further traffic management measures will be explored to minimise the impact of traffic on the narrow 20mph section, such as designating the route for access only, provision of additional signage and provision of horizontal deflection to impose speed reductions for traffic.

B1150 Norwich Road / A149 Junction

10.24 During a site visit with NCC's Road Safety Team, the consented improvements to the B1150 Norwich Road / A149 signalised junction were reviewed. It was identified that the improvements for pedestrians and cyclists on the southern side of the B1150 Norwich Road did not extend to the railway station and that existing facilities in this location were poorly defined for pedestrians and not suitable for cyclists.

10.25 Through liaison with NCC Highways team it was also identified that further pedestrian crossings were required at the signalised junction but had not been secured as part of the consented scheme.

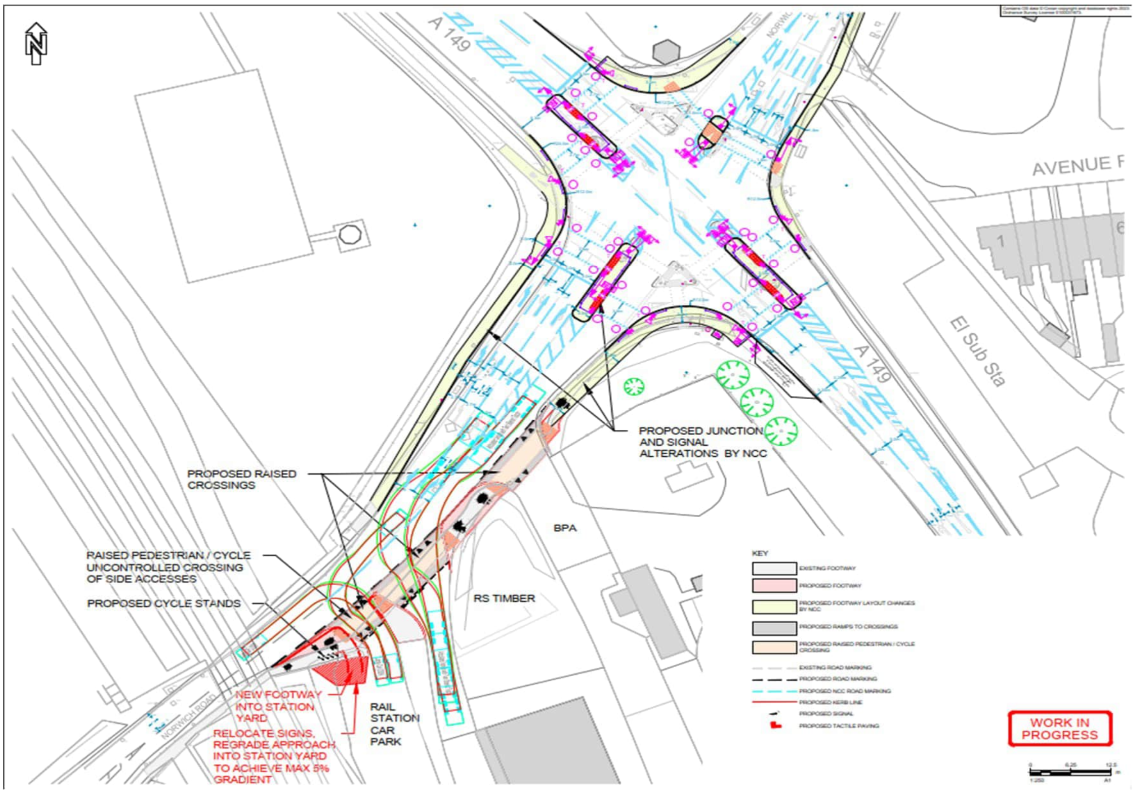
10.26 It is therefore proposed to extend the proposed widening of the existing footway along the southern of the B1150 from the end of the consented scheme to the railway bridge.

10.27 This would include:

- Widening the existing footway to three metres to allow for cyclist use.
- Provide raised crossings at the vehicular access points to indicate priority for pedestrians and cyclists.
- Provide tactile paving at point between the accesses to assist the visually impaired.
- Regrade the approach to the station by the junction with B1150 Norwich Road to achieve a maximum gradient of 5% and provide a new footway to reduce conflict with vehicles.

10.28 The proposed scheme is illustrated on **Figure 43** and included at **Appendix D**.

Figure 43 – Proposed Scheme – Pedestrian and Cyclist Improvements, B1150 Norwich Road



10.29 The proposed design has been audited by NCC's Road Safety Team and updated to reflect the issues raised. A copy of the Stage 1 Road Safety Audit (RSA) and the Designers Response is included at **Appendix G**. The Designers Response has been accepted by NCC.

10.30 It should be noted that the drawing illustrating the improvements proposed as part of the allocation also illustrates the current consented improvement scheme for the B1150 Norwich Road / A149 signalised junction which is being brought forward by NCC as part of the consent for planning application PF/13/0866. This includes the additional signalised crossings on the B1150 south and the A149 west arms, which the proposed allocation will contribute towards.

B1150 Norwich Road / B1354 Church Road, Coltishall

10.31 The VISSIM modelling undertaken for Coltishall illustrated that queueing was occurring at the B1150 Norwich Road / B1354 Church Road junction in all scenarios assessed however it significantly increased when the allocations traffic was added to the network. This was identified as occurring due to vehicles turning right into B1354 blocking through traffic from continuing northbound. To resolve the blocking of through traffic and alleviate queuing in this area of Coltishall, a right turn lane is proposed.

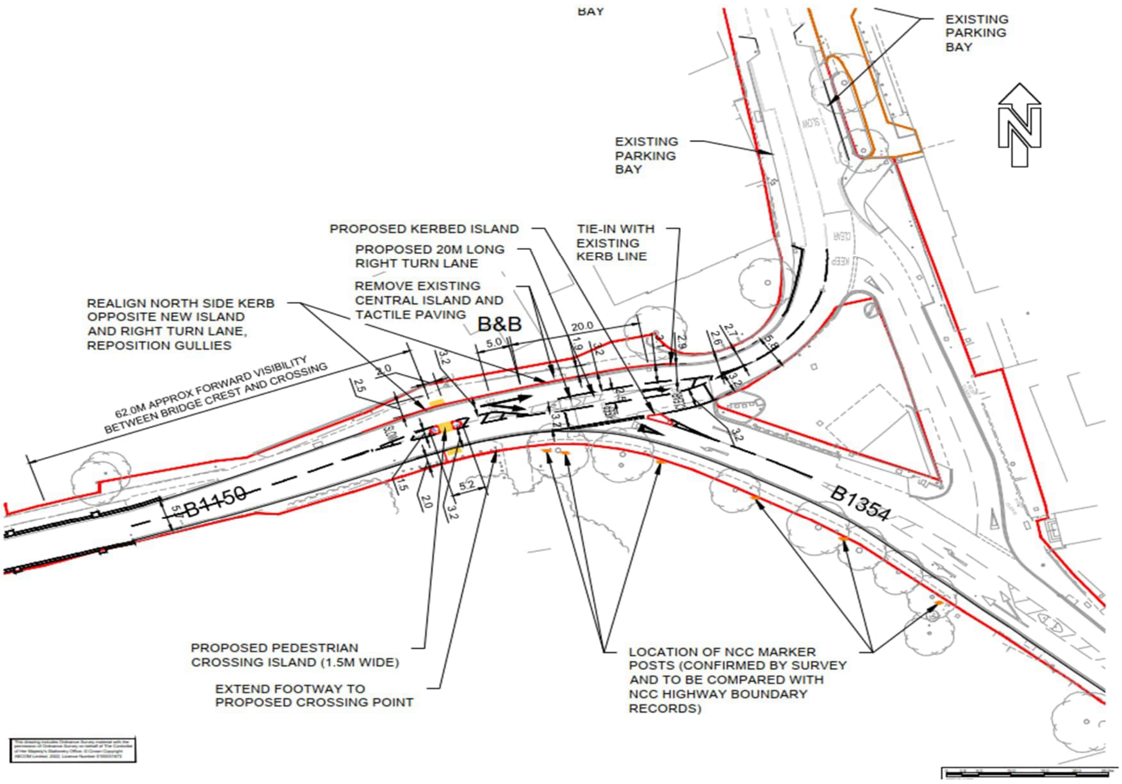
10.32 A right turn lane is proposed which would be approximately 20 metres long and 2.5 metres wide and would result in the relocation of the existing pedestrian island and tactile paving. The pedestrian island would be relocated to the west of the right turn lane, avoiding the accesses to the Anglian Water pump house and the property, identified as 'Bridge House B&B'. Vehicular tracking of the accesses with the new pedestrian island in place has been undertaken and confirms that both accesses would continue to operate as at present. The new pedestrian island would be located some 62 metres from the crest of the river bridge which accords with the standards as set out within DMRB for forward visibility.

10.33 As requested by NCC's Road Safety Team, in addition to the 2.5-metre-wide right turn lane, the through lanes in this area will be provided at 3.2 metres to ensure that HGV movements can be made without encroaching on vehicles waiting to turn. To accommodate this the kerb line on the northern side of the carriageway would need to be realigned slightly.

10.34 Due to the constrained location, the design for this proposal has been undertaken using topographical survey information and validated highway boundaries to ensure deliverability.

10.35 The proposed scheme is illustrated on **Figure 44** and included at **Appendix D**. The red line on the figure illustrates the highway boundary information obtained from the NCC.

Figure 44 – Proposed Scheme – Right Turn Lane, B1150 Norwich Road / B1354 Church Road, Coltishall



10.36 The proposed design has been audited by NCC's Road Safety Team and updated to reflect the issues identified. A copy of the Stage 1 Road Safety Audit (RSA) and the Designers Response is included at **Appendix G**. The Designers Response has been accepted by NCC.

10.37 The implementation of this scheme would result in a significant improvement to queueing at the junction such that the proposed improvement would result in mitigating the increase in queueing created by the allocation to levels estimated to occur in the Do Minimum scenario. It is therefore considered that the proposed right turn lane would be beneficial to the operation of the road network within Coltishall and would mitigate the development impacts.

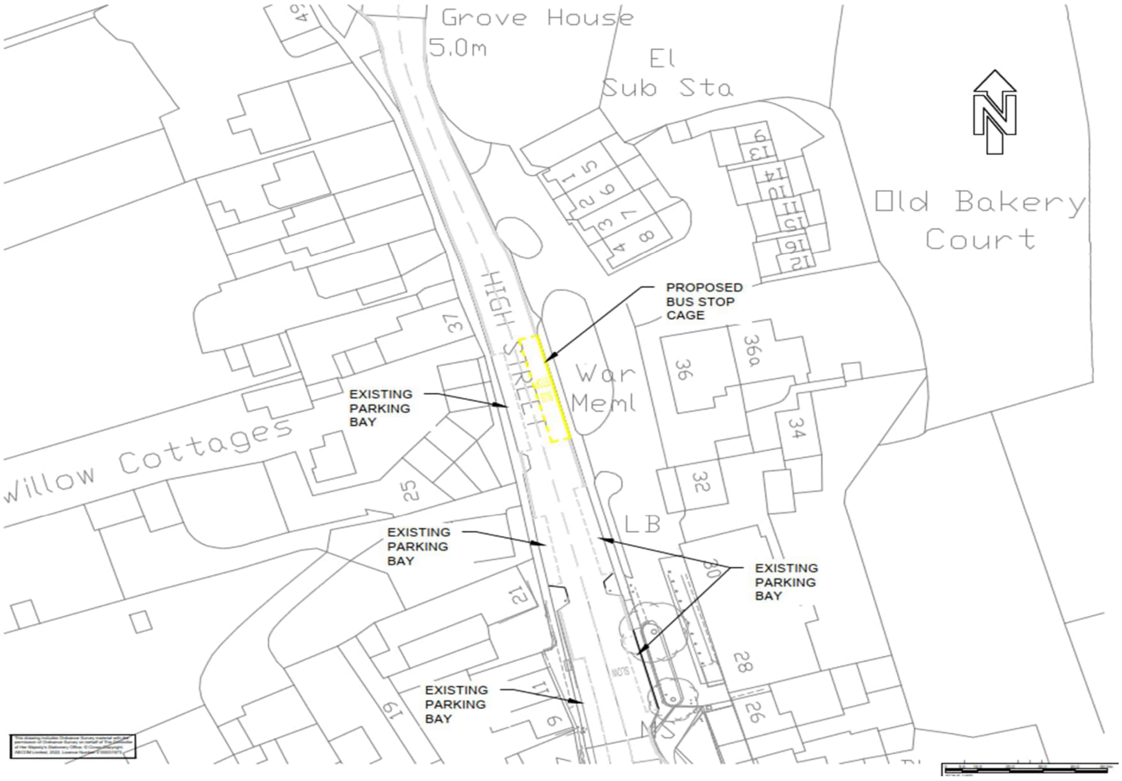
B1150 High Street, Coltishall

10.38 It was observed during the traffic surveys carried out in November 2022 and on-site observations that vehicles currently park on B1150 High Street adjacent to the war memorial restricting access to the bus stop and impeding traffic flow.

10.39 To enable buses to utilise the bus stop safely, as well as aid with traffic movements through Coltishall, it is proposed to provide a bus stop cage on the carriageway adjacent to the war memorial. The provision of the bus cage as shown by the VISSIM modelling would result in a significant improvement in vehicular movements along the B1150 High Street during the peak hours with the queuing dissipating to negligible levels.

10.40 The proposals are illustrated on **Figure 45** and included at **Appendix D**.

Figure 45 – Proposed Scheme – New Bus Stop Cage, B1150 High Street, Coltishall



10.41 The proposed design has been audited by NCC's Road Safety Team and updated to reflect the problems identified. A copy of the Stage 1 Road Safety Audit (RSA) and the Designers Response is included at **Appendix G**. The Designers Response has been accepted by NCC.

Further Mitigation

10.42 Traffic flows on Skeyton Road are low and are forecast to remain low, but it is a well-used route by pedestrians and cyclists. Given that this is a residential lane, to avoid rat running along it, it is proposed to prevent vehicular traffic access from the proposed link road, and only allowing pedestrian and cycle traffic to cross the Link Road from Skeyton Road.

10.43 Provision of a Keep Clear across the access to Frettenham Road to enable access in the event of queueing on the B1150 during peak hours.

10.44 Investigate the need for highway capacity improvements further at the B1150 / Rectory Road junction at planning stage.

Phasing

10.45 As the phasing strategy for the proposed allocation is developed, the phasing for the associated mitigation measures will need to be defined.

10.46 There are views that the proposed link road should come forward as early as possible within the delivery horizon, however this needs to be balanced against funding availability and need. From both a capacity perspective and an access perspective.

10.47 Some key considerations in developing the phasing strategy will be:

- It is important that the first residents are encouraged to use sustainable travel in the first instance and for this reason safety measures and sustainable access measures should be delivered to address the needs of each phase as they come forward.
- Delivery of the link road between B1150 and Aylsham Road should come forward earlier to avoid increased HGV traffic on Station Road and Millfield Road during construction and early phases.
- Early delivery of off-site mitigation in Coltishall and Horstead to mitigate construction impacts and allow the highway authority to monitor the existing issues on the network with the improvements in place, to allow further intervention if required before the development is completed.
- Bus routeing will need to be phased in accordance with the development build out programme and available routes.
- Construction traffic should be accommodated on site, potentially through temporary haul routes until the link road is in place, to minimise impacts local residential roads.

10.48 An indicative phasing strategy for the bringing forward of on and off-site infrastructure has been devised and a copy is included at **Appendix H**. At this point, the strategy is indicative and will be discussed with the authorities as part of the planning application process.

Summary

10.49 A comprehensive package of mitigation measures have been identified in response to consultation and the detailed assessments undertaken. Where necessary deliverability has been interrogated through design and safety reviews.

10.50 The sustainable transport and highways improvements have been discussed with the highway officers at NCC with the highway improvements also have been through a Stage 1 RSA with NCC's Road Safety Team.

10.51 The proposals set out are considered to mitigate the impact of the allocation, are deliverable, and will provide beneficial enhancements to the existing network.

11. Construction

Introduction

11.1 This chapter sets out the potential mitigation measures which could be included in a full Construction Traffic Management Plan (CTMP), to help reduce the construction impacts on the surrounding highway network during the construction phase of the allocation.

Construction Impacts

11.2 At this stage it is considered premature to undertake a detailed assessment of construction vehicle impact, given that any such impact is largely dictated by the phasing and build programme of the allocation itself, which is currently unknown.

11.3 It is considered that the impact of construction traffic on the capacity of the local road network is anticipated to be relatively small overall. HGV movements would occur throughout the day, with a view to avoid peak times, and therefore would not add to peak hour traffic. The most significant impact would therefore be the journeys of construction workers travelling on the local road network. Despite this, construction hours are likely to dictate that staff are required to be at the site prior to the AM peak and leave after the PM peak.

Construction Traffic Management Plan

11.4 As a result of the sensitivities which surround construction vehicles and their impact, a CTMP could be developed and implemented during the entire construction period to mitigate any construction traffic impacts resulting from construction traffic relating to the allocation. If provided, the CTMP would provide a framework to sensitively manage all types of vehicle movement to and from the construction site.

11.5 The main aims of a CTMP are to ensure that there is no disruption to the local highway network, to spread deliveries throughout the day to avoid peaking of deliveries, and to restrict the number / volume of service vehicle movements during the morning and evening peak periods.

11.6 There are several potential mitigation measures that could be implemented during the construction period to mitigate any detrimental impact of construction vehicles on the surrounding highways network. Potential mitigation measures could include the following:

- Early delivery of phases of the link road to remove construction traffic from local roads where possible.
- Early delivery of off-site mitigation in Coltishall and Horstead.
- Use of sufficient clear signage to ensure that construction vehicles use only designated routes.
- Routing of HGVs on main roads away from sensitive areas such as schools, residential areas, and areas sensitive in terms of air quality.
- Routing HGVs away from Coltishall and Horstead where possible.
- All heavy vehicle access to the allocation to be from designated HGVs routes with heavy vehicle movements through North Walsham or local roads being discouraged.
- Time slots for bulk deliveries to ensure that convoys of vehicles do not arrive simultaneously.
- Provision of holding spaces to avoid congestion on the local road network by waiting vehicles.
- Coordination of abnormally large loads.
- Scheduling of deliveries / collections away from peak hours, either before the AM peak or during the inter-peak daytime period.
- Encouraging construction hours to avoid the AM and PM peak traffic periods for construction workers.
- On-site recycling of materials to reduce export and import vehicle movements, including stockpiling topsoil for landscape works, or crushing existing hard standing material for engineering fill.
- Keeping the access routes clear of mud using a road sweeper.
- Implementation of wheel washing facilities to prevent debris being deposited on the highway network.
- Implementation of appropriate traffic management to ensure that construction of the site access junctions does not give rise to undue disruption.

- Staff Travel Plan for construction workers, where possible using public transport/ car sharing to access the site.

11.7 It is considered that a CTMP could be conditioned as part of any planning permission. The CTMP would be tailored to the allocation to ensure that specific issues are identified and covered. The CTMP would be approved by the local authorities prior to implementation.

11.8 The impact of construction traffic on the capacity of the local highway network is anticipated to be relatively small overall as most HGV movements would occur through the day away from the peak periods and would not affect congestion on the surrounding highway network. Potentially the most significant impact could be the journeys of construction workers travelling to and from the construction site. However, this could be managed by ensuring construction hours are outside of the peak AM and PM periods.

12. Summary and Conclusions

Summary

12.1 This report has been prepared by AECOM to present the findings of a Transport Assessment (TA) undertaken to accompany the Local Plan evidence application for a proposed mixed-use development on land west of North Walsham, Norfolk. The principal findings of the TA are summarised in the following paragraphs.

12.2 The allocation, identified in the Regulation 19 version of the NNDC Local Plan 2016-2036 as 'Land West of North Walsham (NW62/A), is expected to deliver:

- Approximately 1,800 dwellings.
- 7ha of serviced employment land.
- Green infrastructure.
- Community facilities, including a new primary school.
- A road linking Norwich Road, Cromer Road, and the industrial estate.
- Other required infrastructure improvements and mitigation including, but not limited to, health services, drainage, and power.

12.3 The allocation has been reviewed against National, Regional, and Local policy to ensure that the site is compliant. This has included a review against NPPF, NPPG, the existing North Norfolk Local Plan, the emerging Local Plan as well as transport policy adopted by NCC and Active Travel England. The allocation accords with the policies based on its sustainable location and being close to existing good quality public transport and in being a mixed development allows trips to be within the site reducing the impact on the wider network.

12.4 The site is located within reasonable walking distance of most amenities and facilities in North Walsham. As such, the site is well located in terms of opportunities for education, retail, and employment. The Weavers' Way footpath runs through the allocation, connecting to existing infrastructure to the west of the railway line. There are some areas in North Walsham where pedestrian and cycling facilities are poor and require improvement.

12.5 The allocation also benefits from already being well serviced with most of the allocation within 400 metres of an existing bus stop. The bus network in North Walsham provides good access to the Norfolk coast and Norwich, as well as a circular route around North Walsham. Visitors and residents of the allocation will also benefit from being closely located to North Walsham Train Station which provides regular services to Norwich and Sheringham. The journey time by rail to Norwich is faster than by road. The station at Norwich allows for wider regional/national travel, which provides a suitable alternative to using a private car. It is noted that travel outside of the peak periods is somewhat limited and therefore it is anticipated that the increase in patronage brought forward by the allocation will assist in allowing further services outside of the peak periods to be provided.

12.6 In terms of the local highway network, the allocation benefits from being located close to some of the main roads into and out of North Walsham avoiding reliance on routing through the town centre.

12.7 The railway line crosses the highway network in North Walsham on four occasions and restricts the movement of high sided HGVs and PSVs to certain routes within the town. Analysis shows that the dominant HGV route west to east is via the A149 Cromer Road with a small number higher sided vehicles and buses using Aylsham Road.

12.8 The B1150 is a dominant desire line for travel towards Norwich and there are existing constraints as it passes through Coltishall and Horstead.

12.9 A comprehensive assessment has been undertaken including surveys recording traffic volumes, composition, turning movements, speeds, journey times and routes. Accident data has also been gathered and analysed to understand any key issues on the receiving highway network. The assessment scope has been developed in liaison with NCC and has been informed by Microsimulation models for North Walsham, and Coltishall and Horstead.

What are the Transport Impacts?

12.10 Assessment of the proposed allocation transport impacts remains underway informed by extensive surveys, and Microsimulation models of North Walsham, and Coltishall and Horstead developed in consultation with NCC. Findings to date have shown that the proposed allocation can be delivered without severe impacts. Any offsite impacts will be mitigated in full through an integrated multi modal access strategy and off-site capacity improvements.

12.11 The trip generation for the proposed allocation has been determined for all modes and for all uses. This process has made a series of conservative assumptions to add robustness to the assessment.

12.12 Future year flows have been identified by applying TEMPro growth factors to the 2022 traffic count data to reflect future background growth which includes the traffic associated with the proposed 343 dwellings at the Hopkins Homes development in North Walsham and the Scottow Business Park development near Coltishall.

12.13 The 2036 future year traffic flows used for this assessment represent a very robust scenario for the following reasons:

- A total of 2,000 dwellings have been assessed rather than the 1,800 identified within the allocation policy, to allow a conservative estimate of development impacts to be tested;
- No allowance for mode shift in background traffic has been made, despite transport policy being focussed on supporting more sustainable travel patterns and modes;
- Future mode shares at the residential development have been assumed to reflect a reduction of car driver trips by ten percentage points from Census 2011 levels in North Walsham. Bearing in mind the improved level of local public transport provision since 2011, increased reliance on home working, changing travel patterns this is a conservative design case;
- No mode shift has been assumed for employment uses, and local internalisation is assumed to be minimal; and
- The most dominant route for highway traffic from the proposed development has been identified to be along the B1150 towards Norwich. This route also accommodates the most significant public transport services, and the likely higher take up of public transport along this desire line has not been reflected in the analysis.

12.14 Taking all these factors into account, the forecast traffic flows are considered to have a safety factor of 15% incorporated (i.e., they are 15% higher than they are expected to be in reality). The reason for this is that it is early in the process, and for Local Plan allocation a high-level understanding of the issues to be addressed needs to be understood to prove deliverability.

12.15 To determine the impact of the allocation, four separate AM and PM peak scenarios have been assessed. These include:

- Base – 2022 Surveyed traffic flows.
- Do Minimum – Base flows growthed to 2036, with the existing highway network and the consented improvement scheme at the A149 / B1150 signalised junction.
- Do Something – Trip generation for the allocation added to the Do Minimum traffic flows.
- Do Something with Mitigation – Do Something traffic flows and the mitigation proposals included in the VISSIM models.

12.16 A percentage change impact assessment was undertaken to identify the change in traffic at the junctions within the VISSIM models for North Walsham, and Coltishall and Horstead. This identified that, generally, there is an increase in traffic at each of the key junctions assessed. The increase in traffic on junction approaches in North Walsham is generally less than 60 vehicles per hour in all periods, except for B1150 Norwich Road where the residual % impact reaches 20%. This is largely because the proposed link road allows traffic to redistribute more efficiently and caters for the growth in traffic. On Norwich Road capacity improvements at the B1150/ A149 junction which are committed and under design by NCC provide for traffic growth and allow traffic to be attracted to this route.

12.17 Traffic is however predicted to decrease on Greens Road, Station Road, Millfield Road, and Skeyton New Road because of the allocation.

12.18 In Coltishall and Horstead, traffic volumes will increase, and this is due to the lack of alternative routes. This impact needs to be considered in terms of both highway capacity and pedestrian crossing activity.

12.19 The forecast results for network delay in North Walsham illustrate that in the PM peak, the most critical time on the network, the average delay is greatest in the Do Minimum scenario in the PM peak, i.e., without the proposed allocation in place, but with developments such as Scottow Business Park and the Hopkins Homes site in North Walsham. The allocation and its associated mitigation therefore results in a betterment in terms of network delay in North Walsham over that which would occur if the allocation were not to come forward.

12.20 The assessment of individual junction impacts highlight that the B1150 / A149 signalised junction in North Walsham suffers an increase in queueing and delay in all scenarios even with the capacity improvements coming forward. The queues increase over the hour however by the end of the time, the queues have cleared the junction, limiting this to a peak hour impact. It should be noted that these delays are caused in part by enhanced crossing facilities for pedestrians and cyclists and traffic management measures on Aylsham Road, which cause traffic to re-route. Given the fact that traffic forecasts are very robust, and that whilst peak hours only were assessed, in practice peak hour spreading and mode choice would be expected to avoid this network constraint, delays are unlikely to materialise, and the betterment for active modes and safety outweigh the need to increase vehicular capacity.

12.21 In Coltishall and Horstead, the modelling illustrates similarly to North Walsham, the greatest average delay occurs in the PM peak. This results also illustrates that once the mitigation proposed as part of the allocation would have a beneficial impact on network delay reducing it to lower levels than would be experienced in the Do Minimum scenario. Mitigation on High Street and at the B1150/ B1345 junction has been identified to successfully ease network constraints but there are residual delays predicted at the Rectory Road/ B1150/ Mill Road junction. There is potential for further improvements to be investigated at this junction at planning stage, but this will need to be balanced against the needs of pedestrians and the adjacent Recruiting Sergeant. As with North Walsham, the modelled forecast traffic flows are very robust, some 15% higher than anticipated in practice. The residual impacts are not considered to be severe.

12.22 The volumetric increase in through flows in Coltishall and Horstead is significant enough to impact on pedestrian crossing activity and safety. As such it has been identified that proportionate contributions towards improvements to pedestrian crossing facilities on High Street at Ling Way and in Horstead will be required at planning stage and following the outcome of safety review work underway by NCC.

What will the allocation deliver?

12.23 The proposed allocation will deliver a comprehensive package of measures to provide safe and sustainable access to the development and to mitigate development impacts along with proportionate contributions. These will be phased as the allocation comes forward; however, the precise details of the phasing is still to be determined. The following measures have been identified:

- A funded, target led **TP** to promote sustainable travel at the proposed allocation land, in accordance with the most recent NCC guidance.

Walking & Cycling

- A network of interconnected streets, squares, green corridors, and public spaces which prioritise moving around on foot and by cycle over the use of private motor vehicles;
- Attractive and convenient connections for walking and cycling to adjacent areas;

- Enhancement of existing PROWs through the site, including Weavers Way;
- Provision of extensive off-site pedestrian and cycle route improvements to the town centre, key services, and railway station focused on the three key 'Mobility Corridors' between the development, the Town Centre, and Railway Station; and
- Increased cycle parking at NW Railway Station, on site Travel Hub and at all public spaces on site.

Public Transport

12.24 Public transport measures on site providing facilities and regular services to/from the town and key services including:

- On-site travel hub for bus/ travel interchange, to attract express services into the site;
- Permeability of the site to bus services along the development Link Road;
- Provision of bus stops along development frontage and within the site with high quality facilities;
- Diversion of services through the site and service enhancements, outside peak periods; and
- Access to rail supported through 'Mobility Corridor' cycle improvements and enhanced station cycle parking.

Traffic Management

12.25 Delivery of a new road designed as an attractive main residential street through the development with mixed-use frontage usages and segregated cycle paths and footways. This new road will be suitable for HGV traffic (including high sided vehicles) and will connect Norwich Road to Cromer Road via two new roundabouts and will form a signalised junction with Aylsham Road.

12.26 The Access Road will:

- ✓ deliver greater network resilience in North Walsham;
- ✓ mitigate the development impacts, other than some predicted congestion on B1150 Norwich Road at the junction with the A149;
- ✓ lead to a substantial reduction in traffic on Station Rd, parts of Aylsham Rd, Green Rd, Millfield Road, Tungate Road, Skeyton Road, and Skeyton New Road of between 10-30%;
- ✓ result in traffic reductions on the A149 between Norwich Rd and Cromer Rd;
- ✓ accommodate more efficient HGV routing, reducing HGV traffic on Station Road;
- ✓ manage the use of Aylsham Road with traffic signals and breaking the through route across the link road;
- ✓ no significant increase in traffic on Bradfield Road, north of the railway, with only the residential uses north of the railway adding light vehicles;
- ✓ Green Rd will be stopped up and access to the Football Club will be improved; and,
- ✓ Close Skeyton Road and Skeyton New Road to through traffic.

12.27 A signalised shuttle one-way system is proposed at the Aylsham Road railway bridge to manage traffic demand and improve safety for pedestrians and cyclists.

12.28 Off-site capacity improvements are identified in Coltishall with a Bus Cage on high street preventing obstructive parking, and a new right turn lane arrangement with associated pedestrian facilities at the B1150/B1354 junction in Coltishall.

12.29 Car parking, Blue Badge Holder car parking, and cycle parking will be provided in line with the standards applicable at the time of any application. The current standard applicable are set out in NCC Parking Provision Guidance 2022. No parking will be provided along the link road, with all parking requirements provided for on plot.

12.30 The improvements proposed to the highway have been subject to a Stage 1 Road Safety Audit undertaken by the NCC Road Safety Team. Audit reports and Designers Responses have been prepared and agreed with NCC.

Northern Link

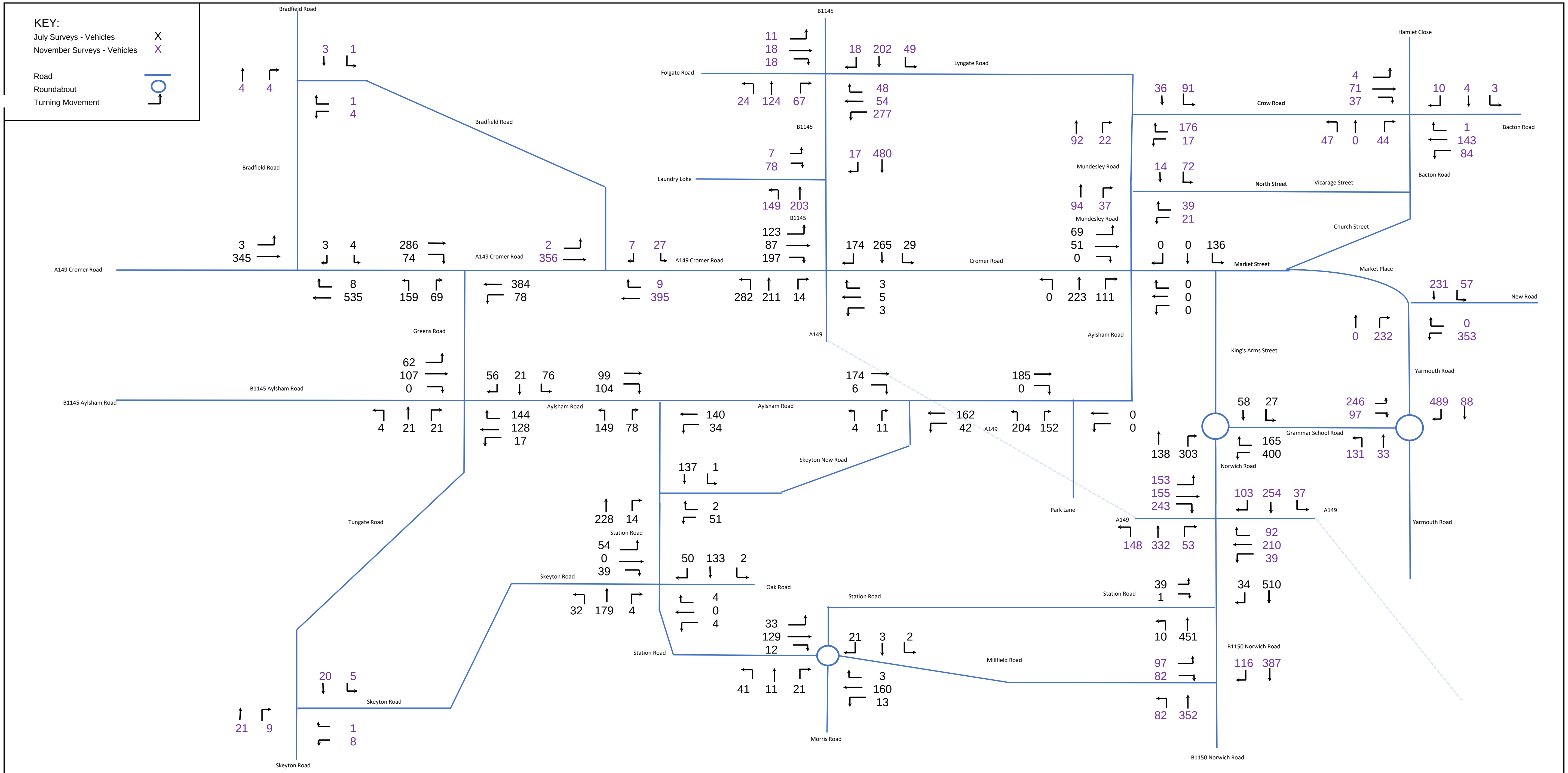
12.31 Due to the uncertainty regarding the proposed northern extension of the link road along Bradfield Road and into Folgate Road through the industrial area north of North Walsham, and since it is not within the control of the proposed allocation landowners to deliver, the Northern Link does not currently form part of the proposals and this assessment has been completed assessing the development impacts in the absence of a Northern Link. Further transport justification for this position is set out in the AECOM Technical Note 'Assessment of need for Northern Extension of Western Link Road to support the Western Urban Extension of North Walsham'. The proposed allocation will allow for future provision of this link if it comes forward through the allowance for land for future upgrades to Bradfield Road.

12.32 Construction of the allocation will be considered at detail in future planning application but for the purposes of this TA, potential mitigation measures have been identified to be implemented through a Construction Traffic Management Plan.

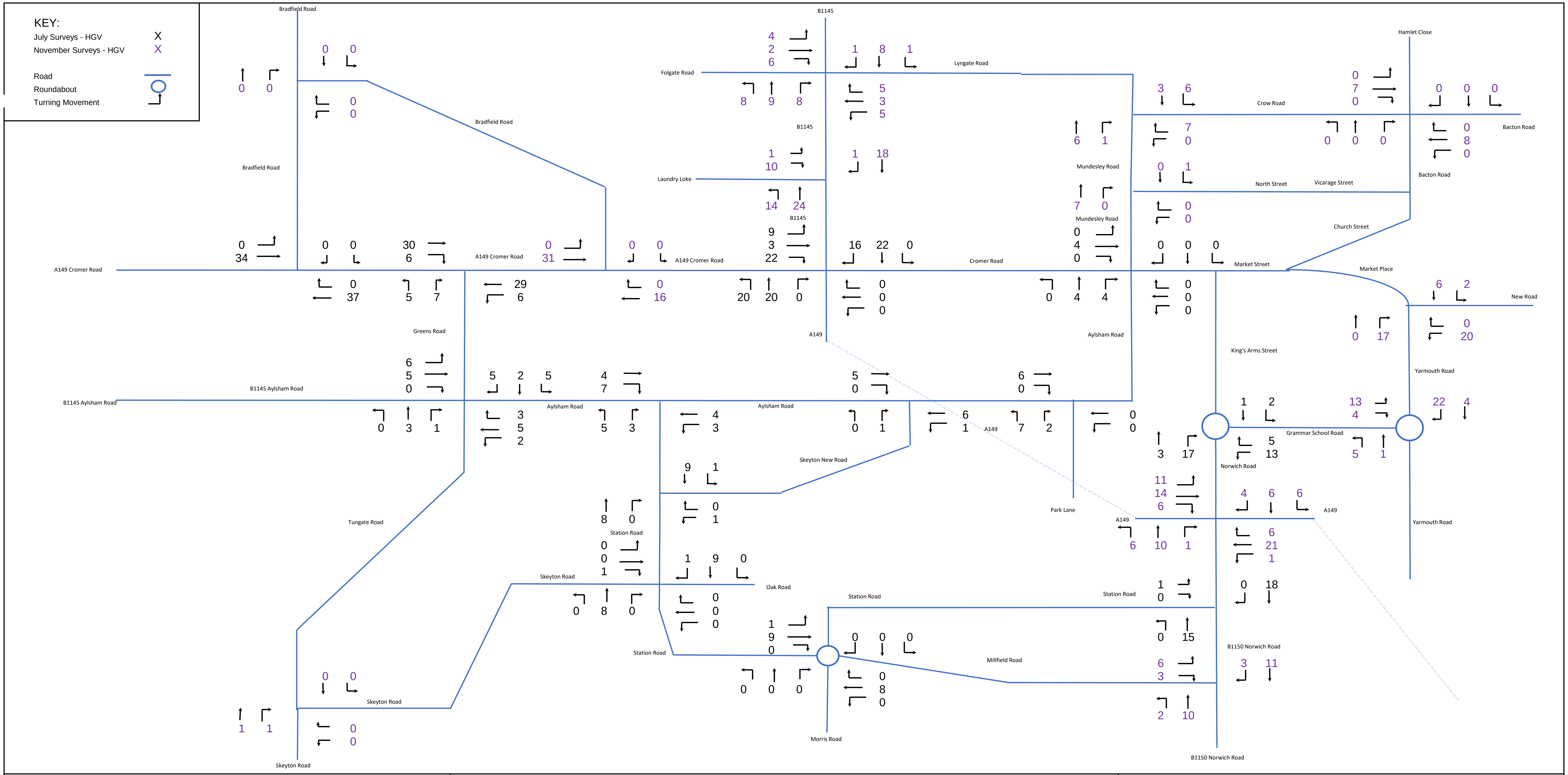
Conclusion

12.33 In conclusion, it is considered that the transport impact of the proposed allocation for housing west of North Walsham can be mitigated through the provision of improvements to both the sustainable transport and highway network. The assessment undertaken includes a high level of robustness and the mitigation measures identified have been tested and illustrated to be deliverable. Any residual impacts are not considered severe in the context of paragraph 111 of the NPPF and are outweighed by the positive impacts of the proposals this development will bring forward.

Appendix A – Flow Diagrams

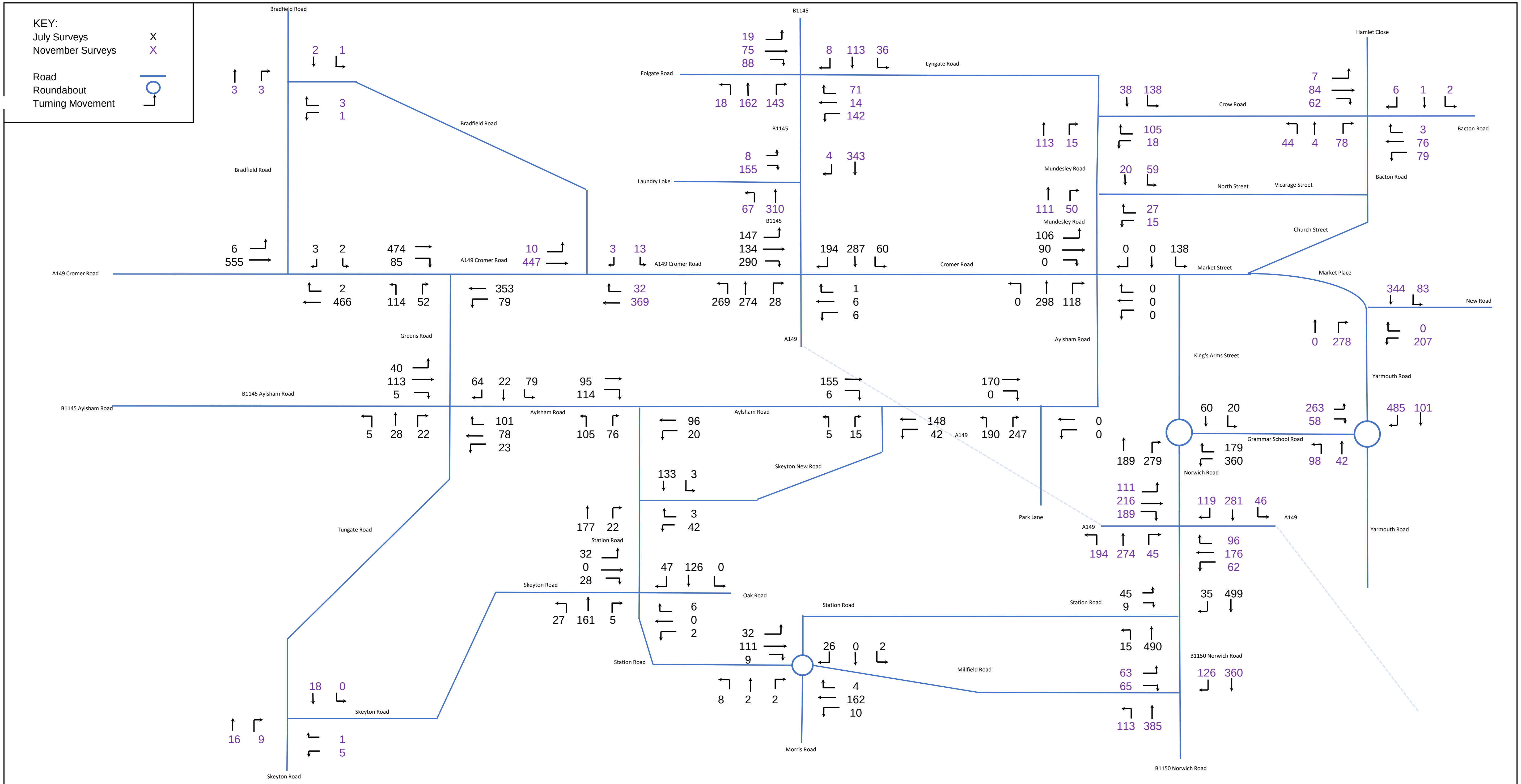


Project		Notes			
60685223 - North Walsham Western Urban Extension		AM PEAK HOUR 08:00-09:00 PM PEAK HOUR: 16:30-17:30 July surveys used at the Market Place signalised junction and B1145/Cromer Road signalised junction as road closure in November surveys			
Client	Title	Drawn	Checked	Date	Figure
ESCO Developments, Lovell Partnerships, Flagship Group	North Walsham 2022 Base AM	BS	TJ	13/10/2023	1

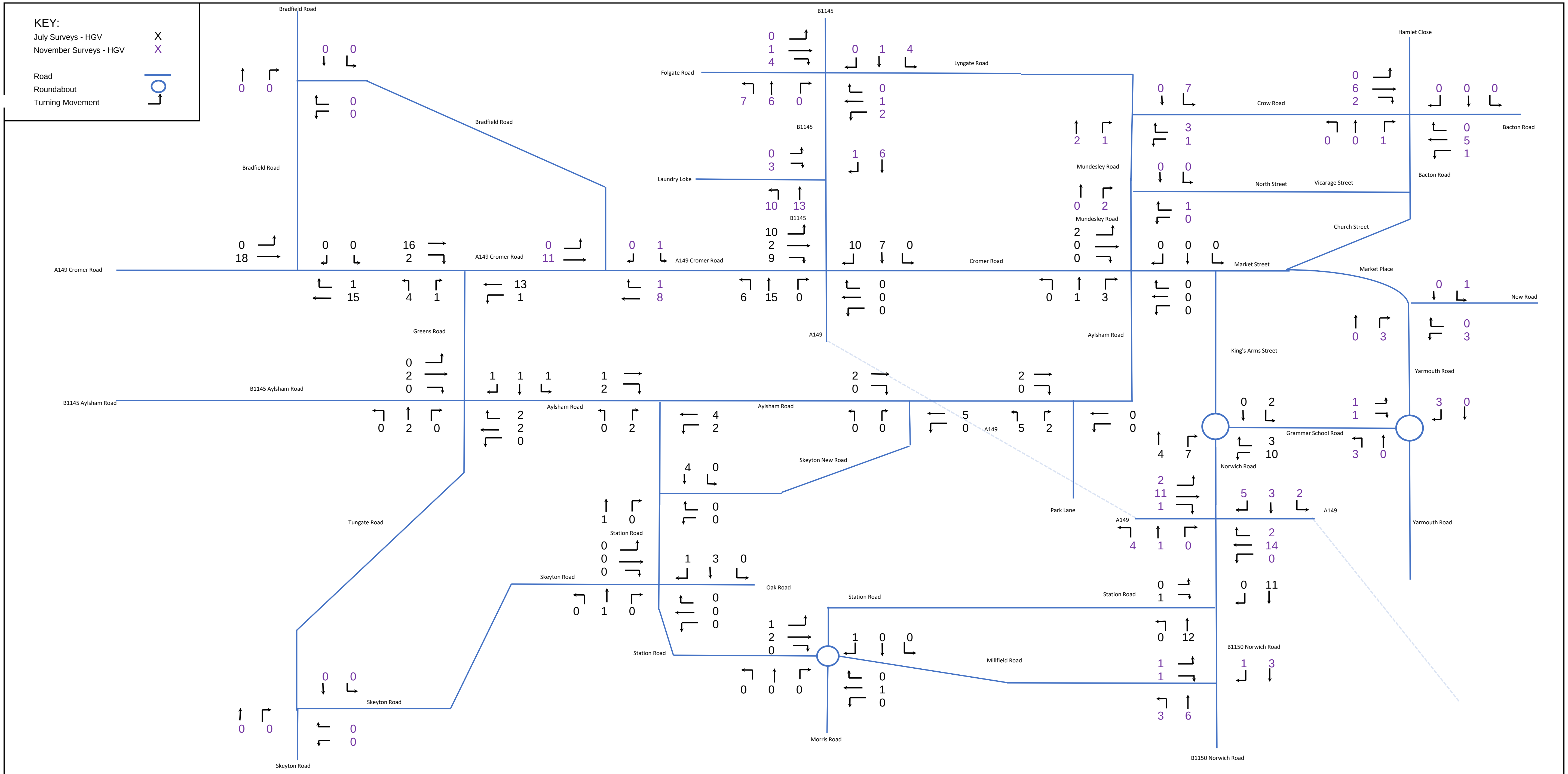


Project		Notes
60685223 - North Walsham Western Urban Extension	AECOM	AM PEAK HOUR 08:00-09:00 PM PEAK HOUR: 16:30-17:30 July surveys used at the Market Place signalised junction and B1145/Cromer Road signalised junction as road closure in November surveys

Client	Title	Drawn	Checked	Date	Figure
ESCO Developments, Lovell Partnerships, Flagship Group	North Walsham 2022 HGV AM	BS	TJ	13/10/2023	2

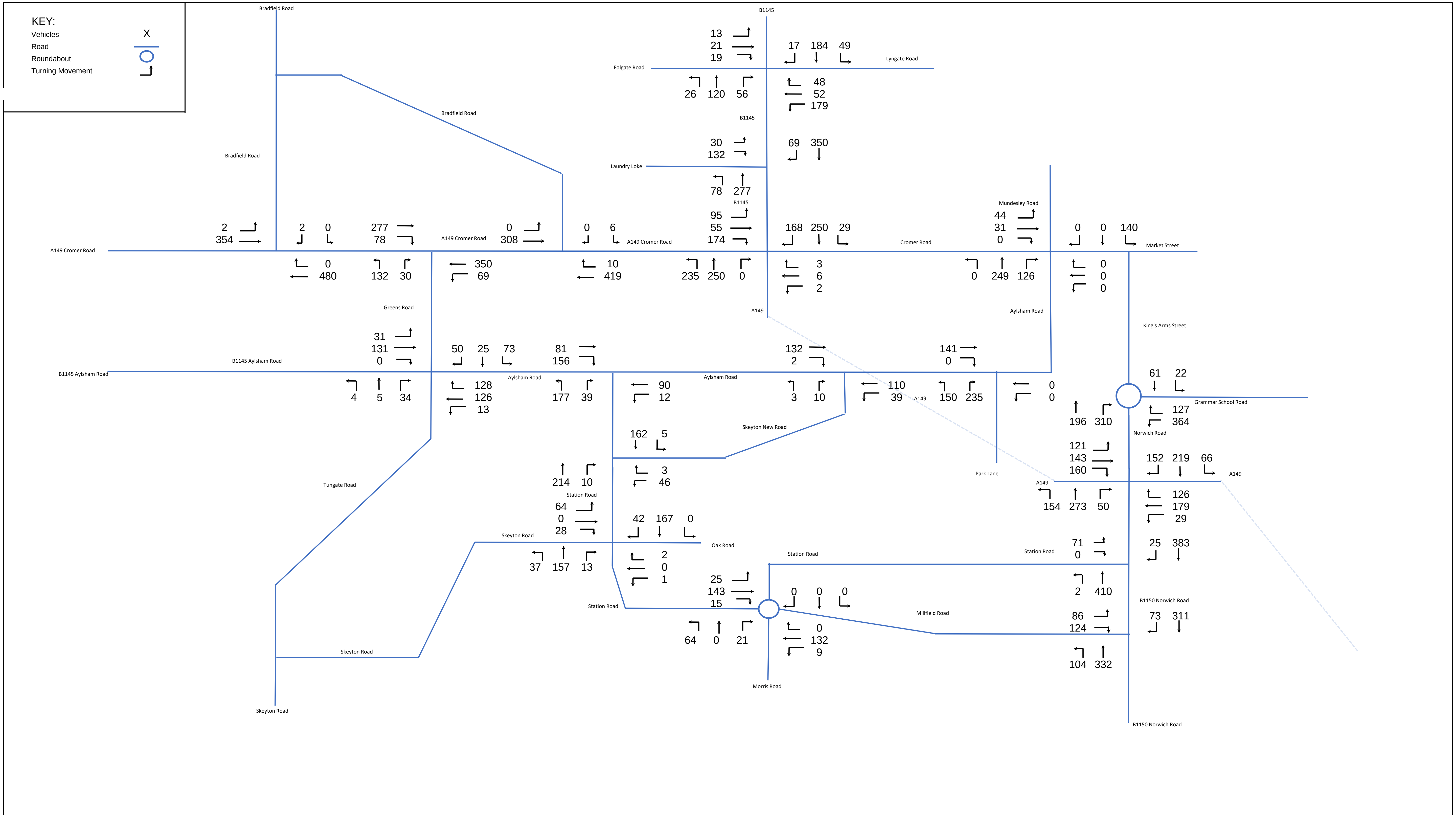


Project		Notes			
60685223 - North Walsham Western Urban Extension	AECOM	AM PEAK HOUR 08:00-09:00 PM PEAK HOUR: 16:30-17:30 July surveys used at the Market Place signalised junction and B1145/Cromer Road signalised junction as road closure in November surveys			
Client	Title	Drawn	Checked	Date	Figure
ESCO Developments, Lovell Partnerships, Flagship Group	North Walsham 2022 Base PM	BS	TJ	13/10/2023	3

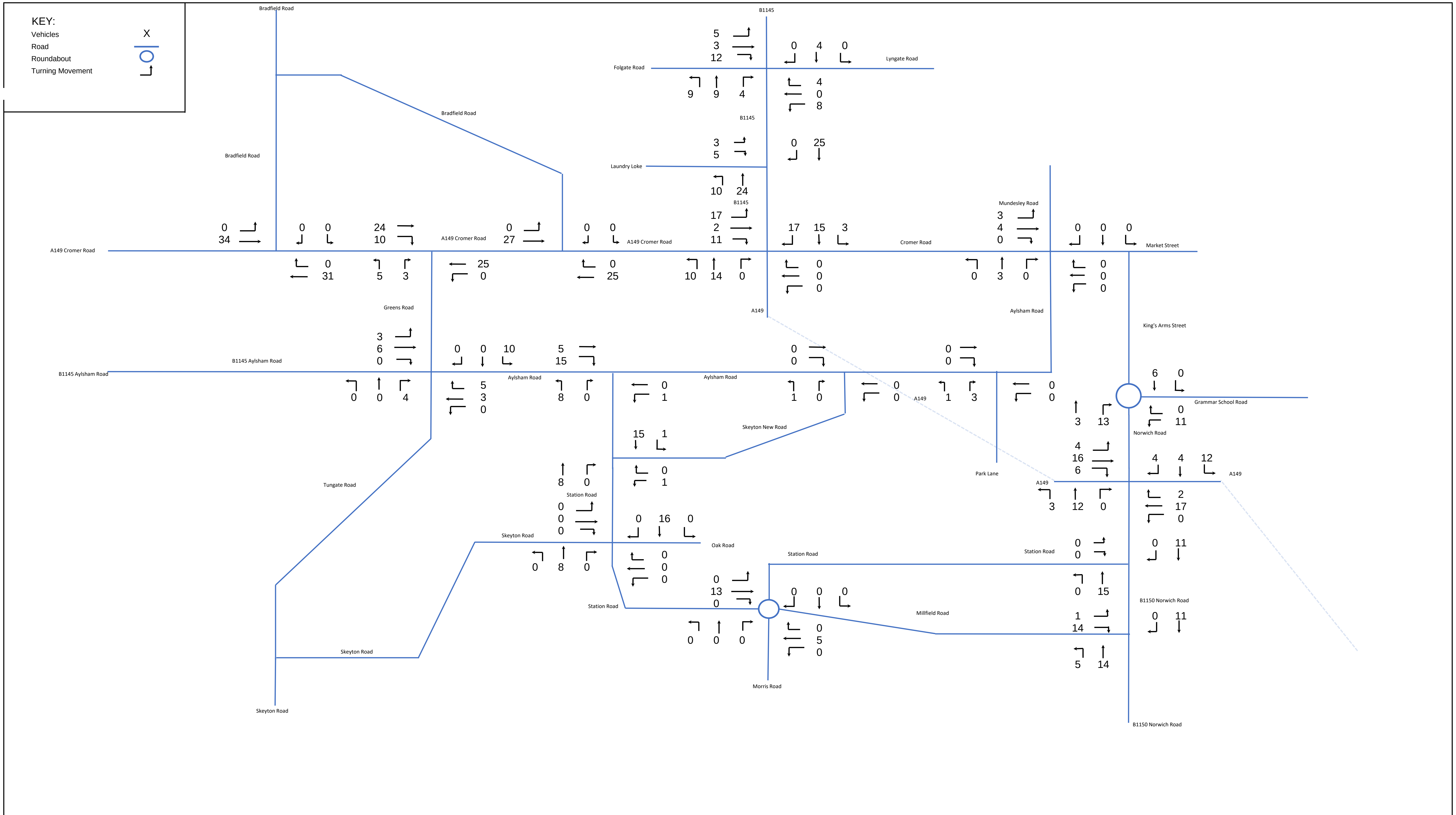


Project		Notes
60685223 - North Walsham Western Urban Extension	AECOM	AM PEAK HOUR 08:00-09:00 PM PEAK HOUR: 16:30-17:30 July surveys used at the Market Place signalised junction and B1145/Cromer Road signalised junction as road closure in November surveys

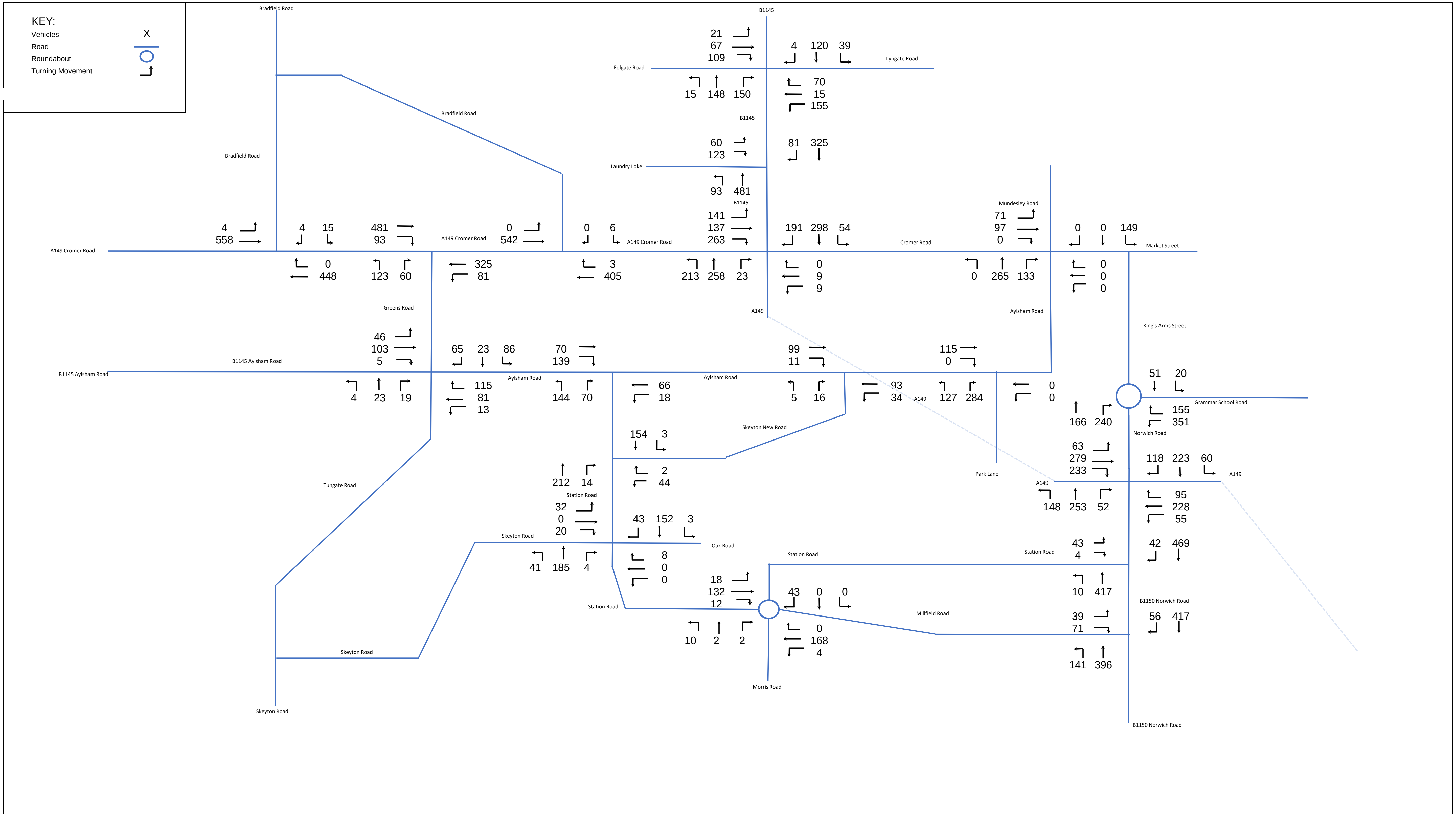
Client	Title	Drawn	Checked	Date	Figure
ESCO Developments, Lovell Partnerships, Flagship Group	North Walsham 2022 HGV PM	BS	TJ	13/10/2023	4



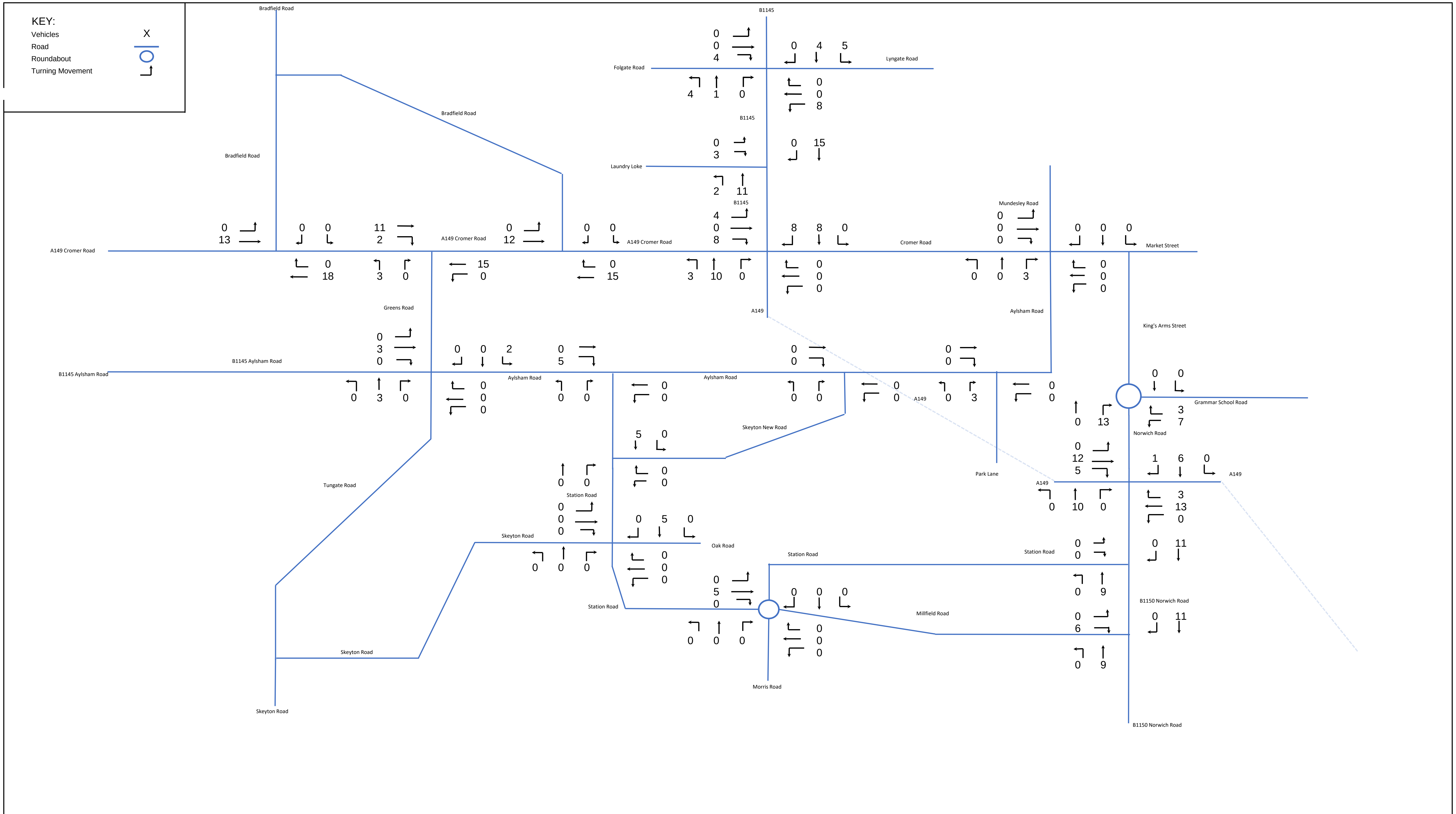
Project		Notes			
60685223 - North Walsham Western Urban Extension	AECOM				
Client	**Title**	**Drawn**	**Checked**	**Date**	**Figure**
ESCO Developments, Lovell Partnerships, Flagship Group	North Walsham 2029 Do Minimum AM	BS	TJ	13/10/2023	5



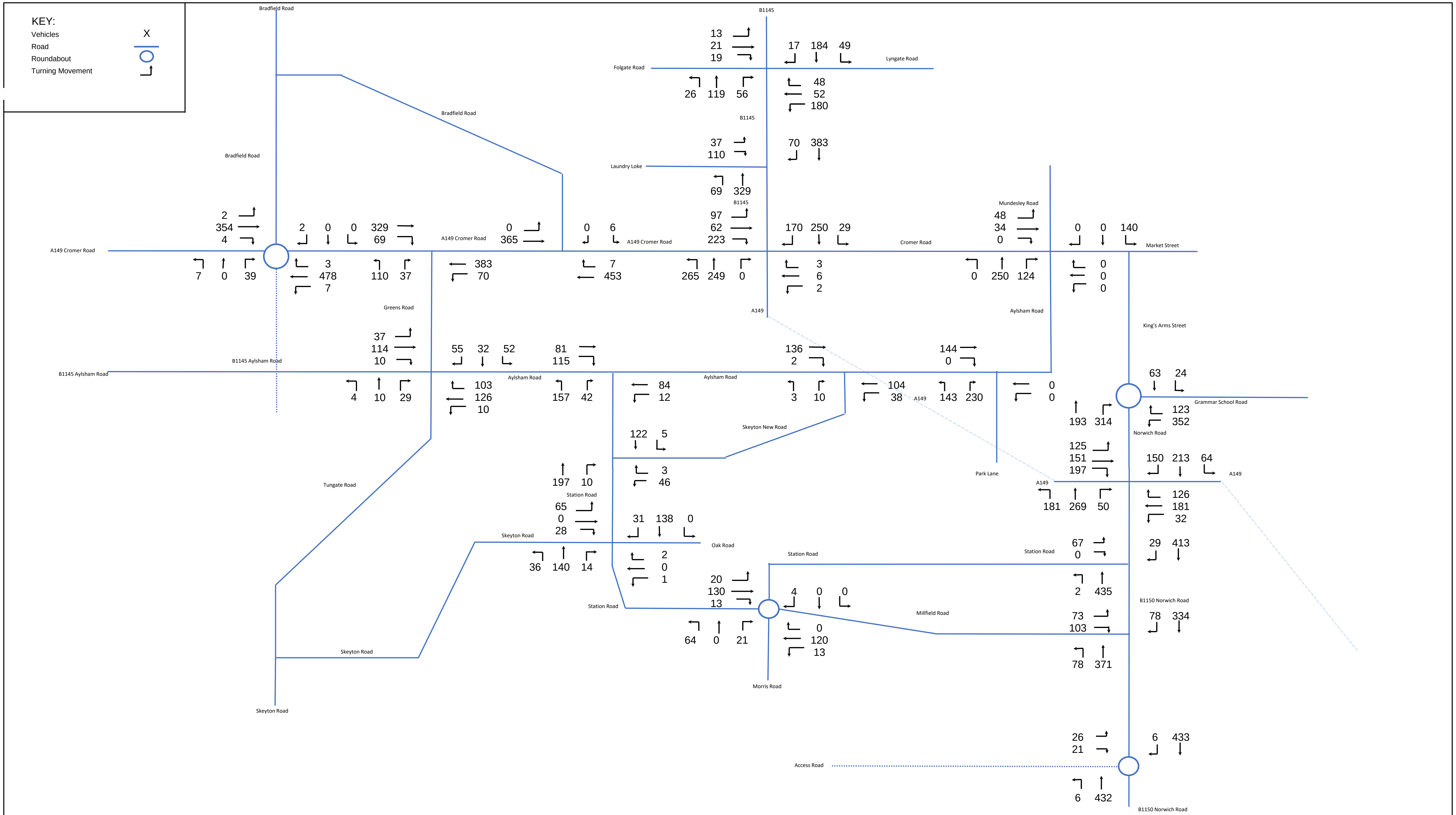
Project		Notes			
60685223 - North Walsham Western Urban Extension	AECOM				
Client	Title	Drawn	Checked	Date	Figure
ESCO Developments, Lovell Partnerships, Flagship Group	North Walsham 2029 Do Minimum AM (HGV Only)	BS	TJ	13/10/2023	6



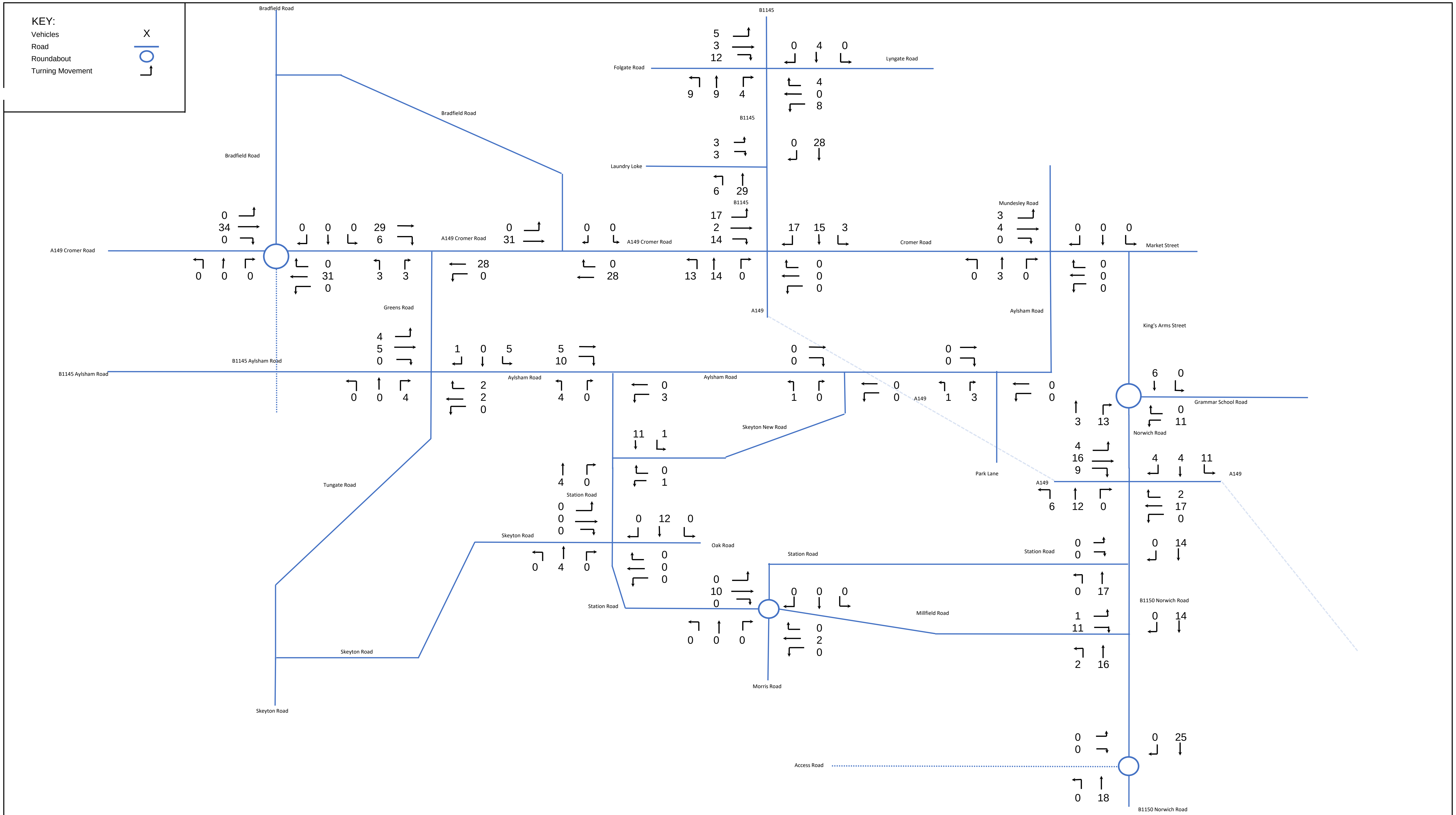
Project		Notes			
60685223 - North Walsham Western Urban Extension	AECOM				
Client	Title	Drawn	Checked	Date	Figure
ESCO Developments, Lovell Partnerships, Flagship Group	North Walsham 2029 Do Minimum PM	BS	TJ	13/10/2023	7



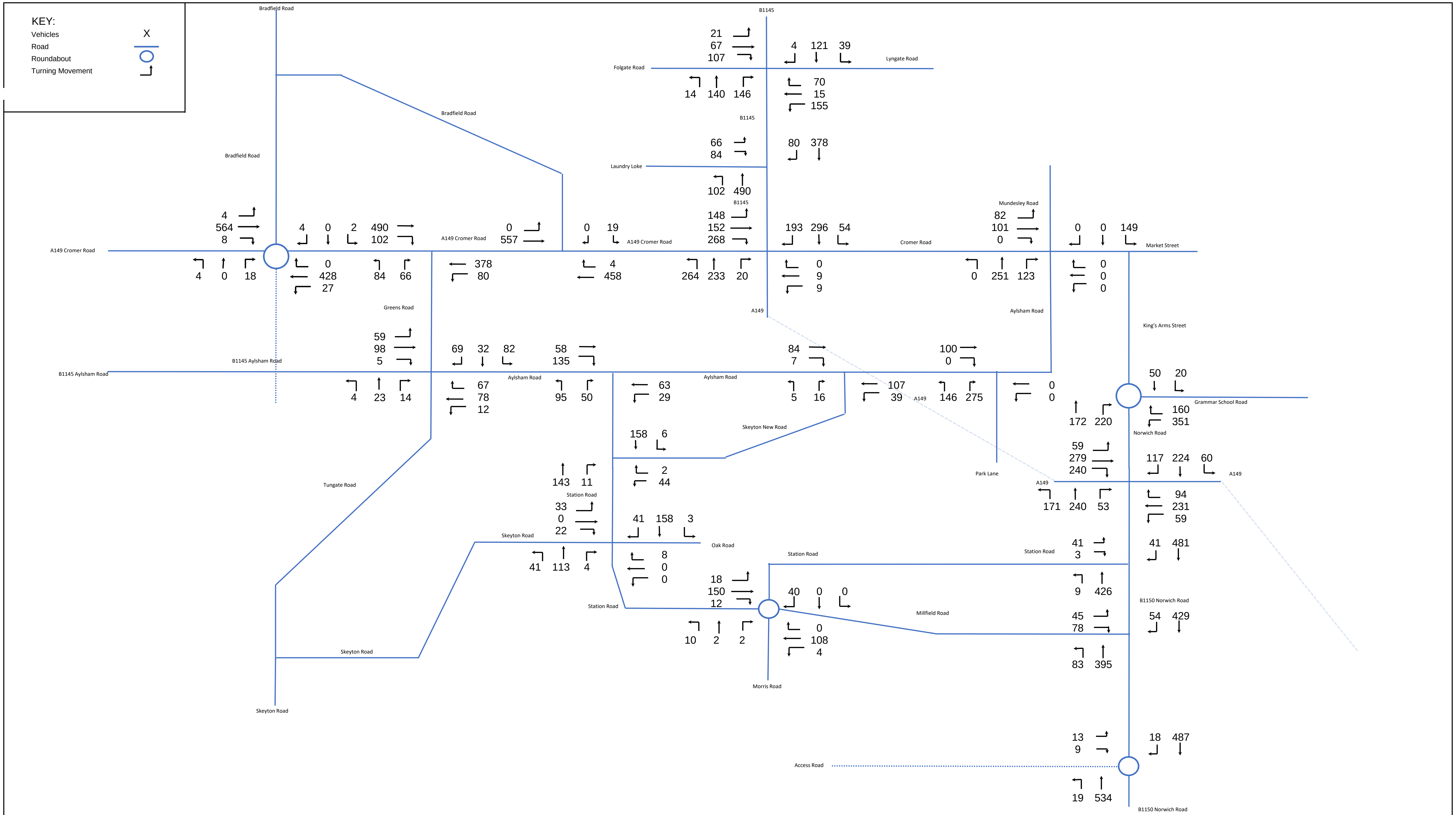
Project		Notes			
60685223 - North Walsham Western Urban Extension					
Client	Title	Drawn	Checked	Date	Figure
ESCO Developments, Lovell Partnerships, Flagship Group	North Walsham 2029 Do Minimum PM (HGV Only)	BS	TJ	13/10/2023	8



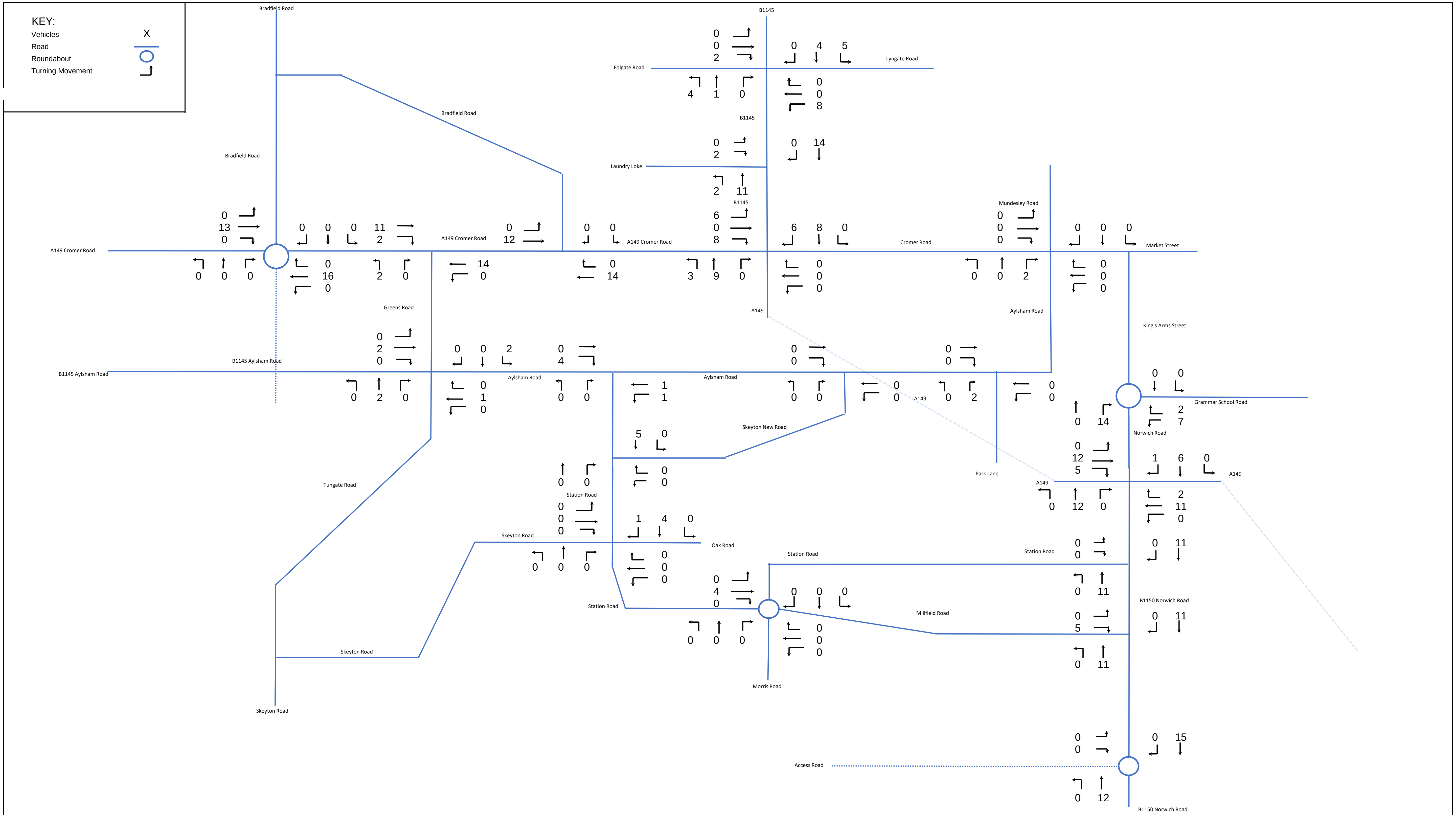
Project		Notes			
60685223 - North Walsham Western Urban Extension	AECOM				
Client	Title	Drawn	Checked	Date	Figure
ESCO Developments, Lovell Partnerships, Flagship Group	North Walsham 2029 Do Something AM	BS	TJ	13/10/2023	9



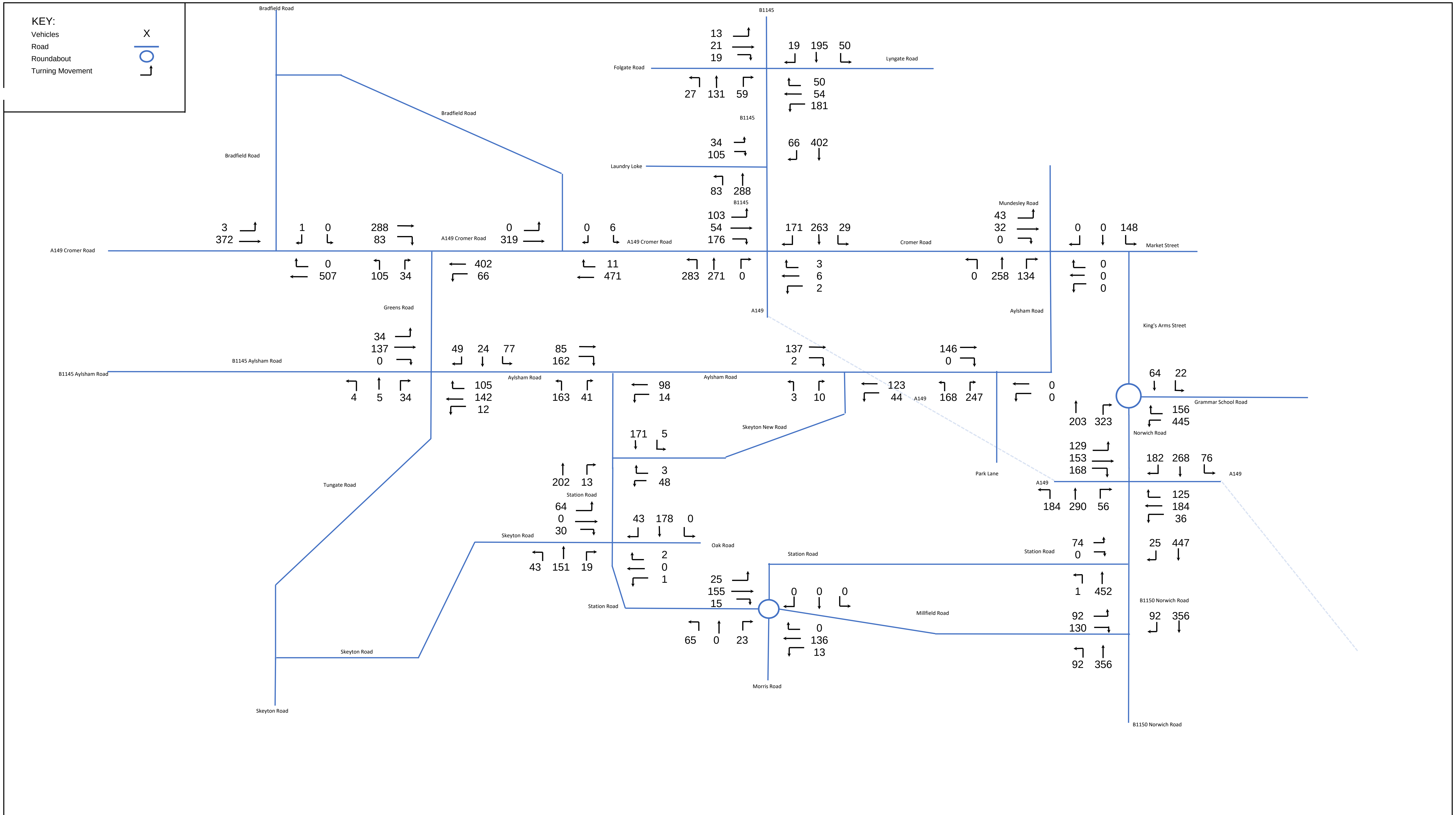
Project		Notes			
60685223 - North Walsham Western Urban Extension	AECOM				
Client	Title	Drawn	Checked	Date	Figure
ESCO Developments, Lovell Partnerships, Flagship Group	North Walsham 2029 Do Something AM (HGV Only)	BS	TJ	13/10/2023	10



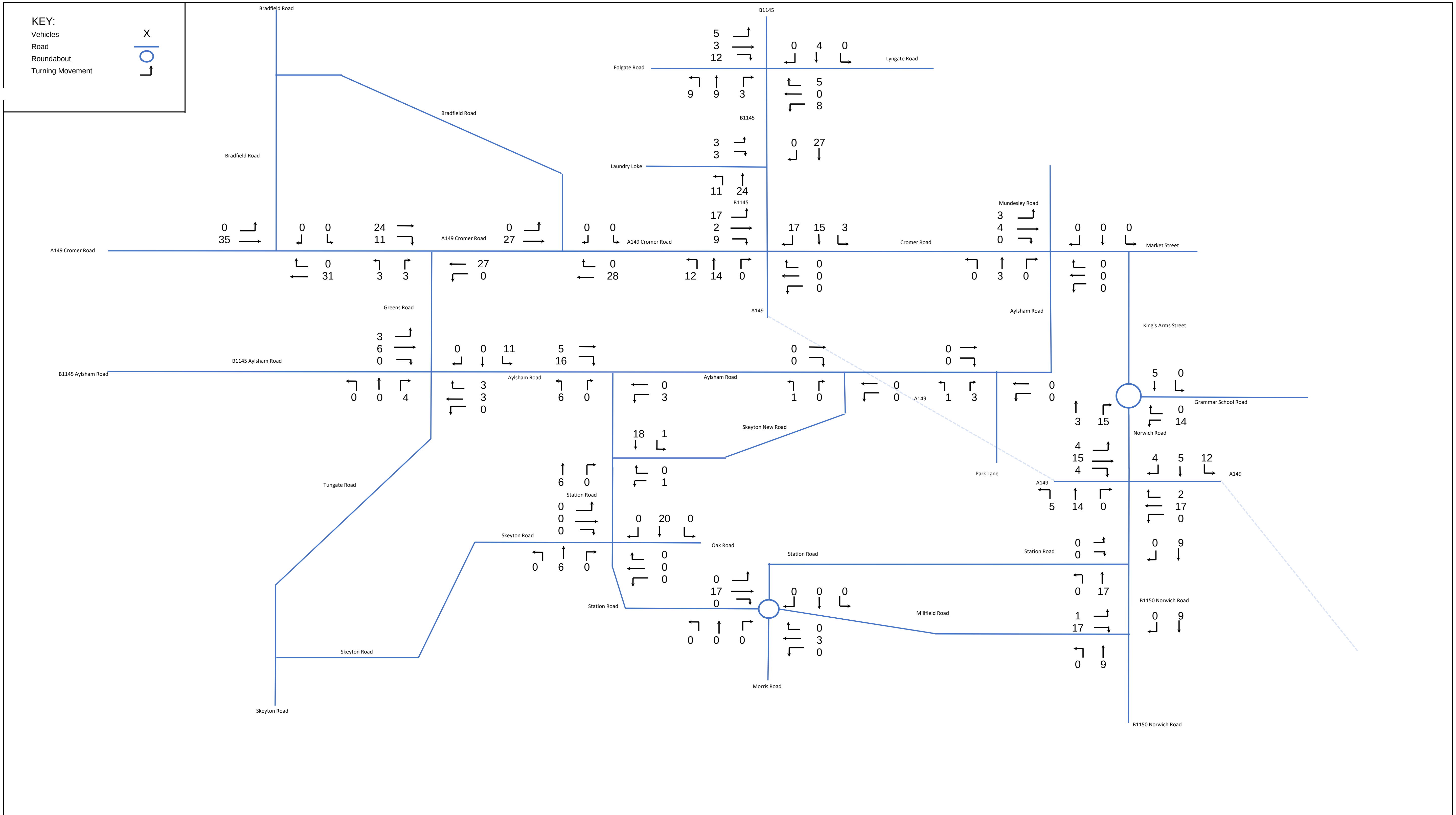
Project		Notes			
60685223 - North Walsham Western Urban Extension	AECOM				
Client	Title	Drawn	Checked	Date	Figure
ESCO Developments, Lovell Partnerships, Flagship Group	North Walsham 2029 Do Something PM	BS	TJ	13/10/2023	11



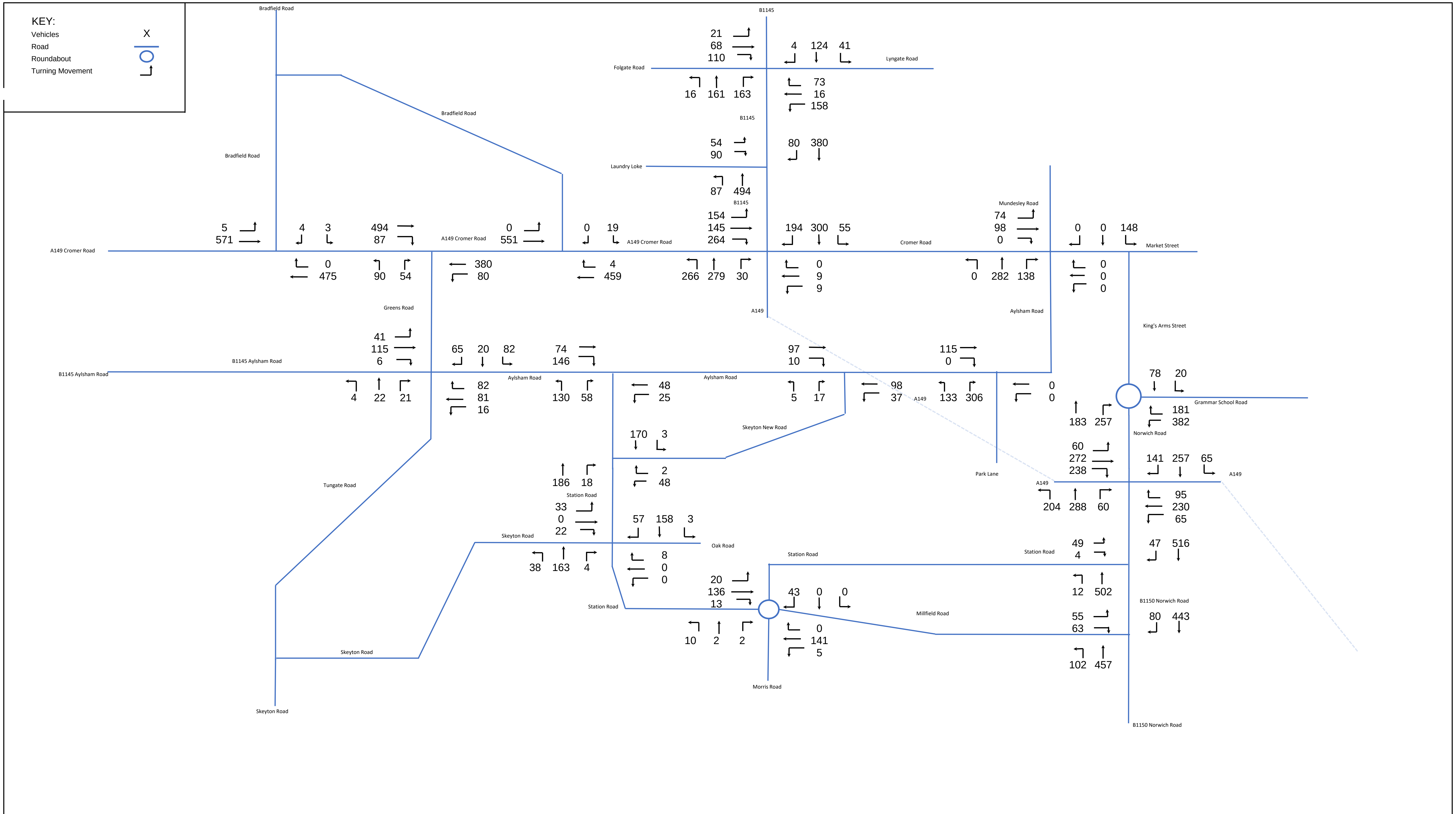
Project		Notes			
60685223 - North Walsham Western Urban Extension	AECOM				
Client	Title	Drawn	Checked	Date	Figure
ESCO Developments, Lovell Partnerships, Flagship Group	North Walsham 2029 Do Something PM (HGV Only)	BS	TJ	13/10/2023	12



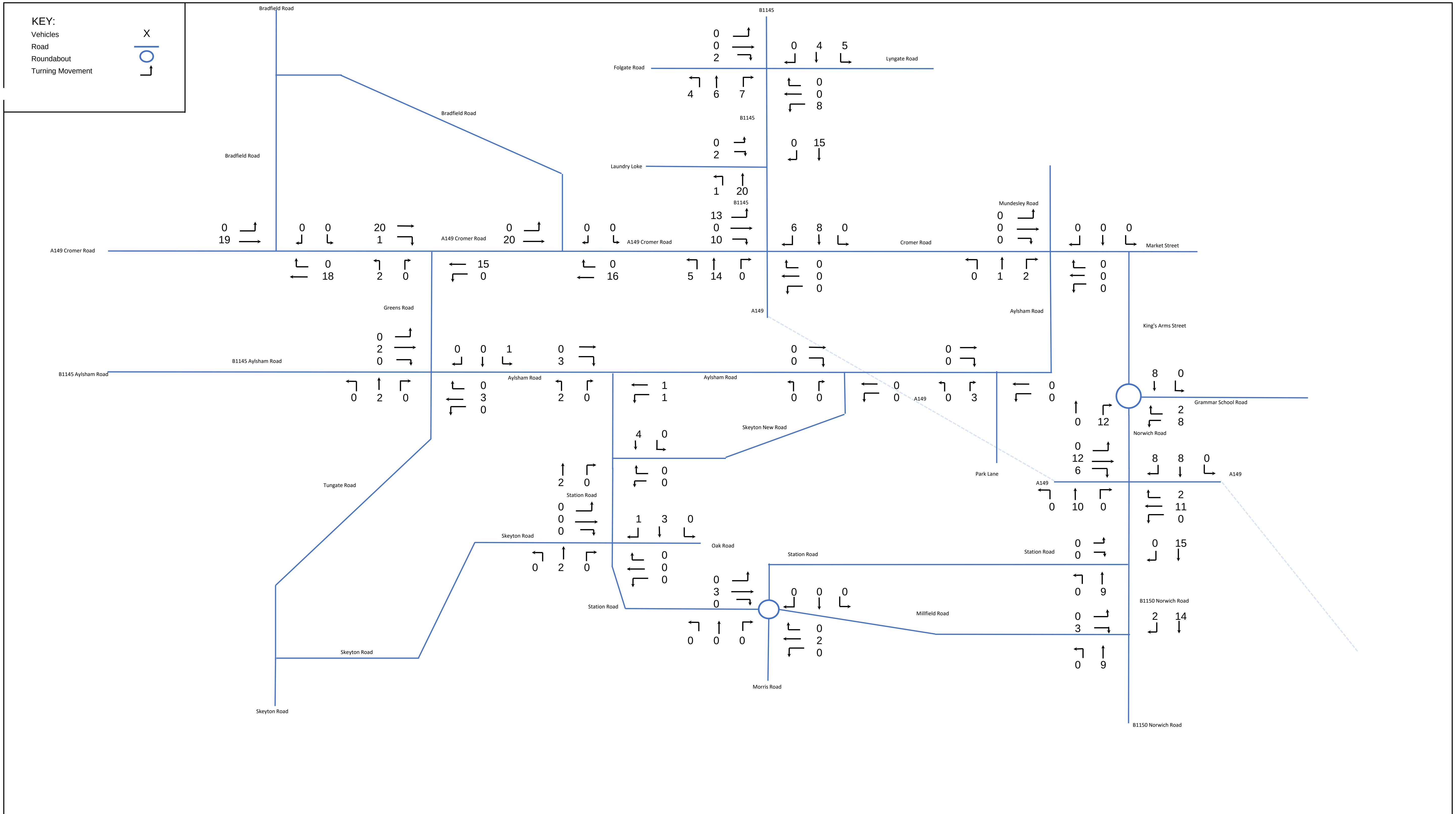
Project		Notes			
60685223 - North Walsham Western Urban Extension	AECOM				
Client	Title	Drawn	Checked	Date	Figure
ESCO Developments, Lovell Partnerships, Flagship Group	North Walsham 2036 Do Minimum AM Demand Flows	BS	TJ	13/10/2023	13



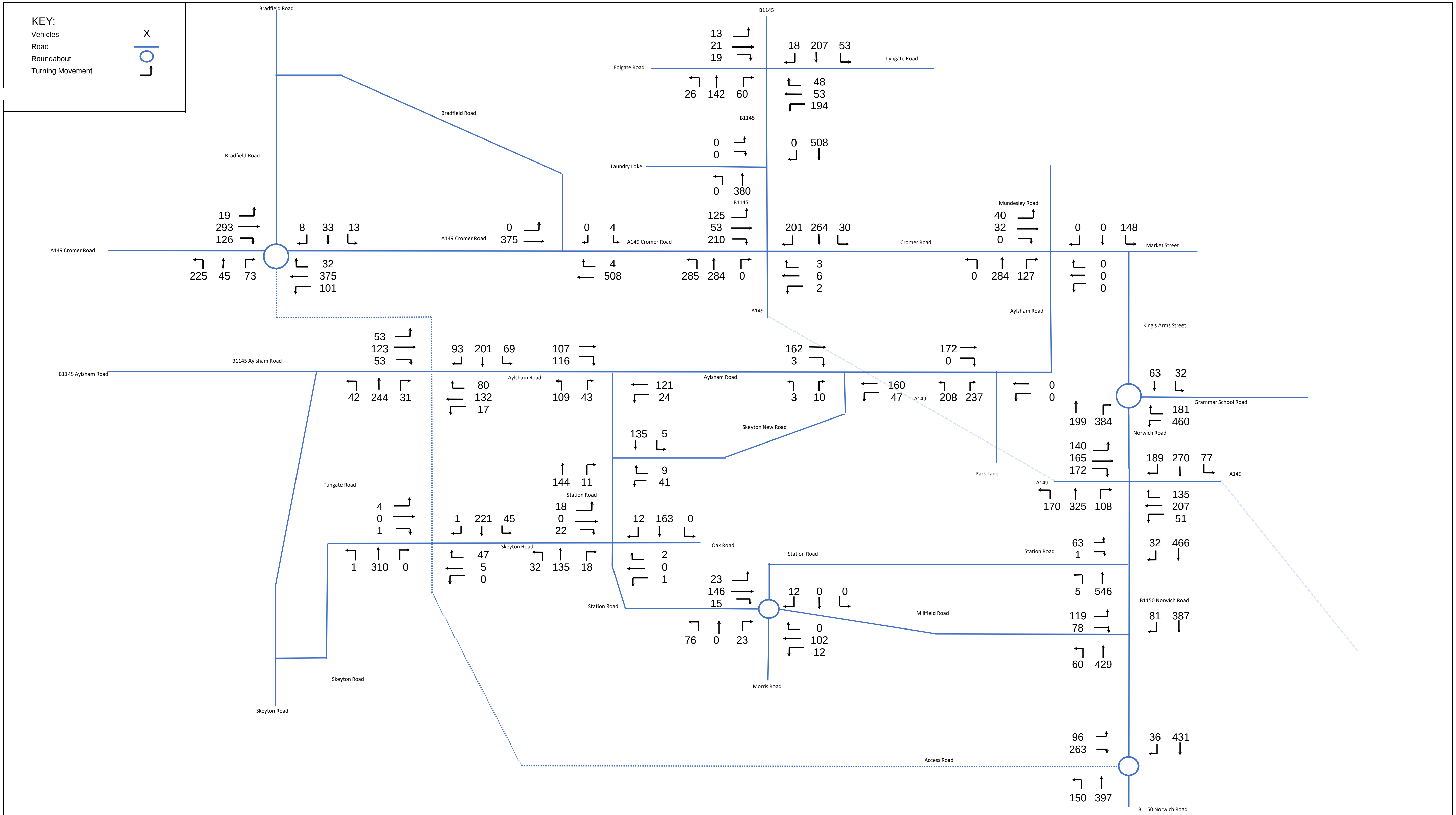
Project		Notes			
60685223 - North Walsham Western Urban Extension	AECOM				
Client	Title	Drawn	Checked	Date	Figure
ESCO Developments, Lovell Partnerships, Flagship Group	North Walsham 2036 Do Minimum AM Demand Flows (HGV Only)	BS	TJ	13/10/2023	14



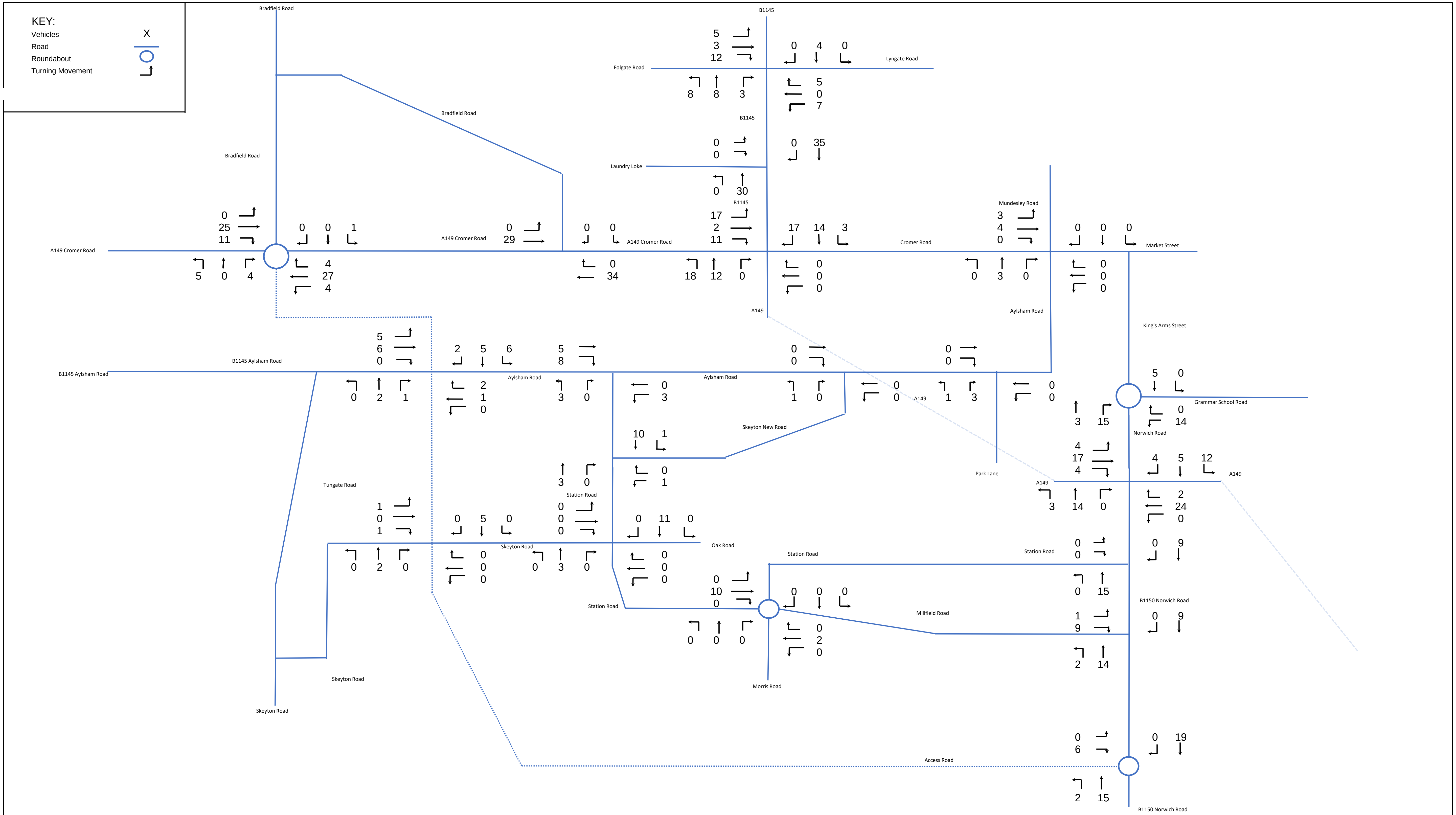
Project		Notes			
60685223 - North Walsham Western Urban Extension	AECOM				
Client	**Title**	**Drawn**	**Checked**	**Date**	**Figure**
ESCO Developments, Lovell Partnerships, Flagship Group	North Walsham 2036 Do Minimum PM Demand Flows	BS	TJ	13/10/2023	15



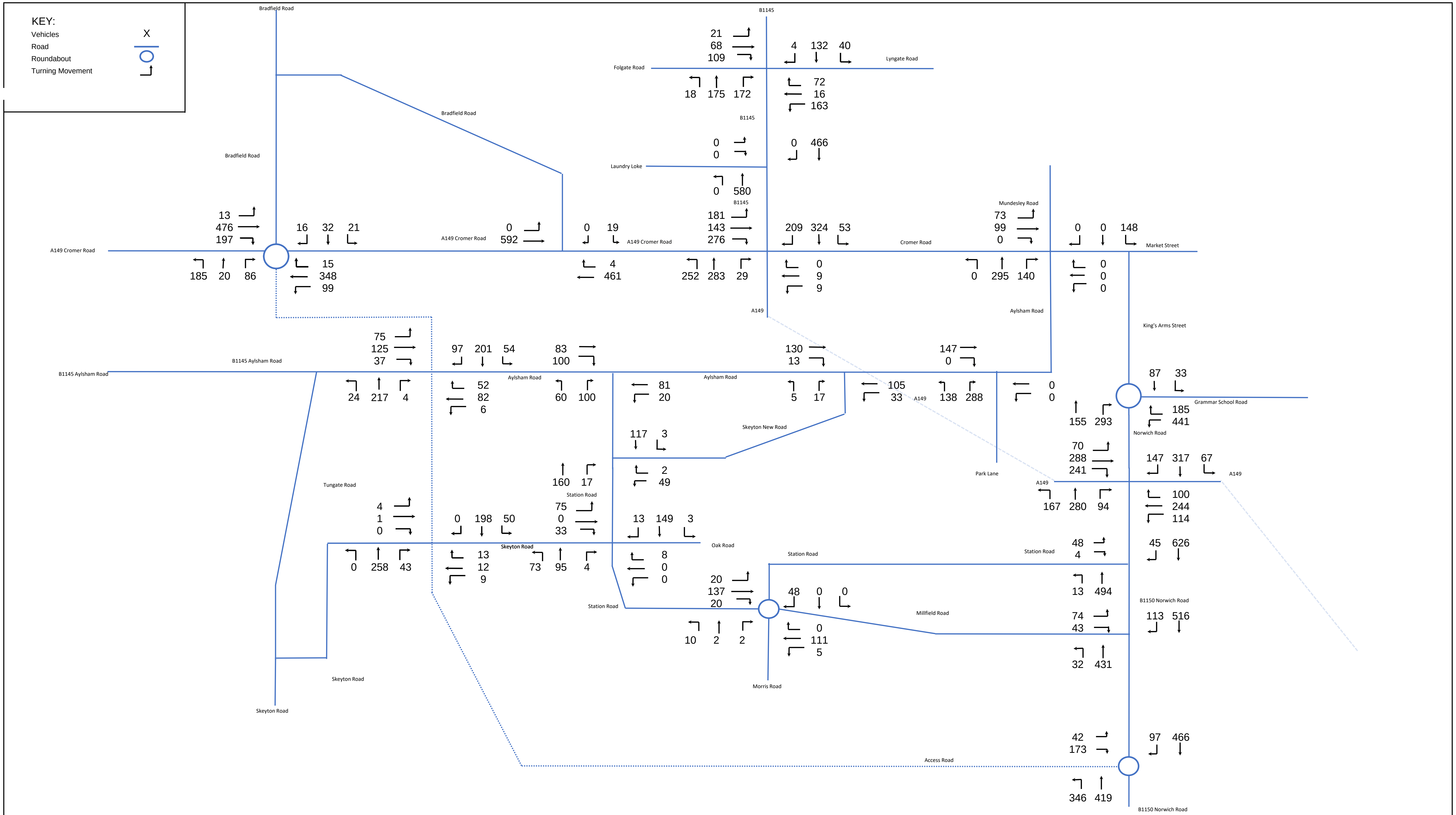
Project		Notes			
60685223 - North Walsham Western Urban Extension	AECOM				
Client	Title	Drawn	Checked	Date	Figure
ESCO Developments, Lovell Partnerships, Flagship Group	North Walsham 2036 Do Minimum PM Demand Flows (HGV Only)	BS	TJ	13/10/2023	16



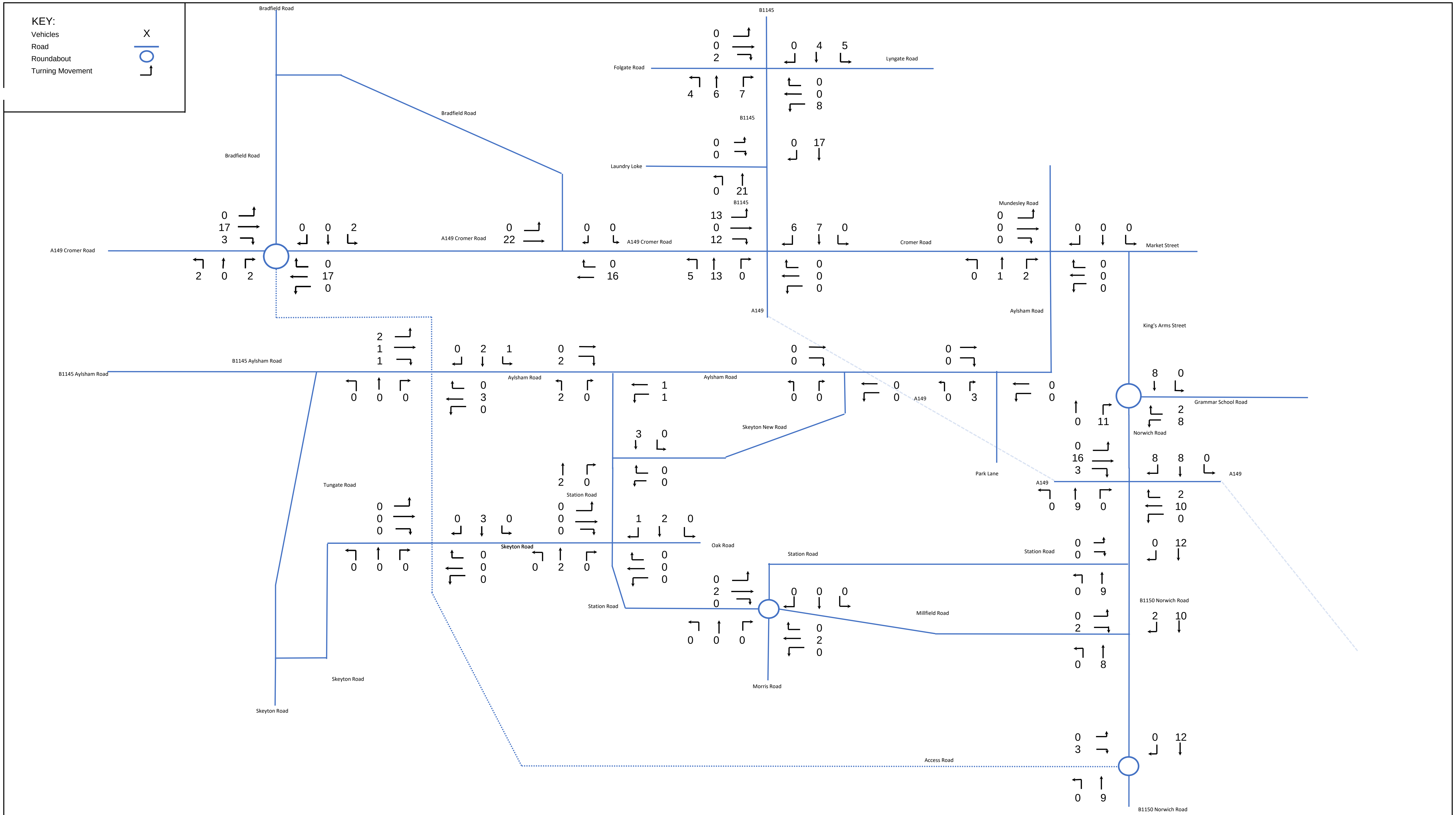
Project		Notes			
60685223 - North Walsham Western Urban Extension	AECOM				
Client	Title	Drawn	Checked	Date	Figure
ESCO Developments, Lovell Partnerships, Flagship Group	North Walsham 2036 Do Something AM Demand Flows	BS	TJ	13/10/2023	17



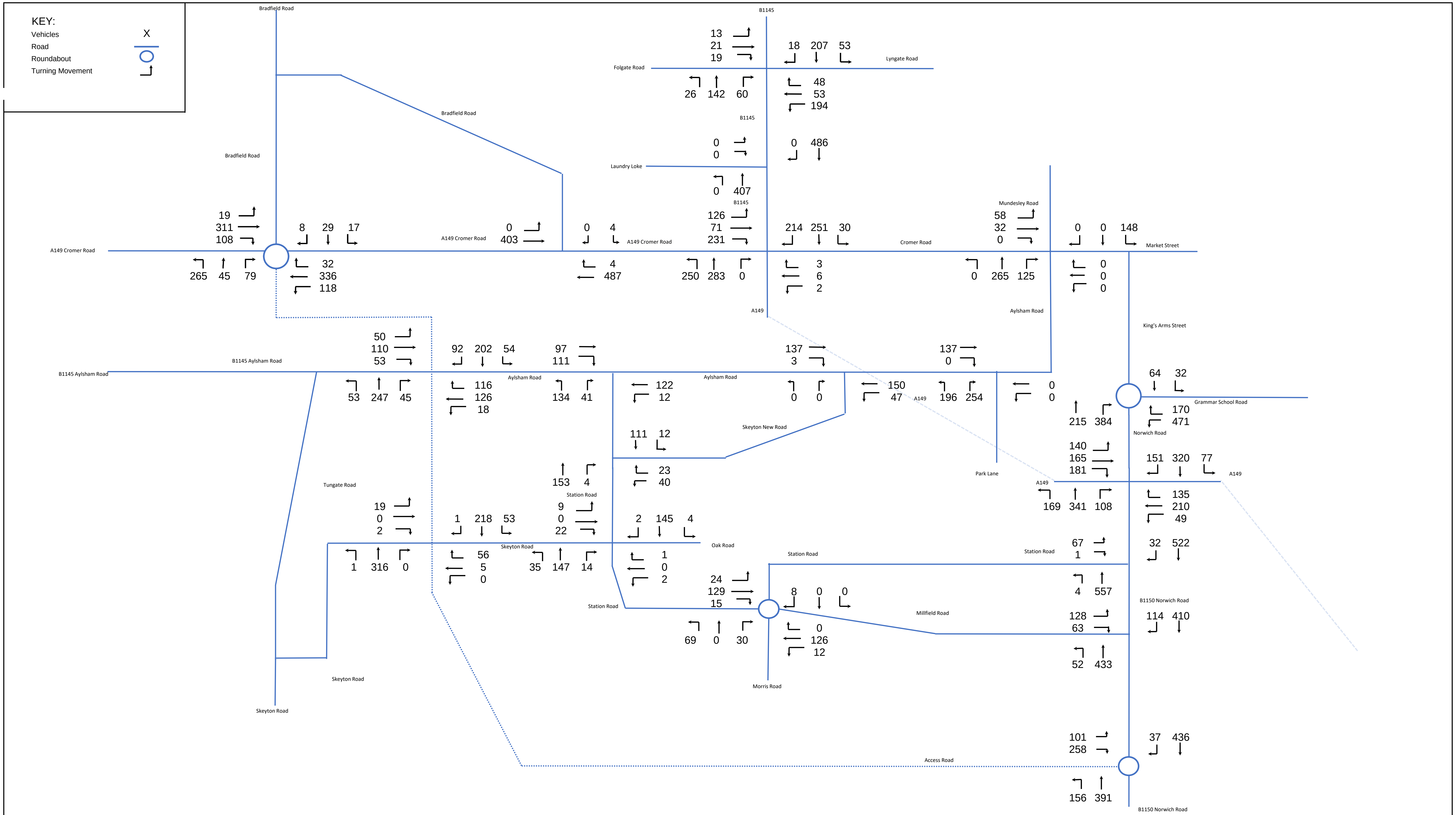
Project		Notes			
60685223 - North Walsham Western Urban Extension	AECOM				
Client	Title	Drawn	Checked	Date	Figure
ESCO Developments, Lovell Partnerships, Flagship Group	North Walsham 2036 Do Something AM Demand Flows (HGV Only)	BS	TJ	13/10/2023	18



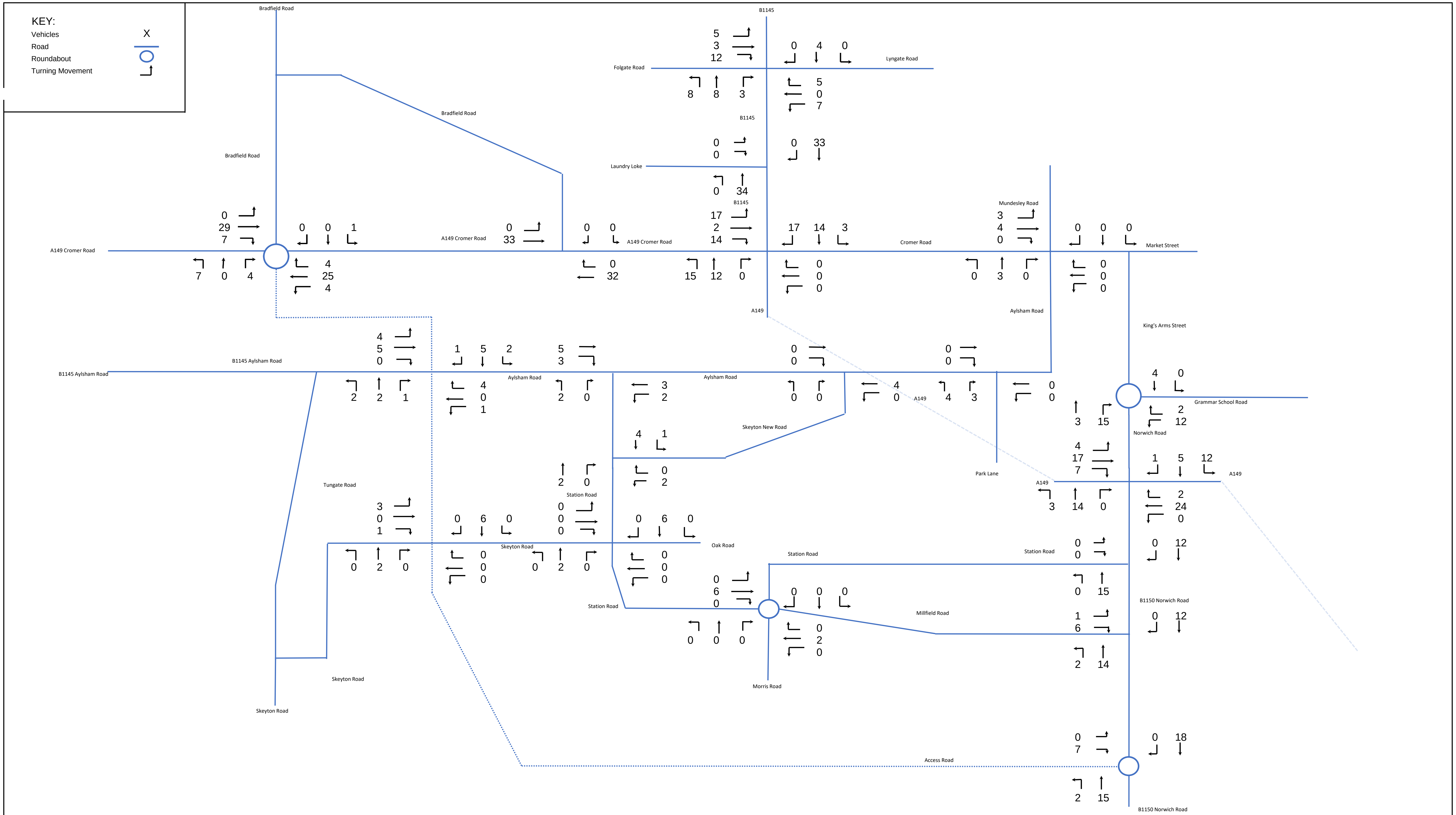
Project		Notes			
60685223 - North Walsham Western Urban Extension	AECOM				
Client	Title	Drawn	Checked	Date	Figure
ESCO Developments, Lovell Partnerships, Flagship Group	North Walsham 2036 Do Something PM Demand Flows	BS	TJ	13/10/2023	19



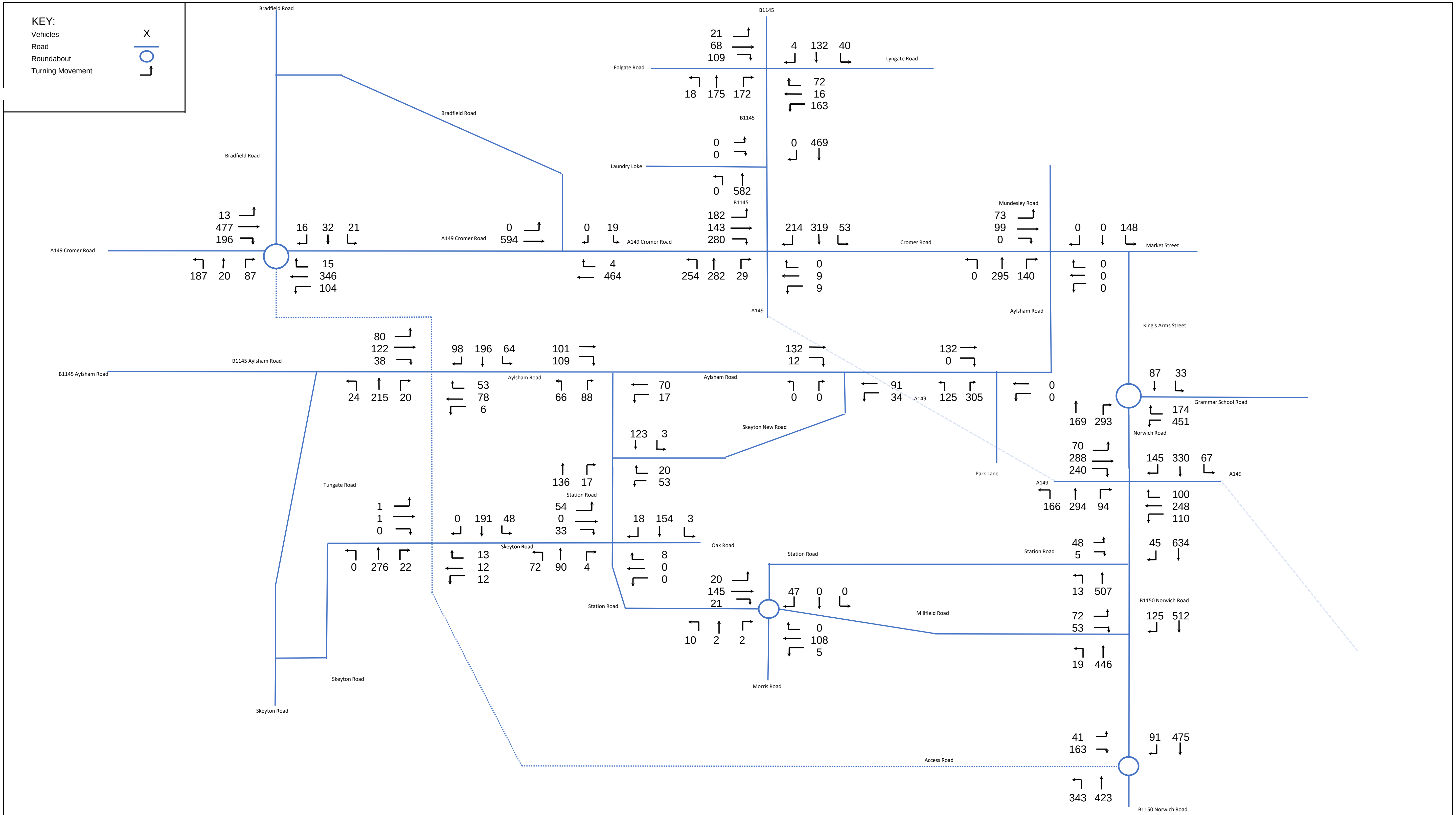
Project		Notes			
60685223 - North Walsham Western Urban Extension	AECOM				
Client	**Title**	**Drawn**	**Checked**	**Date**	**Figure**
ESCO Developments, Lovell Partnerships, Flagship Group	North Walsham 2036 Do Something PM Demand Flows (HGV Only)	BS	TJ	13/10/2023	20



Project		Notes			
60685223 - North Walsham Western Urban Extension	AECOM				
Client	**Title**	**Drawn**	**Checked**	**Date**	**Figure**
ESCO Developments, Lovell Partnerships, Flagship Group	North Walsham 2036 Do Something AM Demand Flows (Mitigation Scenario)	BS	TJ	13/10/2023	21

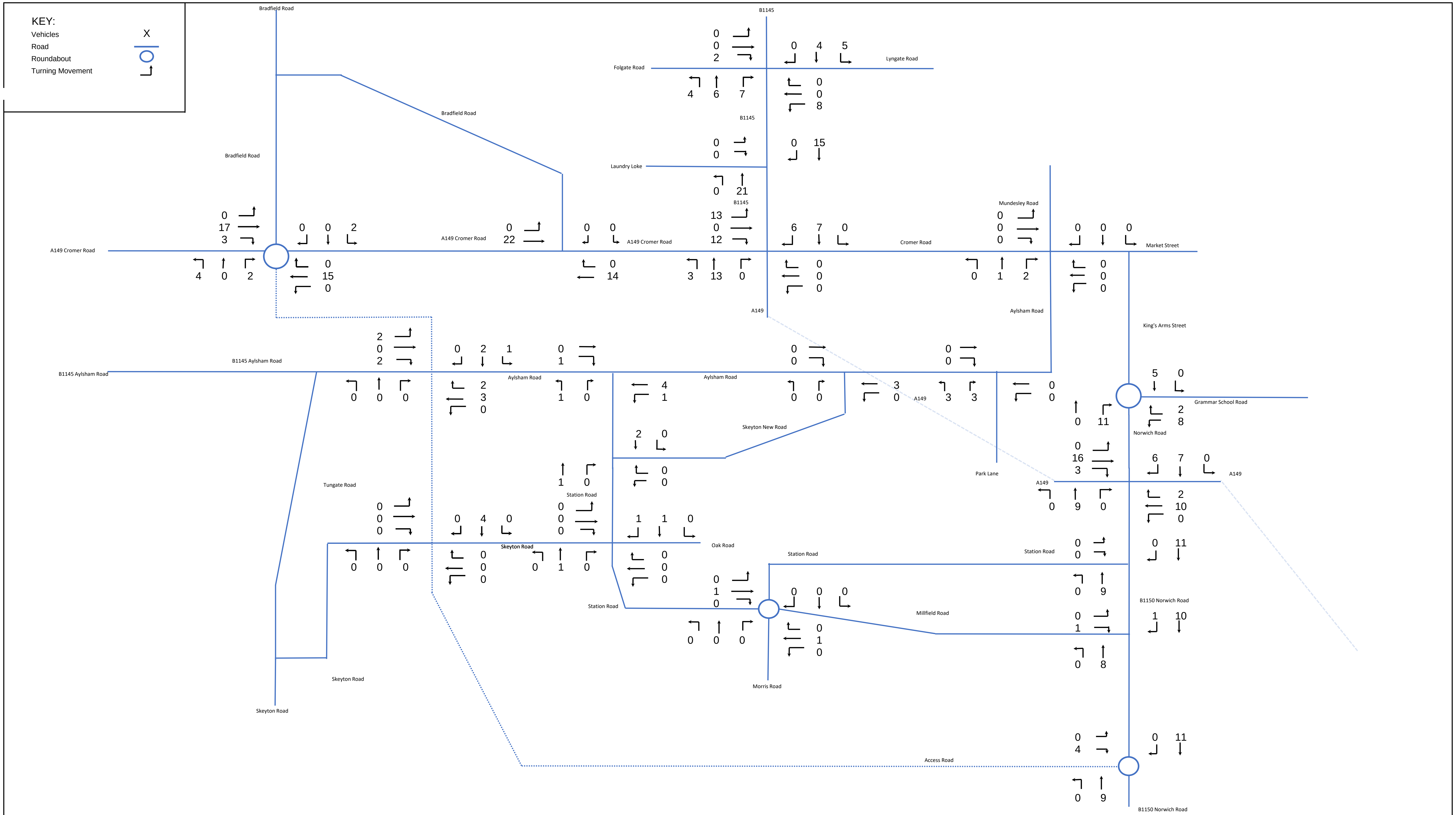


Project		Notes			
60685223 - North Walsham Western Urban Extension	AECOM				
Client	Title	Drawn	Checked	Date	Figure
ESCO Developments, Lovell Partnerships, Flagship Group	North Walsham 2036 Do Something AM Demand Flows (Mitigation Scenario, HGV Only)	BS	TJ	13/10/2023	22

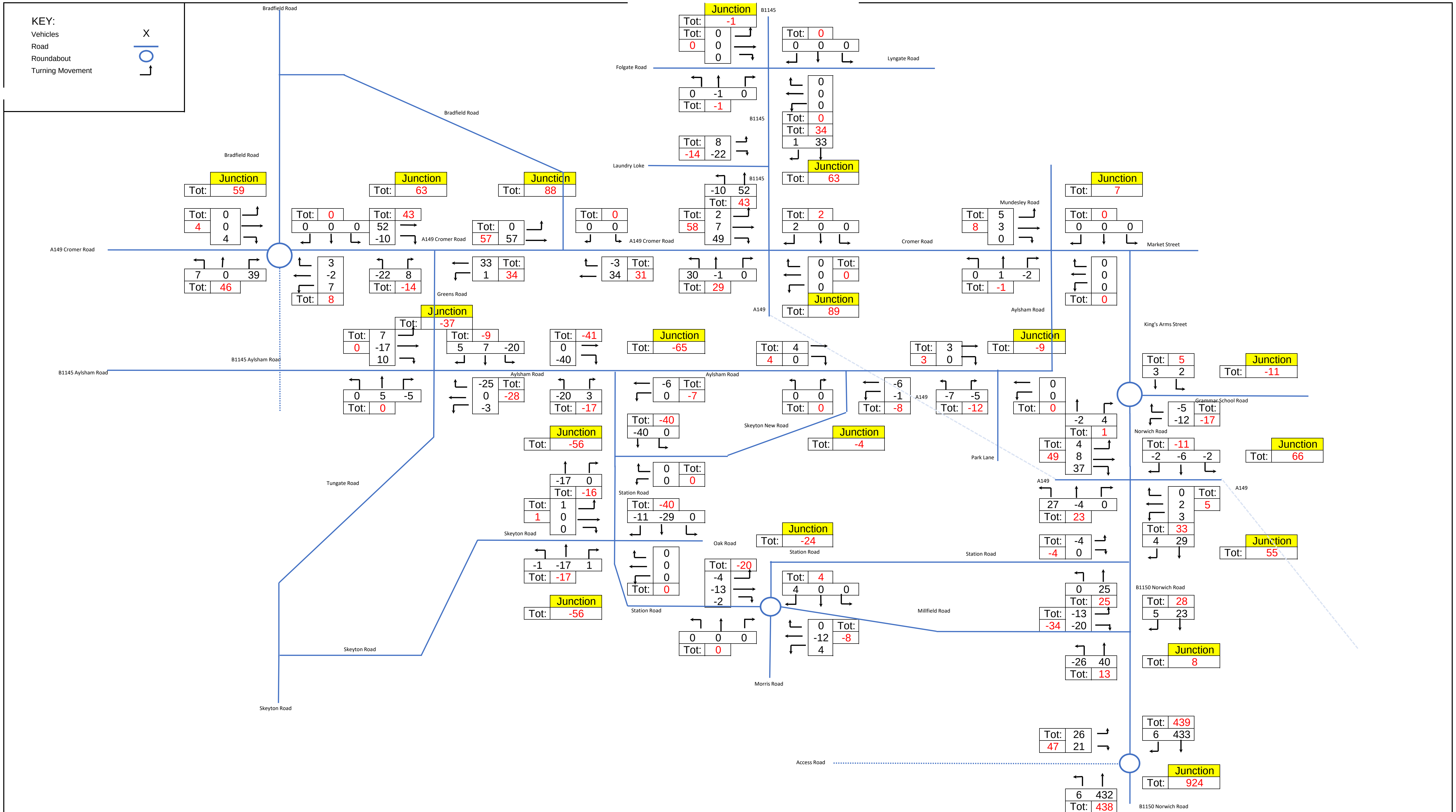


Project		Notes
60685223 - North Walsham Western Urban Extension	AECOM	

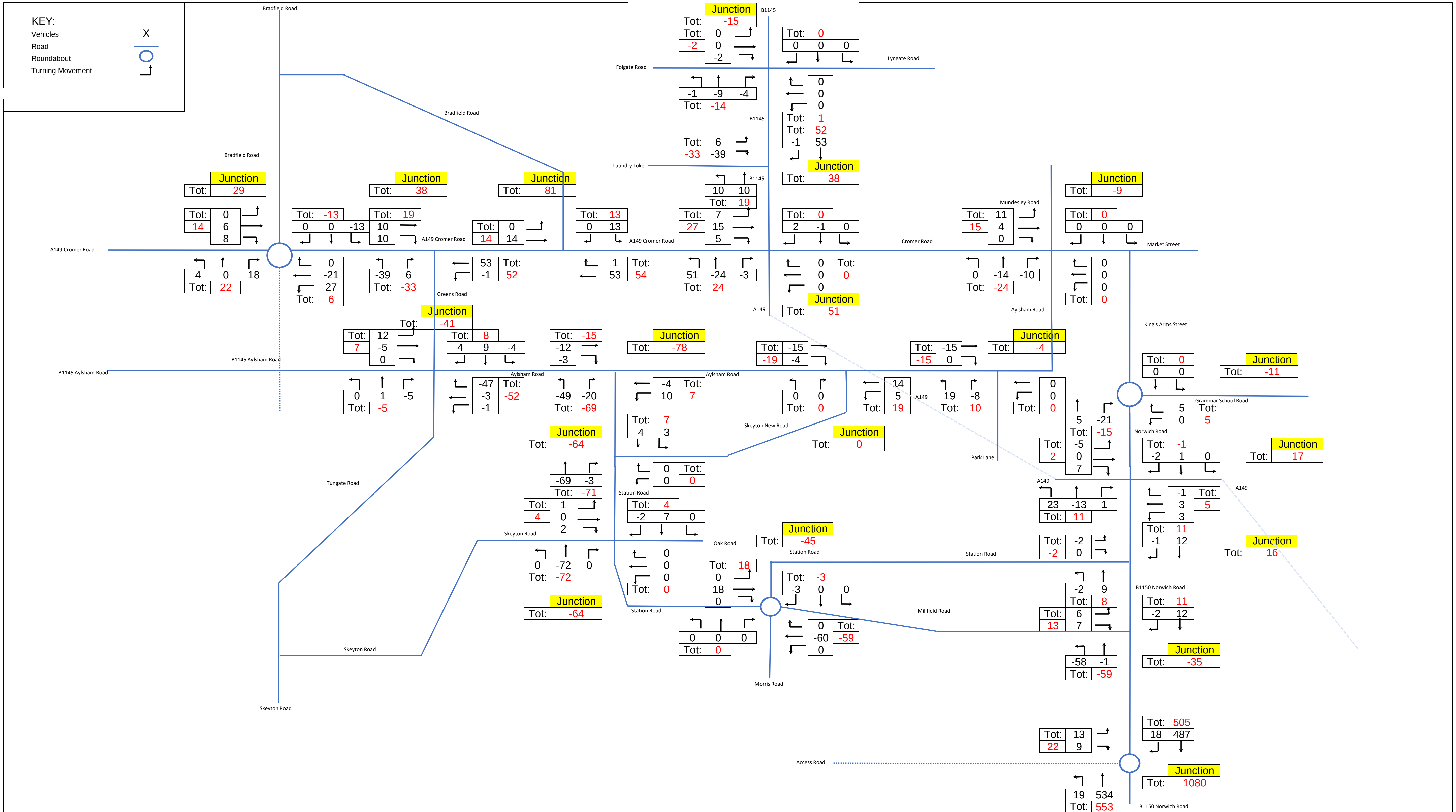
Client	Title	Drawn	Checked	Date	Figure
ESCO Developments, Lovell Partnerships, Flagship Group	North Walsham 2036 Do Something PM Demand Flows (Mitigation Scenario)	BS	TJ	13/10/2023	23



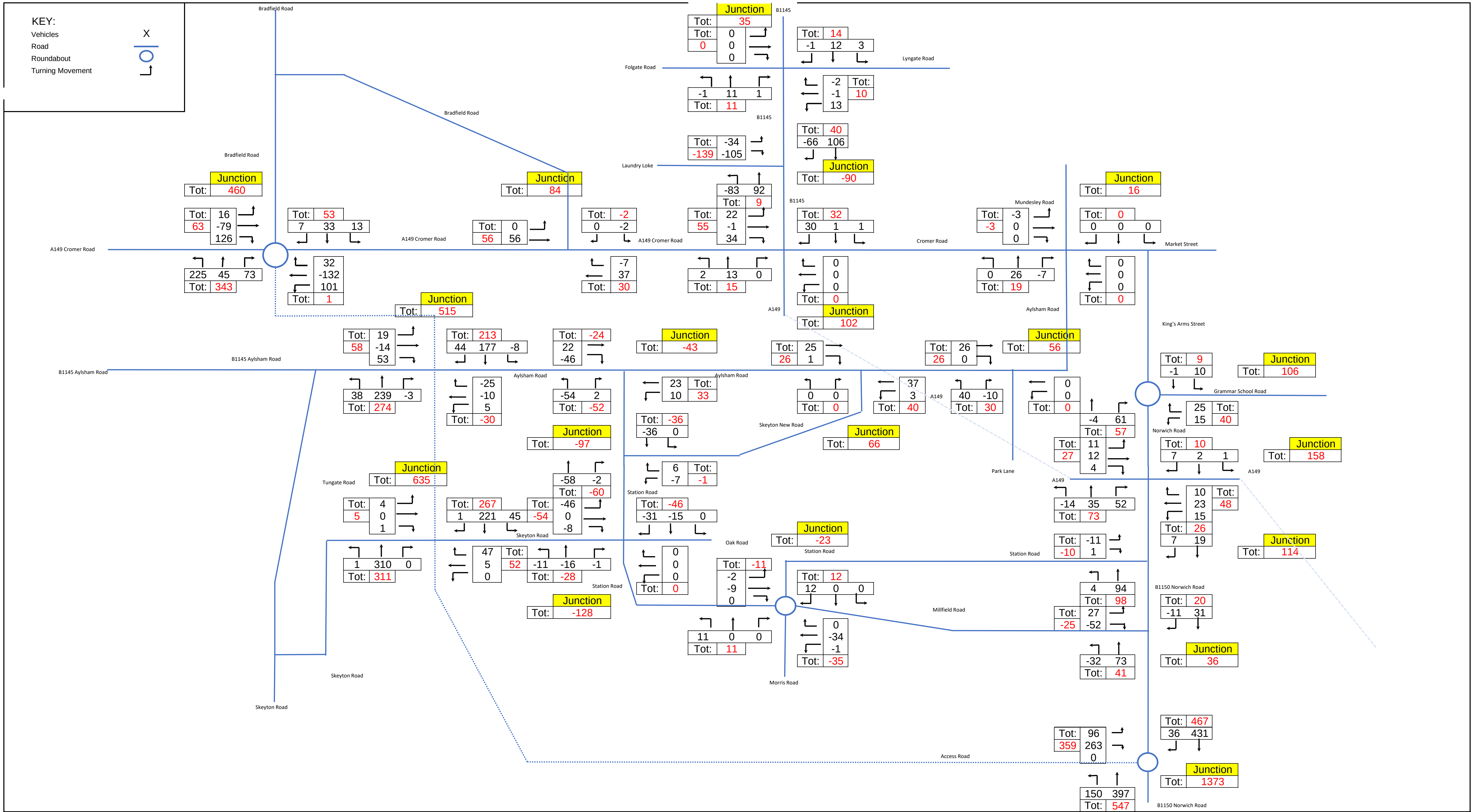
Project		Notes			
60685223 - North Walsham Western Urban Extension	AECOM				
Client	Title	Drawn	Checked	Date	Figure
ESCO Developments, Lovell Partnerships, Flagship Group	North Walsham 2036 Do Something PM Demand Flows (Mitigation Scenario, HGV Only)	BS	TJ	13/10/2023	24



Project		Notes			
60685223 - North Walsham Western Urban Extension	AECOM				
Client	Title	Drawn	Checked	Date	Figure
ESCO Developments, Lovell Partnerships, Flagship Group	North Walsham 2029 Do Something Minus Do Minimum AM	BS	TJ	13/10/2023	25



Project		Notes			
60685223 - North Walsham Western Urban Extension	AECOM				
Client	Title	Drawn	Checked	Date	Figure
ESCO Developments, Lovell Partnerships, Flagship Group	North Walsham 2029 Do Something Minus Do Minimum PM	BS	TJ	13/10/2023	26



Project		Notes			
60685223 - North Walsham Western Urban Extension	AECOM				
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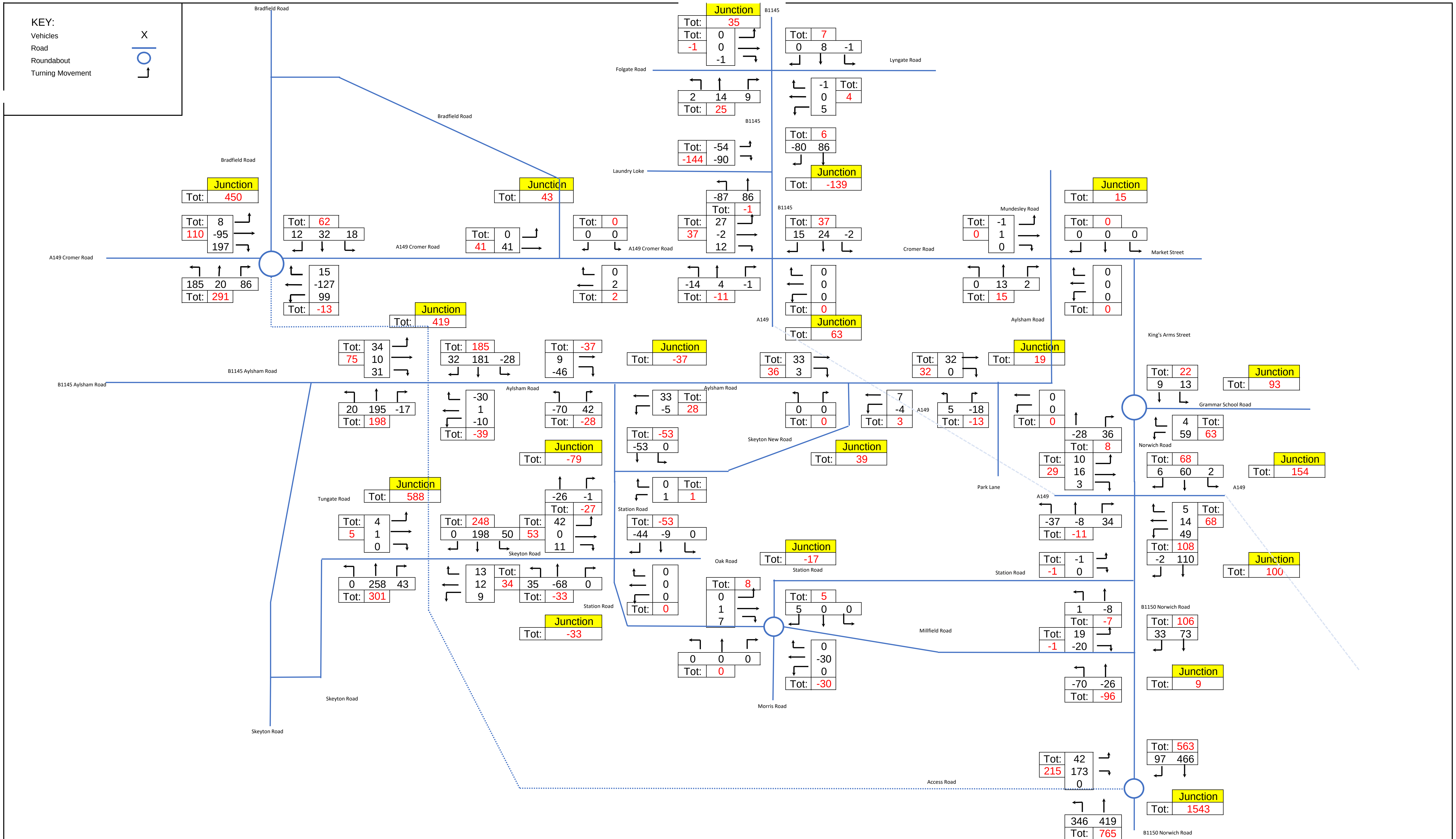
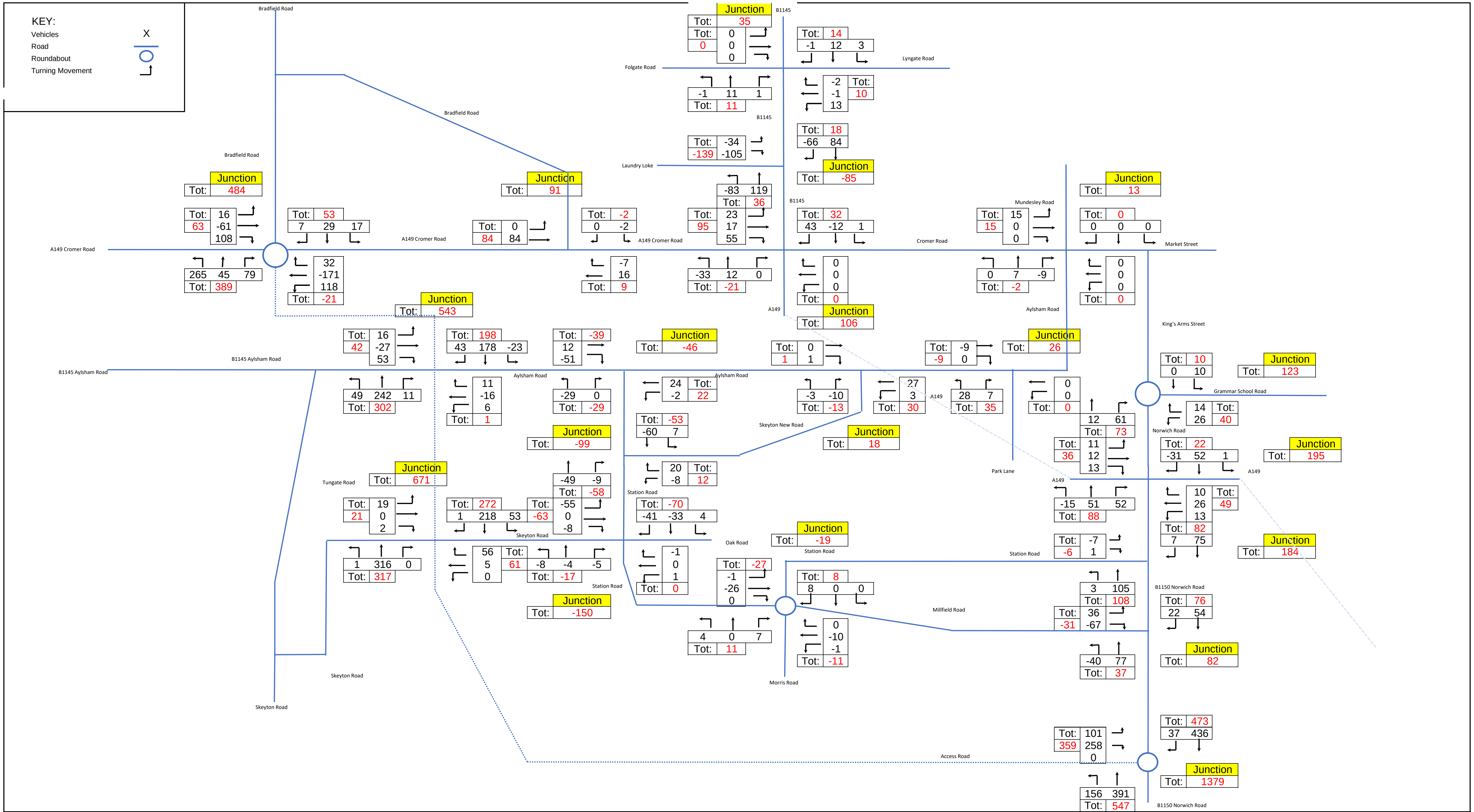
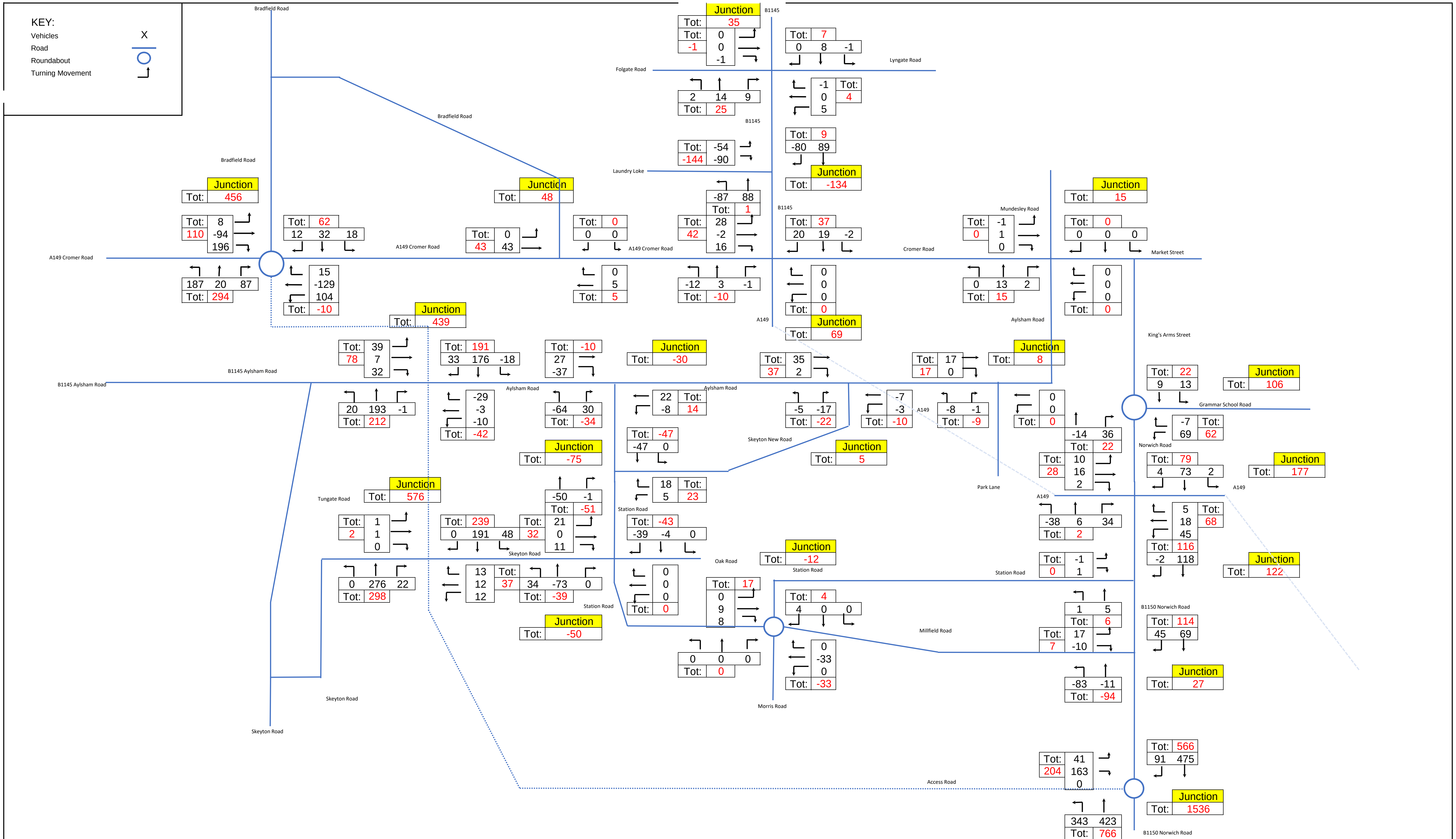
ESCO Developments, Lovell Partnerships, Flagship Group	North Walsham 2036 Do Something Minus Do Minimum AM Demand Flows	BS	TJ	13/10/2023	27



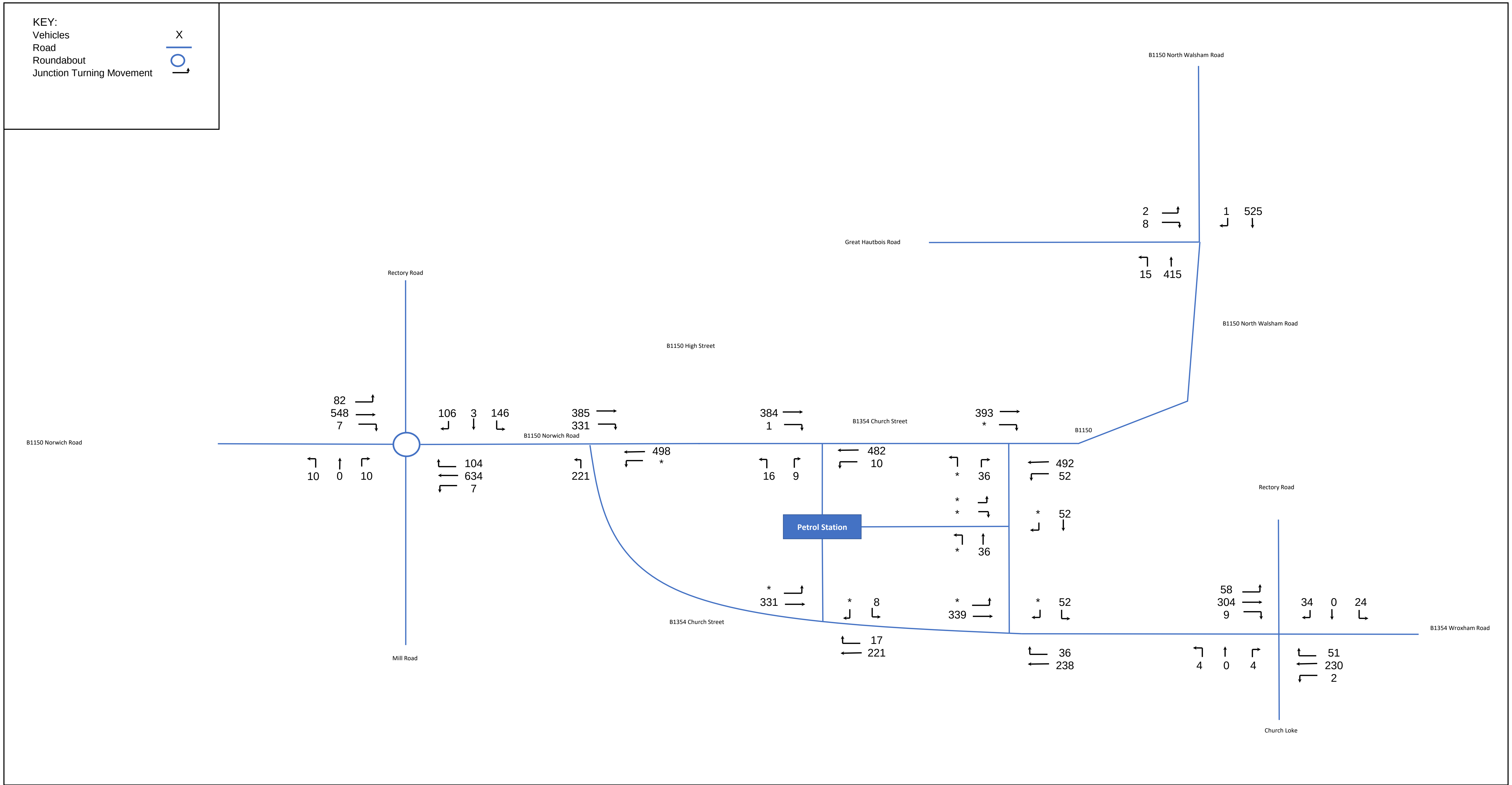
Project		Notes			
60685223 - North Walsham Western Urban Extension	AECOM				
Client	Title	Drawn	Checked	Date	Figure
ESCO Developments, Lovell Partnerships, Flagship Group	North Walsham 2036 Do Something Minus Do Minimum PM Demand Flows	BS	TJ	13/10/2023	28



Project		Notes			
60685223 - North Walsham Western Urban Extension	AECOM				
Client	Title	Drawn	Checked	Date	Figure
ESCO Developments, Lovell Partnerships, Flagship Group	North Walsham 2036 Do Something Minus Do Minimum AM Demand Flows (Mitigation Scenario)	BS	TJ	13/10/2023	29

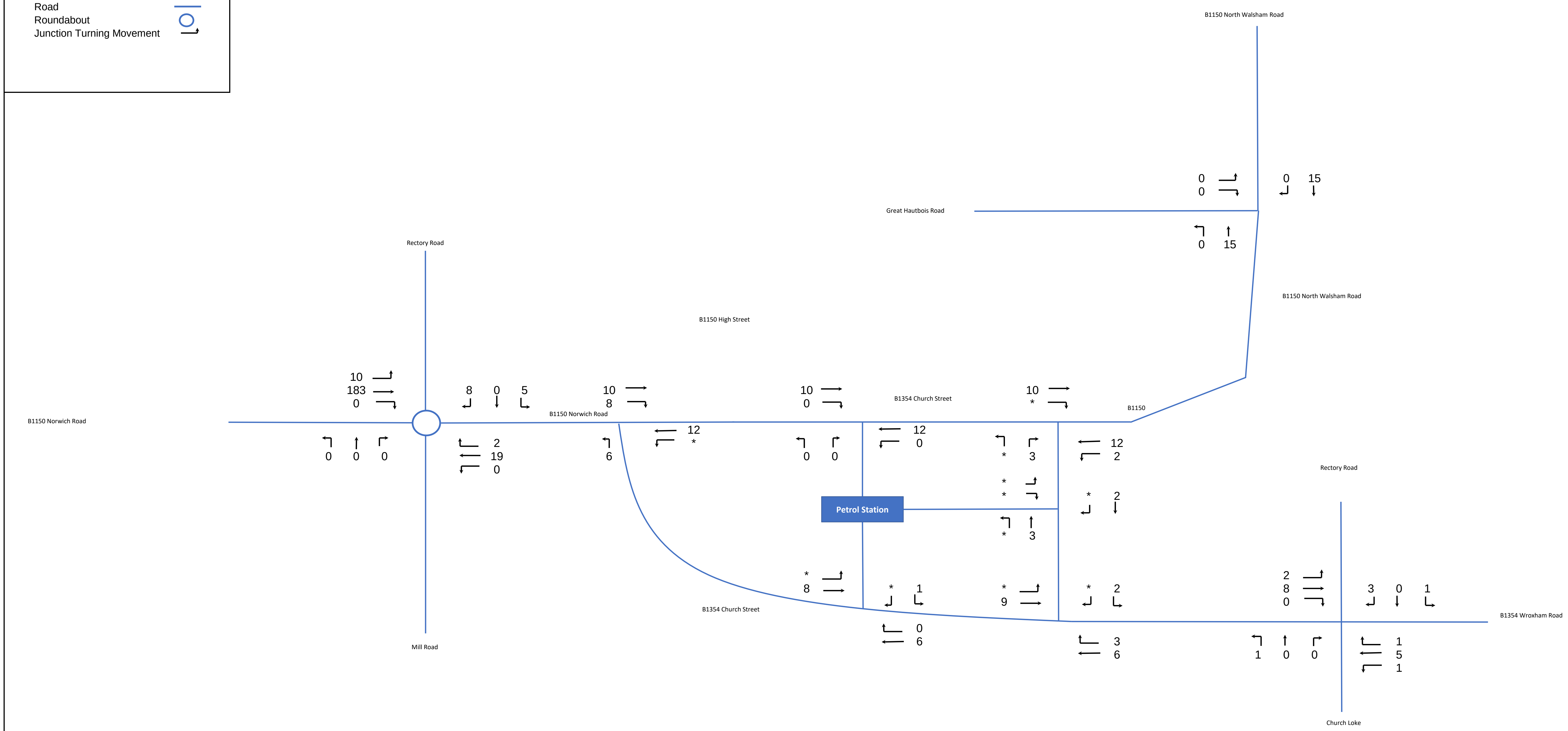


Project		Notes			
60685223 - North Walsham Western Urban Extension	AECOM				
Client	Title	Drawn	Checked	Date	Figure
ESCO Developments, Lovell Partnerships, Flagship Group	North Walsham 2036 Do Something Minus Do Minimum PM Demand Flows (Mitigation Scenario)	BS	TJ	13/10/2023	30

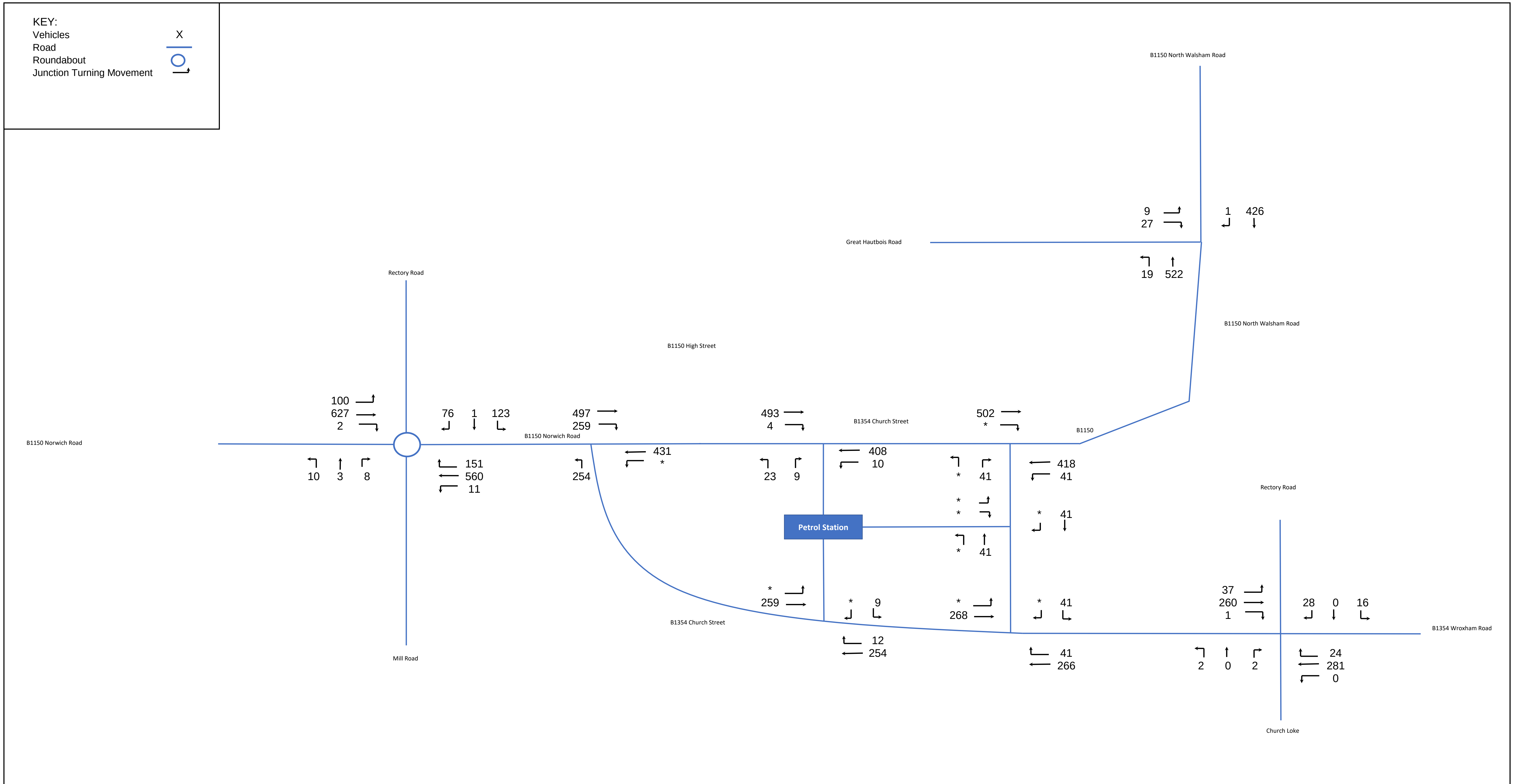


Project		Notes			
60685223 - North Walsham Western Urban Extension	AECOM	AM PEAK HOUR 07:45-08:45 PM PEAK HOUR: 16:30-17:30	All movements from the petrol station have been captured but it is unknown where the exit and entry points from the different arms are		
Client	**Title**	**Drawn**	**Checked**	**Date**	**Figure**
ESCO Developments, Lovell Partnerships, Flagship Group	Coltishall 2022 Base AM	BS	TJ	13/10/2023	31

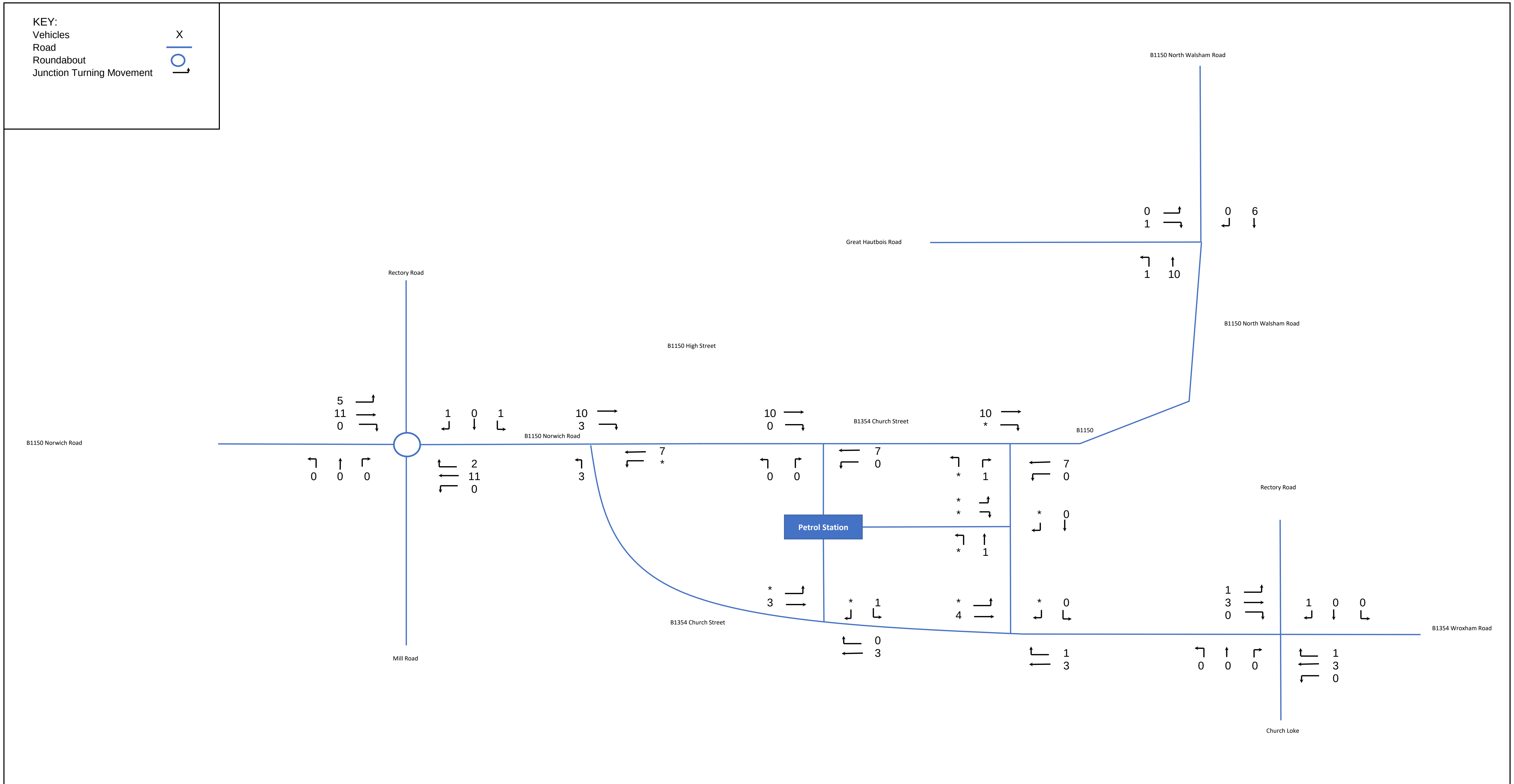
KEY:
Vehicles X
Road
Roundabout
Junction Turning Movement



Project		Notes			
60685223 - North Walsham Western Urban Extension	AECOM	AM PEAK HOUR 07:45-08:45 PM PEAK HOUR: 16:30-17:30	All movements from the petrol station have been captured but it is unknown where the exit and entry points from the different arms are		
Client	**Title**	**Drawn**	**Checked**	**Date**	**Figure**
ESCO Developments, Lovell Partnerships, Flagship Group	Coltishall 2022 Base AM HGV	BS	TJ	13/10/2023	32

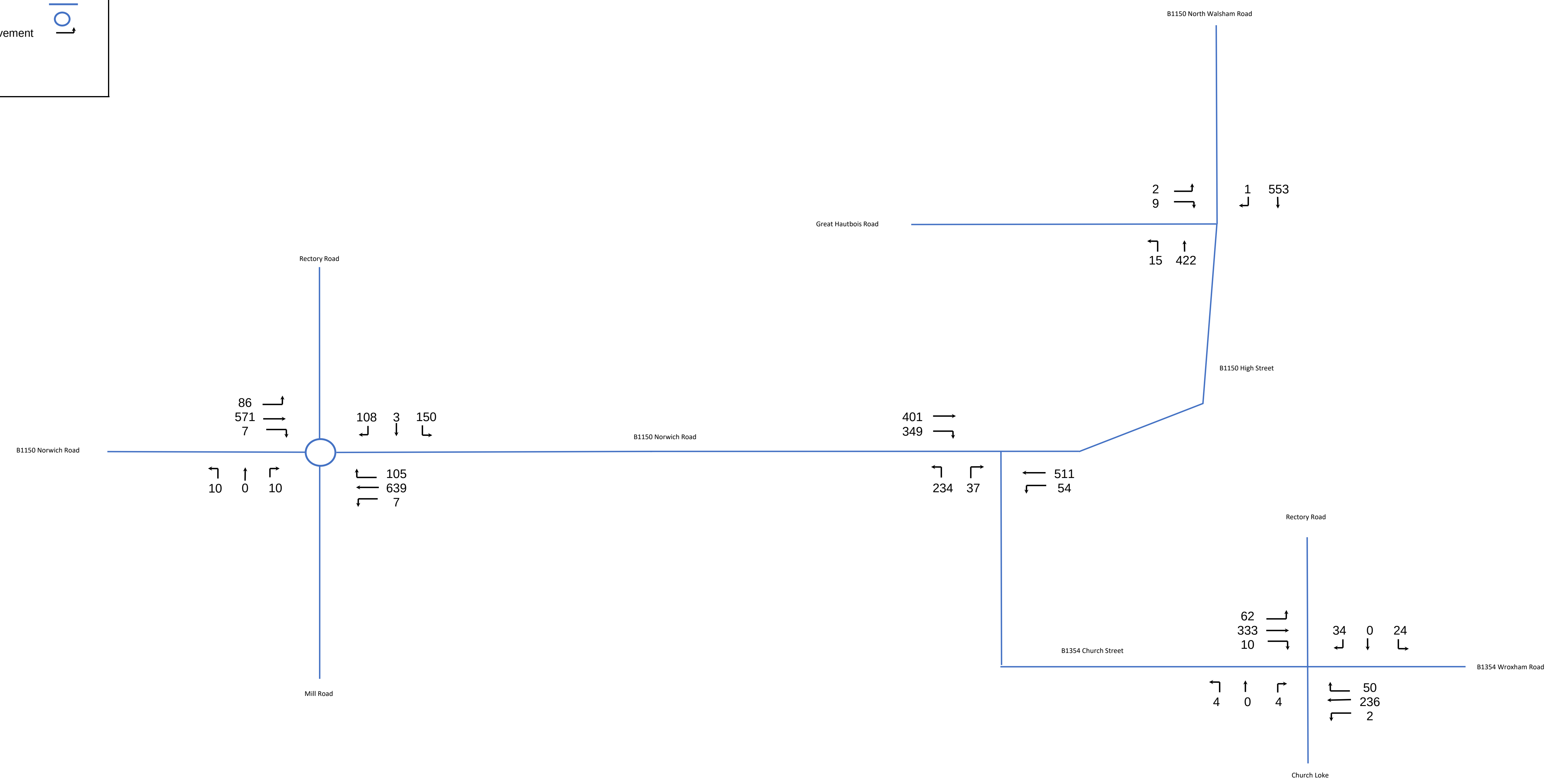


Project		Notes			
60685223 - North Walsham Western Urban Extension	AECOM	AM PEAK HOUR 07:45-08:45 PM PEAK HOUR: 16:30-17:30	All movements from the petrol station have been captured but it is unknown where the exit and entry points from the different arms are		
Client	**Title**	**Drawn**	**Checked**	**Date**	**Figure**
ESCO Developments, Lovell Partnerships, Flagship Group	Coltishall 2022 Base PM	BS	TJ	13/10/2023	33

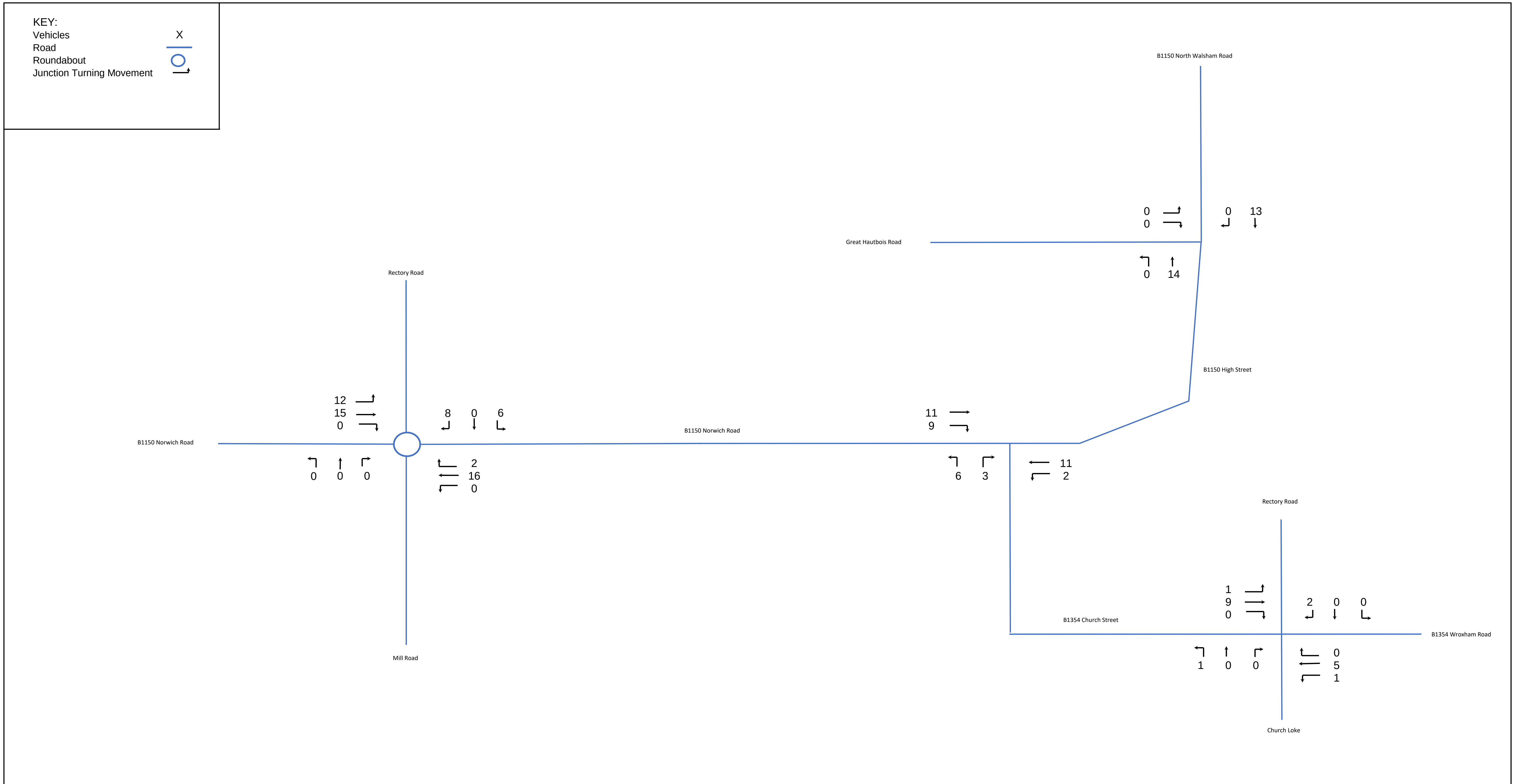


Project		Notes			
60685223 - North Walsham Western Urban Extension	AECOM	AM PEAK HOUR 07:45-08:45 PM PEAK HOUR: 16:30-17:30	All movements from the petrol station have been captured but it is unknown where the exit and entry points from the different arms are		
Client	Title	Drawn	Checked	Date	Figure
ESCO Developments, Lovell Partnerships, Flagship Group	Coltishall 2022 Base PM HGV	BS	TJ	13/10/2023	34

KEY:
Vehicles X
Road
Roundabout
Junction Turning Movement



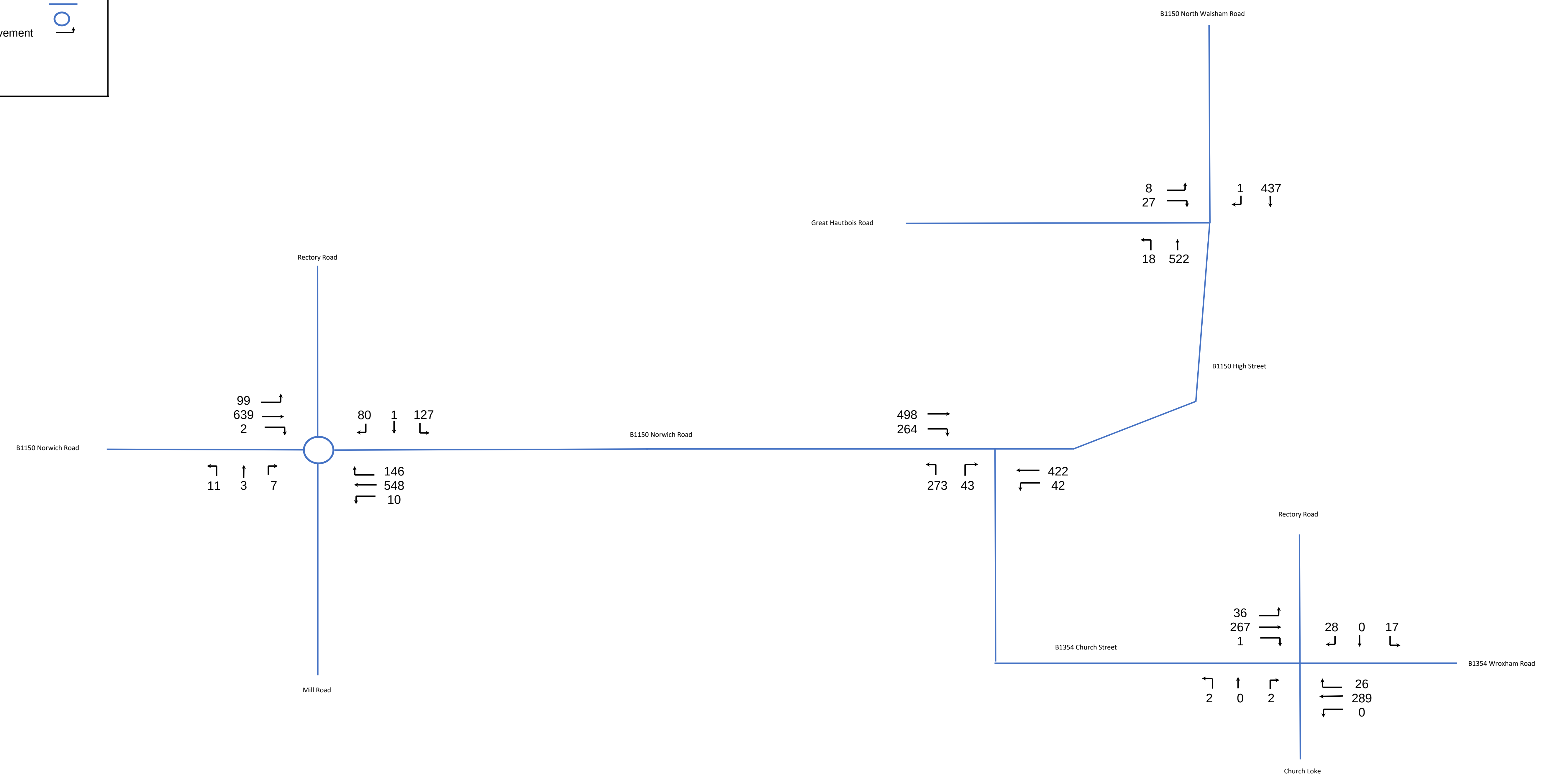
Project		Notes			
60685223 - North Walsham Western Urban Extension	AECOM				
Client	Title	Drawn	Checked	Date	Figure
ESCO Developments, Lovell Partnerships, Flagship Group	Coltishall 2029 Do Minimum AM	WG	TJ	13/10/2023	35



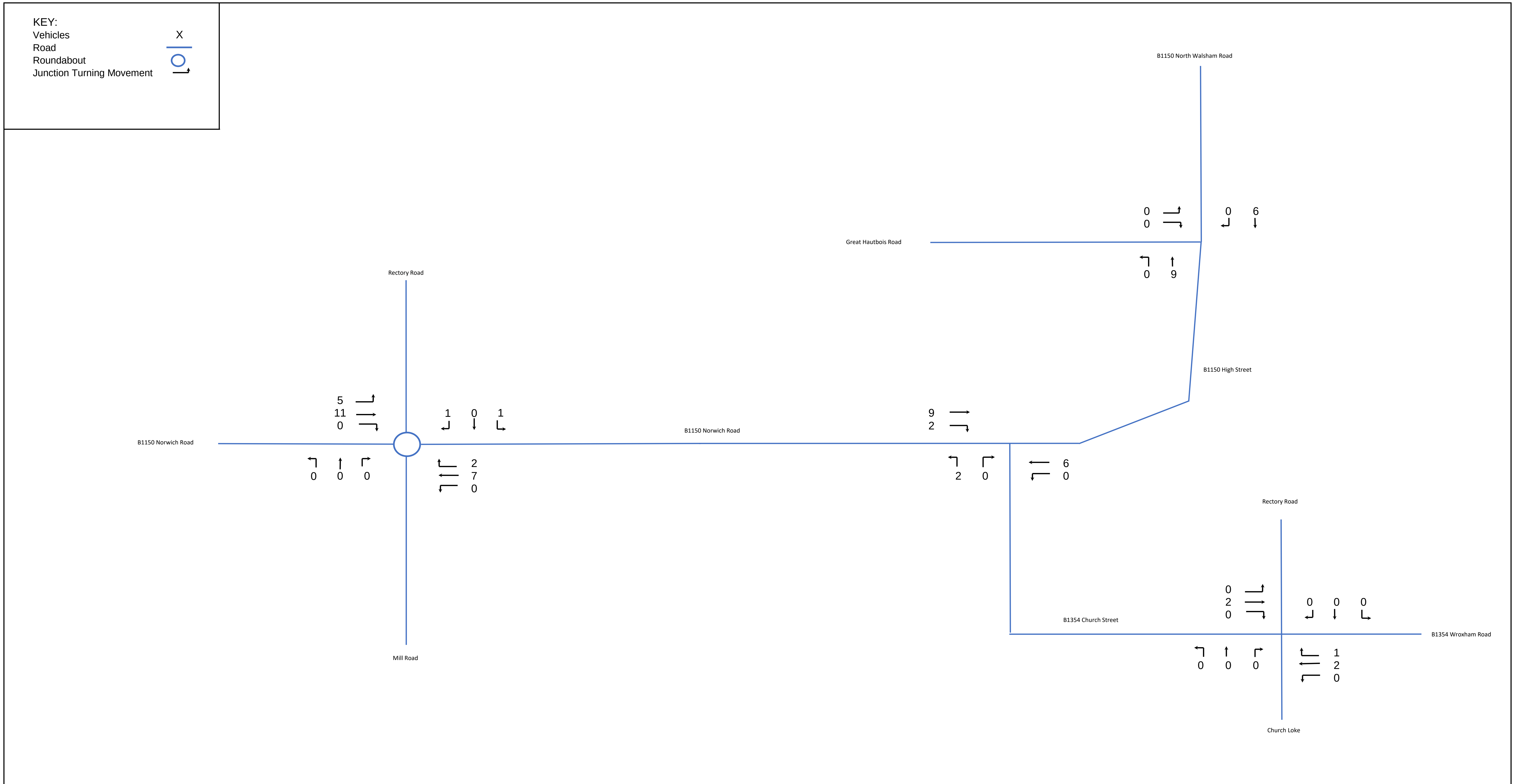
Project		Notes			
60685223 - North Walsham Western Urban Extension	AECOM				
Client	Title	Drawn	Checked	Date	Figure
ESCO Developments, Lovell Partnerships, Flagship Group	Coltishall 2029 Do Minimum AM (HGV Only)	WG	TJ	13/10/2023	36

KEY:

Vehicles	X
Road	
Roundabout	
Junction Turning Movement	

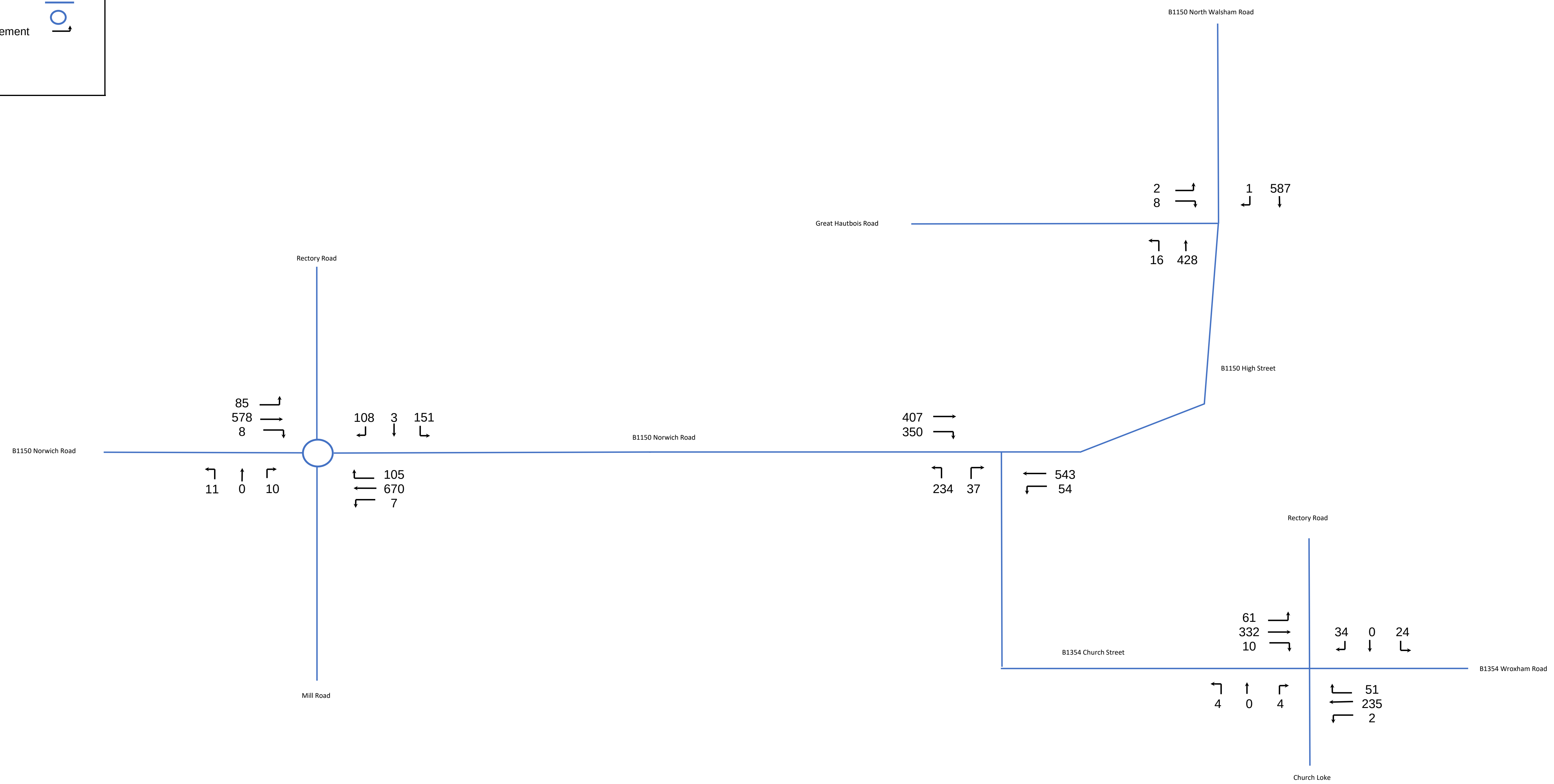


Project		Notes			
60685223 - North Walsham Western Urban Extension	AECOM				
Client	**Title**	**Drawn**	**Checked**	**Date**	**Figure**
ESCO Developments, Lovell Partnerships, Flagship Group	Coltishall 2029 Do Minimum PM	WG	TJ	13/10/2023	37

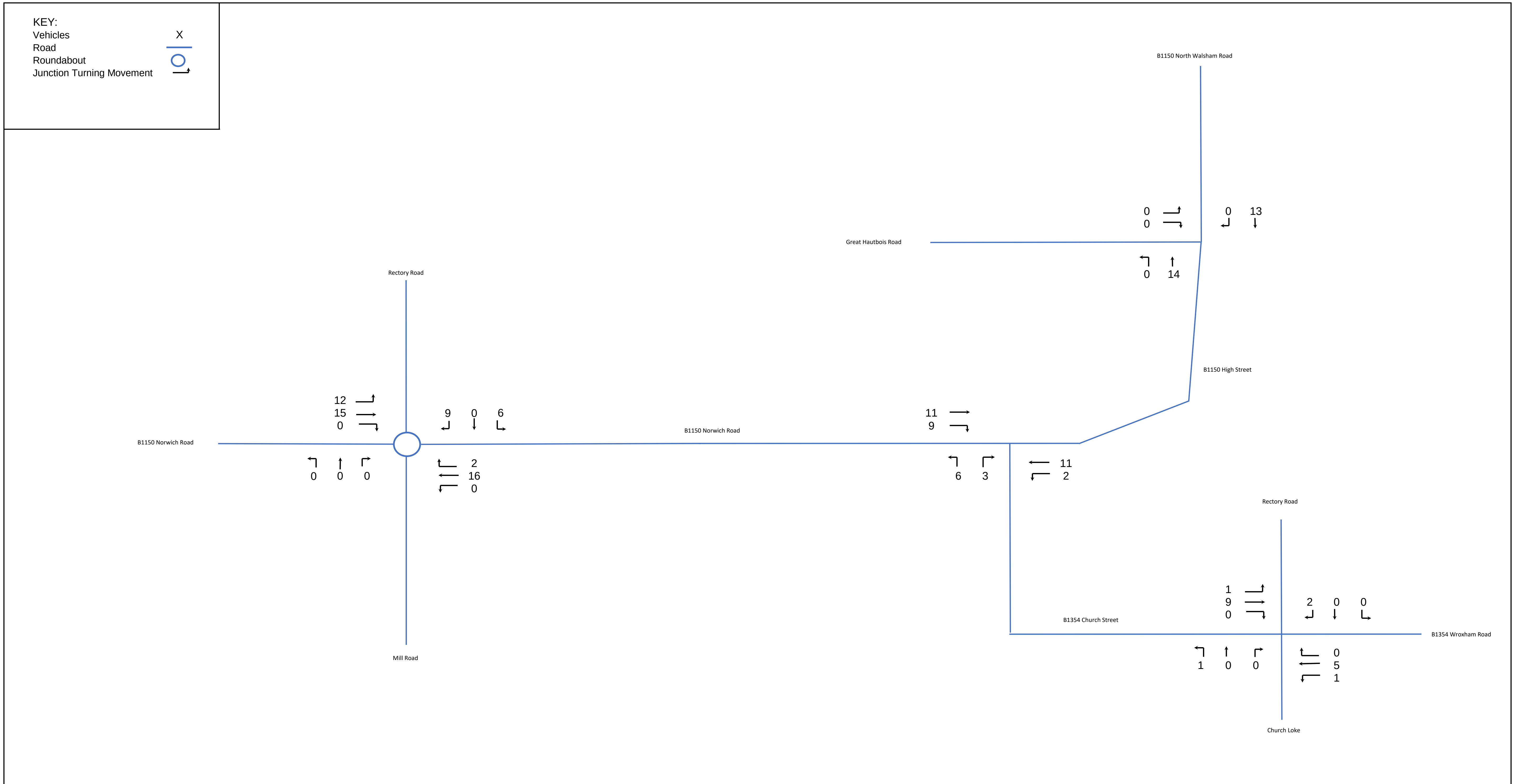


Project		Notes			
60685223 - North Walsham Western Urban Extension	AECOM				
Client	Title	Drawn	Checked	Date	Figure
ESCO Developments, Lovell Partnerships, Flagship Group	Coltishall 2029 Do Minimum PM (HGV Only)	WG	TJ	13/10/2023	38

KEY:
Vehicles X
Road
Roundabout
Junction Turning Movement

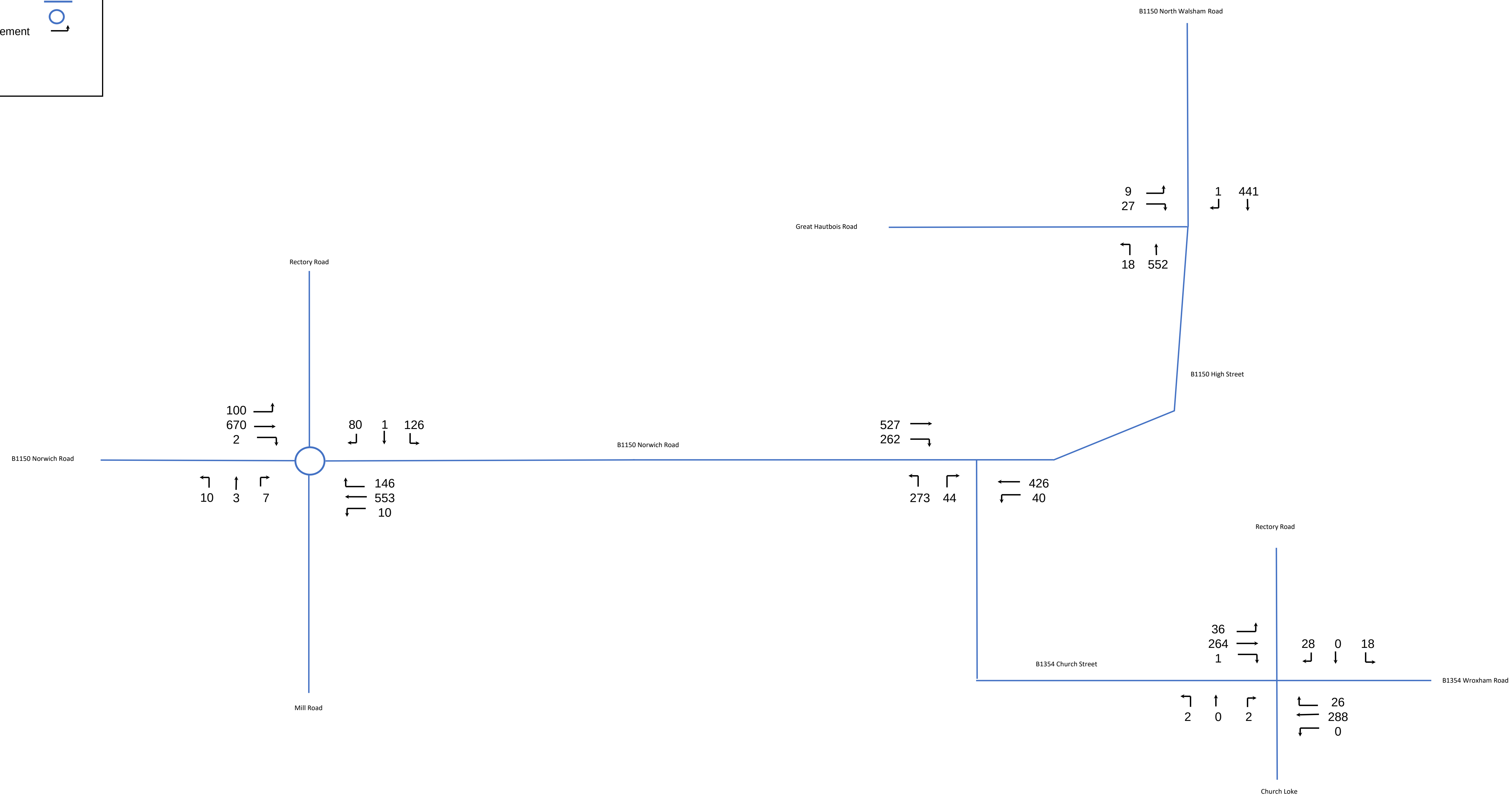


Project		Notes			
60685223 - North Walsham Western Urban Extension	AECOM				
Client	Title	Drawn	Checked	Date	Figure
ESCO Developments, Lovell Partnerships, Flagship Group	Coltishall 2029 Do Something AM	WG	TJ	13/10/2023	39

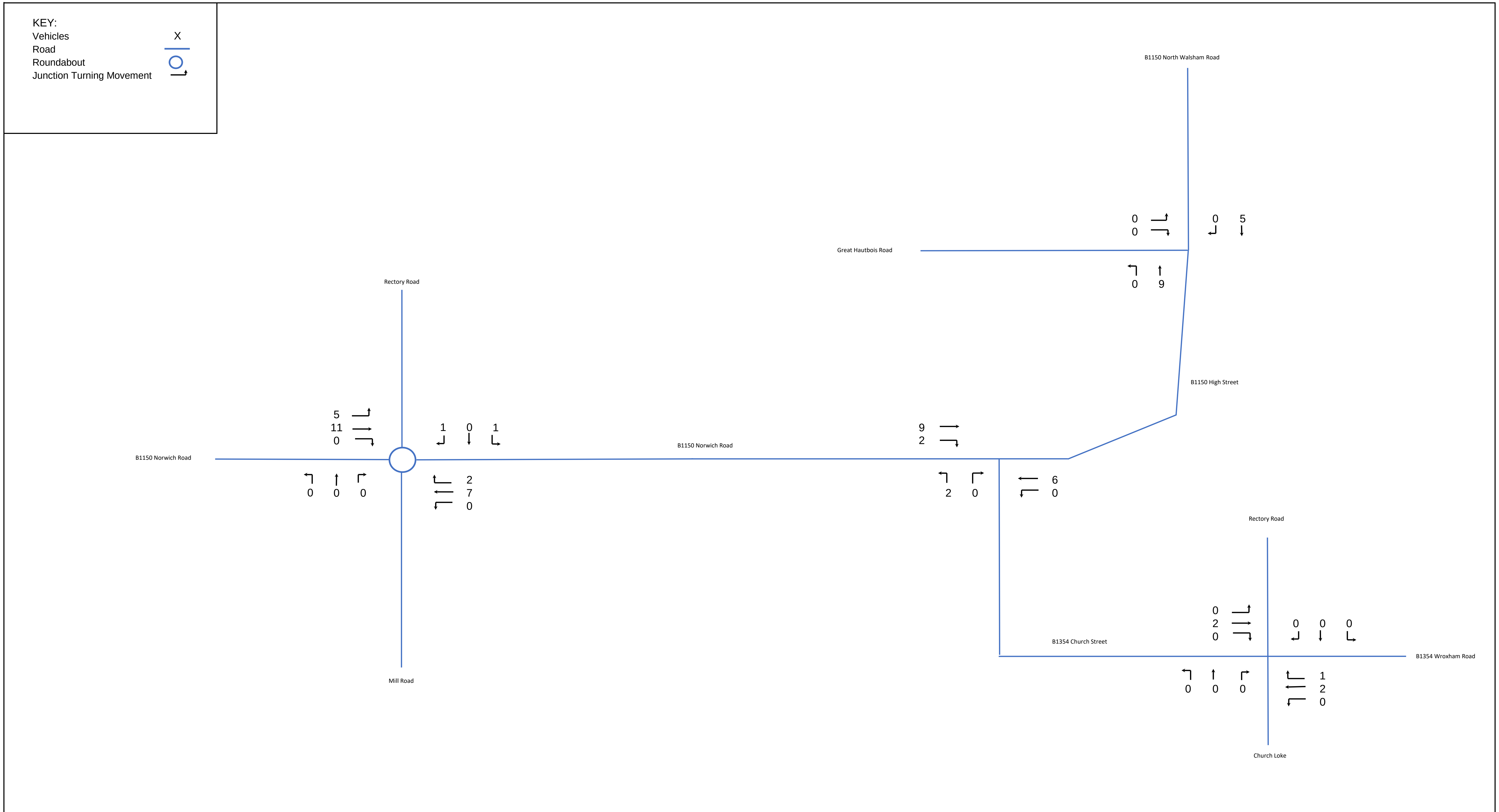


Project					
60685223 - North Walsham Western Urban Extension	AECOM	Notes			
Client	Title	Drawn	Checked	Date	Figure
ESCO Developments, Lovell Partnerships, Flagship Group	Coltishall 2029 Do Something AM (HGV Only)	WG	TJ	13/10/2023	40

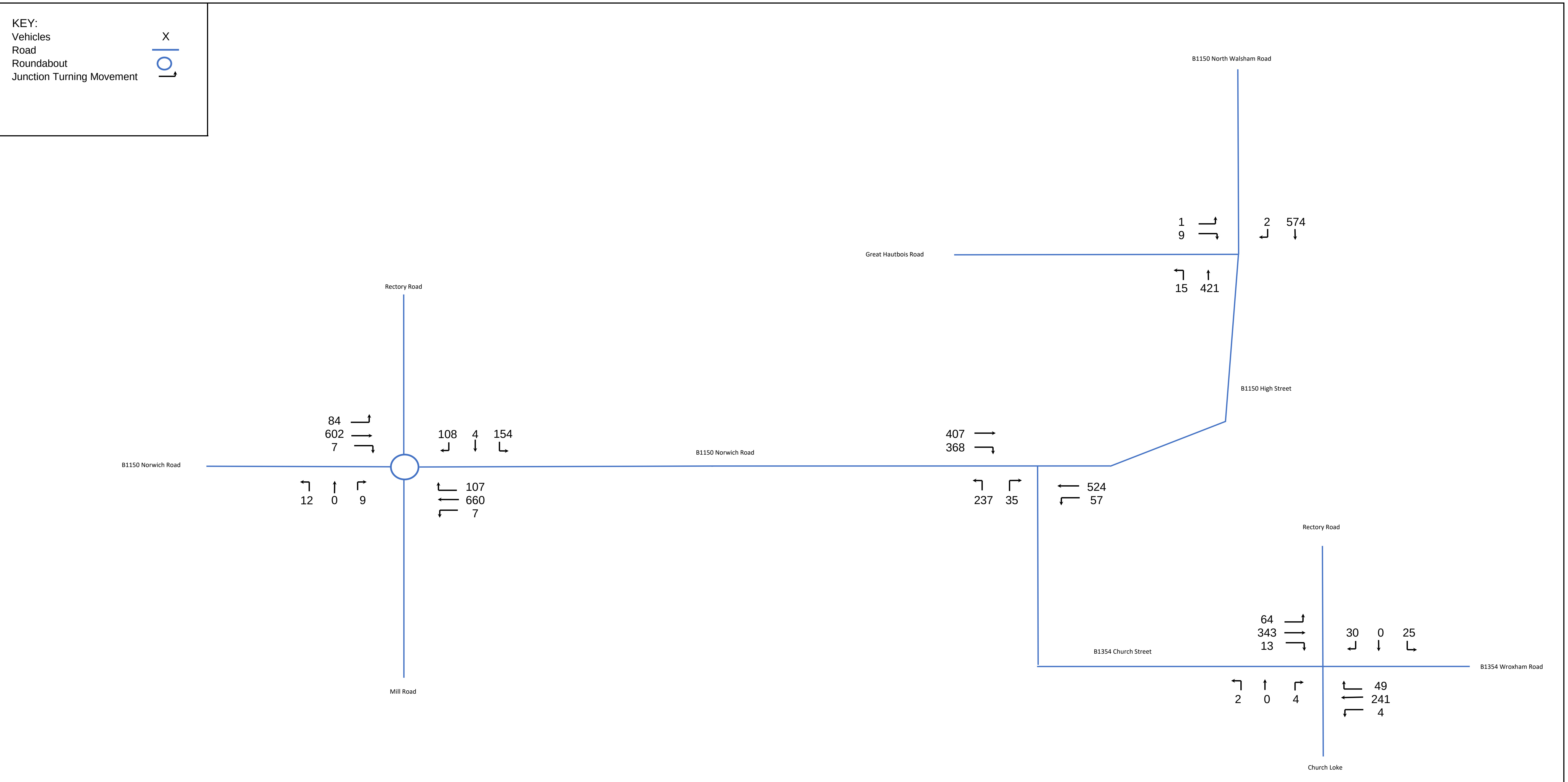
KEY:
Vehicles X
Road
Roundabout
Junction Turning Movement



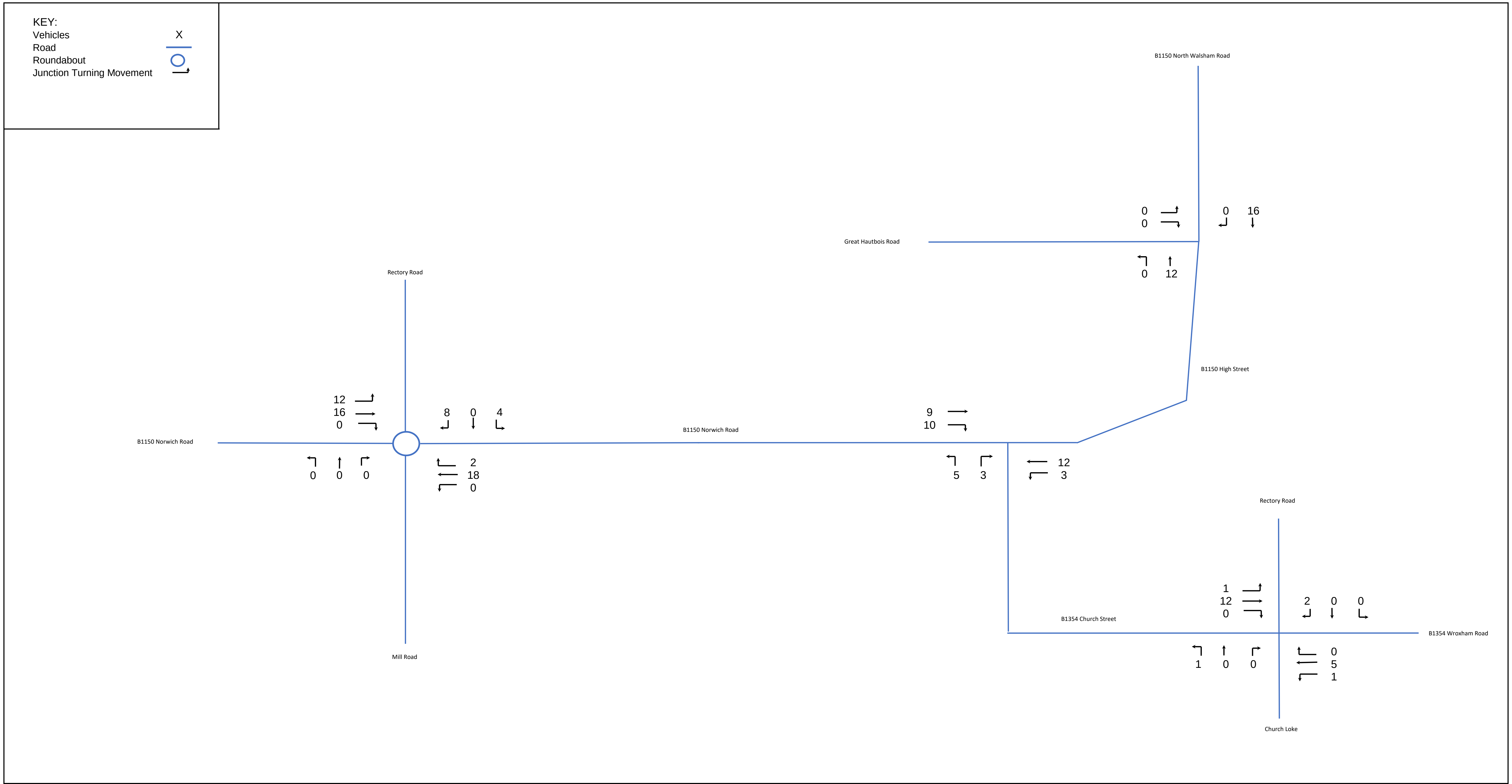
Project		Notes			
60685223 - North Walsham Western Urban Extension	AECOM				
Client	Title	Drawn	Checked	Date	Figure
ESCO Developments, Lovell Partnerships, Flagship Group	Coltishall 2029 Do Something PM	WG	TJ	13/10/2023	41



Project		Notes			
60685223 - North Walsham Western Urban Extension	AECOM				
Client	Title	Drawn	Checked	Date	Figure
ESCO Developments, Lovell Partnerships, Flagship Group	Coltishall 2029 Do Something PM (HGV Only)	WG	TJ	13/10/2023	42



Project		Notes			
60685223 - North Walsham Western Urban Extension	AECOM				
Client	Title	Drawn	Checked	Date	Figure
ESCO Developments, Lovell Partnerships, Flagship Group	Coltishall 2036 Do Minimum AM Demand Flows	WG	TJ	13/10/2023	43



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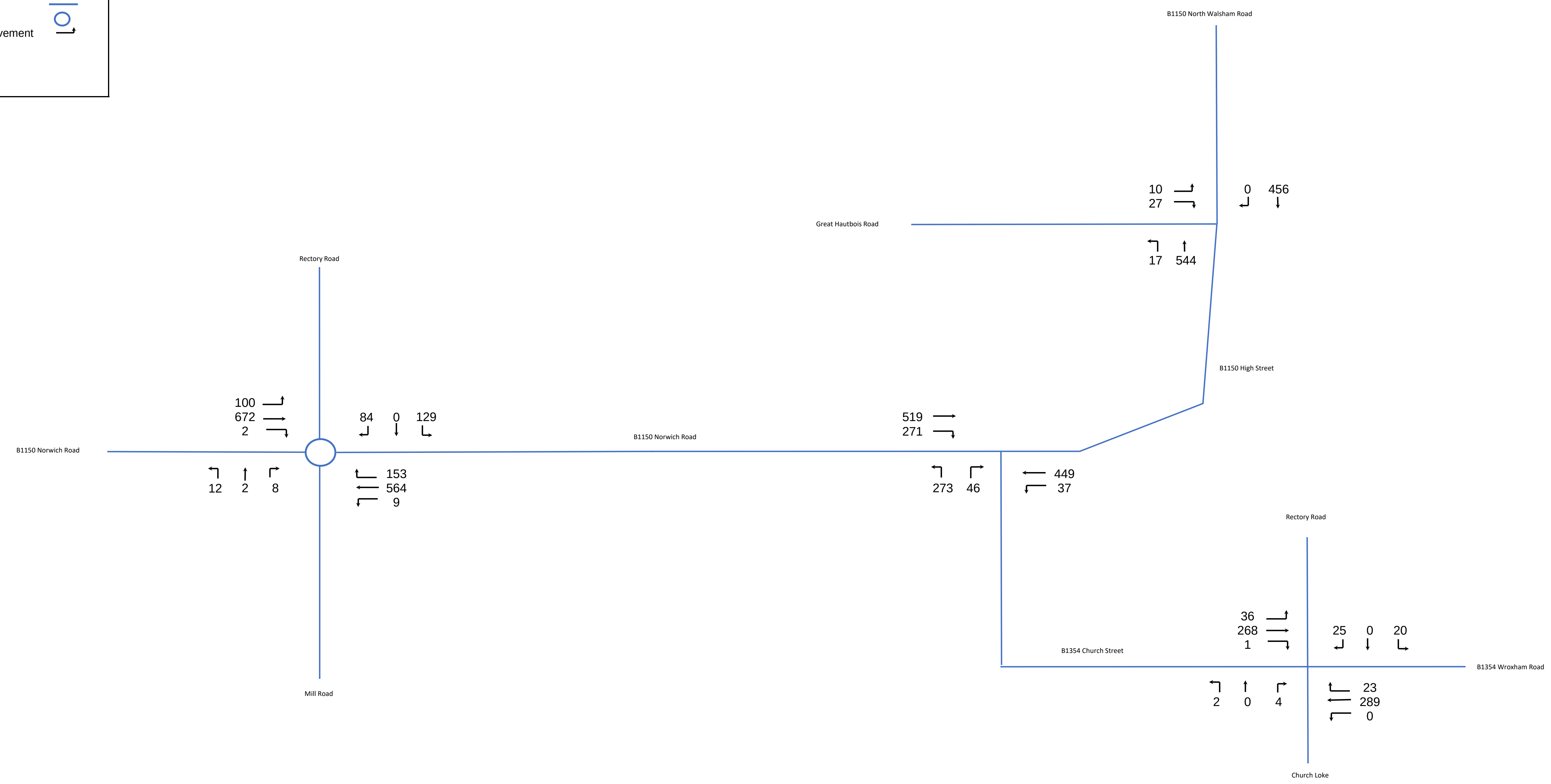
KEY:
Vehicles X
Road
Roundabout
Junction Turning Movement



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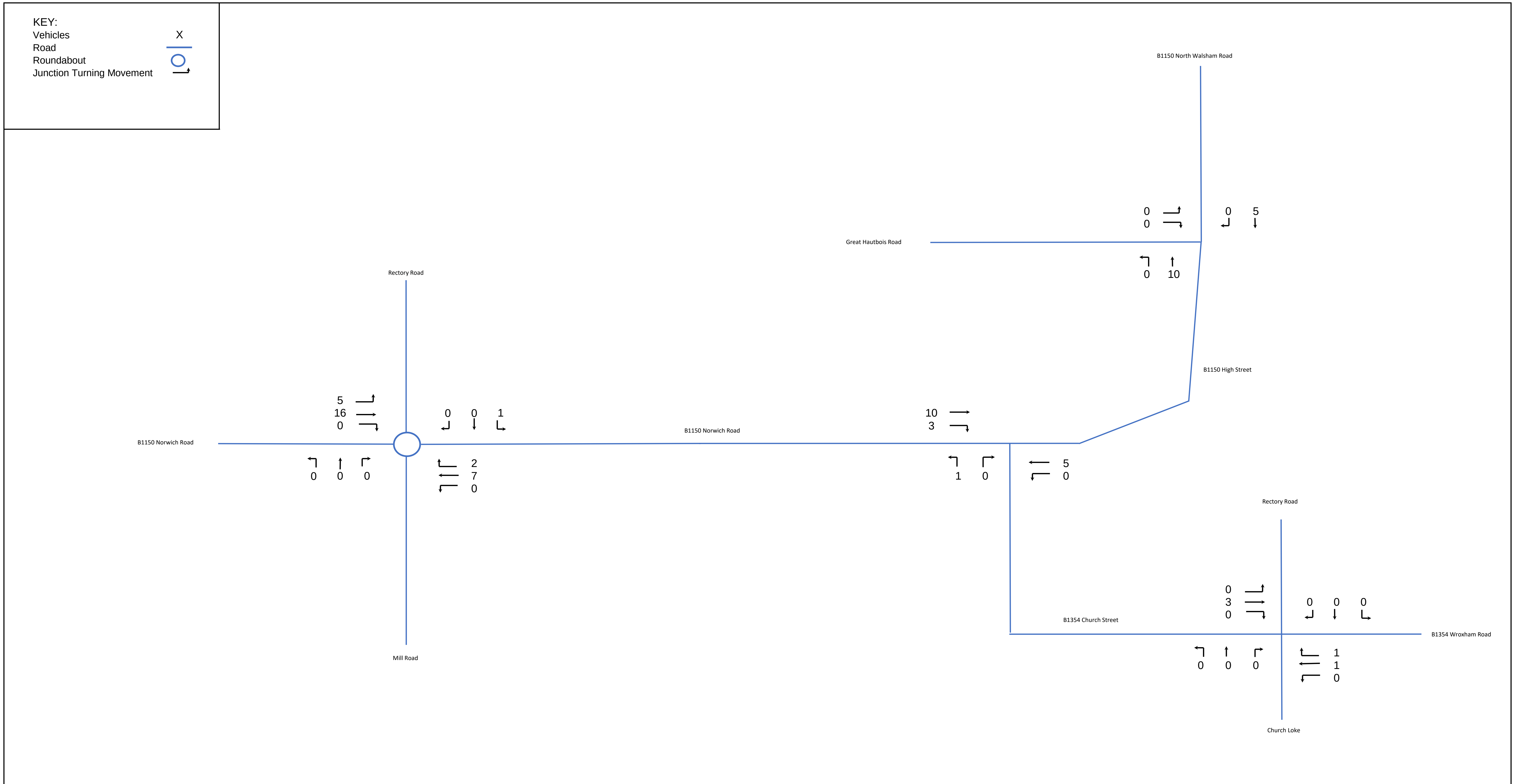

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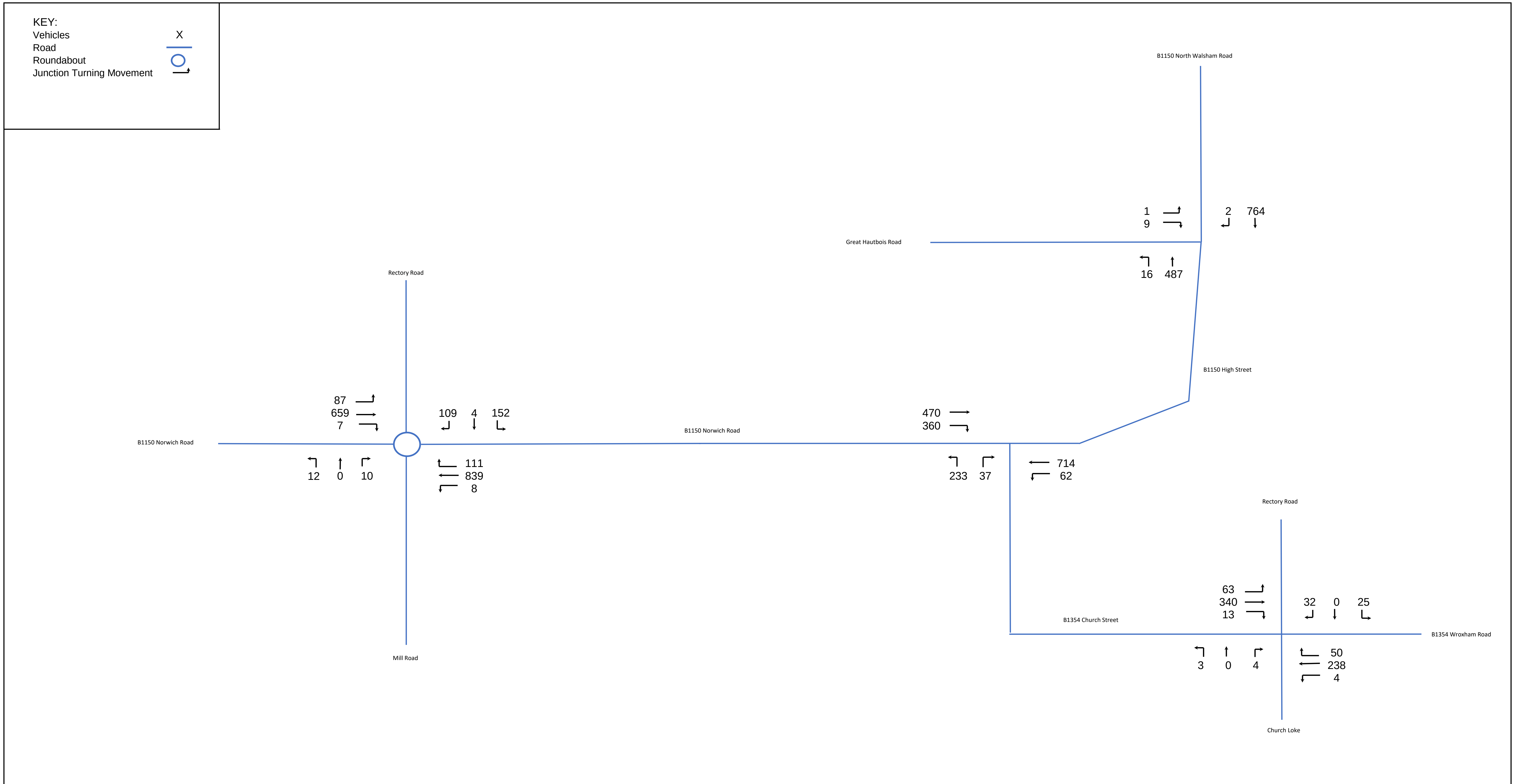

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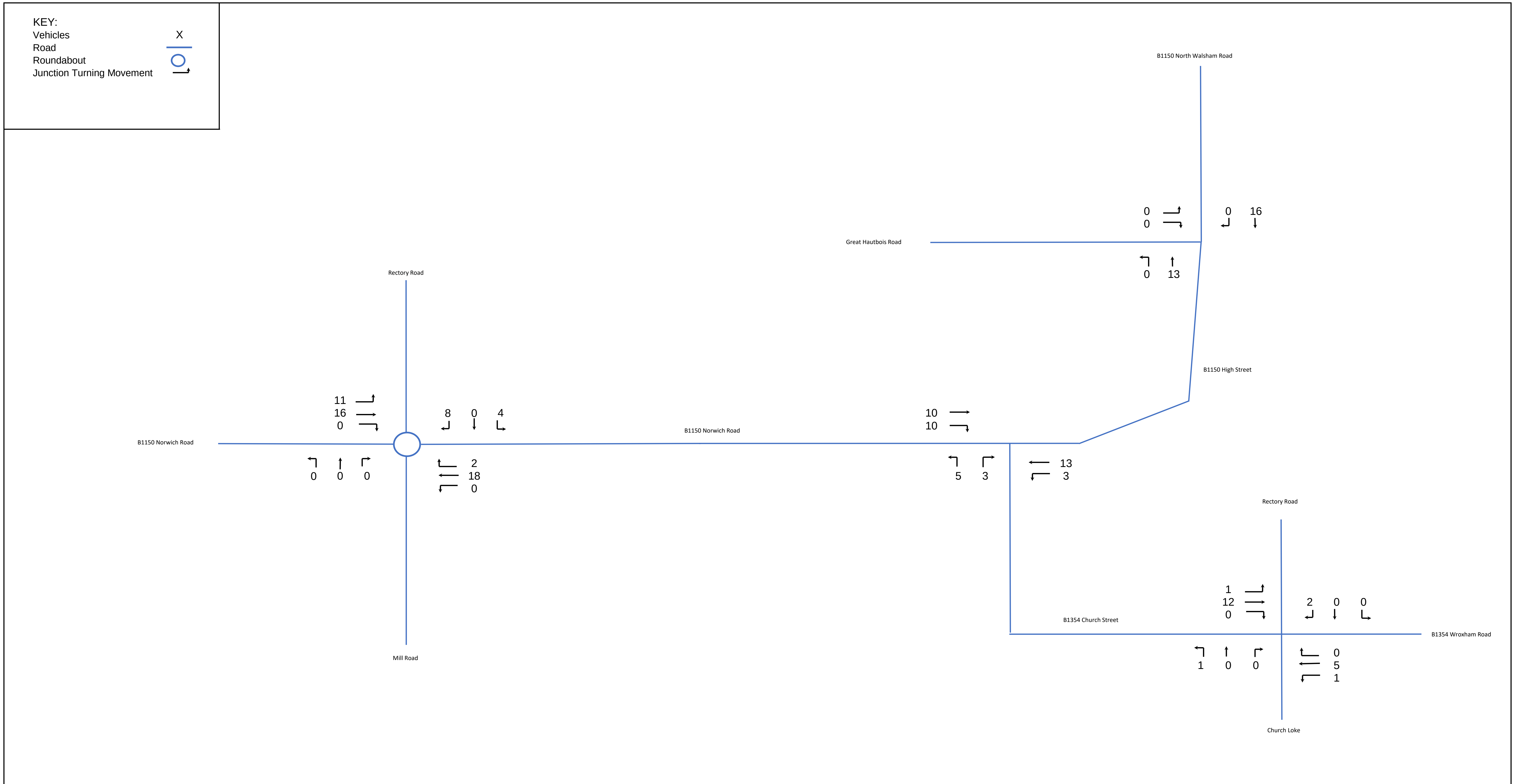

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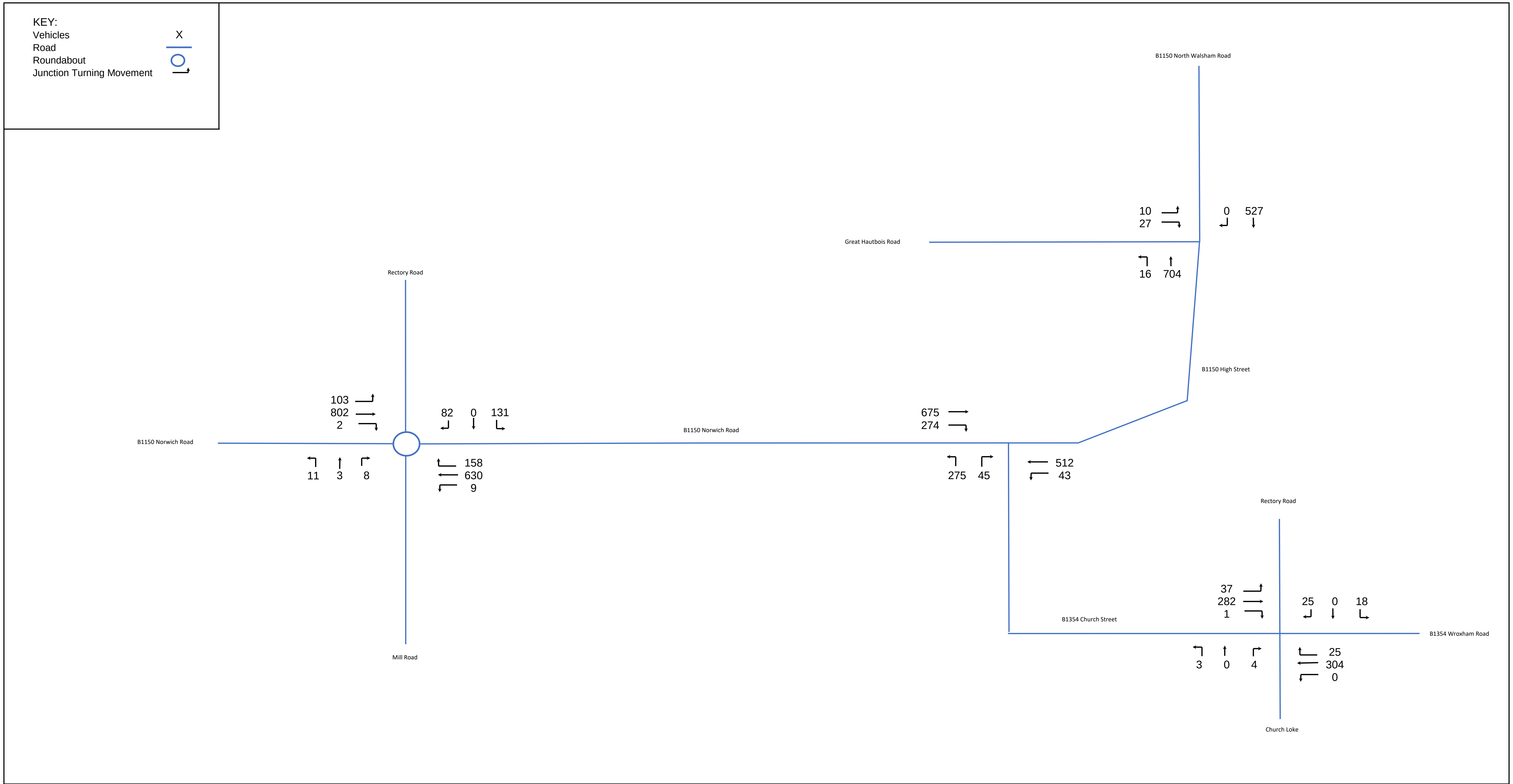

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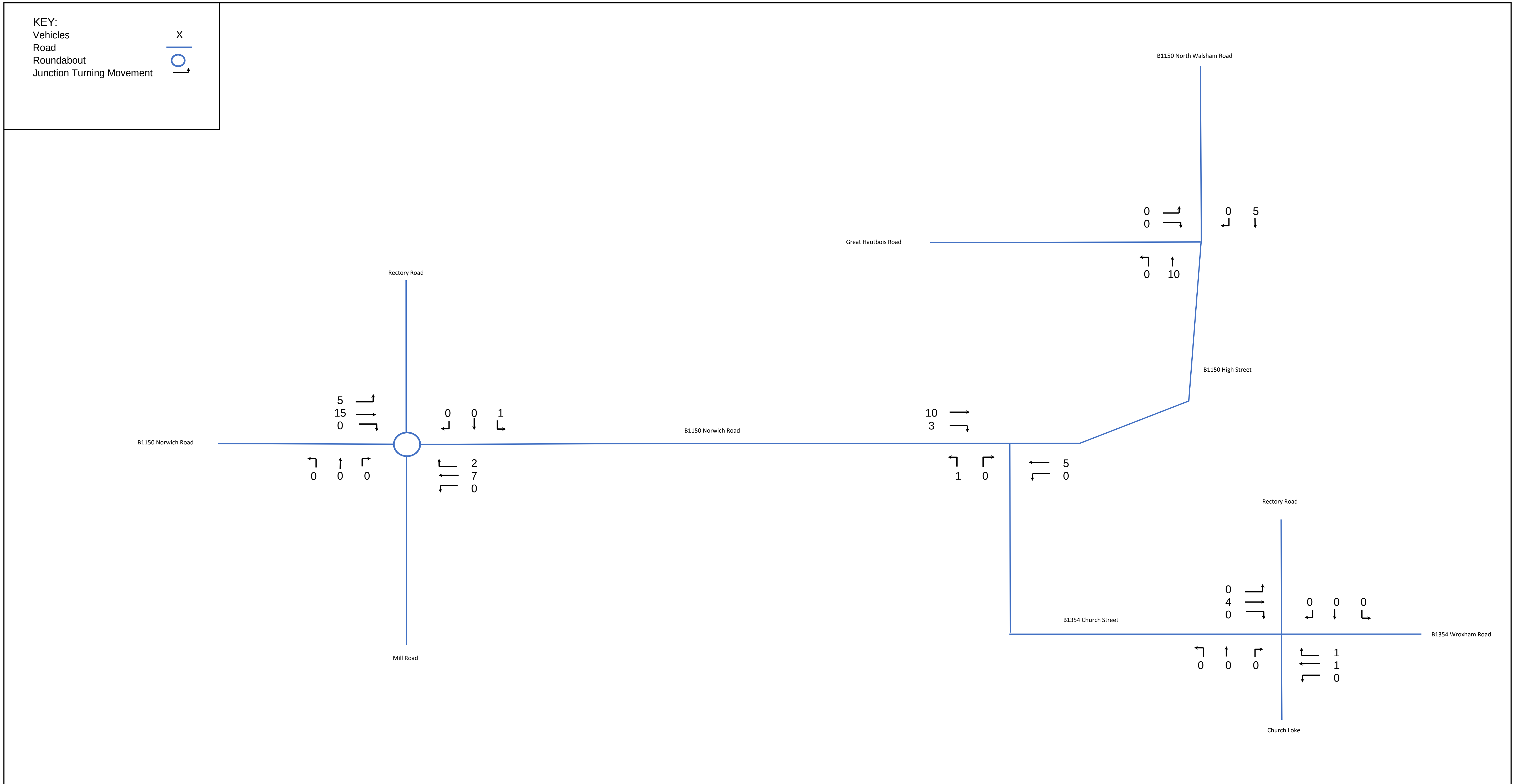

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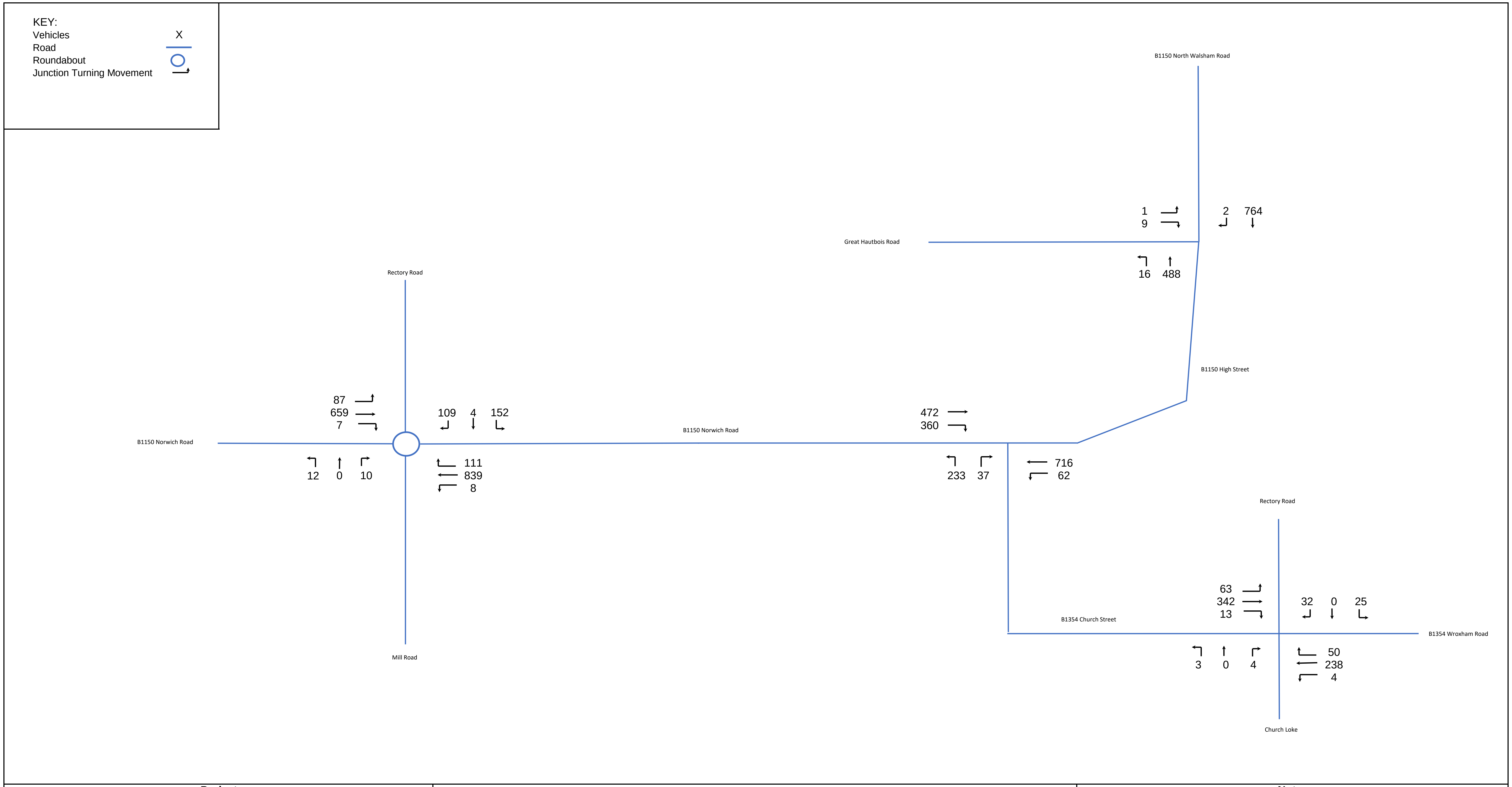

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Client	Title	Drawn	Checked	Date	Figure
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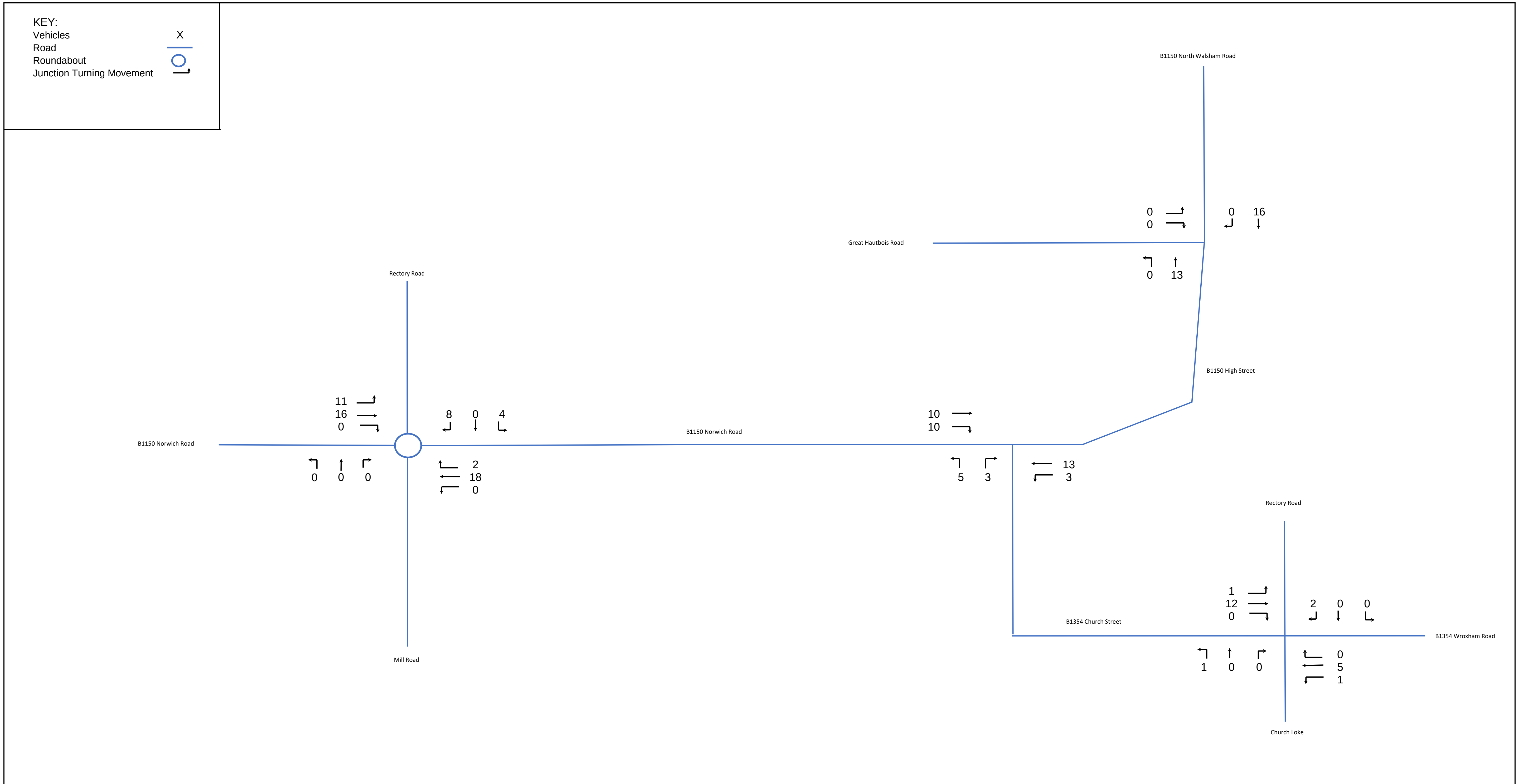

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60685223 - North Walsham Western Urban Extension	

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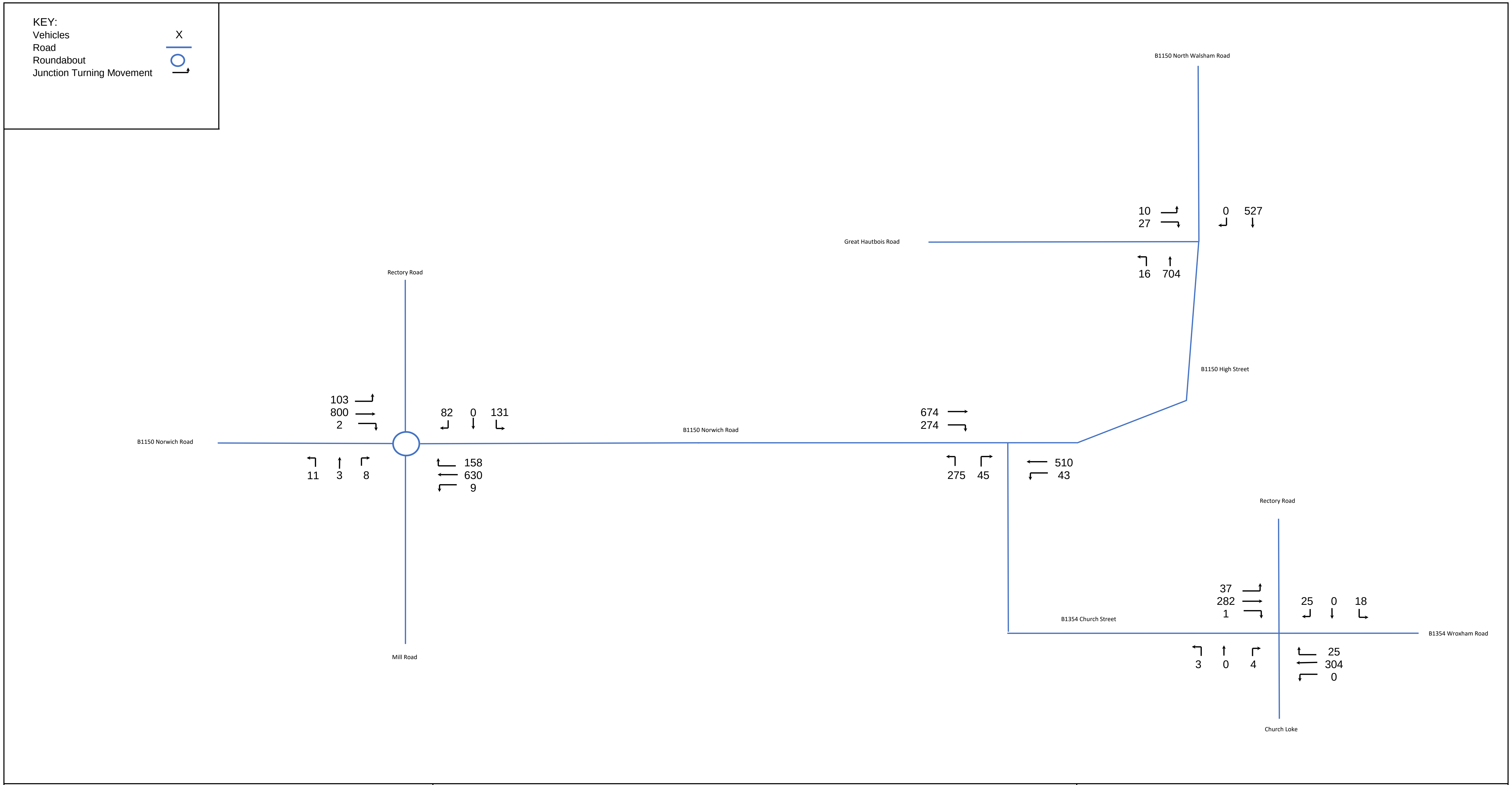

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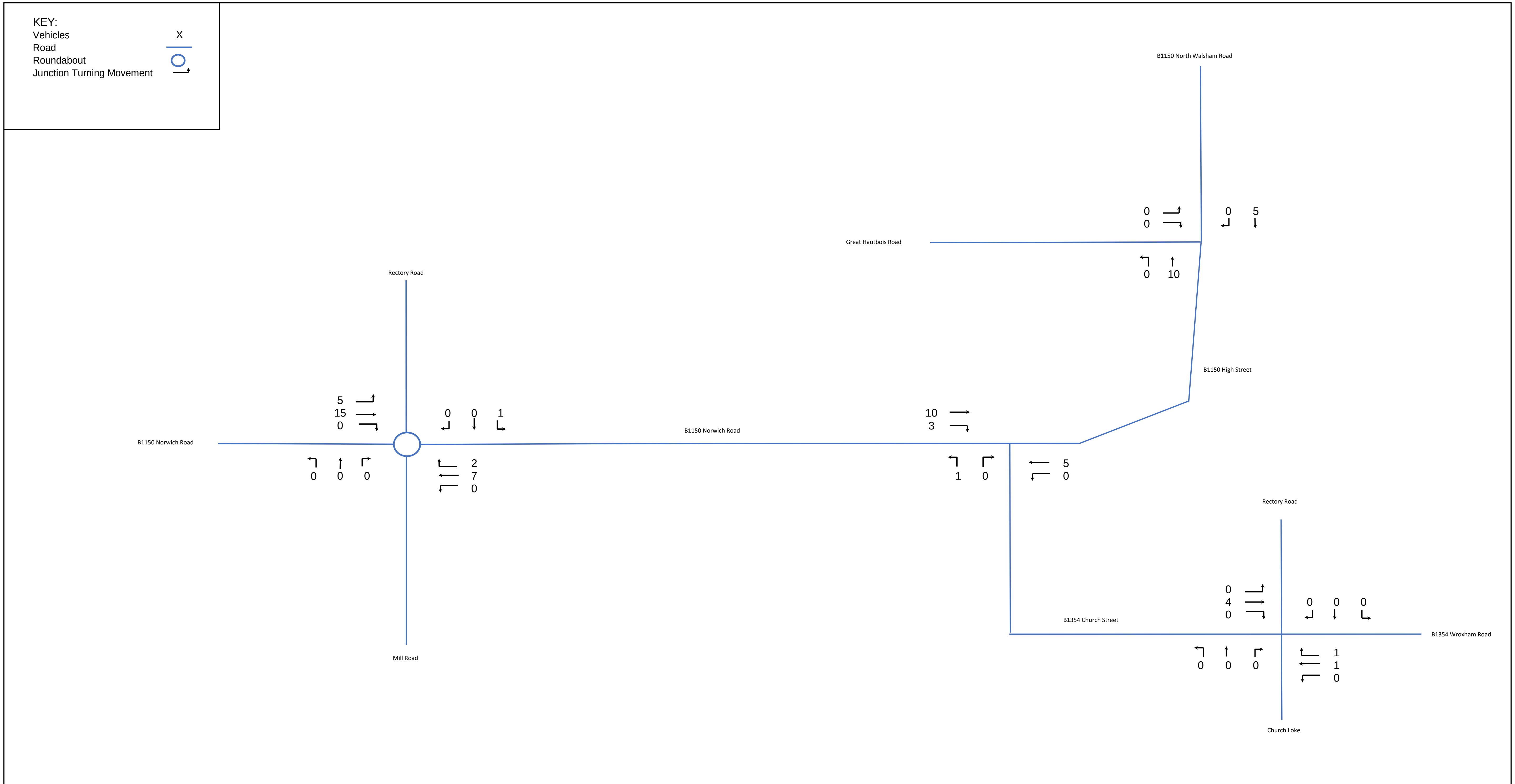

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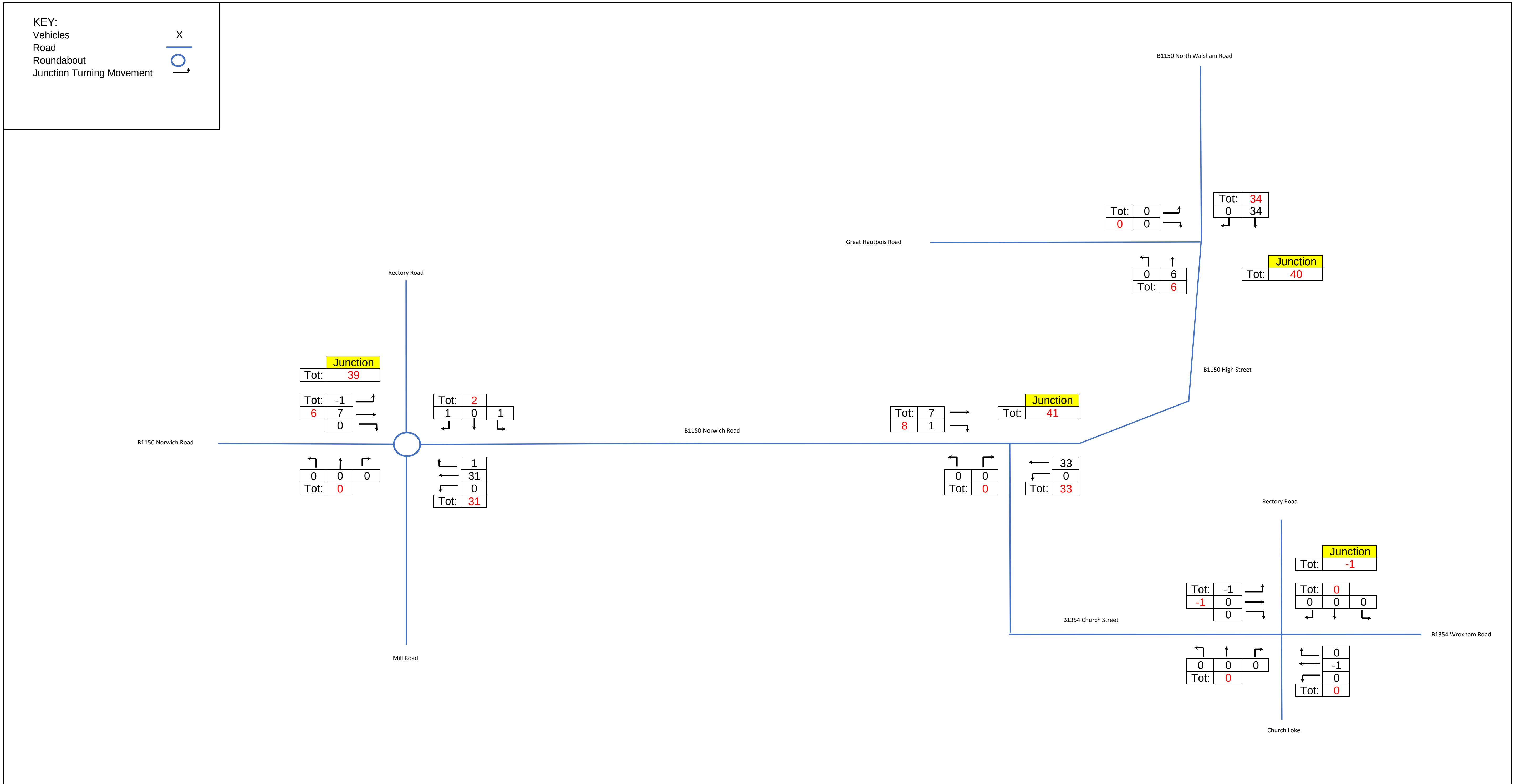

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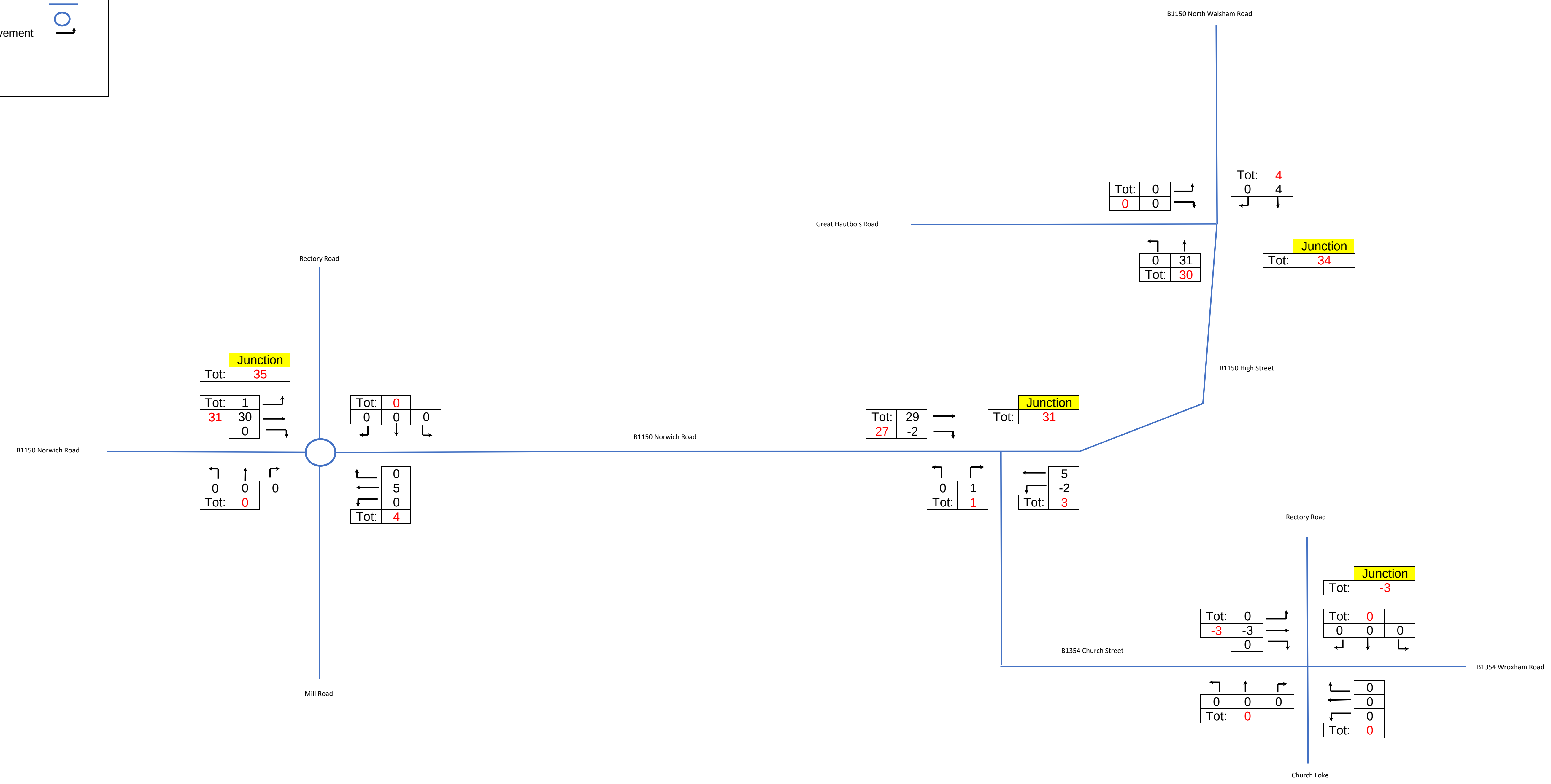
KEY:
Vehicles X
Road
Roundabout
Junction Turning Movement



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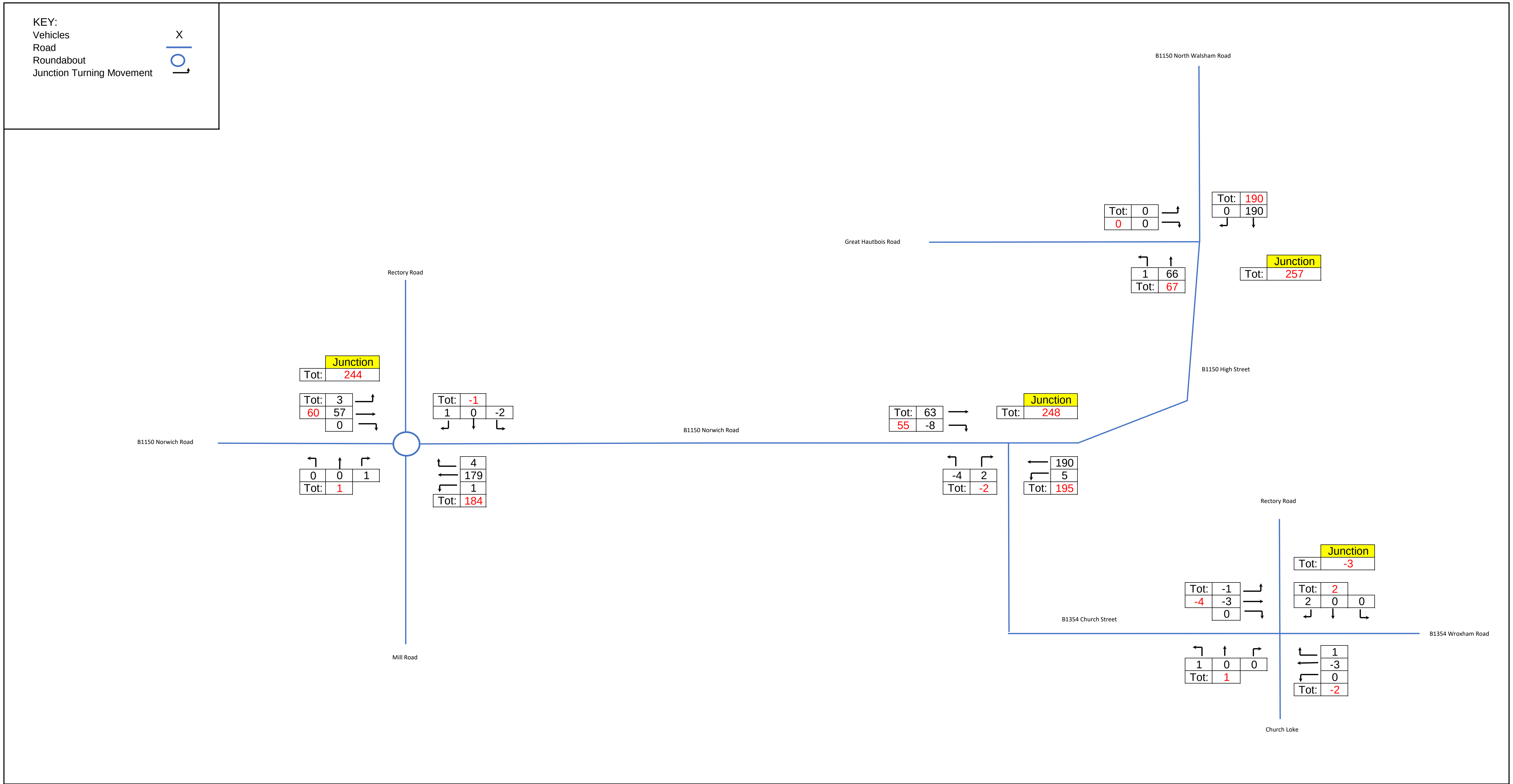

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KEY:
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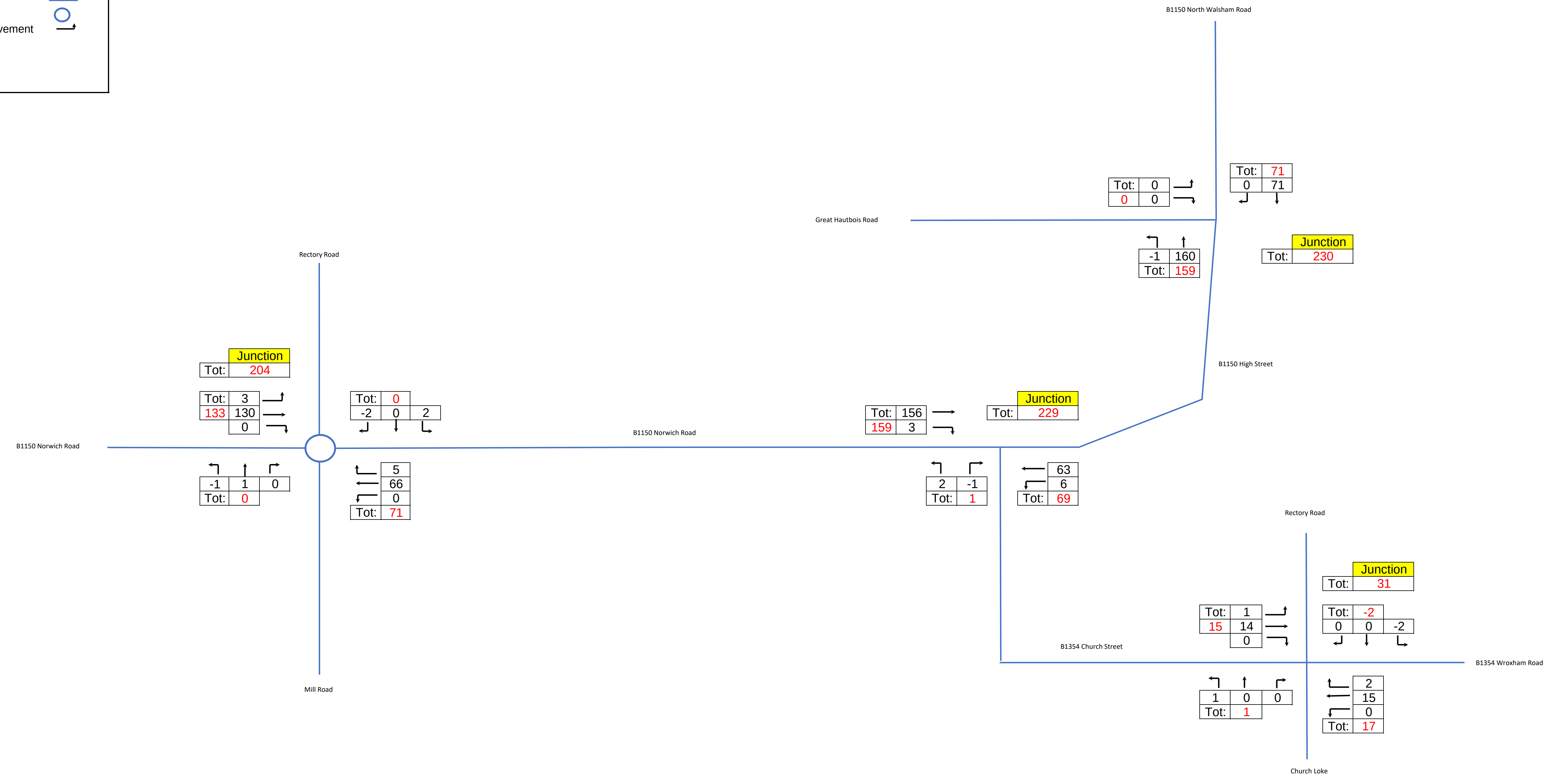
Road
Roundabout
Junction Turning Movement



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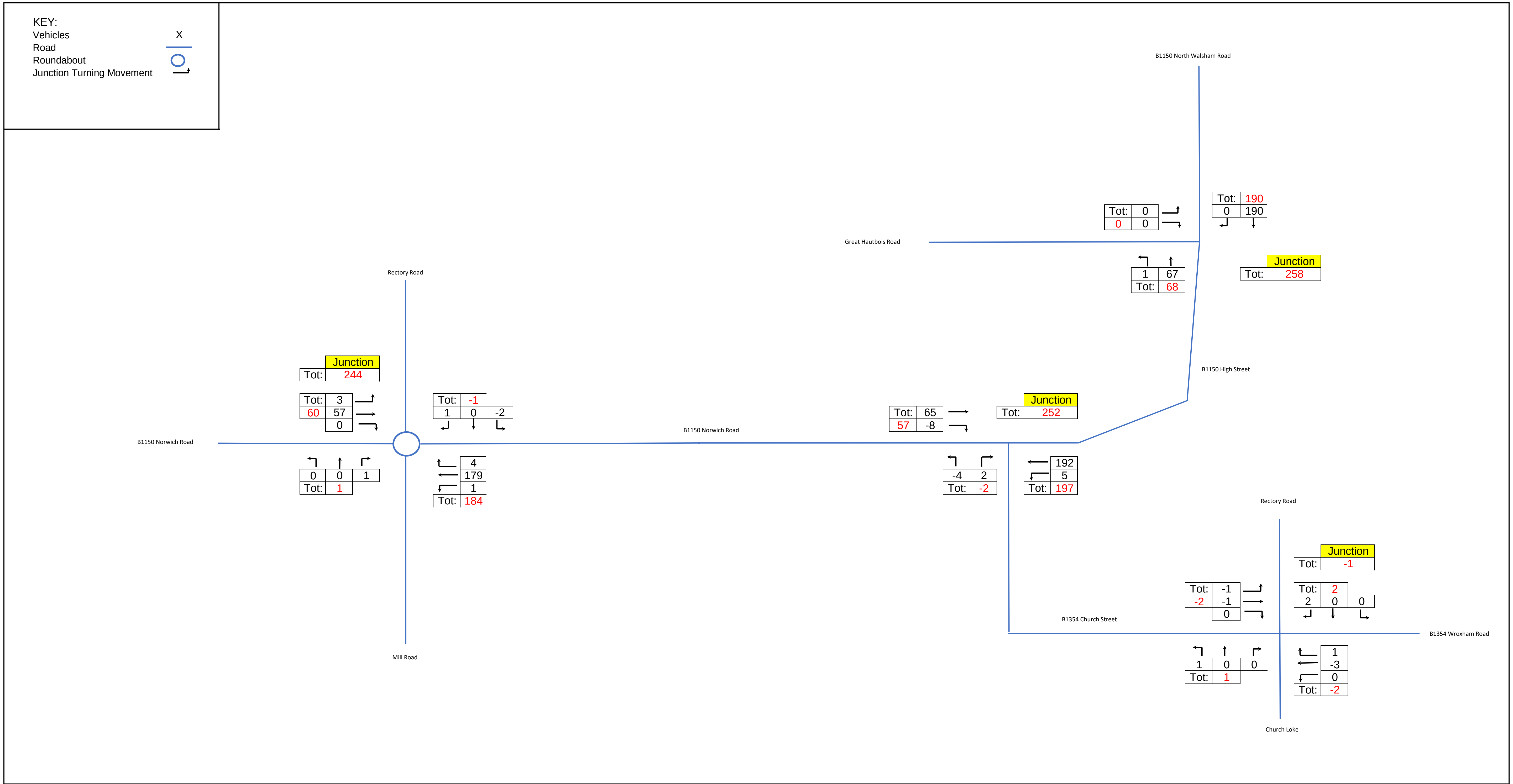

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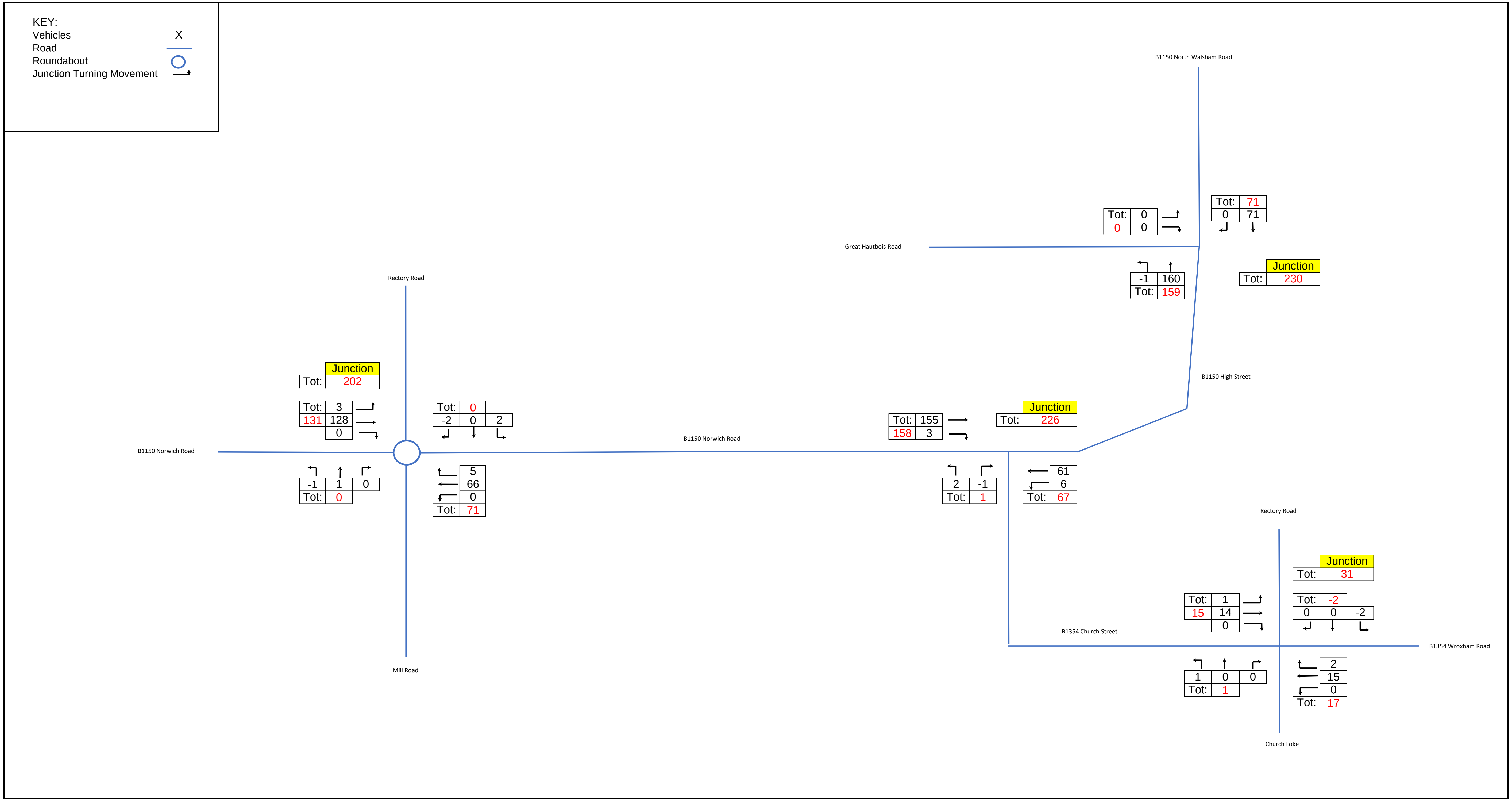

Project			Notes			
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ESCO Developments, Lovell Partnerships, Flagship Group	Coltishall 2036 Do Something Minus Do Minimum PM Demand Flows (Mitigation Scenario)	WG	TJ	13/10/2023	60	

Appendix B – Local Model Validation Reports

AECOM

North Walsham Vissim Model Validation Report

ESCO Developments, Flagship Housing Group and Lovell Partnership

13 April 2023

Delivering a better world

Quality Information

Prepared by	Checked by	Verified by	Approved by
Michael Fowler Graduate Consultant	Javier Navarro Pardo Principal Consultant	Phil Arnold Associate Director	Bevin Carey Regional Director

Revision History

Revision	Revision date	Details	Authorized	Name	Position
0.1	17 February 2023	First Draft		Javier Navarro Pardo	Principal Consultant
0.2	13 March 2023	Second Draft		Phil Arnold	Associate Director
1.0	13 April 2023	Draft Issue for Client Comment		Bevin Carey	Regional Director

Distribution List

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Contents

1. Introduction

Background and Report Structure

1.1 ESCO Developments, Flagship Housing Group and Lovell Partnerships have commissioned AECOM to develop a Vissim base model of the town of North Walsham to assess the impacts of increased demand in forecast years and the proposed North Walsham Western Urban Extension (NWWUE). The model has been calibrated and validated to replicate the operation of the town based on data collected in July and November 2022.

1.2 This report documents the data collection and analysis, the development of the network and base year demand, and the calibration/ validation. The report is structured as follows:

- Data collection and analysis;
- Demand development;
- Modelled Network;
- Calibration results;
- Validation results; and
- Conclusions.

Model Scope

1.3 The Vissim model has been developed for the area shown in Figure 1-1. The North Walsham network comprises three signalized junctions and numerous priority-controlled junctions. The Vissim model area includes the A149, which runs through the town with the signalized junctions with the B1150 and B1145.

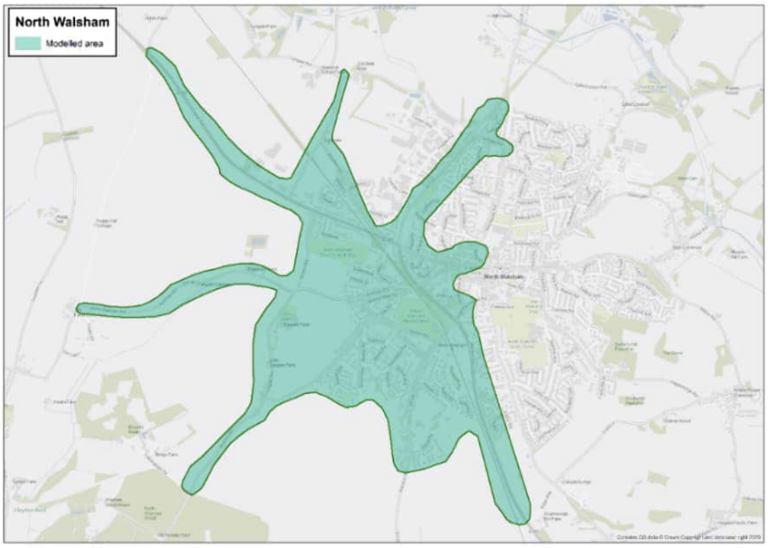

Figure 1-1 – Modelled Area

1.4 Figure 1-2 below shows the key junctions/ links identified from the survey data/ observations in the model area that are significant to local network operation. The key junctions/ links are as follows:

- 1 - Cromer Road and Bradfield Road;
- 2 - Cromer Road and Greens Road;
- 3 - Cromer Road, A149 and B1145;
- 4 - Cromer Road, Aylsham Road, Mundesley Road and Market Street;

- 5 - Aylsham Road underpass;
- 6 - B1150 Norwich Road and A149 North Walsham Bypass; and
- 7- B1150 and Millfield Road.

1.5 These junctions/ links have been considered when developing the model to replicate the existing operation and driving behaviour observed in the video footage available. It should be noted that the operation at some of these locations is dependent on variable factors such as on-street parking, physical constraints, and courtesy/ give way behaviours, which have been modelled and calibrated to observed queuing patterns/levels of delay.

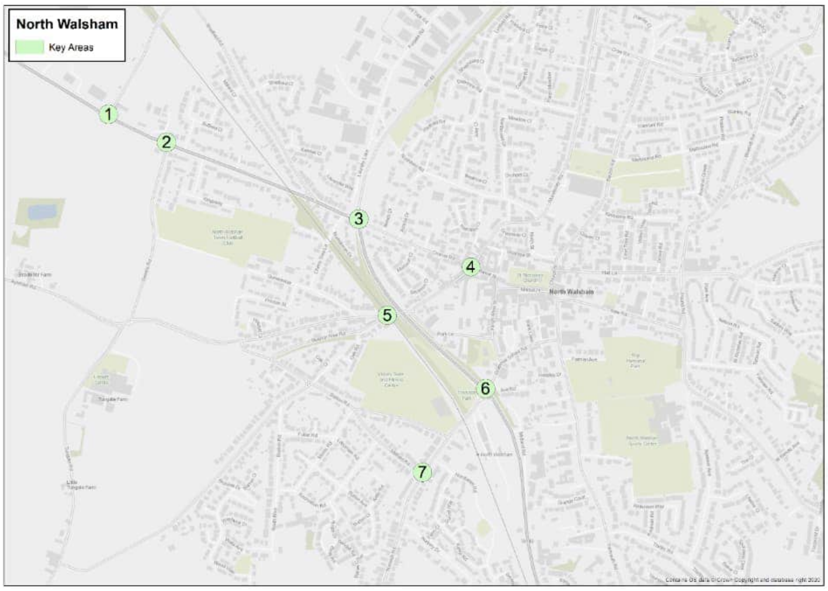

Figure 1-2 – Junctions in North Walsham Model Area

1.6 The Vissim Base models have been developed for the AM and PM peak hours, including 30 minutes warm-up and 15 minutes cool-down periods, to make sure the network is saturated at the beginning of the peak hour and to allow vehicles to complete their journeys after the peak hour.

1.7 The Base models have been developed in line with modelling requirements and the calibration and validation criteria defined in Transport Analysis Guidance (TAG) and the Guidelines for the Use of Microsimulation Software published in May 2022 by National Highways.

2. Data Collection and Analysis

Introduction

2.1 The data collection exercise undertaken by AECOM to inform the Vissim Base model development has been summarised in this section. The data collection comprised the following survey types:

- Automatic Number Plate Recognition (ANPR) data;
- Manual Classified Turning Counts (MCTC) Data; and
- Automatic Traffic Counts (ATC) data.

2.2 The data collection took place between the 12th and 14th July. However, upon review, road works were identified on the 12th of July, which resulted in non-standard delays and routing on this day. The data from the 12th of July was therefore not used.

2.3 Further analysis into the survey data, especially on ANPR sample rates showed that there was a noticeably lower capture rate on the 14th of July compared to the 13th of July across several cameras including key sites such as Site 11 northbound on the B1150.

2.4 An example of the sample rate analysis which was undertaken of the ANPR data can be found in Figure 3.1 for the AM and PM peak hours. The graphs in Figure 3.1 show a large flow difference between the vehicle numbers captured by the ANPR and the total flows along the road on the 14th of July 2022, while the data on the 13th of July show a close match between the two data sets.

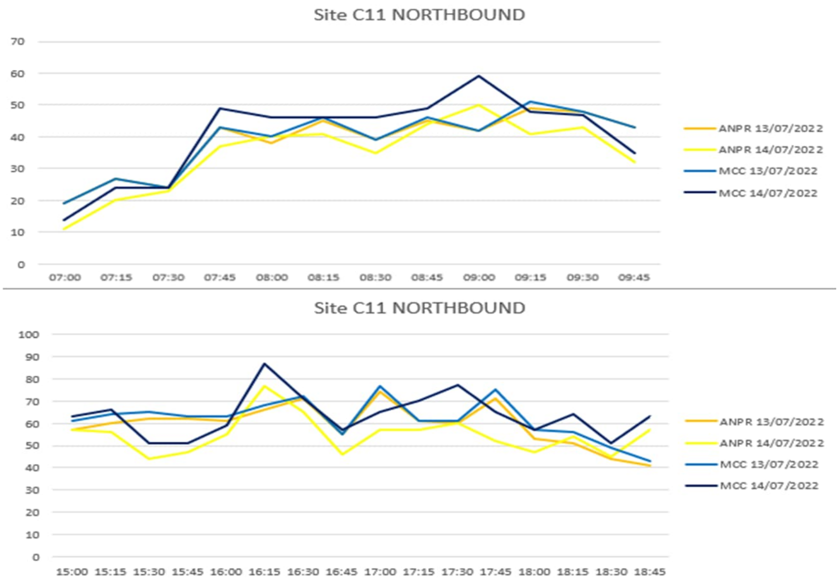

Figure 2-1 – ANPR performance 13th/14th July

2.5 As a result of the initial survey data analysis undertaken it was decided that only the data collected on the 13th of July 2022 will be used to support the VISSIM model development. The ANPR data obtained on the 14th was used to as further verify that origin-destination patterns on the 13th of July were typical.

Automatic Number Plate Recognition (ANPR) data

2.6 The ANPR data collection was categorized into two groups of cameras, Figure 2-2 shows the camera locations.

2.7 The **cordon cameras** were defined to capture the origin/destination demand across the area and total journey time through the model area.

- The **internal cameras** were defined to capture the internal routing within the model area and split the journey times into sections.

2.8 The ANPR data was used to develop the demand matrices and to provide journey times between origins and destinations. The internal cameras were also used to inform the routing through the model area and define the journey time sections used in the model validation.

2.9 As shown in Figure 2-2 some of the ANPR cameras lie outside the modelled area. Whilst these cameras were not used as journey origins or destinations, the routing information obtained from them was also used to inform the routing within the model.

2.10 In addition to the routing and journey time information, the ANPR surveys also included Manual Classified Counts (MCCs) associated with each camera to record the capture rate and classify ANPR data.

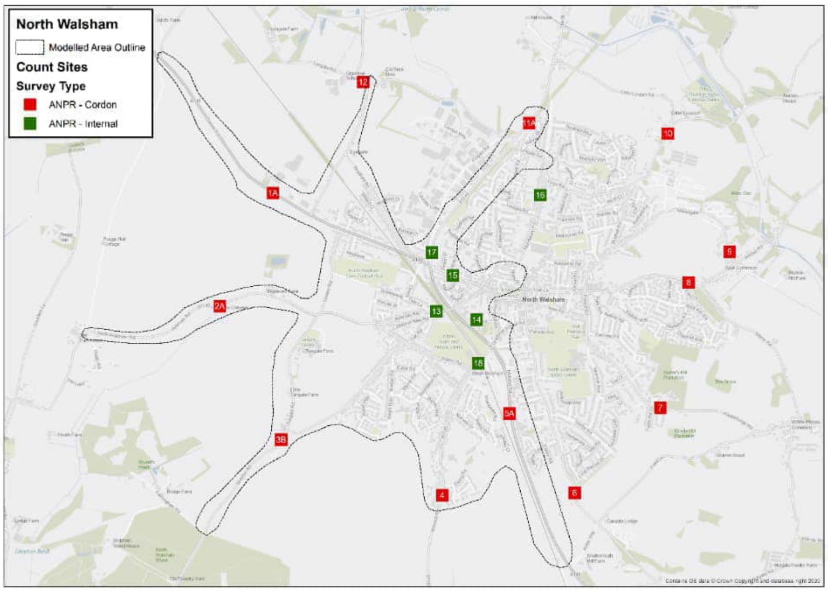

Figure 2-2 – ANPR Cameras

2.11 It should be noted that the ANPR data and routing information is based on the number plates captured successfully during the surveys. Table 2-1 summarizes the captured rate (number of plates that were successfully recognised by the ANPR camera).

2.12 The capture and matched rates in Table 2-1 show that most cameras had a very high sample/ match rate, providing a high degree of confidence that the data reflects the demand and routing patterns within the study area.

Table 2-1 – ANPR Cameras Capture and Match Rate

Site	Sample Rate		
	Overall	Inbound	Outbound
1	99%	100%	99%
2	99%	99%	99%
3	98%	98%	98%
4	98%	99%	97%
5	99%	99%	99%
6	99%	99%	98%
7	94%	94%	94%
8	98%	98%	97%
9	86%	88%	84%
10	99%	99%	99%
11	98%	98%	98%
12	94%	90%	98%

Site	Sample Rate		
	Overall	Inbound	Outbound
13	98%	99%	98%
14	99%	-	99%
15	98%	98%	96%
16	97%	98%	97%
17	98%	99%	97%
18	98%	98%	99%
Total	98%	99%	97%

* For internal cameras inbound refers to Eastbound or Northbound movement and outbound refers to Westbound or Southbound.

Manually Classified Turning Count (MCTC) data

2.13 MCTCs were carried out at the sites indicated in Figure 2-3 on the 12th,13th, and 14th July 2022, between 07:00 and 19:00. The MCTC data was used to refine the base model demand and calibrate the turning flows at each junction shown in Figure 2-3.

2.14 Additional MCTC surveys were undertaken on 10th of November 2022 to compare the traffic flow changes from the July 2022 data.

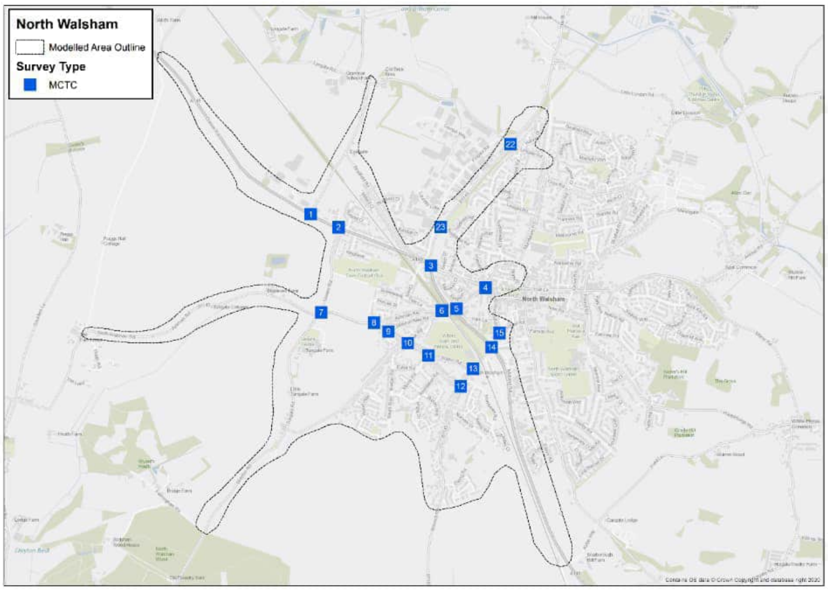

Figure 2-3 – Manual Classified Turning Counts sites

Automatic Traffic Count (ATC) data

2.15 The link counts were collected using ATCs. The ATC data was collected over two weeks period including the 12th, 13th, and 14th July 2022.

2.16 Seventeen ATC sites were surveyed in total that have been used to inform the total trip ends at the entry/ entry points to the model. Their locations are shown in Figure 2-4.

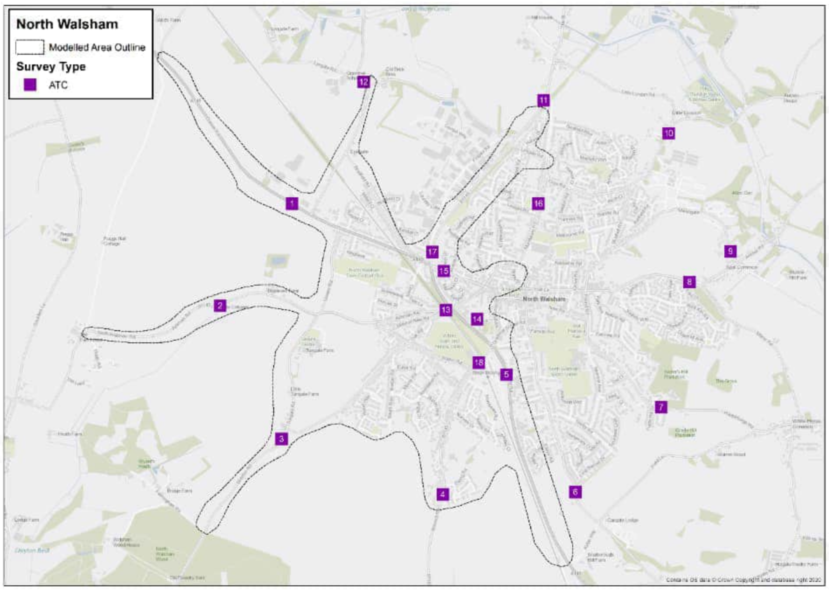

Figure 2-4 – Link counts (Automatic Traffic Counts)

Camera Footage

2.17 Camera footage, which was recorded to produce the MCTC and ANPR data, was obtained to provide the modellers with a more detailed view of the driving behaviour in the area and allow for saturation flow measurements.

3. Data Review and Analysis

Consistency Review

3.1 The locations of MCTCs have been labelled approach arms and model entry points to assist with the analysis of the data consistency review and can be found in Appendix A.

3.2 The consistency between the different data sets was assessed to understand the reliability of the data and identify any discrepancy that could affect the model development. The key comparisons and findings found during the data analysis have been summarised below. The full details of the consistency checks undertaken can be found in Appendix A.

3.3 As a result of consistency checks, it was necessary to include six additional synthetic zones in the model, to balance the flow differences identified between adjacent junctions.

3.4 The synthetic zones identified during the survey data analysis represent minor junctions that were not surveyed during the data collection exercise. These junctions are located between surveyed junctions which were calibrated against observed counts. This is the standard modelling approach to infill volumes between surveyed junctions arising due to minor side roads, parking lots etc.

3.5 Additional MCTC surveys were carried out on 10th of November 2022 to compare the traffic flows against July 2022 data. The analysis showed a close match between the MCTC data of July and November 2022.

Peak Hour Analysis

3.6 The survey data available was processed to identify the morning and evening peak hours by analysing the profile of traffic volumes during the surveyed period. For this calculation, all vehicle movements have been considered as well as calculations of the inbound flows to the model area.

3.7 MCTC and ATC/ MCC data were analysed to determine the peak hour, by totalling all movements and by totalling only entries in the model area. In the AM period, the peak hour was calculated to be 08.00-09.00, both when considering entries into the modelled area and when using all available data. In the PM period calculations similarly returned a consistent peak hour of 16.30-17.30 using both methods. The ATC/MCC data was also analysed and showed the same peak hours as the analysis of the MCTC data.

3.8 Figure 2-4 shows the profile of the rolling hour calculated from the ATC data, which was used for calculating the peak hour.

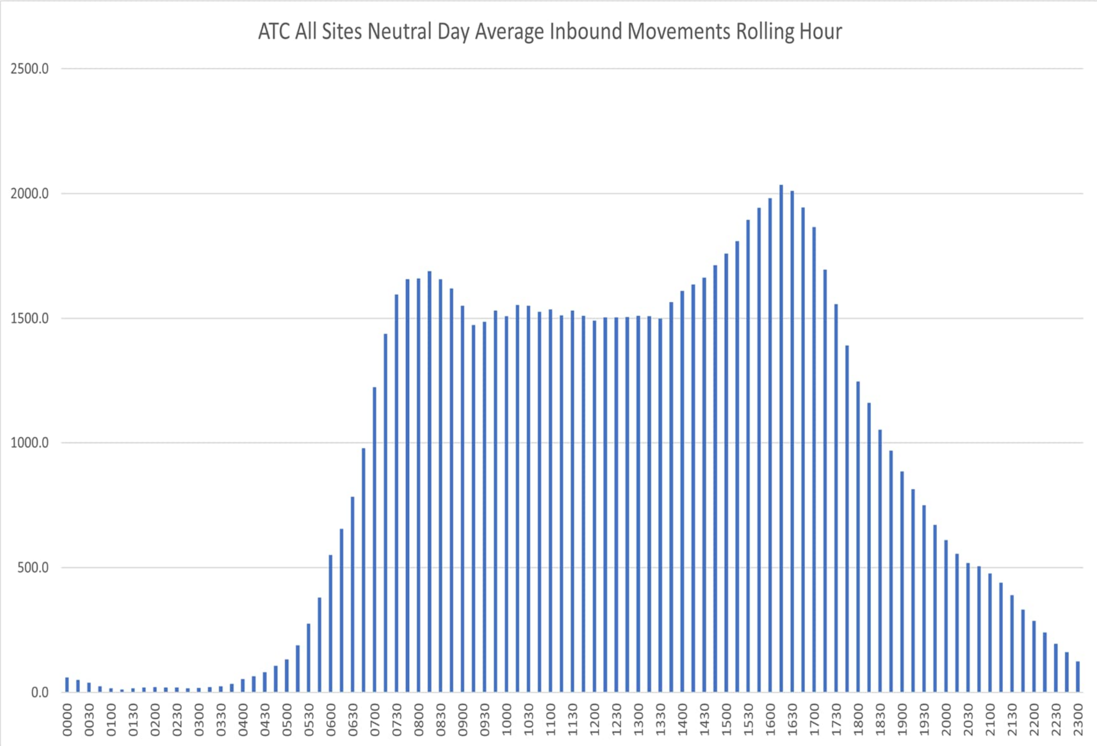

Figure 3-1 – ATC Peak Hour Analysis

3.9 This analysis has identified the following peak hours:

- AM peak hour: 08:00 - 09:00; and
- PM peak hour: 16:30 - 17:30

3.10 The modelled simulation periods include a 30-minute warm-up period to fully saturate the network before the simulated peak hour and a 15-minute cool-down period to allow vehicles to complete their journeys. The modelled periods are, therefore:

- AM modelled period: 07:30 - 09:15; and
- PM modelled period: 16:00 - 17:45.

4. Demand Development

Overview

4.1 This section describes the demand methodology and the routing analysis undertaken to develop and calibrate the traffic demand in the Vissim Base model.

4.2 The model was developed using the dynamic assignment module, as it would allow the model to predict future changes in routing which result from the demand growth, committed schemes or proposed mitigation measures in the area.

4.3 The ANPR data was used to develop the prior demand, which was then adjusted using the MCTC data to calibrate the demand to individual junction turning flows, resulting in the hourly Origin Destination (OD) matrices used in the Vissim model.

4.4 The traffic demand has been calculated for each vehicle type included in the model (Car, Light Goods Vehicle (LGV) and Heavy Goods Vehicle (HGV)) for the modelled peak hours. The available survey data has been used to develop the hourly Origin-destination matrices and the 15-minute profiles for each origin zone.

Demand Development

4.5 ANPR captures number plates at each of the camera locations providing a trip chain report documenting when and where the number plate was captured. This information has been used to develop demand matrices for the Vissim model.

4.6 The ANPR data has been factored up to represent all the vehicles in the network, by expanding the matched vehicles based on the capture rate at each ANPR site. However, the capture rates are not consistent between all the cameras, resulting in small discrepancies between these ANPR demand matrices and the MCTC data.

4.7 To minimise these discrepancies and refine the modelled demand, the ANPR matrix has been manually adjusted to match the MCTC data, allowing for a closer representation of the MCTC counts demand in the area while maintaining a direct correspondence between the VISSIM demand and the original ANPR data, preserving the observed routing data. The process followed is outlined in Figure 4-1.

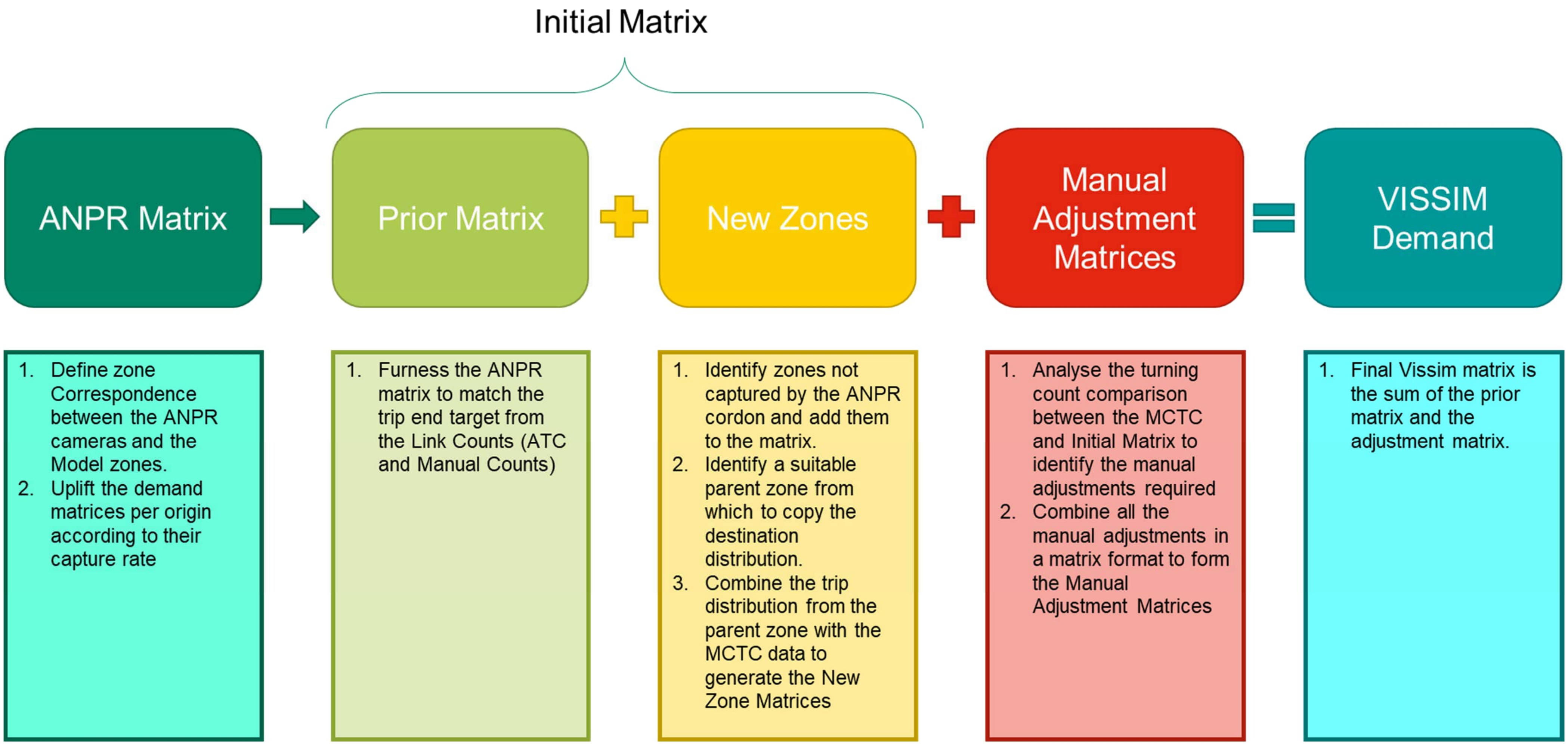

Figure 4-1 – Demand Development Methodology

4.8 To ensure the best possible correlation between the observed data and the Vissim model demand, the vehicle inputs and origin/destination routing have been developed by combining three different components:

- Initial Matrix – reflecting the routing patterns in the ANPR matrix and the link counts at entries and exits of the model;
- New Zones Matrix – additional zones required in Vissim but not directly captured by the ANPR; and
- Manual Adjustment Matrix – adjustments required to address routing and discrepancies between the Initial Matrix and MCTC data.

4.9 The process outline below was followed:

- The ANPR cameras and the Vissim model zones have been consistently referenced to define a correspondence between them e.g., Camera 5 is representative of Zone 5. The OD matrix extracted from the ANPR data has then been uplifted to reflect the number of vehicles at each origin, since the ANPR capture rate is less than 100%.
- The imperfect capture rate, with different number plates missed at each camera, means that the resulting matrix requires uplifting to outbound observed flows. The entry and exit link counts were used to furness the matrix. The last iteration has been set up to match the origin trip ends, to ensure that the demand matrix represents the traffic volumes entering the model area. This process results in an hourly OD matrix for each vehicle type: Cars, HGVs, Taxis, and LGVs.
- Once the matrix derived from ANPR and link counts was in a usable OD matrix format, the entries to the model where ANPR data is unavailable were reviewed. The total origin and destination demand for each additional zone was derived from the differences between adjacent turning counts and the trip distribution was assumed to be the same as another zone with similar characteristics. In this way, a New Zones Matrix was developed, which will infill the Initial Matrix to include zones not covered by ANPR cameras.
- The Initial matrix and the New Zones Matrix were combined and assigned in Vissim – the modelled turning flows and observed turning counts were compared to identify manual adjustments required to meet the flow calibration criteria. This was an iterative process, and several adjustments were needed before adequate match between observed and modelled turning counts was achieved.
- The manual adjustments identified from the comparison between the modelled and observed turning flows are implemented in a separate Manual Adjustments Matrix for each vehicle class; this is then combined with the Initial Matrix and New Zones Matrix developed previously to obtain the final Vissim demand.

Convergence and routing analysis

4.10 The Vissim dynamic assignment module assigns the vehicles on the different paths based on the journey time cost and distance, assigning most of the vehicles to the shorter or faster paths, depending on the convergence parameters.

4.11 The journey time and routing data obtained from the ANPR was used to analyse the routing patterns in the model area and calculate the parameters required to support the convergence process.

4.12 The results of the convergence process and dynamic assignment were then checked against the routing information obtained from the ANPR data to ensure the model provides a suitable representation of the routing patterns in the area for the OD pairs with multiple route choice.

4.13 An example of the routing checks is shown in Figure 4-2 below, for two possible routes between Zone 1 and Zone 4 in both directions. The routing analysis compared the flows along each route against the observed data from ANPR surveys. This analysis provided further reassurance that the observed routing patterns were replicated in the model for the main OD pairs with multiple route options.

4.14 It should be noted that these routing checks were undertaken to identify and address any potential routing issues in the assignment that may affect the operation of the model. However, these checks are not part of the TAG validation criteria required for microsimulation models.

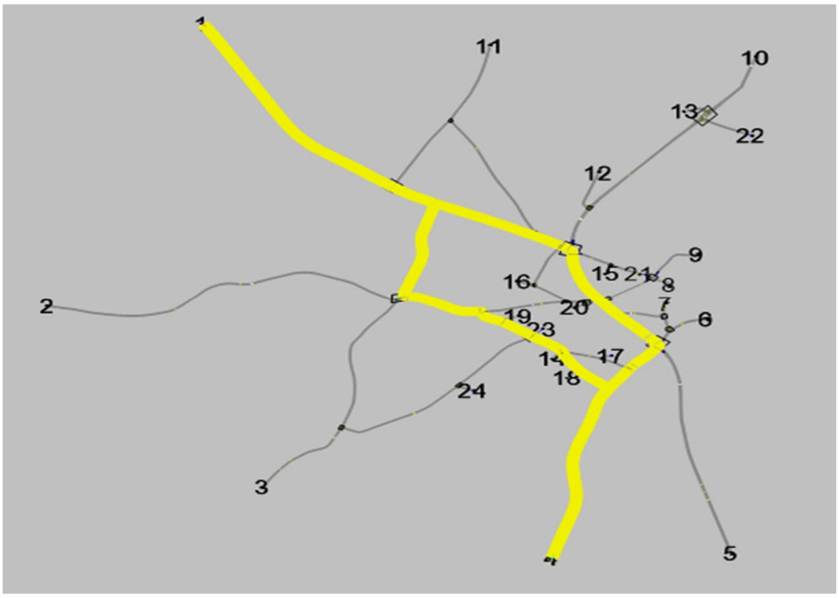

Figure 4-2 - VISSIM Dynamic Assignment with Two Possible Routes

5. Network Development

Network coding

5.1 Scaled Bing maps within Vissim have been used to code the network geometry and structure, such as number of lanes and flare lengths. Reference was also made to Google Maps and Street view to ensure the network reflects conditions on the ground.

5.2 Observation from the video footage available have also been used to inform the network coding and replicate the operation of the existing layout.

Desired Speed Decisions & Reduced Speed Areas

5.3 Desired Speed Decisions, defining the speed distribution that vehicles follow at each point of the network, have been updated to represent the posted speed limits for each link. Reduced Speed Areas have been included to replicate driving behaviours such as bends curves, narrow road sections or pedestrian crossings, but also, to calibrate saturation flows and replicate behaviour at signalised junctions.

5.4 The speed distributions used in the model have been obtained from two different sources. The Guidelines for the Use of Microsimulation Software from National Highways provide distributions for 50 mph and 70 mph, while 30 mph and 60 mph have been obtained from the SPE0111 - Vehicle Speed Compliance by road type and vehicle type in Great Britain from Department for Transport (DfT).

5.5 On some links, the speed limits do not provide a realistic representation of the average speeds. For example, Bradfield Road is a country lane with the national speed limit of 60 mph, However, the average speed for a narrow unlit road is significantly lower according to the ANPR data. The speed limits coded on such links have been derived from observed ANPR data.

5.6 Similar behaviour has been observed in Tungate Road and Skeyton Road, where the journey time data suggests that vehicles travel at lower speeds. A 30-mph speed limit has been coded on Tungate Road since this is a single-track road, and vehicles will slow down at narrow sections or when a vehicle in the opposite direction approaches. Due to the unpredictable/ variable behaviour along these links, and fact that vehicle may need to pass each other/ stop at any point along the link, this can only be replicated by Reduced Speed Areas (RSAs) representing average delay along the link.

5.7 Closer to the town centre on the section of Aylsham Road between Cherry Tree Lane and Station Road the road narrows with residential property walls and fences at either side of the road. A lower speed limit (15mph) was introduced in the model to represent the observed behaviour along this section, where vehicles slow-down below the speed limit (20 mph).

Route Closures

5.8 The routing analysis undertaken during the convergence and assignment was also used to identify certain routes with negligible traffic flows. These routes have been removed from the model to avoid rat-running and improve the model stability.

5.9 The following route closures were implemented in the model to prohibit certain routes which are not practical, due to the conditions of the roads, and this was confirmed by ANPR and MCTC data:

- A route closure has been coded on Skeyton Road, banning the through movement from the south, so the road is only used for access to and from Zone 24 (Brookes Drive). This assumption was supported by the ANPR and MCTC data in the area showing less than 15 vehicles per hour along this route in both directions;
- Secondly, a route closure was applied to avoid vehicles accessing Cromer Road to and from Cherry Tree Lane, as the road is narrow and on-street parking makes this route highly unattractive; and,
- A route closure was also added to Bradfield Road allowing vehicles to only use Cromer Road for Eastbound and Westbound movements.

Priority Rules and Conflict Areas

5.10 Priority Rules and Conflict Areas have been coded and calibrated based on observed network conditions and driving behaviour at roundabouts, priority junctions and other give way situations.

5.11 Priority Rules have also been used to replicate specific behaviours such as the operation of the underpass on Aylsham Road shown in Figure 5-1 where large vehicles use the centre of the road to go through the underpass due to the height of the bridge.

Figure 5-1 – Eastbound Road view on Aylsham Road at A149 underpass

5.12 In addition to the underpass on Aylsham Road there are height restrictions in place for HGVs at the B1150 Norwich Road and A149 Cromer Road. The traffic data collected at the nearby junctions suggests that the constraints created by the height restrictions do not affect all the HGVs as the data and the video footage shows OGV1 and OGV2 going through the underpass.

5.13 The Vissim model has been calibrated to match the number of Cars, LGVs and HGVs observed in the area. However, vehicle classification used to develop the Vissim demand (DfT vehicle classification) which defines the vehicle characteristics, such as vehicle length, acceleration or speed profile does not include any reference to vehicle height as this parameter is not linked to the vehicle type.

Figure 5-2 – Height restriction on N Walsham Rd

Buses

5.14 All bus services in the model were coded based on information available online. For all bus stops in the model a standard dwell time of 20 seconds was assumed.

Signal Information

5.15 The signalised junctions included in the model area have the capability to operate on MOVA (Microprocessor Optimised Vehicle Actuation). However, MOVA logs, and operational files were not collected on the day of the surveys, so it was not possible to model this operation explicitly in the model. This requires use of PCMOVA, an add-on to Vissim, which adds additional time/cost to the model development and increases run-times, so this is typically only used in complex strategic junctions where it is proportionate.

5.16 The signal data provided by Norfolk County Council (NCC), including the specification of the existing controller, and the average green times at the junction were used to develop a variable signal logic file included in the model using VisVAP. The Vehicle Actuated (VA) signal operation allows the model to extend or reduce the green time allocated to each arm of the junction depending on the traffic demand, which is monitored through detectors (representing loops in the road).

5.17 The minimum and maximum green times as well as signal patterns defining the priority of each arm have been calibrated to observed signal operation and signal information, to provide a realistic approximation of the operation of MOVA.

Differences between AM and PM Networks

5.18 Some elements of the models are expected to be different in different time periods. The demand, routing, and signal controllers represent the different flow patterns/ routeing and signal timings in the AM and the PM model. However, there are no differences between AM and PM networks to report.

6. Model Calibration

Introduction

6.1 The purpose of the model calibration process is to ensure that the model represents existing traffic conditions. Calibration is an iterative process in which the model is revised to replicate observed traffic volumes, traffic conditions and vehicle behaviour as closely as possible.

Saturation Flow Calibration

6.2 The saturation flow is the maximum number of vehicles that are able to pass across a lane at a signal stop-line in an hour.

6.3 The modelled saturation flows on each signalized stop line have been compared to estimated saturation flows calculated using the RR67 formula. The measurements required for the RR67 formula (lane-width, radius, etc.) have been measured using Google Maps.

6.4 The modelled saturation flows were extracted from Vissim using a saturation flow script developed by AECOM. Modelled values have been compared to the RR67 values to ensure that they are within an acceptable range. The saturation flow results have been presented, below in Table 6-1.

Table 6-1 - Saturation Flows

Junction	Approach	Modelled	RR67	Difference
Cromer Road / Aylsham Road	Mundesley Road	1761.25	1865	-6%
	Aylsham Road	1761.25	1865	-6%
	Cromer Road	1761.25	1915	-8%
Cromer Road / B1150 / A149	A149 Northbound	1731.16	1808	-4%
	A149 Northbound	1818.8	1915	-5%
	B1150 Southbound	1979.0	1915	3%
	B1150 Southbound	1717.74	1808	-5%
	Cromer Road	1672.69	1785	-6%
	Cromer Road	1717.74	1808	-5%
A149 / Norwich Road / Grammar School Road	A149 Southbound	1781.58	1915	-7%
	A149 Northbound	1780.27	1915	-7%
	A149 Southbound	1723.09	1808	-5%
	Norwich Road	1720.85	1783	-3%
	A149 Northbound	1727.75	1808	-4%
	Norwich Road	1935.75	1859	4%

Flow Calibration Criteria

6.5 This section presents the traffic flow calibration which was undertaken and compares modelled and observed traffic flows using the criteria provided in TAG Unit M3-1.

6.6 The observed and modelled turning flows were compared for each of the junctions for the AM and PM peak hours, using the TAG criteria (Unit M3.1) for flow calibration as shown in Table 6-2.

Table 6-2 – TAG Calibration Criteria

Type	Criteria	Acceptability Guidelines
1 - % Flows	**a.** Individual flows within 15% for flows 700-2700 vph **b.** Individual flows within 100 vph for flows < 700 vph **C.** Individual flows within 400 vph for flows > 2700 vph	> 85% of all cases
2 – GEH Criteria	GEH Statistic - Individual flows: GEH < 5	

6.7 The differences between modelled and observed flows were calculated and the TAG criteria, both for absolute differences and for GEH statistic, were used to determine if these differences were acceptable. The GEH statistic incorporates both relative and the absolute differences and provides a better indication of the significance of differences, compared to using percentage differences which can be misleading.

6.8 The GEH statistic is defined as:

$$GEH=\sqrt{\frac{(M-C)^2}{(M+C)/2}}$$, where M and C are different datasets to be compared.

Flow Calibration Results

6.9 The modelled turning flows were compared against the surveyed turning flows to calibrate the demand inputs and model assignment. The models were run twenty times using different random seeds to produce a set of average turning count results for comparison with the survey data.

6.10 The AM calibration results in Table 5-3 show the calibration results for each vehicle type. The results demonstrate that the AM peak hour flows are also calibrated closely against the observed turning counts when analysed vehicle class, and all exceed the thresholds set out in TAG. The structure of the junctions and turning count references included in the AM calibration results can be found in Appendix B.

Table 6-3 - AM Calibration Results - Peak Hour by Vehicle Class

Vehicle Class	Tag Criteria	Within	Total Counts	Percentage Passing
Car	% Counts within GEH <5	150	151	99%
	% Flows within Individual Flow	151	151	100%
HGV	% Counts within GEH <5	151	151	100%
	% Flows within Individual Flow	151	151	100%
LGV	% Counts within GEH <5	151	151	100%
	% Flows within Individual Flow	151	151	100%
Total	% Counts within GEH <5	145	151	96%
	% Flows within Individual Flow	150	151	99%

6.11 The AM calibration results in Table 5.4 shows the calibration results for total vehicles entering the model. Although not required in TAG, explicitly matching the observed number of vehicles entering the network is a key metric to validate the capacity and delays of the microsimulation models.

6.12 The results demonstrate that modelled flows at all entries to the model are calibrated closely with observed data as all the inputs are below GEH 5 as required in TAG guidance.

Table 6-4 - AM Calibration results - Model Entries

Entry Road	Observed	Modelled	GEH
Bradfield Road Joining Cromer Road	7	2	2.36
Cromer Road Eastbound	346	344	0.11
Mundesley Road Southbound	136	135	0.09
Market Street Westbound	0	0	0.00
Tungate Road Northbound	46	42	0.60
Aylsham Road Eastbound	166	155	0.87
Skeyton Road Eastbound	92	92	0.00
Morris Road Eastbound	73	82	1.02
Norwich Road Northbound	428	419	0.44
North Walsham Bypass Northbound	325	320	0.28
Grammar School Road Westbound	555	551	0.17
Laundry Loke Eastbound	69	71	0.24
Lyngate Road North	225	241	1.05
Lyngate Road West	320	272	2.79
Folgate Road	47	48	0.15
Total	2835	2777	1.09

6.13 The calibration summary in Table 6-5 demonstrates that the PM peak hour model flows are also closely calibrated against the observed turning counts when analysed by vehicle class, exceeding the requirements set out in TAG. The structure of the junctions and turning counts references included in the PM calibration results can be found in Appendix B.

Table 6-5 - PM Calibration Results - Peak Hour by Vehicle Class

Vehicle Class	Tag Criteria	Within	Total Counts	Percentage Passing
Cars	% Counts within GEH <5	151	151	100%
	% Flows within Individual Flow	151	151	100%
HGVs	% Counts within GEH <5	151	151	100%
	% Flows within Individual Flow	151	151	100%
LGVs	% Counts within GEH <5	150	151	99%
	% Flows within Individual Flow	151	151	100%
Total	% Counts within GEH <5	148	151	98%
	% Flows within Individual Flow	151	151	100%

6.14 The PM calibration results in Table 5.6 shows the calibration results for total vehicles entering the model. The results demonstrate that the total entry volumes into the model are calibrated closely with observed data.

Table 6-6 - PM Calibration Results – Model Entries

Junction	Observed	Modelled	GEH
Bradfield Road Joining Cromer Road	5	7	0.82
Cromer Road Eastbound	552	542	0.43
Mundesley Road Southbound	135	143	0.68
Market Street Westbound	0	0	0.00
Tungate Road Northbound	55	46	1.27
Aylsham Road Eastbound	155	147	0.65
Skeyton Road Eastbound	58	54	0.53
Morris Road Eastbound	12	15	0.82
Norwich Road Northbound	537	521	0.70
North Walsham Bypass Northbound	376	373	0.16
Grammar School Road Westbound	530	522	0.35
Laundry Loke Eastbound	167	158	0.71
Lyngate Road Southbound	232	235	0.20
Lyngate Road Westbound	232	235	0.20
Folgate Road	184	188	0.29
Total	3169	3116	0.95

6.15 A flow diagram was constructed to visualise the junctions/ network and show turning flows within the model. The flow diagrams, showing calibration of flows for all turning movements in the AM and PM, can be found in Appendix C.

Calibration Parameters

6.16 Table 6-7 summarises the main calibration and specific driving behaviour parameters recommended by TAG and DfT for microsimulation models. These parameters have been included in the North Walsham VISSIM model in line with the recommended guidance.

Table 6-7 - Microsimulation Model Parameters – TAG/DfT

Parameter	Value	Following Guidance
Headway	1s time	Yes
Gap	1 to 4 seconds, depends on location	Yes
Vehicle Dynamics	Following graphs	Yes
Reaction Time	-	-
Desired Speed Distributions	Following graphs	Yes
Driver Awareness	Following graphs	Yes
Influence of signing on the approach to a diverge of the motorway lane selection	5	Yes
Cooperative Merging	Yes, used on merging and weaving links Maximum speed difference - 6.71mph Maximum collision time – 10s	Yes
Implied Capacity at roundabouts and signal stop lines	-	-
Min Distance between vehicles at a standstill	1.5m	Yes

7. Model Validation

Introduction

7.1 Following the model calibration process, the VISSIM models were validated using journey time data. The vehicle travel time results from the models were compared against the surveyed journey time data to validate the queuing and delay in the model. The models were run twenty times using different random seeds to produce a set of average journey time results for comparison with the survey data.

7.2 The TAG M3-1 criteria for journey time validation are shown in Table 7-1 below.

Table 7-1 – TAG Validation Criteria

Criteria	Acceptability Guidelines
Modelled times along routes should be within 15% of surveyed times (or 1 minute, if higher than 15%)	> 85% of routes

Journey Time Validation Results

7.3 Figure 7-1 shows the nine journey time routes which have been defined within the model area. The average observed journey times were compared to the average modelled journey times in accordance with the criteria set out in TAG M3-1. The journey times routes were defined using the camera position of the ANPR surveys used to capture the observed journey time data.

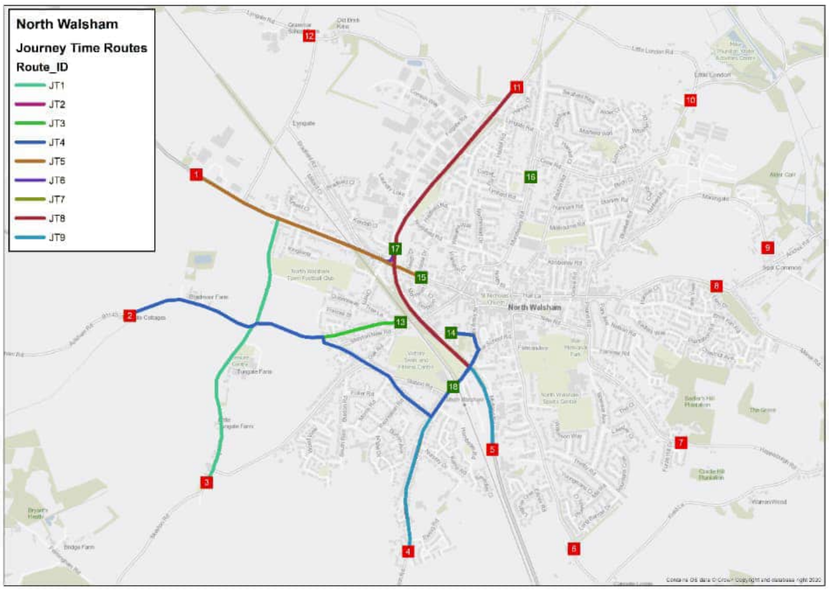

Figure 7-1 – Journey Time Routes

7.4 The definition of these journey times routes has been carried out using the position of the ANPR cameras used to capture the observed journey time data. The inner cameras have also been used split the longer routes into sections, so the profile of delays along the routes can be replicated to make sure the main capacity constraints in the area are validated.

7.5 Tables 6-2 and 6-3 show the individual performance of each of the defined journey time routes for all vehicles, all of which pass the TAG criteria. For ease, the routes are identified as JT 1 to 9 in the following paragraphs.

Table 7-2 – AM Journey Time Validation

ID	Route Name	Observed	Modelled	% Difference	Validation
1	JT1_EB	183	173	-6%	Yes
2	JT1_WB	167	174	4%	Yes
3	JT2_NB	178	186	5%	Yes
4	JT2_SB	173	168	-3%	Yes
5	JT3_EB	105	109	4%	Yes
6	JT3_WB	129	135	4%	Yes
7	JT4_EB	340	309	-9%	Yes
8	JT4_WB	258	251	-3%	Yes
9	JT5_EB	142	134	-6%	Yes
10	JT5_WB	146	142	-3%	Yes
11	JT6_NB	158	171	8%	Yes
12	JT6_SB	176	175	0%	Yes
13	JT7_NB	222	214	-4%	Yes
14	JT7_SB	94	89	-5%	Yes
15	JT8_NB	291	303	4%	Yes
16	JT8_SB	264	255	-3%	Yes
17	JT9_EB	211	194	-8%	Yes
18	JT9_WB	160	156	-2%	Yes

Table 7-3 – PM Journey Time Validation

ID	Route Name	Observed	Modelled	% Difference	Validation
1	JT1_EB	204	176	-14%	Yes
2	JT1_WB	180	180	0%	Yes
3	JT2_NB	192	198	3%	Yes
4	JT2_SB	207	206	0%	Yes
5	JT3_EB	104	104	0%	Yes
6	JT3_WB	134	130	-3%	Yes
7	JT4_EB	364	342	-6%	Yes
8	JT4_WB	267	256	-4%	Yes
9	JT5_EB	155	151	-3%	Yes
10	JT5_WB	150	149	0%	Yes
11	JT6_NB	189	186	-1%	Yes
12	JT6_SB	192	184	-4%	Yes
13	JT7_NB	274	244	-11%	Yes
14	JT7_SB	96	94	-2%	Yes
15	JT8_NB	362	349	-4%	Yes
16	JT8_SB	294	295	0%	Yes
17	JT9_EB	265	226	-14.5%	Yes
18	JT9_WB	173	160	-8%	Yes

7.6 The detailed journey time comparisons through the key parts of the model have been extracted and compared against the observed data in the sections below Figure 7-2 to Figure 7-10, showing that the model provides an accurate representation of the journey time and delays along the routes. The comparison of all the journey time routes included in the model routes can be found in Appendix D.

JT1

7.7 JT1 runs from Zone 1 – Cromer Road South to Zone 3 – Skeyton Road, as shown in Figure 7-2. This route is considered important as this is the region of the proposed development. This route shows that the lower speeds included in the models is aligned with the average speed obtained from the observed journey time data.

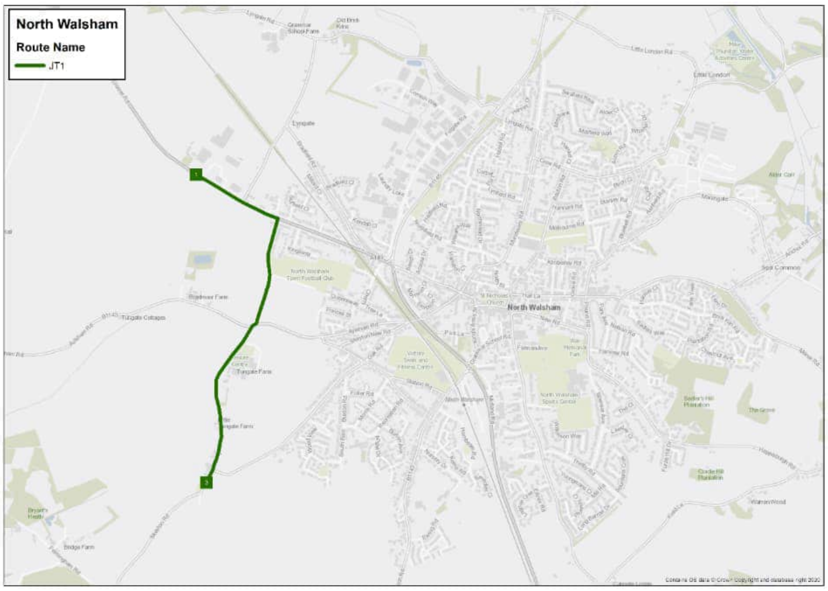

Figure 7-2 – JT1 Route Diagram

7.8 Figure 7-3 show the eastbound validation profile of this route with the observed data for both peaks.

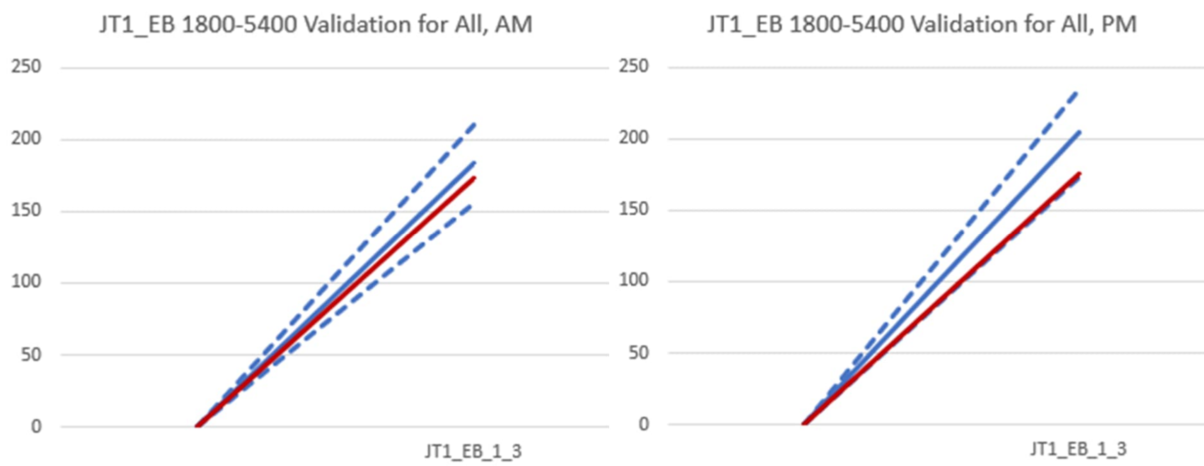

Figure 7-3 – JT1 Eastbound Journey Time Validation profile

7.9 Figure 7-4 show the westbound validation profile of this route with the observed data for both peaks.

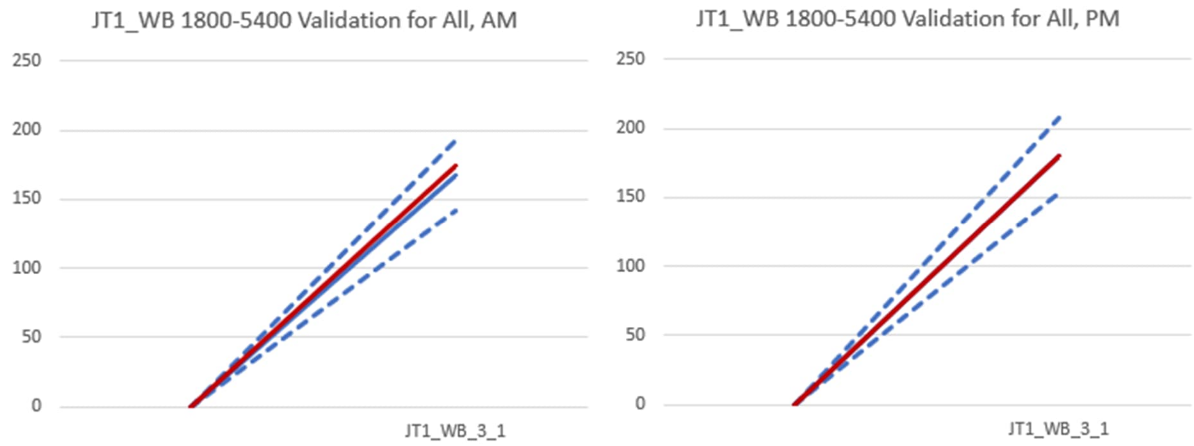

Figure 7-4 – JT1 Westbound Journey Time Validation profile

JT2

7.10 JT2 run from Zone 5 – North Walsham Bypass North to Zone 10 – North Walsham Bypass, as shown in Figure 5-5.

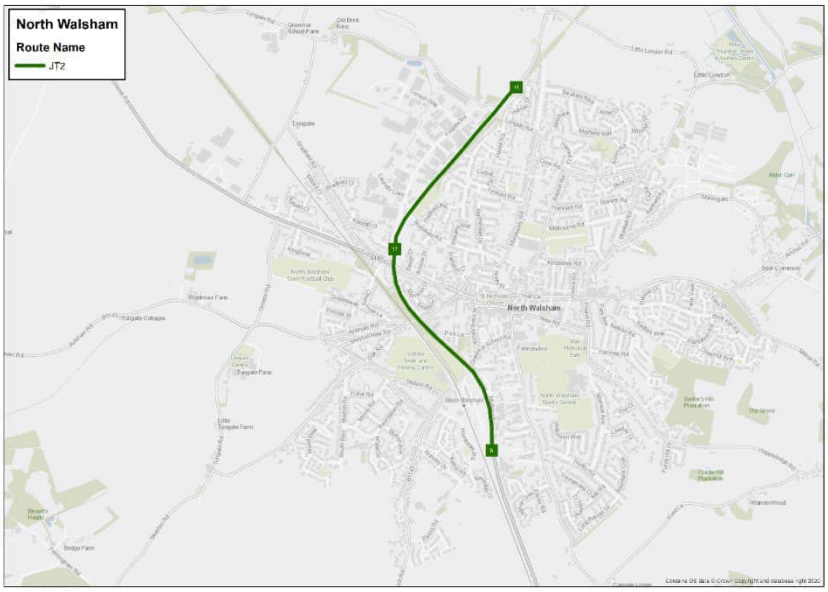

Figure 7-5 – JT 2 Route Diagram

7.11 Figure 7-6 show the northbound validation profile of this route with the observed data for both peaks.

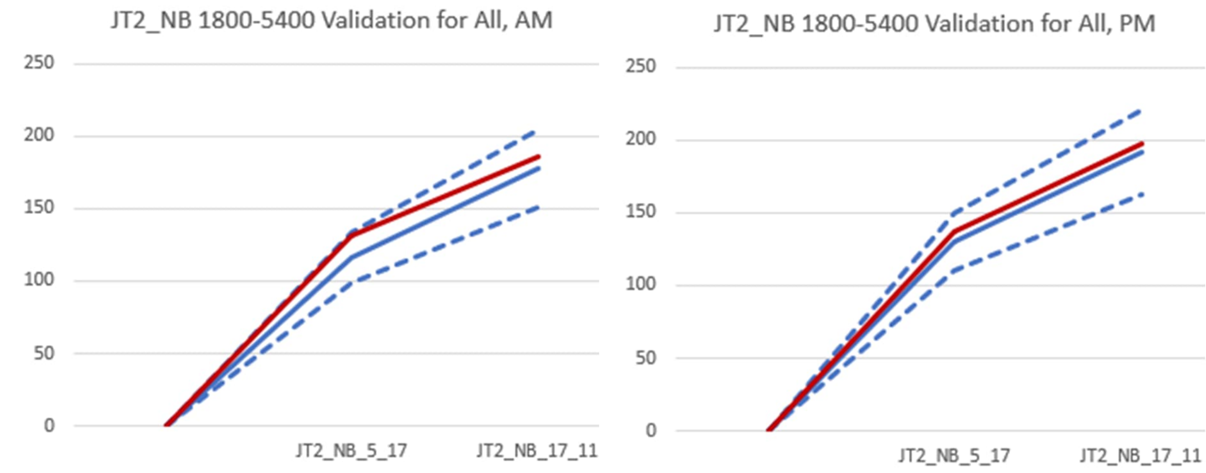

Figure 7-6 – JT2 Northbound Validation Profile

7.12 Figure 7-7 show the southbound validation profile of this route with the observed data for both peaks.

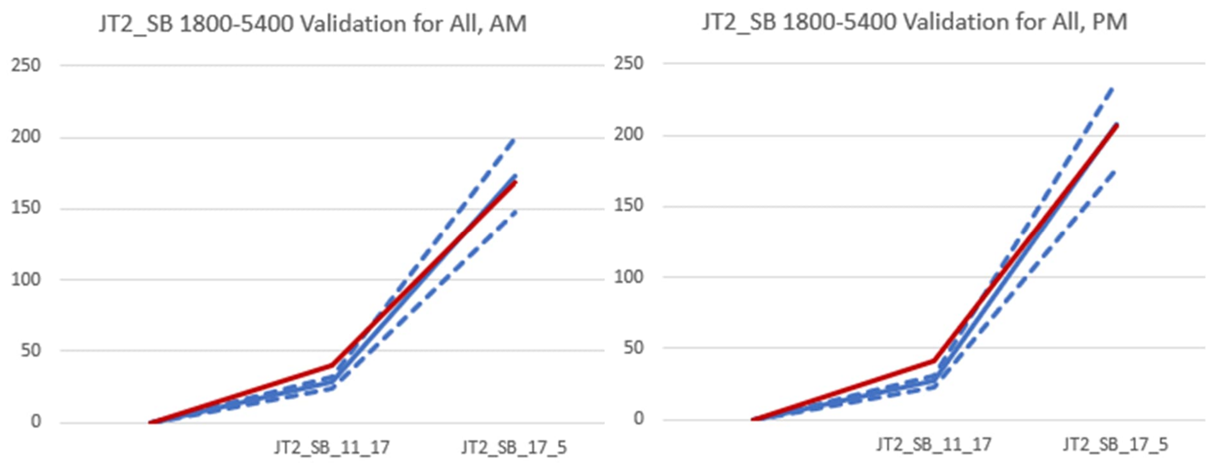

Figure 7-7 – JT2 Southbound Validation Profile

JT4

7.13 JT4 runs from Zone 2 Aylsham Road to Camera 14 Park Lane in the eastbound direction and from Zone 5 to Zone 2 in the westbound direction. This route has a different start/end point in the east as Park Lane is a one-way street.

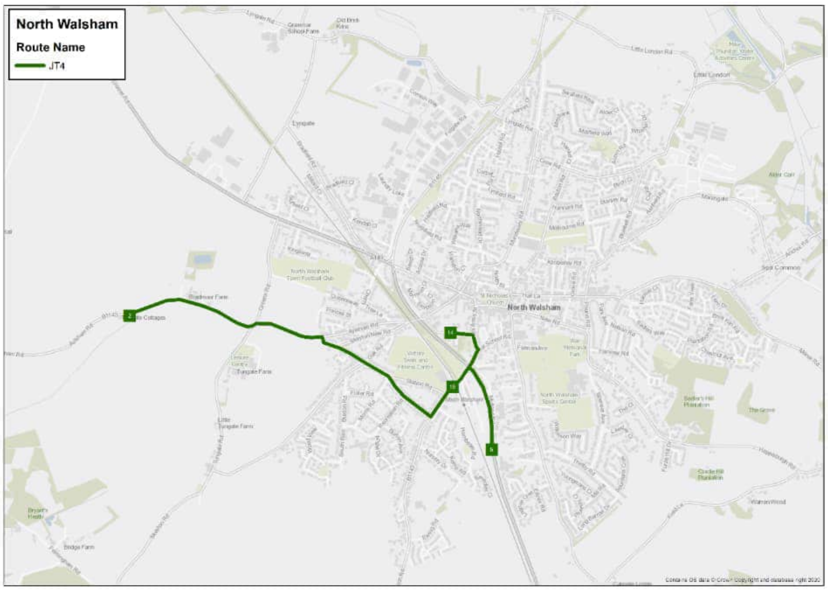

Figure 7-8 – JT4 Route Diagram

7.14 Figure 7-9 show the eastbound validation profile of this route with the observed data for both peaks.

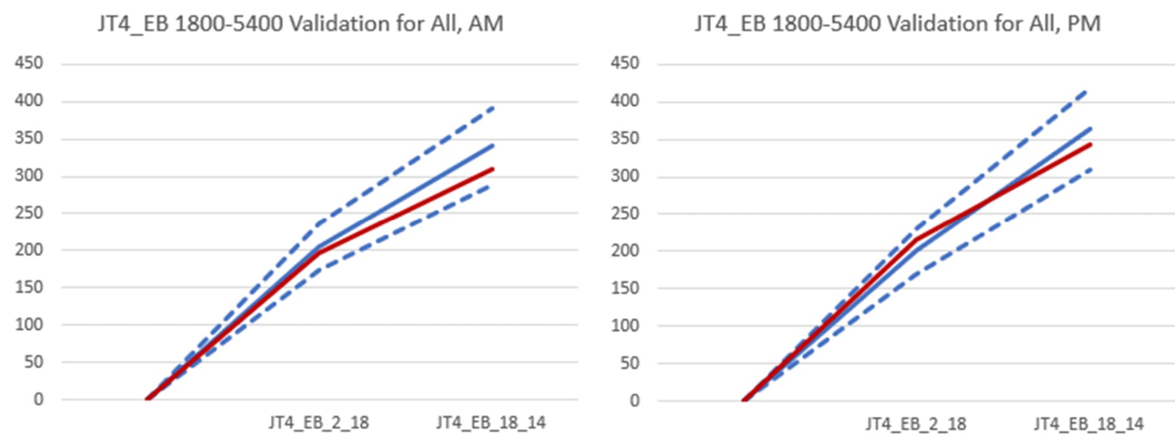

Figure 7-9 – JT4 Eastbound Validation Profile

7.15 Figure 7-10 show the westbound validation profile of this route with the observed data for both peaks.

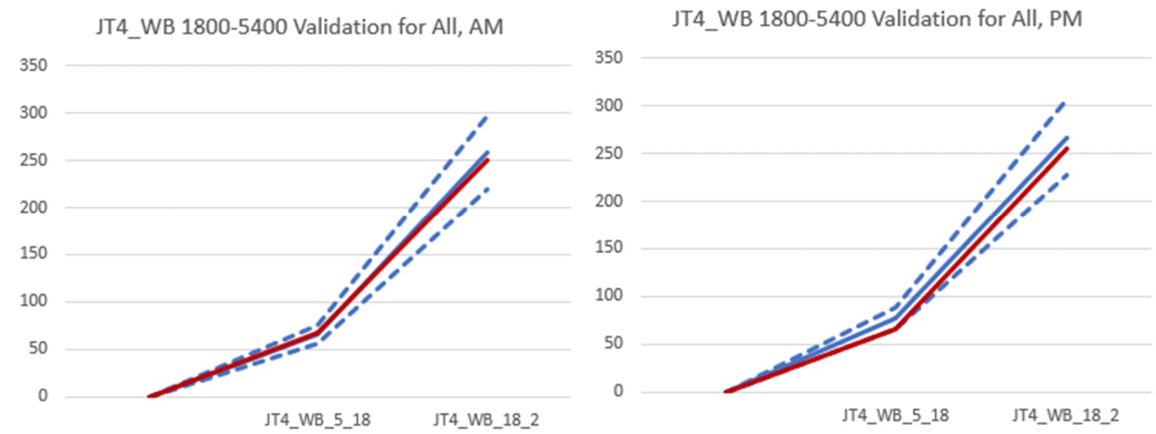

Figure 7-10 – JT4 Westbound Validation profile

Queue Comparison

7.16 In addition to the journey time validation of the model, TAG also recommends a review of the queues in the model and how these relate to existing queues. Although journey times provide a more accurate representation of the existing delays, the visual comparison of the queue patterns in the area provides further reassurance to support the model operation and results.

7.17 Two main sources have been used to understand the main queues in the model area: survey videos and live traffic information from Google Maps on the day the surveys took place.

7.18 The main queues in the AM peak hour are:

- Queues approaching the signalised crossroads of the B1150 and A149; and
- Queues approaching the signalised crossroad of Cromer Road and The North Walsham Bypass.

7.19 Figure 7-11 shows the typical traffic conditions from Google Maps, on a neutral weekday at 08:30.

7.20 Figure 7-12 below, shows a peak hour average speed plot extracted from the model at the same time. The comparison shows that the model provides a reasonable representation of the queuing patterns in the area.

7.21 It should be noted that the lower speeds along Millfield Road, Aylsham Road or Tungate Road shown on the average speed plots, result from lower speeds coded in the model to represent the impact of on-street parking or narrow roads.

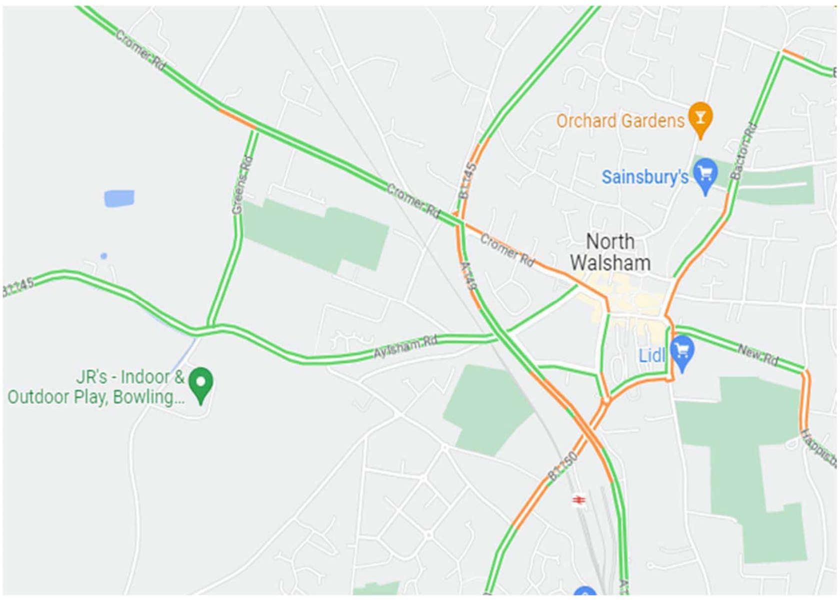

Figure 7-11 - Typical queues from Google Traffic on a Wednesday, 08:30

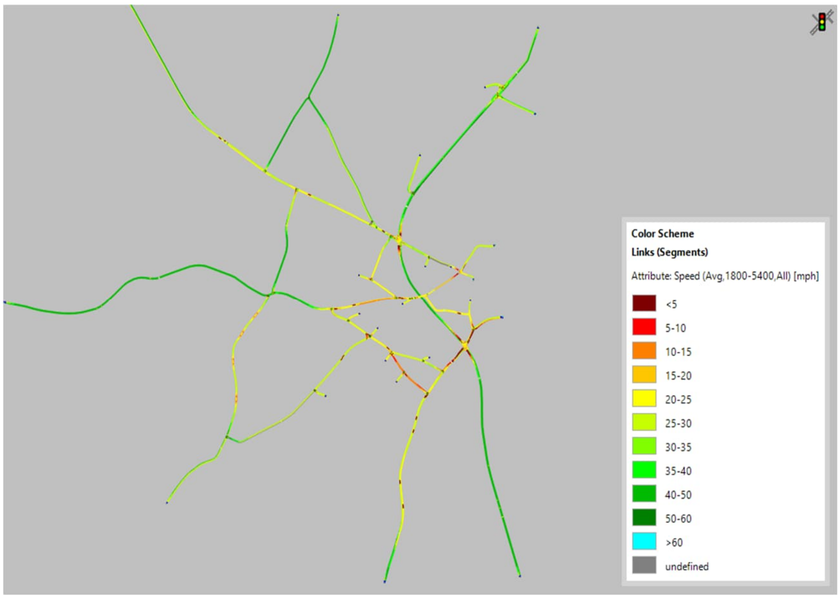

Figure 7-12 - AM Peak Hour Speed Plot

7.22 The main queues in PM peak are largely similar to those in the AM peak hour. These are:

- Queues approaching the crossroads of the A149 and the B1150; and
- Queues/ reduced speeds on Aylsham Road.

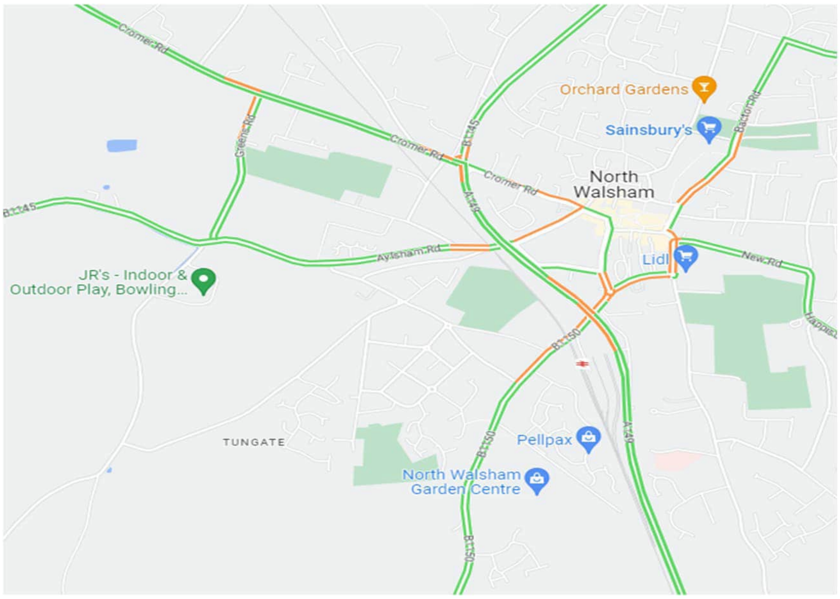

Figure 7-13 - Typical queues from Google Traffic on a Wednesday, 17:00

7.23 Figure 7-13 shows the typical traffic conditions from Google Maps, on a Wednesday at 17:00, and Figure 7-14 below, show the modelled queues during the PM peak. It can be observed that similar queueing patterns are replicated in the model.

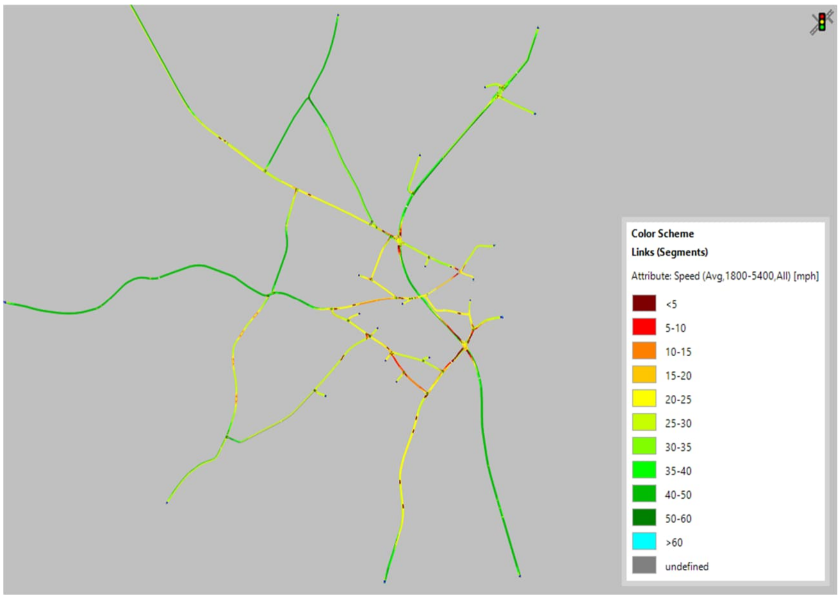

Figure 7-14 – PM Peak Hour Speed Plot

Model Variability

7.24 Microsimulation models are run several times with different random seeds to obtain a statistically representative result. This approach replicates daily variability, since each run has different arrival profiles which results in a different chain of events. A representative average of the results is the obtained/ presented.

7.25 The observed data indicates there is limited variability in the network operation except for the signalised A149/B1150 junction. The queue along Norwich Road approaching this junction is generally long but varied in length, and often disperses every cycle, resulting in highly variable journey times along this section, depending on when the vehicles arrive at the junction.

7.26 This operation and the associated variability have been represented in the model. Figure 7-15 and 7-16 show the operation of the signalised junction on the A149 and Norwich Road in the VISSIM model.

7.27 The figures show how the queues along Norwich Road northbound build up to a significant length but are discharged fully every cycle. This operation is consistent with the observations from the video footage.

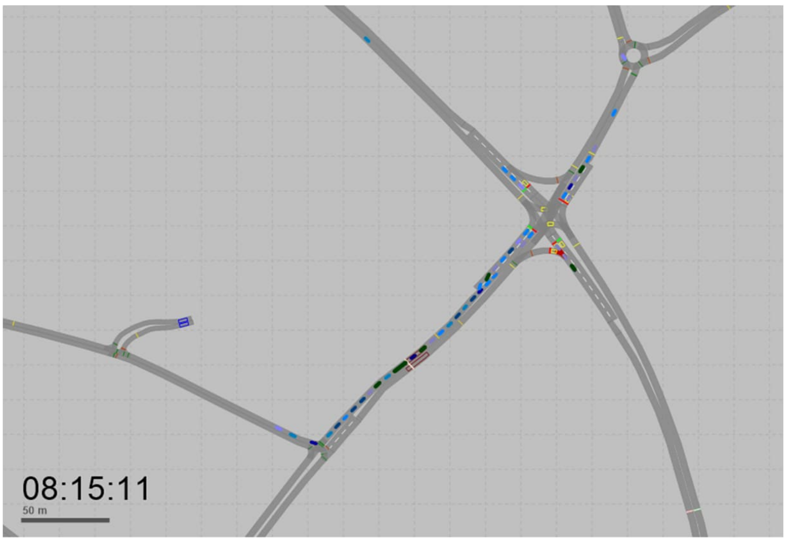

Figure 7-15 - A149/B1150 Junction – Norwich Road northbound green signal starts (AM)

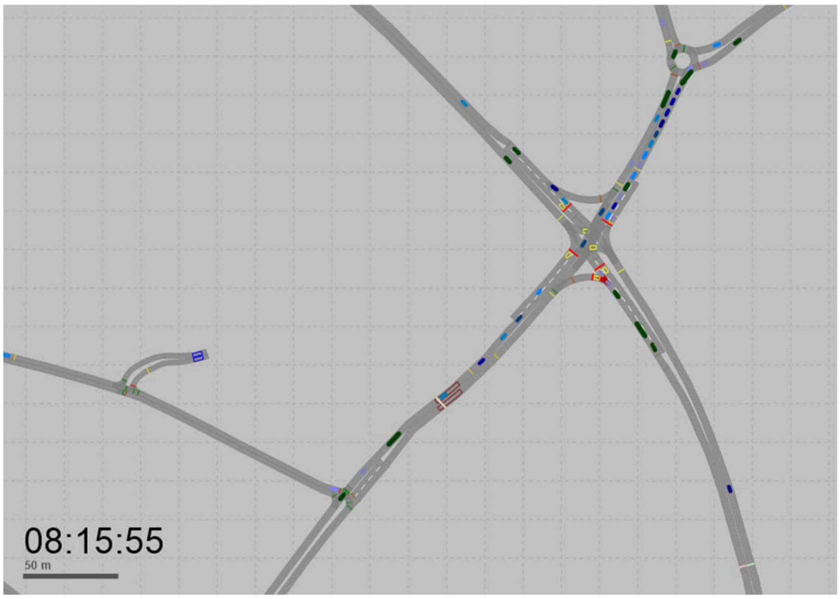

Figure 7-16 - A149/B1150 Junction – Norwich Road northbound green signal ends (AM)

7.28 Figure 7-17 shows the crossroads of the A149 and the B1150 in the VISSIM model at the moment that the green period begins for traffic from the B1150 at 16:42. While Figure 7-18 shows the same junction at the end of the green period. The two figures demonstrate how the queues in this direction build up significantly, but then disperse which is in accordance with observations from video footage.

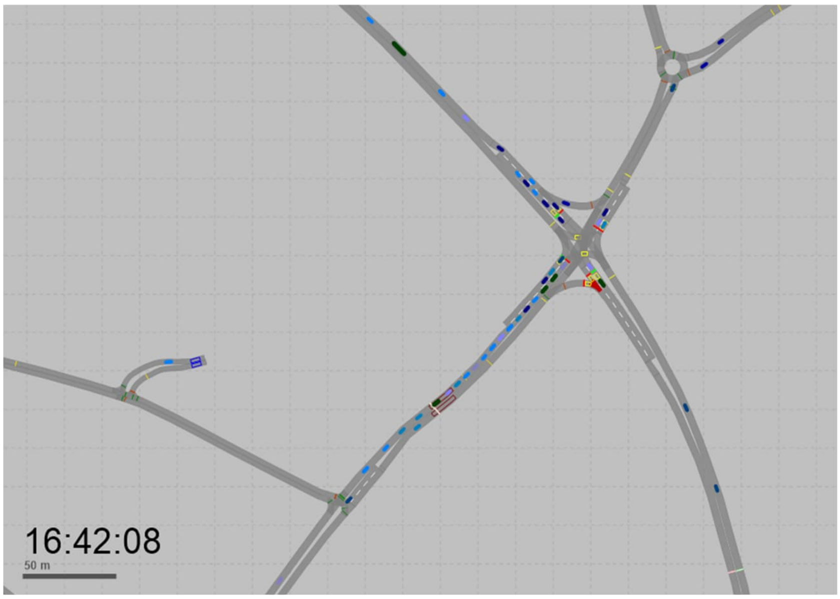

Figure 7-17 - A149/B1150 Junction – Norwich Road northbound green signal starts (PM)

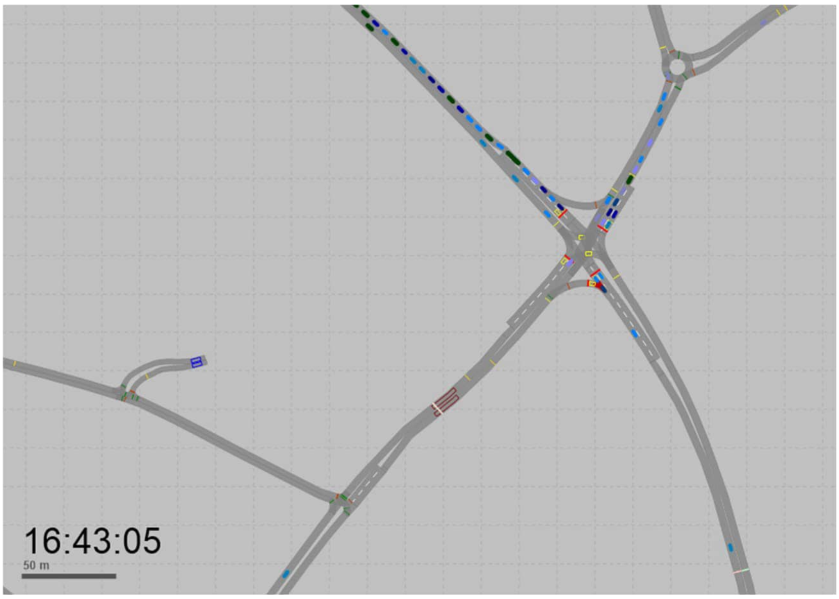

Figure 7-18 - A149/B1150 Junction – Norwich Road northbound green signal ends (PM)

8. Conclusion

8.1 North Walsham is located on the east of England, north of Norwich. The town experiences some congestion around the signalised junctions and the town centre roads with queues often building up in these areas at AM and PM peak times. However, these queues are not too extensive with vehicles usually progressing through signals in a single cycle, with minimum impacts on nearby junctions.

8.2 The base models have been calibrated and validated against the observed traffic flow and journey time data in line with the required criteria set out in TAG and best practice. The calibration/ validation results exceed the requirements for turning counts and journey times and the models are therefore closely aligned with observed data. The models also replicate observed queueing patterns and specific behaviours observed from video footage. The models are therefore validated to industry standard guidelines.

8.3 It is considered the base models provide a close representation of the queues and delays in the network, as well as the observed driving behaviour in the area, and are fit for the purpose of testing future traffic levels/ patterns or potential changes to the road network.

Appendix A – Consistency Checks

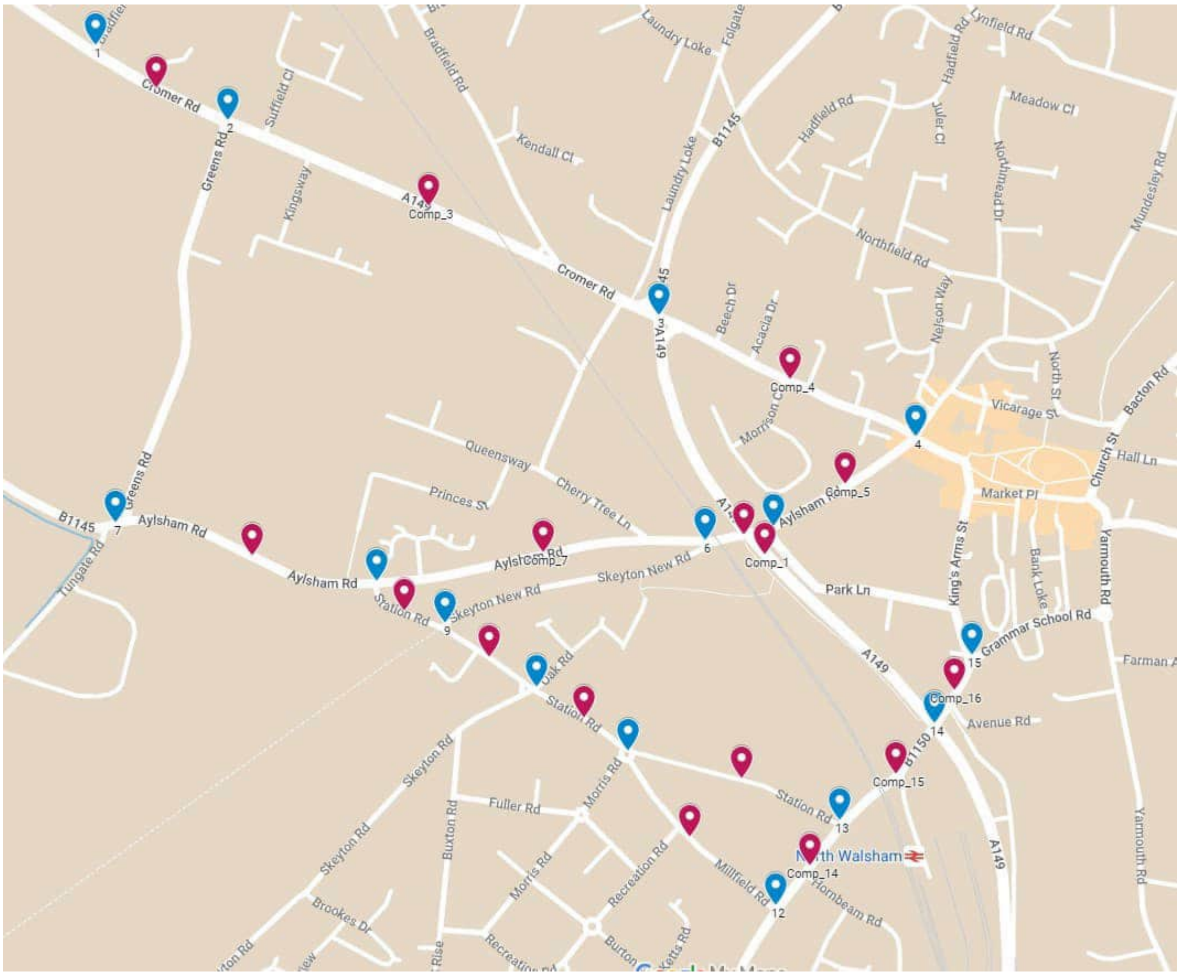

Figure 7. MCTC Count Sites and Comparisons

ID	Site Exit	Site Entry	Difference 13/07/2022	Difference 14/07/2022	Difference AM Avg	GEH ########	GEH ########	GEH ########	GEH AM Avg
Comp_1	14 B	3 C	4	12	**8**	17	0	1	**0**
	3 C	14 B	0	5	**3**	18	0	0	**0**
Comp_2	1 C	2 A	11	4	**8**	0	1	0	**0**
	2 A	1 C	0	0	**0**	0	0	0	**0**
Comp_3	2 C	3 B	56	34	**45**	5	3	2	**2**
	3 B	2 C	3	-19	**-8**	2	0	1	**0**
Comp_4	3 D	4 B	-10	-12	**-11**	2	1	1	**1**
	4 B	3 D	11	15	**13**	6	5	5	**5**
Comp_5	4 C	5 A	0	0	**0**	#DIV/0!	#DIV/0!	#DIV/0!	**#DIV/0!**
	5 A	4 C	-3	0	**-2**	0	0	0	**0**
Comp_6	5 B	6 A	2	0	**1**	0	0	0	**0**
	6 A	5 B	0	0	**0**	0	0	0	**0**
Comp_7	6 B	8 A	5	9	**7**	0	0	1	**1**
	8 A	6 B	6	5	**6**	0	0	0	**0**
Comp_8	7 D	8 B	-1	1	**0**	0	0	0	**0**
	8 B	7 D	0	0	**0**	0	0	0	**0**
Comp_9	8 C	9 B	1	0	**1**	0	0	0	**0**
	9 B	8 C	-2	2	**0**	0	0	0	**0**
Comp_10	9 C	10 B	-3	1	**-1**	0	0	0	**0**
	10 B	9 C	5	4	**5**	0	0	0	**0**
Comp_11	10 D	11 A	-2	-7	**-5**	0	0	1	**0**
	11 A	10 D	-8	2	**-3**	1	1	0	**0**
Comp_12	11 D	13 B	-8	1	**-4**	9	1	0	**1**
	13 B	11 D	-19	-13	**-16**	6	3	2	**3**
Comp_13	11 C	12 B	23	40	**32**	1	2	3	**2**
	12 B	11 C	-29	-30	**-30**	2	2	2	**2**
Comp_14	12 A	13 C	31	22	**27**	30	1	1	**1**
	13 C	12 A	-9	4	**-3**	31	0	0	**0**
Comp_15	13 A	14 C	2	3	**3**	31	0	0	**0**
	14 C	13 A	5	-16	**-6**	32	0	1	**0**
Comp_16	14 A	15 B	-5	10	**3**	0	0	0	**0**
	15 B	14 A	-7	11	**2**	0	0	1	**0**

ID	Site Exit	Site Entry	Difference 13/07/2022	Difference 14/07/2022	Difference PM Avg	GEH ########	GEH ########	GEH ########	GEH AM Avg
Comp_1	14 B	3 C	16	-2	**7**	18	1	0	**0**
	3 C	14 B	23	23	**23**	16	1	1	**1**
Comp_2	1 C	2 A	3	1	**2**	0	0	0	**0**
	2 A	1 C	1	2	**2**	0	0	0	**0**
Comp_3	2 C	3 B	30	57	**44**	4	1	3	**2**
	3 B	2 C	-40	-21	**-31**	4	2	1	**2**
Comp_4	3 D	4 B	-11	-13	**-12**	1	1	1	**1**
	4 B	3 D	5	17	**11**	6	3	6	**5**
Comp_5	4 C	5 A	0	0	**0**	#DIV/0!	#DIV/0!	#DIV/0!	**#DIV/0!**
	5 A	4 C	-5	2	**-2**	0	0	0	**0**
Comp_6	5 B	6 A	2	0	**1**	0	0	0	**0**
	6 A	5 B	0	-1	**-1**	0	0	0	**0**
Comp_7	6 B	8 A	-27	-38	**-33**	3	2	3	**3**
	8 A	6 B	-2	-14	**-8**	1	0	1	**1**
Comp_8	7 D	8 B	-2	0	**-1**	0	0	0	**0**
	8 B	7 D	1	-1	**0**	0	0	0	**0**
Comp_9	8 C	9 B	3	2	**3**	0	0	0	**0**
	9 B	8 C	0	-4	**-2**	0	0	0	**0**
Comp_10	9 C	10 B	-2	-2	**-2**	0	0	0	**0**
	10 B	9 C	-1	4	**2**	0	0	0	**0**
Comp_11	10 D	11 A	-5	-1	**-3**	0	0	0	**0**
	11 A	10 D	-11	6	**-3**	1	1	0	**0**
Comp_12	11 D	13 B	-19	9	**-5**	9	4	1	**1**
	13 B	11 D	-6	-17	**-12**	9	1	3	**2**
Comp_13	11 C	12 B	10	19	**15**	2	1	2	**1**
	12 B	11 C	-32	-50	**-41**	2	2	4	**3**
Comp_14	12 A	13 C	10	12	**11**	32	0	1	**0**
	13 C	12 A	-23	-10	**-17**	29	1	0	**1**
Comp_15	13 A	14 C	48	14	**31**	33	2	1	**1**
	14 C	13 A	2	-6	**-2**	30	0	0	**0**
Comp_16	14 A	15 B	4	-7	**-2**	1	0	0	**0**
	15 B	14 A	4	-1	**2**	1	0	0	**0**

Figure 8. MCTC Consistency Check

Appendix B - Calibration Results

									Cars			HGV			LGV		
						ALL VEH			CAR			HGV			LGV		
	Junction	From	To	Turn ID	Node	Observed	Modelled	GEH	Observed	Modelled	GEH	Observed	Modelled	GEH	Observed	Modelled	GEH
1AC	1	A	C	J1_A_C	101	4	0	2.828	2	0	2.000	0	0	0.000	2	0	2.000
1AB	1	A	B	J1_A_B	101	3	2	0.632	2	1	0.816	0	0	0.000	1	1	0.000
1BA	1	B	A	J1_B_A	101	3	2	0.632	2	2	0.000	0	0	0.000	1	0	1.414
1BC	1	B	C	J1_B_C	101	346	342	0.197	254	253	0.085	33	34	0.164	56	56	0.033
1CB	1	C	B	J1_C_B	101	537	470	3.004	406	357	2.511	33	30	0.498	88	82	0.601
1CA	1	C	A	J1_C_A	101	8	4	1.509	4	4	0.129	0	0	0.000	4	0	2.828
2AC	2	A	C	J2_A_C	102	287	266	1.248	209	196	0.881	29	24	0.981	46	46	0.022
2AB	2	A	B	J2_A_B	102	74	76	0.265	52	56	0.564	6	10	1.399	16	10	1.602
2BA	2	B	A	J2_B_A	102	159	130	2.430	139	107	2.900	4	5	0.471	14	18	0.988
2BC	2	B	C	J2_B_C	102	70	27	6.113	55	25	4.828	7	3	1.897	7	0	3.742
2CB	2	C	B	J2_C_B	102	78	64	1.699	64	57	0.841	6	0	3.464	8	6	0.656
2CA	2	C	A	J2_C_A	102	386	345	2.120	273	256	1.073	26	25	0.148	79	65	1.693
3AD	3	A	D	J3_A_D	103	29	25	0.710	16	18	0.461	0	3	2.510	12	4	2.719
3AC	3	A	C	J3_A_C	103	265	245	1.275	206	197	0.641	15	15	0.051	32	33	0.097
3AB	3	A	B	J3_A_B	103	174	159	1.182	135	123	1.097	15	17	0.500	21	19	0.401
3BA	3	B	A	J3_B_A	103	124	89	3.418	99	62	4.130	9	17	2.160	15	10	1.399
3BD	3	B	D	J3_B_D	103	92	52	4.727	72	38	4.631	2	2	0.000	10	12	0.660
3BC	3	B	C	J3_B_C	103	197	167	2.193	145	135	0.841	22	10	3.045	29	23	1.281
3CB	3	C	B	J3_C_B	103	282	232	3.125	192	177	1.089	18	9	2.370	68	45	2.994
3CA	3	C	A	J3_C_A	103	211	240	1.951	149	184	2.731	16	14	0.463	40	42	0.289
3CD	3	C	D	J3_C_D	103	14	0	5.292	12	0	4.899	0	0	0.000	2	0	2.000
3DC	3	D	C	J3_D_C	103	3	2	0.632	3	2	0.632	0	0	0.000	0	0	0.000
3DB	3	D	B	J3_D_B	103	5	6	0.282	4	4	0.258	0	0	0.000	1	2	0.916
3DA	3	D	A	J3_D_A	103	3	3	0.057	3	3	0.057	0	0	0.000	0	0	0.000
4AD	4	A	D	J4_A_D	104	137	135	0.141	119	118	0.064	0	0	0.000	17	17	0.012
4BA	4	B	A	J4_B_A	104	70	38	4.378	55	26	4.483	0	3	2.530	12	8	1.179
4BD	4	B	D	J4_B_D	104	55	30	3.826	38	22	2.983	3	4	0.485	8	4	1.423
4CA	4	C	A	J4_C_A	104	224	243	1.240	193	211	1.249	2	3	0.772	26	29	0.563
4CD	4	C	D	J4_C_D	104	120	120	0.046	93	102	0.936	3	0	2.449	13	17	1.093
5BA	5	B	A	J5_B_A	105	195	135	4.641	156	122	2.875	3	0	2.449	22	13	2.084
5CB	5	C	B	J5_C_B	105	208	158	3.716	168	143	2.013	3	1	1.596	28	14	3.042
5CA	5	C	A	J5_C_A	105	152	228	5.497	131	192	4.768	1	3	1.543	19	33	2.737
6AC	6	A	C	J6_A_C	106	46	42	0.680	37	41	0.562	1	0	1.414	4	1	1.897
6AB	6	A	B	J6_A_B	106	164	115	4.135	131	102	2.682	2	0	2.000	24	13	2.531
6BA	6	B	A	J6_B_A	106	179	126	4.252	146	113	2.881	2	0	2.000	22	13	2.084
6BC	6	B	C	J6_B_C	106	6	2	1.907	4	0	2.828	0	0	0.000	2	2	0.104
6CB	6	C	B	J6_C_B	106	7	3	1.789	4	2	1.155	0	1	1.414	0	0	0.000
6CA	6	C	A	J6_C_A	106	16	0	5.657	10	0	4.472	1	0	1.414	0	0	0.000
7AD	7	A	D	J7_A_D	107	76	70	0.660	58	50	1.053	5	10	1.811	13	10	0.838
7AC	7	A	C	J7_A_C	107	21	25	0.844	17	25	1.756	2	0	2.000	2	0	2.000
7AB	7	A	B	J7_A_B	107	56	45	1.526	42	39	0.511	5	0	3.162	9	6	0.937
7BA	7	B	A	J7_B_A	107	62	30	4.796	48	27	3.485	6	3	1.497	8	0	4.000
7BD	7	B	D	J7_B_D	107	109	126	1.551	90	107	1.684	2	6	1.924	12	13	0.366
7BC	7	B	C	J7_B_C	107	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000
7CB	7	C	B	J7_C_B	107	4	4	0.076	4	4	0.076	0	0	0.000	0	0	0.000
7CA	7	C	A	J7_C_A	107	22	5	4.663	16	5	3.434	3	0	2.449	2	0	2.000
7CD	7	C	D	J7_C_D	107	22	34	2.183	17	27	2.141	1	4	2.090	3	2	0.632
7DC	7	D	C	J7_D_C	107	18	13	1.229	12	12	0.043	2	0	2.000	2	1	0.816
7DB	7	D	B	J7_D_B	107	128	129	0.119	96	105	0.854	2	3	0.487	26	22	0.806
7DA	7	D	A	J7_D_A	107	146	124	1.893	128	101	2.503	2	5	1.561	13	18	1.247
8AC	8	A	C	J8_A_C	108	35	13	4.416	27	11	3.629	3	2	0.530	4	0	2.828
8AB	8	A	B	J8_A_B	108	141	91	4.627	114	78	3.641	0	0	0.000	21	13	1.981
8BA	8	B	A	J8_B_A	108	101	77	2.572	79	63	1.868	2	5	1.645	16	8	2.176
8BC	8	B	C	J8_B_C	108	105	153	4.194	85	120	3.466	6	15	2.826	12	17	1.385
8CB	8	C	B	J8_C_B	108	151	176	1.989	123	141	1.541	5	8	1.089	20	28	1.633
8CA	8	C	A	J8_C_A	108	78	38	5.191	69	32	5.148	2	0	2.000	5	6	0.447
9AC	9	A	C	J9_A_C	109	51	45	0.873	46	41	0.766	1	1	0.000	4	3	0.535
9AB	9	A	B	J9_A_B	109	2	2	0.000	1	0	1.414	0	0	0.000	1	2	0.816
9BA	9	B	A	J9_B_A	109	2	5	1.645	0	4	2.775	1	1	0.236	0	0	0.000
9BC	9	B	C	J9_B_C	109	139	161	1.784	112	127	1.412	8	16	2.357	16	17	0.295
9CB	9	C	B	J9_C_B	109	229	213	1.049	193	174	1.425	7	8	0.276	24	32	1.503
9CA	9	C	A	J9_C_A	109	16	10	1.711	14	10	1.202	0	0	0.000	0	0	0.000
10AD	10	A	D	J10_A_D	110	4	1	1.897	1	0	1.414	0	0	0.000	3	1	1.414
10AC	10	A	C	J10_A_C	110	1	0	1.414	0	0	0.000	0	0	0.000	0	0	0.000
10AB	10	A	B	J10_A_B	110	4	2	1.155	3	0	2.449	0	0	0.000	0	2	2.000
10BA	10	B	A	J10_B_A	110	2	0	2.000	1	0	1.414	0	0	0.000	1	0	1.414
10BD	10	B	D	J10_B_D	110	133	165	2.618	109	131	2.047	9	17	2.266	15	16	0.329
10BC	10	B	C	J10_B_C	110	52	41	1.660	44	37	1.116	0	0	0.000	5	4	0.572
10CB	10	C	B	J10_C_B	110	55	64	1.142	48	53	0.690	0	0	0.000	6	11	1.686
10CA	10	C	A	J10_C_A	110	3	0	2.449	0	0	0.000	0	0	0.000	0	0	0.000
10CD	10	C	D	J10_C_D	110	41	28	2.251	33	28	0.943	0	0	0.000	5	0	3.162
10DC	10	D	C	J10_D_C	110	33	38	0.839	31	37	0.980	0	0	0.000	1	1	0.280
10DB	10	D	B	J10_D_B	110	181	158	1.790	151	131	1.684	7	8	0.258	18	19	0.232
10DA	10	D	A	J10_D_A	110	5	15	3.198	2	14	4.198	0	0	0.000	2	1	0.502
11AD	11	A	D	J11_A_D	111	34	25	1.627	30	25	0.924	0	0	0.000	2	0	2.000
11AC	11	A	C	J11_A_C	111	129	142	1.117	102	110	0.777	9	14	1.592	18	18	0.107
11AB	11	A	B	J11_A_B	111	12	14	0.461	11	14	0.755	0	0	0.000	1	0	1.414
11AA	11	A	A	J11_A_A	111	1	13	4.470	1	10	3.812	0	3	2.366	0	0	0.000
11BA	11	B	A	J11_B_A	111	42	62	2.736	39	60	2.953	0	0	0.000	2	2	0.036
11BD	11	B	D	J11_B_D	111	13	0	5.099	11	0	4.690	0	0	0.000	0	0	0.000
11BC	11	B	C	J11_B_C	111	21	20	0.243	18	18	0.024	0	0	0.000	3	2	0.632
11BB	11	B	B	J11_B_B	111	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000
11CB	11	C	B	J11_C_B	111	13	10	0.948	13	10	0.948	0	0	0.000	0	0	0.000
11CA	11	C	A	J11_C_A	111	162	133	2.401	133	108	2.244	7	5	0.861	17	20	0.608
11CD	11	C	D	J11_C_D	111	3	0	2.449	3	0	2.449	0	0	0.000	0	0	0.000
11CC	11	C	C	J11_C_C	111	0	11	4.712	0	4	2.846	0	0	0.000	0	7	3.755
11DC	11	D	C	J11_D_C	111	2	0	2.000	1	0	1.414	0	0	0.000	1	0	1.414
11DB	11	D	B	J11_D_B	111	3	0	2.449	3	0	2.449	0	0	0.000	0	0	0.000
11DA	11	D	A	J11_D_A	111	22	4	4.895	19	4	4.321	0	0	0.000	2	0	2.000
11DD	11	D	D	J11_D_D	111	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000
12AC	12	A	C	J12_A_C	112	385	327	3.055	308	263	2.691	14	11	0.985	55	54	0.101
12AB	12	A	B	J12_A_B	112	122	78	4.422	105	74	3.237	2	0	2.000	13	3	3.330
12BA	12	B	A	J12_B_A	112	86	84	0.272	74	73	0.093	0	1	1.414	12	9	0.827
12BC	12	B	C	J12_B_C	112	89	120	3.064	68	86	2.078	7	15	2.350	12	19	1.856
12CB	12	C	B	J12_C_B	112	85	99	1.495	66	68	0.202	5	5	0.045	12	27	3.360
12CA	12	C	A	J12_C_A	112	350	320	1.667	262	256	0.370	14	14	0.121	69	50	2.477
13AC	13	A	C	J13_A_C	113	511	406	4.891	417	338	4.066	15	10	1.276	69	58	1.407
13AB	13	A	B	J13_A_B	113	35	26	1.610	33	26	1.269	0	0	0.000	1	0	1.414
13BA	13	B	A	J13_B_A	113	40	64	3.340	35	62	3.889	0	0	0.000	3	2	0.632
13BC	13	B	C	J13_B_C	113	1	0	1.414	1	0	1.414	0	0	0.000	0	0	0.000
13CB	13	C	B	J13_C_B	113	10	2	3.293	8	2	2.712	0	0	0.000	2	0	2.000
13CA	13	C	A	J13_C_A	113	455	399	2.715	354	325	1.555	15	15	0.130	81	59	2.623
14AD	14	A	D	J14_A_D	114	47	71	3.177	34	37	0.520	1	13	4.448	11	22	2.657
14AC	14	A	C	J14_A_C	114	277	247	1.825	236	205	2.067	5	5	0.067	33	37	0.676
14AB	14	A	B	J14_A_B	114	130	161	2.535	94	139	4.182	6	4	0.749	28	17	2.295
14BA	14	B	A	J14_B_A	114	89	117	2.764	70	97	2.965	9	4	1.938	6	16	2.992
14BD	14	B	D	J14_B_D	114	160	141	1.578	110	104	0.614	21	16	1.113	27	21	1.268
14BC	14	B	C	J14_B_C	114	216	155	4.479	172	131	3.374	7	5	0.707	29	19	1.985
14CB	14	C	B	J14_C_B	114	179	146	2.630	123	114	0.789	11	3	2.903	44	28	2.694
14CA	14	C	A	J14_C_A	114	279	264	0.898	234	225	0.621	7	12	1.523	31	28	0.562
14CD	14	C	D	J14_C_D	114	47	51	0.557	35	46	1.662	0	0	0.000	12	5	2.258
14DC	14	D	C	J14_D_C	114	55	30	3.791	42	29	2.145	3	0	2.449	9	1	3.546
14DB	14	D	B	J14_D_B	114	194	168	1.906	133	110	2.120	15	16	0.316	39	42	0.541
14DA	14	D	A	J14_D_A	114	84	121	3.668	73	105	3.421	1	2	0.816	10	14	1.115
15AC	15	A	C	J15_A_C	115	30	21	1.815	21	21	0.033	1	0	1.414	3	0	2.449
15AB	15	A	B	J15_A_B	115	60	59	0.071	46	49	0.435	1	5	2.478	11	5	2.121
15AA	15	A	A	J15_A_A	115	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000
15BA	15	B	A	J15_B_A	115	139	190	3.998	119	170	4.269	2	3	0.744	16	17	0.185
15BC	15	B	C	J15_B_C	115	307	298	0.535	252	248	0.237	15	13	0.674	33	37	0.668
15BB	15	B	B	J15_B_B	115	1	14	4.716	1	8	3.271	0	2	2.000	0	4	2.811
15CB	15	C	B	J15_C_B	115	400	409	0.433	322	328	0.308	11	14	0.862	62	67	0.635
15CA	15	C	A	J15_C_A	115	165	142	1.852	137	127	0.884	1	0	1.414	22	15	1.577
15CC	15	C	C	J15_C_C	115	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000
22AC	22	A	C	J22_A_C	122	190	195	0.339	139	135	0.333	16	22	1.324	35	38	0.472
22AB	22	A	B	J22_A_B	122	141	138	0.284	112	114	0.212	9	9	0.116	20	14	1.442
22BC	22	B	C	J22_B_C	122	6	0	3.464	3	0	2.449	0	0	0.000	3	0	2.449
22BA	22	B	A	J22_B_A	122	63	72	1.125	30	41	1.854	11	11	0.015	22	20	0.403
22CA	22	C	A	J22_C_A	122	389	357	1.683	327	297	1.704	19	24	1.109	43	35	1.205
22CB	22	C	B	J22_C_B	122	12	12	0.014	8	8	0.000	0	0	0.000	4	4	0.025
23AB	23	A	B	J23_A_B	123	47	47	0.000	41	41	0.016	0	0	0.000	6	6	0.041
23AC	23	A	C	J23_A_C	123	160	178	1.385	132	159	2.227	7	4	1.303	21	15	1.363
23AD	23	A	D	J23_A_D	123	18	16	0.485	11	10	0.324	1	0	1.414	6	6	0.020
23BA	23	B	A	J23_B_A	123	45	47	0.229	36	36	0.025	3	4	0.704	6	6	0.020
23BC	23	B	C	J23_B_C	123	224	174	3.575	198	145	4.072	5	8	1.177	21	21	0.022
23BD	23	B	D	J23_B_D	123	51	51	0.000	37	38	0.139	1	0	1.414	13	13	0.041
23CA	23	C	A	J23_C_A	123	123	117	0.525	81	75	0.633	8	9	0.259	34	33	0.155
23CB	23	C	B	J23_C_B	123	67	55	1.557	47	47	0.029	8	4	1.681	12	4	2.940
23CD	23	C	D	J23_C_D	123	22	23	0.179	13	13	0.084	6	9	1.145	3	1	1.414
23DA	23	D	A	J23_D_A	123	11	12	0.295	4	4	0.025	4	5	0.494	3	3	0.000
23DB	23	D	B	J23_D_B	123	18	19	0.244	7	7	0.019	2	3	0.661	9	9	0.017
23DC	23	D	C	J23_D_C	123	18	17	0.203	6	2	2.000	8	12	1.293	4	3	0.506

Figure 8-1. AM Cal Turns

					ALL VEH			CAR			HGV			LGV		
Junction	From	To	Turn ID	Node	Observed	Modelled	GEH	Observed	Modelled	GEH	Observed	Modelled	GEH	Observed	Modelled	GEH
1	A	C	J1_A_C	101	6	3	1.332	2	3	0.717	0	0	0.000	0	0	0.000
1	A	B	J1_A_B	101	3	4	0.584	2	3	0.661	0	0	0.000	1	1	0.049
1	B	A	J1_B_A	101	6	4	0.944	4	4	0.050	0	0	0.000	1	0	1.414
1	B	C	J1_B_C	101	563	536	1.143	452	456	0.197	17	16	0.159	78	64	1.705
1	C	B	J1_C_B	101	467	439	1.323	388	374	0.709	13	19	1.397	54	46	1.109
1	C	A	J1_C_A	101	2	0	2.000	1	0	1.414	1	0	1.414	0	0	0.000
2	A	C	J2_A_C	102	482	438	2.073	387	378	0.481	15	13	0.411	65	47	2.478
2	A	B	J2_A_B	102	88	104	1.604	70	83	1.486	2	3	0.632	12	18	1.479
2	B	A	J2_B_A	102	115	116	0.102	95	95	0.041	3	3	0.000	13	19	1.386
2	B	C	J2_B_C	102	53	48	0.696	41	44	0.438	1	0	1.033	9	4	1.961
2	C	B	J2_C_B	102	79	76	0.352	70	72	0.190	1	0	1.414	6	4	0.749
2	C	A	J2_C_A	102	353	323	1.632	296	280	0.958	12	16	0.944	37	28	1.626
3	A	D	J3_A_D	103	60	52	1.104	47	46	0.191	0	0	0.000	12	6	1.981
3	A	C	J3_A_C	103	287	282	0.293	232	219	0.842	7	8	0.276	45	55	1.407
3	A	B	J3_A_B	103	194	184	0.727	164	161	0.220	9	8	0.290	14	15	0.172
3	B	A	J3_B_A	103	148	134	1.153	113	111	0.198	9	4	1.891	23	19	0.816
3	B	D	J3_B_D	103	135	135	0.009	119	116	0.300	2	3	0.772	11	16	1.385
3	B	C	J3_B_C	103	290	226	3.955	233	201	2.176	9	7	0.632	45	18	4.746
3	C	B	J3_C_B	103	269	211	3.727	228	191	2.545	6	3	1.252	32	17	3.077
3	C	A	J3_C_A	103	275	258	1.038	215	216	0.058	11	16	1.336	40	26	2.379
3	C	D	J3_C_D	103	28	23	0.907	26	23	0.523	0	0	0.000	1	0	1.414
3	D	C	J3_D_C	103	6	9	1.112	6	9	1.112	0	0	0.000	0	0	0.000
3	D	B	J3_D_B	103	6	9	1.079	6	9	1.079	0	0	0.000	0	0	0.000
3	D	A	J3_D_A	103	1	0	1.414	1	0	1.414	0	0	0.000	0	0	0.000
4	A	D	J4_A_D	104	139	142	0.261	127	131	0.326	0	0	0.000	8	11	1.092
4	B	A	J4_B_A	104	107	68	4.128	88	52	4.296	2	0	2.000	16	16	0.075
4	B	D	J4_B_D	104	91	95	0.379	72	79	0.749	0	3	2.550	13	13	0.028
4	C	A	J4_C_A	104	304	260	2.617	252	247	0.294	1	0	1.414	41	13	5.462
4	C	D	J4_C_D	104	121	131	0.930	102	97	0.486	2	3	0.632	12	31	4.148
4	D	C (Banned Movement)	Banned M	104	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000
4	D	B (Banned Movement)	Banned M	104	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000
4	D	A (Banned Movement)	Banned M	104	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000
5	A	C (Banned Movement)	Banned M	105	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000
5	A	B (Banned Movement)	Banned M	105	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000
5	B	A	J5_B_A	105	180	110	5.818	142	98	4.002	1	0	1.414	24	12	2.884
5	B	C (Banned Movement)	Banned M	105	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000
5	C	B	J5_C_B	105	194	139	4.304	171	122	4.084	4	0	2.828	12	17	1.289
5	C	A	J5_C_A	105	248	282	2.074	213	247	2.220	2	3	0.632	29	32	0.561
6	A	C	J6_A_C	106	50	38	1.737	42	38	0.560	0	0	0.000	0	0	0.000
6	A	B	J6_A_B	106	148	100	4.320	129	83	4.463	4	0	2.828	12	17	1.277
6	B	A	J6_B_A	106	159	94	5.769	128	82	4.457	1	0	1.414	24	12	2.884
6	B	C	J6_B_C	106	9	7	0.670	6	7	0.430	0	0	0.000	0	0	0.000
6	C	B	J6_C_B	106	5	5	0.000	4	4	0.000	0	0	0.000	1	1	0.000
6	C	A	J6_C_A	106	21	16	1.162	14	16	0.516	0	0	0.000	0	0	0.000
7	A	D	J7_A_D	107	81	101	2.052	68	80	1.356	1	3	1.414	10	18	2.115
7	A	C	J7_A_C	107	27	21	1.203	17	21	0.939	1	0	1.414	4	0	2.828
7	A	B	J7_A_B	107	64	59	0.625	53	55	0.232	1	0	1.414	7	4	1.089
7	B	A	J7_B_A	107	40	35	0.741	30	31	0.226	0	0	0.548	9	4	1.938
7	B	D	J7_B_D	107	116	104	1.174	91	91	0.021	2	3	0.744	18	10	2.230
7	B	C	J7_B_C	107	5	5	0.000	5	5	0.000	0	0	0.000	0	0	0.000
7	C	B	J7_C_B	107	5	4	0.496	4	4	0.025	0	0	0.000	1	0	1.414
7	C	A	J7_C_A	107	29	22	1.439	24	19	1.136	2	3	0.632	2	0	2.000
7	C	D	J7_C_D	107	22	16	1.266	17	16	0.134	0	0	0.000	5	0	3.162
7	D	C	J7_D_C	107	24	17	1.594	21	17	0.966	0	0	0.000	2	0	2.000
7	D	B	J7_D_B	107	79	78	0.164	66	64	0.236	2	0	2.000	10	13	1.008
7	D	A	J7_D_A	107	101	108	0.685	82	89	0.773	2	0	2.000	15	19	0.936
8	A	C	J8_A_C	108	20	18	0.530	15	16	0.179	1	0	1.414	3	2	0.632
8	A	B	J8_A_B	108	97	67	3.331	79	59	2.453	4	0	2.828	13	8	1.474
8	B	A	J8_B_A	108	99	68	3.339	71	62	1.142	1	0	1.414	22	7	4.022
8	B	C	J8_B_C	108	116	153	3.194	100	126	2.424	2	6	2.093	11	21	2.511
8	C	B	J8_C_B	108	106	136	2.740	89	112	2.290	0	0	0.000	14	24	2.334
8	C	A	J8_C_A	108	77	56	2.549	59	48	1.475	1	0	1.414	14	8	1.809
9	A	C	J9_A_C	109	43	42	0.130	42	42	0.023	0	0	0.000	0	0	0.000
9	A	B	J9_A_B	109	4	1	1.897	3	1	1.414	0	0	0.000	0	0	0.000
9	B	A	J9_B_A	109	4	2	1.292	1	2	0.676	0	0	0.000	2	0	2.000
9	B	C	J9_B_C	109	134	169	2.828	113	139	2.350	3	6	1.511	15	23	1.866
9	C	B	J9_C_B	109	178	192	1.008	145	160	1.175	0	0	0.000	28	32	0.766
9	C	A	J9_C_A	109	24	14	2.333	20	12	1.972	0	0	0.000	1	2	0.640
10	A	D	J10_A_D	110	6	0	3.464	2	0	2.000	0	0	0.000	0	0	0.000
10	A	C	J10_A_C	110	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000
10	A	B	J10_A_B	110	6	8	0.756	6	8	0.756	0	0	0.000	0	0	0.000
10	B	A	J10_B_A	110	0	2	1.924	0	2	1.924	0	0	0.000	0	0	0.000
10	B	D	J10_B_D	110	127	168	3.395	108	139	2.768	2	6	2.093	14	23	2.143
10	B	C	J10_B_C	110	47	41	0.905	44	41	0.460	1	0	1.414	1	0	1.414
10	C	B	J10_C_B	110	34	30	0.671	29	30	0.221	0	0	0.000	2	0	2.000
10	C	A	J10_C_A	110	2	0	2.000	0	0	0.000	0	0	0.000	0	0	0.000
10	C	D	J10_C_D	110	28	20	1.644	21	20	0.232	0	0	0.000	6	0	3.464
10	D	C	J10_D_C	110	27	45	2.978	19	35	3.038	0	0	0.000	8	10	0.698
10	D	B	J10_D_B	110	162	167	0.394	130	133	0.257	0	0	0.000	27	34	1.285
10	D	A	J10_D_A	110	5	4	0.397	5	4	0.397	0	0	0.000	0	0	0.000
11	A	D	J11_A_D	111	33	18	2.993	28	16	2.583	0	0	0.000	2	2	0.000
11	A	C	J11_A_C	111	111	150	3.418	91	122	3.044	2	6	2.129	18	21	0.734
11	A	B	J11_A_B	111	9	12	0.854	8	12	1.193	0	0	0.000	1	0	1.414
11	A	A	J11_A_A	111	8	9	0.293	6	9	1.046	0	0	0.000	2	0	2.000
11	B	A	J11_B_A	111	8	10	0.667	6	6	0.000	0	0	0.000	2	4	1.155
11	B	D	J11_B_D	111	3	2	0.632	2	2	0.000	0	0	0.000	0	0	0.000
11	B	C	J11_B_C	111	2	2	0.000	2	2	0.000	0	0	0.000	0	0	0.000
11	B	B	J11_B_B	111	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000
11	C	B	J11_C_B	111	10	4	2.314	6	4	0.944	0	0	0.000	3	0	2.449
11	C	A	J11_C_A	111	163	154	0.703	126	124	0.183	0	0	0.000	33	30	0.498
11	C	D	J11_C_D	111	4	0	2.828	3	0	2.449	0	0	0.000	1	0	1.414
11	C	C	J11_C_C	111	1	2	0.782	1	2	0.782	0	0	0.000	0	0	0.000
11	D	C	J11_D_C	111	2	0	2.000	2	0	2.000	0	0	0.000	0	0	0.000
11	D	B	J11_D_B	111	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000
11	D	A	J11_D_A	111	27	43	2.667	22	33	2.080	1	0	1.414	2	10	3.225
11	D	D	J11_D_D	111	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000
12	A	C	J12_A_C	112	388	390	0.104	303	315	0.691	10	14	1.141	68	61	0.878
12	A	B	J12_A_B	112	101	56	5.137	80	46	4.334	0	0	0.000	20	10	2.612
12	B	A	J12_B_A	112	51	44	0.956	44	42	0.243	0	0	0.000	6	2	2.000
12	B	C	J12_B_C	112	68	85	1.987	55	63	0.991	3	7	1.643	10	16	1.713
12	C	B	J12_C_B	112	109	125	1.510	85	109	2.446	0	0	0.000	19	16	0.655
12	C	A	J12_C_A	112	442	395	2.292	358	319	2.097	9	12	1.053	66	63	0.342
13	A	C	J13_A_C	113	501	441	2.746	394	357	1.917	11	14	0.822	88	71	1.948
13	A	B	J13_A_B	113	35	40	0.777	30	40	1.651	0	0	0.000	4	0	2.828
13	B	A	J13_B_A	113	25	42	2.967	43	41	0.379	0	0	0.000	2	2	0.259
13	B	C	J13_B_C	113	9	4	2.079	8	4	1.753	0	0	0.000	0	0	0.000
13	C	B	J13_C_B	113	8	10	0.667	11	10	0.309	0	0	0.000	3	0	2.449
13	C	A	J13_C_A	113	492	428	2.998	399	350	2.537	10	13	0.745	74	65	1.042
14	A	D	J14_A_D	114	60	61	0.173	53	49	0.517	1	0	1.414	6	12	2.014
14	A	C	J14_A_C	114	237	227	0.650	194	189	0.332	5	7	0.760	34	31	0.553
14	A	B	J14_A_B	114	132	122	0.892	105	111	0.582	3	3	0.000	22	8	3.647
14	B	A	J14_B_A	114	96	58	4.369	80	58	2.688	4	0	2.828	12	0	4.899
14	B	D	J14_B_D	114	263	261	0.142	211	212	0.079	10	11	0.443	38	37	0.147
14	B	C	J14_B_C	114	239	199	2.703	189	157	2.405	3	4	0.485	44	38	0.978
14	C	B	J14_C_B	114	194	150	3.331	160	129	2.605	4	3	0.450	25	18	1.405
14	C	A	J14_C_A	114	289	261	1.679	238	208	2.009	5	8	1.246	44	45	0.142
14	C	D	J14_C_D	114	58	55	0.446	51	50	0.212	1	1	0.236	6	4	0.944
14	D	C	J14_D_C	114	64	57	0.920	52	52	0.021	2	3	0.689	10	2	3.321
14	D	B	J14_D_B	114	237	222	1.024	195	192	0.237	10	13	0.787	26	17	1.905
14	D	A	J14_D_A	114	85	93	0.858	65	70	0.632	2	3	0.689	14	20	1.411
15	A	C	J15_A_C	115	20	21	0.254	16	17	0.270	1	1	0.000	2	3	0.661
15	A	B	J15_A_B	115	60	51	1.215	50	51	0.134	0	0	0.000	9	0	4.243
15	A	A	J15_A_A	115	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000
15	B	A	J15_B_A	115	190	172	1.304	151	138	1.047	4	0	2.828	31	34	0.535
15	B	C	J15_B_C	115	280	235	2.827	230	193	2.562	7	11	1.436	40	31	1.591
15	B	B	J15_B_B	115	1	4	1.875	1	4	1.875	0	0	0.000	0	0	0.000
15	C	B	J15_C_B	115	361	358	0.137	294	298	0.209	8	10	0.651	52	51	0.160
15	C	A	J15_C_A	115	180	164	1.251	160	148	0.996	2	3	0.632	14	13	0.286
15	C	C	J15_C_C	115	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000
22	A	C	J22_A_C	122	338	304	1.921	282	259	1.411	10	10	0.048	46	35	1.737
22	A	B	J22_A_B	122	74	89	1.709	47	69	2.859	10	10	0.047	17	11	1.738
22	B	C	J22_B_C	122	8	8	0.018	8	8	0.018	0	0	0.000	0	0	0.000
22	B	A	J22_B_A	122	163	155	0.655	127	125	0.218	6	2	2.000	30	28	0.334
22	C	A	J22_C_A	122	367	363	0.194	316	303	0.750	10	14	1.115	41	47	0.853
22	C	B	J22_C_B	122	5	6	0.447	3	2	0.632	2	2	0.000	0	2	2.025
23	A	B	J23_A_B	123	38	38	0.049	27	27	0.029	5	5	0.044	6	6	0.020
23	A	C	J23_A_C	123	120	115	0.438	105	96	0.893	2	4	1.131	13	15	0.599
23	A	D	J23_A_D	123	9	4	1.915	8	4	1.609	0	0	0.000	1	0	1.311
23	B	A	J23_B_A	123	68	69	0.121	58	59	0.085	0	0	0.000	10	10	0.110
23	B	C	J23_B_C	123	152	151	0.114	130	125	0.483	5	8	1.194	17	18	0.239
23	B	D	J23_B_D	123	12	15	0.816	11	13	0.577	0	0	0.000	1	2	0.816
23	C	A	J23_C_A	123	160	151	0.722	124	117	0.601	6	6	0.121	30	27	0.504
23	C	B	J23_C_B	123	142	145	0.284	132	138	0.474	0	0	0.000	10	8	0.702
23	C	D	J23_C_D	123	14	16	0.491	8	12	1.336	4	4	0.179	2	0	2.000
23	D	A	J23_D_A	123	19	19	0.011	16	15	0.254	0	0	0.000	3	4	0.510
23	D	B	J23_D_B	123	72	64	0.958	61	53	1.046	0	0	0.000	11	11	0.000
23	D	C	J23_D_C	123	93	104	1.089	80	85	0.534	4	4	0.000	9	15	1.719

Figure 8-2. PM Cal Turns

Appendix C – Flow Diagram

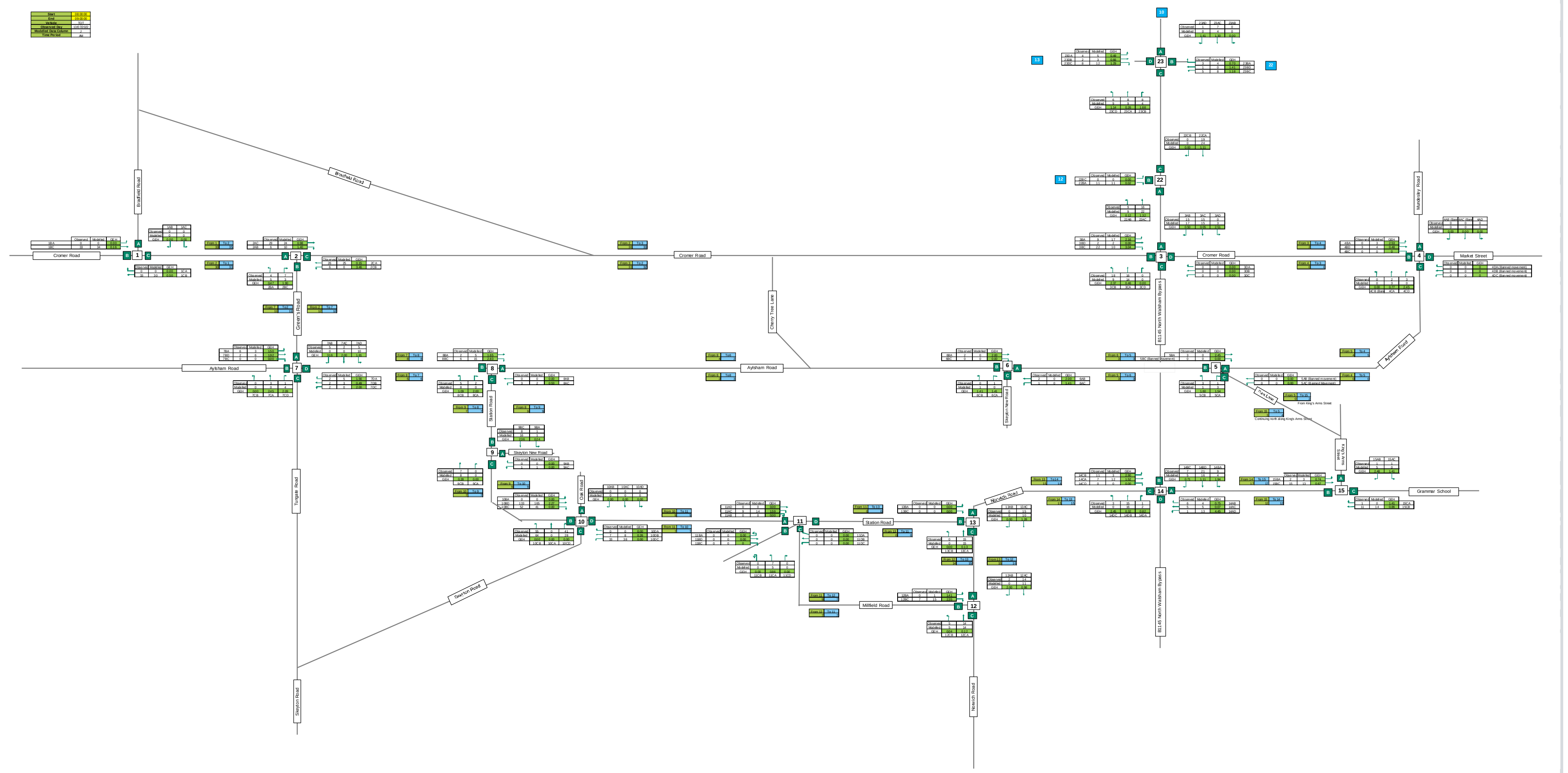

Figure 8-3. AM Calibration Flow Diagram

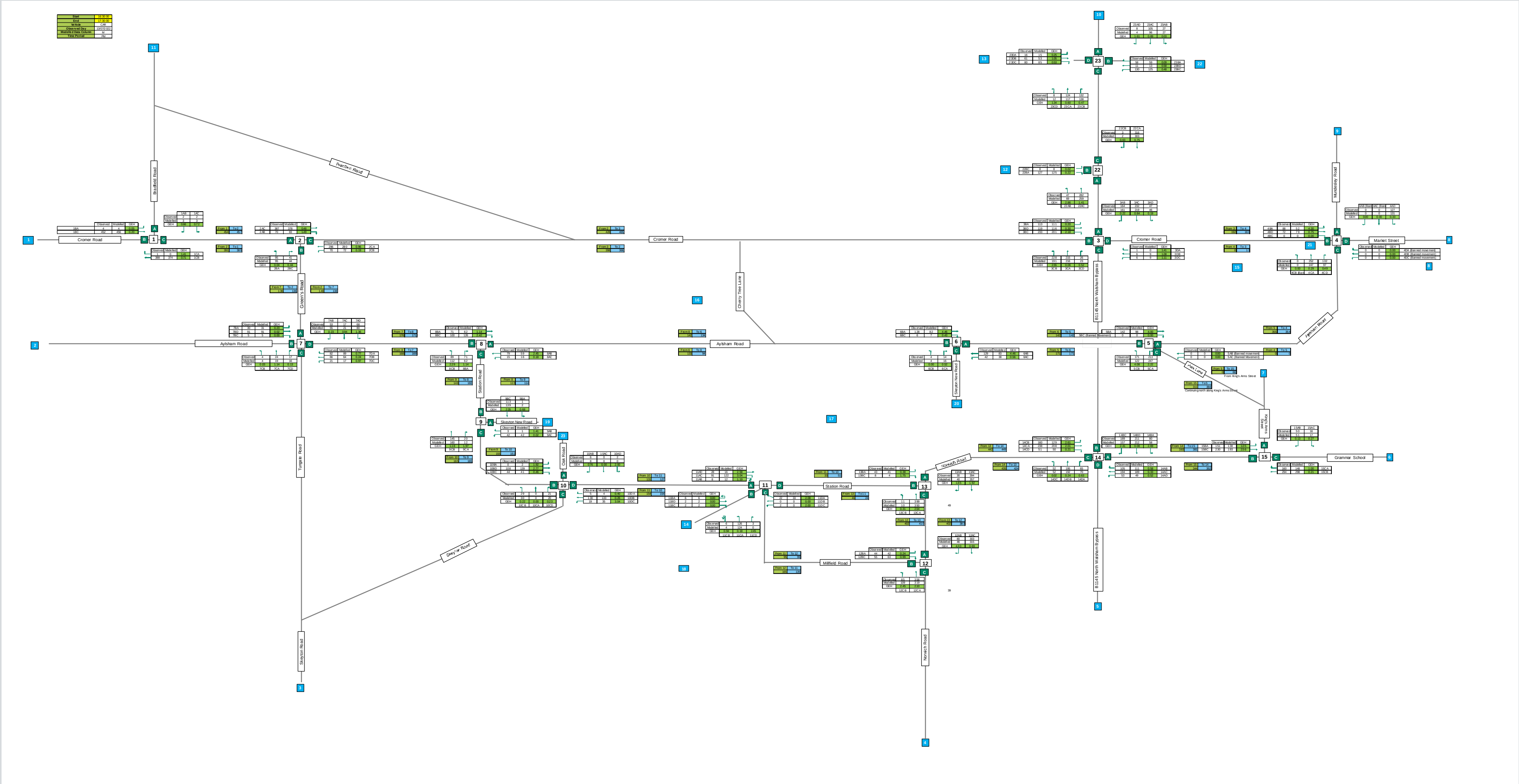

Figure 8-4. PM Calibration Flow Chart

Appendix D – Journey Time Validation Results

Journey Time Route 1

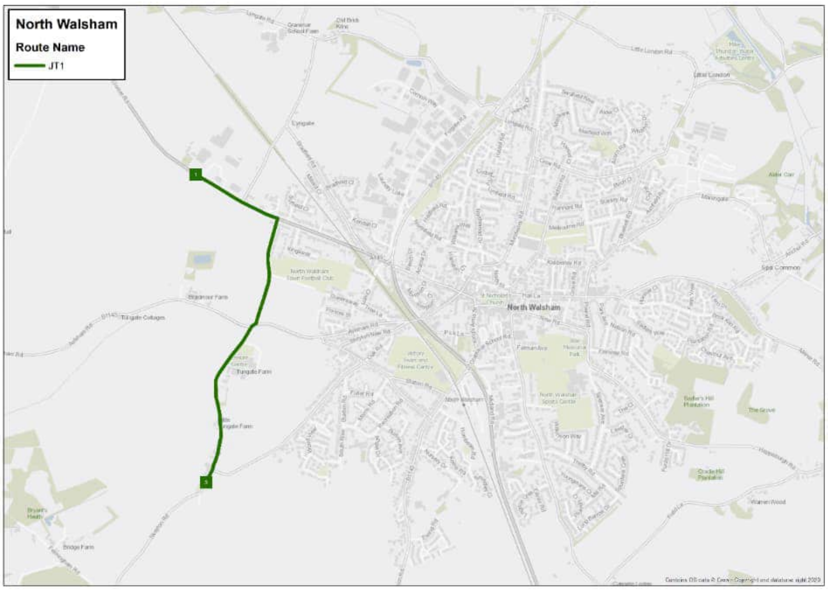

Figure 8-5. JT1 Route Diagram

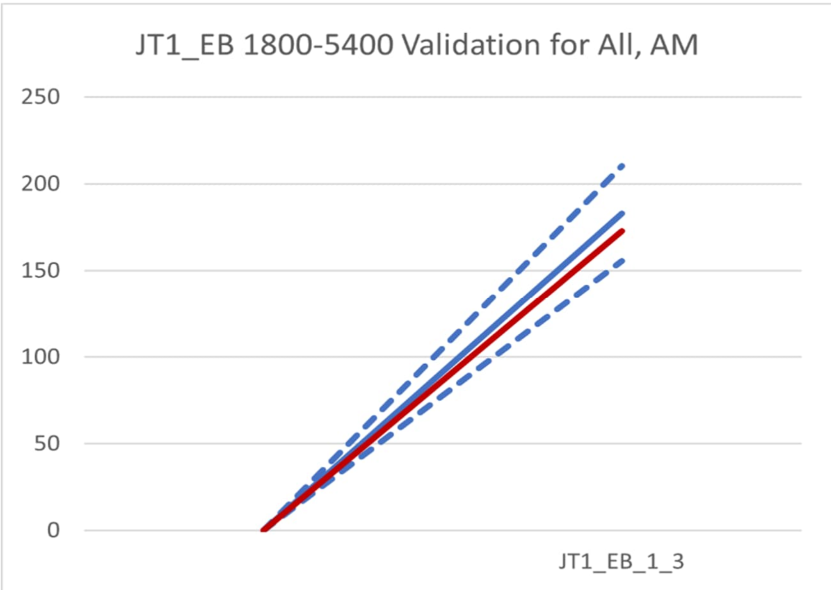

Figure 8-6. Journey Time 1 Eastbound AM Validation

Figure 8-7. Journey Time 1 Westbound AM Validation

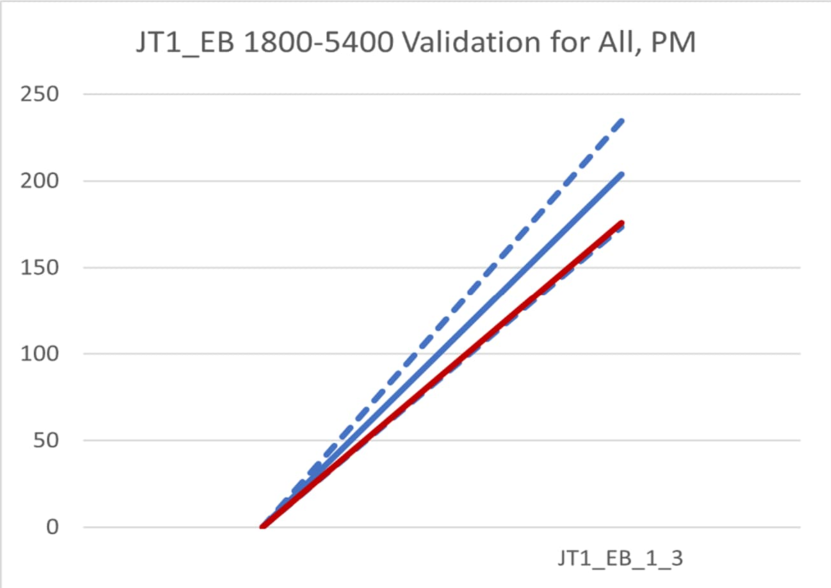

Figure 8-8. Journey Time 1 PM Eastbound Validation

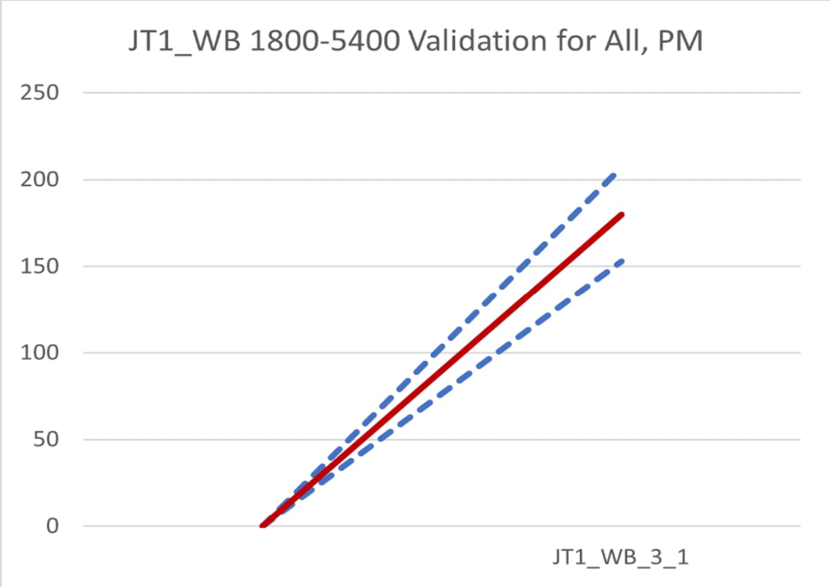

Figure 8-9. Journey Time 1 PM Westbound Validation

Journey Time Route 2

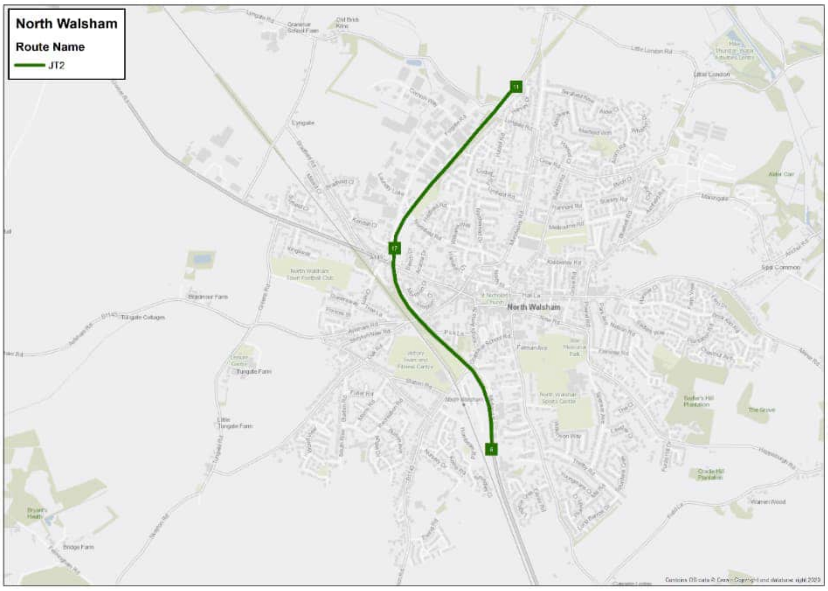

Figure 8-10. JT2 Route Diagram

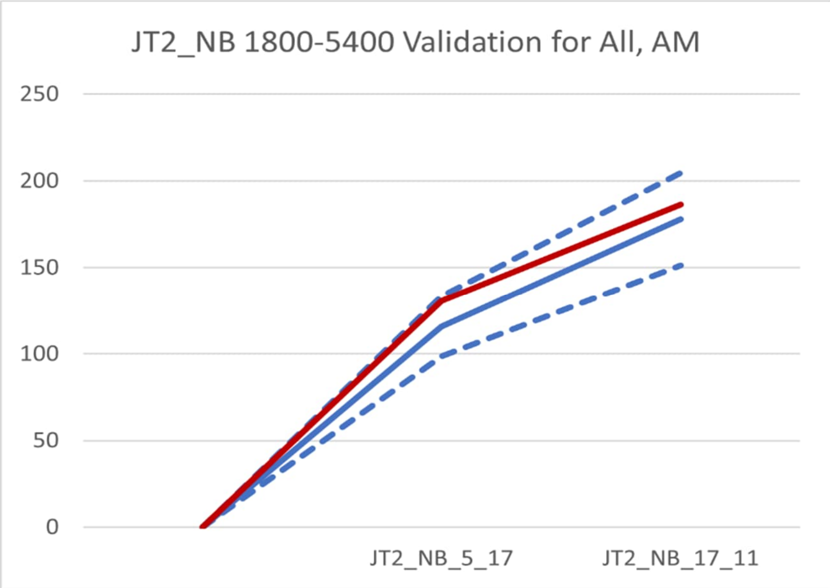

Figure 8-11. Journey Time 2 AM Northbound Validation

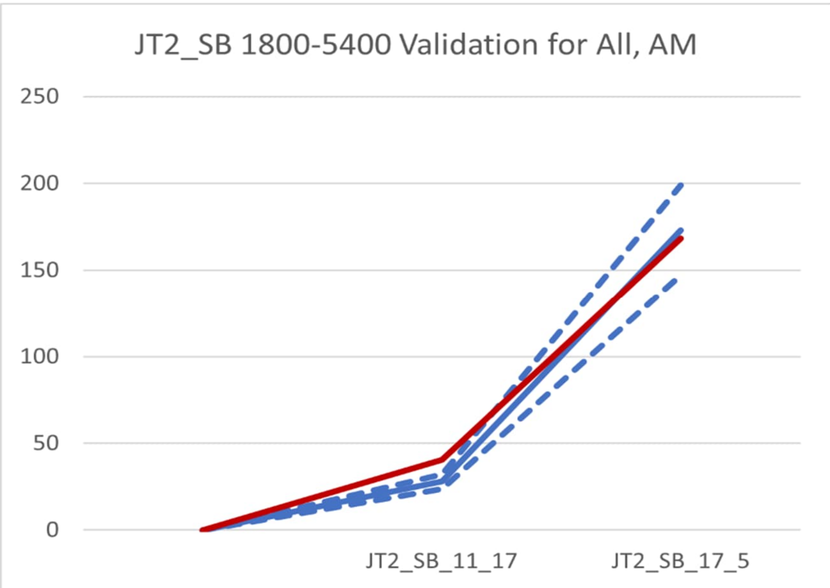

Figure 8-12. Journey Time 2 AM Southbound Validation

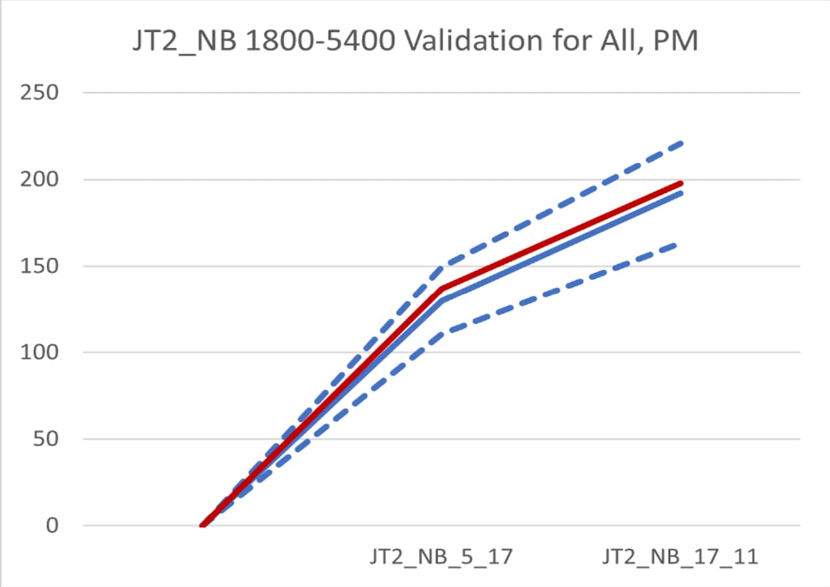

Figure 8-13. Journey Time 2 PM Northbound Validation

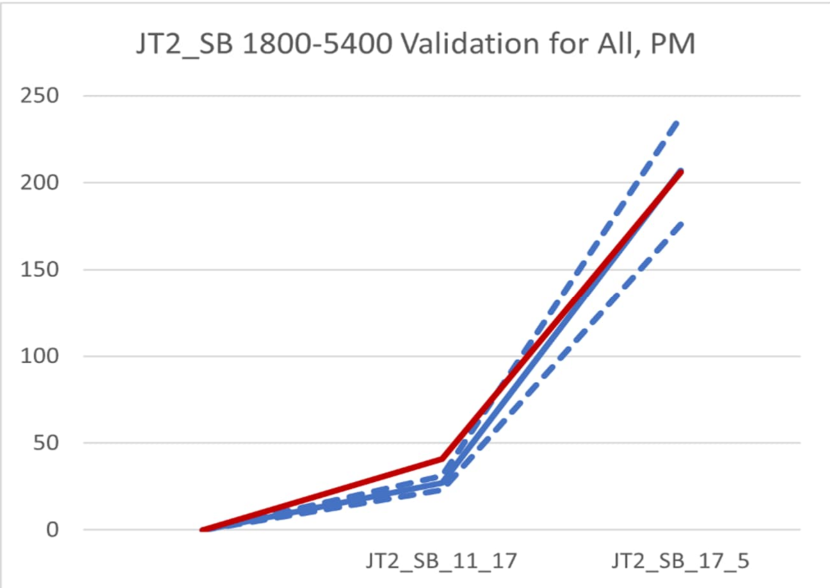

Figure 8-14. Journey Time 2 PM Southbound Validation

Journey Time Route 3

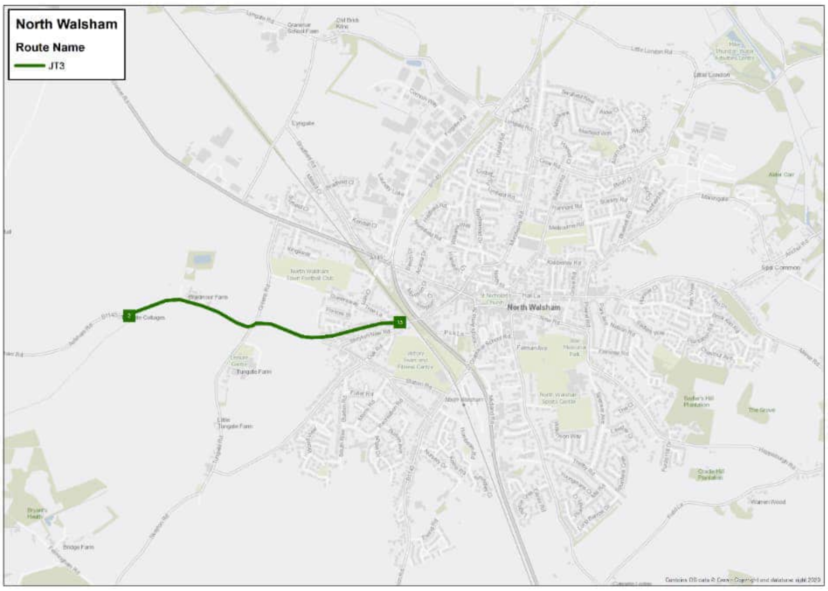

Figure 8-15. JT3 Route Diagram

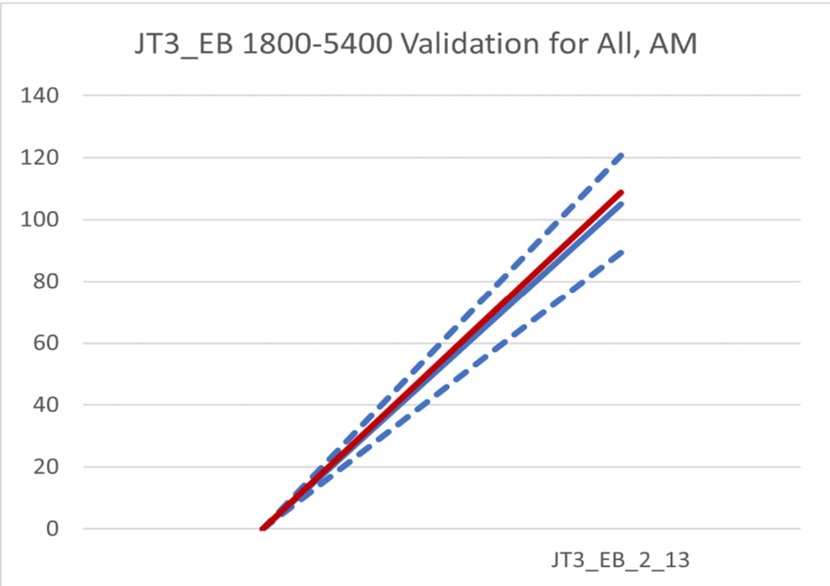

Figure 8-16. Journey Time 3 AM Eastbound Validation

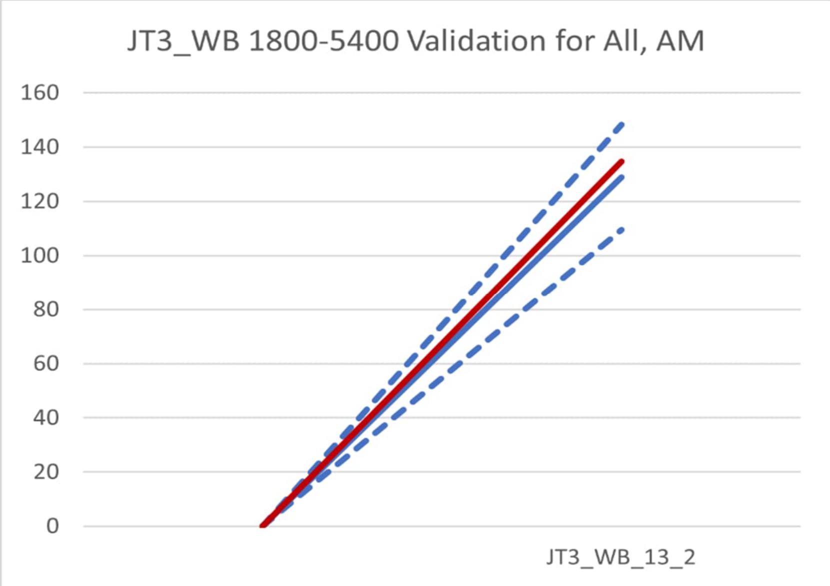

Figure 8-17. Journey Time 3 AM Westbound Validation

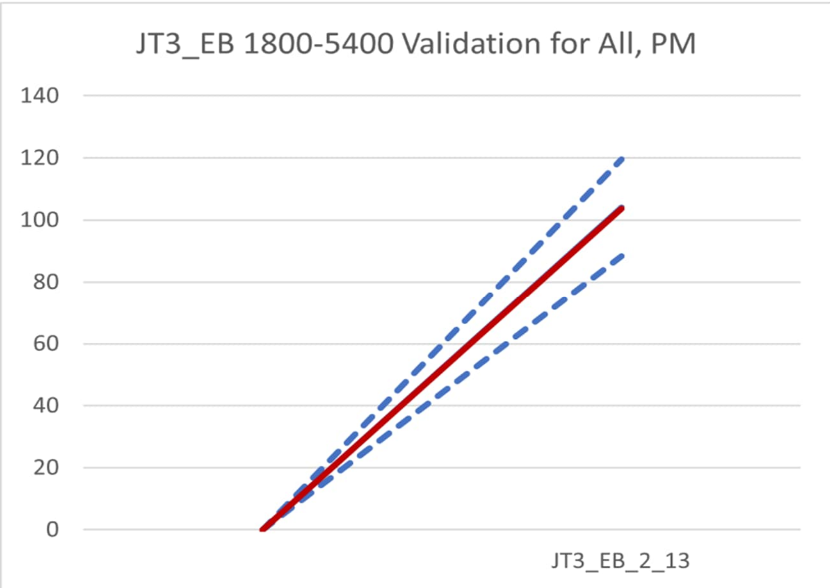

Figure 8-18. Journey Time 3 PM Eastbound Validation

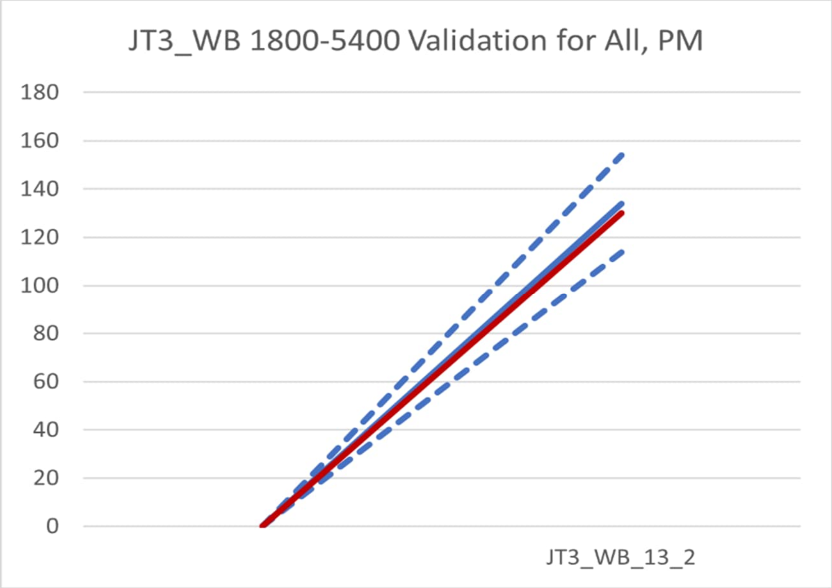

Figure 8-19. Journey Time 3 PM Westbound Validation

Journey Time Route 4

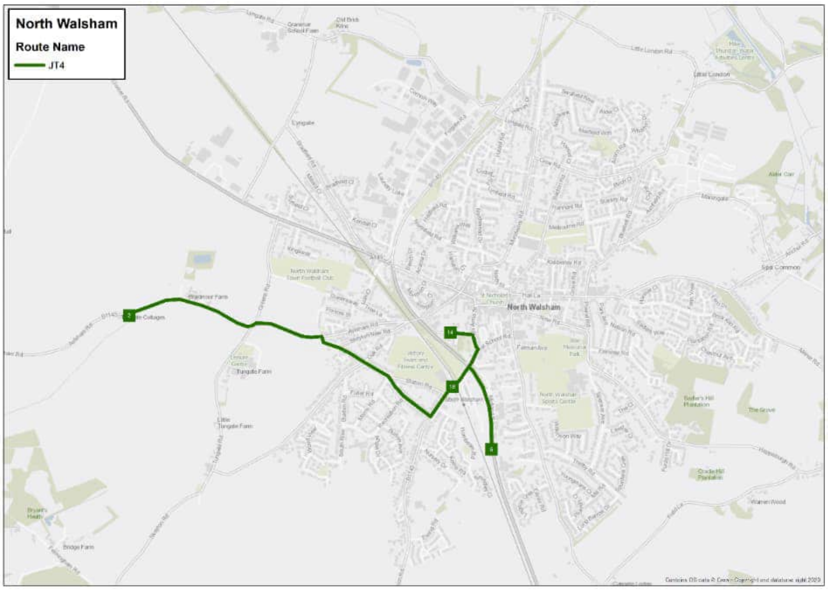

Figure 8-20. JT4 Route Diagram

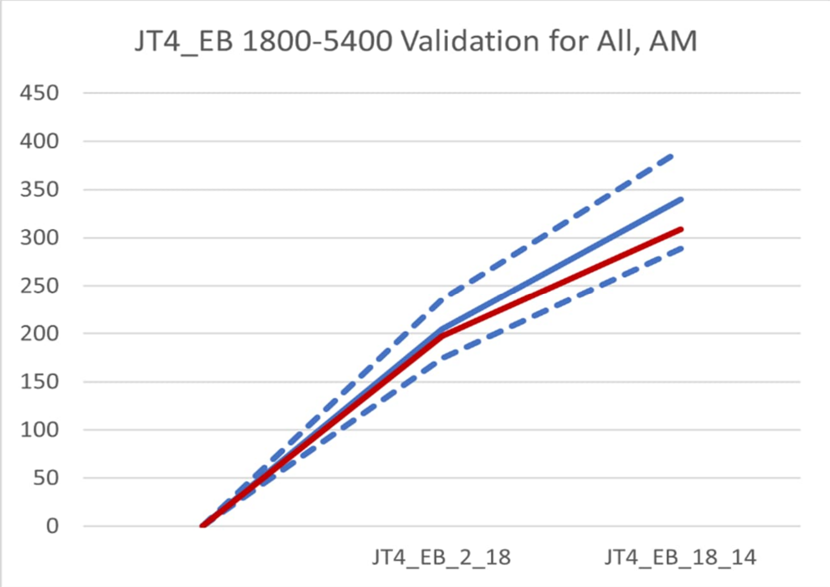

Figure 8-21. Journey Time 4 AM Eastbound Validation

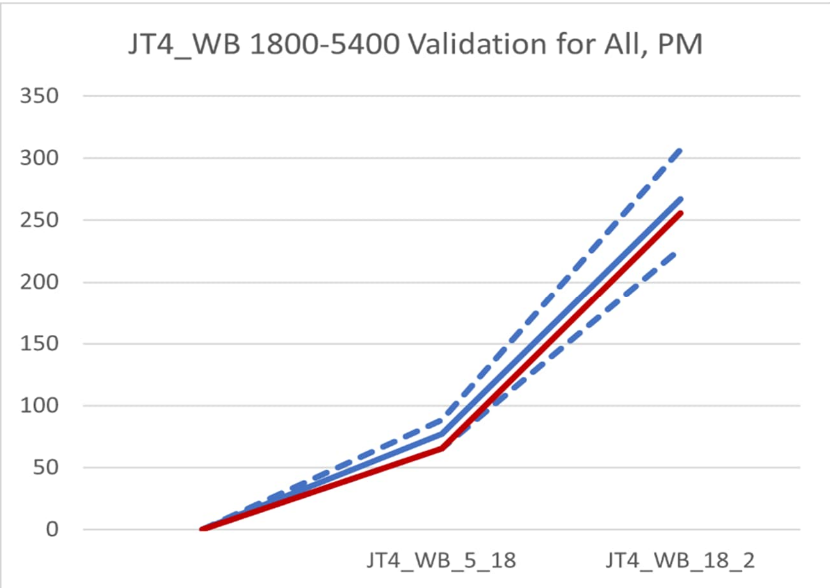

Figure 8-22. Journey Time 4 AM Westbound Validation

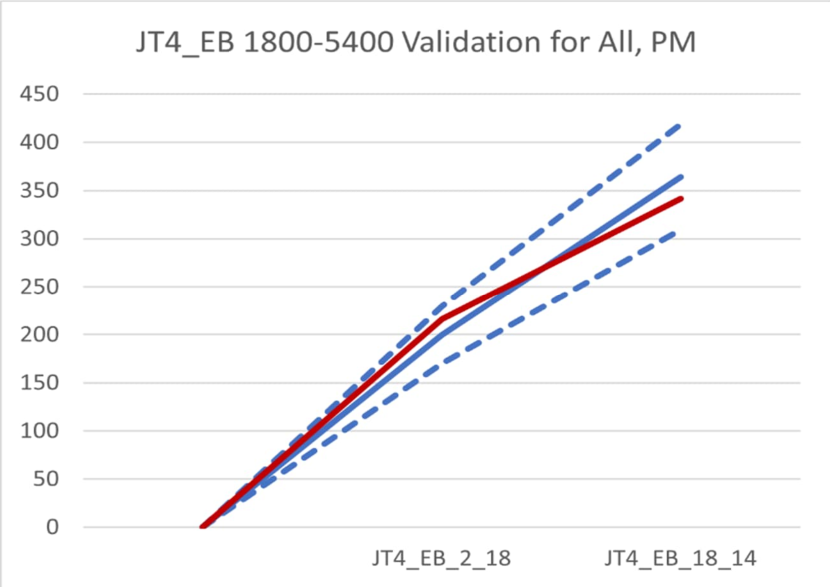

Figure 8-23. Journey Time 4 PM Eastbound Validation

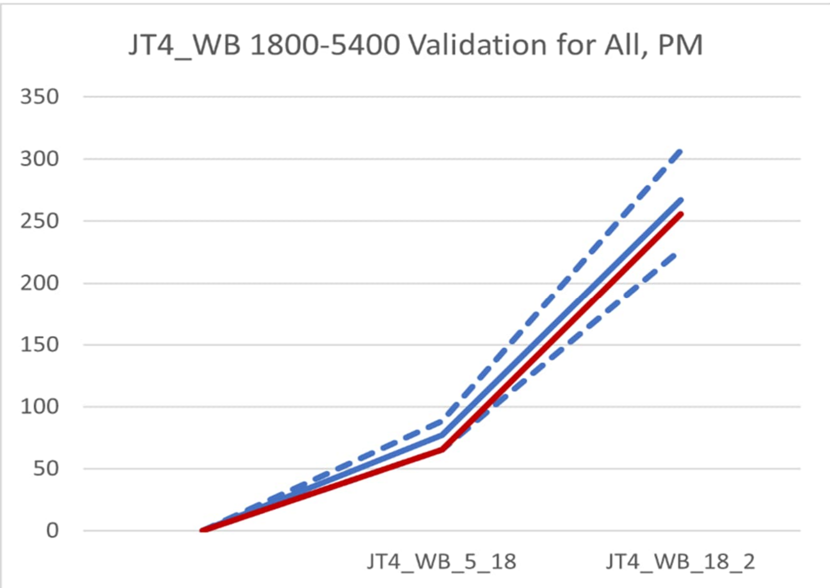

Figure 8-24. Journey Time 4 PM Westbound Validation

Journey Time Route 5

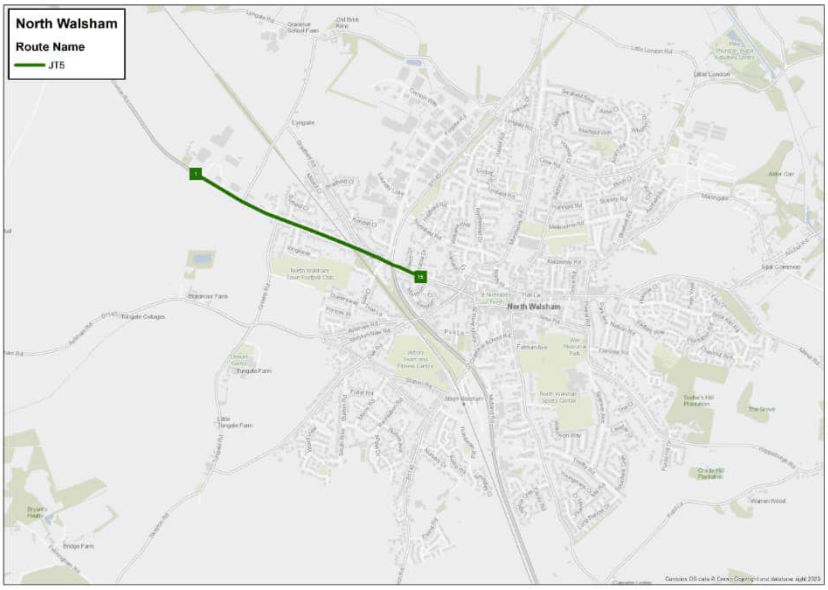

Figure 8-25. JT5 Route Diagram

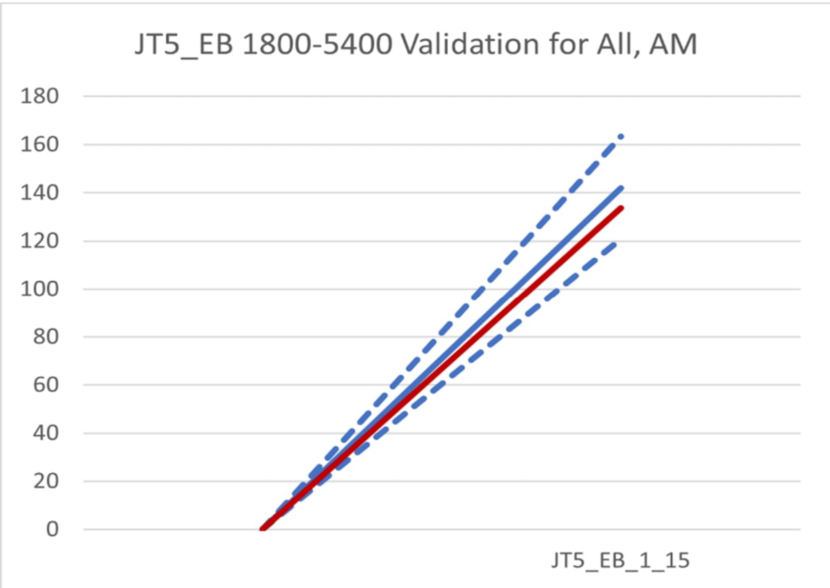

Figure 8-26. Journey Time 5 AM Eastbound Validation

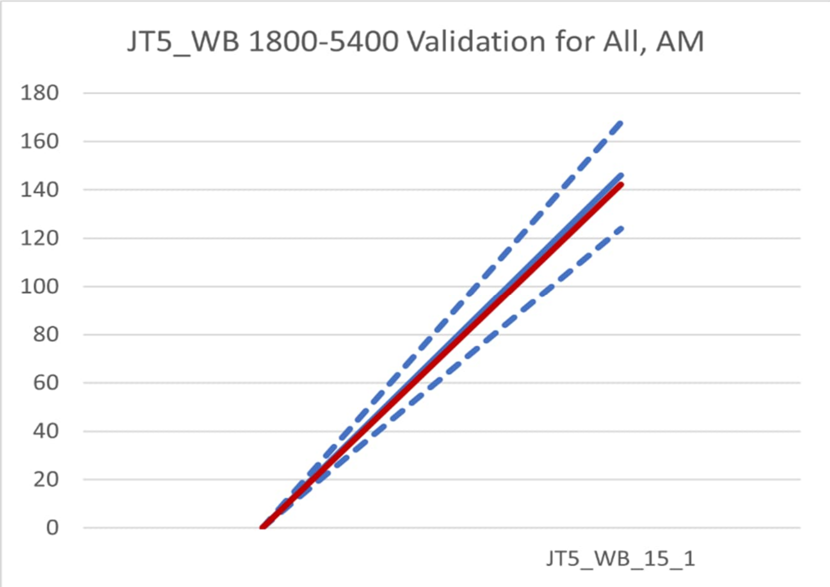

Figure 8-27. Journey Time 5 AM Westbound Validation

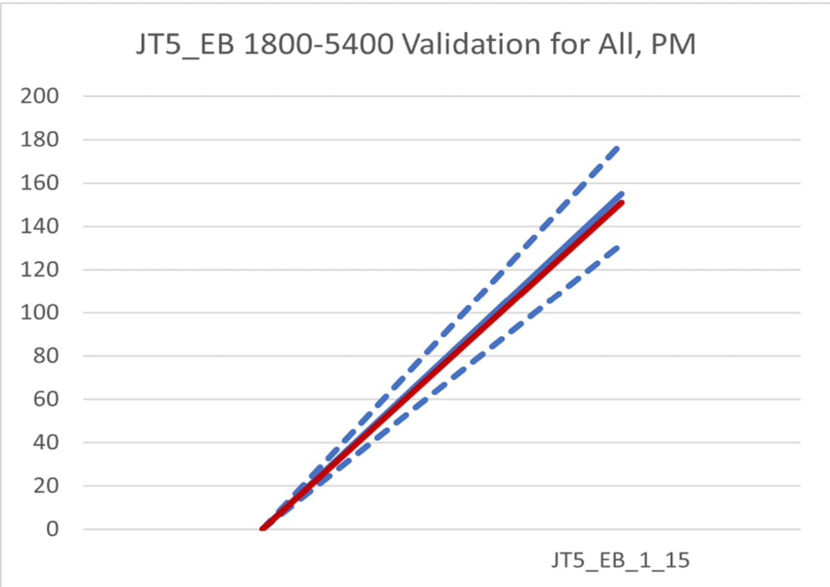

Figure 8-28. Journey Time 5 PM Eastbound Validation

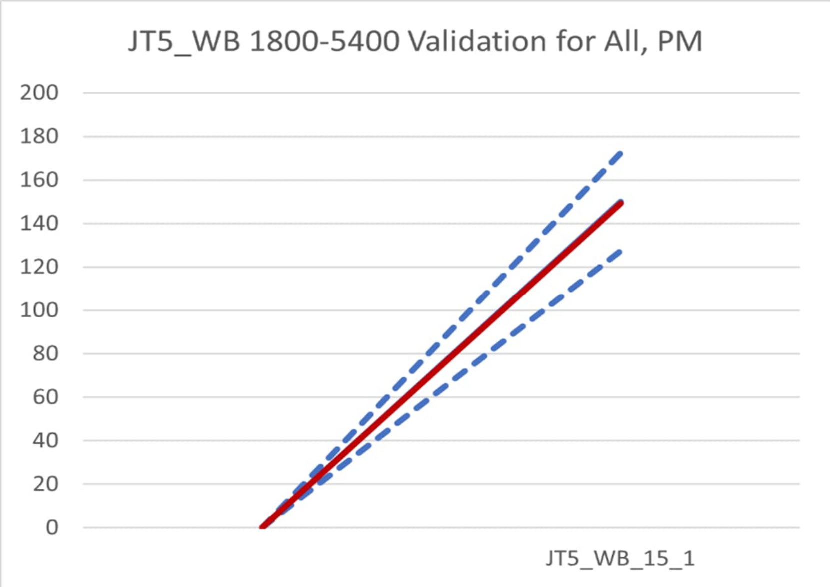

Figure 8-29. Journey Time 5 PM Westbound Validation

Journey Time Route 6

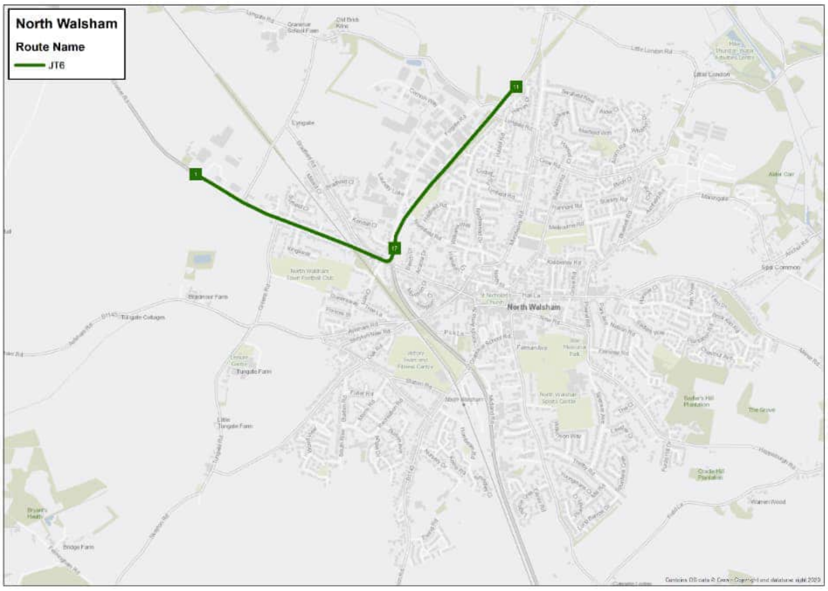

Figure 8-30. JT6 Route Diagram

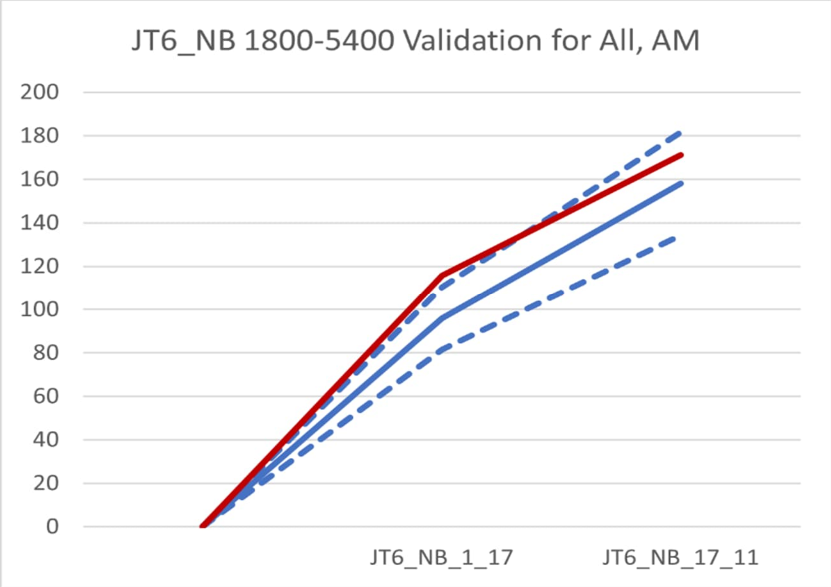

Figure 8-31. Journey Time 6 AM Northbound Validation

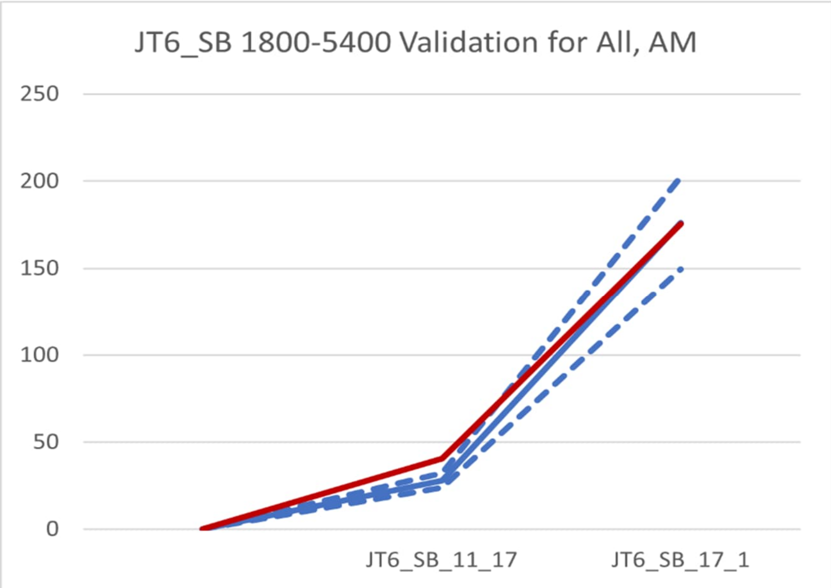

Figure 8-32. Journey Time 6 AM Southbound Validation

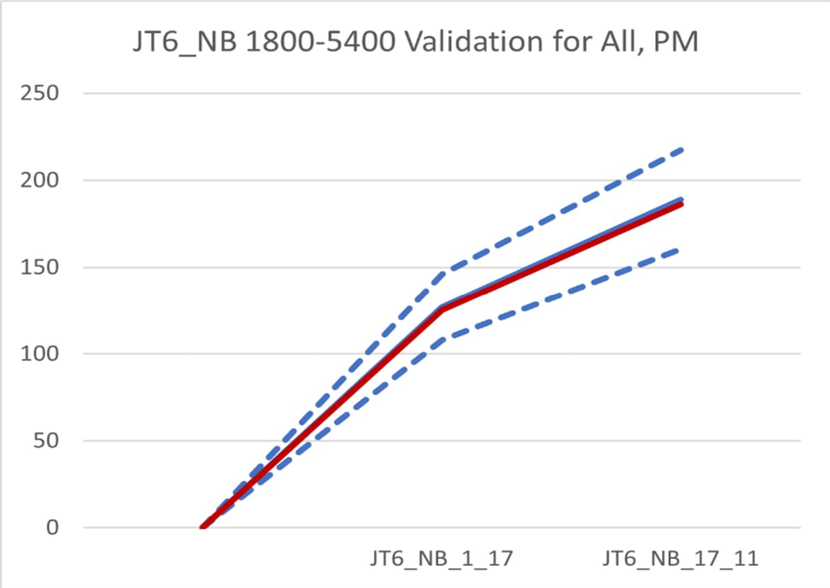

Figure 8-33. Journey Time 6 PM Northbound Validation

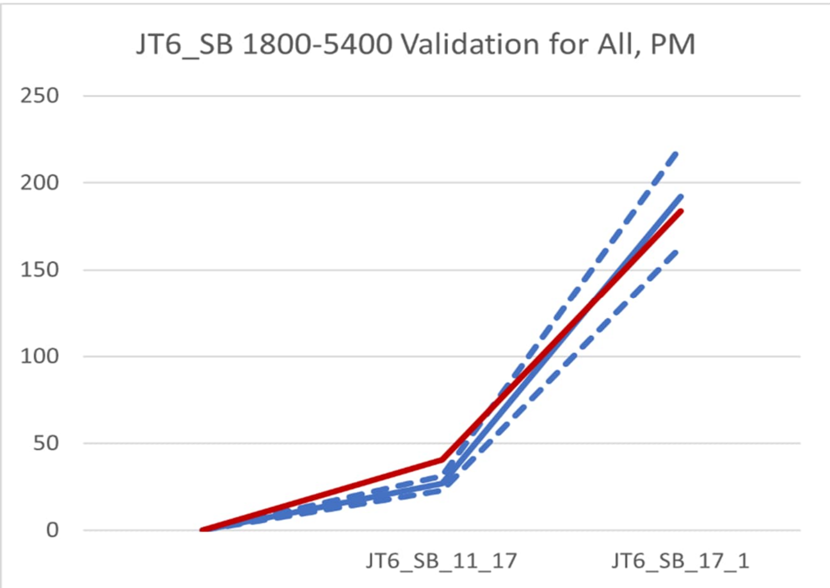

Figure 8-34. Journey Time 6 PM Southbound Validation

Journey Time Route 7

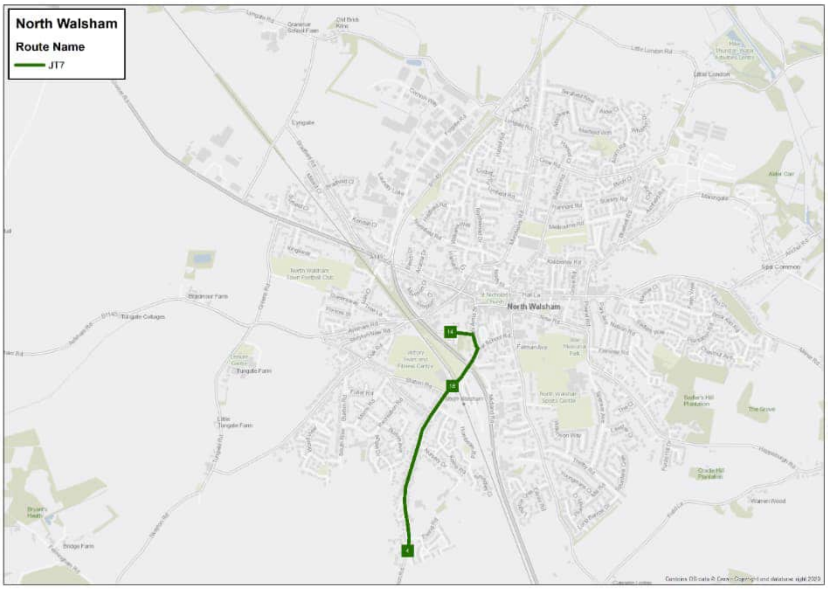

Figure 8-35. JT7 Route Diagram

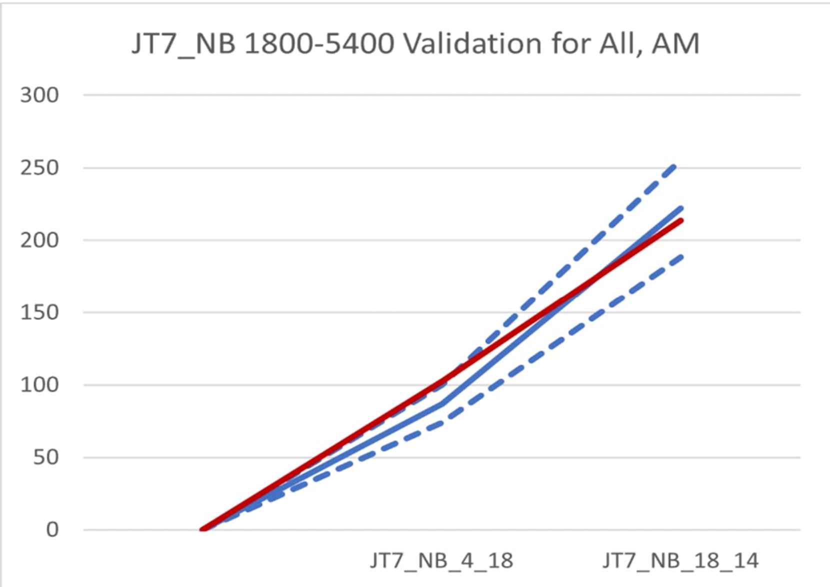

Figure 8-36. Journey Time 7 AM Northbound Validation

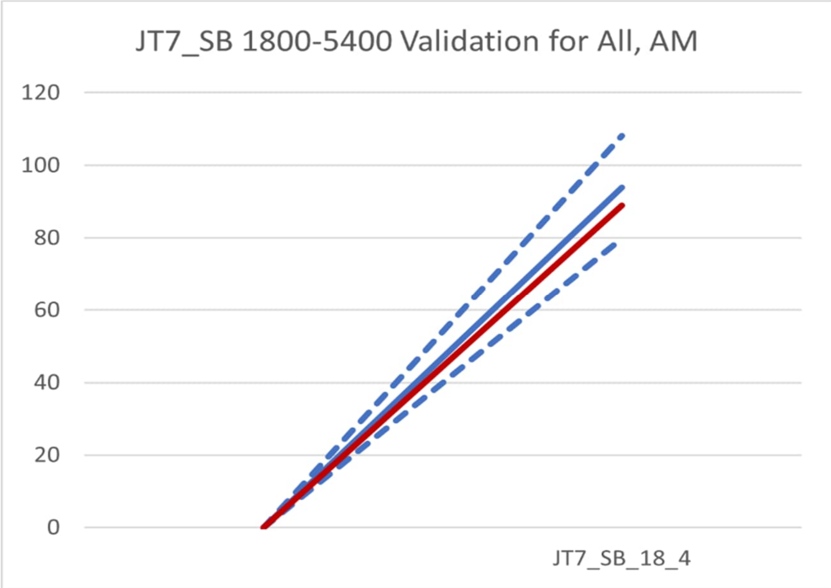

Figure 8-37. Journey Time 7 AM Southbound Validation

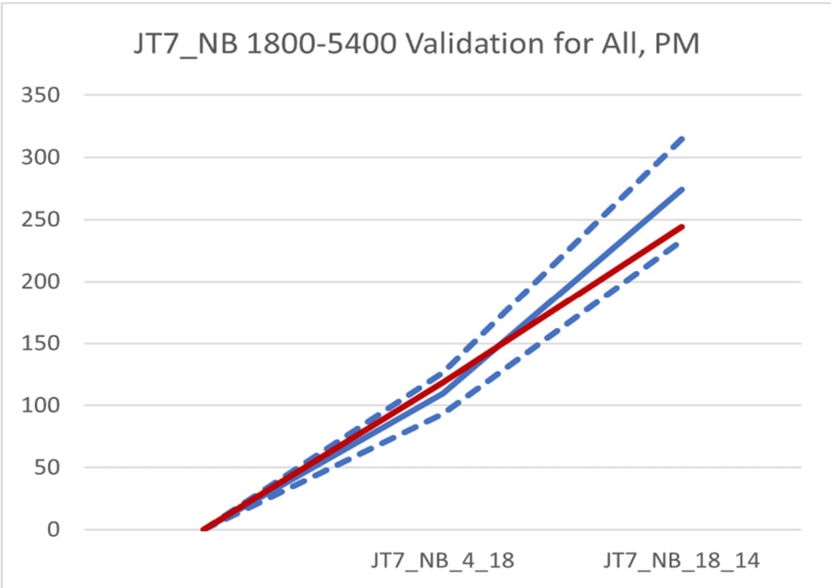

Figure 8-38. Journey Time 7 PM Northbound Validation

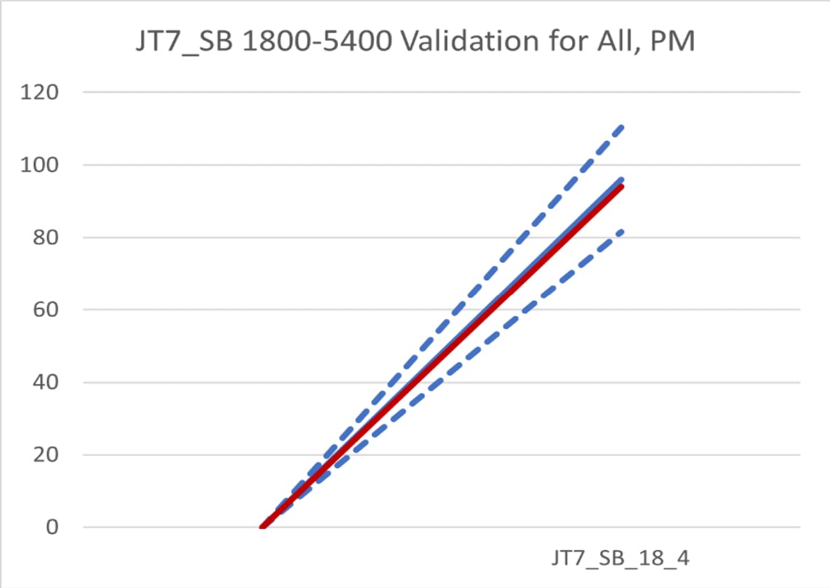

Figure 8-39. Journey Time 7 PM Southbound Validation

Journey Time Route 8

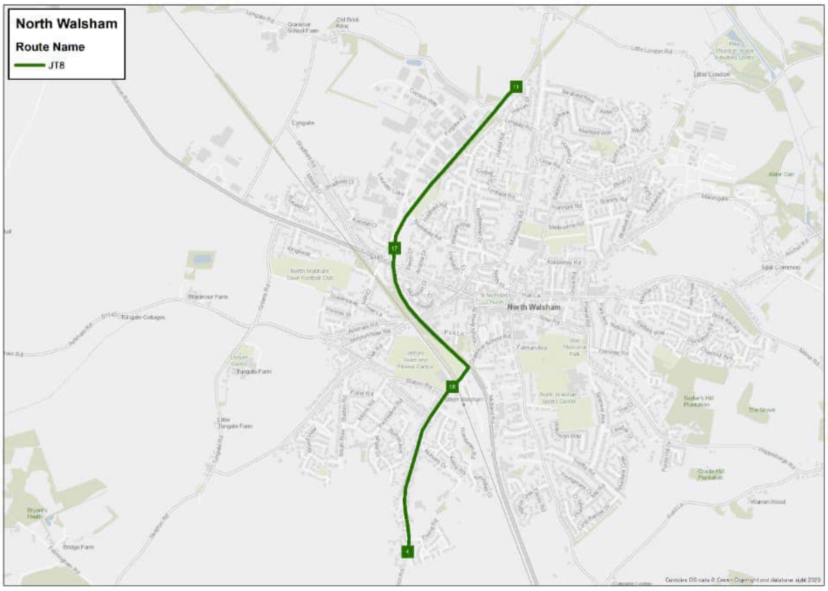

Figure 8-40. JT8 Route Diagram

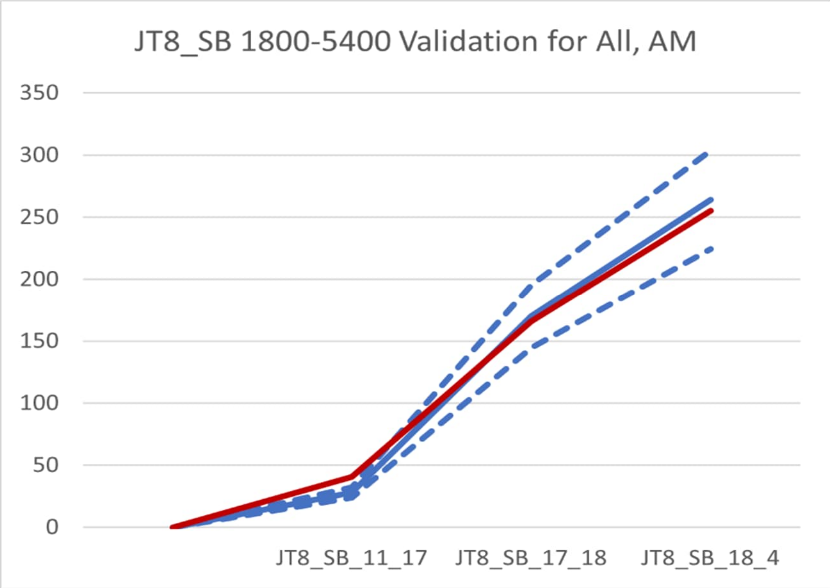

Figure 8-41. Journey Time 8 AM Northbound Validation

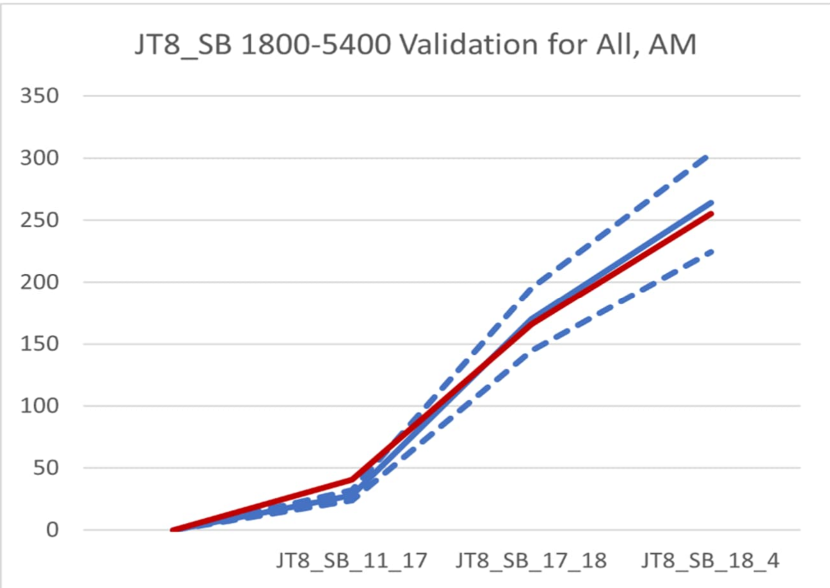

Figure 8-42. Journey Time 8 AM Southbound Validation

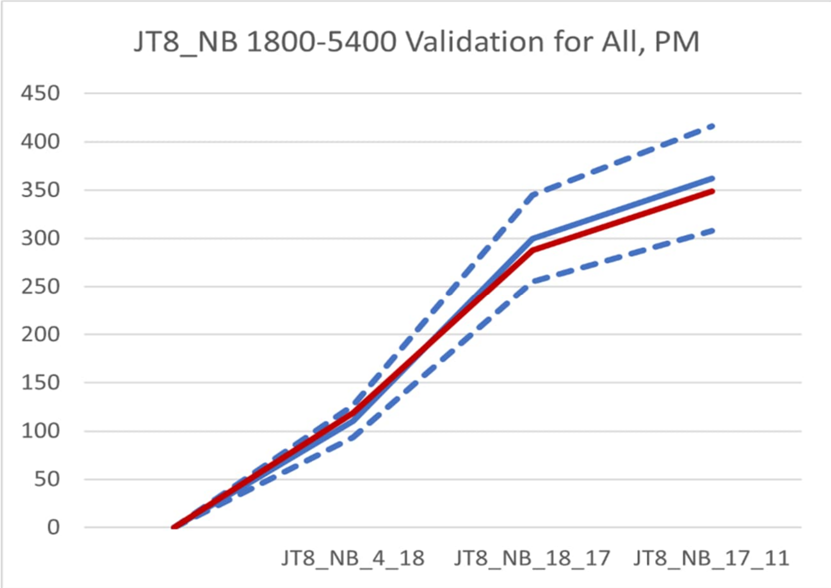

Figure 8-43. Journey Time 8 PM Northbound Validation

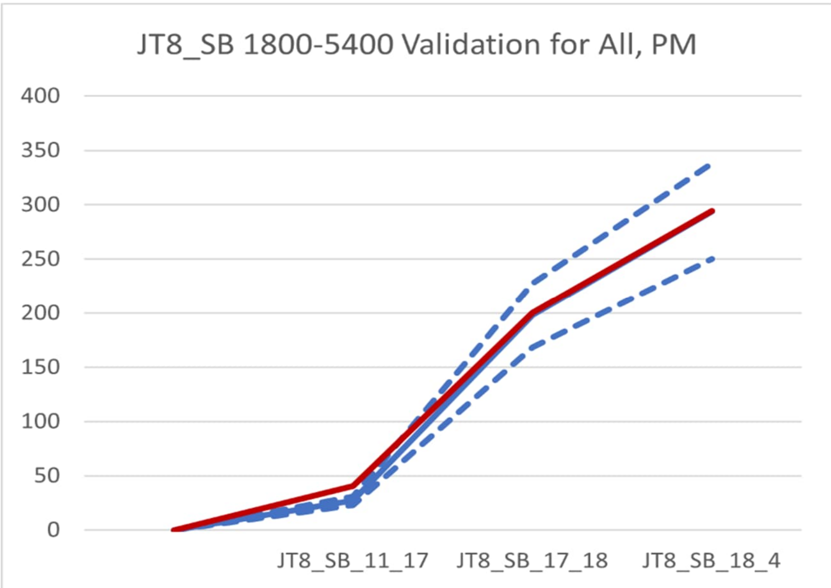

Figure 8-44. Journey Time 8 PM Southbound Validation

Journey Time Route 9

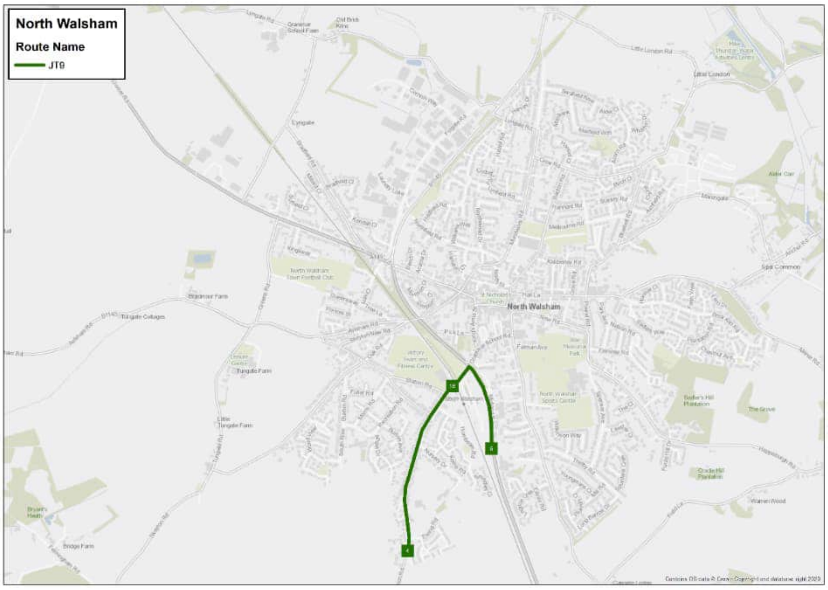

Figure 8-45. JT9 Route Diagram

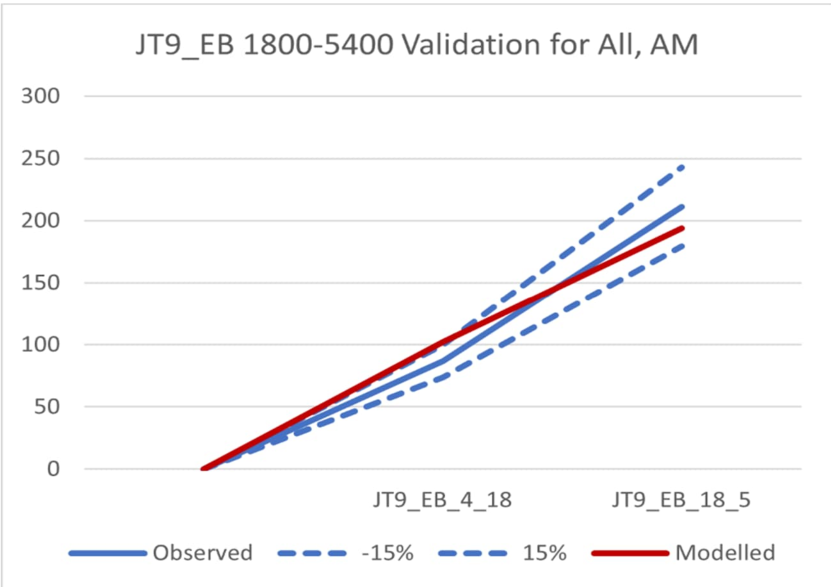

Figure 8-46. Journey Time 9 AM Eastbound Validation

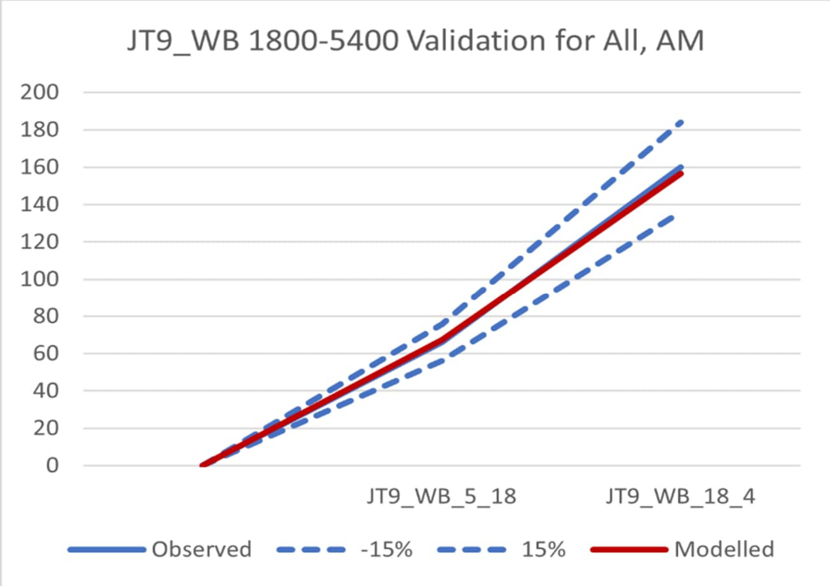

Figure 8-47. Journey Time 9 AM Westbound Validation

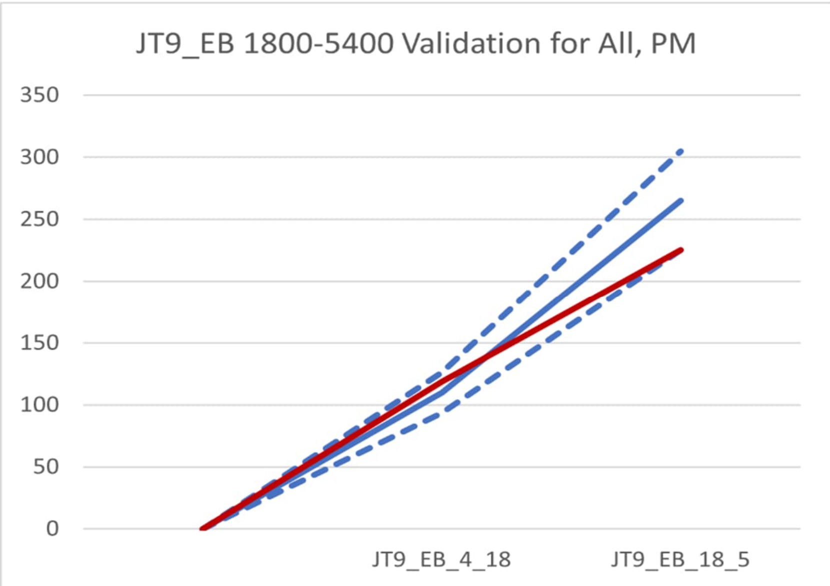

Figure 8-48. Journey Time 9 PM Eastbound Validation

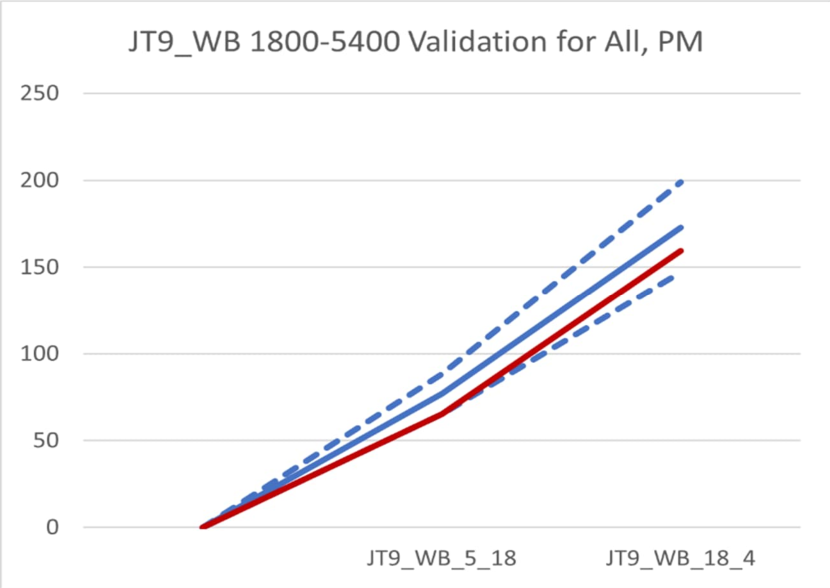

Figure 8-49. Journey Time 9 PM Westbound Validation

Appendix E – Journey Time Variability

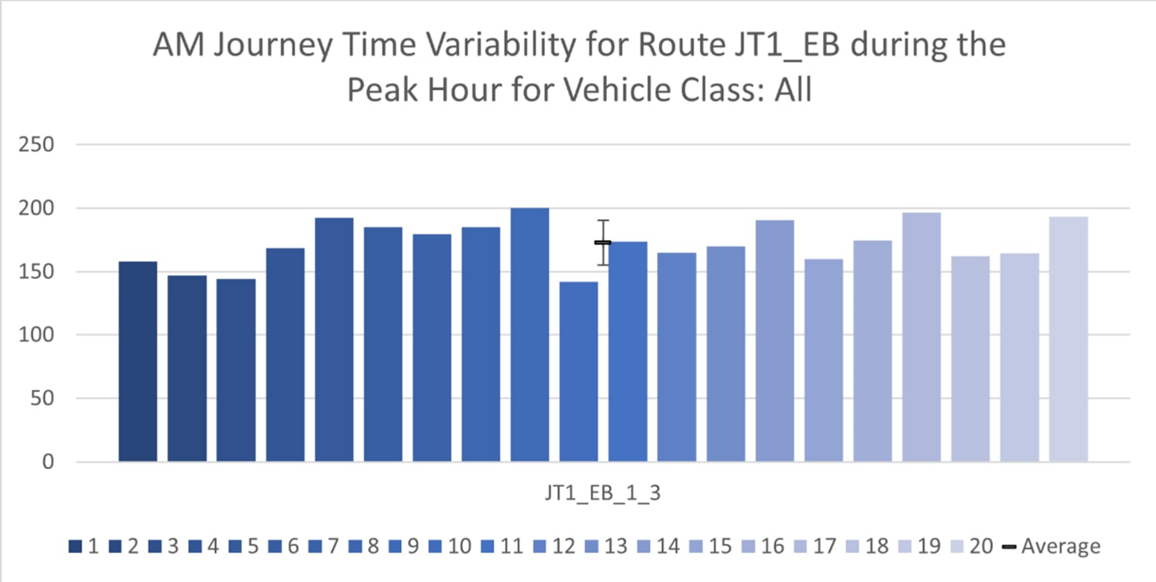

Figure 8-50. Journey Time 1 AM Eastbound Variability

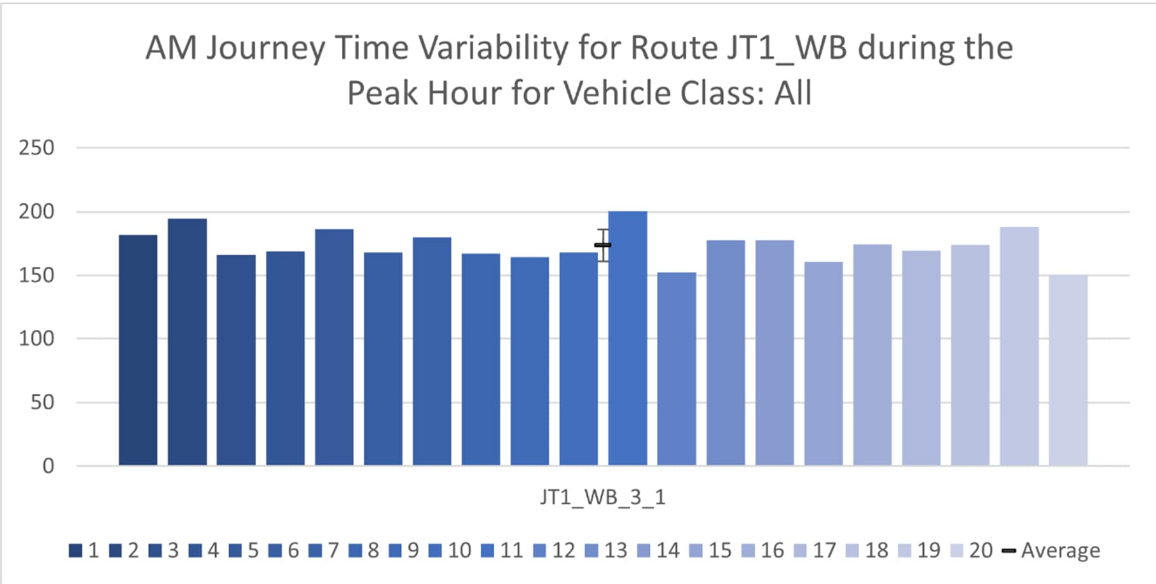

Figure 8-51. Journey Time 1 AM Westbound Variability

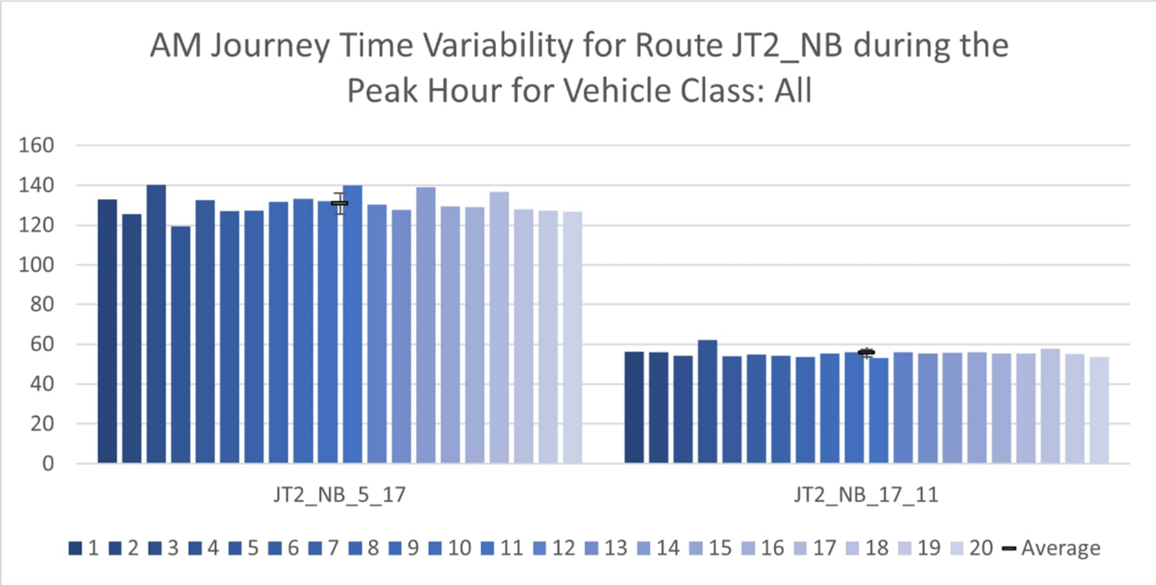

Figure 8-52. Journey Time 2 AM Northbound Variability

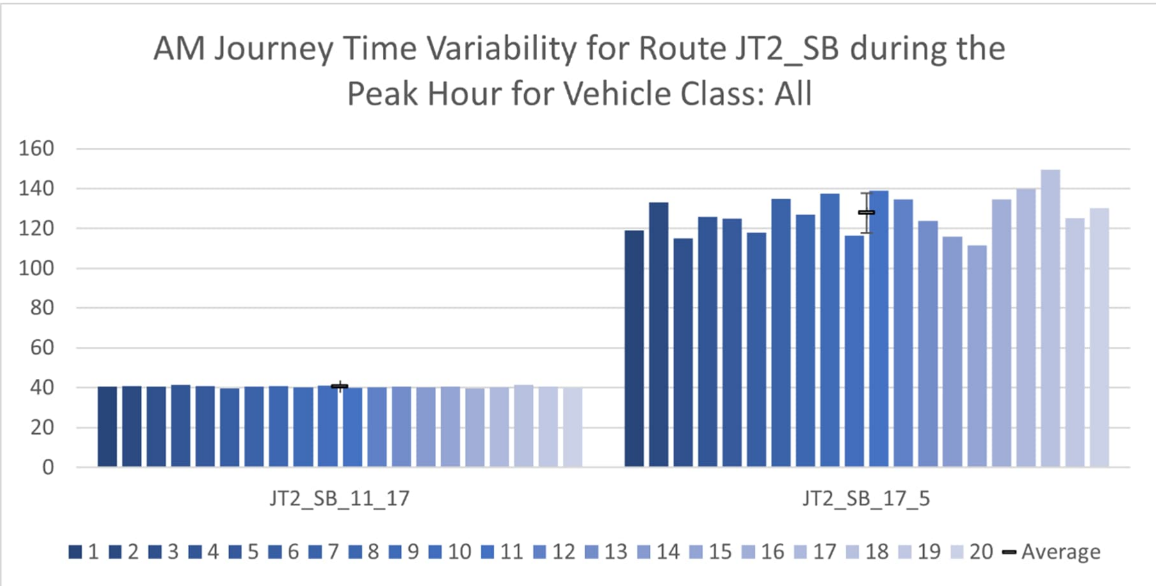

Figure 8-53. Journey Time 2 AM Southbound Variability

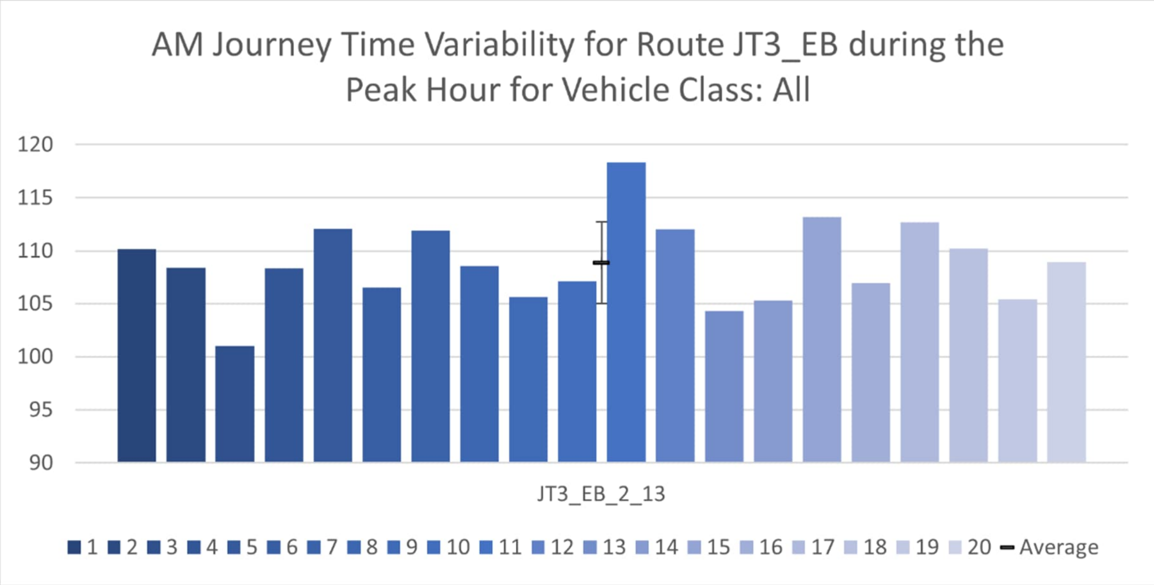

Figure 8-54. Journey Time 3 AM Eastbound Variability

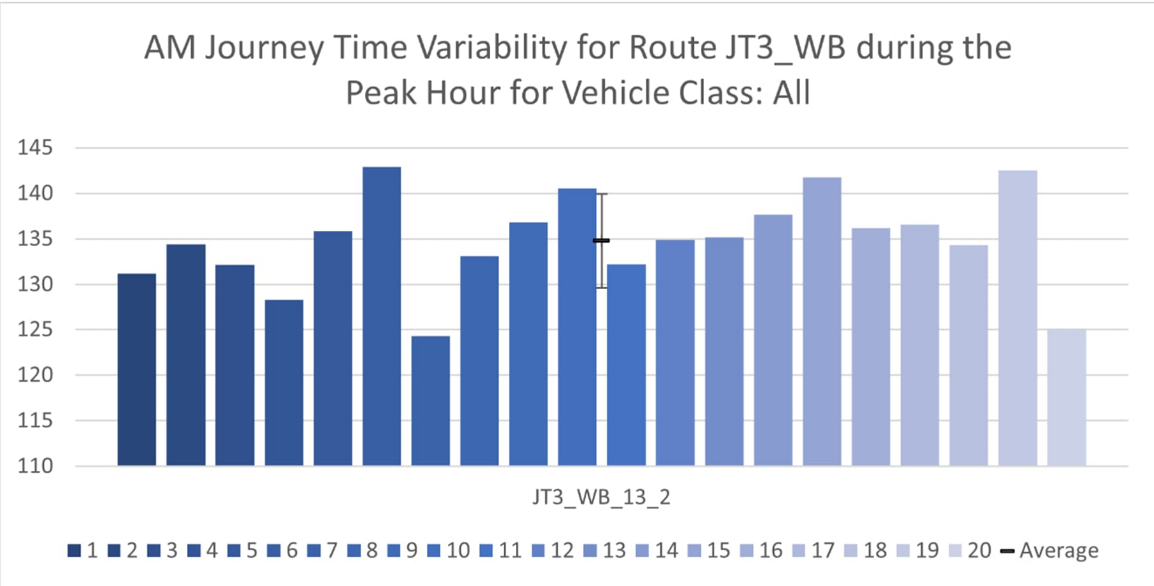

Figure 8-55. Journey Time 3 AM Westbound Variability

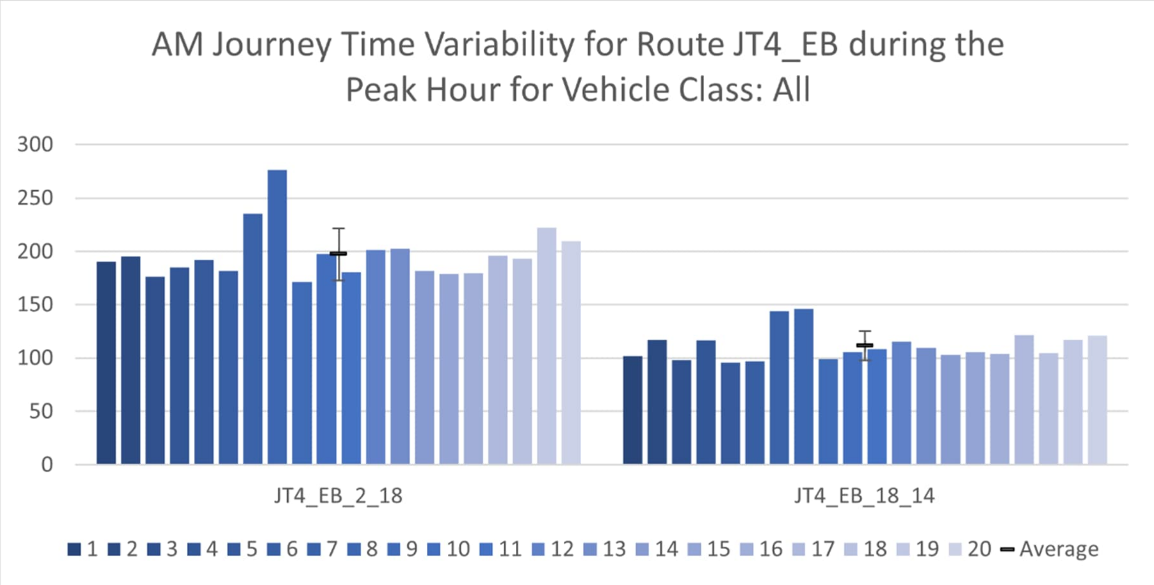

Figure 8-56. Journey Time 4 AM Eastbound Variability

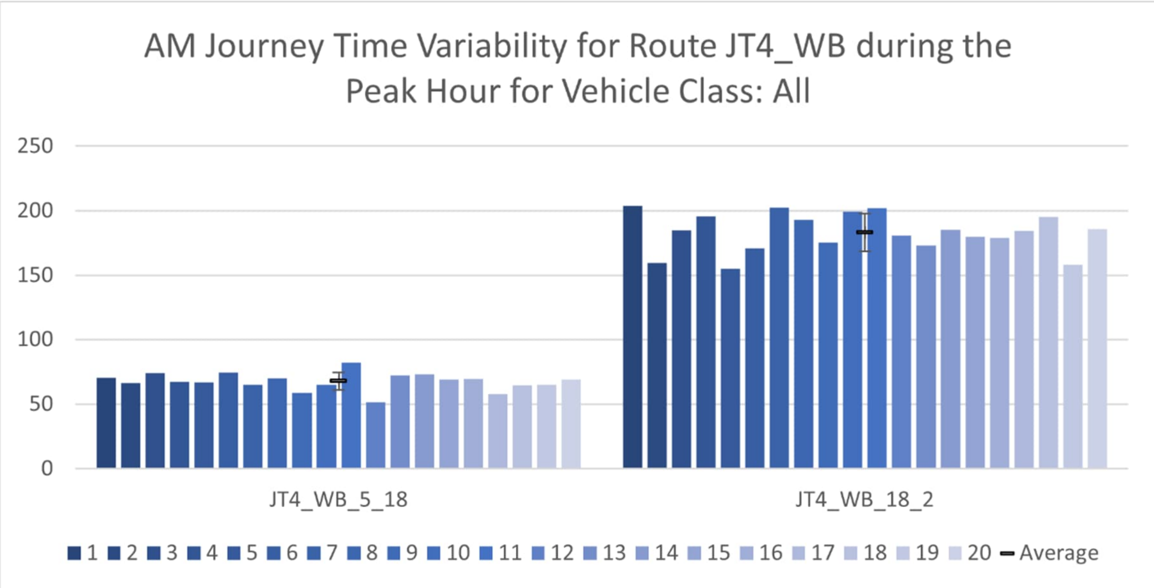

Figure 8-57. Journey Time 4 AM Westbound Variability

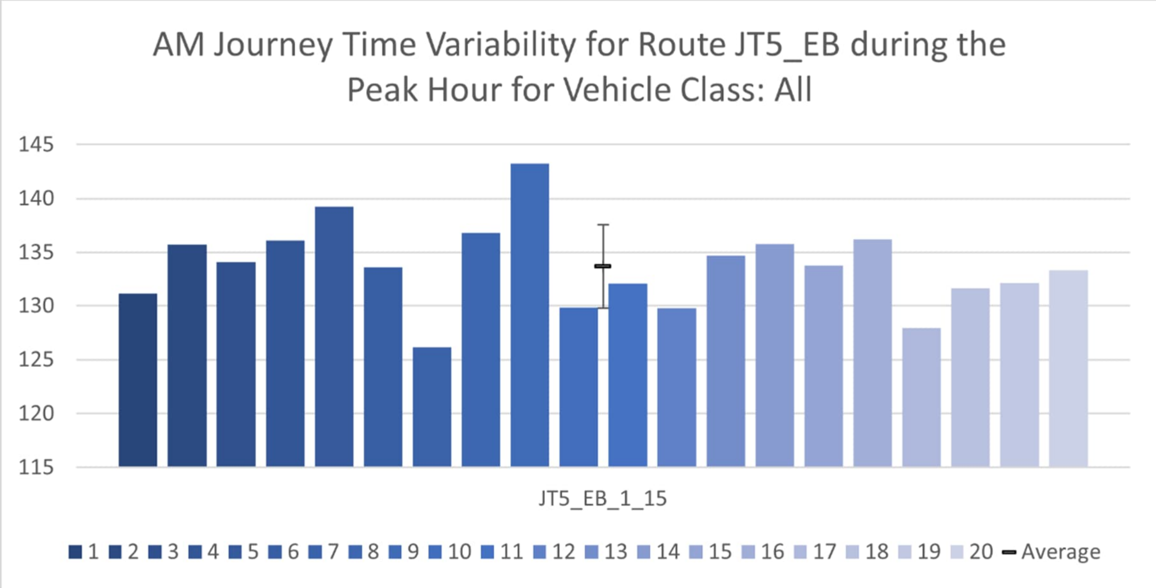

Figure 8-58. Journey Time 5 AM Eastbound Variability

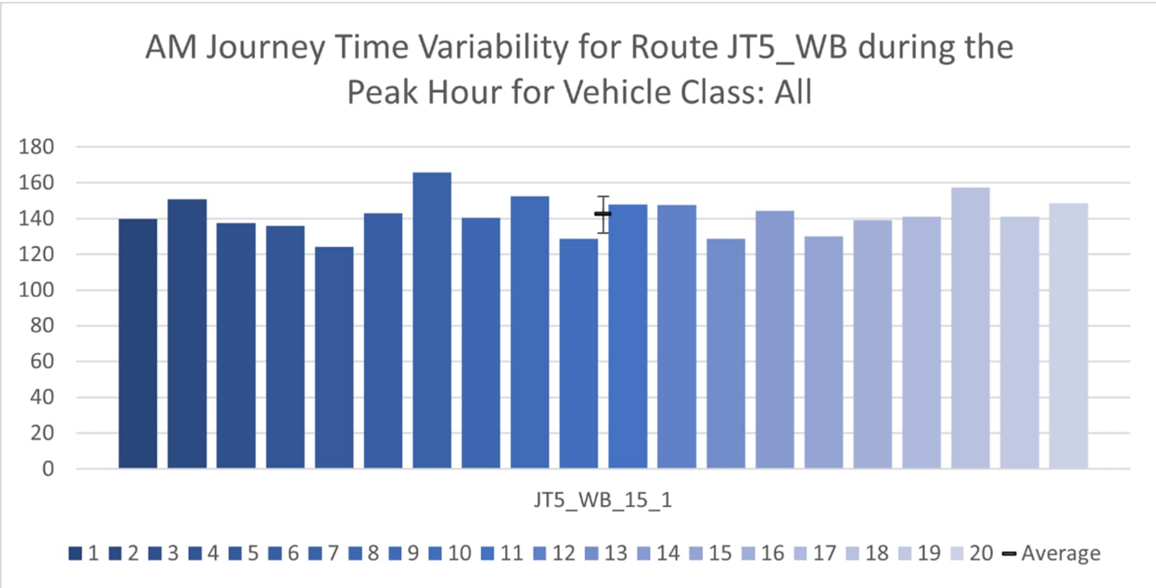

Figure 8-59. Journey Time 5 AM Westbound Variability

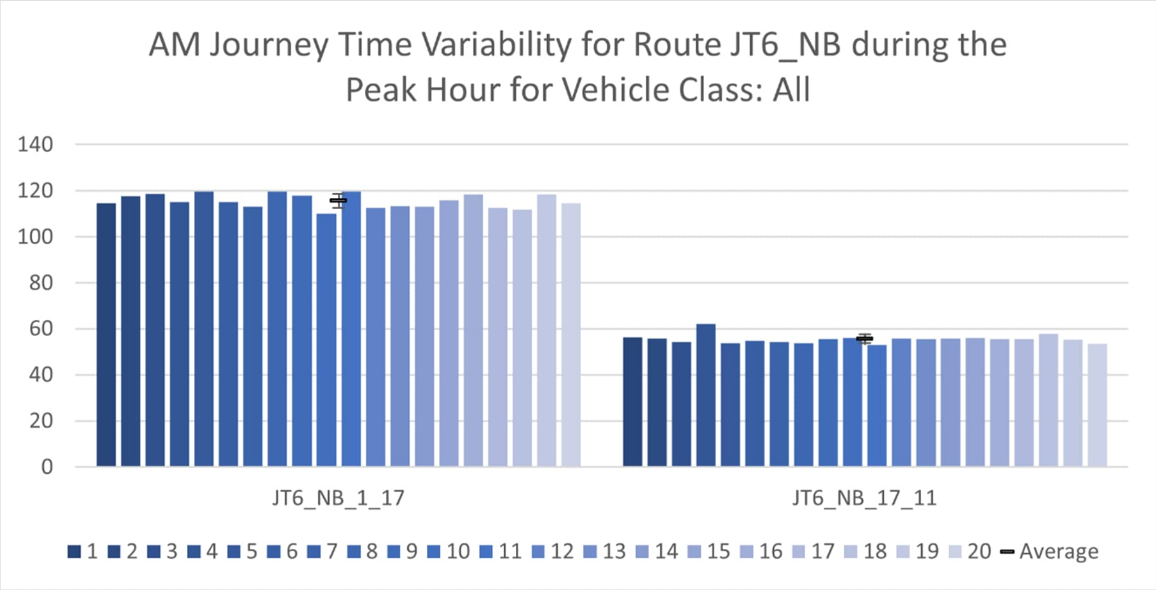

Figure 8-60. Journey Time 6 AM Northbound Variability

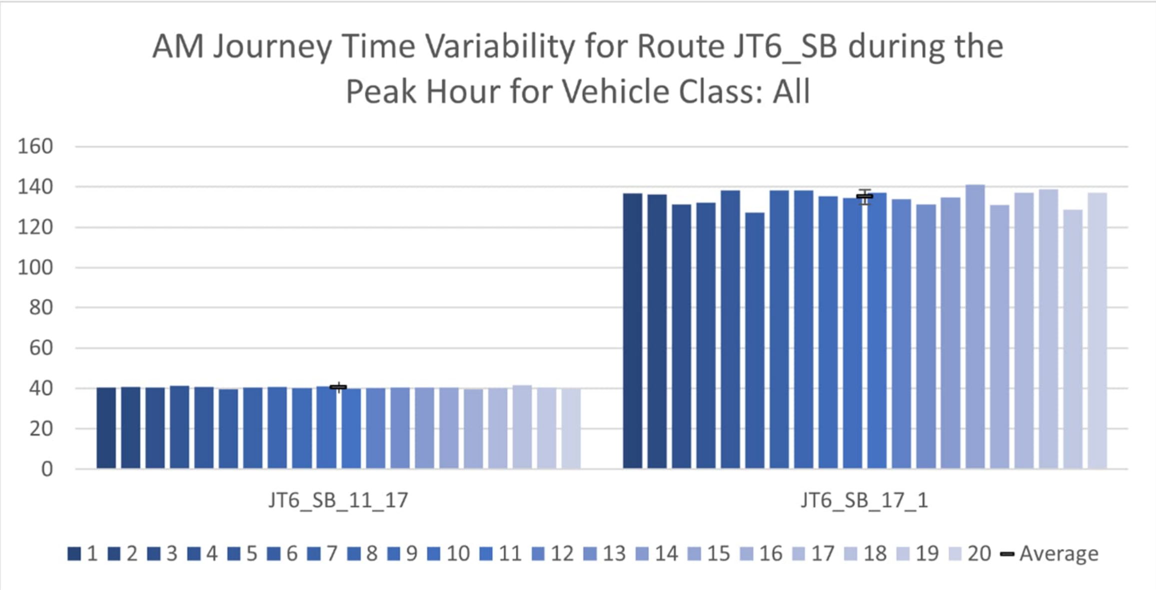

Figure 8-61. Journey Time 6 AM Southbound Variability

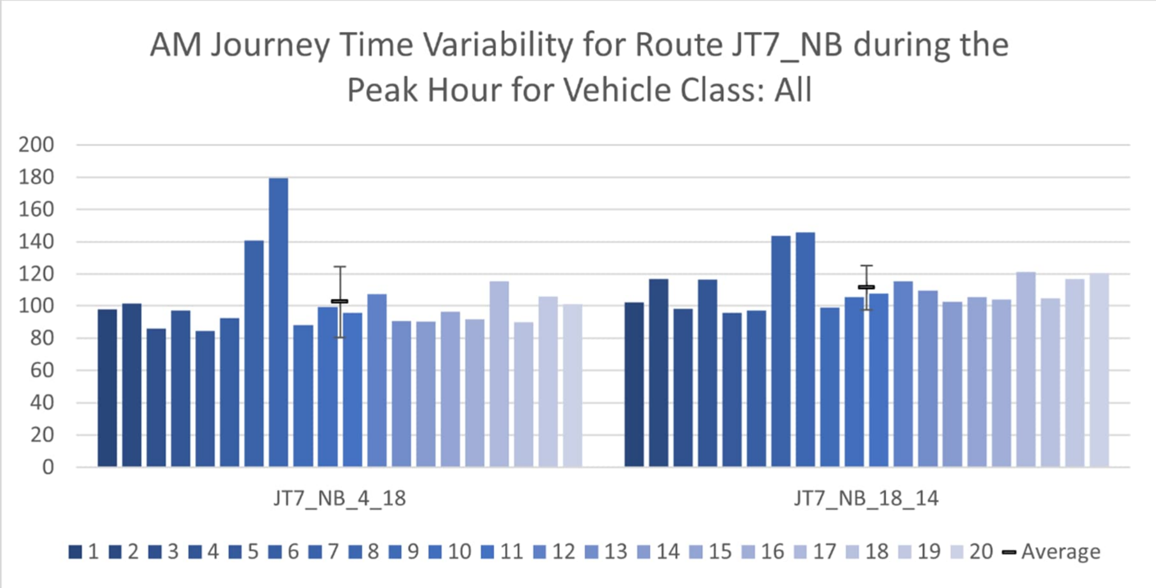

Figure 8-62. Journey Time 7 AM Northbound Variability

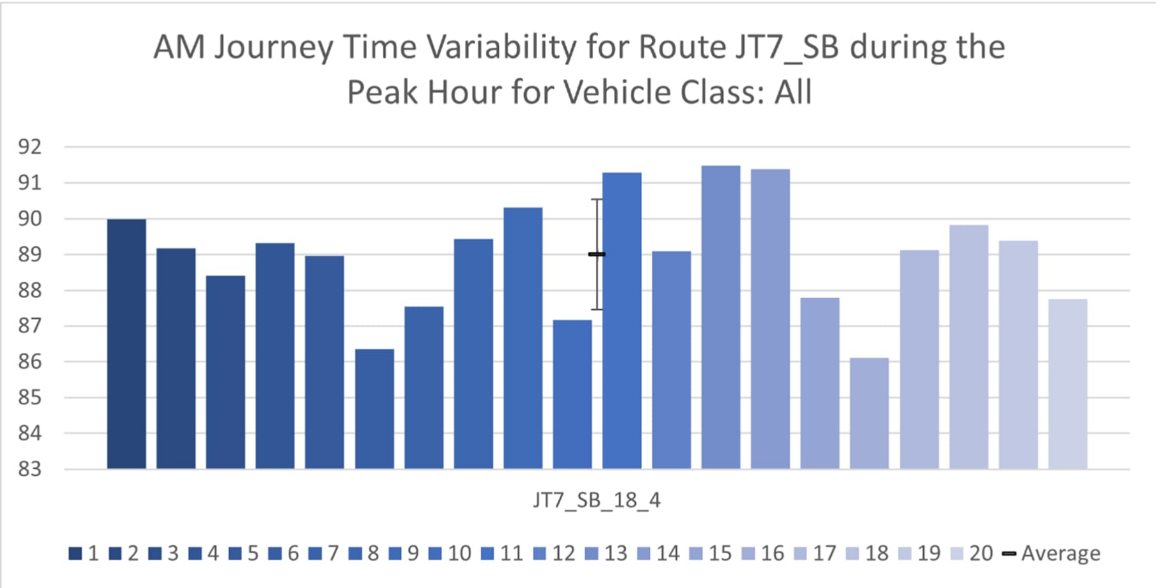

Figure 8-63. Journey Time 7 AM Southbound Variability

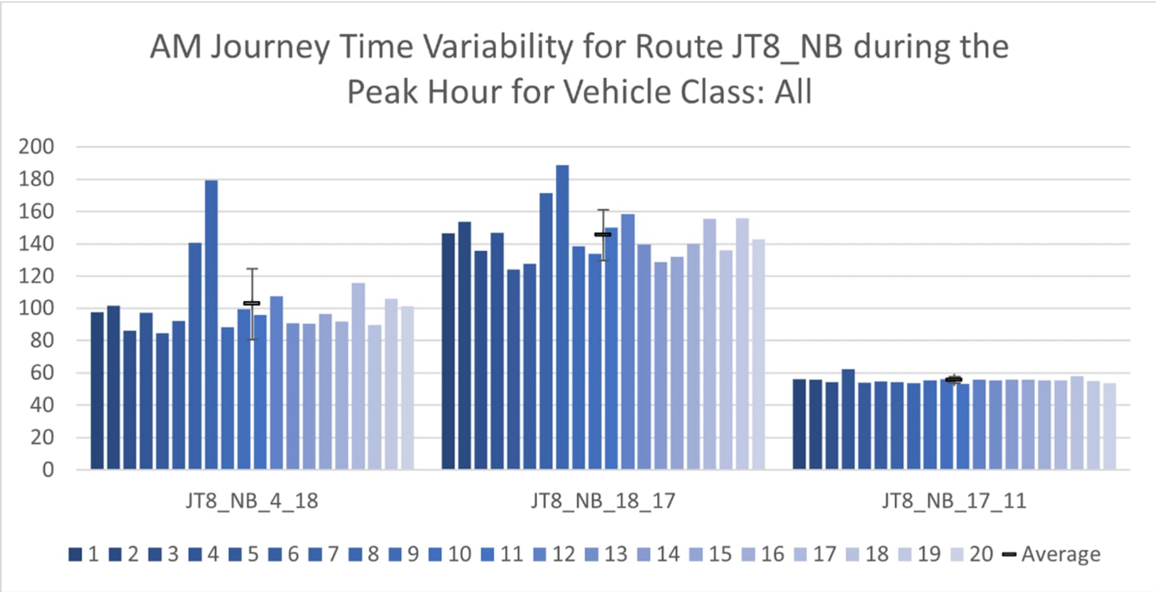

Figure 8-64. Journey Time 8 AM Northbound Variability

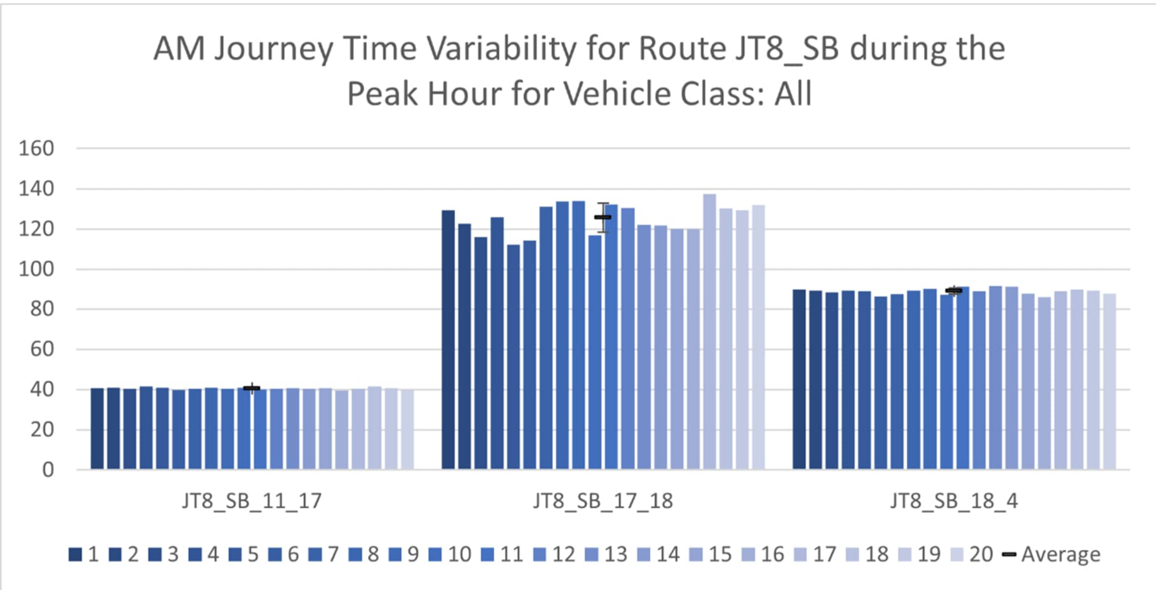

Figure 8-65. Journey Time 8 AM Southbound Variability

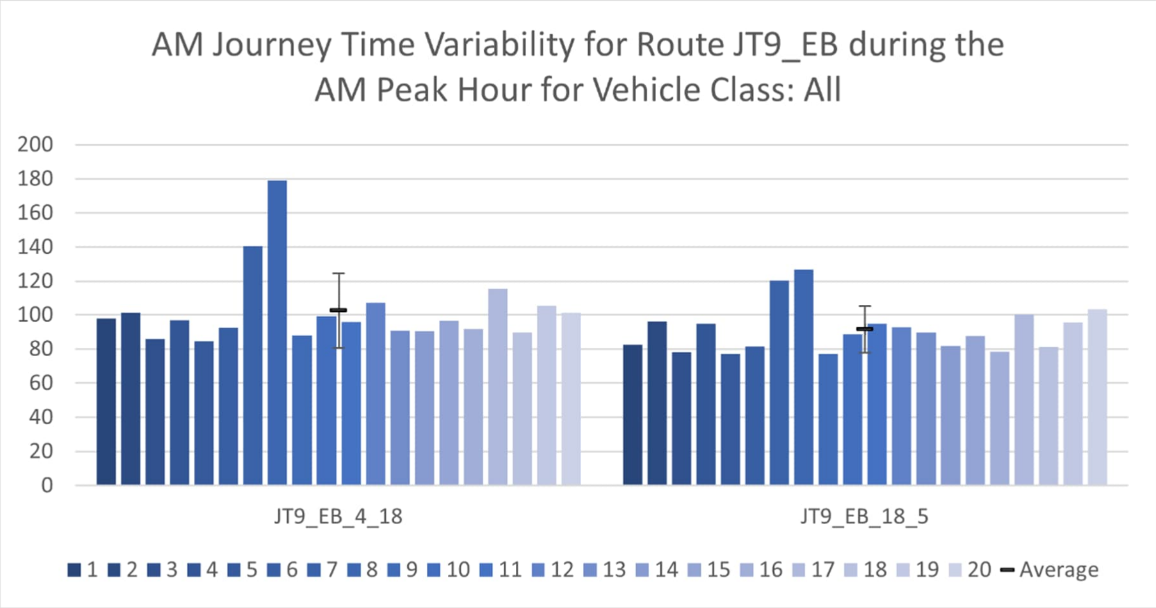

Figure 8-66. Journey Time 9 AM Eastbound Variability

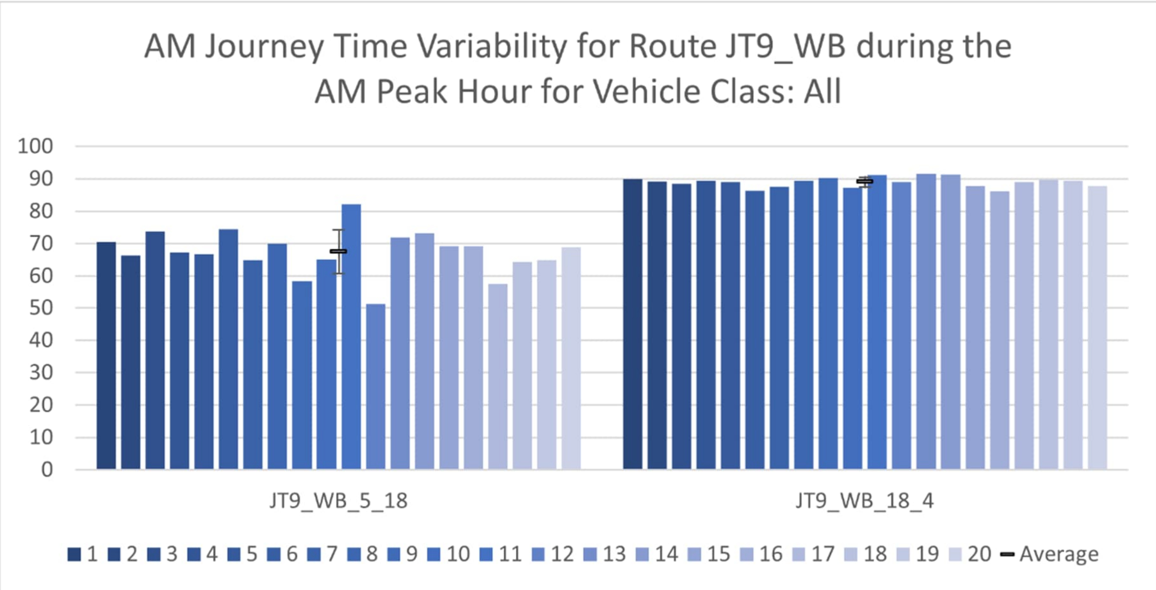

Figure 8-67. Journey Time 9 AM Westbound Variability

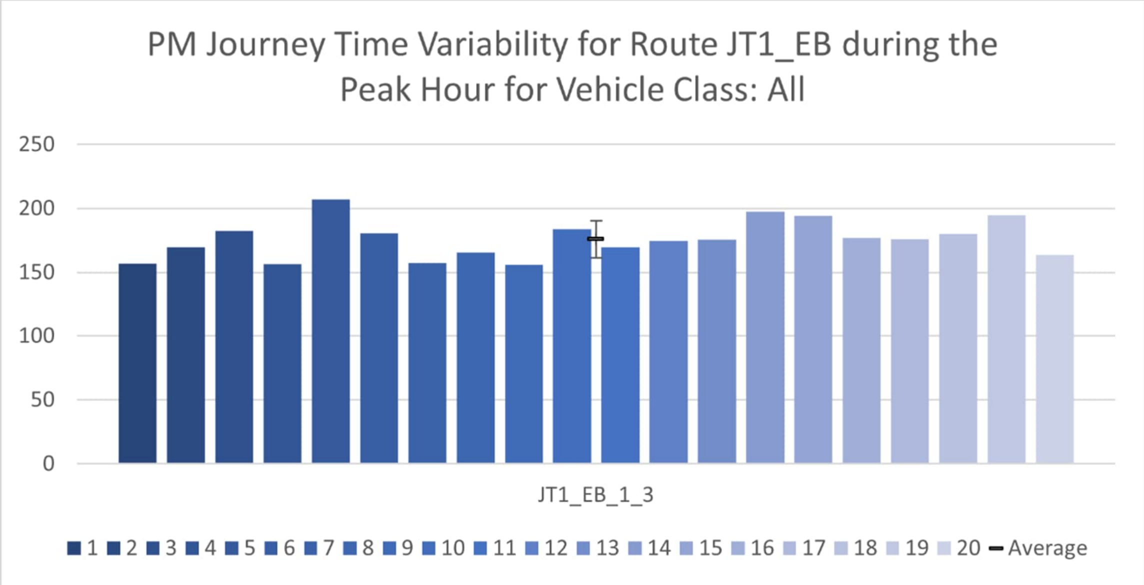

Figure 8-68. Journey Time 1 PM Eastbound Variability

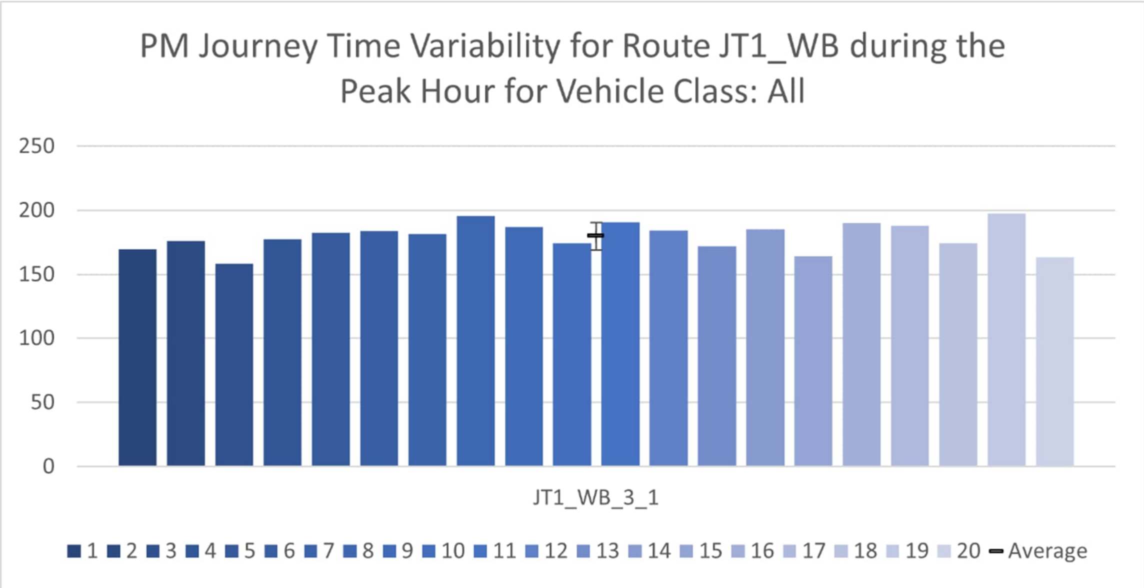

Figure 8-69. Journey Time 1 PM Westbound Variability

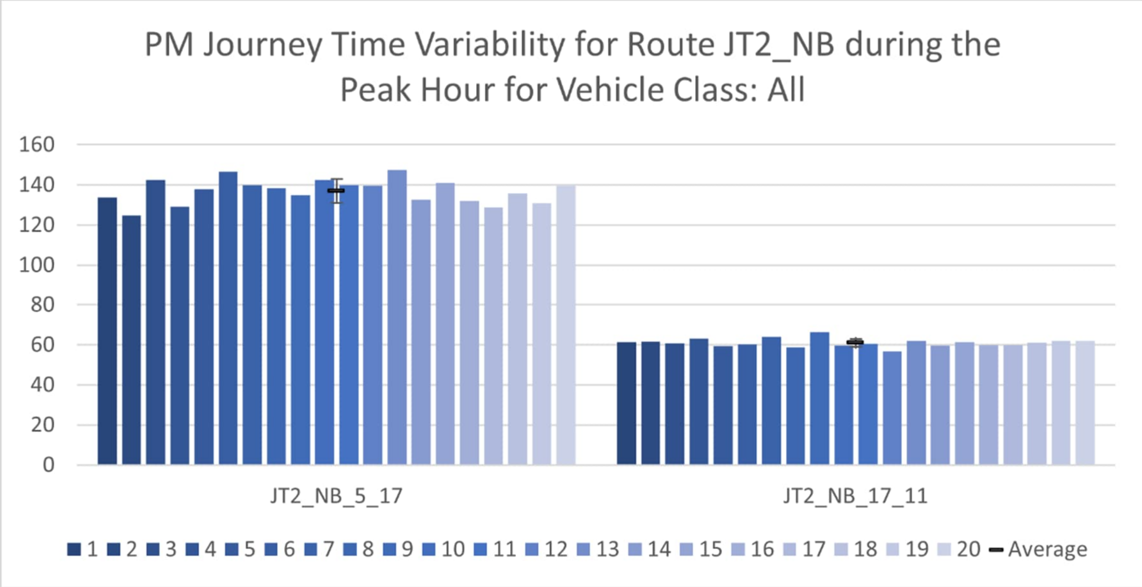

Figure 8-70. Journey Time 2 PM Northbound Variability

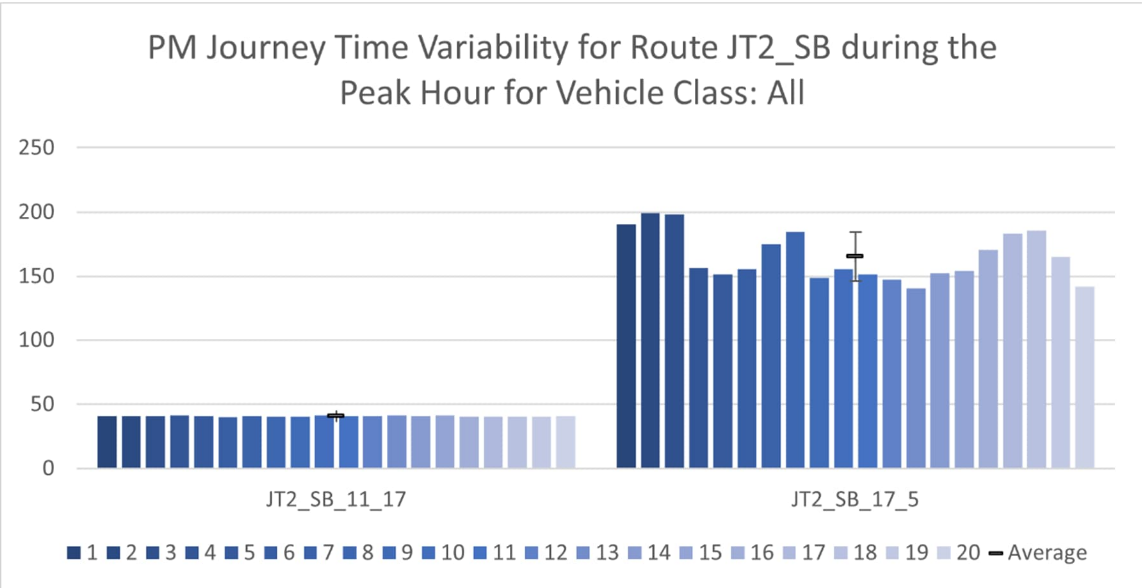

Figure 8-71. Journey Time 2 PM Northbound Variability

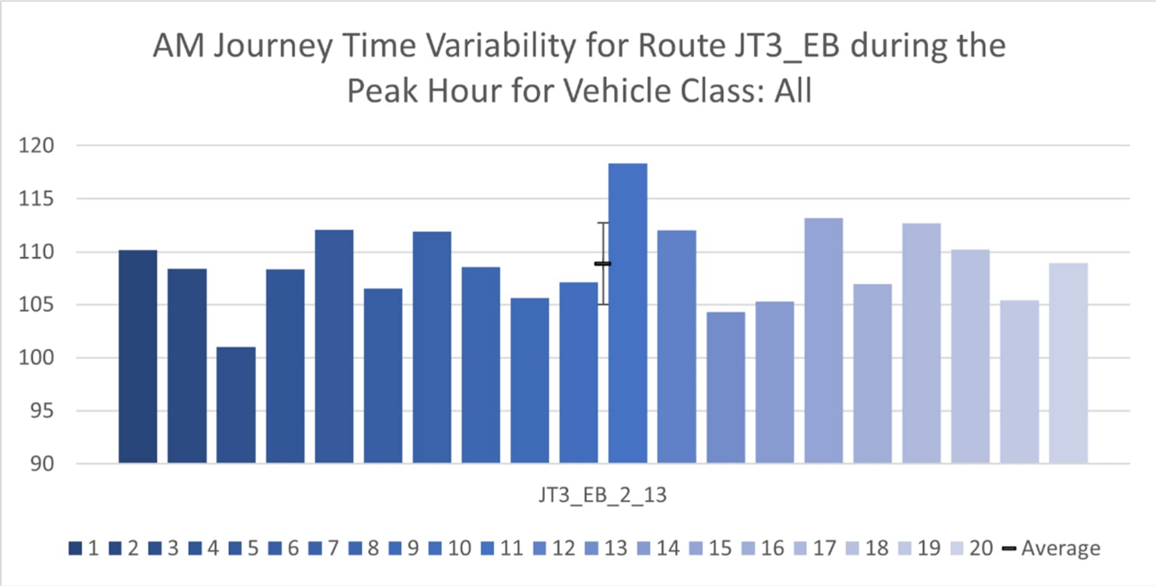

Figure 8-72. Journey Time 3 PM Eastbound Variability

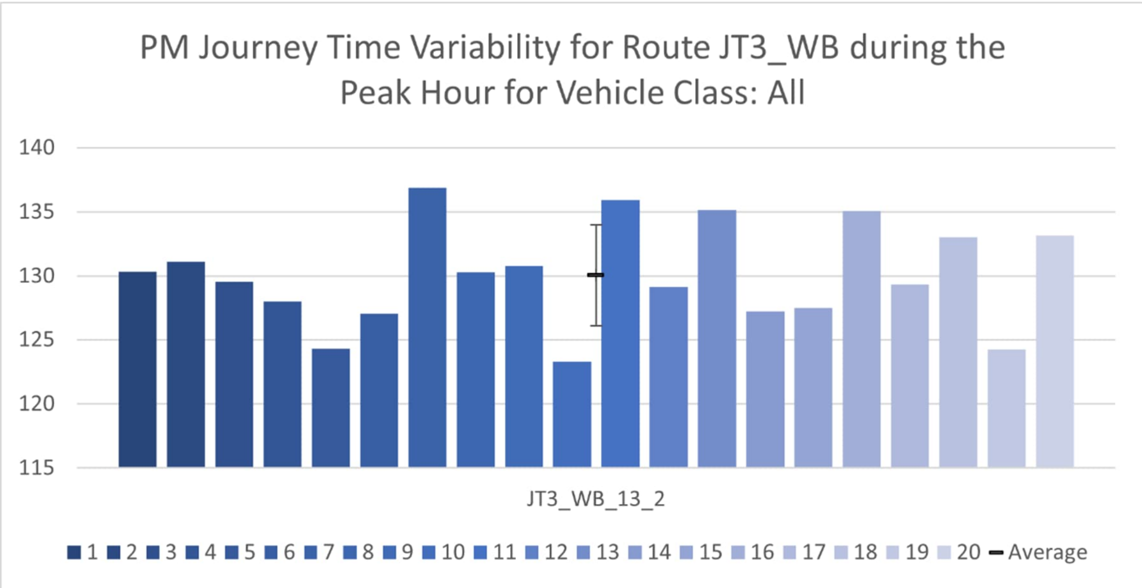

Figure 8-73. Journey Time 3 PM Westbound Variability

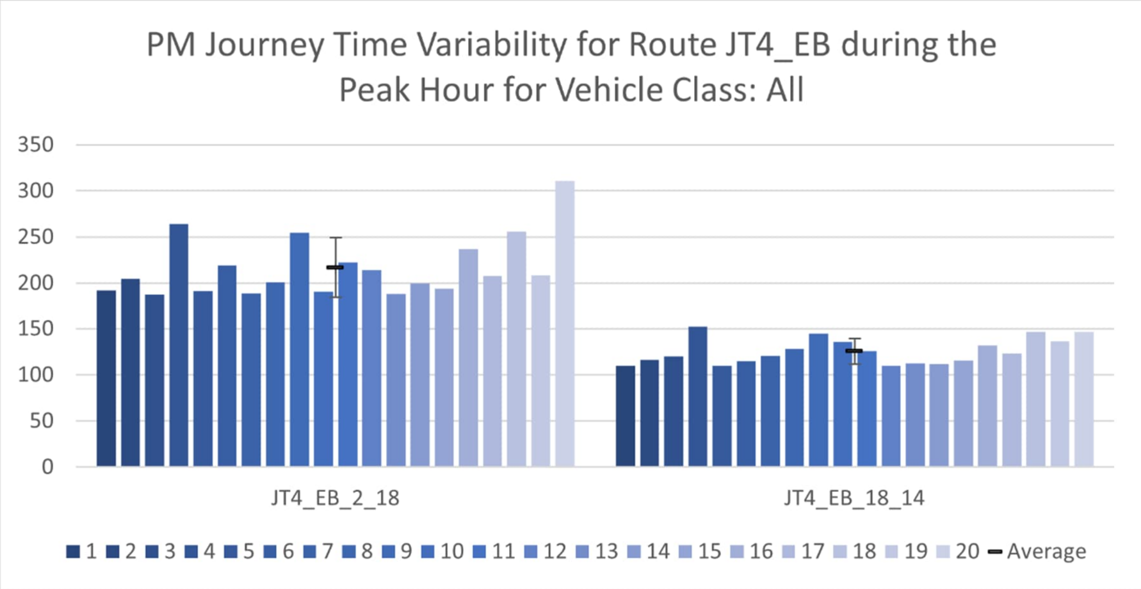

Figure 8-74. Journey Time 4 PM Eastbound Variability

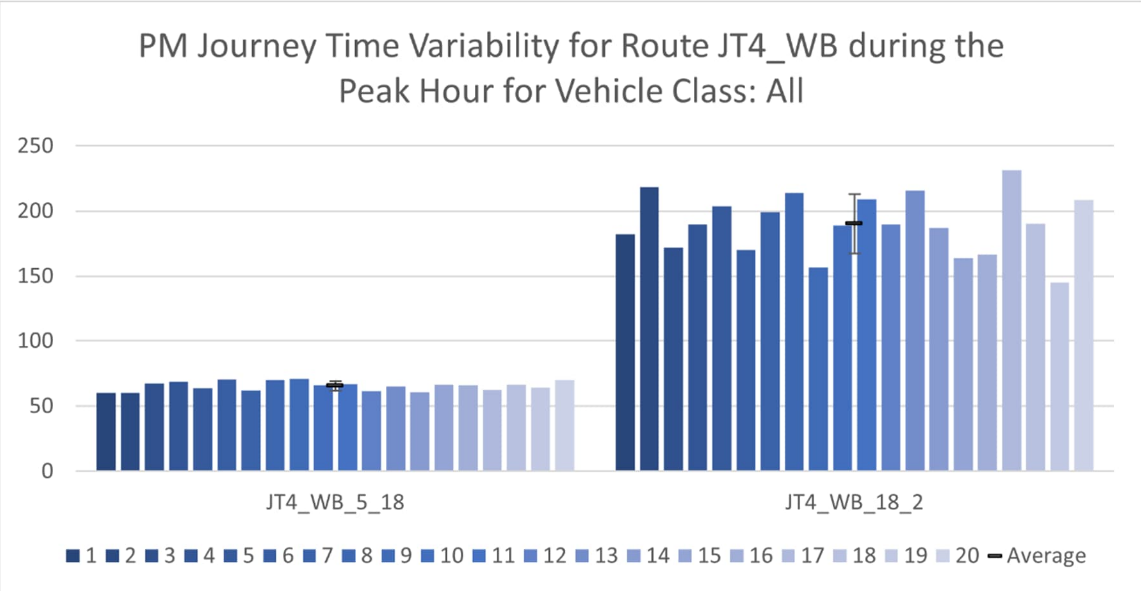

Figure 8-75. Journey Time 4 PM Westbound Variability

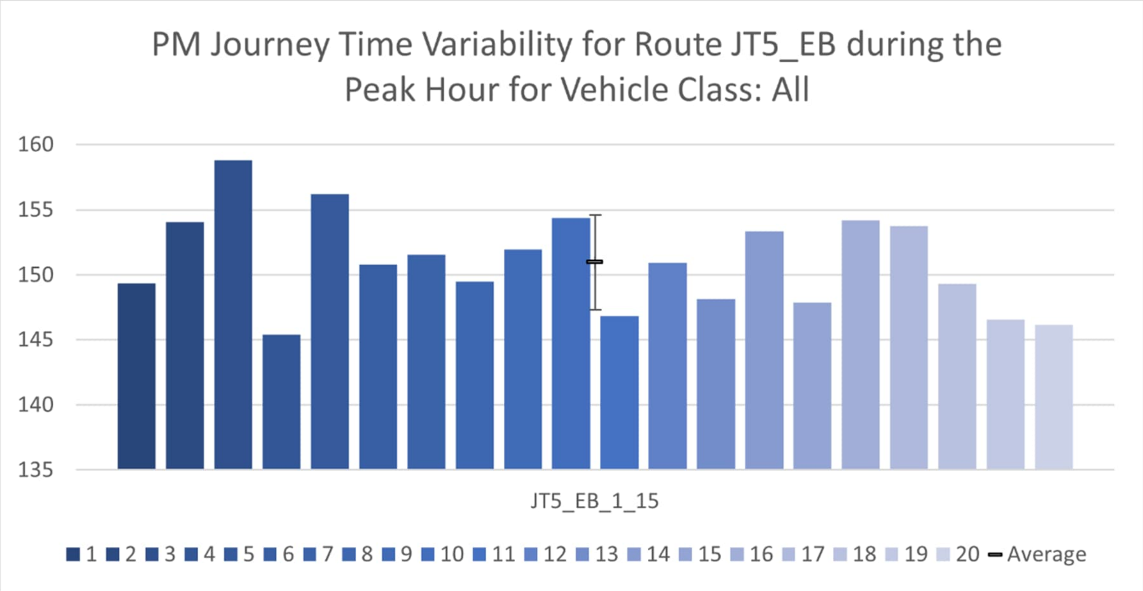

Figure 8-76. Journey Time 5 PM Eastbound Variability

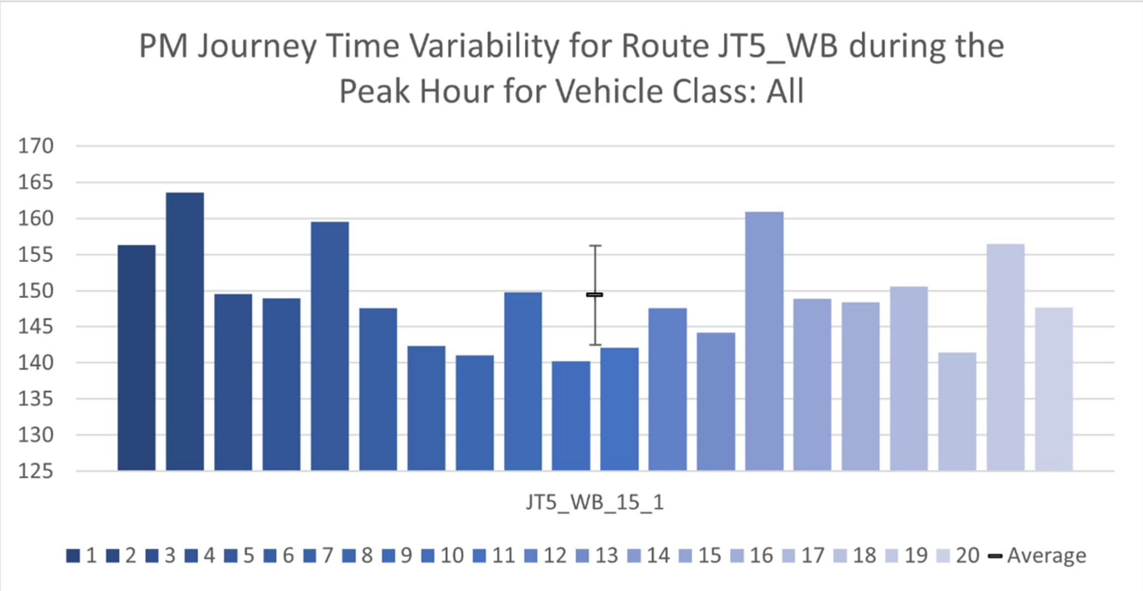

Figure 8-77. Journey Time 5 PM Westbound Variability

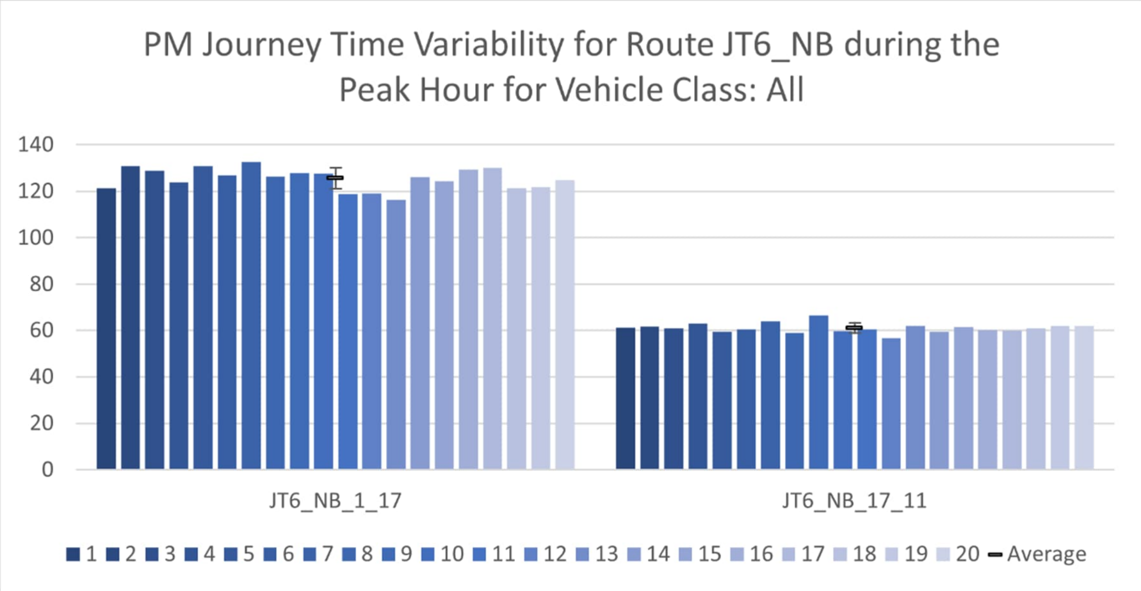

Figure 8-78. Journey Time 6 PM Northbound Variability

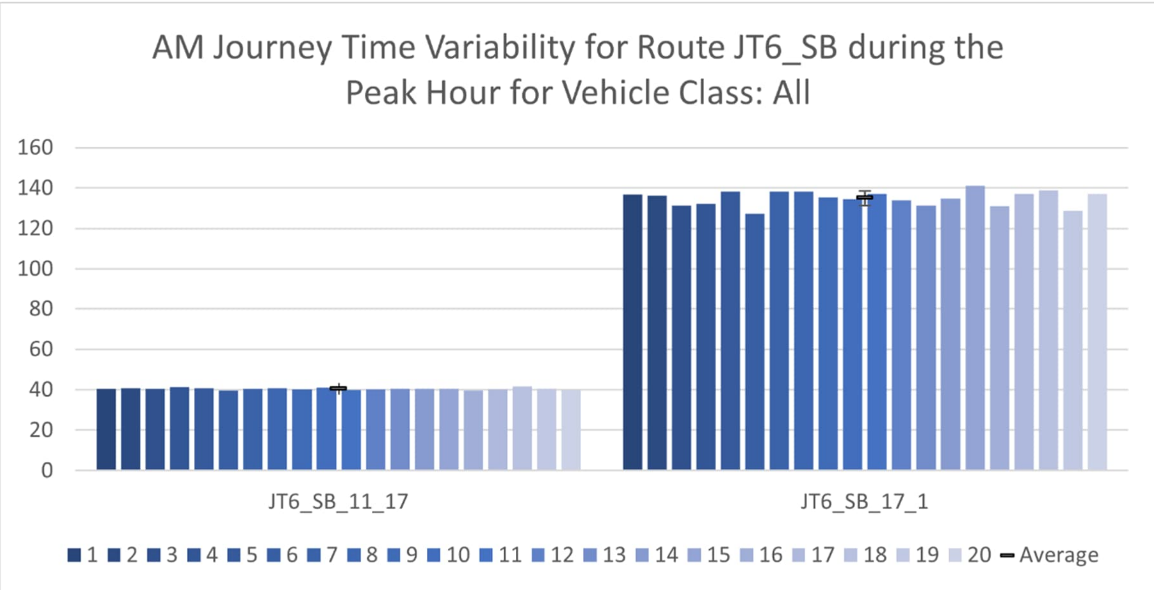

Figure 8-79. Journey Time 6 PM Southbound Variability

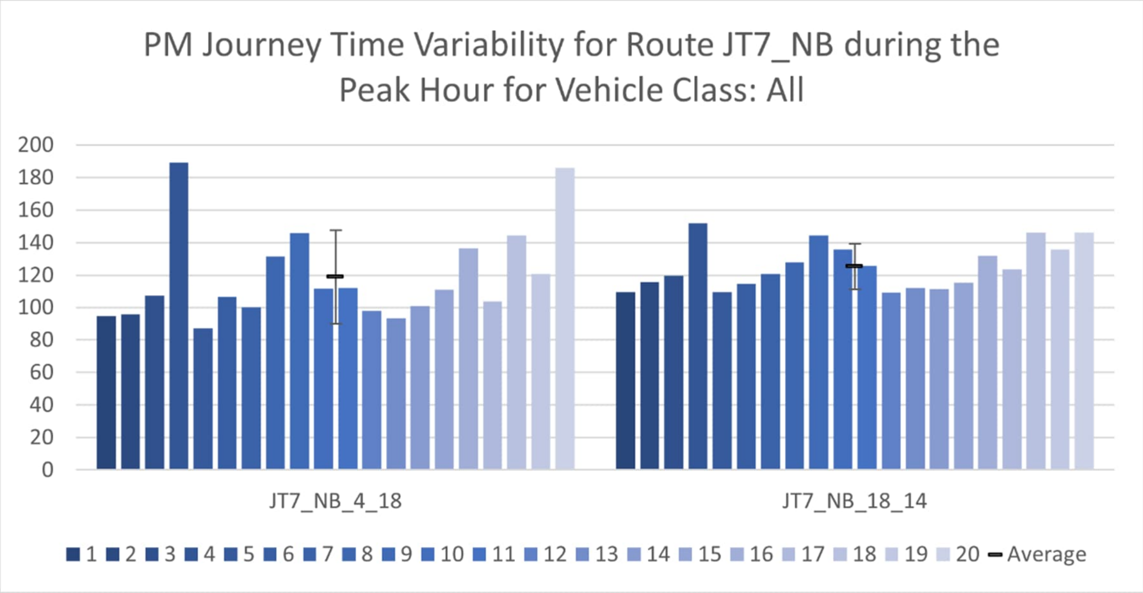

Figure 8-80. Journey Time 7 PM Northbound Variability

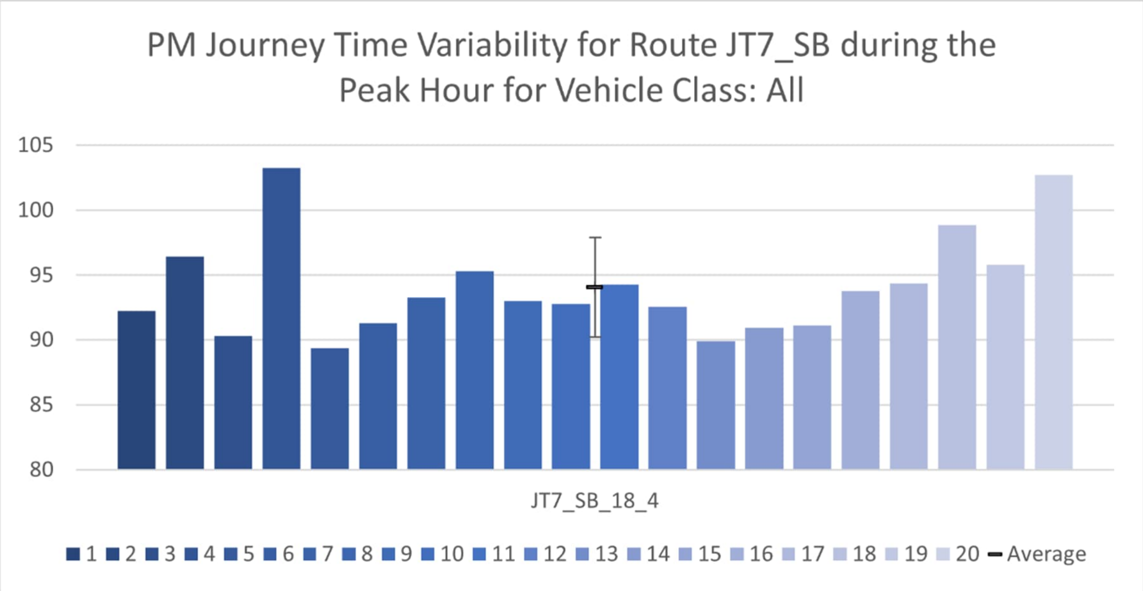

Figure 8-81. Journey Time 7 PM Southbound Variability

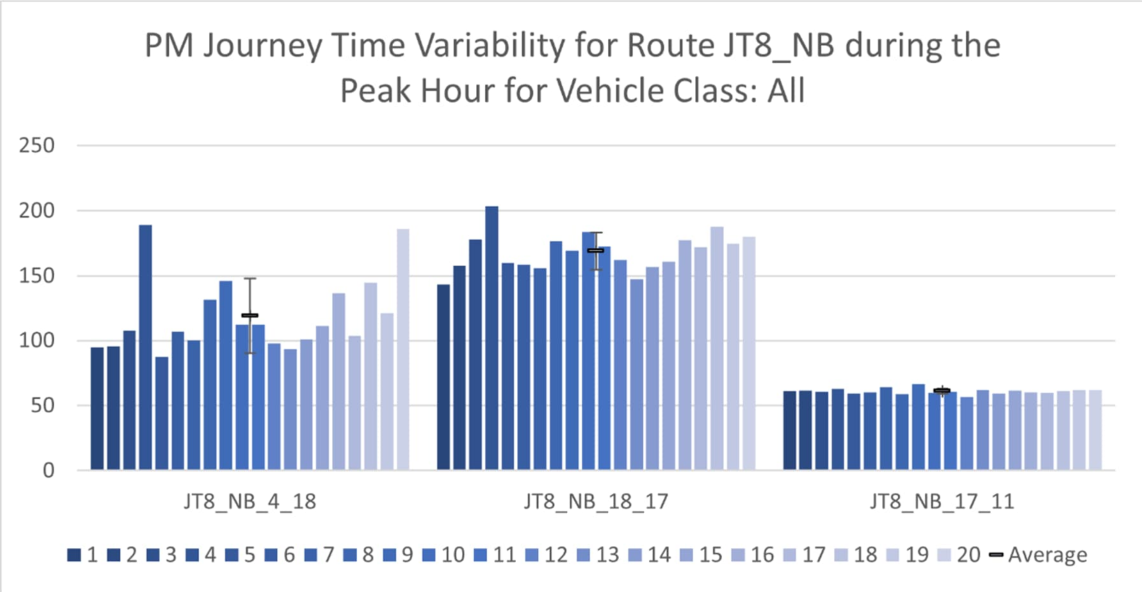

Figure 8-82. Journey Time 8 PM Northbound Variability

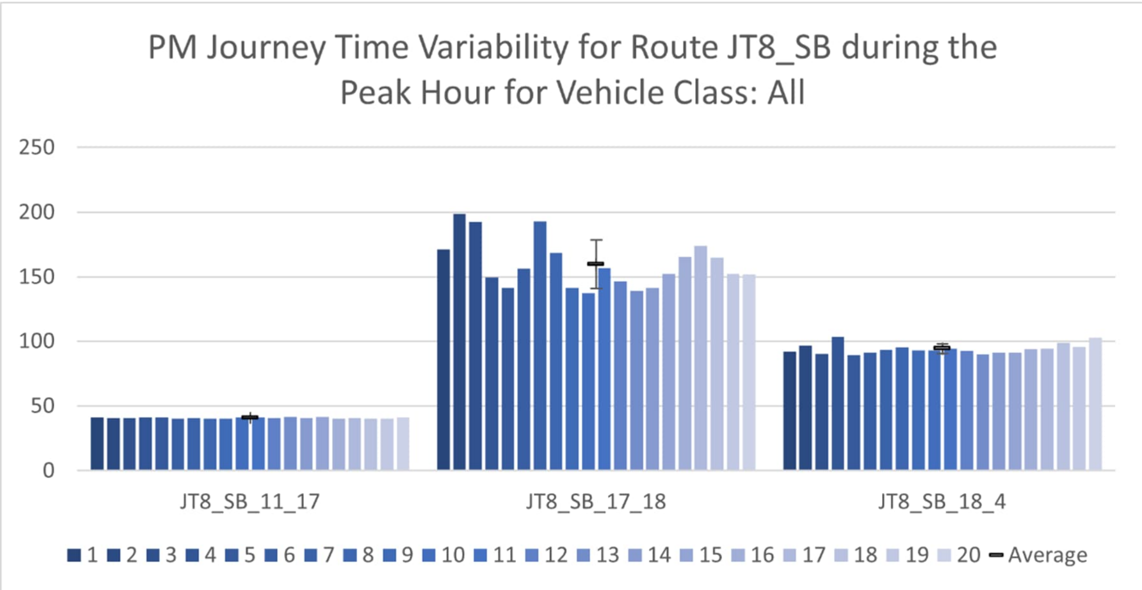

Figure 8-83. Journey Time 8 PM Southbound Variability

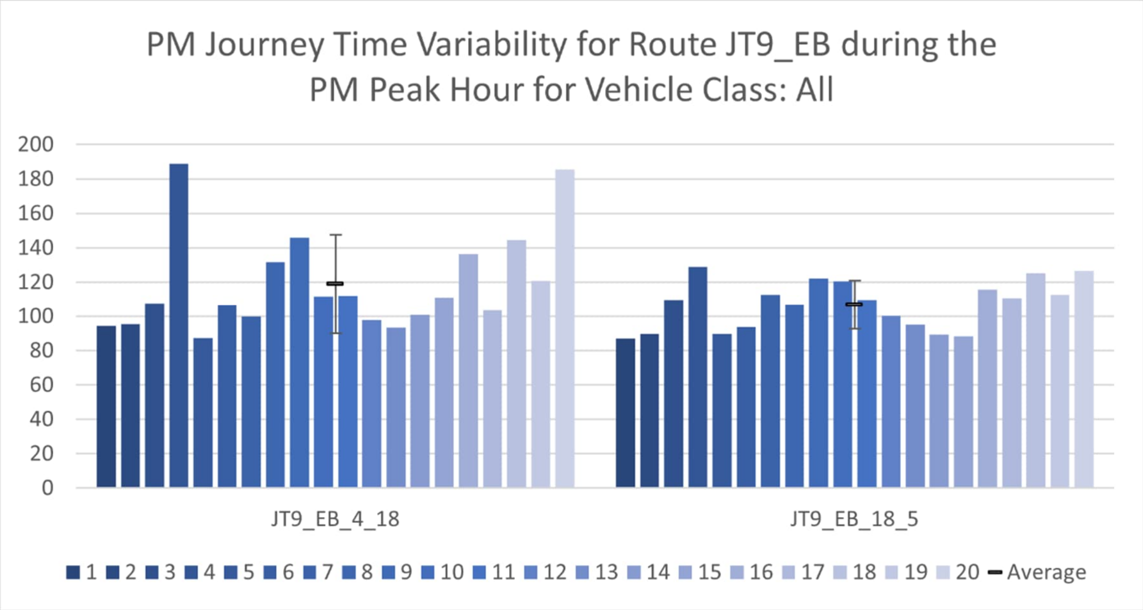

Figure 8-84. Journey Time 9 PM Eastbound Variability

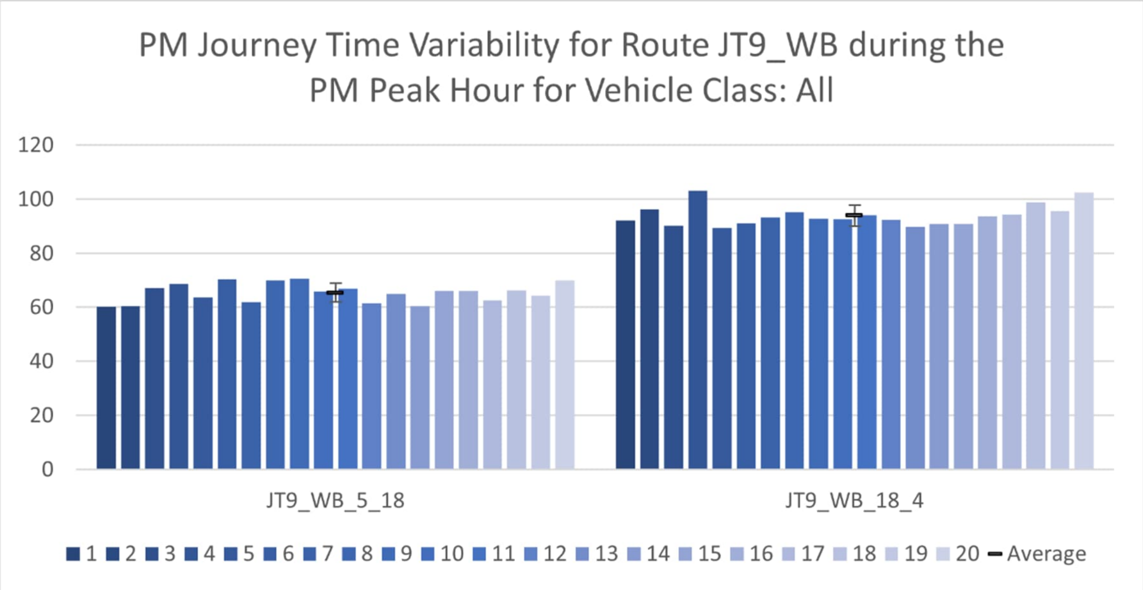

Figure 8-85. Journey Time 9 PM Westbound Variability

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Coltishall and Horstead Vissim Model Validation Report

ESCO Developments, Flagship Housing Group and Lovell Partnerships

21 April 2023

Delivering a better world

Quality information

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Table of Contents

1. Introduction

Background and Report Structure

1.1 ESCO Developments, Flagship Housing Group and Lovell Partnerships ('The Client Group') have commissioned AECOM to develop a VISSIM base model of the villages of Coltishall and Horstead to set up a reliable basis to assess the future operation of the network and the potential impact of the North Walsham Western Urban Extension (NWWUE). The model has been calibrated and validated to replicate the operation of the town based on data collected in November 2022.

1.2 This report documents the data collection and analysis, the development of the network and base year demand, and the calibration/ validation. The report is structured as follows:

- Data collection and analysis;
- Demand development;
- Network Development;
- Model Calibration results;
- Model Validation results; and
- Conclusion.

Model Scope

1.3 The Vissim model has been developed for the area shown in Figure 1-1. The Coltishall and Horstead network has no signalised junctions with all the junctions operating as priority controlled. The model area includes a mini roundabout in Horstead, a small gyratory road around a petrol station in the centre of the village and the narrow bridge over the river in the middle of the Coltishall. The Vissim model area shown in Figure 1-1 includes the B1150, which is the main corridor between Norwich and North Walsham, and the critical junctions/ links constraining the capacity of the corridor, such as the bridge and the village centres.

Figure 1-1 – Coltishall and Horstead Modelled Area

1.4 Figure 1-2 below shows the key junctions/ locations identified from the survey data/ observations in the model area that have a critical impact on network operation.

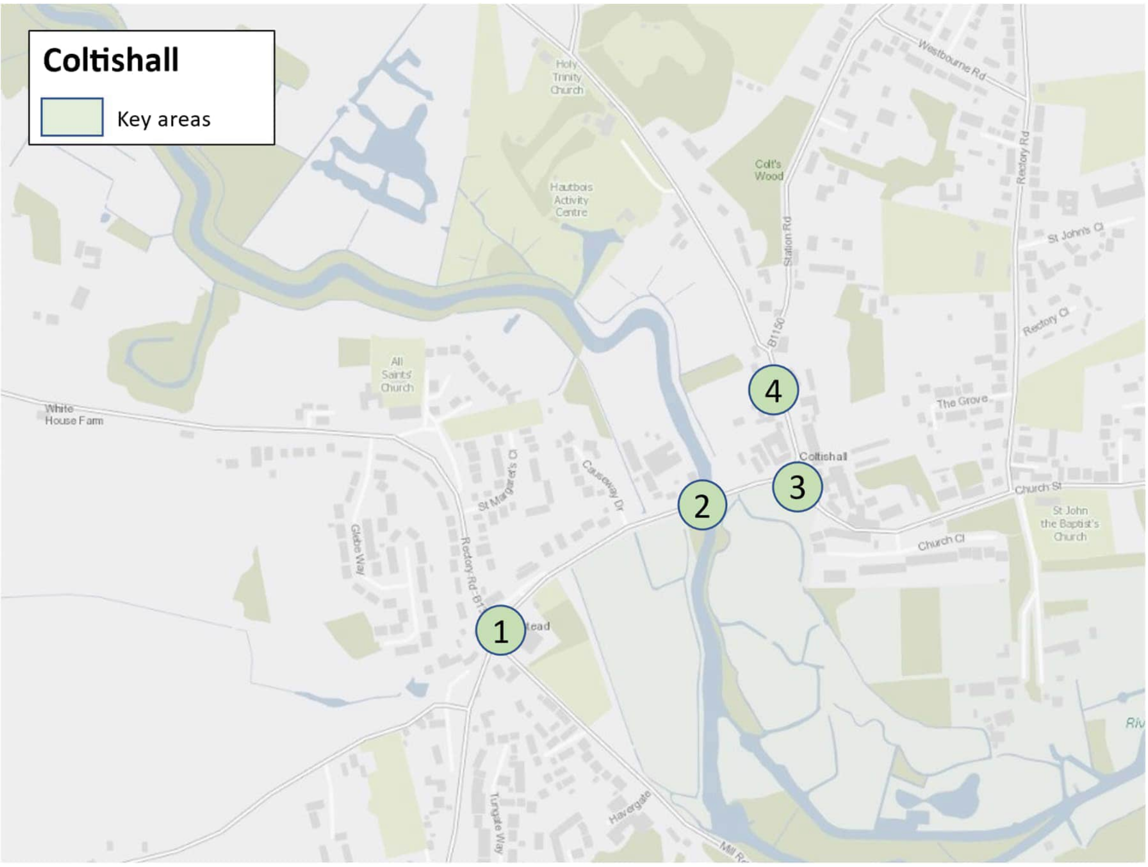


Figure 1-2 – Key areas in Coltishall and Horstead

1.5 The key areas are defined as follows:

1. Roundabout linking Rectory Road to the B1150 in Horstead;
2. Bridge over the River Bure on the B1150;
3. Gyratory road around the Esso Petrol Filling Station (PFS); and
4. High Street in Coltishall.

1.6 These areas have been considered when developing the model to replicate the existing operation and driving behaviour observed in the video footage available. It should be noted that the operation of some of these critical areas is entirely dependent on variable factors such as on-street parking and courtesy/ give way behaviours, which have been modelled and calibrated to observed queuing patterns/ levels of delay.

1.7 The Vissim Base models have been developed for the AM and PM peak hours, including 15-minute warm-up and 15-minute cool-down periods.

1.8 The Base models have been developed in line with modelling requirements and the calibration and validation criteria defined in Transport Analysis Guidance (TAG) and the Guidelines for the Use of Microsimulation Software published in May 2022 by National Highways.

2. Data Collection and Analysis

Introduction

2.1 The data collection exercise undertaken by AECOM to inform the Vissim Base model development has been summarised in this section.

Manual Classified Turning Count (MCTC) Data

2.2 Manual Classified Turning Counts (MCTCs) were carried out at the sites indicated in Figure 2-1 on Thursday 10th November 2022 between 07:00 and 19:00. The MCTC data was used to develop the base model demand and calibrate the turning flows at each junction shown in Figure 2-1.

Figure 2-1 – Manual Classified Turning Counts sites

Automatic Traffic Count (ATC) data

2.3 The link counts were collected using Automatic Traffic Count (ATC) loops. The ATC data was collected over two weeks between Thursday 10th of November and Wednesday 23rd of November 2022.

2.4 Five ATC sites were surveyed in total that have been used to inform the total trip ends at the entry/ entry points to the model. Their locations are shown below in Figure 2-2.

Figure 2-2 – Link counts (Automatic Traffic Counts)

Journey Time Data

2.5 The surveys also captured floating car data for two routes through the modelled area on 30th November 2022. The surveyed journey time routes are shown in Figure 2-3.

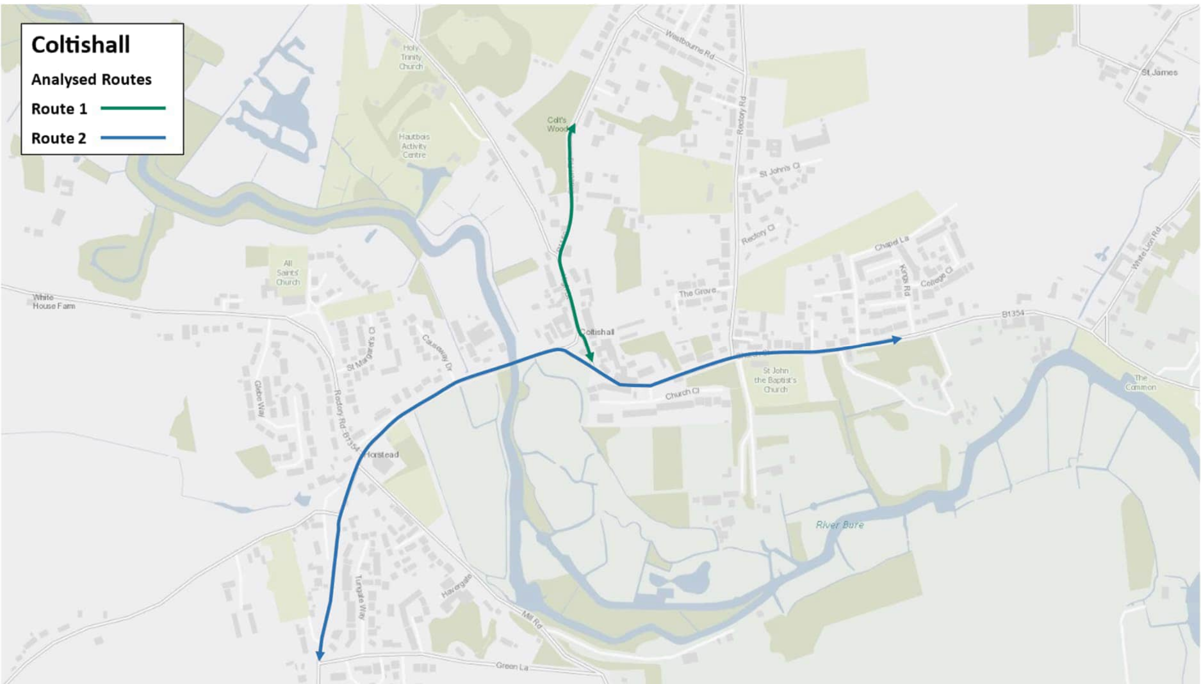


Figure 2-3 Journey Time Routes

Camera Footage

2.6 Camera footage, which was recorded to produce the MCTC and floating car journey time data, was obtained to provide the modellers with a more detailed view of the driving behaviour in the area.

Data Review and Analysis

Consistency Review

2.7 The locations of MCTC counts with labelled approach arms and model entry points to assist with the analysis of the data consistency review can be found in Appendix A.

2.8 The consistency between the different data sets was assessed to understand the reliability of the data and identify any discrepancies which could affect the model development. The full details of the consistency checks undertaken can be found in Appendix B.

2.9 The flow analysis and consistency checks highlighted a small flow difference between some junctions, these differences were below GEH 3 and will not affect the model calibration.

2.10 However, the flow difference between the PFS and the Rectory Road/ Norwich Road mini roundabout (Causeway Drive) could be affected by a potential increase in queue length from the bridge. To address this flow difference and ensure the model will capture any detrimental effects on Causeway Drive in the forecast scenarios, an additional model zone was added to represent Causeway Drive, to balance the flows between the junctions.

Peak Hour Analysis

2.11 The survey data available was processed to identify the morning and evening peak hours by analysing the profile of traffic volumes during the surveyed period. For this calculation, all vehicle movements have been considered as well as calculations of the inbound flows to the model area.

2.12 MCTC data was analysed using two methods to determine the peak hour, by totalling all movements and by totalling only entries in the model area. In the AM period, the peak hour was calculated to be 07.45-08.45, both when considering entries into the modelled area and when using all available data. In the PM period calculations similarly returned a consistent peak hour of 16.30-17.30 using both methods. The ATC data was also analysed and showed the same peak hours as analysis of the MCTC data.

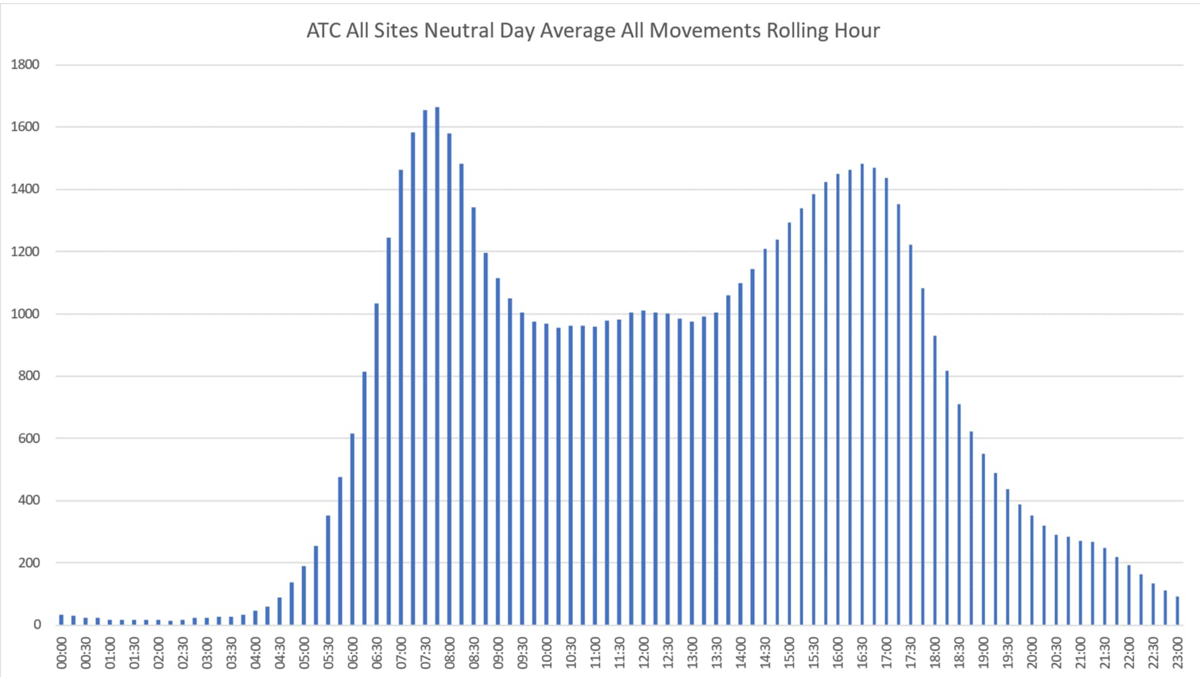


Figure 2-4 ATC Neutral Day Average All Movements Rolling Hour

2.13 Based on the assessment of the cumulative hourly flows shown above in Figure 2-4, the following morning and evening peak periods for the general traffic were assumed as follows:

- Morning Peak (AM): 07:45 to 08:45; and
- Evening Peak (PM): 16:30 to 17:30.

2.14 The modelled simulation periods include a 15-minute warm-up period to fully saturate the network before the simulated peak hour and a 15-minute cool-down period to allow vehicles to complete their journeys. The modelled periods are therefore:

- AM modelled period: 07:30 - 09:00; and
- PM modelled period: 16:15 - 17:45.

3. Demand Development

Overview

3.1 This section describes the demand methodology and the routing analysis undertaken to develop and calibrate the traffic demand and routing in the Vissim Base model.

3.2 The model was developed using the dynamic assignment module, as it would allow the model to predict future changes in routing as a consequence of the demand growth, committed schemes or proposed mitigation measures in the area.

3.3 The traffic demand has been calculated for each vehicle type included in the model (Car, Light Goods Vehicles (LGV) and Heavy Goods Vehicles (HGV)) for the modelled peak hours. The available survey data has been used to develop the hourly Origin-destination matrices and the 15-minute profiles for each origin zone.

Methodology

3.4 To ensure the best possible correlation between the observed data and the Vissim model demand, the vehicle inputs and origin/destination routing have been developed by combining two different components:

- Prior Matrix – This was developed using MCTC turning count proportions to define origin to destination routes.
- New Zones Matrix – a synthetic zone was added on Causeway Drive, labelled as Zone 2. The demand at this zone has been estimated based on the flow differences identified between the adjacent MCTC data.

3.5 Figure 3-1 shows the location of the defined zones in Vissim. The MCTC sites are labelled with numbers 101-105, whilst the origin zones are labelled with numbers 1-9.

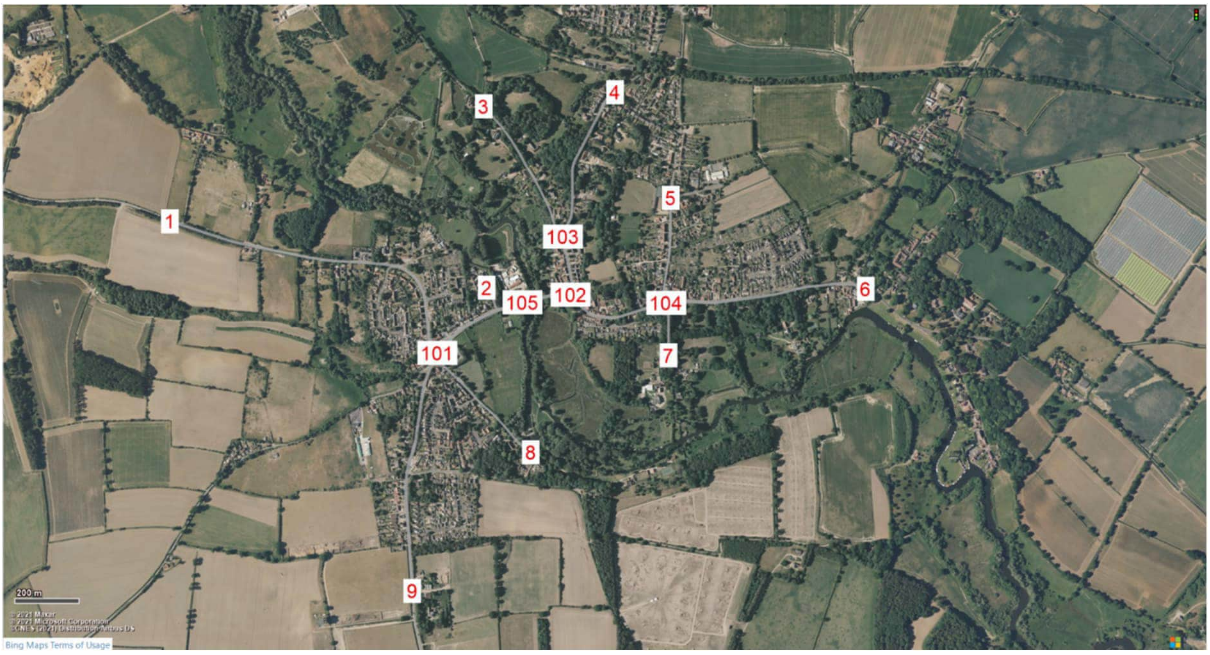


Figure 3-1 Vissim Zone Map

3.6 The movements to and from Zone 2, which was added as a synthetic zone, were estimated from flow difference between MCTC-1 and MCTC-5. All other zone movements were estimated through turn proportion data gathered from MCTC surveys.

3.7 The final matrix was sense-checked against key movements in the modelled area to ensure accuracy, most notably the movement between Zones 4 to 9, since this is the central corridor which passes through Coltishall and Horstead, linking North Walsham to Norwich in the south.

Convergence

3.8 The models have been converged using standard convergence criteria from Vissim, although there is no route choice available in the Coltishall and Horstead model network.

Routing Analysis & Closures

3.9 The routing proportions obtained from the convergence process were analysed and reviewed to ensure that there are not unrealistic route patterns included in the model.

3.10 Several paths were highlighted as unrealistic and have been closed to prevent abnormal or unrealistic driving behaviour. Some examples of these routes are shown in Figure 3-2 and Figure 3-3.

3.11 As shown in Figure 3-2, a route for vehicles travelling northbound on the B1150 which involves looping around the roundabout on Rectory Road to turn onto Mill Road has been closed, since drivers can make a direct right-turn onto Mill Road before the roundabout.

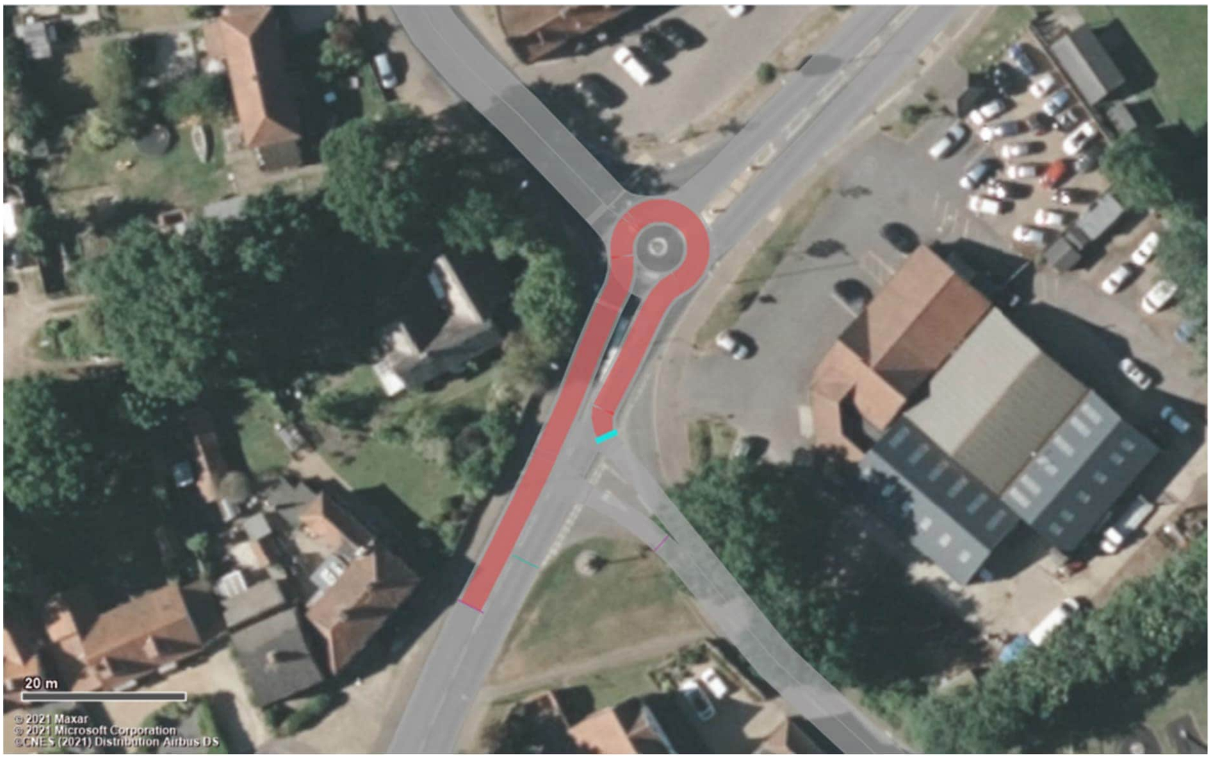


Figure 3-2 Closed route at Rectory Road roundabout

3.12 As shown in Figure 3-3, a route for vehicles travelling from the B1150 onto the High Street which involves a circulating around the petrol station has been closed, since drivers can make continue straight onto the high street instead.

Figure 3-3 Closed route at petrol station gyratory

4. Network Development

Network coding

4.1 Scaled Bing maps within Vissim have been used to code the network geometry and structure, such as number of lanes and flare lengths and reference was also made to Google Maps and Streetview to ensure the network reflects conditions on the ground.

4.2 Observation from the video footage available have also been used to inform the network coding and replicate the operation of the existing layout.

Desired Speed Decisions

4.3 Desired Speed Decisions, defining the speed distribution that vehicles follow at each point of the network, have been updated to represent the posted speed limits for each link.

4.4 The speed distributions used in the model, and the variability that a group of vehicles show at the same speed limit, have been obtained from two different sources. The Guidelines for the Use of Microsimulation Software from National Highways provide distributions for 50 mph and 70 mph, while 30 mph and 60 mph have been obtained from the SPE0111 - Vehicle Speed Compliance by road type and vehicle type in Great Britain from the Department for Transport (DfT).

4.5 40mph distributions have been obtained by interpolation between the 30 mph and the 50 mph distributions. The 30 mph, 40 mph and 50 mph distributions are shown in Appendix C.

4.6 It should be noted that the speed distribution for 20mph included in the models has been calculated using the journey time data on the section operating in free flow conditions.

Reduced Speed Areas

4.7 Reduced Speed Areas (RSAs) have been included to replicate driving behaviour, for example on curved roads and turns onto roads.

4.8 RSA have also been used to represent specific behaviours observed in the model area. It should be noted that additional RSAs have been coded in the PM model to represent the queuing patterns observed on the High Street. These queues are caused by parked cars which were only observed in the PM peak and these RSAs have not been included in the AM peak hour model, as the parked vehicles were not present.

Priority Rules and Conflict areas

4.9 Priority Rules and Conflict Areas have been coded following the industry standard approach and were calibrated to replicate the observed network conditions and driver behaviour.

4.10 Priority rules have also been used to represent the give way operation observed on the Norwich Road bridge, where large vehicles give way to each other as they cannot pass over the bridge at the same time.

4.11 It should be noted that additional priority rules were coded in the PM model to reflect the observed queuing and give way behaviour on the High Street. The floating car journey time video footage was used to observe give way behaviour, which was replicated in the model, so the queues caused by the parked cars in the PM peak are replicated.

Public Transport

4.12 Bus routes and departure times included in the modelled area were sourced from the website https://bustimes.org/. An average dwell time of ten seconds was assumed for all bus stops in the model.

Differences between AM and PM model networks

4.13 Some limited differences between the AM and PM peak hour models were coded to replicate the operation of the High Street, where the queues, delays and give way behaviour caused by the parked cars along this route were only present in the PM peak hour.

5. Model Calibration

Introduction

5.1 The purpose of the model calibration process is to ensure that the model represents existing traffic conditions. Calibration is an iterative process in which the model is revised to replicate observed traffic volumes, traffic conditions and vehicle behaviour as closely as possible.

Flow Calibration Criteria

5.2 This section presents the traffic flow calibration and the comparison between the modelled and observed traffic flows using the criteria provided in TAG Unit M3-1.

5.3 The observed and modelled turning flows were compared for each of the junctions for the AM and PM peak hours, using the TAG criteria (Unit M3.1) for flow calibration as shown in Table 1.

Table 1 – TAG Calibration Criteria

Criteria	Acceptability Guidelines
Criteria 1 - % Flows a. Individual flows within 15% for flows 700-2700 vph b. Individual flows within 100 vph for flows < 700 vph c. Individual flows within 400 vph for flows > 2700 vph	> 85% of all cases
Criteria 2 – GEH Criteria a. GEH Statistic -Individual flows: GEH < 5	

5.4 The differences between modelled and observed flows were calculated and the TAG criteria, both for absolute differences and for GEH statistic, were used to determine if these differences were acceptable. The GEH statistic incorporates both relative and the absolute differences and provides a better indication of the significance of differences, compared to using percentage differences which can be misleading.

5.5 The GEH statistic is defined as:

GEH= $\sqrt{\frac{(M-C)^2}{(M+C)/2}}$, where M and C are different datasets to be compared.

Flow Calibration Results

5.6 The modelled turning flows were compared against the surveyed turning flows to calibrate the demand inputs and model assignment. The models were run twenty times using different random seeds to produce a set of average turning count results for comparison with the survey data.

5.7 The structure of the junctions and turning counts references within the model area can be seen in Appendix A, whilst tables indicating the GEH scores can be found in Appendix D.

5.8 The AM calibration results in Table 2 show the calibration results for each vehicle type. The results demonstrate that the AM peak hour flows are calibrated closely against the observed turning counts when analysed vehicle class, and all exceed the thresholds set out in TAG.

Table 2 – AM Calibration Results - Peak Hour by Vehicle Class

Vehicle Class	Tag Criteria	Within	Total Counts	Percentage Passing
Cars	**% Counts within GEH <5**	50	50	100%
	% Flows within Individual Flow	50	50	100%
LGVS	**% Counts within GEH <5**	50	50	100%
	% Flows within Individual Flow	50	50	100%

Vehicle Class	Tag Criteria	Within	Total Counts	Percentage Passing
HGVs	**% Counts within GEH <5**	50	50	100%
	% Flows within Individual Flow	50	50	100%
Total	**% Counts within GEH <5**	50	50	100%
	% Flows within Individual Flow	50	50	100%

5.9 The AM calibration results in Table 3 show the calibration results for total vehicles entering the model. Although not required in TAG, explicitly matching the observed number of vehicles entering the network is a key metric to validate the capacity and delays of the microsimulation models.

5.10 The results demonstrate that all entry junctions into the model are calibrated closely with observed data. It has therefore been checked that the correct number of vehicles are entering the model.

Table 4 – AM Peak Hour Calibration results - Model Entries

From	Observed	Modelled	% Diff.
Mill Road	20	20	0.0%
B1150 / Norwich Road (EB)	637	634	-0.5%
B1354 / Buxton Road	255	249	-2.4%
Station Road	527	523	-0.8%
Great Hautbois Road	10	10	0.0%
Rectory Road	58	56	-3.4%
B1354 / Wroxham Road (WB)	285	280	-1.8%
Church Loke	8	8	0.0%

5.11 The calibration summary in Table 5 demonstrates that the PM peak hour model flows are also closely calibrated against the observed turning counts when analysed by vehicle class, exceeding the requirements set out in TAG.

Table 5 – PM Calibration Results - Peak Hour by Vehicle Class

Vehicle Class	Tag Criteria	Within	Total Counts	Percentage Passing
Car	**% Counts within GEH <5**	50	50	100%
	% Flows within Individual Flow	50	50	100%
LGV	**% Counts within GEH <5**	50	50	100%
	% Flows within Individual Flow	50	50	100%
HGV	**% Counts within GEH <5**	50	50	100%
	% Flows within Individual Flow	50	50	100%
Total	**% Counts within GEH <5**	50	50	100%
	% Flows within Individual Flow	50	50	100%

5.12 The PM calibration results in Table 6 shows the calibration results for total vehicles entering the model. The results demonstrate that all entry junctions into the model are calibrated closely with observed data. It has therefore been checked that the correct number of vehicles are entering the model.

Table 6 – PM Peak Hour Calibration Results – Model Entries

From	Observed	Modelled	% Diff.
Mill Road	21	20	-4.8%
B1150 / Norwich Road (EB)	730	715	-2.1%
B1354 / Buxton Road	200	197	-1.5%
Station Road	427	418	-2.1%

From	Observed	Modelled	% Diff.
Great Hautbois Road	36	34	-5.6%
Rectory Road	44	43	-2.3%
B1354 / Wroxham Road (WB)	305	302	-1.0%
Church Loke	4	4	0.0%

Calibration Parameters

5.13 Table 7 summarises the main calibration and specific driving behaviour parameters recommended by TAG and DfT for microsimulation models. These parameters have been included in the Coltishall and Horstead Vissim model in line with the recommended guidance.

Table 7 – Microsimulation Model Parameters – TAG/DfT

Parameter	Value	Following guidance
Headway	1s time	Yes
Gap	1 to 4 seconds, depends on location.	Yes
Vehicle Dynamics	Following graphs	Yes
Reaction Time	-	-
Desired Speed Distributions	Following graphs	Yes
Driver Awareness	Following graphs	Yes
Influence of signing on the approach to a diverge of the motorway lane selection	5	Yes
Cooperative Merging	Yes, used on merging and weaving links. Maximum speed difference - 6.71mph Maximum collision time – 10s	Yes
Implied Capacity at roundabouts and signal stop lines	-	-
Min Distance between vehicles at a standstill	1.5m	Yes

6. Model Validation

Introduction

6.1 Following the model calibration process, the VISSIM models were validated using journey time data. The vehicle travel time results from the models were compared against the surveyed journey time data to validate the queuing and delay in the model. The models were run twenty times using different random seeds to produce a set of average journey time results for comparison with the survey data.

6.2 The TAG M3-1 criteria for journey time validation are shown in Table 8 below.

Table 8 – TAG Validation Criteria

Criteria	Acceptability Guidelines
Modelled times along routes should be within 15% of surveyed times (or 1 minute, if higher than 15%)	> 85% of routes

Journey Time Validation Results

6.3 Figure 6-1 shows the two journey time routes which have been defined within the model area. The average observed journey times were compared to the average modelled journey times in accordance with the criteria set out in TAG M3-1. The journey times routes were defined using the GPS position of the floating car video footage used to capture the observed journey time data.

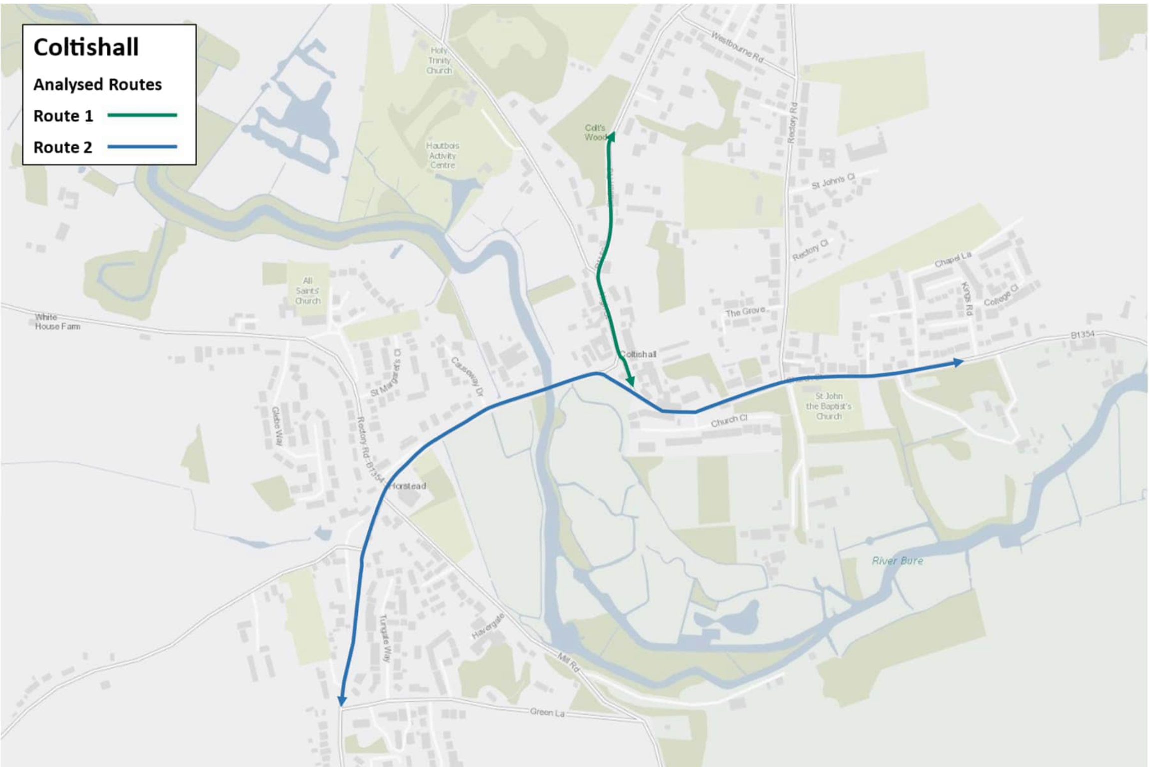


Figure 6-1 Coltishall and Horstead Routes

6.4 Table 9 and Table 10 show the individual performance of each of the defined journey time routes for all vehicles, all of which pass the TAG criteria.

Table 9 – AM Journey Time Validation

ID	Route Name	Observed	Modelled	% Difference	Validation
1	JT1_SB	58	62	7%	Yes
2	JT1_NB	75	70	-6%	Yes
3	JT2_EB	174	175	1%	Yes
4	JT2_WB	154	165	7%	Yes

Table 10 – PM Journey Time Validation

ID	Route Name	Observed	Modelled	% Difference	Validation
1	JT1_SB	102	102	0%	Yes
2	JT1_NB	96	88	-8%	Yes
3	JT2_EB	187	176	-6%	Yes
4	JT2_WB	151	164	9%	Yes

6.5 Figure 6-2 to Figure 6-7 show the cumulative journey time profiles of these routes with the maps and observed data for both peaks. It can be seen that the models closely replicate the profile of delay along the modelled routes.

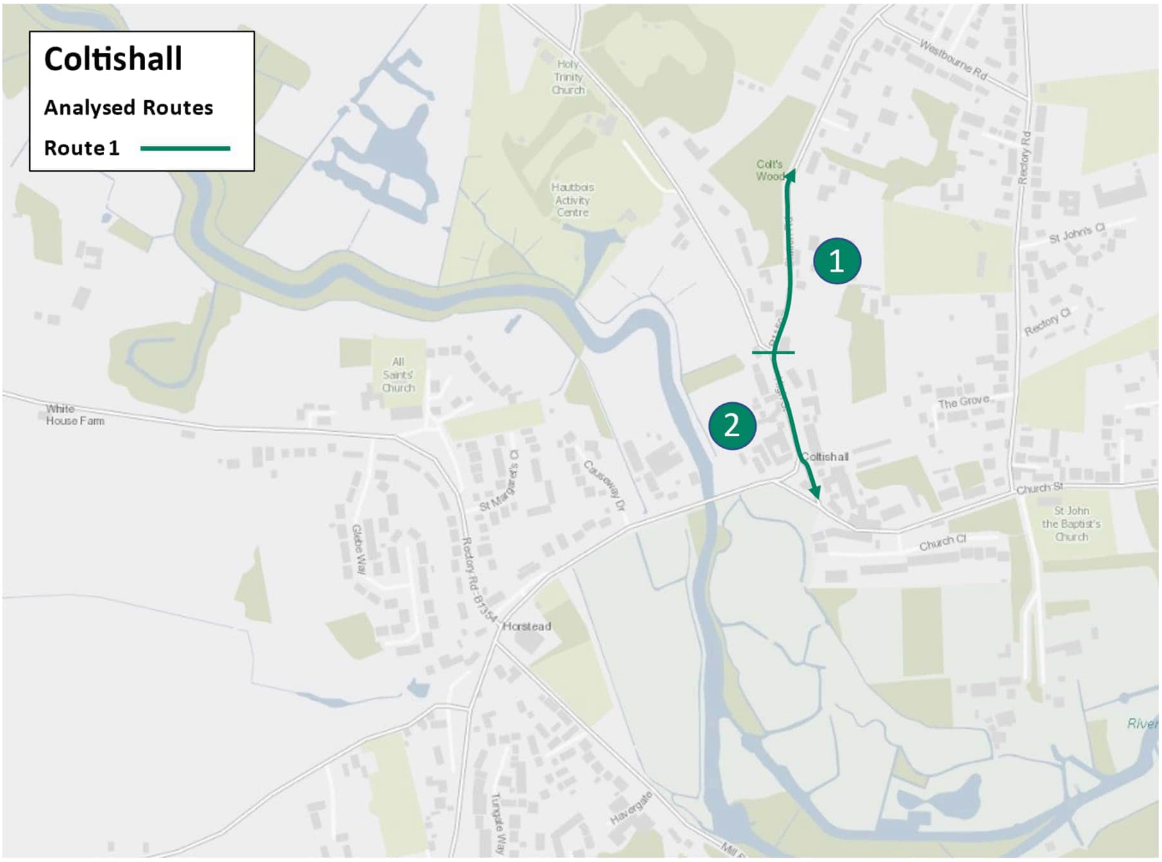


Figure 6-2 – Route 1 SB Map

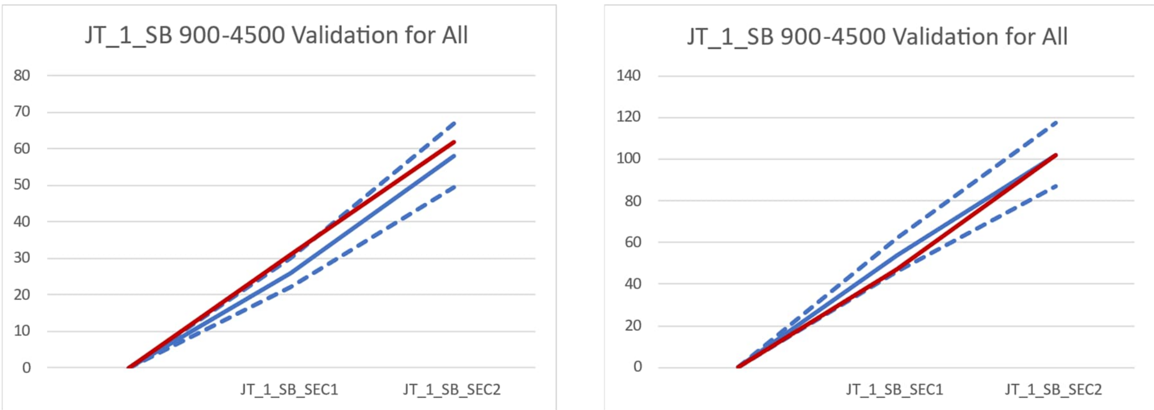


Figure 6-3 – Route 1 SB journey time validation profiles

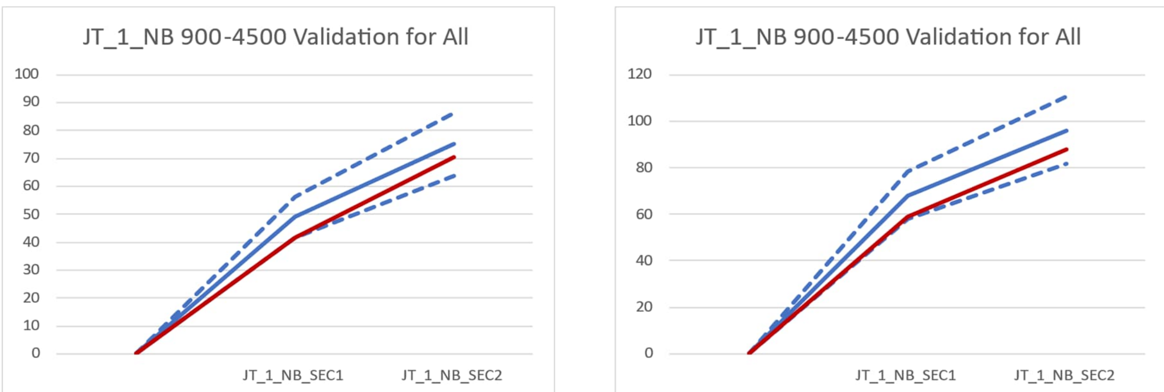


Figure 6-4 – Route 1 NB journey time validation profiles

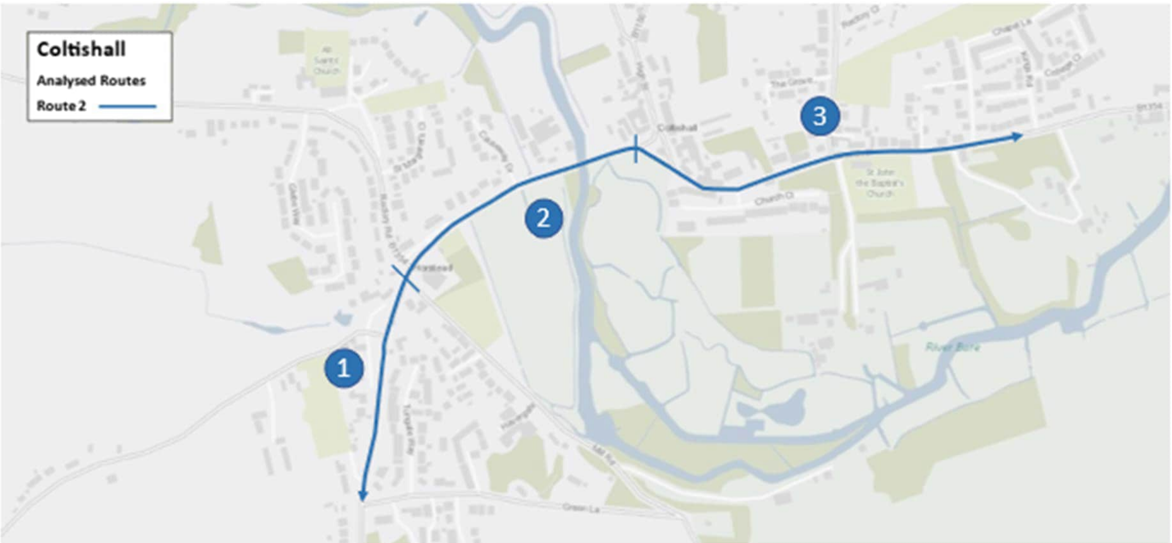


Figure 6-5 – Route 2 EB Map

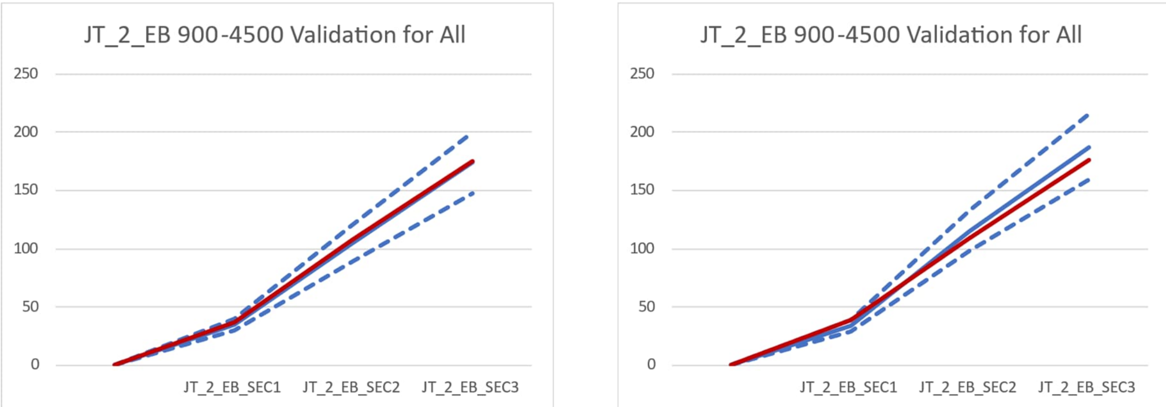


Figure 6-6 – Route 2 EB journey time validation profiles

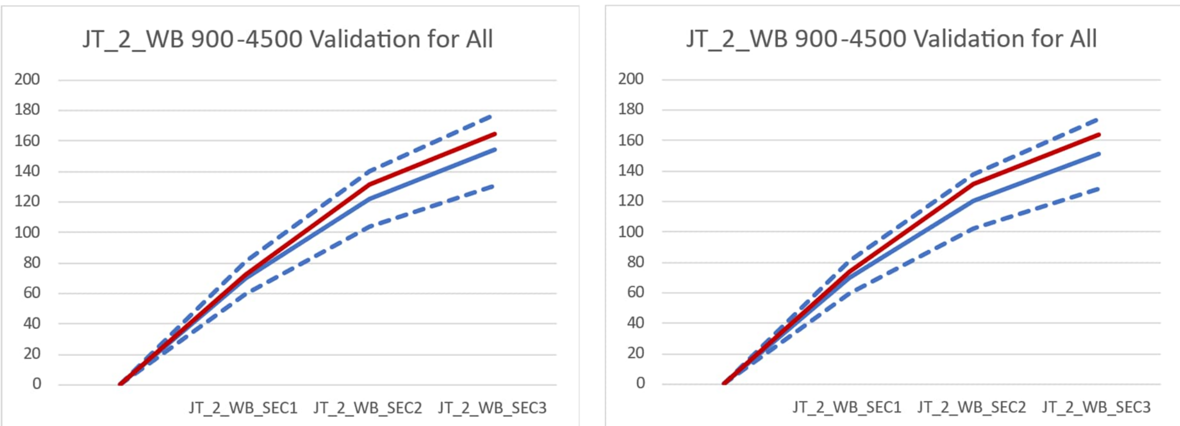


Figure 6-7 – Route 2 WB journey time validation profiles

Queue Calibration

6.6 In addition to the journey time validation of the model, TAG recommends a review of the representation of existing queues in the model. Although journey times provide a more accurate representation of the existing delays, the visual comparison of the queue patterns in the area provides further reassurance that the model represents the operation of the network.

6.7 Two main sources have been used to define the main queues of the model: the floating car footage of driving behaviour in Coltishall and Horstead and the typical travel speed information taken from Google Maps.

AM Peak Hour

6.8 The main queue in the AM period occurs on the B1150 as traffic approaches the petrol station from the southwest. This queueing behaviour can be seen in Figure 6-8, which was captured from floating car footage of Route 2, this was a moving queue caused by right turning vehicles waiting to turn into the B1150 northwards.

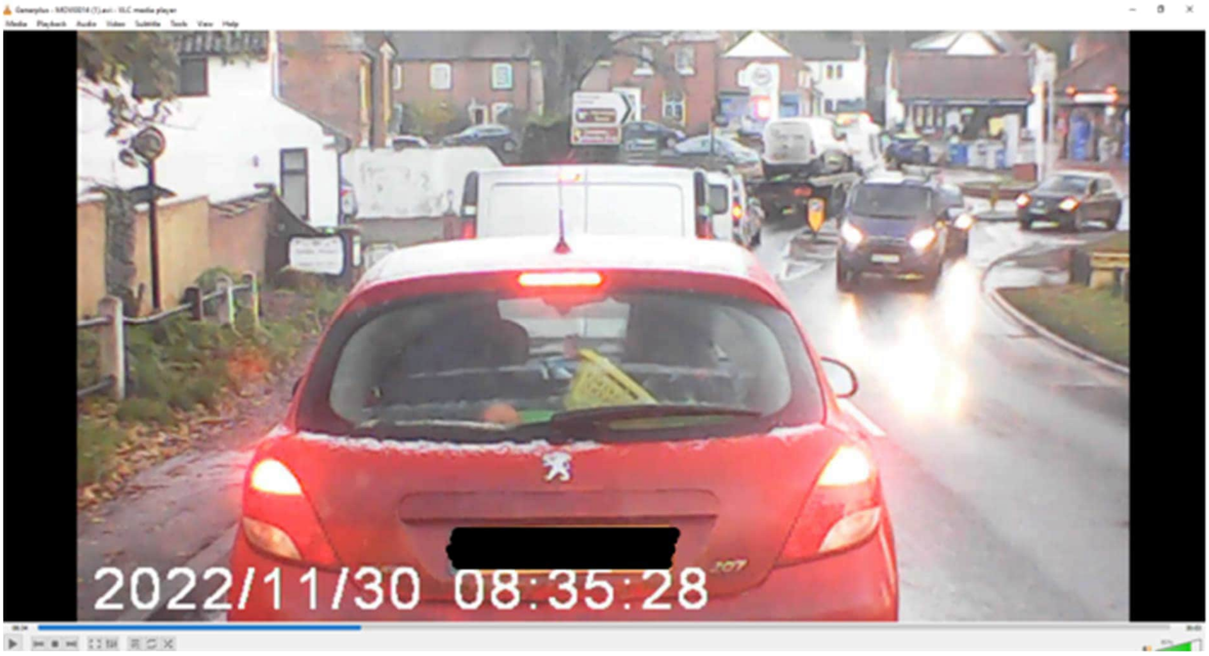


Figure 6-8 – Floating car footage of AM queuing on B1150

6.9 Figure 6-9 shows the typical traffic conditions according to Google Maps on a Tuesday at 08:30. Figure 6-10 shows the peak hour average speed plot from the AM model, where it can be observed that a similar queue is present.

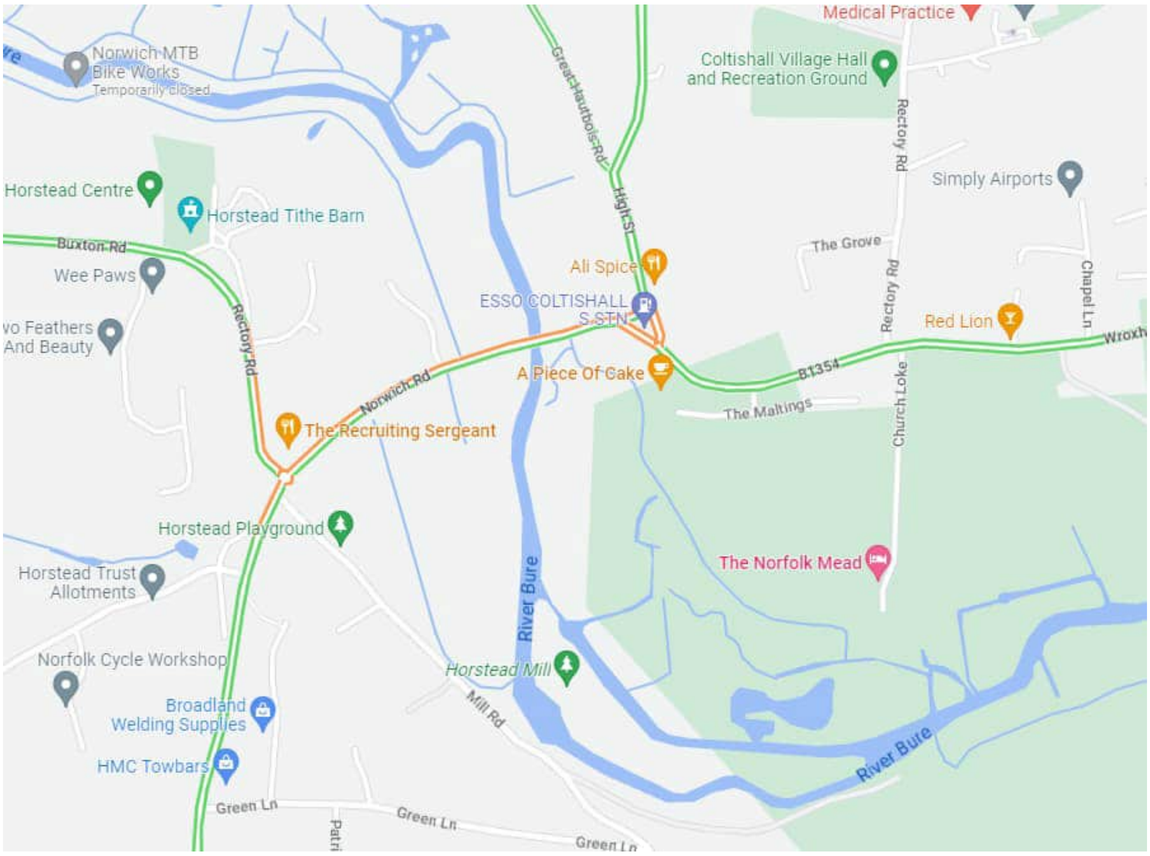


Figure 9 - Typical queues from Google traffic on a Wednesday, 08:30

Figure 10 – AM Peak Hour Speed Plot

PM Peak Hour

6.10 The main queue in PM period occurs on the High Street, where parked cars prevent the free flow of traffic in both directions simultaneously. The presence of parked cars can be seen in Figure 6-11, taken from a Google StreetView. This image shows that cars are parked on both sides of the street, which limits the road space available for vehicles to pass. Figure 6-12 is a still taken from the floating car footage of the Route 1 southbound journey in the PM period which shows how parked cars impede the free flow of traffic in both directions.

Figure 6-11-1 Parked cars on High Street

Figure 6-12 PM queuing on High Street, from floating car footage

6.11 Figure 6-13 shows the typical traffic conditions according to Google Maps on a Tuesday at 16:40, whilst Figure 6-14 shows the modelled queues during the PM peak, where this queuing is replicated.

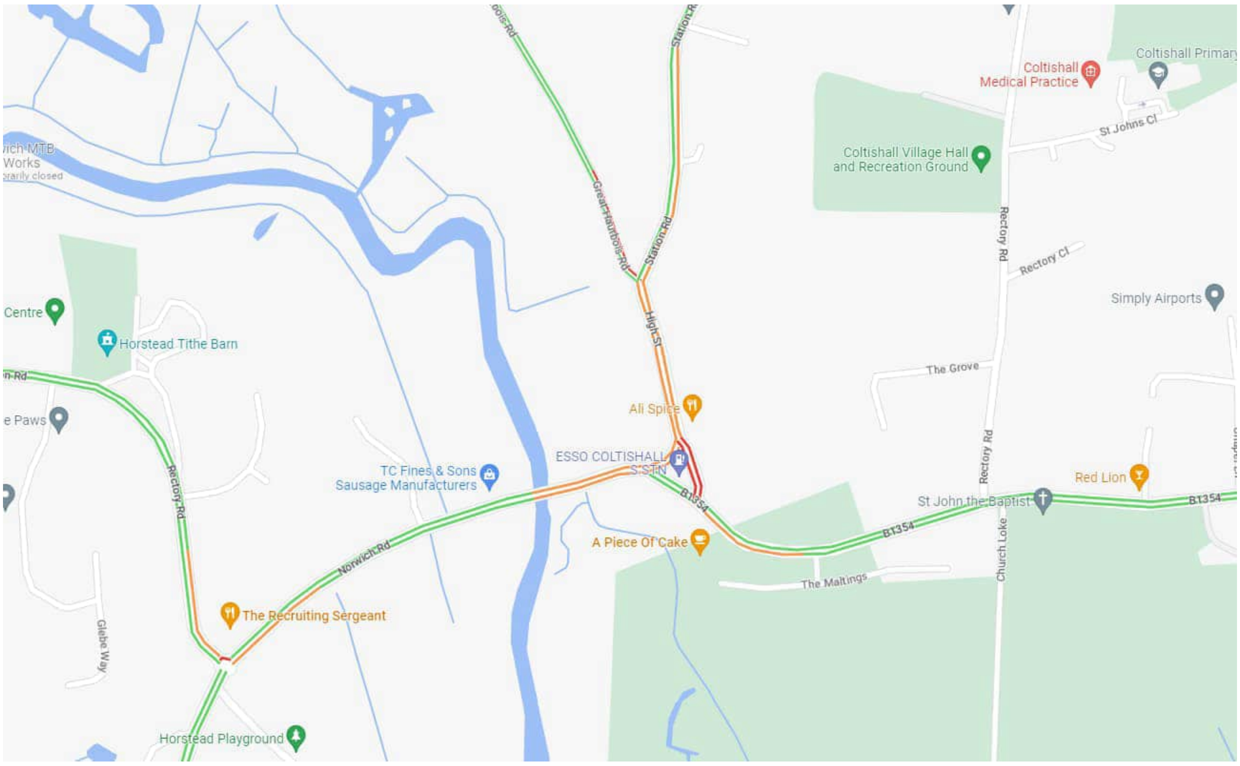


Figure 6-13 –Google traffic view captured on a Monday at 16:40

Figure 6-14 – PM peak hour Speed Plot

Model Variability

6.12 Microsimulation models are run several times with different random seeds to obtain a statistically representative result. This approach replicates daily variability, since each run has different arrival profiles which results in a different chain of events. A representative average of the results is the obtained/ presented.

6.13 The survey videos show that the queues on the High Street in the PM period can be highly variable since they can appear and disappear in short periods of time.

6.14 A variability analysis of the modelling journey times results has been undertaken in this section. Figure Error! No text of specified style in document.-2 shows the modelled journey times for Route 1 SB in the PM period for all of the model runs, whilst Figure 6-16 shows the modelled journey times for Route 1 NB in the PM period for all the model runs.

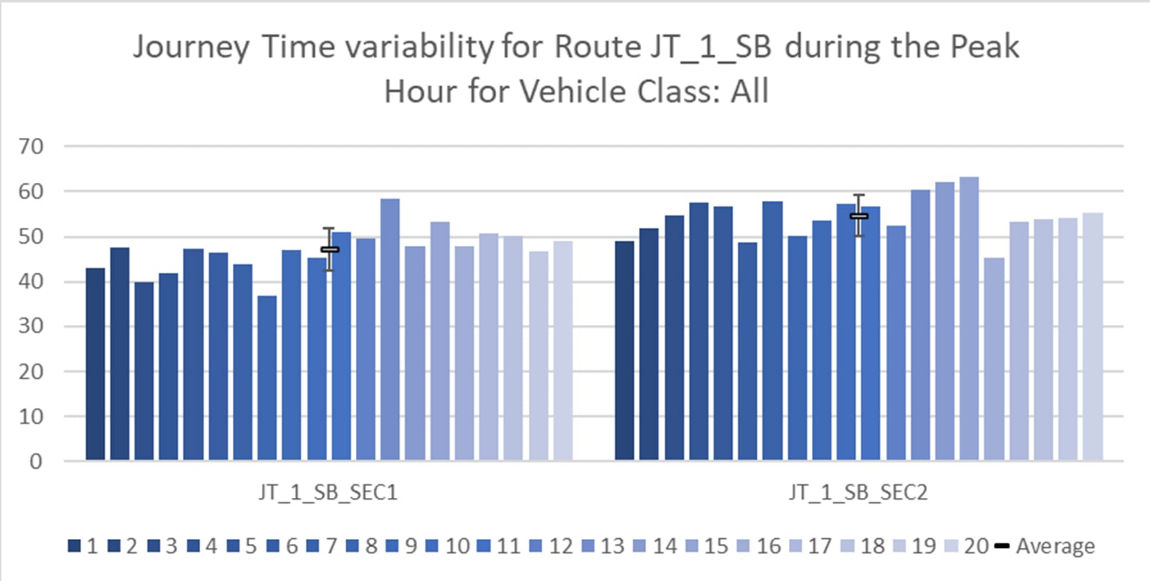


Figure Error! No text of specified style in document.**-2 – Route 1 SB modelled journey times**

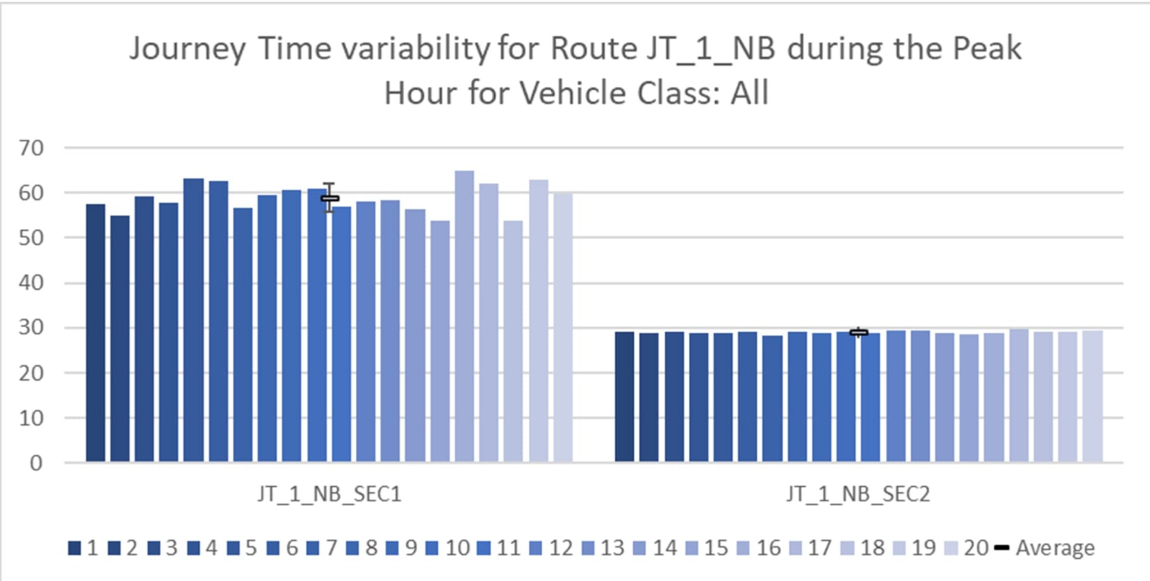


Figure 6-16 – Route 1 NB modelled journey times

6.15 As can be seen in these graphs, the modelled journey times in the PM peak are variable, particularly in the southbound direction. This variability is caused by parked cars on the High Street and the subsequent give way behaviour and queuing. This phenomenon has been replicated in the model, replicating the variability seen in the surveys.

7. Conclusion

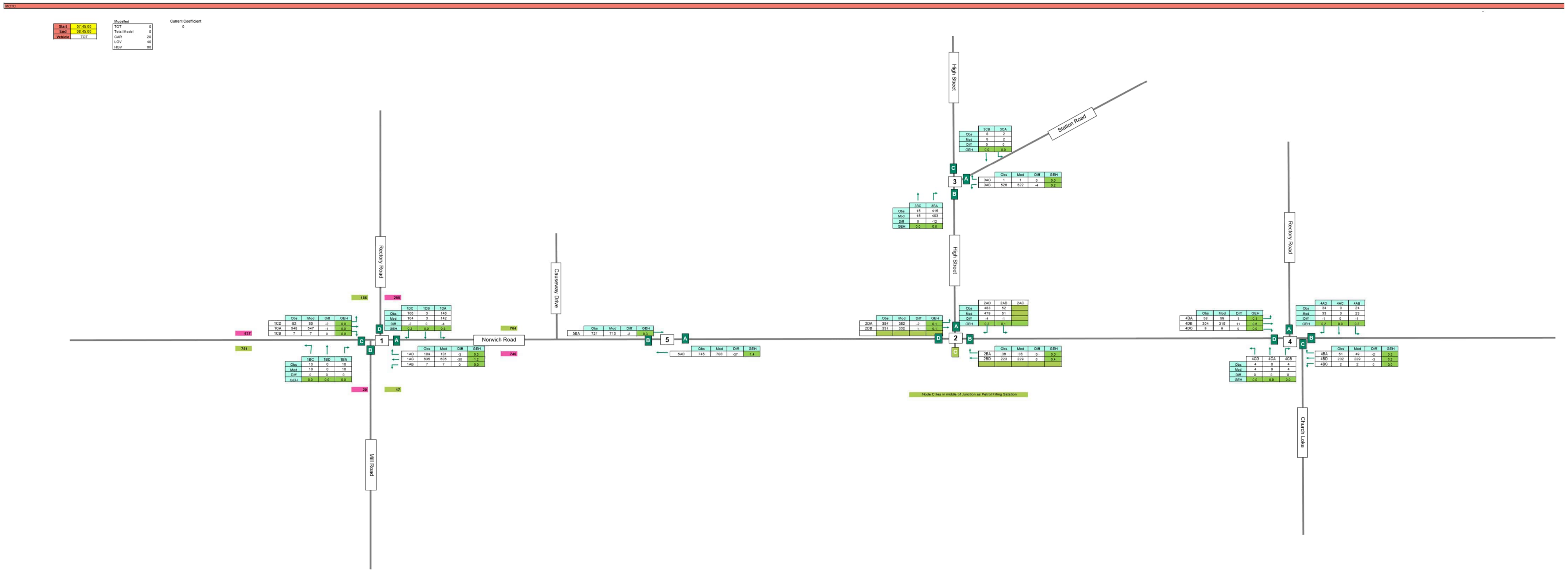
7.1 Coltishall and Horstead villages are located on the B1150 between Norwich and North Walsham and the road network is therefore busy at peak times. In the AM period there is a small amount of congestion on the eastbound approach to the petrol station due to the vehicles waiting to turn right into B1150 northwards, as explained in paragraph 6.8, whilst in the PM period parked cars on the High Street were seen to cause a significant amount of queuing, particularly in the southbound direction.

7.2 The base models have been calibrated and validated against the observed data in line with the required criteria. The calibration/ validation results exceed the requirements for turning counts and journey times and the models are therefore closely aligned with observed data. The models also replicate observed queueing patterns well. The models are therefore validated to industry standard guidelines.

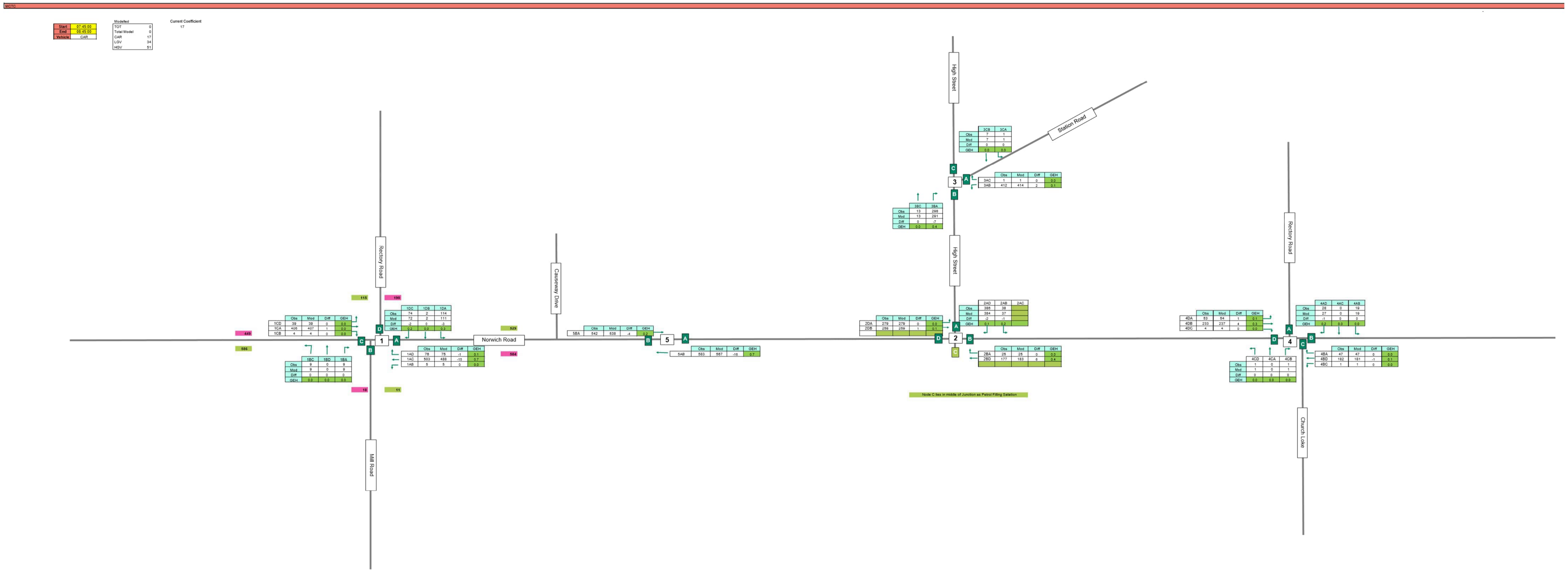
7.3 It is considered the base models provide a close representation of the queues and delays in the network, as well as the observed driving behaviour in the area, and are fit for the purpose of testing future traffic levels/ patterns or potential changes to the road network.

Appendix A MCTC Turning Counts

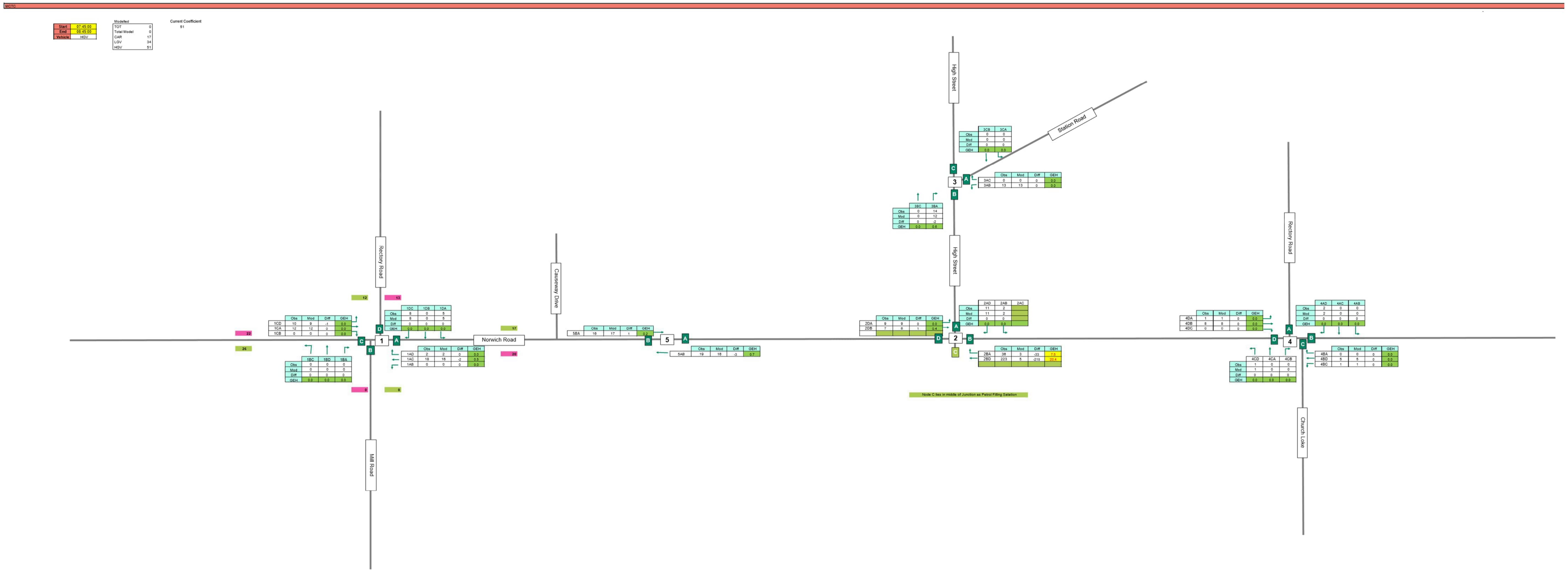
AM – All vehicles



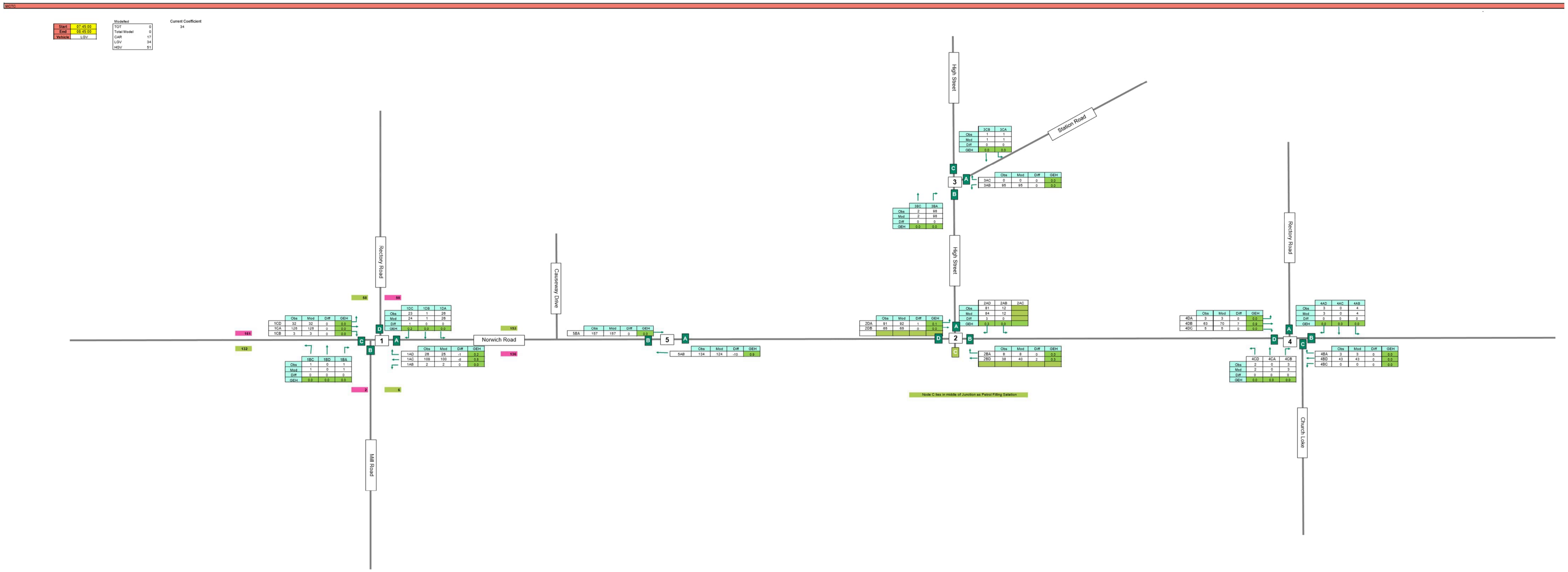
AM – Cars


High Street
Station Road
Rectory Road
Causeway Drive
Norwich Road
Mill Road
Church Lake
High Street
Rectory Road
Node C lies in middle of Junction as Petrol Filling Satation

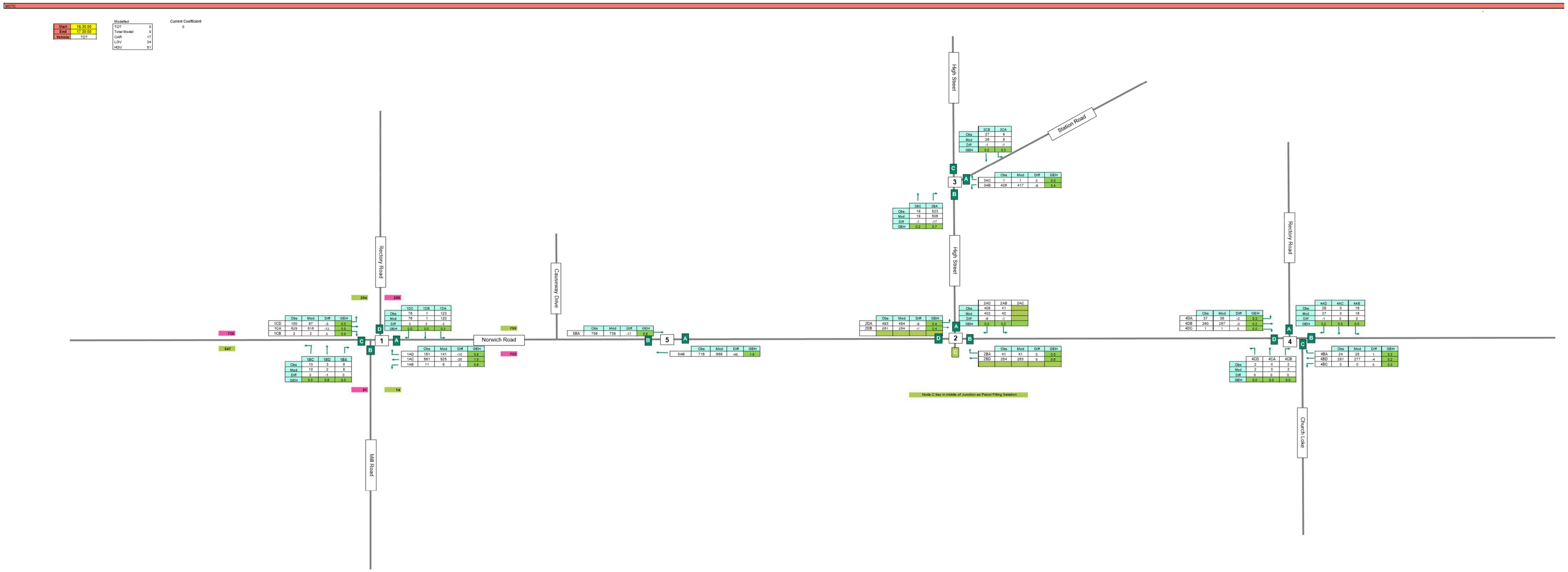
AM – HGV


High Street
Station Road
Rectory Road
Causeway Drive
Norwich Road
Mill Road
Church Lake

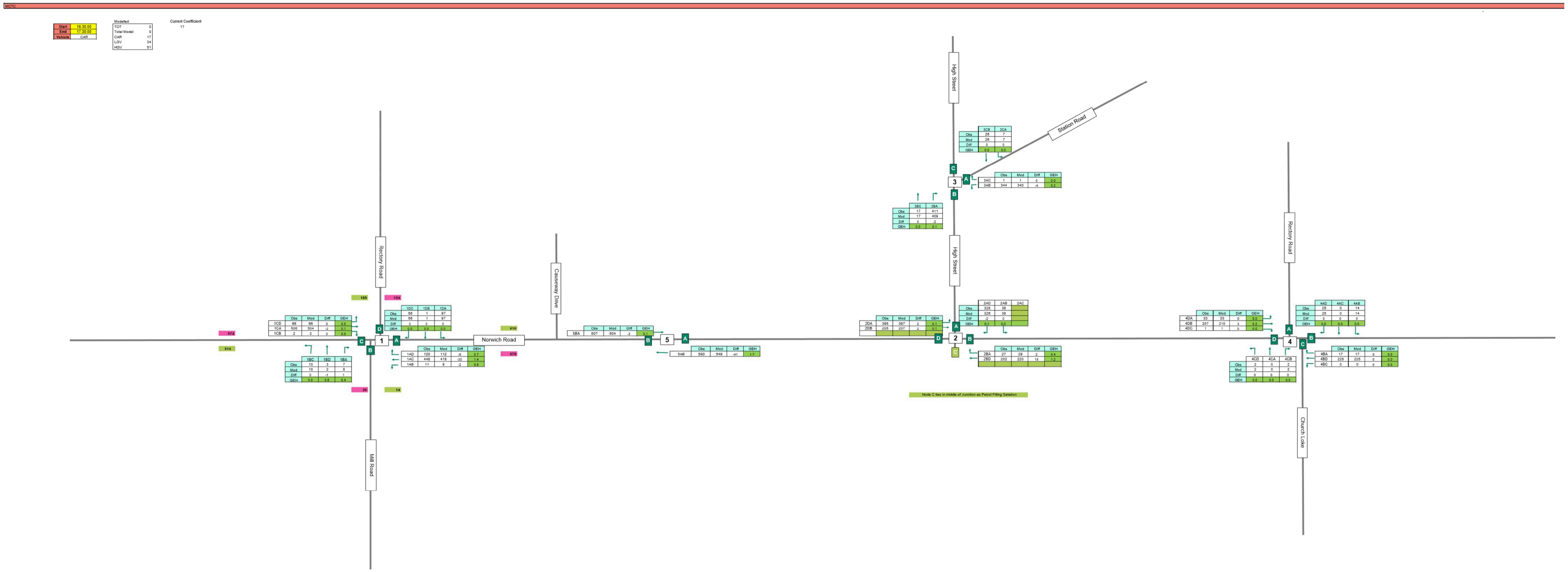
AM – LGV


High Street
Station Road
Rectory Road
Causeway Drive
Norwich Road
Mill Road

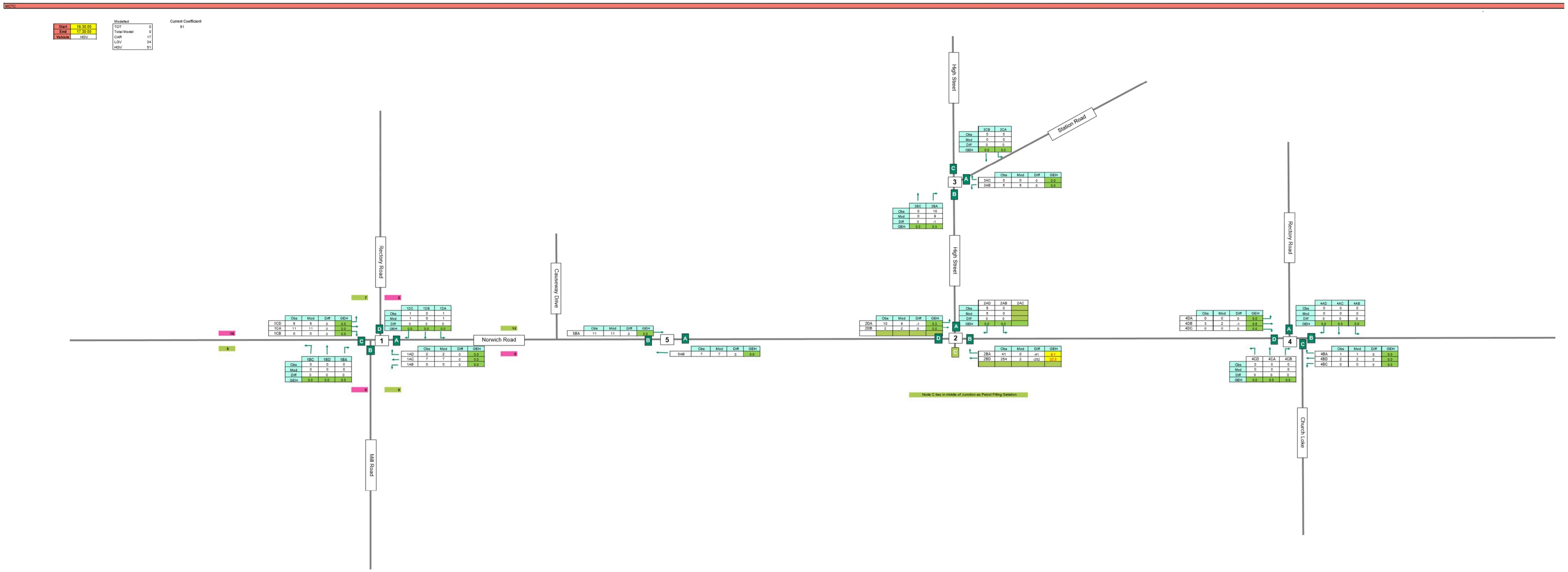
PM – All Vehicles



PM – Cars

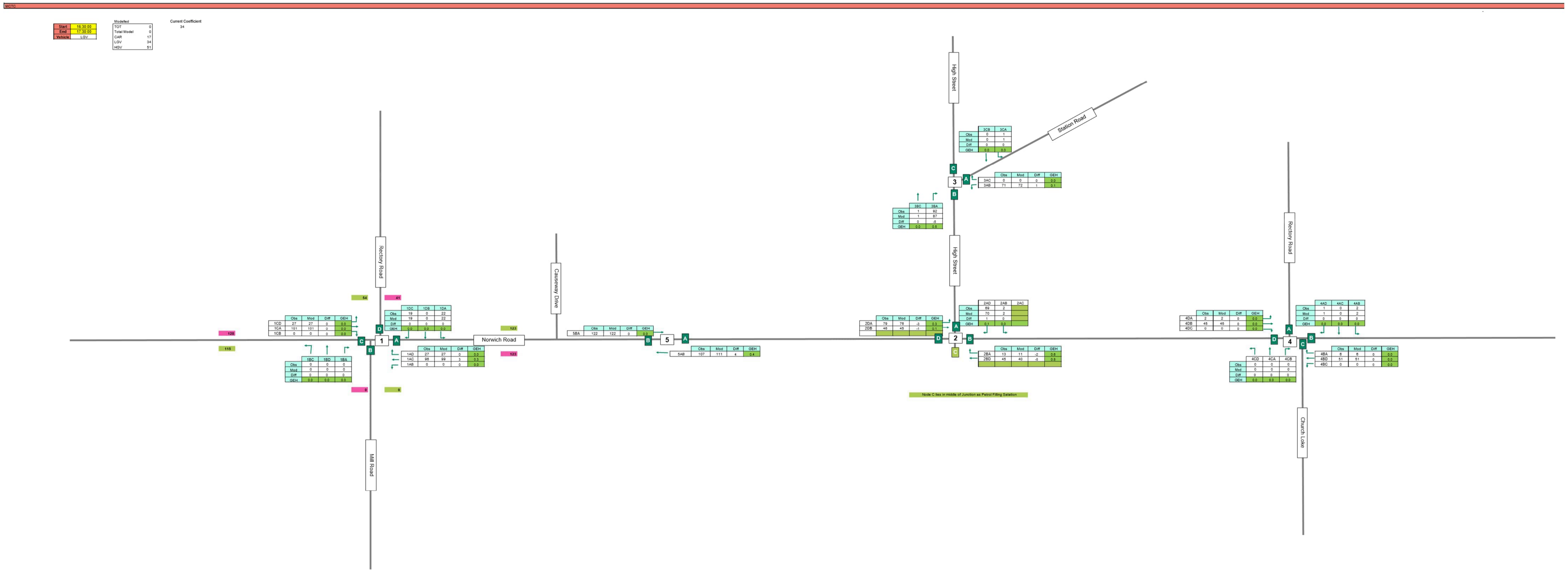

High Street
Station Road
Rectory Road
Causeway Drive
Norwich Road
Mill Road
Church Lake
Node C lies in middle of Junction as Petrol Filling Sataion

PM – HGV

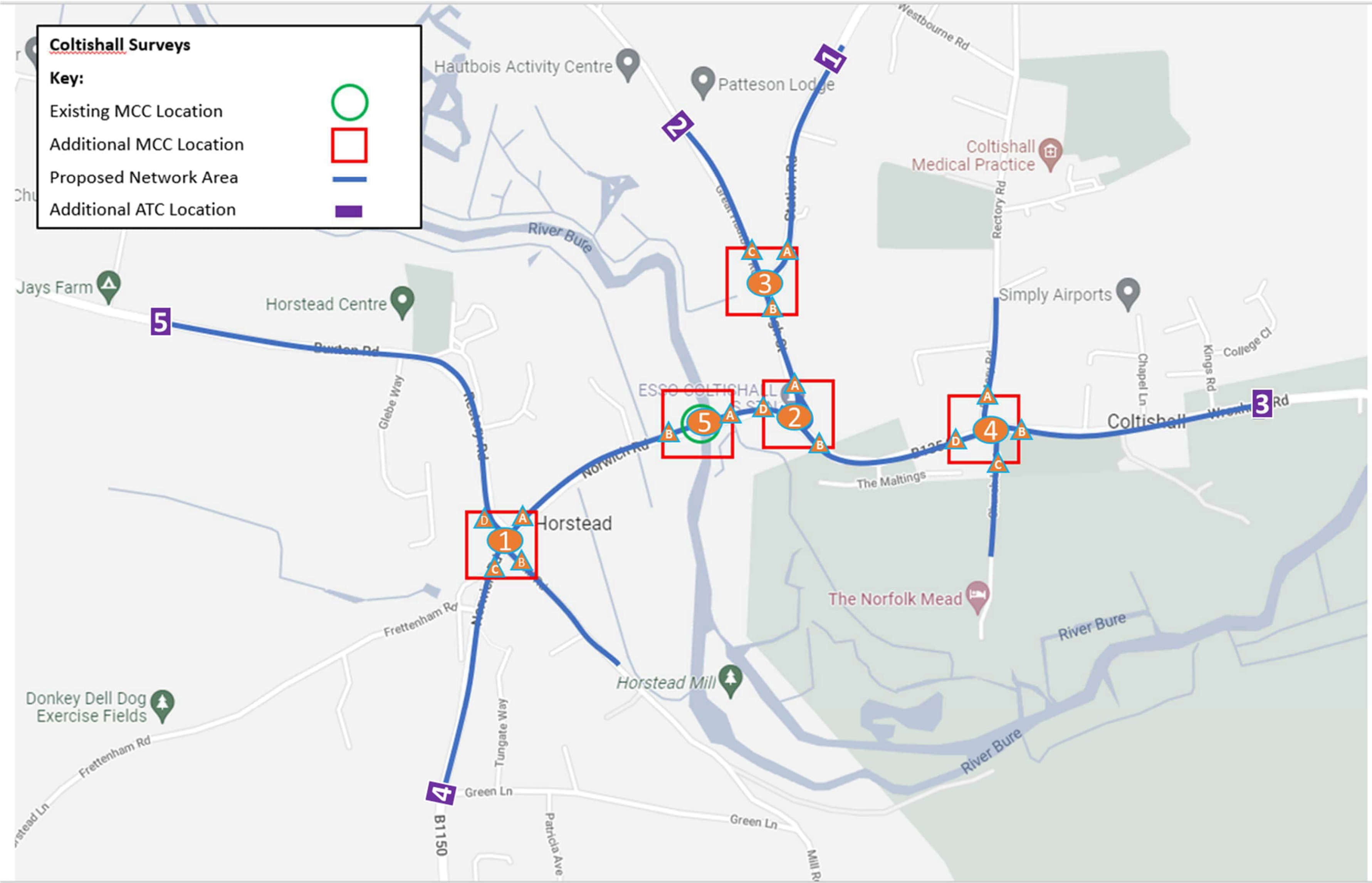


Start 16:30:00
End 17:30:00
Vehicle HGV
Modelled
TOT 0
Total Model 0
CAR 17
LGV 34
HGV 51
Current Coefficient
51
High Street
Station Road
Rectory Road
Causeway Drive
Norwich Road
Mill Road
Church Loke
Obs Mod Diff GEH
2BA 41 0 -41 9.1
2BD 254 2 -252 22.3
4BA 1
4BD 2
4BC 0
Node C lies in middle of Junction as Petrol Filling Satation

PM – LGV


High Street
Station Road
Rectory Road
Causeway Drive
Norwich Road
Mill Road
Church Loke

Appendix B Consistency Checks



From		Traffic Flow		to		Traffic Flow		Difference		GEH	
Site	Arm	CAR	LGV	Site	Arm	CAR	LGV	CAR	LGV	CAR	LGV
1	A	3398	714	5	B	3390	701	8	13	0.1	0.5
5	B	3410	809	1	A	3427	788	-17	21	0.3	0.7
5	A	3390	701	2	D	3312	659	78	42	1.3	1.6
2	D	3403	808	5	A	3410	809	-7	-1	0.1	0.0
2	A	2384	474	3	B	2339	472	45	2	0.9	0.1
3	B	2343	549	2	A	2348	558	-5	-9	0.1	0.4
2	B	1383	288	4	D	1405	266	-22	22	0.6	1.3
4	D	1481	334	2	B	1556	357	-75	-23	1.9	1.2

Appendix C Desired Speed Distributions

Description	Posted Limit	Normal Distributions (mph)			
		LVs		HVs	
		Lower	Upper	Lower	Upper
DfT's Motorways	70	50	89	50	89
DfT's Dual Carriageways	70	58	80	48	80
DfT's Single Carriageways	60	20	70	20	69

Appendix D Turning Count Calibration Tables

AM – All vehicles

VISSIM Node 101 **Vehicle Type** Total

Junction Name	MCC Site	Node No.	From Arm	FromLink	To Arm	ToLink	MCC ID	Flow Peak Time		Difference			GEH	
								Observed	Modelled	Value	%	Value	<5	Individual Flows
Rectory Road roundabout	1	101	A	38	A	3	1AA	0	2	2	-	2	Y	OK
Rectory Road roundabout	1	101	A	38	B	19	1AB	7	7	0	0%	0	Y	OK
Rectory Road roundabout	1	101	A	38	C	22	1AC	635	605	-30	-5%	1	Y	OK
Rectory Road roundabout	1	101	A	38	D	18	1AD	104	101	-3	-3%	0	Y	OK
Rectory Road roundabout	1	101	B	20	A	3	1BA	10	10	0	0%	0	Y	OK
Rectory Road roundabout	1	101	B	20	B	19	1BB	0	0	0	-	0	Y	OK
Rectory Road roundabout	1	101	B	20	C	22	1BC	10	10	0	0%	0	Y	OK
Rectory Road roundabout	1	101	B	20	D	18	1BD	0	0	0	-	0	Y	OK
Rectory Road roundabout	1	101	C	1	A	3	1CA	548	547	-1	0%	0	Y	OK
Rectory Road roundabout	1	101	C	1	B	19	1CB	7	7	0	0%	0	Y	OK
Rectory Road roundabout	1	101	C	1	C	22	1CC	0	0	0	-	0	Y	OK
Rectory Road roundabout	1	101	C	1	D	18	1CD	82	80	-2	-2%	0	Y	OK
Rectory Road roundabout	1	101	D	17	A	3	1DA	146	142	-4	-3%	0	Y	OK
Rectory Road roundabout	1	101	D	17	B	19	1DB	3	3	0	0%	0	Y	OK
Rectory Road roundabout	1	101	D	17	C	22	1DC	106	104	-2	-2%	0	Y	OK
Rectory Road roundabout	1	101	D	17	D	18	1DD	0	0	0	-	0	Y	OK

VISSIM Node 102 **Vehicle Type** Total

Junction Name	MCC Site	Node No.	From Arm	FromLink	To Arm	ToLink	MCC ID	Flow Peak Time		Difference			GEH	
								Observed	Modelled	Value	%	Value	<5	Individual Flows
Petrol Station Gyratory	2	102	A	10011	A	15	2AA	0	0	0	-	0	Y	OK
Petrol Station Gyratory	2	102	A	10011	B	10	2AB	52	51	-1	-2%	0	Y	OK
Petrol Station Gyratory	2	102	A	34	D	12	2AD	483	479	-4	-1%	0	Y	OK
Petrol Station Gyratory	2	102	B	11	A	15	2BA	36	36	0	0%	0	Y	OK
Petrol Station Gyratory	2	102	B	11	B	10	2BB	0	0	0	-	0	Y	OK
Petrol Station Gyratory	2	102	B	11	D	12	2BD	223	229	6	3%	0	Y	OK
Petrol Station Gyratory	2	102	D	37	A	15	2DA	384	382	-2	-1%	0	Y	OK
Petrol Station Gyratory	2	102	D	37	B	10	2DB	331	332	1	0%	0	Y	OK
Petrol Station Gyratory	2	102	D	37	D	12	2DD	0	1	1	-	1	Y	OK

VISSIM Node 103 **Vehicle Type** Total

Junction Name	MCC Site		From Arm	FromLink	To Arm	ToLink		Flow Peak Time		Difference			GEH	

		Node No.					MCC ID	Observed	Modelled	Value	%	Value	<5	Individual Flows
Great Hautbois Road / Station Road	3	103	A	4	A	33	3AA	0	0	0	-	0	Y	OK
Great Hautbois Road / Station Road	3	103	A	4	B	34	3AB	526	522	-4	-1%	0	Y	OK
Great Hautbois Road / Station Road	3	103	A	4	C	31	3AC	1	1	0	0%	0	Y	OK
Great Hautbois Road / Station Road	3	103	B	15	A	33	3BA	415	403	-12	-3%	1	Y	OK
Great Hautbois Road / Station Road	3	103	B	15	B	34	3BB	0	0	0	-	0	Y	OK
Great Hautbois Road / Station Road	3	103	B	15	C	31	3BC	15	15	0	0%	0	Y	OK
Great Hautbois Road / Station Road	3	103	C	32	A	33	3CA	2	2	0	0%	0	Y	OK
Great Hautbois Road / Station Road	3	103	C	32	B	34	3CB	8	8	0	0%	0	Y	OK
Great Hautbois Road / Station Road	3	103	C	32	C	31	3CC	0	0	0	-	0	Y	OK

VISSIM Node 104 **Vehicle Type** Total

Junction Name	MCC Site	Node No.	From Arm	FromLink	To Arm	ToLink	MCC ID	Flow Peak Time		Difference			GEH	
								Observed	Modelled	Value	%	Value	<5	Individual Flows
Church Loke	4	104	A	24	A	23	4AA	0	0	0	-	0	Y	OK
Church Loke	4	104	A	24	B	29	4AB	24	23	-1	-4%	0	Y	OK
Church Loke	4	104	A	24	C	27	4AC	0	0	0	-	0	Y	OK
Church Loke	4	104	A	24	D	26	4AD	34	33	-1	-3%	0	Y	OK
Church Loke	4	104	B	6	A	23	4BA	51	49	-2	-4%	0	Y	OK
Church Loke	4	104	B	6	B	29	4BB	0	0	0	-	0	Y	OK
Church Loke	4	104	B	6	C	27	4BC	2	2	0	0%	0	Y	OK
Church Loke	4	104	B	6	D	26	4BD	232	229	-3	-1%	0	Y	OK
Church Loke	4	104	C	28	A	23	4CA	0	0	0	-	0	Y	OK
Church Loke	4	104	C	28	B	29	4CB	4	4	0	0%	0	Y	OK
Church Loke	4	104	C	28	C	27	4CC	0	0	0	-	0	Y	OK
Church Loke	4	104	C	28	D	26	4CD	4	4	0	0%	0	Y	OK
Church Loke	4	104	D	10	A	23	4DA	58	59	1	2%	0	Y	OK
Church Loke	4	104	D	10	B	29	4DB	304	315	11	4%	1	Y	OK
Church Loke	4	104	D	10	C	27	4DC	9	9	0	0%	0	Y	OK
Church Loke	4	104	D	10	D	26	4DD	0	0	0	-	0	Y	OK

VISSIM Node 105 **Vehicle Type** Total

Junction Name	MCC Site	Node No.	From Arm	FromLink	To Arm	ToLink	MCC ID	Flow Peak Time		Difference			GEH	
								Observed	Modelled	Value	%	Value	<5	Individual Flows
B1150 Bridge	5	105	A	12	A	37	5AA	0	0	0	-	0	Y	OK
B1150 Bridge	5	105	A	12	B	12	5AB	745	708	-37	-5%	1	Y	OK
B1150 Bridge	5	105	B	37	A	37	5BA	721	713	-8	-1%	0	Y	OK
B1150 Bridge	5	105	B	37	B	12	5BB	0	0	0	-	0	Y	OK

AM – Cars

VISSIM Node 101 **Vehicle Type** Car

Junction Name			From Arm	FromLink	To Arm	ToLink	MCC ID	Flow Peak Time	Difference		GEH	

	MCC Site	Node No.						Observed	Modelled	Value	%	Value	<5	Individual Flows
Rectory Road roundabout	1	101	A	38	A	3	1AA	0	1	1	-	1	Y	OK
Rectory Road roundabout	1	101	A	38	B	19	1AB	5	5	0	0%	0	Y	OK
Rectory Road roundabout	1	101	A	38	C	22	1AC	503	488	-15	-3%	1	Y	OK
Rectory Road roundabout	1	101	A	38	D	18	1AD	76	75	-1	-1%	0	Y	OK
Rectory Road roundabout	1	101	B	20	A	3	1BA	9	9	0	0%	0	Y	OK
Rectory Road roundabout	1	101	B	20	B	19	1BB	0	0	0	-	0	Y	OK
Rectory Road roundabout	1	101	B	20	C	22	1BC	9	9	0	0%	0	Y	OK
Rectory Road roundabout	1	101	B	20	D	18	1BD	0	0	0	-	0	Y	OK
Rectory Road roundabout	1	101	C	1	A	3	1CA	406	407	1	0%	0	Y	OK
Rectory Road roundabout	1	101	C	1	B	19	1CB	4	4	0	0%	0	Y	OK
Rectory Road roundabout	1	101	C	1	C	22	1CC	0	0	0	-	0	Y	OK
Rectory Road roundabout	1	101	C	1	D	18	1CD	39	39	0	0%	0	Y	OK
Rectory Road roundabout	1	101	D	17	A	3	1DA	114	111	-3	-3%	0	Y	OK
Rectory Road roundabout	1	101	D	17	B	19	1DB	2	2	0	0%	0	Y	OK
Rectory Road roundabout	1	101	D	17	C	22	1DC	74	72	-2	-3%	0	Y	OK
Rectory Road roundabout	1	101	D	17	D	18	1DD	0	0	0	-	0	Y	OK

VISSIM Node 102 **Vehicle Type** Car

Junction Name	MCC Site	Node No.	From Arm	FromLink	To Arm	ToLink	MCC ID	Flow Peak Time		Difference			GEH	
								Observed	Modelled	Value	%	Value	<5	Individual Flows
Petrol Station Gyratory	2	102	A	10011	A	15	2AA	0	0	0	-	0	Y	OK
Petrol Station Gyratory	2	102	A	10011	B	10	2AB	38	37	-1	-3%	0	Y	OK
Petrol Station Gyratory	2	102	A	34	D	12	2AD	386	384	-2	-1%	0	Y	OK
Petrol Station Gyratory	2	102	B	11	A	15	2BA	25	25	0	0%	0	Y	OK
Petrol Station Gyratory	2	102	B	11	B	10	2BB	0	0	0	-	0	Y	OK
Petrol Station Gyratory	2	102	B	11	D	12	2BD	177	183	6	3%	0	Y	OK
Petrol Station Gyratory	2	102	D	37	A	15	2DA	279	279	0	0%	0	Y	OK
Petrol Station Gyratory	2	102	D	37	B	10	2DB	258	259	1	0%	0	Y	OK
Petrol Station Gyratory	2	102	D	37	D	12	2DD	0	1	1	-	1	Y	OK

VISSIM Node 103 **Vehicle Type** Car

Junction Name	MCC Site	Node No.	From Arm	FromLink	To Arm	ToLink	MCC ID	Flow Peak Time		Difference			GEH	
								Observed	Modelled	Value	%	Value	<5	Individual Flows
Great Hautbois Road / Station Road	3	103	A	4	A	33	3AA	0	0	0	-	0	Y	OK
Great Hautbois Road / Station Road	3	103	A	4	B	34	3AB	412	414	2	0%	0	Y	OK
Great Hautbois Road / Station Road	3	103	A	4	C	31	3AC	1	1	0	0%	0	Y	OK
Great Hautbois Road / Station Road	3	103	B	15	A	33	3BA	298	291	-7	-2%	0	Y	OK
Great Hautbois Road / Station Road	3	103	B	15	B	34	3BB	0	0	0	-	0	Y	OK
Great Hautbois Road / Station Road	3	103	B	15	C	31	3BC	13	13	0	0%	0	Y	OK
Great Hautbois Road / Station Road	3	103	C	32	A	33	3CA	1	1	0	0%	0	Y	OK
Great Hautbois Road / Station Road	3	103	C	32	B	34	3CB	7	7	0	0%	0	Y	OK
Great Hautbois Road / Station Road	3	103	C	32	C	31	3CC	0	0	0	-	0	Y	OK

VISSIM Node	104		Vehicle Type	Car

Junction Name	MCC Site	Node No.	From Arm	FromLink	To Arm	ToLink	MCC ID	Flow Peak Time		Difference			GEH	Individual Flows
								Observed	Modelled	Value	%	Value	<5	
Church Loke	4	104	A	24	A	23	4AA	0	0	0	-	0	Y	OK
Church Loke	4	104	A	24	B	29	4AB	19	19	0	0%	0	Y	OK
Church Loke	4	104	A	24	C	27	4AC	0	0	0	-	0	Y	OK
Church Loke	4	104	A	24	D	26	4AD	28	27	-1	-4%	0	Y	OK
Church Loke	4	104	B	6	A	23	4BA	47	47	0	0%	0	Y	OK
Church Loke	4	104	B	6	B	29	4BB	0	0	0	-	0	Y	OK
Church Loke	4	104	B	6	C	27	4BC	1	1	0	0%	0	Y	OK
Church Loke	4	104	B	6	D	26	4BD	182	181	-1	-1%	0	Y	OK
Church Loke	4	104	C	28	A	23	4CA	0	0	0	-	0	Y	OK
Church Loke	4	104	C	28	B	29	4CB	1	1	0	0%	0	Y	OK
Church Loke	4	104	C	28	C	27	4CC	0	0	0	-	0	Y	OK
Church Loke	4	104	C	28	D	26	4CD	1	1	0	0%	0	Y	OK
Church Loke	4	104	D	10	A	23	4DA	53	54	1	2%	0	Y	OK
Church Loke	4	104	D	10	B	29	4DB	233	237	4	2%	0	Y	OK
Church Loke	4	104	D	10	C	27	4DC	4	4	0	0%	0	Y	OK
Church Loke	4	104	D	10	D	26	4DD	0	0	0	-	0	Y	OK

VISSIM Node	105		Vehicle Type	Car

Junction Name	MCC Site	Node No.	From Arm	FromLink	To Arm	ToLink	MCC ID	Flow Peak Time		Difference			GEH	Individual Flows
								Observed	Modelled	Value	%	Value	<5	
B1150 Bridge	5	105	A	12	A	37	5AA	0	0	0	-	0	Y	OK
B1150 Bridge	5	105	A	12	B	12	5AB	583	567	-16	-3%	1	Y	OK
B1150 Bridge	5	105	B	37	A	37	5BA	542	538	-4	-1%	0	Y	OK
B1150 Bridge	5	105	B	37	B	12	5BB	0	0	0	-	0	Y	OK

AM – LGV

VISSIM Node	101		Vehicle Type	LGV

Junction Name	MCC Site	Node No.	From Arm	FromLink	To Arm	ToLink	MCC ID	Flow Peak Time		Difference			GEH	Individual Flows
								Observed	Modelled	Value	%	Value	<5	
Rectory Road roundabout	1	101	A	38	A	3	1AA	0	1	1	-	1	Y	OK
Rectory Road roundabout	1	101	A	38	B	19	1AB	2	2	0	0%	0	Y	OK
Rectory Road roundabout	1	101	A	38	C	22	1AC	108	100	-8	-7%	1	Y	OK
Rectory Road roundabout	1	101	A	38	D	18	1AD	26	25	-1	-4%	0	Y	OK
Rectory Road roundabout	1	101	B	20	A	3	1BA	1	1	0	0%	0	Y	OK
Rectory Road roundabout	1	101	B	20	B	19	1BB	0	0	0	-	0	Y	OK
Rectory Road roundabout	1	101	B	20	C	22	1BC	1	1	0	0%	0	Y	OK
Rectory Road roundabout	1	101	B	20	D	18	1BD	0	0	0	-	0	Y	OK
Rectory Road roundabout	1	101	C	1	A	3	1CA	126	126	0	0%	0	Y	OK
Rectory Road roundabout	1	101	C	1	B	19	1CB	3	3	0	0%	0	Y	OK

Rectory Road roundabout	1	101	C	1	C	22	1CC	0	0	0	-	0	Y	OK
Rectory Road roundabout	1	101	C	1	D	18	1CD	32	32	0	0%	0	Y	OK
Rectory Road roundabout	1	101	D	17	A	3	1DA	26	26	0	0%	0	Y	OK
Rectory Road roundabout	1	101	D	17	B	19	1DB	1	1	0	0%	0	Y	OK
Rectory Road roundabout	1	101	D	17	C	22	1DC	23	24	1	4%	0	Y	OK
Rectory Road roundabout	1	101	D	17	D	18	1DD	0	0	0	-	0	Y	OK

VISSIM Node 102 **Vehicle Type** LGV

Junction Name	MCC Site	Node No.	From Arm	FromLink	To Arm	ToLink	MCC ID	Flow Peak Time		Difference			GEH	
								Observed	Modelled	Value	%	Value	<5	Individual Flows
Petrol Station Gyratory	2	102	A	10011	A	15	2AA	0	0	0	-	0	Y	OK
Petrol Station Gyratory	2	102	A	10011	B	10	2AB	12	12	0	0%	0	Y	OK
Petrol Station Gyratory	2	102	A	34	D	12	2AD	81	84	3	4%	0	Y	OK
Petrol Station Gyratory	2	102	B	11	A	15	2BA	8	8	0	0%	0	Y	OK
Petrol Station Gyratory	2	102	B	11	B	10	2BB	0	0	0	-	0	Y	OK
Petrol Station Gyratory	2	102	B	11	D	12	2BD	38	40	2	5%	0	Y	OK
Petrol Station Gyratory	2	102	D	37	A	15	2DA	91	92	1	1%	0	Y	OK
Petrol Station Gyratory	2	102	D	37	B	10	2DB	65	65	0	0%	0	Y	OK
Petrol Station Gyratory	2	102	D	37	D	12	2DD	0	0	0	-	0	Y	OK

VISSIM Node 103 **Vehicle Type** LGV

Junction Name	MCC Site	Node No.	From Arm	FromLink	To Arm	ToLink	MCC ID	Flow Peak Time		Difference			GEH	
								Observed	Modelled	Value	%	Value	<5	Individual Flows
Great Hautbois Road / Station Road	3	103	A	4	A	33	3AA	0	0	0	-	0	Y	OK
Great Hautbois Road / Station Road	3	103	A	4	B	34	3AB	95	95	0	0%	0	Y	OK
Great Hautbois Road / Station Road	3	103	A	4	C	31	3AC	0	0	0	-	0	Y	OK
Great Hautbois Road / Station Road	3	103	B	15	A	33	3BA	98	98	0	0%	0	Y	OK
Great Hautbois Road / Station Road	3	103	B	15	B	34	3BB	0	0	0	-	0	Y	OK
Great Hautbois Road / Station Road	3	103	B	15	C	31	3BC	2	2	0	0%	0	Y	OK
Great Hautbois Road / Station Road	3	103	C	32	A	33	3CA	1	1	0	0%	0	Y	OK
Great Hautbois Road / Station Road	3	103	C	32	B	34	3CB	1	1	0	0%	0	Y	OK
Great Hautbois Road / Station Road	3	103	C	32	C	31	3CC	0	0	0	-	0	Y	OK

VISSIM Node 104 **Vehicle Type** LGV

Junction Name	MCC Site	Node No.	From Arm	FromLink	To Arm	ToLink	MCC ID	Flow Peak Time		Difference			GEH	
								Observed	Modelled	Value	%	Value	<5	Individual Flows
Church Loke	4	104	A	24	A	23	4AA	0	0	0	-	0	Y	OK
Church Loke	4	104	A	24	B	29	4AB	4	4	0	0%	0	Y	OK
Church Loke	4	104	A	24	C	27	4AC	0	0	0	-	0	Y	OK
Church Loke	4	104	A	24	D	26	4AD	3	3	0	0%	0	Y	OK
Church Loke	4	104	B	6	A	23	4BA	3	3	0	0%	0	Y	OK
Church Loke	4	104	B	6	B	29	4BB	0	0	0	-	0	Y	OK
Church Loke	4	104	B	6	C	27	4BC	0	0	0	-	0	Y	OK

Church Loke	4	104	B	6	D	26	4BD	43	43	0	0%	0	Y	OK
Church Loke	4	104	C	28	A	23	4CA	0	0	0	-	0	Y	OK
Church Loke	4	104	C	28	B	29	4CB	3	3	0	0%	0	Y	OK
Church Loke	4	104	C	28	C	27	4CC	0	0	0	-	0	Y	OK
Church Loke	4	104	C	28	D	26	4CD	2	2	0	0%	0	Y	OK
Church Loke	4	104	D	10	A	23	4DA	3	3	0	0%	0	Y	OK
Church Loke	4	104	D	10	B	29	4DB	63	70	7	11%	1	Y	OK
Church Loke	4	104	D	10	C	27	4DC	5	5	0	0%	0	Y	OK
Church Loke	4	104	D	10	D	26	4DD	0	0	0	-	0	Y	OK

VISSIM Node 105 **Vehicle Type** LGV

Junction Name	MCC Site	Node No.	From Arm	FromLink	To Arm	ToLink	MCC ID	Flow Peak Time		Difference			GEH	Individual Flows
								Observed	Modelled	Value	%	Value	<5	
B1150 Bridge	5	105	A	12	A	37	5AA	0	0	0	-	0	Y	OK
B1150 Bridge	5	105	A	12	B	12	5AB	134	124	-10	-7%	1	Y	OK
B1150 Bridge	5	105	B	37	A	37	5BA	157	157	0	0%	0	Y	OK
B1150 Bridge	5	105	B	37	B	12	5BB	0	0	0	-	0	Y	OK

AM – HGV

VISSIM Node 101 **Vehicle Type** HGV

Junction Name	MCC Site	Node No.	From Arm	FromLink	To Arm	ToLink	MCC ID	Flow Peak Time		Difference			GEH	Individual Flows
								Observed	Modelled	Value	%	Value	<5	
Rectory Road roundabout	1	101	A	38	A	3	1AA	0	0	0	-	0	Y	OK
Rectory Road roundabout	1	101	A	38	B	19	1AB	0	0	0	-	0	Y	OK
Rectory Road roundabout	1	101	A	38	C	22	1AC	18	16	-2	-11%	0	Y	OK
Rectory Road roundabout	1	101	A	38	D	18	1AD	2	2	0	0%	0	Y	OK
Rectory Road roundabout	1	101	B	20	A	3	1BA	0	0	0	-	0	Y	OK
Rectory Road roundabout	1	101	B	20	B	19	1BB	0	0	0	-	0	Y	OK
Rectory Road roundabout	1	101	B	20	C	22	1BC	0	0	0	-	0	Y	OK
Rectory Road roundabout	1	101	B	20	D	18	1BD	0	0	0	-	0	Y	OK
Rectory Road roundabout	1	101	C	1	A	3	1CA	12	12	0	0%	0	Y	OK
Rectory Road roundabout	1	101	C	1	B	19	1CB	0	0	0	-	0	Y	OK
Rectory Road roundabout	1	101	C	1	C	22	1CC	0	0	0	-	0	Y	OK
Rectory Road roundabout	1	101	C	1	D	18	1CD	10	9	-1	-10%	0	Y	OK
Rectory Road roundabout	1	101	D	17	A	3	1DA	5	5	0	0%	0	Y	OK
Rectory Road roundabout	1	101	D	17	B	19	1DB	0	0	0	-	0	Y	OK
Rectory Road roundabout	1	101	D	17	C	22	1DC	8	8	0	0%	0	Y	OK
Rectory Road roundabout	1	101	D	17	D	18	1DD	0	0	0	-	0	Y	OK

VISSIM Node 102 **Vehicle Type** HGV

Junction Name	MCC Site	Node No.	From Arm	FromLink	To Arm	ToLink	MCC ID	Flow Peak Time		Difference			GEH	Individual Flows
								Observed	Modelled	Value	%	Value	<5	

Petrol Station Gyratory	2	102	A	10011	A	15	2AA	0	0	0	-	0	Y	OK
Petrol Station Gyratory	2	102	A	10011	B	10	2AB	2	2	0	0%	0	Y	OK
Petrol Station Gyratory	2	102	A	34	D	12	2AD	11	11	0	0%	0	Y	OK
Petrol Station Gyratory	2	102	B	11	A	15	2BA	3	3	0	0%	0	Y	OK
Petrol Station Gyratory	2	102	B	11	B	10	2BB	0	0	0	-	0	Y	OK
Petrol Station Gyratory	2	102	B	11	D	12	2BD	5	5	0	0%	0	Y	OK
Petrol Station Gyratory	2	102	D	37	A	15	2DA	9	9	0	0%	0	Y	OK
Petrol Station Gyratory	2	102	D	37	B	10	2DB	7	8	1	14%	0	Y	OK
Petrol Station Gyratory	2	102	D	37	D	12	2DD	0	0	0	-	0	Y	OK

VISSIM Node 103 **Vehicle Type** HGV

Junction Name	MCC Site	Node No.	From Arm	FromLink	To Arm	ToLink	MCC ID	Flow Peak Time		Difference			GEH	Individual Flows
								Observed	Modelled	Value	%	Value	<5	
Great Hautbois Road / Station Road	3	103	A	4	A	33	3AA	0	0	0	-	0	Y	OK
Great Hautbois Road / Station Road	3	103	A	4	B	34	3AB	13	13	0	0%	0	Y	OK
Great Hautbois Road / Station Road	3	103	A	4	C	31	3AC	0	0	0	-	0	Y	OK
Great Hautbois Road / Station Road	3	103	B	15	A	33	3BA	14	12	-2	-14%	1	Y	OK
Great Hautbois Road / Station Road	3	103	B	15	B	34	3BB	0	0	0	-	0	Y	OK
Great Hautbois Road / Station Road	3	103	B	15	C	31	3BC	0	0	0	-	0	Y	OK
Great Hautbois Road / Station Road	3	103	C	32	A	33	3CA	0	0	0	-	0	Y	OK
Great Hautbois Road / Station Road	3	103	C	32	B	34	3CB	0	0	0	-	0	Y	OK
Great Hautbois Road / Station Road	3	103	C	32	C	31	3CC	0	0	0	-	0	Y	OK

VISSIM Node 104 **Vehicle Type** HGV

Junction Name	MCC Site	Node No.	From Arm	FromLink	To Arm	ToLink	MCC ID	Flow Peak Time		Difference			GEH	Individual Flows
								Observed	Modelled	Value	%	Value	<5	
Church Loke	4	104	A	24	A	23	4AA	0	0	0	-	0	Y	OK
Church Loke	4	104	A	24	B	29	4AB	0	0	0	-	0	Y	OK
Church Loke	4	104	A	24	C	27	4AC	0	0	0	-	0	Y	OK
Church Loke	4	104	A	24	D	26	4AD	2	2	0	0%	0	Y	OK
Church Loke	4	104	B	6	A	23	4BA	0	0	0	-	0	Y	OK
Church Loke	4	104	B	6	B	29	4BB	0	0	0	-	0	Y	OK
Church Loke	4	104	B	6	C	27	4BC	1	1	0	0%	0	Y	OK
Church Loke	4	104	B	6	D	26	4BD	5	5	0	0%	0	Y	OK
Church Loke	4	104	C	28	A	23	4CA	0	0	0	-	0	Y	OK
Church Loke	4	104	C	28	B	29	4CB	0	0	0	-	0	Y	OK
Church Loke	4	104	C	28	C	27	4CC	0	0	0	-	0	Y	OK
Church Loke	4	104	C	28	D	26	4CD	1	1	0	0%	0	Y	OK
Church Loke	4	104	D	10	A	23	4DA	1	1	0	0%	0	Y	OK
Church Loke	4	104	D	10	B	29	4DB	8	8	0	0%	0	Y	OK
Church Loke	4	104	D	10	C	27	4DC	0	0	0	-	0	Y	OK
Church Loke	4	104	D	10	D	26	4DD	0	0	0	-	0	Y	OK

VISSIM Node 105 **Vehicle Type** HGV

Junction Name	MCC Site	Node No.	From Arm	FromLink	To Arm	ToLink	MCC ID	Flow Peak Time		Difference			GEH	
								Observed	Modelled	Value	%	Value	<5	Individual Flows
B1150 Bridge	5	105	A	12	A	37	5AA	0	0	0	-	0	Y	OK
B1150 Bridge	5	105	A	12	B	12	5AB	19	16	-3	-16%	1	Y	OK
B1150 Bridge	5	105	B	37	A	37	5BA	16	17	1	6%	0	Y	OK
B1150 Bridge	5	105	B	37	B	12	5BB	0	0	0	-	0	Y	OK

PM – All Vehicles

VISSIM Node 101 **Vehicle Type** Total

Junction Name	MCC Site	Node No.	From Arm	FromLink	To Arm	ToLink	MCC ID	Flow Peak Time		Difference			GEH	
								Observed	Modelled	Value	%	Value	<5	Individual Flows
Rectory Road roundabout	1	101	A	38	A	3	1AA	1	2	1	100%	1	Y	OK
Rectory Road roundabout	1	101	A	38	B	19	1AB	11	9	-2	-18%	1	Y	OK
Rectory Road roundabout	1	101	A	38	C	22	1AC	561	525	-36	-6%	2	Y	OK
Rectory Road roundabout	1	101	A	38	D	18	1AD	151	141	-10	-7%	1	Y	OK
Rectory Road roundabout	1	101	B	20	A	3	1BA	8	8	0	0%	0	Y	OK
Rectory Road roundabout	1	101	B	20	B	19	1BB	0	0	0	-	0	Y	OK
Rectory Road roundabout	1	101	B	20	C	22	1BC	10	10	0	0%	0	Y	OK
Rectory Road roundabout	1	101	B	20	D	18	1BD	3	2	-1	-33%	1	Y	OK
Rectory Road roundabout	1	101	C	1	A	3	1CA	628	616	-12	-2%	0	Y	OK
Rectory Road roundabout	1	101	C	1	B	19	1CB	2	2	0	0%	0	Y	OK
Rectory Road roundabout	1	101	C	1	C	22	1CC	0	0	0	-	0	Y	OK
Rectory Road roundabout	1	101	C	1	D	18	1CD	100	97	-3	-3%	0	Y	OK
Rectory Road roundabout	1	101	D	17	A	3	1DA	123	120	-3	-2%	0	Y	OK
Rectory Road roundabout	1	101	D	17	B	19	1DB	1	1	0	0%	0	Y	OK
Rectory Road roundabout	1	101	D	17	C	22	1DC	76	76	0	0%	0	Y	OK
Rectory Road roundabout	1	101	D	17	D	18	1DD	0	0	0	-	0	Y	OK

VISSIM Node 102 **Vehicle Type** Total

Junction Name	MCC Site	Node No.	From Arm	FromLink	To Arm	ToLink	MCC ID	Flow Peak Time		Difference			GEH	
								Observed	Modelled	Value	%	Value	<5	Individual Flows
Petrol Station Gyratory	2	102	A	10011	A	15	2AA	0	0	0	-	0	Y	OK
Petrol Station Gyratory	2	102	A	10011	B	10	2AB	41	40	-1	-2%	0	Y	OK
Petrol Station Gyratory	2	102	A	34	D	12	2AD	408	402	-6	-1%	0	Y	OK
Petrol Station Gyratory	2	102	B	11	A	15	2BA	41	41	0	0%	0	Y	OK
Petrol Station Gyratory	2	102	B	11	B	10	2BB	0	0	0	-	0	Y	OK
Petrol Station Gyratory	2	102	B	11	D	12	2BD	254	263	9	4%	1	Y	OK
Petrol Station Gyratory	2	102	D	37	A	15	2DA	493	484	-9	-2%	0	Y	OK
Petrol Station Gyratory	2	102	D	37	B	10	2DB	261	254	-7	-3%	0	Y	OK
Petrol Station Gyratory	2	102	D	37	D	12	2DD	0	3	3	-	2	Y	OK

VISSIM Node 103 **Vehicle Type** Total

Junction Name	MCC Site	Node No.	From Arm	FromLink	To Arm	ToLink	MCC ID	Flow Peak Time		Difference			GEH	Individual Flows
								Observed	Modelled	Value	%	Value	<5	
Great Hautbois Road / Station Road	3	103	A	4	A	33	3AA	0	0	0	-	0	Y	OK
Great Hautbois Road / Station Road	3	103	A	4	B	34	3AB	426	417	-9	-2%	0	Y	OK
Great Hautbois Road / Station Road	3	103	A	4	C	31	3AC	1	1	0	0%	0	Y	OK
Great Hautbois Road / Station Road	3	103	B	15	A	33	3BA	523	506	-17	-3%	1	Y	OK
Great Hautbois Road / Station Road	3	103	B	15	B	34	3BB	0	0	0	-	0	Y	OK
Great Hautbois Road / Station Road	3	103	B	15	C	31	3BC	19	18	-1	-5%	0	Y	OK
Great Hautbois Road / Station Road	3	103	C	32	A	33	3CA	9	8	-1	-11%	0	Y	OK
Great Hautbois Road / Station Road	3	103	C	32	B	34	3CB	27	26	-1	-4%	0	Y	OK
Great Hautbois Road / Station Road	3	103	C	32	C	31	3CC	0	0	0	-	0	Y	OK

VISSIM Node 104 **Vehicle Type** Total

Junction Name	MCC Site	Node No.	From Arm	FromLink	To Arm	ToLink	MCC ID	Flow Peak Time		Difference			GEH	Individual Flows
								Observed	Modelled	Value	%	Value	<5	
Church Loke	4	104	A	24	A	23	4AA	0	0	0	-	0	Y	OK
Church Loke	4	104	A	24	B	29	4AB	16	16	0	0%	0	Y	OK
Church Loke	4	104	A	24	C	27	4AC	0	0	0	-	0	Y	OK
Church Loke	4	104	A	24	D	26	4AD	28	27	-1	-4%	0	Y	OK
Church Loke	4	104	B	6	A	23	4BA	24	25	1	4%	0	Y	OK
Church Loke	4	104	B	6	B	29	4BB	0	0	0	-	0	Y	OK
Church Loke	4	104	B	6	C	27	4BC	0	0	0	-	0	Y	OK
Church Loke	4	104	B	6	D	26	4BD	281	277	-4	-1%	0	Y	OK
Church Loke	4	104	C	28	A	23	4CA	0	0	0	-	0	Y	OK
Church Loke	4	104	C	28	B	29	4CB	2	2	0	0%	0	Y	OK
Church Loke	4	104	C	28	C	27	4CC	0	0	0	-	0	Y	OK
Church Loke	4	104	C	28	D	26	4CD	2	2	0	0%	0	Y	OK
Church Loke	4	104	D	10	A	23	4DA	37	35	-2	-5%	0	Y	OK
Church Loke	4	104	D	10	B	29	4DB	260	257	-3	-1%	0	Y	OK
Church Loke	4	104	D	10	C	27	4DC	1	1	0	0%	0	Y	OK
Church Loke	4	104	D	10	D	26	4DD	0	0	0	-	0	Y	OK

VISSIM Node 105 **Vehicle Type** Total

Junction Name	MCC Site	Node No.	From Arm	FromLink	To Arm	ToLink	MCC ID	Flow Peak Time		Difference			GEH	Individual Flows
								Observed	Modelled	Value	%	Value	<5	
B1150 Bridge	5	105	A	12	A	37	5AA	0	0	0	-	0	Y	OK
B1150 Bridge	5	105	A	12	B	12	5AB	716	668	-48	-7%	2	Y	OK
B1150 Bridge	5	105	B	37	A	37	5BA	756	739	-17	-2%	1	Y	OK
B1150 Bridge	5	105	B	37	B	12	5BB	0	0	0	-	0	Y	OK

PM – Cars

VISSIM Node 101 **Vehicle Type** Car

Junction Name	MCC Site	Node No.	From Arm	FromLink	To Arm	ToLink	MCC ID	Flow Peak Time		Difference			GEH	
								Observed	Modelled	Value	%	Value	<5	Individual Flows
Rectory Road roundabout	1	101	A	38	A	3	1AA	1	1	0	0%	0	Y	OK
Rectory Road roundabout	1	101	A	38	B	19	1AB	11	9	-2	-18%	1	Y	OK
Rectory Road roundabout	1	101	A	38	C	22	1AC	448	418	-30	-7%	1	Y	OK
Rectory Road roundabout	1	101	A	38	D	18	1AD	120	112	-8	-7%	1	Y	OK
Rectory Road roundabout	1	101	B	20	A	3	1BA	7	8	1	14%	0	Y	OK
Rectory Road roundabout	1	101	B	20	B	19	1BB	0	0	0	-	0	Y	OK
Rectory Road roundabout	1	101	B	20	C	22	1BC	10	10	0	0%	0	Y	OK
Rectory Road roundabout	1	101	B	20	D	18	1BD	3	2	-1	-33%	1	Y	OK
Rectory Road roundabout	1	101	C	1	A	3	1CA	506	504	-2	0%	0	Y	OK
Rectory Road roundabout	1	101	C	1	B	19	1CB	2	2	0	0%	0	Y	OK
Rectory Road roundabout	1	101	C	1	C	22	1CC	0	0	0	-	0	Y	OK
Rectory Road roundabout	1	101	C	1	D	18	1CD	66	66	0	0%	0	Y	OK
Rectory Road roundabout	1	101	D	17	A	3	1DA	97	97	0	0%	0	Y	OK
Rectory Road roundabout	1	101	D	17	B	19	1DB	1	1	0	0%	0	Y	OK
Rectory Road roundabout	1	101	D	17	C	22	1DC	56	56	0	0%	0	Y	OK
Rectory Road roundabout	1	101	D	17	D	18	1DD	0	0	0	-	0	Y	OK

VISSIM Node 102 **Vehicle Type** Car

Junction Name	MCC Site	Node No.	From Arm	FromLink	To Arm	ToLink	MCC ID	Flow Peak Time		Difference			GEH	
								Observed	Modelled	Value	%	Value	<5	Individual Flows
Petrol Station Gyratory	2	102	A	10011	A	15	2AA	0	0	0	-	0	Y	OK
Petrol Station Gyratory	2	102	A	10011	B	10	2AB	38	38	0	0%	0	Y	OK
Petrol Station Gyratory	2	102	A	34	D	12	2AD	328	326	-2	-1%	0	Y	OK
Petrol Station Gyratory	2	102	B	11	A	15	2BA	27	29	2	7%	0	Y	OK
Petrol Station Gyratory	2	102	B	11	B	10	2BB	0	0	0	-	0	Y	OK
Petrol Station Gyratory	2	102	B	11	D	12	2BD	202	220	18	9%	1	Y	OK
Petrol Station Gyratory	2	102	D	37	A	15	2DA	395	397	2	1%	0	Y	OK
Petrol Station Gyratory	2	102	D	37	B	10	2DB	205	207	2	1%	0	Y	OK
Petrol Station Gyratory	2	102	D	37	D	12	2DD	0	1	1	-	1	Y	OK

VISSIM Node 103 **Vehicle Type** Car

Junction Name	MCC Site	Node No.	From Arm	FromLink	To Arm	ToLink	MCC ID	Flow Peak Time		Difference			GEH	
								Observed	Modelled	Value	%	Value	<5	Individual Flows
Great Hautbois Road / Station Road	3	103	A	4	A	33	3AA	0	0	0	-	0	Y	OK
Great Hautbois Road / Station Road	3	103	A	4	B	34	3AB	344	340	-4	-1%	0	Y	OK
Great Hautbois Road / Station Road	3	103	A	4	C	31	3AC	1	1	0	0%	0	Y	OK
Great Hautbois Road / Station Road	3	103	B	15	A	33	3BA	411	409	-2	0%	0	Y	OK
Great Hautbois Road / Station Road	3	103	B	15	B	34	3BB	0	0	0	-	0	Y	OK
Great Hautbois Road / Station Road	3	103	B	15	C	31	3BC	17	17	0	0%	0	Y	OK
Great Hautbois Road / Station Road	3	103	C	32	A	33	3CA	7	7	0	0%	0	Y	OK
Great Hautbois Road / Station Road	3	103	C	32	B	34	3CB	26	26	0	0%	0	Y	OK
Great Hautbois Road / Station Road	3	103	C	32	C	31	3CC	0	0	0	-	0	Y	OK

VISSIM Node 104 **Vehicle Type** Car

Junction Name	MCC Site	Node No.	From Arm	FromLink	To Arm	ToLink	MCC ID	Flow Peak Time		Difference			GEH	Individual Flows
								Observed	Modelled	Value	%	Value	<5	
Church Loke	4	104	A	24	A	23	4AA	0	0	0	-	0	Y	OK
Church Loke	4	104	A	24	B	29	4AB	14	14	0	0%	0	Y	OK
Church Loke	4	104	A	24	C	27	4AC	0	0	0	-	0	Y	OK
Church Loke	4	104	A	24	D	26	4AD	25	25	0	0%	0	Y	OK
Church Loke	4	104	B	6	A	23	4BA	17	17	0	0%	0	Y	OK
Church Loke	4	104	B	6	B	29	4BB	0	0	0	-	0	Y	OK
Church Loke	4	104	B	6	C	27	4BC	0	0	0	-	0	Y	OK
Church Loke	4	104	B	6	D	26	4BD	225	225	0	0%	0	Y	OK
Church Loke	4	104	C	28	A	23	4CA	0	0	0	-	0	Y	OK
Church Loke	4	104	C	28	B	29	4CB	2	2	0	0%	0	Y	OK
Church Loke	4	104	C	28	C	27	4CC	0	0	0	-	0	Y	OK
Church Loke	4	104	C	28	D	26	4CD	2	2	0	0%	0	Y	OK
Church Loke	4	104	D	10	A	23	4DA	33	33	0	0%	0	Y	OK
Church Loke	4	104	D	10	B	29	4DB	207	210	3	1%	0	Y	OK
Church Loke	4	104	D	10	C	27	4DC	1	1	0	0%	0	Y	OK
Church Loke	4	104	D	10	D	26	4DD	0	0	0	-	0	Y	OK

VISSIM Node 105 **Vehicle Type** Car

Junction Name	MCC Site	Node No.	From Arm	FromLink	To Arm	ToLink	MCC ID	Flow Peak Time		Difference			GEH	Individual Flows
								Observed	Modelled	Value	%	Value	<5	
B1150 Bridge	5	105	A	12	A	37	5AA	0	0	0	-	0	Y	OK
B1150 Bridge	5	105	A	12	B	12	5AB	590	549	-41	-7%	2	Y	OK
B1150 Bridge	5	105	B	37	A	37	5BA	607	604	-3	0%	0	Y	OK
B1150 Bridge	5	105	B	37	B	12	5BB	0	0	0	-	0	Y	OK

PM – LGV

VISSIM Node 101 **Vehicle Type** LGV

Junction Name	MCC Site	Node No.	From Arm	FromLink	To Arm	ToLink	MCC ID	Flow Peak Time		Difference			GEH	Individual Flows
								Observed	Modelled	Value	%	Value	<5	
Rectory Road roundabout	1	101	A	38	A	3	1AA	0	0	0	-	0	Y	OK
Rectory Road roundabout	1	101	A	38	B	19	1AB	0	0	0	-	0	Y	OK
Rectory Road roundabout	1	101	A	38	C	22	1AC	96	99	3	3%	0	Y	OK
Rectory Road roundabout	1	101	A	38	D	18	1AD	27	27	0	0%	0	Y	OK
Rectory Road roundabout	1	101	B	20	A	3	1BA	0	0	0	-	0	Y	OK
Rectory Road roundabout	1	101	B	20	B	19	1BB	0	0	0	-	0	Y	OK
Rectory Road roundabout	1	101	B	20	C	22	1BC	0	0	0	-	0	Y	OK
Rectory Road roundabout	1	101	B	20	D	18	1BD	0	0	0	-	0	Y	OK
Rectory Road roundabout	1	101	C	1	A	3	1CA	101	101	0	0%	0	Y	OK

Rectory Road roundabout	1	101	C	1	B	19	1CB	0	0	0	-	0	Y	OK
Rectory Road roundabout	1	101	C	1	C	22	1CC	0	0	0	-	0	Y	OK
Rectory Road roundabout	1	101	C	1	D	18	1CD	27	27	0	0%	0	Y	OK
Rectory Road roundabout	1	101	D	17	A	3	1DA	22	22	0	0%	0	Y	OK
Rectory Road roundabout	1	101	D	17	B	19	1DB	0	0	0	-	0	Y	OK
Rectory Road roundabout	1	101	D	17	C	22	1DC	19	19	0	0%	0	Y	OK
Rectory Road roundabout	1	101	D	17	D	18	1DD	0	0	0	-	0	Y	OK

VISSIM Node 102 **Vehicle Type** LGV

Junction Name	MCC Site	Node No.	From Arm	FromLink	To Arm	ToLink	MCC ID	Flow Peak Time		Difference			GEH	Individual Flows
								Observed	Modelled	Value	%	Value	<5	
Petrol Station Gyratory	2	102	A	10011	A	15	2AA	0	0	0	-	0	Y	OK
Petrol Station Gyratory	2	102	A	10011	B	10	2AB	2	2	0	0%	0	Y	OK
Petrol Station Gyratory	2	102	A	34	D	12	2AD	69	70	1	1%	0	Y	OK
Petrol Station Gyratory	2	102	B	11	A	15	2BA	13	11	-2	-15%	1	Y	OK
Petrol Station Gyratory	2	102	B	11	B	10	2BB	0	0	0	-	0	Y	OK
Petrol Station Gyratory	2	102	B	11	D	12	2BD	45	40	-5	-11%	1	Y	OK
Petrol Station Gyratory	2	102	D	37	A	15	2DA	79	76	-3	-4%	0	Y	OK
Petrol Station Gyratory	2	102	D	37	B	10	2DB	46	45	-1	-2%	0	Y	OK
Petrol Station Gyratory	2	102	D	37	D	12	2DD	0	1	1	-	1	Y	OK

VISSIM Node 103 **Vehicle Type** LGV

Junction Name	MCC Site	Node No.	From Arm	FromLink	To Arm	ToLink	MCC ID	Flow Peak Time		Difference			GEH	Individual Flows
								Observed	Modelled	Value	%	Value	<5	
Great Hautbois Road / Station Road	3	103	A	4	A	33	3AA	0	0	0	-	0	Y	OK
Great Hautbois Road / Station Road	3	103	A	4	B	34	3AB	71	72	1	1%	0	Y	OK
Great Hautbois Road / Station Road	3	103	A	4	C	31	3AC	0	0	0	-	0	Y	OK
Great Hautbois Road / Station Road	3	103	B	15	A	33	3BA	92	87	-5	-5%	1	Y	OK
Great Hautbois Road / Station Road	3	103	B	15	B	34	3BB	0	0	0	-	0	Y	OK
Great Hautbois Road / Station Road	3	103	B	15	C	31	3BC	1	1	0	0%	0	Y	OK
Great Hautbois Road / Station Road	3	103	C	32	A	33	3CA	1	1	0	0%	0	Y	OK
Great Hautbois Road / Station Road	3	103	C	32	B	34	3CB	0	0	0	-	0	Y	OK
Great Hautbois Road / Station Road	3	103	C	32	C	31	3CC	0	0	0	-	0	Y	OK

VISSIM Node 104 **Vehicle Type** LGV

Junction Name	MCC Site	Node No.	From Arm	FromLink	To Arm	ToLink	MCC ID	Flow Peak Time		Difference			GEH	Individual Flows
								Observed	Modelled	Value	%	Value	<5	
Church Loke	4	104	A	24	A	23	4AA	0	0	0	-	0	Y	OK
Church Loke	4	104	A	24	B	29	4AB	2	2	0	0%	0	Y	OK
Church Loke	4	104	A	24	C	27	4AC	0	0	0	-	0	Y	OK
Church Loke	4	104	A	24	D	26	4AD	1	1	0	0%	0	Y	OK
Church Loke	4	104	B	6	A	23	4BA	6	6	0	0%	0	Y	OK
Church Loke	4	104	B	6	B	29	4BB	0	0	0	-	0	Y	OK

Church Loke	4	104	B	6	C	27	4BC	0	0	0	-	0	Y	OK
Church Loke	4	104	B	6	D	26	4BD	51	51	0	0%	0	Y	OK
Church Loke	4	104	C	28	A	23	4CA	0	0	0	-	0	Y	OK
Church Loke	4	104	C	28	B	29	4CB	0	0	0	-	0	Y	OK
Church Loke	4	104	C	28	C	27	4CC	0	0	0	-	0	Y	OK
Church Loke	4	104	C	28	D	26	4CD	0	0	0	-	0	Y	OK
Church Loke	4	104	D	10	A	23	4DA	2	2	0	0%	0	Y	OK
Church Loke	4	104	D	10	B	29	4DB	45	45	0	0%	0	Y	OK
Church Loke	4	104	D	10	C	27	4DC	0	0	0	-	0	Y	OK
Church Loke	4	104	D	10	D	26	4DD	0	0	0	-	0	Y	OK

VISSIM Node 105 **Vehicle Type** LGV

Junction Name	MCC Site	Node No.	From Arm	FromLink	To Arm	ToLink	MCC ID	Flow Peak Time		Difference			GEH	Individual Flows
								Observed	Modelled	Value	%	Value	<5	
B1150 Bridge	5	105	A	12	A	37	5AA	0	0	0	-	0	Y	OK
B1150 Bridge	5	105	A	12	B	12	5AB	107	111	4	4%	0	Y	OK
B1150 Bridge	5	105	B	37	A	37	5BA	122	122	0	0%	0	Y	OK
B1150 Bridge	5	105	B	37	B	12	5BB	0	0	0	-	0	Y	OK

PM – HGV

VISSIM Node 101 **Vehicle Type** HGV

Junction Name	MCC Site	Node No.	From Arm	FromLink	To Arm	ToLink	MCC ID	Flow Peak Time		Difference			GEH	Individual Flows
								Observed	Modelled	Value	%	Value	<5	
Rectory Road roundabout	1	101	A	38	A	3	1AA	0	0	0	-	0%	Y	OK
Rectory Road roundabout	1	101	A	38	B	19	1AB	0	0	0	-	0%	Y	OK
Rectory Road roundabout	1	101	A	38	C	22	1AC	7	7	0	0%	0%	Y	OK
Rectory Road roundabout	1	101	A	38	D	18	1AD	2	2	0	0%	0%	Y	OK
Rectory Road roundabout	1	101	B	20	A	3	1BA	0	0	0	-	0%	Y	OK
Rectory Road roundabout	1	101	B	20	B	19	1BB	0	0	0	-	0%	Y	OK
Rectory Road roundabout	1	101	B	20	C	22	1BC	0	0	0	-	0%	Y	OK
Rectory Road roundabout	1	101	B	20	D	18	1BD	0	0	0	-	0%	Y	OK
Rectory Road roundabout	1	101	C	1	A	3	1CA	11	11	0	0%	0%	Y	OK
Rectory Road roundabout	1	101	C	1	B	19	1CB	0	0	0	-	0%	Y	OK
Rectory Road roundabout	1	101	C	1	C	22	1CC	0	0	0	-	0%	Y	OK
Rectory Road roundabout	1	101	C	1	D	18	1CD	5	5	0	0%	0%	Y	OK
Rectory Road roundabout	1	101	D	17	A	3	1DA	1	1	0	0%	0%	Y	OK
Rectory Road roundabout	1	101	D	17	B	19	1DB	0	0	0	-	0%	Y	OK
Rectory Road roundabout	1	101	D	17	C	22	1DC	1	1	0	0%	0%	Y	OK
Rectory Road roundabout	1	101	D	17	D	18	1DD	0	0	0	-	0%	Y	OK

VISSIM Node 102 **Vehicle Type** HGV

Junction Name			From Arm	FromLink	To Arm	ToLink	MCC ID	Flow Peak Time		Difference			GEH	

	MCC Site	Node No.						Observed	Modelled	Value	%	Value	<5	Individual Flows
Petrol Station Gyratory	2	102	A	10011	A	15	2AA	0	0	0	-	0%	Y	OK
Petrol Station Gyratory	2	102	A	10011	B	10	2AB	0	0	0	-	0%	Y	OK
Petrol Station Gyratory	2	102	A	34	D	12	2AD	5	5	0	0%	0%	Y	OK
Petrol Station Gyratory	2	102	B	11	A	15	2BA	0	0	0	-	0%	Y	OK
Petrol Station Gyratory	2	102	B	11	B	10	2BB	0	0	0	-	0%	Y	OK
Petrol Station Gyratory	2	102	B	11	D	12	2BD	2	2	0	0%	0%	Y	OK
Petrol Station Gyratory	2	102	D	37	A	15	2DA	10	9	-1	-10%	32%	Y	OK
Petrol Station Gyratory	2	102	D	37	B	10	2DB	2	2	0	0%	0%	Y	OK
Petrol Station Gyratory	2	102	D	37	D	12	2DD	0	0	0	-	0%	Y	OK

VISSIM Node 103 **Vehicle Type** HGV

Junction Name	MCC Site	Node No.	From Arm	FromLink	To Arm	ToLink	MCC ID	Flow Peak Time		Difference			GEH	
								Observed	Modelled	Value	%	Value	<5	Individual Flows
Great Hautbois Road / Station Road	3	103	A	4	A	33	3AA	0	0	0	-	0%	Y	OK
Great Hautbois Road / Station Road	3	103	A	4	B	34	3AB	5	5	0	0%	0%	Y	OK
Great Hautbois Road / Station Road	3	103	A	4	C	31	3AC	0	0	0	-	0%	Y	OK
Great Hautbois Road / Station Road	3	103	B	15	A	33	3BA	10	9	-1	-10%	32%	Y	OK
Great Hautbois Road / Station Road	3	103	B	15	B	34	3BB	0	0	0	-	0%	Y	OK
Great Hautbois Road / Station Road	3	103	B	15	C	31	3BC	0	0	0	-	0%	Y	OK
Great Hautbois Road / Station Road	3	103	C	32	A	33	3CA	0	0	0	-	0%	Y	OK
Great Hautbois Road / Station Road	3	103	C	32	B	34	3CB	0	0	0	-	0%	Y	OK
Great Hautbois Road / Station Road	3	103	C	32	C	31	3CC	0	0	0	-	0%	Y	OK

VISSIM Node 104 **Vehicle Type** HGV

Junction Name	MCC Site	Node No.	From Arm	FromLink	To Arm	ToLink	MCC ID	Flow Peak Time		Difference			GEH	
								Observed	Modelled	Value	%	Value	<5	Individual Flows
Church Loke	4	104	A	24	A	23	4AA	0	0	0	-	0%	Y	OK
Church Loke	4	104	A	24	B	29	4AB	0	0	0	-	0%	Y	OK
Church Loke	4	104	A	24	C	27	4AC	0	0	0	-	0%	Y	OK
Church Loke	4	104	A	24	D	26	4AD	0	0	0	-	0%	Y	OK
Church Loke	4	104	B	6	A	23	4BA	1	1	0	0%	0%	Y	OK
Church Loke	4	104	B	6	B	29	4BB	0	0	0	-	0%	Y	OK
Church Loke	4	104	B	6	C	27	4BC	0	0	0	-	0%	Y	OK
Church Loke	4	104	B	6	D	26	4BD	2	2	0	0%	0%	Y	OK
Church Loke	4	104	C	28	A	23	4CA	0	0	0	-	0%	Y	OK
Church Loke	4	104	C	28	B	29	4CB	0	0	0	-	0%	Y	OK
Church Loke	4	104	C	28	C	27	4CC	0	0	0	-	0%	Y	OK
Church Loke	4	104	C	28	D	26	4CD	0	0	0	-	0%	Y	OK
Church Loke	4	104	D	10	A	23	4DA	0	0	0	-	0%	Y	OK
Church Loke	4	104	D	10	B	29	4DB	3	2	-1	-33%	63%	Y	OK
Church Loke	4	104	D	10	C	27	4DC	0	0	0	-	0%	Y	OK
Church Loke	4	104	D	10	D	26	4DD	0	0	0	-	0%	Y	OK

VISSIM Node 105

Vehicle Type HGV

Junction Name	MCC Site	Node No.	From Arm	FromLink	To Arm	ToLink	MCC ID	Flow Peak Time		Difference			GEH	
								Observed	Modelled	Value	%	Value	<5	Individual Flows
B1150 Bridge	5	105	A	12	A	37	5AA	0	0	0	-	0%	Y	OK
B1150 Bridge	5	105	A	12	B	12	5AB	7	7	0	0%	0%	Y	OK
B1150 Bridge	5	105	B	37	A	37	5BA	11	11	0	0%	0%	Y	OK
B1150 Bridge	5	105	B	37	B	12	5BB	0	0	0	-	0%	Y	OK

Appendix C – Masterplan

KEY

- Site Allocation Boundary
- Residential (Northern)
- Residential (Central)
- Residential (Southern)
- Employment
- Local Centre
- School
- Link Road
- Primary Route
- Secondary Route
- Tertiary Route
- Proposed Vegetation
- Proposed Open Space
- Proposed Attenuation
- Proposed Footpath Link
- Weavers Way
- Urban Area
- LEAP
- NEAP
- Allotments
- Sport Provision

DRAFT

Rev.	Date.	Details.
B	04.01.2024	UPDATED DEVELOPMENT PARCELS
A	16.08.2023	UPDATED DEVELOPMENT PARCELS

GENERAL
Do not scale from this drawing.
All dimensions to be checked on site.
This plan is to be read with all accompanying documentation.

ESCO Developments | Flagship Group | LOVELL

BIDWELLS | Urban Design Studio
Bidwell House, Trumpington Road, Cambridge CB2 9LD

LAND WEST OF NORTH WALSHAM, NORFOLK

ILLUSTRATIVE MASTER PLAN

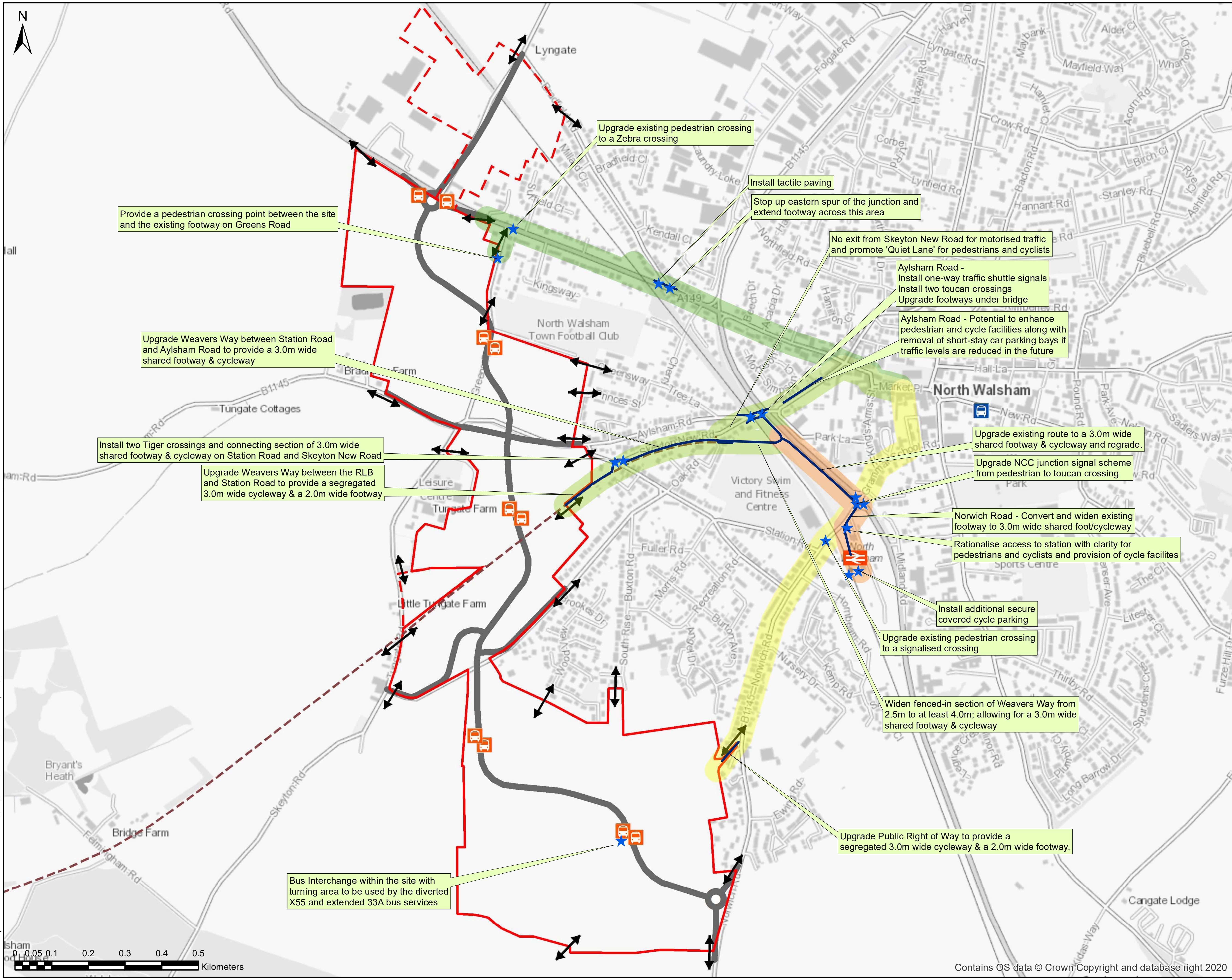
Scale:	Job Code:	OS License Number:
NTS	73525	100017734

Project Phase :	Date:	Drawn By:	Checked By:
PLANNING	23.08.01	DP / TB	JP

Drawing Number: UDS73525-A1-0202

Revision: B

Appendix D – Proposals and Design Drawings



THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT

LEGEND

- Proposed Improvement
- Proposed Improvement
- Town Travel Hub
- Proposed Bus Stop (Spine Rd)
- Mobility Corridor 1 (2m wide footway; on-road cycling)
- Mobility Corridor 2 (including off-carriageway cycling)
- Mobility Corridor 3 (2m wide footway; on-road cycling)
- Mobility Corridor Rail Extension (including off-carriageway cycle)
- Walk and Cycle RLB Connection
- Weavers Way
- RLB
- RLB Emerging Allocation
- Link Road

Purpose of Issue
DRAFT

Client
ESCO DEVELOPMENTS
FLAGSHIP HOUSING GROUP
LOVELL PARTNERSHIPS

Project Title
NORTH WALSHAM WESTERN URBAN EXTENSION

Drawing Title
PROPOSED IMPROVEMENTS NORTH WALSHAM

Drawn	Checked	Approved	Date
BS	TJ	BC	23/08/2023

AECOM Internal Project No.	Scale @ A3
60685223	1:9,500

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St Crispins Road
Norwich
NR3 1YE
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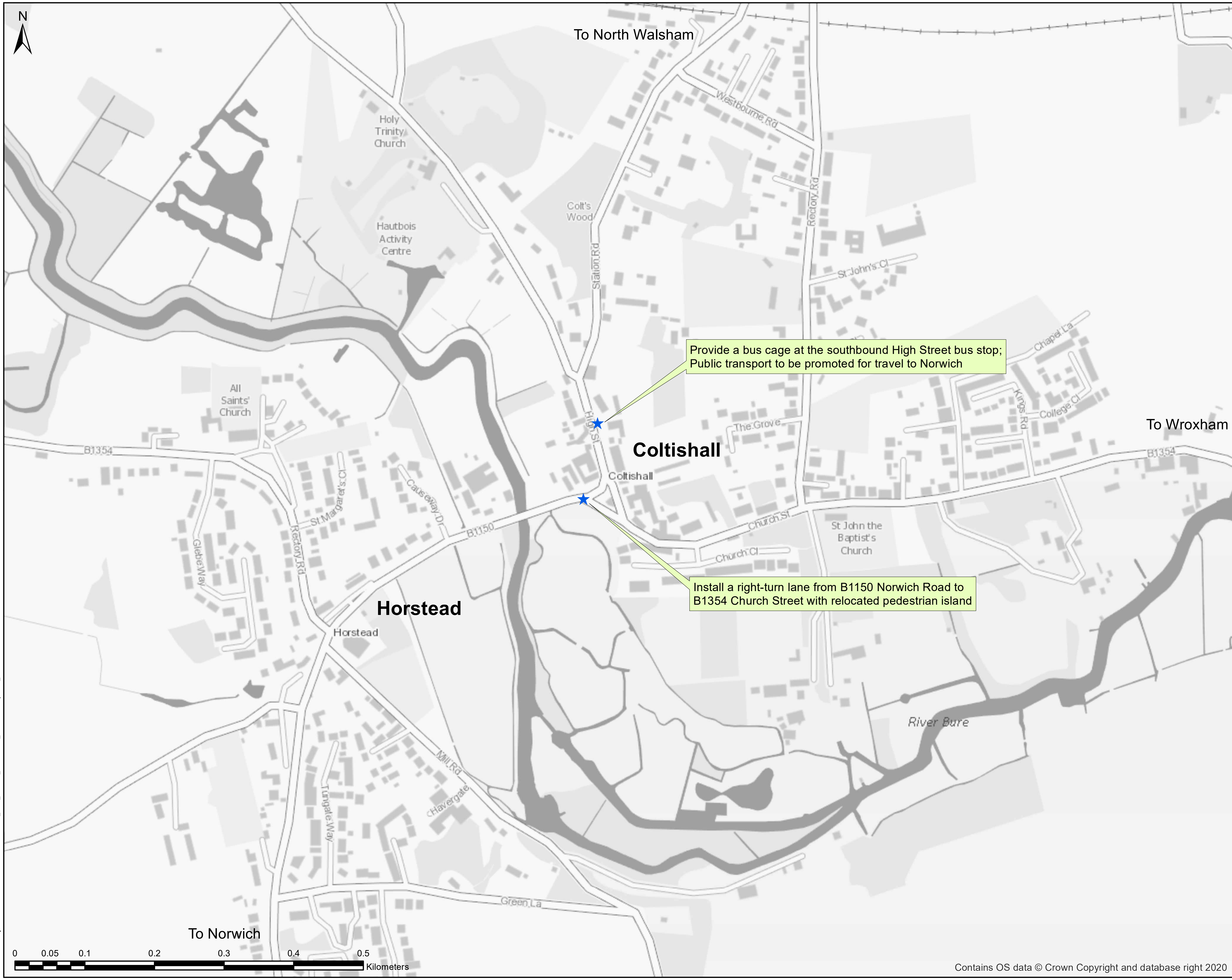
AECOM

Drawing Number	Rev
FIGURE A.001	04

File Name:A:\Projects\60685223 - North Walsham WUE\900_CAD_GIS\960_GIS\230822_NW WUE Proposals_V10.mxd



LEGEND

★ Proposed Improvement

Purpose of Issue
DRAFT

Client
ESCO DEVELOPMENTS
FLAGSHIP HOUSING GROUP
LOVELL PARTNERSHIPS

Project Title
NORTH WALSHAM WESTERN URBAN EXTENSION

Drawing Title
PROPOSED IMPROVEMENTS COLTISHALL

Drawn	Checked	Approved	Date
BS	TJ	BC	23/08/2023

AECOM Internal Project No.	Scale @ A3
60685223	1:5,000

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NR3 1YE
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AECOM

Drawing Number	Rev
FIGURE A.003	02

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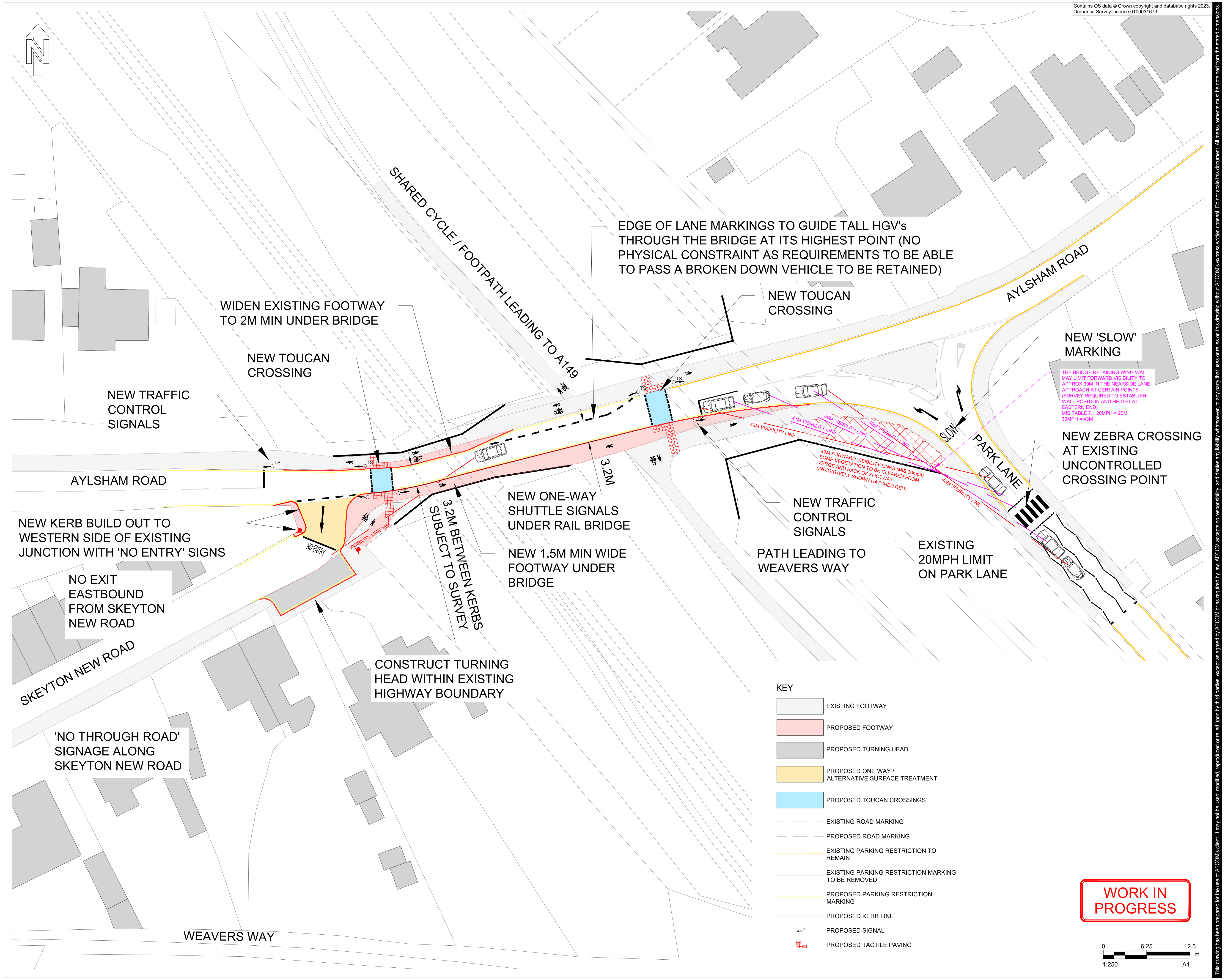

AECOM

PROJECT

North Walsham
Western Urban Extension

CLIENT

Esco Developments
Flagship Group
Lovel

CONSULTANT

AECOM
CAVELL HOUSE, STANNARD PLACE
ST CRISPINS ROAD
NORWICH, NR3 1YE, UK
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NOTES

LEGEND

SUITABILITY

S0 WORK IN PROGRESS

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P03	05/09/2023	FORWARD VISIBILITY ON PARK RD ADDED
P02	07/08/2023	AMENDMENTS TO LAYOUT
P01	25/07/2023	LAYOUT FOR DISCUSSION

KEY PLAN

PROJECT NUMBER

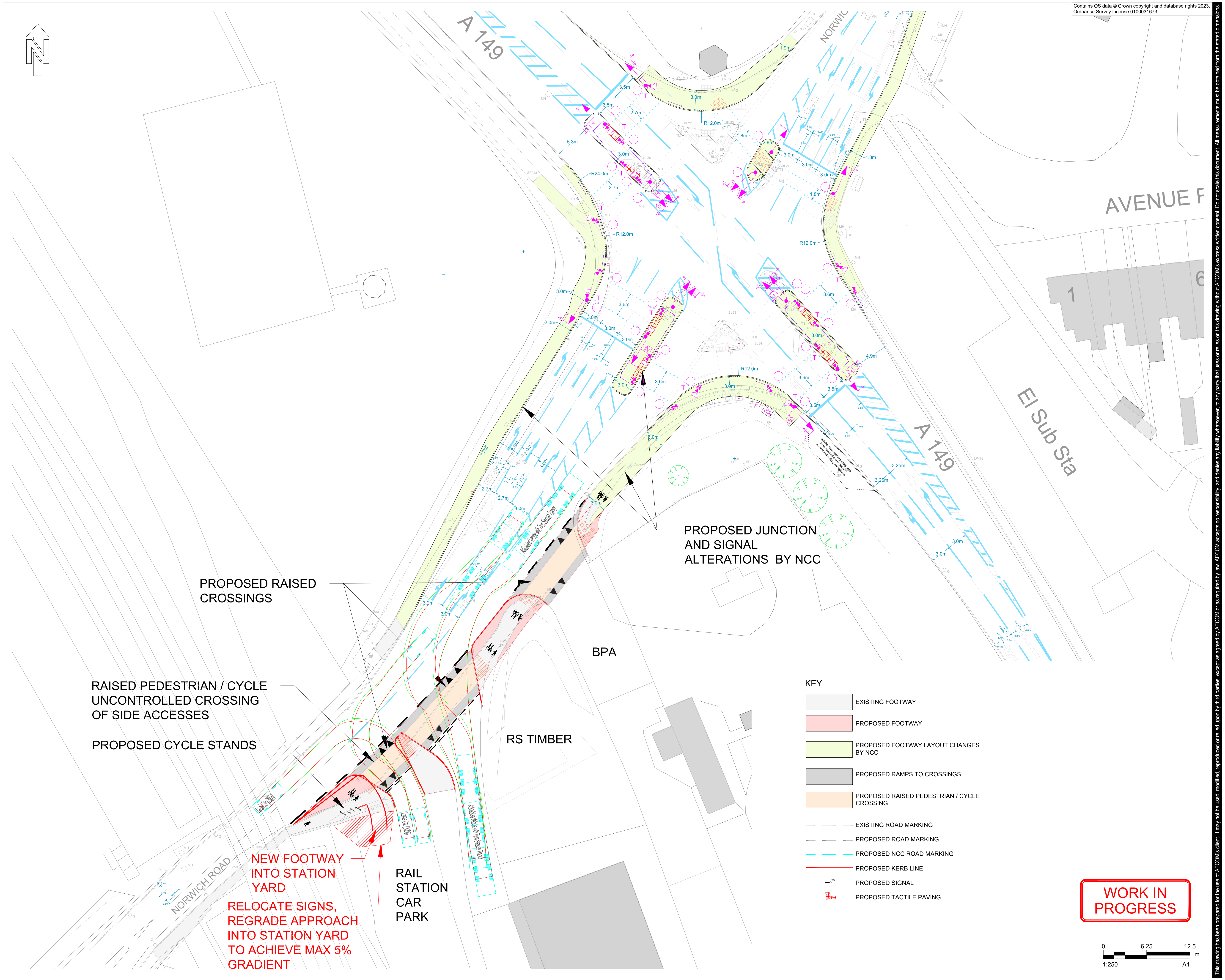
60685223

SHEET TITLE

SKEYTON NEW ROAD JUNCTION DETAIL AND VISIBILITY LINES AT AYLSHAM ROAD END

SHEET NUMBER

60685223-ACM-XX-XX-DR-CE-0154



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Last saved by: DAVID BALL(2023-09-11) Last Plotted: 2023-09-27

Project Management Initials: Designer: Checked: Approved: ISO A1 594mm x 841mm

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NOTES

LEGEND

SUITABILITY

S0 WORK IN PROGRESS

ISSUE/REVISION

I/R	DATE	DESCRIPTION
P01	02/08/2023	LAYOUT FOR DISCUSSION

KEY PLAN

PROJECT NUMBER

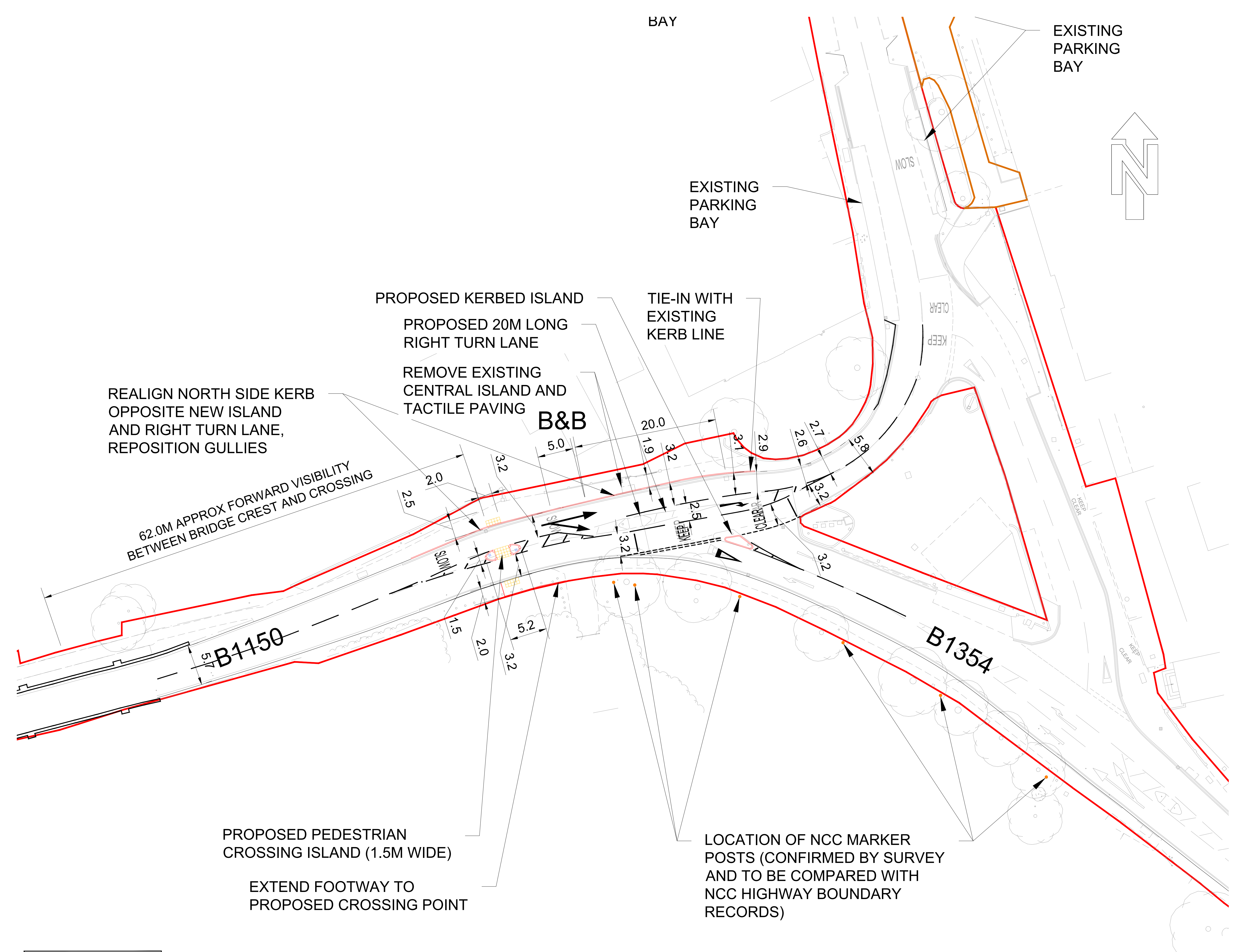
60685223

SHEET TITLE

NORWICH ROAD
CYCLE PROVISION TO A149
IN CONJUNCTION WITH NCC SCHEME

SHEET NUMBER

60685223-ACM-XX-XX-DR-CE-0155



ISO A1 594mm x 841mm

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Printed on ___% Post-Consumer Recycled Content Paper

0 2.5 5.0 10.0 15.0 20.0 25.0m
SCALE 1:250

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NOTES

KEY

New Kerb Line

Boundaries Created BY NCC - Received in pdf format: 29 Aug 2023

Boundary recreated IN CAD BY DJB 31/08/2023:

Public Highway Boundary

Public Right of Way Boundary

FOR INFORMATION ONLY

SUITABILITY

S0 WORK IN PROGRESS

ISSUE/REVISION

DRAWN: CHECKED: APPROVED:

I/R	DATE	DESCRIPTION
P04	31/08/2023	THRO' LANES 3.2M WIDE, HIGHWAY BOUNDARIES ADDED
P03	09/08/2023	KEEP CLEAR / SLOW MARKINGS ADDED
P02	07/08/2023	LAYOUT REV'D TO SUIT TOPO SURVEY
P01	26/06/2023	ISSUED FOR INFORMATION

KEY PLAN

PROJECT NUMBER

60685223

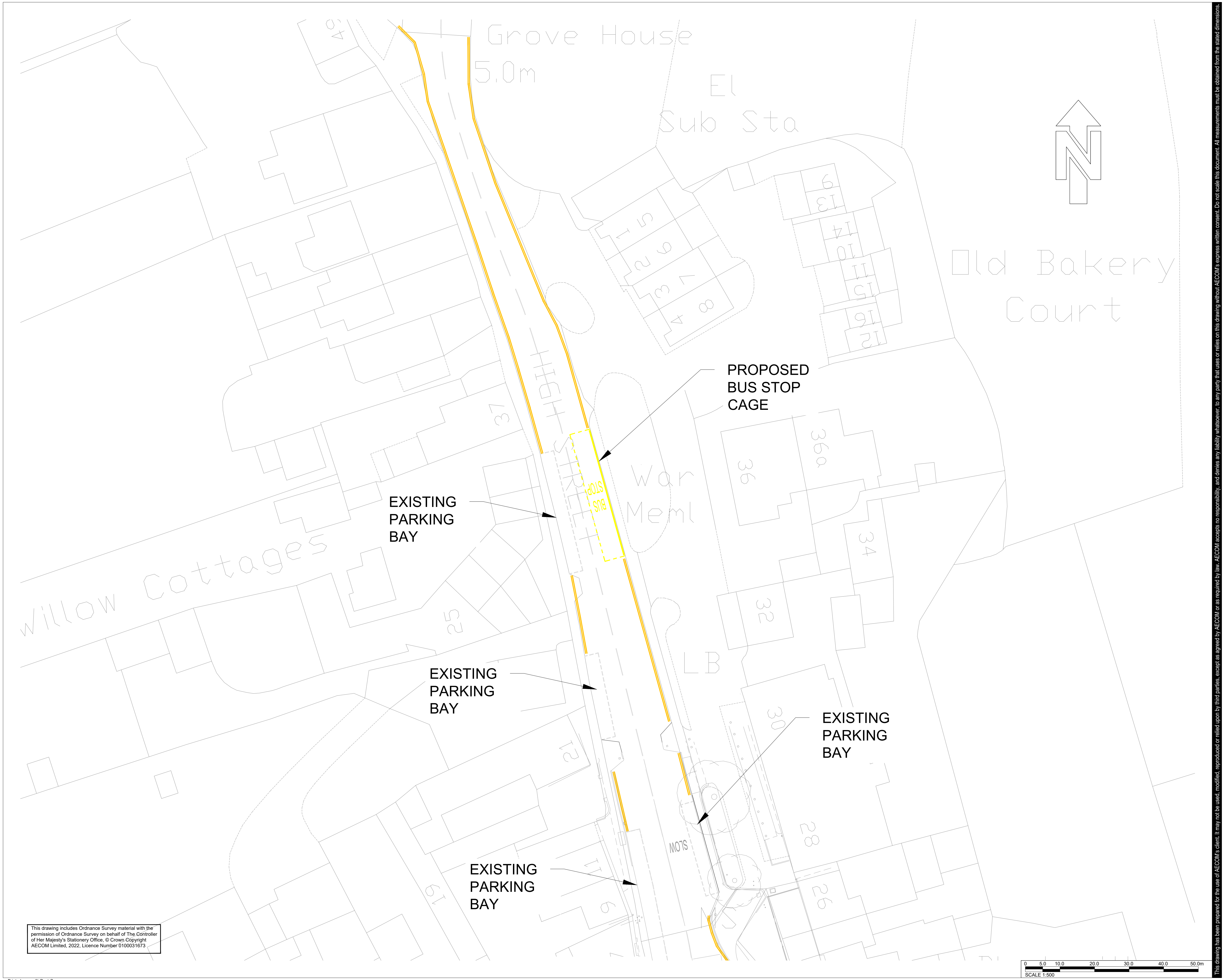
SHEET TITLE

B1150 CHURCH ST COLTISHALL
PROPOSED ROAD LAYOUT
SHEET 1 OF 2

SHEET NUMBER

60685223-ACM-XX-XX-DR-CE-0130

SCALE: 1:500 @A1 **REV:** P04



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PROJECT

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CLIENT

OWNER/CLIENT

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SUITABILITY

S0 WORK IN PROGRESS

ISSUE/REVISION

DRAWN:	CHECKED:	APPROVED:

I/R	DATE	DESCRIPTION
P01	07/08/2023	ISSUED FOR INFORMATION

KEY PLAN

PROJECT NUMBER

60685223

SHEET TITLE

NORTH WALSHAM ROAD COLTISHALL
PROPOSED BUS STOP

SHEET NUMBER

60685223-ACM-XX-XX-DR-CE-0133

SCALE: 1:500 @A1 **REV:** P01

Appendix E – Percentage Impact Assessment

% Impact Assessment

AM Peak Hour

			2029 DM Turn	2029 DM Arm	2029 DS Turn	2029 DS Arm	2029 % increase Turn	2029 % increase	2029 % increase Arm	2036 DM Turn	2036 DM Arm	2036 DS Turn	2036 DS Arm	2036 % increase Turn	2036 % increase	2036 % increase Arm
Junction 1 - Bradfield Road / Cromer Road Priority Junction / Proposed Road	A to C		0		0		0%			0		13		0%		
	A to B		2		2		3%	0		1		8		700%	53	
	A to D	N Bradfield	0	2	0	2	0%		3%	0	1	33	54	0%		5300%
	B to A		2		2		-5%			3		19		533%		
	B to C		354		354		0%	4		372		293		-21%	63	
	B to D	W Cromer	0	356	4	360	0%		1%	0	375	126	438	0%		17%
	C to B		480		478		0%			507		375		-26%		
	C to A		0		3		0%	8		0		32		0%	1	
	C to D	E Cromer	0	480	7	488	0%		2%	0	507	101	508	0%		0%
	D to A		0		0		0%			0		45		0%		
	D to B		0		7		0%	46		0		225		0%	343	
	D to C	Link Road	0	0	39	46	0%		-	0	0	73	343	0%		-
	Junction			838		897		59	7%		883		1343		460	52%
Junction 2 - Cromer Road / Greens Road Priority Junction	A to B		78		69		-12%	43		83		0		-100%	9	
	A to C	W Cromer	277	355	329	398	19%		12%	288	371	380	380	32%		2%
	B to A		132		110		-17%	-14		105		0		-100%	-139	
	B to C	S Greens	30	161	37	147	27%		-9%	34	139	0	0	-100%		-100%
	C to B		69		70		1%	34		66		0		-100%	40	
	C to A	E Cromer	350	419	383	453	10%		8%	402	468	508	508	26%		9%
	Junction			935		997		63	7%		978		888		-90	-9%
Junction 3 - B1145 / A149 / A149 Cromer Road / Cromer Road Signalised Junction	A to D		29		29		1%			29		30		3%		
	A to C		250		250		0%	2		263		264		0%	32	
	A to B	N B1145	168	447	170	449	1%		0%	171	463	201	495	18%		7%
	B to D		55		62		13%			54		53		-2%		
	B to C		174		223		28%	58		176		210		19%	55	
	B to A	W Cromer	95	324	97	382	2%		18%	103	333	125	388	21%		17%
	C to D		0		0		0%			0		0		0%		
	C to B		235		265		13%	29		283		285		1%	15	
	C to A	S A149	250	485	249	514	0%		6%	271	554	284	569	5%		3%
	D to C		2		2		15%			2		2		0%		
	D to B		6		6		0%	0		6		6		0%	0	
	D to A	E Cromer	3	11	3	11	2%		3%	3	11	3	11	0%		0%
	Junction			1267		1356		89	7%		1361		1463		102	7%
Junction 4 - Cromer Road / Mundesley Road / Market Street / Aylsham Road Signalised Junction	A to D		140		140		0%			148		148		0%		
	A to C		0		0		0%	0		0		0		0%	0	
	A to B	N Mundesley	0	140	0	140	0%		0%	0	148	0	148	0%		0%
	B to D		31		34		11%			32		32		0%		
	B to C		0		0		0%	8		0		0		0%	-3	
	B to A	W Cromer	44	74	48	83	11%		11%	43	75	40	72	-7%		-4%
	C to D		126		124		-2%			134		127		-5%		
	C to B		0		0		0%	-1		0		0		0%	19	
	C to A	S Aylsham	249	375	250	374	0%		0%	258	392	284	411	10%		5%
	D to C		0		0		0%			0		0		0%		
	D to B		0		0		0%	0		0		0		0%	0	
	D to A	E Market	0	0	0	0	0%		0%	0	0	0	0	0%		0%
	Junction			590		596		7	1%		615		631		16	3%
Junction 5 - Aylsham Road / Park Lane Priority Junction	A to B		0		0		0%	0		0		0		0%	0	
	A to C	E Aylsham	0	0	0	0	0%		0%	0	0	0	0	0%		0%
	B to A		141		144		2%	3		146		172		18%	26	
	B to C	W Aylsham	0	141	0	144	0%		2%	0	146	0	172	0%		18%
	C to B		150		143		-5%	-12		168		208		24%	30	
	C to A	S Park	235	385	230	373	-2%		-3%	247	415	237	445	-4%		7%
	Junction			526		517		-9	-2%		561		617		56	10%
Junction 6 - Aylsham Road / Skeyton New Road Priority Junction	A to B		110		104		-6%	-8		123		160		30%	40	
	A to C	E Aylsham	39	149	38	142	-3%		-5%	44	167	47	207	7%		24%
	B to A		132		136		3%	4		137		162		18%	26	
	B to C	W Aylsham	2	135	2	138	-2%		3%	2	139	3	165	50%		19%
	C to B		3		3		2%	0		3		3		0%	0	
	C to A	S Skeyton	10	13	10	13	-1%		-1%	10	13	10	13	0%		0%
	Junction			297		293		-4	-1%		319		385		66	21%
Junction 7 - B1145 Aylsham Road / Aylsham Road / Greens Road / Tungate Road Crossroads Junction	A to D		73		52		-28%			77		0		-100%		
	A to C		25		32		26%	-9		24		0		-100%	-150	
	A to B	N Greens	50	148	55	139	10%		-6%	49	150	0	0	-100%		-100%
	B to D		131		114		-13%			137		194		42%		
	B to C		0		10		0%	0		0		0		0%	23	
	B to A	W Aylsham	31	162	37	161	22%		0%	34	171	0	194	-100%		13%
	C to D		34		29		-14%			34		34		0%		
	C to B		4		4		-1%	0		4		4		0%	-5	
	C to A	S Tungate	5	43	10	43	96%		0%	5	43	0	38	-100%		-12%

PM Peak Hour

			2029 DM Turn	2029 DM Arm	2029 DS Turn	2029 DS Arm	2029 % increase Turn	2029 % increase	2029 % increase Arm	2036 DM Turn	2036 DM Arm	2036 DS Turn	2036 DS Arm	2036 % increase Turn	2036 % increase	2036 % increase Arm
Junction 1 - Bradfield Road / Cromer Road Priority Junction / Proposed Road	A to C		15		2		-86%			3		21		600%		
	A to B		4		4		-1%			4		16		300%		
	A to D	N Bradfield	0	19	0	6	0%	-13	-67%	0	7	32	69	0%	62	886%
	B to A		4		4		0%			5		13		160%		
	B to C		558		564		1%			571		476		-17%		
	B to D	W Cromer	0	562	8	576	0%	14	2%	0	576	197	686	0%	110	19%
	C to B		448		428		-5%			475		348		-27%		
	C to A		0		0		0%			0		15		0%		
	C to D	E Cromer	0	448	27	454	0%	6	1%	0	475	99	462	0%	-13	-3%
	D to A		0		0		0%			0		20		0%		
	D to B		0		4		0%			0		185		0%		
	D to C	Link Road	0	0	18	22	0%	22	-	0	0	86	291	0%	291	-
	Junction			1029		1058		29	3%		1058		1508		450	43%
Junction 2 - Cromer Road / Greens Road Priority Junction	A to B		93		102		10%			87		0		-100%		
	A to C	W Cromer	481	574	490	593	2%	19	3%	494	581	580	580	17%	-1	0%
	B to A		123		84		-32%			90		0		-100%		
	B to C	S Greens	60	183	66	150	10%	-33	-18%	54	144	0	0	-100%	-144	-100%
	C to B		81		80		-1%			80		0		-100%		
	C to A	E Cromer	325	406	378	458	16%	52	13%	380	460	466	466	23%	6	1%
	Junction			1163		1200		38	3%		1185		1046		-139	-12%
Junction 3 - B1145 / A149 / A149 Cromer Road / Cromer Road Signalised Junction	A to D		54		54		0%			55		53		-4%		
	A to C		298		296		0%			300		324		8%		
	A to B	N B1145	191	543	193	543	1%	0	0%	194	549	209	586	8%	37	7%
	B to D		137		152		11%			145		143		-1%		
	B to C		263		268		2%			264		276		5%		
	B to A	W Cromer	141	542	148	568	5%	27	5%	154	563	181	600	18%	37	7%
	C to D		23		20		-13%			30		29		-3%		
	C to B		213		264		24%			266		252		-5%		
	C to A	S A149	258	494	233	517	-9%	24	5%	279	575	283	564	1%	-11	-2%
	D to C		9		9		1%			9		9		0%		
	D to B		9		9		2%			9		9		0%		
	D to A	E Cromer	0	18	0	18	0%	0	1%	0	18	0	18	0%	0	0%
	Junction			1597		1647		51	3%		1705		1768		63	4%
Junction 4 - Cromer Road / Mundesley Road / Market Street / Aylsham Road Signalised Junction	A to D		149		149		0%			148		148		0%		
	A to C		0		0		0%			0		0		0%		
	A to B	N Mundesley	0	149	0	149	0%	0	0%	0	148	0	148	0%	0	0%
	B to D		97		101		4%			98		99		1%		
	B to C		0		0		0%			0		0		0%		
	B to A	W Cromer	71	168	82	183	16%	15	9%	74	172	73	172	-1%	0	0%
	C to D		133		123		-7%			138		140		1%		
	C to B		0		0		0%			0		0		0%		
	C to A	S Aylsham	265	398	251	374	-5%	-24	-6%	282	420	295	435	5%	15	4%
	D to C		0		0		0%			0		0		0%		
	D to B		0		0		0%			0		0		0%		
	D to A	E Market	0	0	0	0	0%	0	0%	0	0	0	0	0%	0	0%
	Junction			715		705		-9	-1%		740		755		15	2%
Junction 5 - Aylsham Road / Park Lane Priority Junction	A to B		0		0		0%			0		0		0%		
	A to C	E Aylsham	0	0	0	0	0%	0	0%	0	0	0	0	0%	0	0%
	B to A		115		100		-13%			115		147		28%		
	B to C	W Aylsham	0	115	0	100	0%	-15	-13%	0	115	0	147	0%	32	28%
	C to B		127		146		15%			133		138		4%		
	C to A	S Park	284	411	275	422	-3%	10	3%	306	439	288	426	-6%	-13	-3%
	Junction			526		522		-4	-1%		554		573		19	3%
Junction 6 - Aylsham Road / Skeyton New Road Priority Junction	A to B		93		107		15%			98		105		7%		
	A to C	E Aylsham	34	127	39	146	14%	19	15%	37	135	33	138	-11%	3	2%
	B to A		99		84		-15%			97		130		34%		
	B to C	W Aylsham	11	110	7	91	-39%	-19	-17%	10	107	13	143	30%	36	34%
	C to B		5		5		-1%			5		5		0%		
	C to A	S Skeyton	16	21	16	21	0%	0	0%	17	22	17	22	0%	0	0%
	Junction			258		258		0	0%		264		303		39	15%
Junction 7 - B1145 Aylsham Road / Aylsham Road / Greens Road / Tungate Road Crossroads Junction	A to D		86		82		-5%			82		0		-100%		
	A to C		23		32		38%			20		0		-100%		
	A to B	N Greens	65	174	69	183	6%	8	5%	65	167	0	0	-100%	-167	-100%
	B to D		103		98		-5%			115		201		75%		
	B to C		5		5		3%			6		6		0%		
	B to A	W Aylsham	46	154	59	161	26%	7	5%	41	162	0	207	-100%	45	28%
	C to D		19		14		-27%			21		36		71%		
	C to B		4		4		-6%			4		4		0%		
	C to A	S Tungate	23	46	23	41	4%	-5	-10%	22	47	0	40	-100%	-7	-15%

Junction	D to C		13		10		-21%			12		38		217%			13		12		-11%			16		31		94%		
	D to B		126		126		0%	-28		142		230		62%	9		81		78		-4%			81		173		114%		
	D to A	E Aylsham	128	267	103	240	-19%		-10%	105	259	0	268	-100%		3%	115	209	67	157	-41%	-52	-25%	82	179	0	204	-100%	25	14%
	Junction			619		582		-37	-6%		623		500		-123	-20%		583		542		-41	-7%		555		451		-104	-19%
Junction 8 - Aylsham Road / Station Road Priority Junction	A to B		90		84		-7%	-7		98		121		23%	33		66		63		-6%			48		81		69%		
	A to C	E Aylsham	12	102	12	96	-4%		-6%	14	112	24	145	71%		29%	18	85	29	91	56%	7	8%	25	73	20	101	-20%	28	38%
	B to A		81		81		0%	-41		85		107		26%	-24		70		58		-17%			74		83		12%		
	B to C	W Aylsham	156	237	115	196	-26%		-17%	162	247	116	223	-28%		-10%	139	209	135	193	-2%	-15	-7%	146	220	100	183	-32%	-37	-17%
	C to B		177		157		-12%	-17		163		109		-33%	-52		144		95		-34%			130		60		-54%		
	C to A	S Station	39	216	42	199	8%		-8%	41	204	43	152	5%		-25%	70	214	50	145	-29%	-69	-32%	58	188	100	160	72%	-28	-15%
	Junction			555		491		-65	-12%		563		520		-43	-8%		507		429		-78	-15%		481		444		-37	-8%
Junction 9 - Station Road / Skeyton New Road Priority Junction	A to B		3		3		0%	0		3		9		200%	-1		2		2		0%			2		2		0%		
	A to C	E Skeyton	46	49	46	49	0%		0%	48	51	41	50	-15%		-2%	44	46	44	46	0%	0	0%	48	50	49	51	2%	1	2%
	B to A		5		5		2%	-40		5		5		0%	-36		3		6		115%			3		3		0%		
	B to C	N Station	162	167	122	128	-25%		-24%	171	176	135	140	-21%		-20%	154	157	158	164	3%	7	5%	170	173	117	120	-31%	-53	-31%
	C to B		214		197		-8%	-16		202		144		-29%	-60		212		143		-32%			186		160		-14%		
	C to A	S Station	10	224	10	208	3%		-7%	13	215	11	155	-15%		-28%	14	225	11	154	-20%	-71	-32%	18	204	17	177	-6%	-27	-13%
	Junction			440		384		-56	-13%		442		345		-97	-22%		428		364		-64	-15%		427		348		-79	-19%
Junction 10 - Station Road / Oak Road / Skeyton Road Crossroads Junction	A to D		1		1		0%			1		1		0%			0		0		0%			0		0		0%		
	A to C		0		0		0%	0		0		0		0%	0		0		0		0%			0		0		0%		
	A to B	N Oak	2	3	2	3	0%		0%	2	3	2	3	0%		0%	8	8	8	8	0%	0	0%	8	8	8	8	0%	0	0%
	B to D		167		138		-17%			178		163		-8%			152		158		4%			158		149		-6%		
	B to C		42		31		-26%	-40		43		12		-72%	-46		43		41		-5%			57		13		-77%		
	B to A	W Station	0	208	0	169	0%		-19%	0	221	0	175	0%		-21%	3	198	3	202	0%	4	2%	3	218	3	165	0%	-53	-24%
	C to D		28		28		0%			30		22		-27%			20		22		12%			22		33		50%		
	C to B		64		65		1%	1		64		18		-72%	-54		32		33		4%			33		75		127%		
	C to A	S Skeyton	0	92	0	93	0%		1%	0	94	0	40	0%		-57%	0	52	0	56	0%	4	7%	0	55	0	108	0%	53	96%
	D to C		37		36		-3%			43		32		-26%			41		41		0%			38		73		92%		
	D to B		157		140		-11%	-17		151		135		-11%	-28		185		113		-39%			163		95		-42%		
	D to A	E Station	13	207	14	191	11%		-8%	19	213	18	185	-5%		-13%	4	230	4	159	0%	-72	-31%	4	205	4	172	0%	-33	-16%
	Junction			511		455		-56	-11%		531		403		-128	-24%		488		425		-64	-13%		486		453		-33	-7%
Junction 11 - Station Road / Millfield Road / Morris Road Mini-roundabout	A to D		25		20		-17%			25		23		-8%			18		18		-2%			20		20		0%		
	A to C		143		130		-9%	-29		155		146		-6%	-25		132		150		14%			136		137		1%		
	A to B		15		13		-15%			15		15		0%			12		12		-2%			13		20		54%		
	A to A	N Station	12	195	3	166	-76%		-15%	15	210	1	185	-93%		-12%	10	172	1	181	-89%	9	5%	10	179	3	180	-70%	1	1%
	B to D		0		0		0%			0		0		0%			2		2		0%			2		2		0%		
	B to C		21		21		0%	0		23		23		0%	11		2		2		0%			2		2		0%		
	B to A		64		64		0%			65		76		17%			10		10		-1%			10		10		0%		
	B to B	W Morris	0	85	0	85	0%		0%	0	88	0	99	0%		13%	0	14	0	14	0%	0	0%	0	14	0	14	0%	0	0%
	C to D		0		0		0%			0		0		0%			0		0		0%			0		0		0%		
	C to B		9		13		42%	-19		13		12		-8%	-45		4		4		3%			5		5		0%		
	C to A		132		120		-9%			136		102		-25%			168		108		-36%			141		111		-21%		
	C to C	S Millfield	11	152	0	133	-100%		-12%	10	159	0	114	-100%		-28%	3	175	0	112	-100%	-62	-36%	4	150	0	116	-100%	-34	-23%
	D to C		0		0		0%			0		0		0%			0		0		0%			0		0		0%		
	D to B		0		0		0%	4		0		0		0%	12		0		0		0%			0		0		0%		
	D to A		0		4		0%			0		12		0%			43		40		-7%			43		48		12%		
	D to D	E Station	0	0	0	4	0%		0%	0	0	0	12	0%		#DIV/0!	0	43	0	40	0%	-3	-7%	0	43	0	48	0%	5	12%
	Junction			432		388		-44	-10%		457		410		-47	-10%		403		347		-57	-14%		386		358		-28	-7%
Junction 12 - B1150 Norwich Road / Millfield Road Priority Junction	A to B		73		78		7%	28		92		81		-12%	20		56		54		-3%			80		113		41%		
	A to C	N Norwich	311	384	334	412	7%		7%	356	448	387	468	9%		4%	417	472	429	483	3%	11	2%	443	523	516	629	16%	106	20%
	B to A		86		73		-16%	-34		92		119		29%	-25		39		45		15%			55		74		35%		
	B to C	W Millfield	124	210	103	176	-17%		-16%	130	222	78	197	-40%		-11%	71	109	78	123	10%	13	12%	63	118	43	117	-32%	-1	-1%
	C to B		104		78		-25%	13		92		60		-35%	41		141		83		-41%			102		32		-69%		
	C to A	S Norwich	332	436	371	449	12%		3%	356	448	429	489	21%		9%	396	537	395	478	0%	-59	-11%	457	559	431	463	-6%	-96	-17%
	Junction			1029		1037		8	1%		1118		1154		36	3%		1119		1083		-35	-3%		1200		1209		9	1%
Junction 13 - B1150 Norwich Road / Station Road Priority Junction	A to B		25		29		18%	33		25		32		28%	26		42		41		-3%			47		45		-4%		
	A to C	N Norwich	383	408	413	442	8%		8%	447	472	466	498	4%		6%	469	511	481	522	2%	11	2%	516	563	626	671	21%	108	19%
	B to A		71		67		-5%	-4		74		63		-15%	-10		43		41		-5%			49		48		-2%		
	B to C	W Station	0	71	0	67	0%		-5%	0	74	1	64	0%		-14%	4	47	3	44	-11%	-2	-5%	4	53	4	52	0%	-1	-2%
	C to B		2		2		10%	25		1		5		400%	98		10		9		-15%			12		13		8%		
	C to A	S Norwich	410	412	435	437	6%		6%	452	453	546	551	21%		22%	417	427	426	435	2%	8	2%	502	514	494	507	-2%	-7	-1%
	Junction			891		946		55	6%		999		1113		114	11%		985		1001		16	2%		1130		1230		100	9%
Junction 14 - B1150 Norwich Road / A149 / Norwich Road Signalised Junction	A to D		66		64		-3%			76		77		1%			60		60		0%			65		67		3%		
	A to C		219		213		-3%	-11		268		270		1%	10		223		224		1%			257		317		23%		
	A to B	E Norwich	152	437	150	427	-1%		-2%	182	526	189	536	4%		2%	118	401	117	400	-1%	-1	0%	141	463	147	531	4%	68	15%
	B to D		143		151		5%			153		165		8%			279		279		0%			272		288		6%		
	B to C		160		197		23%	49		168		172		2%	27		233		240		3%			238		241		1%		
	B to A	N A149	121	424	125	473	3%		11%	129	450	140	477	9%		6%	63	575	59	577	-7%	2	0%	60	570	70	599	17%	29	5%
	C to D		50		50		0%			56		108		93%			52		53		3%			60		94		57%		
	C to B		154		181		18%	23		184		170		-8%	73		148		171		15%			204		167		-18%		
	C to A	W Norwich	273	477	269	500	-2%		5%	290	530	325	603	12%		14%	253	453	240	465	-5%	11	2%	288	552	280	541	-3%	-11	-2%
	D to C		29		32		10%			36		51		42%			55		59		6%			65		114		75%		
	D to B		179		181		1%	5		184		207		13%	48		228		231		1%			230		244		6%		
	D to A	S A149	126	335	126	340	0%		1%	125	345	135	393	8%		14%	95	378	94	383	-1%	5	1%	95	390	100	458	5%	68	17%
	Junction			1674		1739		66	4%		1851		2009		158	9%		1808		1825		17	1%		1975		2129		154	8%

Junction 15 - Grammar School Road / King's Arms Street Mini-roundabout	A to B		61		63		5%			64		63		-2%			51		50		-1%			78		87		12%		
	A to C		22		24		8%	5		22		32		45%	9		20		20		0%			20		33		65%		
	A to A	N King's	0	82	0	87	0%		6%	0	86	0	95	0%		10%	0	71	0	70	0%	0	0%	0	98	0	120	0%	22	22%
	B to A		196		193		-1%			203		199		-2%			166		172		3%			183		155		-15%		
	B to C		310		314		1%	0		323		384		19%	55		240		220		-9%			257		293		14%		
	B to B	W Grammar	15	521	14	521	-7%		0%	19	545	17	600	-11%		10%	4	411	1	392	-75%	-18	-4%	5	445	3	451	-40%	6	1%
	C to B		364		352		-3%			445		460		3%			351		351		0%			382		441		15%		
	C to A		127		123		-4%	-17		156		181		16%	40		155		160		3%			181		185		2%		
	C to C	E Grammar	0	492	0	475	0%		-3%	0	601	0	641	0%		7%	0	506	0	511	0%	5	1%	0	563	0	626	0%	63	11%
	Junction			1095		1083		-12	-1%		1232		1336		104	8%		987		973		-14	-1%		1106		1197		91	8%
Junction 22 - B1145 / Laundry Loke Priority Junction	A to B		145		148		2%	1		160		183		14%	34		93		90		-3%			99		106		7%		
	A to C	S B1145	203	348	201	349	-1%		0%	216	376	227	410	5%		9%	306	399	292	383	-4%	-16	-4%	336	435	358	464	7%	29	7%
	B to A		77		77		0%	0		83		89		7%	6		165		166		1%			165		187		13%		
	B to C	W Laundry	0	77	0	77	0%		0%	0	83	0	89	0%		7%	8	173	8	174	-1%	1	1%	8	173	8	195	0%	22	13%
	C to B		12		12		0%	1		12		12		0%	27		6		5		-16%			5		5		0%		
	C to A	N B1145	370	382	371	383	0%		0%	380	392	407	419	7%		7%	378	384	378	383	0%	-1	0%	384	389	400	405	4%	16	4%
	Junction			808		809		2	0%		851		918		67	8%		956		940		-16	-2%		997		1064		67	7%
Junction 23 - B1145 / Lyngate Road / Folgate Road Staggered Crossroads	A to D		17		17		0%			19		18		-5%			4		4		0%			4		4		0%		
	A to C		184		184		0%	0		195		207		6%	14		120		121		0%			124		132		6%		
	A to B	N B1145	49	250	49	250	0%		0%	50	264	53	278	6%		5%	39	164	39	164	0%	0	0%	41	169	40	176	-2%	7	4%
	B to D		52		52		0%			54		53		-2%			15		15		1%			16		16		0%		
	B to C		179		180		0%	0		181		194		7%	10		155		155		0%			158		163		3%		
	B to A	E Lyngate	48	280	48	280	-1%		0%	50	285	48	295	-4%		4%	70	240	70	240	0%	1	0%	73	247	72	251	-1%	4	2%
	C to D		26		26		-1%			27		26		-4%			15		14		-10%			16		18		13%		
	C to B		56		56		0%	-17		59		60		2%	-17		150		146		-3%			163		172		6%		
	C to A	S B1145	120	202	119	201	-1%		-1%	131	217	142	228	8%		5%	148	313	140	299	-6%	-17	-4%	161	340	175	365	9%	-17	7%
	D to C		19		19		0%			19		19		0%			109		107		-2%			110		109		-1%		
	D to B		21		21		1%	0		21		21		0%	0		67		67		0%			68		68		0%		
	D to A	W Folgate	13	53	13	53	-1%		0%	13	53	13	53	0%		0%	21	197	21	195	0%	-2	-1%	21	199	21	198	0%	-1	-1%
	Junction			785		784		-1	0%		819		854		35	4%		913		898		-15	-2%		955		990		35	4%

% Impact Assessment (with Mitigation)																														
			AM Peak Hour														PM Peak Hour													
			2029							2036							2029							2036						
			DM		DS					DM		DS					DM		DS					DM		DS				
			Total Vehicles				% increase			Total Vehicles				% increase			Total Vehicles				% increase			Total Vehicles				% increase		
			Turn	Arm	Turn	Arm	Turn		Arm	Turn	Arm	Turn	Arm	Turn		Arm	Turn	Arm	Turn	Arm	Turn		Arm	Turn	Arm	Turn	Arm	Turn		Arm
Junction 1 - Bradfield Road / Cromer Road Priority Junction / Proposed Road	A to C		0		0		0%			0		13		0%			15		2		-86%			3		21		600%		
	A to B		2		2		3%	0		1		8		700%	53		4		4		-1%			4		16		300%		
	A to D	N Bradfield	0	2	0	2	0%		3%	0	1	33	54	0%		5300%	0	19	0	6	0%	-13	-67%	0	7	32	69	0%	62	886%
	B to A		2		2		-5%			3		19		533%			4		4		0%			5		13		160%		
	B to C		354		354		0%	4		372		293		-21%	63		558		564		1%			571		476		-17%		
	B to D	W Cromer	0	356	4	360	0%		1%	0	375	126	438	0%		17%	0	562	8	576	0%	14	2%	0	576	197	686	0%	110	19%
	C to B		480		478		0%			507		375		-26%			448		428		-5%			475		348		-27%		
	C to A		0		3		0%	8		0		32		0%	1		0		0		0%			0		15		0%		
	C to D	E Cromer	0	480	7	488	0%		2%	0	507	101	508	0%		0%	0	448	27	454	0%	6	1%	0	475	99	462	0%	-13	-3%
	D to A		0		0		0%			0		45		0%			0		0		0%			0		20		0%		
	D to B		0		7		0%	46		0		225		0%	343		0		4		0%			0		185		0%		
	D to C	Link Road	0	0	39	46	0%		-	0	0	73	343	0%		-	0	0	18	22	0%	22	-	0	0	86	291	0%	291	-
	Junction			838		897		59	7%		883		1343		460	52%		1029		1058		29	3%		1058		1508		450	43%
Junction 2 - Cromer Road / Greens Road Priority Junction	A to B		78		69		-12%	43		83		0		-100%	9		93		102		10%			87		0		-100%		
	A to C	W Cromer	277	355	329	398	19%		12%	288	371	380	380	32%		2%	481	574	490	593	2%	19	3%	494	581	580	580	17%	-1	0%
	B to A		132		110		-17%	-14		105		0		-100%	-139		123		84		-32%			90		0		-100%		
	B to C	S Greens	30	161	37	147	27%		-9%	34	139	0	0	-100%		-100%	60	183	66	150	10%	-33	-18%	54	144	0	0	-100%	-144	-100%
	C to B		69		70		1%	34		66		0		-100%	40		81		80		-1%			80		0		-100%		
	C to A	E Cromer	350	419	383	453	10%		8%	402	468	508	508	26%		9%	325	406	378	458	16%	52	13%	380	460	466	466	23%	6	1%
	Junction			935		997		63	7%		978		888		-90	-9%		1163		1200		38	3%		1185		1046		-139	-12%
Junction 3 - B1145 / A149 / A149 Cromer Road / Cromer Road Signalised Junction	A to D		29		29		1%			29		30		3%			54		54		0%			55		53		-4%		
	A to C		250		250		0%	2		263		264		0%	32		298		296		0%			300		324		8%		
	A to B	N B1145	168	447	170	449	1%		0%	171	463	201	495	18%		7%	191	543	193	543	1%	0	0%	194	549	209	586	8%	37	7%
	B to D		55		62		13%			54		53		-2%			137		152		11%			145		143		-1%		
	B to C		174		223		28%	58		176		210		19%	55		263		268		2%			264		276		5%		
	B to A	W Cromer	95	324	97	382	2%		18%	103	333	125	388	21%		17%	141	542	148	568	5%	27	5%	154	563	181	600	18%	37	7%
	C to D		0		0		0%			0		0		0%			23		20		-13%			30		29		-3%		
	C to B		235		265		13%	29		283		285		1%	15		213		264		24%			266		252		-5%		
	C to A	S A149	250	485	249	514	0%		6%	271	554	284	569	5%		3%	258	494	233	517	-9%	24	5%	279	575	283	564	1%	-11	-2%
	D to C		2		2		15%			2		2		0%			9		9		1%			9		9		0%		
	D to B		6		6		0%	0		6		6		0%	0		9		9		2%			9		9		0%		
	D to A	E Cromer	3	11	3	11	2%		3%	3	11	3	11	0%		0%	0	18	0	18	0%	0	1%	0	18	0	18	0%	0	0%
	Junction			1267		1356		89	7%		1361		1463		102	7%		1597		1647		51	3%		1705		1768		63	4%
Junction 4 - Cromer Road / Mundesley Road / Market Street / Aylsham Road Signalised Junction	A to D		140		140		0%			148		148		0%			149		149		0%			148		148		0%		
	A to C		0		0		0%	0		0		0		0%	0		0		0		0%			0		0		0%		
	A to B	N Mundesley	0	140	0	140	0%		0%	0	148	0	148	0%		0%	0	149	0	149	0%	0	0%	0	148	0	148	0%	0	0%
	B to D		31		34		11%			32		32		0%			97		101		4%			98		99		1%		
	B to C		0		0		0%	8		0		0		0%	-3		0		0		0%			0		0		0%		
	B to A	W Cromer	44	74	48	83	11%		11%	43	75	40	72	-7%		-4%	71	168	82	183	16%	15	9%	74	172	73	172	-1%	0	0%
	C to D		126		124		-2%			134		127		-5%			133		123		-7%			138		140		1%		
	C to B		0		0		0%	-1		0		0		0%	19		0		0		0%			0		0		0%		
	C to A	S Aylsham	249	375	250	374	0%		0%	258	392	284	411	10%		5%	265	398	251	374	-5%	-24	-6%	282	420	295	435	5%	15	4%
	D to C		0		0		0%			0		0		0%			0		0		0%			0		0		0%		
	D to B		0		0		0%	0		0		0		0%	0		0		0		0%			0		0		0%		
	D to A	E Market	0	0	0	0	0%		0%	0	0	0	0	0%		0%	0	0	0	0	0%	0	0%	0	0	0	0	0%	0	0%
	Junction			590		596		7	1%		615		631		16	3%		715		705		-9	-1%		740		755		15	2%
Junction 5 - Aylsham Road / Park Lane Priority Junction	A to B		0		0		0%	0		0		0		0%	0		0		0		0%			0		0		0%		
	A to C	E Aylsham	0	0	0	0	0%		0%	0	0	0	0	0%		0%	0	0	0	0	0%	0	0%	0	0	0	0	0%	0	0%
	B to A		141		144		2%	3		146		172		18%	26		115		100		-13%			115		147		28%		
	B to C	W Aylsham	0	141	0	144	0%		2%	0	146	0	172	0%		18%	0	115	0	100	0%	-15	-13%	0	115	0	147	0%	32	28%
	C to B		150		143		-5%	-12		168		208		24%	30		127		146		15%			133		138		4%		
	C to A	S Park	235	385	230	373	-2%		-3%	247	415	237	445	-4%		7%	284	411	275	422	-3%	10	3%	306	439	288	426	-6%	-13	-3%
	Junction			526		517		-9	-2%		561		617		56	10%		526		522		-4	-1%		554		573		19	3%
Junction 6 - Aylsham Road / Skeyton New Road Priority Junction	A to B		110		104		-6%	-8		123		160		30%	40		93		107		15%			98		105		7%		
	A to C	E Aylsham	39	149	38	142	-3%		-5%	44	167	47	207	7%		24%	34	127	39	146	14%	19	15%	37	135	33	138	-11%	3	2%
	B to A		132		136		3%	4		137		162		18%	26		99		84		-15%			97		130		34%		
	B to C	W Aylsham	2	135	2	138	-2%		3%	2	139	3	165	50%		19%	11	110	7	91	-39%	-19	-17%	10	107	13	143	30%	36	34%
	C to B		3		3		2%	0		3		3		0%	0		5		5		-1%			5		5		0%		
	C to A	S Skeyton	10	13	10	13	-1%		-1%	10	13	10	13	0%		0%	16	21	16	21	0%	0	0%	17	22	17	22	0%	0	0%
	Junction			297		293		-4	-1%		319		385		66	21%		258		258		0	0%		264		303		39	15%
Junction 7 - B1145 Aylsham Road / Aylsham Road / Greens Road / Tungate Road Crossroads Junction	A to D		73		52		-28%			77		0		-100%			86		82		-5%			82		0		-100%		
	A to C		25		32		26%	-9		24		0		-100%	-150		23		32		38%			20		0		-100%		
	A to B	N Greens	50	148	55	139	10%		-6%	49	150	0	0	-100%		-100%	65	174	69	183	6%	8	5%	65	167	0	0	-100%	-167	-100%
	B to D		131		114		-13%			137		194		42%			103		98		-5%			115		201		75%		
	B to C		0		10		0%	0		0		0		0%	23		5		5		3%			6		6		0%		
	B to A	W Aylsham	31	162	37	161	22%		0%	34	171	0	194	-100%		13%	46	154	59	161	26%	7	5%	41	162	0	207	-100%	45	28%
	C to D		34		29		-14%			34		34		0%			19		14		-27%			21		36		71%		
	C to B		4		4		-1%	0		4		4		0%	-5		4		4		-6%			4		4		0%		
	C to A	S Tungate	5	43	10	43	96%		0%	5	43	0	38	-100%		-12%	23	46	23	41	4%	-5	-10%	22	47	0	40	-100%	-7	-15%

Junction	D to C		13		10		-21%			12		38		217%			13		12		-11%			16		31		94%		
	D to B		126		126		0%	-28		142		230		62%	9		81		78		-4%			81		173		114%		
	D to A	E Aylsham	128	267	103	240	-19%		-10%	105	259	0	268	-100%		3%	115	209	67	157	-41%	-52	-25%	82	179	0	204	-100%	25	14%
	Junction			619		582		-37	-6%		623		500		-123	-20%		583		542		-41	-7%		555		451		-104	-19%
Junction 8 - Aylsham Road / Station Road Priority Junction	A to B		90		84		-7%	-7		98		121		23%	33		66		63		-6%			48		81		69%		
	A to C	E Aylsham	12	102	12	96	-4%		-6%	14	112	24	145	71%		29%	18	85	29	91	56%	7	8%	25	73	20	101	-20%	28	38%
	B to A		81		81		0%	-41		85		107		26%	-24		70		58		-17%			74		83		12%		
	B to C	W Aylsham	156	237	115	196	-26%		-17%	162	247	116	223	-28%		-10%	139	209	135	193	-2%	-15	-7%	146	220	100	183	-32%	-37	-17%
	C to B		177		157		-12%	-17		163		109		-33%	-52		144		95		-34%			130		60		-54%		
	C to A	S Station	39	216	42	199	8%		-8%	41	204	43	152	5%		-25%	70	214	50	145	-29%	-69	-32%	58	188	100	160	72%	-28	-15%
	Junction			555		491		-65	-12%		563		520		-43	-8%		507		429		-78	-15%		481		444		-37	-8%
Junction 9 - Station Road / Skeyton New Road Priority Junction	A to B		3		3		0%	0		3		9		200%	-1		2		2		0%			2		2		0%		
	A to C	E Skeyton	46	49	46	49	0%		0%	48	51	41	50	-15%		-2%	44	46	44	46	0%	0	0%	48	50	49	51	2%	1	2%
	B to A		5		5		2%	-40		5		5		0%	-36		3		6		115%			3		3		0%		
	B to C	N Station	162	167	122	128	-25%		-24%	171	176	135	140	-21%		-20%	154	157	158	164	3%	7	5%	170	173	117	120	-31%	-53	-31%
	C to B		214		197		-8%	-16		202		144		-29%	-60		212		143		-32%			186		160		-14%		
	C to A	S Station	10	224	10	208	3%		-7%	13	215	11	155	-15%		-28%	14	225	11	154	-20%	-71	-32%	18	204	17	177	-6%	-27	-13%
	Junction			440		384		-56	-13%		442		345		-97	-22%		428		364		-64	-15%		427		348		-79	-19%
Junction 10 - Station Road / Oak Road / Skeyton Road Crossroads Junction	A to D		1		1		0%			1		1		0%			0		0		0%			0		0		0%		
	A to C		0		0		0%	0		0		0		0%	0		0		0		0%			0		0		0%		
	A to B	N Oak	2	3	2	3	0%		0%	2	3	2	3	0%		0%	8	8	8	8	0%	0	0%	8	8	8	8	0%	0	0%
	B to D		167		138		-17%			178		163		-8%			152		158		4%			158		149		-6%		
	B to C		42		31		-26%	-40		43		12		-72%	-46		43		41		-5%			57		13		-77%		
	B to A	W Station	0	208	0	169	0%		-19%	0	221	0	175	0%		-21%	3	198	3	202	0%	4	2%	3	218	3	165	0%	-53	-24%
	C to D		28		28		0%			30		22		-27%			20		22		12%			22		33		50%		
	C to B		64		65		1%	1		64		18		-72%	-54		32		33		4%			33		75		127%		
	C to A	S Skeyton	0	92	0	93	0%		1%	0	94	0	40	0%		-57%	0	52	0	56	0%	4	7%	0	55	0	108	0%	53	96%
	D to C		37		36		-3%			43		32		-26%			41		41		0%			38		73		92%		
	D to B		157		140		-11%	-17		151		135		-11%	-28		185		113		-39%			163		95		-42%		
	D to A	E Station	13	207	14	191	11%		-8%	19	213	18	185	-5%		-13%	4	230	4	159	0%	-72	-31%	4	205	4	172	0%	-33	-16%
	Junction			511		455		-56	-11%		531		403		-128	-24%		488		425		-64	-13%		486		453		-33	-7%
Junction 11 - Station Road / Millfield Road / Morris Road Mini-roundabout	A to D		25		20		-17%			25		23		-8%			18		18		-2%			20		20		0%		
	A to C		143		130		-9%	-29		155		146		-6%	-25		132		150		14%			136		137		1%		
	A to B		15		13		-15%			15		15		0%			12		12		-2%			13		20		54%		
	A to A	N Station	12	195	3	166	-76%		-15%	15	210	1	185	-93%		-12%	10	172	1	181	-89%	9	5%	10	179	3	180	-70%	1	1%
	B to D		0		0		0%			0		0		0%			2		2		0%			2		2		0%		
	B to C		21		21		0%	0		23		23		0%	11		2		2		0%			2		2		0%		
	B to A		64		64		0%			65		76		17%			10		10		-1%			10		10		0%		
	B to B	W Morris	0	85	0	85	0%		0%	0	88	0	99	0%		13%	0	14	0	14	0%	0	0%	0	14	0	14	0%	0	0%
	C to D		0		0		0%			0		0		0%			0		0		0%			0		0		0%		
	C to B		9		13		42%	-19		13		12		-8%	-45		4		4		3%			5		5		0%		
	C to A		132		120		-9%			136		102		-25%			168		108		-36%			141		111		-21%		
	C to C	S Millfield	11	152	0	133	-100%		-12%	10	159	0	114	-100%		-28%	3	175	0	112	-100%	-62	-36%	4	150	0	116	-100%	-34	-23%
	D to C		0		0		0%			0		0		0%			0		0		0%			0		0		0%		
	D to B		0		0		0%	4		0		0		0%	12		0		0		0%			0		0		0%		
	D to A		0		4		0%			0		12		0%			43		40		-7%			43		48		12%		
	D to D	E Station	0	0	0	4	0%		0%	0	0	0	12	0%		#DIV/0!	0	43	0	40	0%	-3	-7%	0	43	0	48	0%	5	12%
	Junction			432		388		-44	-10%		457		410		-47	-10%		403		347		-57	-14%		386		358		-28	-7%
Junction 12 - B1150 Norwich Road / Millfield Road Priority Junction	A to B		73		78		7%	28		92		81		-12%	20		56		54		-3%			80		113		41%		
	A to C	N Norwich	311	384	334	412	7%		7%	356	448	387	468	9%		4%	417	472	429	483	3%	11	2%	443	523	516	629	16%	106	20%
	B to A		86		73		-16%	-34		92		119		29%	-25		39		45		15%			55		74		35%		
	B to C	W Millfield	124	210	103	176	-17%		-16%	130	222	78	197	-40%		-11%	71	109	78	123	10%	13	12%	63	118	43	117	-32%	-1	-1%
	C to B		104		78		-25%	13		92		60		-35%	41		141		83		-41%			102		32		-69%		
	C to A	S Norwich	332	436	371	449	12%		3%	356	448	429	489	21%		9%	396	537	395	478	0%	-59	-11%	457	559	431	463	-6%	-96	-17%
	Junction			1029		1037		8	1%		1118		1154		36	3%		1119		1083		-35	-3%		1200		1209		9	1%
Junction 13 - B1150 Norwich Road / Station Road Priority Junction	A to B		25		29		18%	33		25		32		28%	26		42		41		-3%			47		45		-4%		
	A to C	N Norwich	383	408	413	442	8%		8%	447	472	466	498	4%		6%	469	511	481	522	2%	11	2%	516	563	626	671	21%	108	19%
	B to A		71		67		-5%	-4		74		63		-15%	-10		43		41		-5%			49		48		-2%		
	B to C	W Station	0	71	0	67	0%		-5%	0	74	1	64	0%		-14%	4	47	3	44	-11%	-2	-5%	4	53	4	52	0%	-1	-2%
	C to B		2		2		10%	25		1		5		400%	98		10		9		-15%			12		13		8%		
	C to A	S Norwich	410	412	435	437	6%		6%	452	453	546	551	21%		22%	417	427	426	435	2%	8	2%	502	514	494	507	-2%	-7	-1%
	Junction			891		946		55	6%		999		1113		114	11%		985		1001		16	2%		1130		1230		100	9%
Junction 14 - B1150 Norwich Road / A149 / Norwich Road Signalised Junction	A to D		66		64		-3%			76		77		1%			60		60		0%			65		67		3%		
	A to C		219		213		-3%	-11		268		270		1%	10		223		224		1%			257		317		23%		
	A to B	E Norwich	152	437	150	427	-1%		-2%	182	526	189	536	4%		2%	118	401	117	400	-1%	-1	0%	141	463	147	531	4%	68	15%
	B to D		143		151		5%			153		165		8%			279		279		0%			272		288		6%		
	B to C		160		197		23%	49		168		172		2%	27		233		240		3%			238		241		1%		
	B to A	N A149	121	424	125	473	3%		11%	129	450	140	477	9%		6%	63	575	59	577	-7%	2	0%	60	570	70	599	17%	29	5%
	C to D		50		50		0%			56		108		93%			52		53		3%			60		94		57%		
	C to B		154		181		18%	23		184		170		-8%	73		148		171		15%			204		167		-18%		
	C to A	W Norwich	273	477	269	500	-2%		5%	290	530	325	603	12%		14%	253	453	240	465	-5%	11	2%	288	552	280	541	-3%	-11	-2%
	D to C		29		32		10%			36		51		42%			55		59		6%			65		114		75%		
	D to B		179		181		1%	5		184		207		13%	48		228		231		1%			230		244		6%		
	D to A	S A149	126	335	126	340	0%		1%	125	345	135	393	8%		14%	95	378	94	383	-1%	5	1%	95	390	100	458	5%	68	17%
	Junction			1674		1739		66	4%		1851		2009		158	9%		1808		1825		17	1%		1975		2129		154	8%

Junction 15 - Grammar School Road / King's Arms Street Mini-roundabout	A to B		61		63		5%			64		63		-2%			51		50		-1%			78		87		12%		
	A to C		22		24		8%	5		22		32		45%	9		20		20		0%			20		33		65%		
	A to A	N King's	0	82	0	87	0%		6%	0	86	0	95	0%		10%	0	71	0	70	0%	0	0%	0	98	0	120	0%	22	22%
	B to A		196		193		-1%			203		199		-2%			166		172		3%			183		155		-15%		
	B to C		310		314		1%	0		323		384		19%	55		240		220		-9%			257		293		14%		
	B to B	W Grammar	15	521	14	521	-7%		0%	19	545	17	600	-11%		10%	4	411	1	392	-75%	-18	-4%	5	445	3	451	-40%	6	1%
	C to B		364		352		-3%			445		460		3%			351		351		0%			382		441		15%		
	C to A		127		123		-4%	-17		156		181		16%	40		155		160		3%			181		185		2%		
	C to C	E Grammar	0	492	0	475	0%		-3%	0	601	0	641	0%		7%	0	506	0	511	0%	5	1%	0	563	0	626	0%	63	11%
	Junction			1095		1083		-12	-1%		1232		1336		104	8%		987		973		-14	-1%		1106		1197		91	8%
Junction 22 - B1145 / Laundry Loke Priority Junction	A to B		145		148		2%	1		160		183		14%	34		93		90		-3%			99		106		7%		
	A to C	S B1145	203	348	201	349	-1%		0%	216	376	227	410	5%		9%	306	399	292	383	-4%	-16	-4%	336	435	358	464	7%	29	7%
	B to A		77		77		0%	0		83		89		7%	6		165		166		1%			165		187		13%		
	B to C	W Laundry	0	77	0	77	0%		0%	0	83	0	89	0%		7%	8	173	8	174	-1%	1	1%	8	173	8	195	0%	22	13%
	C to B		12		12		0%	1		12		12		0%	27		6		5		-16%			5		5		0%		
	C to A	N B1145	370	382	371	383	0%		0%	380	392	407	419	7%		7%	378	384	378	383	0%	-1	0%	384	389	400	405	4%	16	4%
	Junction			808		809		2	0%		851		918		67	8%		956		940		-16	-2%		997		1064		67	7%
Junction 23 - B1145 / Lyngate Road / Folgate Road Staggered Crossroads	A to D		17		17		0%			19		18		-5%			4		4		0%			4		4		0%		
	A to C		184		184		0%	0		195		207		6%	14		120		121		0%			124		132		6%		
	A to B	N B1145	49	250	49	250	0%		0%	50	264	53	278	6%		5%	39	164	39	164	0%	0	0%	41	169	40	176	-2%	7	4%
	B to D		52		52		0%			54		53		-2%			15		15		1%			16		16		0%		
	B to C		179		180		0%	0		181		194		7%	10		155		155		0%			158		163		3%		
	B to A	E Lyngate	48	280	48	280	-1%		0%	50	285	48	295	-4%		4%	70	240	70	240	0%	1	0%	73	247	72	251	-1%	4	2%
	C to D		26		26		-1%			27		26		-4%			15		14		-10%			16		18		13%		
	C to B		56		56		0%	-17		59		60		2%	-17		150		146		-3%			163		172		6%		
	C to A	S B1145	120	202	119	201	-1%		-1%	131	217	142	228	8%		5%	148	313	140	299	-6%	-17	-4%	161	340	175	365	9%	-17	7%
	D to C		19		19		0%			19		19		0%			109		107		-2%			110		109		-1%		
	D to B		21		21		1%	0		21		21		0%	0		67		67		0%			68		68		0%		
	D to A	W Folgate	13	53	13	53	-1%		0%	13	53	13	53	0%		0%	21	197	21	195	0%	-2	-1%	21	199	21	198	0%	-1	-1%
	Junction			785		784		-1	0%		819		854		35	4%		913		898		-15	-2%		955		990		35	4%

% Impact Assessment																														
			AM Peak Hour														PM Peak Hour													
			2029							2036							2029							2036						
			DM		DS					DM		DS					DM		DS					DM		DS				
			Total Vehicles				% increase			Total Vehicles				% increase			Total Vehicles				% increase			Total Vehicles				% increase		
			Turn	Arm	Turn	Arm	Turn		Arm	Turn	Arm	Turn	Arm	Turn		Arm	Turn	Arm	Turn	Arm	Turn		Arm	Turn	Arm	Turn	Arm	Turn		Arm
Junction 1 - Rectory Road / B1150 Norwich Road / Mill Road Mini-Roundabout	A to D		105		105		0%			107		111		4%			146		146		0%			153		158		3%		
	A to C		639		670		5%			660		839		27%			548		553		1%			564		630		12%		
	A to B	E Norwich	7		7		0%			7		8		14%			10		10		-4%			9		9		0%		
	A to A		0	751	0	783	0%	32	4%	4	778	0	958	-100%	180	23%	0	704	0	708	0%	4	1%	4	730	0	797	-100%	67	9%
	B to D		0		0		0%			0		0		0%			3		3		-2%			2		3		50%		
	B to C		10		11		1%			12		12		0%			11		10		-2%			12		11		-8%		
	B to A	S Millfield	10		10		-1%			9		10		11%			7		7		3%			8		8		0%		
	B to B		0	21	0	21	0%	0	0%	0	21	0	22	0%	1	5%	0	20	0	20	0%	0	0%	0	22	0	22	0%	0	0%
	C to D		86		85		-1%			84		87		4%			99		100		1%			100		103		3%		
	C to B		7		8		6%			7		7		0%			2		2		-2%			2		2		0%		
	C to A	W Norwich	571		578		1%			602		659		9%			639		670		5%			672		802		19%		
	C to C		0	664	0	670	0%	6	1%	0	693	0	753	0%	60	9%	0	740	0	771	0%	31	4%	0	774	0	907	0%	133	17%
	D to C		108		108		0%			108		109		1%			80		80		0%			84		82		-2%		
	D to B		3		3		5%			4		4		0%			1		1		15%			0		0		0%		
	D to A	N Rectory	150		151		1%			154		152		-1%			127		126		0%			129		131		2%		
	D to D		0	261	0	263	0%	2	1%	0	266	0	265	0%	-1	0%	0	208	0	208	0%	0	0%	0	213	0	213	0%	0	0%
	Junction			1696		1736		40	2%		1758		1998		240	14%		1673		1708		35	2%		1739		1939		200	12%
Junction 2 - B1150 Norwich Road / B1354 Church Street / High Street / Petrol Station Gyratory	A to D		511		543		6%			524		714		36%			422		426		1%			449		512		14%		
	A to C		0		0		0%			0		0		0%			0		0		0%			0		0		0%		
	A to B	N High	54		54		0%			57		62		9%			42		40		-4%			37		43		16%		
	A to A		0	565	0	597	0%	33	6%	0	581	0	776	0%	195	34%	0	463	0	466	0%	3	1%	0	486	0	555	0%	69	14%
	B to D		234		234		0%			237		233		-2%			273		273		0%			273		275		1%		
	B to C		0		0		0%			0		0		0%			0		0		0%			0		0		0%		
	B to A	E B1354	37		37		1%			35		37		6%			43		44		1%			46		45		-2%		
	B to B		0	271	0	271	0%	0	0%	0	272	0	270	0%	-2	-1%	0	316	0	317	0%	1	0%	0	319	0	320	0%	1	0%
	C to D		0		0		0%			0		0		0%			0		0		0%			0		0		0%		
	C to B		0		0		0%			0		0		0%			0		0		0%			0		0		0%		
	C to A	S Petrol	0		0		0%			0		0		0%			0		0		0%			0		0		0%		
	C to C		0	0	0	0	0%	0	0%	0	0	0	0	0%	0	0%	0	0	0	0	0%	0	0%	0	0	0	0	0%	0	0%
	D to C		0		0		0%			0		0		0%			0		0		0%			0		0		0%		
	D to B		349		350		0%			368		360		-2%			264		262		-1%			271		274		1%		
	D to A	W Norwich	401		407		2%			407		470		15%			498		527		6%			519		675		30%		
	D to D		0	750	0	758	0%	8	1%	0	775	0	830	0%	55	7%	0	762	0	789	0%	27	4%	0	790	0	949	0%	159	20%
	Junction			1586		1626		41	3%		1628		1876		248	15%		1541		1572		31	2%		1595		1824		229	14%
Junction 3 - High Street / Station Road Priority Junction	A to B		553		587		6%			574		764		33%			437		441		1%			456		527		16%		
	A to C	E Station	1	554	1	588	-4%	34	6%	2	576	2	766	0%	190	33%	1	438	1	442	0%	4	1%	0	456	0	527	0%	71	16%
	B to A		422		428		1%			421		487		16%			522		552		6%			544		704		29%		
	B to C	S High	15	437	16	444	2%	6	1%	15	436	16	503	7%	67	15%	18	540	18	570	-3%	30	6%	17	561	16	720	-6%	159	28%
	C to B		9		8		-1%			9		9		0%			27		27		0%			27		27		0%		
	C to A	N High	2	11	2	10	-3%	0	-1%	1	10	1	10	0%	0	0%	8	36	9	36	1%	0	0%	10	37	10	37	0%	0	0%
	Junction			1002		1043		40	4%		1022		1279		257	25%		1014		1048		34	3%		1054		1284		230	22%
Junction 4 - Church Loke / B1354 / Rectory Road Crossroads Junction	A to D		34		34		0%			30		32		7%			28		28		-1%			25		25		0%		
	A to C		0		0		0%			0		0		0%			0		0		0%			0		0		0%		
	A to B	N Rectory	24	57	24	57	0%	0	0%	25	55	25	57	0%	2	4%	17	45	18	45	1%	0	0%	20	45	18	43	-10%	-2	-4%
	B to D		236		235		0%			241		238		-1%			289		288		0%			289		304		5%		
	B to C		2		2		0%			4		4		0%			0		0		0%			0		0		0%		
	B to A	E B1354	50	288	51	288	1%	0	0%	49	294	50	292	2%	-2	-1%	26	314	26	314	1%	0	0%	23	312	25	329	9%	17	5%
	C to D		4		4		1%			2		3		50%			2		2		0%			2		3		50%		
	C to B		4		4		0%			4		4		0%			2		2		3%			4		4		0%		
	C to A	S Church	0	8	0	8	0%	0	1%	0	6	0	7	0%	1	17%	0	4	0	4	0%	0	1%	0	6	0	7	0%	1	17%
	D to C		10		10		3%			13		13		0%			1		1		-17%			1		1		0%		
	D to B		333		332		0%			343		340		-1%			267		264		-1%			268		282		5%		
	D to A	W B1354	62	404	61	404	-1%	-1	0%	64	420	63	416	-2%	-4	-1%	36	304	36	302	0%	-3	-1%	36	305	37	320	3%	15	5%
	Junction			758		758		-1	0%		775		772		-3	0%		668		665		-3	0%		668		699		31	5%
Link 5 - B1150 Norwich Road, at bridge	A to B	A - to West	743		778		5%			759		948		25%			695		699		1%			720		785		9%		
	B to A	B - to East	751	1494	756	1533	1%	39	3%	784	1543	837	1785	7%	242	16%	762	1457	790	1489	4%	32	2%	800	1520	947	1732	18%	212	14%
	Junction			1494		1533		39	3%		1543		1785		242	16%		1457		1489		32	2%		1520		1732		212	14%
Link 6 - High Street	A to B	A - to North	438		444		1%			438		504		15%			540		569		5%			564		720		28%		
	B to A	B - to South	563	1001	597	1041	6%	40	4%	579	1017	775	1279	34%	262	26%	463	1003	467	1037	1%	33	3%	487	1051	558	1278	15%	227	22%
	Junction			1001		1041		40	4%		1017		1279		262	26%		1003		1037		33	3%		1051		1278		227	22%

% Impact Assessment (with Mitigation)																														
			AM Peak Hour														PM Peak Hour													
			2029							2036							2029							2036						
			DM		DS					DM		DS					DM		DS					DM		DS				
			Total Vehicles				% increase			Total Vehicles				% increase			Total Vehicles				% increase			Total Vehicles				% increase		
			Turn	Arm	Turn	Arm	Turn		Arm	Turn	Arm	Turn	Arm	Turn		Arm	Turn	Arm	Turn	Arm	Turn		Arm	Turn	Arm	Turn	Arm	Turn		Arm
Junction 1 - Rectory Road / B1150 Norwich Road / Mill Road Mini-Roundabout	A to D		105		105		0%			107		111		4%			146		146		0%			153		158		3%		
	A to C		639		670		5%			660		839		27%			548		553		1%			564		630		12%		
	A to B	E Norwich	7		7		0%			7		8		14%			10		10		-4%			9		9		0%		
	A to A		0	751	0	783	0%	32	4%	4	778	0	958	-100%	180	23%	0	704	0	708	0%	4	1%	4	730	0	797	-100%	67	9%
	B to D		0		0		0%			0		0		0%			3		3		-2%			2		3		50%		
	B to C		10		11		1%			12		12		0%			11		10		-2%			12		11		-8%		
	B to A	S Millfield	10		10		-1%			9		10		11%			7		7		3%			8		8		0%		
	B to B		0	21	0	21	0%	0	0%	0	21	0	22	0%	1	5%	0	20	0	20	0%	0	0%	0	22	0	22	0%	0	0%
	C to D		86		85		-1%			84		87		4%			99		100		1%			100		103		3%		
	C to B		7		8		6%			7		7		0%			2		2		-2%			2		2		0%		
	C to A	W Norwich	571		578		1%			602		659		9%			639		670		5%			672		800		19%		
	C to C		0	664	0	670	0%	6	1%	0	693	0	753	0%	60	9%	0	740	0	771	0%	31	4%	0	774	0	905	0%	131	17%
	D to C		108		108		0%			108		109		1%			80		80		0%			84		82		-2%		
	D to B		3		3		5%			4		4		0%			1		1		15%			0		0		0%		
	D to A	N Rectory	150		151		1%			154		152		-1%			127		126		0%			129		131		2%		
	D to D		0	261	0	263	0%	2	1%	0	266	0	265	0%	-1	0%	0	208	0	208	0%	0	0%	0	213	0	213	0%	0	0%
	Junction			1696		1736		40	2%		1758		1998		240	14%		1673		1708		35	2%		1739		1937		198	11%
Junction 2 - B1150 Norwich Road / B1354 Church Street / High Street / Petrol Station Gyratory	A to D		511		543		6%			524		716		37%			422		426		1%			449		510		14%		
	A to C		0		0		0%			0		0		0%			0		0		0%			0		0		0%		
	A to B	N High	54		54		0%			57		62		9%			42		40		-4%			37		43		16%		
	A to A		0	565	0	597	0%	33	6%	0	581	0	778	0%	197	34%	0	463	0	466	0%	3	1%	0	486	0	553	0%	67	14%
	B to D		234		234		0%			237		233		-2%			273		273		0%			273		275		1%		
	B to C		0		0		0%			0		0		0%			0		0		0%			0		0		0%		
	B to A	E B1354	37		37		1%			35		37		6%			43		44		1%			46		45		-2%		
	B to B		0	271	0	271	0%	0	0%	0	272	0	270	0%	-2	-1%	0	316	0	317	0%	1	0%	0	319	0	320	0%	1	0%
	C to D		0		0		0%			0		0		0%			0		0		0%			0		0		0%		
	C to B		0		0		0%			0		0		0%			0		0		0%			0		0		0%		
	C to A	S Petrol	0		0		0%			0		0		0%			0		0		0%			0		0		0%		
	C to C		0	0	0	0	0%	0	0%	0	0	0	0	0%	0	0%	0	0	0	0	0%	0	0%	0	0	0	0	0%	0	0%
	D to C		0		0		0%			0		0		0%			0		0		0%			0		0		0%		
	D to B		349		350		0%			368		360		-2%			264		262		-1%			271		274		1%		
	D to A	W Norwich	401		407		2%			407		472		16%			498		527		6%			519		674		30%		
	D to D		0	750	0	758	0%	8	1%	0	775	0	832	0%	57	7%	0	762	0	789	0%	27	4%	0	790	0	948	0%	158	20%
	Junction			1586		1626		41	3%		1628		1880		252	15%		1541		1572		31	2%		1595		1821		226	14%
Junction 3 - High Street / Station Road Priority Junction	A to B		553		587		6%			574		764		33%			437		441		1%			456		527		16%		
	A to C	E Station	1	554	1	588	-4%	34	6%	2	576	2	766	0%	190	33%	1	438	1	442	0%	4	1%	0	456	0	527	0%	71	16%
	B to A		422		428		1%			421		488		16%			522		552		6%			544		704		29%		
	B to C	S High	15	437	16	444	2%	6	1%	15	436	16	504	7%	68	16%	18	540	18	570	-3%	30	6%	17	561	16	720	-6%	159	28%
	C to B		9		8		-1%			9		9		0%			27		27		0%			27		27		0%		
	C to A	N High	2	11	2	10	-3%	0	-1%	1	10	1	10	0%	0	0%	8	36	9	36	1%	0	0%	10	37	10	37	0%	0	0%
	Junction			1002		1043		40	4%		1022		1280		258	25%		1014		1048		34	3%		1054		1284		230	22%
Junction 4 - Church Loke / B1354 / Rectory Road Crossroads Junction	A to D		34		34		0%			30		32		7%			28		28		-1%			25		25		0%		
	A to C		0		0		0%			0		0		0%			0		0		0%			0		0		0%		
	A to B	N Rectory	24	57	24	57	0%	0	0%	25	55	25	57	0%	2	4%	17	45	18	45	1%	0	0%	20	45	18	43	-10%	-2	-4%
	B to D		236		235		0%			241		238		-1%			289		288		0%			289		304		5%		
	B to C		2		2		0%			4		4		0%			0		0		0%			0		0		0%		
	B to A	E B1354	50	288	51	288	1%	0	0%	49	294	50	292	2%	-2	-1%	26	314	26	314	1%	0	0%	23	312	25	329	9%	17	5%
	C to D		4		4		1%			2		3		50%			2		2		0%			2		3		50%		
	C to B		4		4		0%			4		4		0%			2		2		3%			4		4		0%		
	C to A	S Church	0	8	0	8	0%	0	1%	0	6	0	7	0%	1	17%	0	4	0	4	0%	0	1%	0	6	0	7	0%	1	17%
	D to C		10		10		3%			13		13		0%			1		1		-17%			1		1		0%		
	D to B		333		332		0%			343		342		0%			267		264		-1%			268		282		5%		
	D to A	W B1354	62	404	61	404	-1%	-1	0%	64	420	63	418	-2%	-2	0%	36	304	36	302	0%	-3	-1%	36	305	37	320	3%	15	5%
	Junction			758		758		-1	0%		775		774		-1	0%		668		665		-3	0%		668		699		31	5%
Link 5 - B1150 Norwich Road, at bridge	A to B	A - to West	743		778		5%			759		949		25%			695		699		1%			720		785		9%		
	B to A	B - to East	751	1494	756	1533	1%	39	3%	784	1543	841	1790	7%	247	16%	762	1457	790	1489	4%	32	2%	800	1520	948	1733	19%	213	14%
	Junction			1494		1533		39	3%		1543		1790		247	16%		1457		1489		32	2%		1520		1733		213	14%
Link 6 - High Street	A to B	A - to North	438		444		1%			438		505		15%			540		569		5%			564		721		28%		
	B to A	B - to South	563	1001	597	1041	6%	40	4%	579	1017	775	1280	34%	263	26%	463	1003	467	1037	1%	33	3%	487	1051	558	1279	15%	228	22%
	Junction			1001		1041		40	4%		1017		1280		263	26%		1003		1037		33	3%		1051		1279		228	22%

Appendix F – Forecast Reports

North Walsham Modelling

Forecast Report

ESCO Developments, Flagship Housing Group and Lovell Partnerships

21 February 2023

Delivering a better world

Quality information

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Revision History

Revision	Revision date	Details	Authorized	Name	Position

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Table Of Contents

1. Introduction

Base VISSIM Model

1.1 The 2022 VISSIM Base model for North Walsham has been used as a starting point to develop the forecast scenarios. AECOM developed and validated the Vissim Base model at the end of 2022.

1.2 The 2022 Base model was successfully calibrated and validated to replicate the existing operation during the traffic surveys for the North Walsham Model area, shown in Figure 1-1. Further details regarding the Base model operation and the calibration and validation results can be found in the VISSIM Local Model Validation Report for North Walsham: “North Walsham - Local Model Validation Report.”

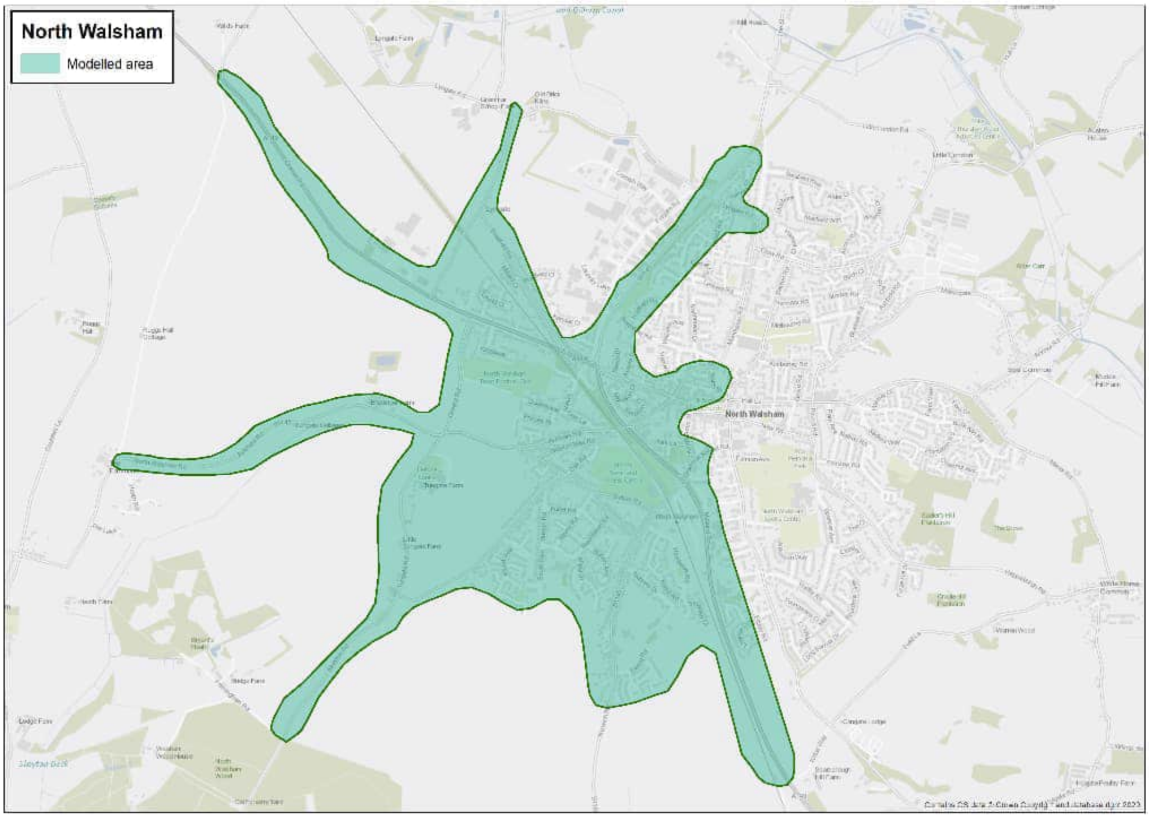


Figure 1-1 – North Walsham Modelled Area

1.3 The forecast year models have been developed for the 2036 forecast year. The models were developed for the Weekday AM and PM peak hours defined as 07:45 – 08:45 in AM and 16:30 – 17:30 in PM. Thirty-minute warm-up and fifteen-minute cool-down periods have also been modelled to saturate the network with traffic and allow journeys to be completed after the peak hour.

Model Purpose

1.4 The forecast models have been used to assess the operation of the network in 2036 in line with the forecast assumptions contained in the Transport Assessment (TA) for North Walsham Western Urban Extension (NWWUE). Three different scenarios: ‘Do Minimum’, ‘Do Something’, and ‘Do Something with Mitigation’ have been developed for the 2036 forecast year.

1.5 The Do Minimum scenario includes the estimated traffic growth in the area for the forecast year and proposed infrastructure changes at the Norwich Road/A149/Grammar School Road junction. The infrastructure changes are discussed in the Network Coding section.

1.6 The Do Something scenario has been developed using the Do Minimum scenario as a starting point. In addition to the same demand and network changes included in the Do Minimum scenario, the Do Something scenarios include the additional trips generated by the NWWUE which were added on top of the Do Minimum demand and the proposed Link Road through the NWWUE development.

1.7 The Do Something with Mitigation scenario is the Do Something scenario with a proposed mitigation on Aylsham Road. Further detail on the differences between scenarios can be found in Table 2-1.

1.8 The operation of the Do Minimum model has been used as a benchmark to assess the impact of the trip generation and infrastructure changes linked to the NWWUE included in the Do Something scenarios.

Report Structure

1.9 The remainder of the report is structured as follows:

- Section 2 provides an overview of the forecast scenarios and outlines the development of the forecast model networks;
- Section 3 describes the demand development methodology for future scenarios;
- Section 4 describes the assignment methodology;
- Section 5 presents and analyses the forecast modelling results;
- Section 6 provides an analysis of key areas/ locations in the models; and
- Section 7 provides a summary and conclusions.

2. Forecast Model Development

Overview

2.1 The North Walsham forecast models were coded using the same software version (Vissim 21.00-12) as used to develop the 2022 Base models. This section outlines the changes made to the Base models to build the forecast models.

2.2 Three forecast model scenarios were developed:

- 2036 'Do Minimum' model for AM and PM peak periods;
- 2036 ‘Do Something’ model for AM and PM peak periods; and
- 2036 ‘Do Something + Mitigation’ model for AM and PM peak periods.

2.3 The demand and network assumptions included in each scenario have been summarised in Table 2-1.

Table 2-1 – Forecast Scenarios

Scenario	Network	Demand
Do Minimum	Base Model network + B1150/A149 Improvement	2022 Base * 2022-2036 Growth Factor
Do Something	Do Minimum network + Link Road	Do Minimum + WUE 2036 Demand
Do Something + Mitigation	Do Something network + Aylsham Road Improvement	Do Minimum + WUE 2036 Demand

Network Coding

2.4 This section discusses the committed schemes and development sites coded in the forecast scenarios. Unless otherwise stated, all the modelling elements not affected by the proposed schemes – such as the desired speed decisions, reduced speed areas, public transport, and priority rules – have been coded consistently with the 2022 Base model.

Network Coding – Do Minimum

2.5 The Do Minimum network has been updated to include the proposed new layout for the B1150 / A149 / Grammar School Road junction. The layout for this junction is shown below in Figure 2-1.

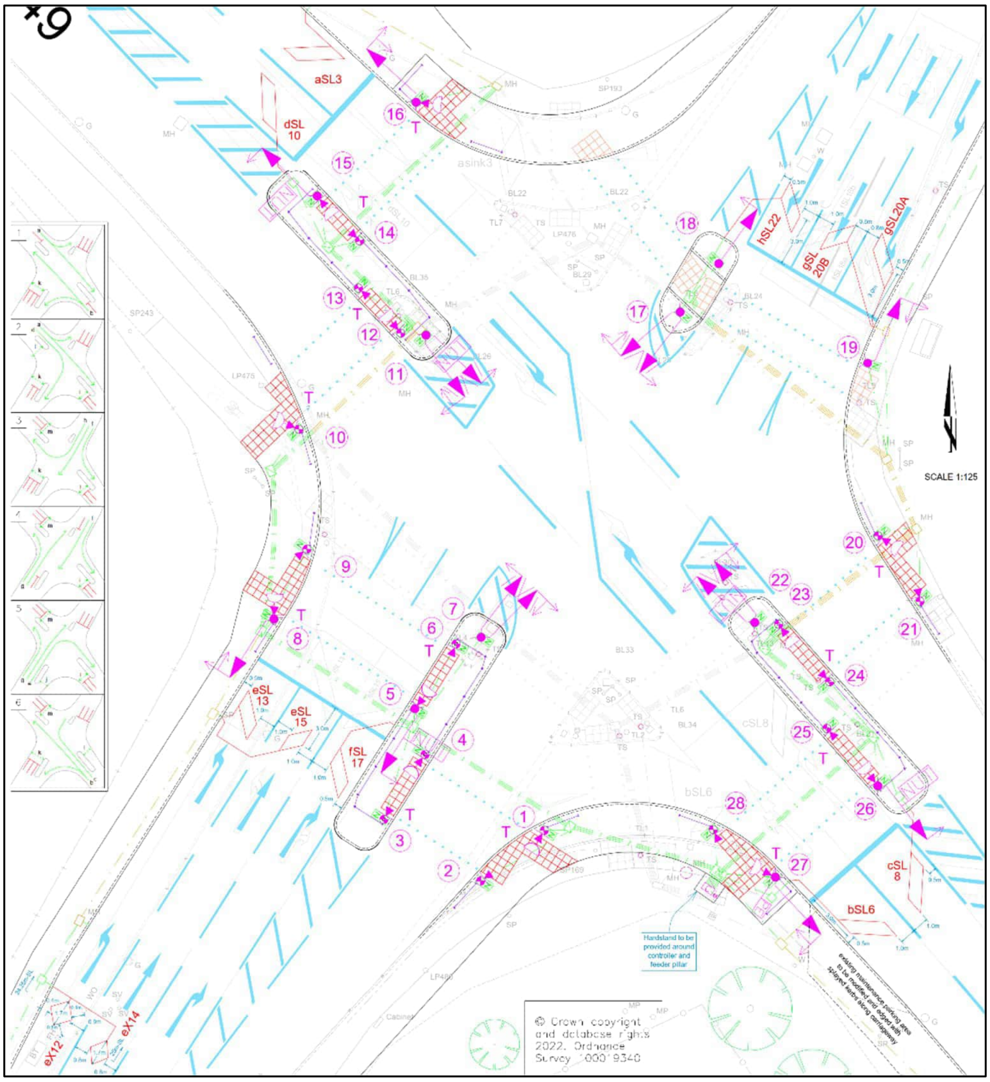


Figure 2-1 – B1150 / A149 / Grammar School Road Traffic Signal Layout

2.6 The timings at the signalised junctions have been optimised to reflect the predicted growth in traffic flows. The proposed signal optimisation has been consistently applied in all the forecast scenarios and assumes that the existing signal controllers will be appropriately maintained and updated in the future.

2.7 Furthermore, some additional priority rules have been added to the models to accurately represent the expected cooperative/ keep clear driving behaviours at locations which become more congested in the future year models, due to higher traffic flows. These rules would have no impact in the base year as this congestion is not present.

Network Coding – Do Something

2.8 The Do Something scenarios have been developed using the Do Minimum as a starting point, including the B1150 / A149 / Grammar School Road junction improvement shown in Table 2-1. In addition to the changes and optimisation included in the Do Minimum scenarios, the Do Something scenarios also include the new link road through the NWWUE development and the roundabout junctions at either end to connect to the existing network.

2.9 The 2036 scenarios include the full extent of the proposed link road within the existing road network. Figure 2-2 shows the alignment of the NWWUE link road, highlighting the key junctions and signalised crossings included in the model, which include the access junctions with the B1150 and A149, the junctions with Aylsham Road and Skeyton Road and the crossing of Weavers Way.

Figure 2-2 – Do Something Network

Network Coding – Do Something with Mitigation

2.10 The Do Something with Mitigation scenarios have been developed using the Do Something as a starting point. In addition to the changes included in the Do Something scenarios, the Do Something with Mitigation scenarios also include the proposed one-way signalised layout on Aylsham Road under the bridge. The proposed layout is shown below in Figure 2-3.

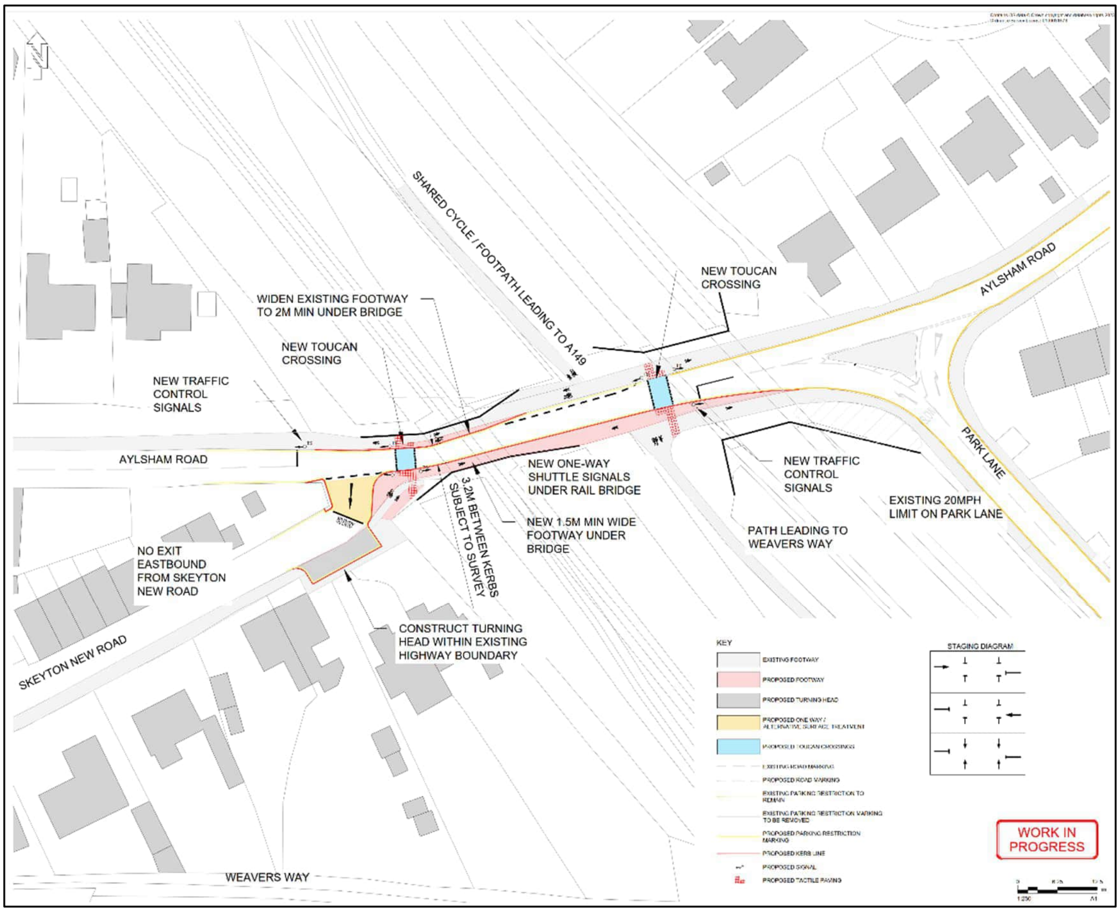


Figure 2-3 – Aylsham Road One-way Signalised Layout

2.11 The signals at the proposed one-way signalised junction have been optimised, with signal timings adapting to arrival patterns, allowing the model to provide a more realistic representation of the proposed signal operation, minimising delay.

3. Future Year Demand

Zoning

3.1 The zoning system developed for the Vissim Base model has also been used for the Do Minimum models.

3.2 The zoning system included in the Do Something scenarios has been updated to include the additional loading points for the NWWUE demand. In the Do Something scenario, seven additional zones have been added to represent access points to the development.

3.3 Table 3-1 shows the correspondence between the zone numbers and the development sites.

Table 3-1 – Development Zones

Development Site	Zone
Residential Zone South	25
Residential Zone Central	26
Residential Zone North Central	27
Residential Zone North	28
Local Centre / School	29
Employment North Central	30
Employment North	31

3.4 Figure 3-1 and Figure 3-2 show the locations of the VISSIM zones in the Do Something networks.

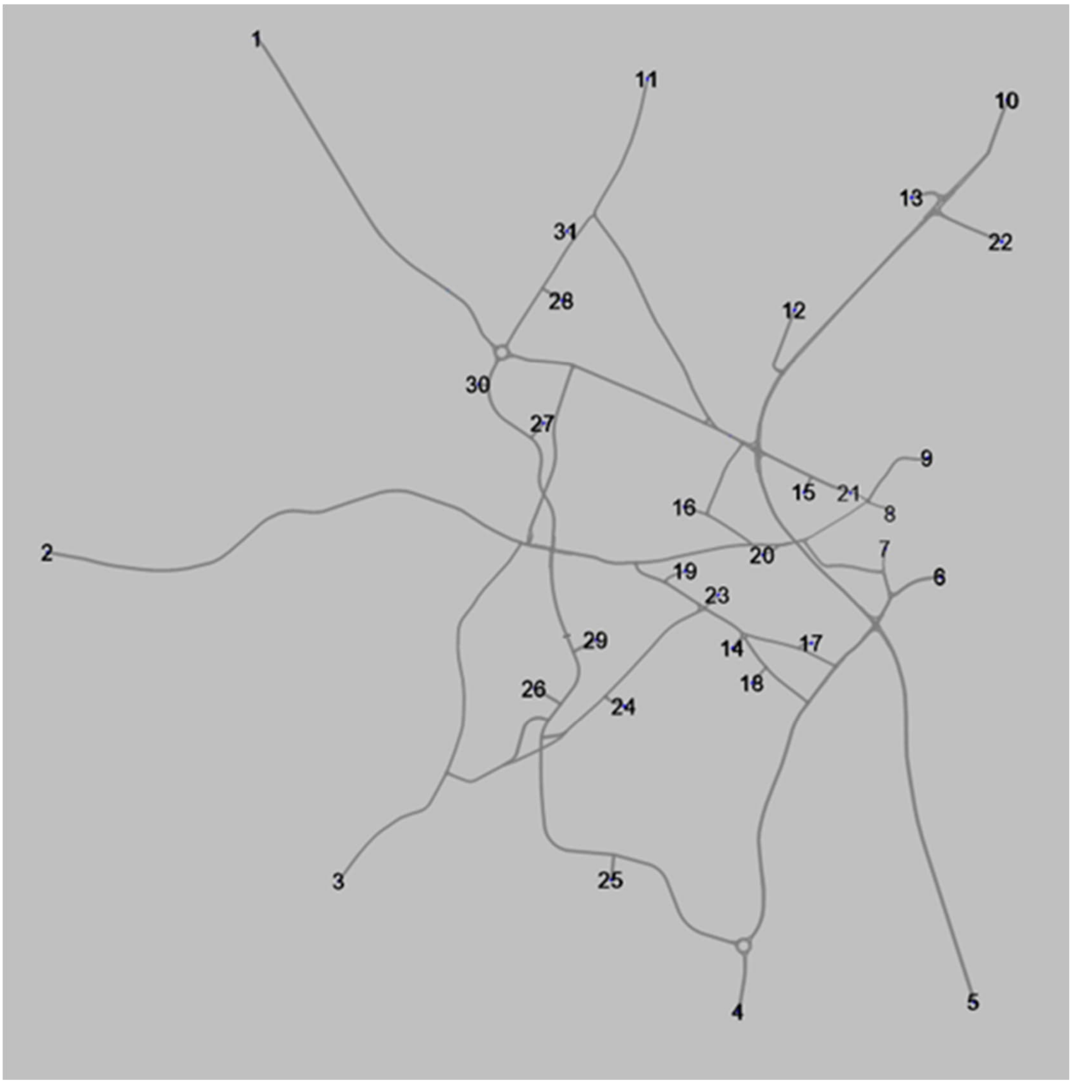


Figure 3-1 – Do Something Scenario Zones

Demand Methodology

3.5 The forecast Vissim demand matrices were derived using the growth factors and the trip distribution from the Transport Assessment (TA) developed by AECOM.

3.6 Table 3-2 shows the growth factors derived for each forecast year based on TEMPRO, as set out in the TA. These growth factors were applied to the Base model demand matrices to uplift traffic volumes for the 2036 Do Minimum scenarios.

Table 3-2 – Growth Factors

Vehicle	2036 AM	2036 PM
Car/LGV	1.084	1.080
HGV	1.039	1.039

3.7 The NWWUE trip generation and trip distribution assumptions included in the TA have been used to derive the number of additional trips associated with the NWWUE and the distribution in North Walsham. These trips have been added to the Do Minimum scenarios to develop the Do Something forecast demand matrix forecasts.

3.8 Table 3-3 details the additional trips included in the Do Something models for each forecast year.

Table 3-3 – Do Something Development Demand

Development Demand	2036 AM	2036 PM
Car/LGV	1,261	1,013
HGV	12	7

3.9 It should be noted that the development trip totals were provided in two vehicle types: Cars/Light Goods Vehicles (LGVs) and Heavy Goods Vehicles (HGVs). However, since the Vissim models categorise Cars and LGVs as separate vehicle types, Car and LGV proportions were calculated from the base matrix and used to split the development demand.

3.10 The absolute demand changes for each Origin-Destination (O-D) pair were applied by vehicle class (Cars, LGVs and HGVs) to the base peak hour matrices from the Vissim base model to develop the Forecast demand matrices.

3.11 The forecast peak hour matrices were profiled into 15-minute periods using the same profiles used in the Vissim base model matrices to develop each 15-minute matrix, creating six matrices for each vehicle type.

Routing Assumptions

3.12 There are multiple routes available between the development zones and the eastern side of the town centre. For a few O-D pairs, the assignment of trips within the model area was not considered realistic, due to some town-centre networks not being included in the model area, such as King's Arms Street or Yarmouth Road (due to lack of survey data). In these cases, the model was unable to dynamically adjust routeing to respond to delay increases, as the destinations were fixed.

3.13 The O-D patterns were therefore adjusted in a few cases. Google Maps was used to indicate which routes would be attractive, as shown in Figure 3-2, to define adjustments to the preferred town centre destination zones for each of the development zones. These routing assumptions have been developed consistently with the TA to provide a realistic representation of the trip distribution expected in the area.

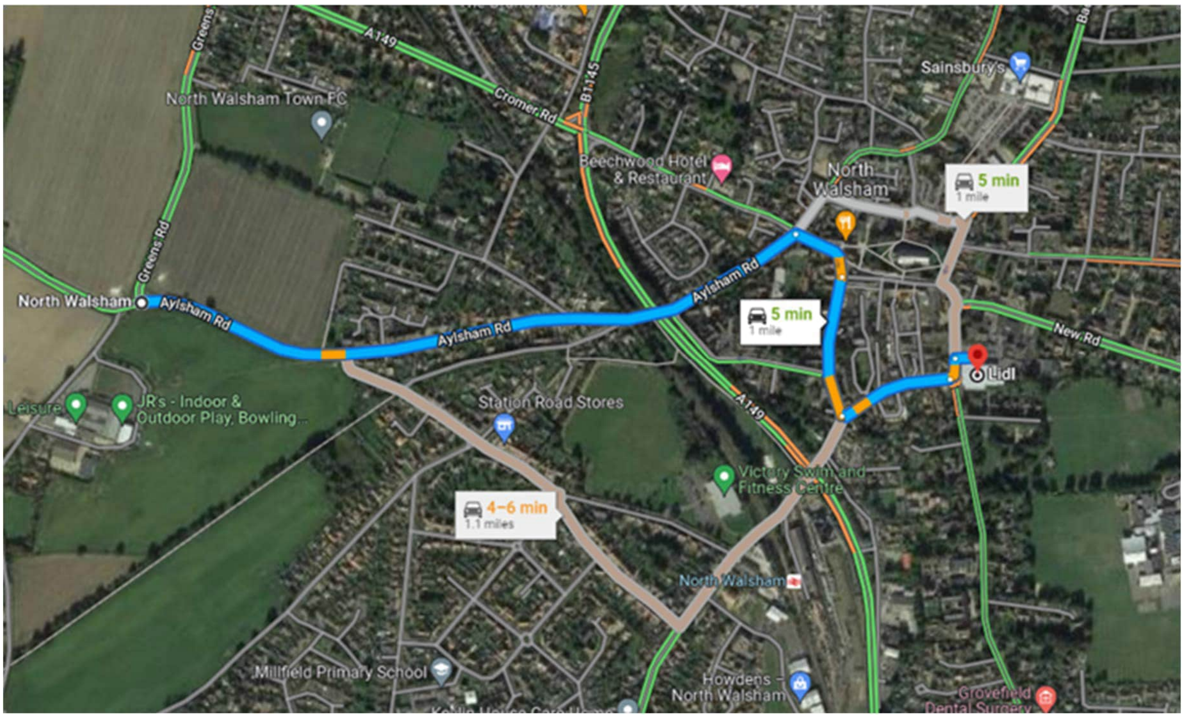


Figure 3-2 – Route Comparison from Development Location to Zone 6

4. Model Assignment

Convergence

4.1 The model assignment and convergence parameters for the 2036 models used the same settings as the base year models with a minor change in the Kirchhoff parameter (it was changed from 10 to 3.5), as it was not possible to converge the 2036 Do Something PM model using the same parameters defined in the Base model, as there are significant changes in future congestion patterns. The Kirchhoff parameter is consistent in all the 2036 scenarios to allow reliable comparison of Do Minimum and Do Something scenarios. Further details of the convergence process followed can be found in the North Walsham Vissim Local Model Validation Report (LMVR).

4.2 Fixed signal timings, based on average green times, were used during forecast model convergence, allowing the model to reach a stable convergence.

4.3 The Kirchoff parameter affects the flow balance between the lowest cost route for each O-D pair and the alternative routes. Analysis was undertaken of the 2036 AM model assignments, which converged using both settings, which showed that the routing changes caused by the different Kirchhoff values had a negligible effect on the model operation.

5. Model Evaluation

Introduction

5.1 This section presents the analysis of results for the Do Minimum, Do Something and Do Something with Mitigation forecast scenarios. The results were extracted for the following models and analysed:

- Base (2022) – AM and PM peak hours;
- Do Minimum (2036) – AM and PM peak hours;
- Do Something (2036) – AM and PM peak hours; and
- Do Something with Mitigation (2036) – AM and PM peak hours.

5.2 The analysis in the following section has been divided into the peak hours for each scenario, as each has unique characteristics.

5.3 The results were extracted from the models and averaged for 20 simulation runs with different random seeds. Different seeds randomise the release of vehicles into the network, resulting in a different chain of events, replicating daily variability.

AM Peak Hour Results

5.4 This section presents results for the modelled network in the AM period and includes an analysis of total delay, plots of average speeds and journey times within the modelled area.

Network Performance – AM Peak

5.5 The Network Performance results, and average speed plots have been extracted from the models to assess the operation of the overall network. These results show the overall delays for each scenario to enable comparison of the performance of the network.

Average Delay

5.6 Average delay, including latent delay, has been extracted from the models in seconds per vehicle for the AM peak. The average delay is higher in all forecast scenarios when compared to the Base model, which has an average delay of 69 seconds per vehicle. The Do Minimum has 82 seconds per vehicle; the Do Something has 100 seconds per vehicle and Do Something with Mitigation has 105 seconds per vehicle.

5.7 The increase in average delay in the Do Something with Mitigation scenario is caused by the additional delay and routing changes in the area as a result of the proposed mitigation scheme. The results are shown in Figure 5-1 below.

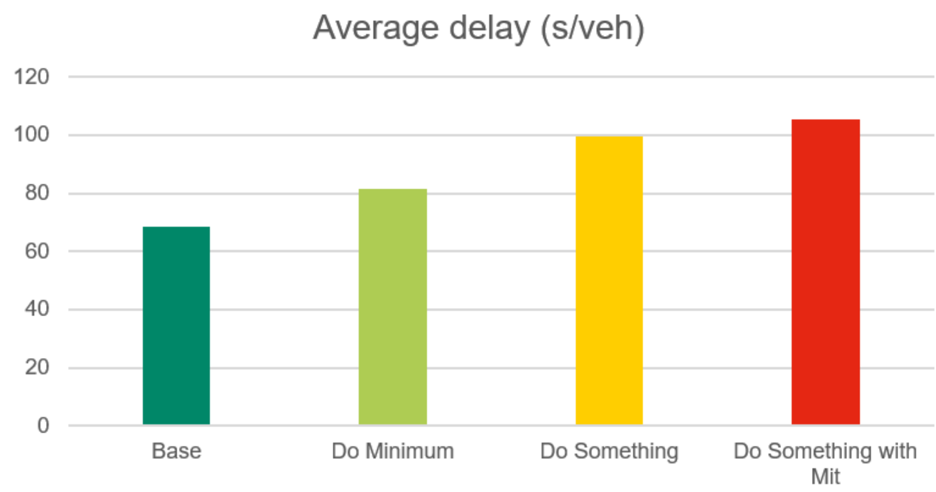


Figure 5-1 – AM Average Delay Per Vehicle (In Seconds)

5.8 The AM forecast models have an average of 2 vehicles in latent demand. This result is considered to be caused by vehicles trying to join the network just as the model is finishing and is, therefore, considered negligible.

Average Speed Plots

5.9 The average speeds have been plotted on the network for the Base and Forecast models (Do Minimum, Do Something and Do Something with Mitigation) in Figure 5-2 to Figure 5-5.

5.10 A comparison between the speed plots for the Base AM model and the speed plots for the forecast models indicates that the main congestion points across the network remain consistent (darker blue areas) although the increased demand results in longer queues in future.

5.11 The Do Minimum scenario results predict slow moving traffic/ queues which extend along B1150 Norwich Road northbound, approaching the A149 / Norwich Road / Grammar School Road signalised junction. Although there are a significant number of additional trips from the NWSUE in the Do Something model, the Do Something scenario only predicts slightly lower speeds along B1150 Norwich Road compared to the Do Minimum scenario, since the Link Road mitigates for much of the impact of the NWWUE trips.

5.12 The Do Something with Mitigation scenario shows a very similar performance to the Do Something. The main differences are observed in Aylsham Road, where the proposed mitigation scheme results in a minor increase in delays and queues approaching the underpass, since the signals mean vehicles have to stop. The changes on the B1150 Norwich Road are caused by the routing changes predicted by the model, as drivers change their route to avoid the additional delays on Aylsham Road.

5.13 The operation of other key locations identified in the model, such as Cromer Road, or the A149/ B1150 junction are broadly consistent with the existing traffic conditions in all the forecast models.

Figure 5-2 – AM Base Speeds

Figure 5-3 – AM Do Minimum 2036 Speeds

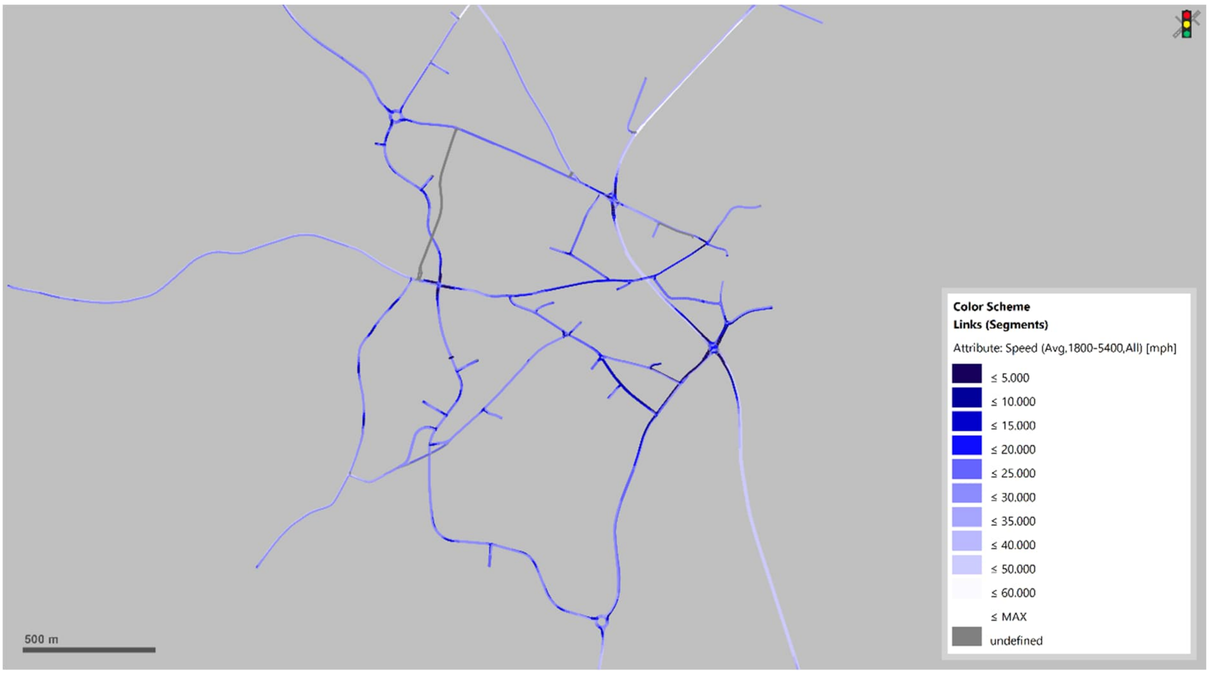


Figure 5-4 – AM Do Something 2036 Speed Plot

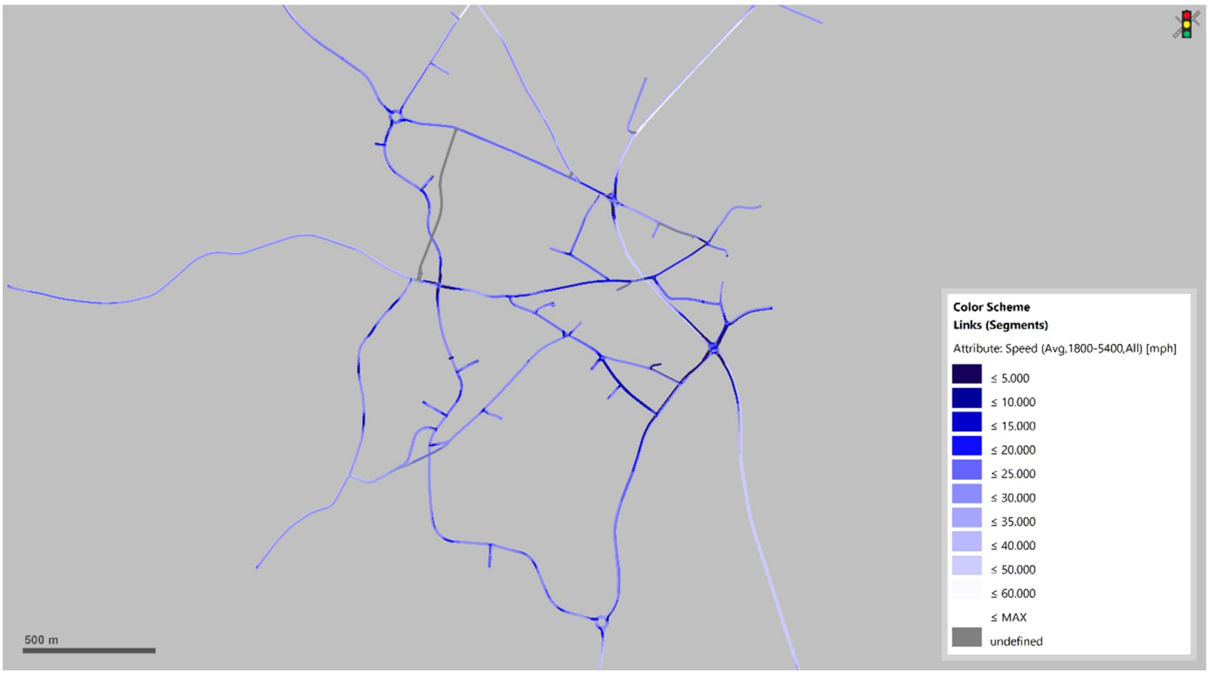


Figure 5-5 – AM Do Something with Mitigation 2036 Speed Plot

Journey Times

5.14 As part of the performance assessment carried out in the present study, the key journey time routes have been analysed to compare delays across the forecast scenarios in the AM peak hour.

5.15 Figure 5-6 and Figure 5-9 show the journey time routes selected within the model area, Journey Time Route 2 (A149 and B1145), and Journey Time Route 8 (B1150 Norwich Road, A149, and B1145).

Journey Time Route 2 – A149 and B1145

5.16 Figure 5-6 below shows Journey Time Route (JTR) 2, along the A149 and B1145.

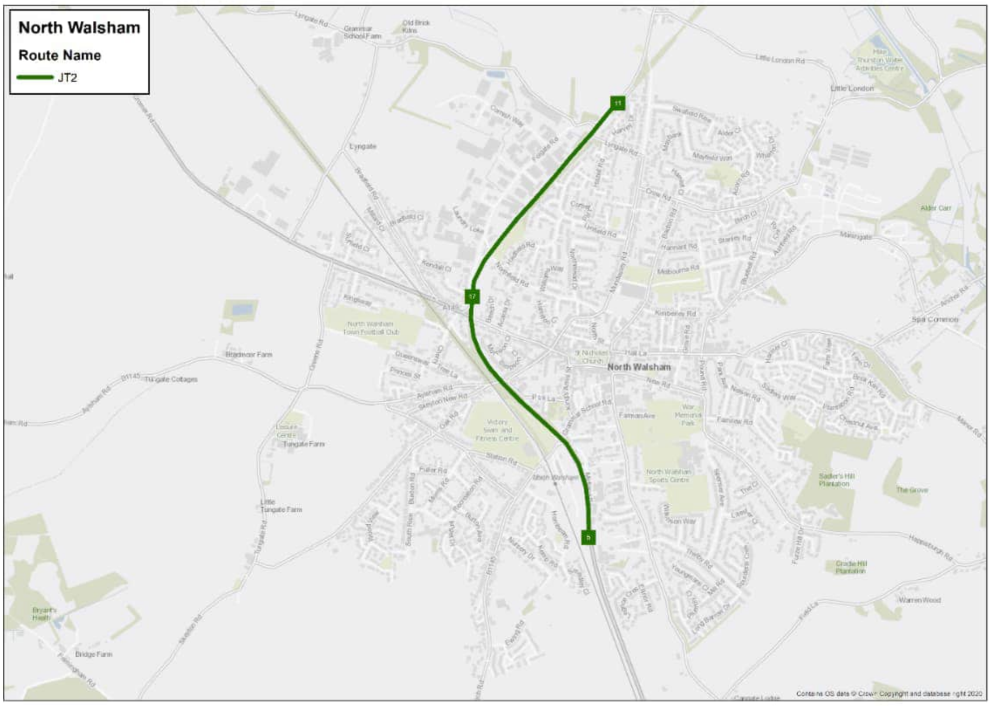


Figure 5-6 – Journey Time Route 2 Diagram

5.17 Figure 5-7 and Figure 5-8 show the modelled results for the Base and all Forecast scenarios in the AM peak hour, for Journey Time Route 2.

5.18 Consistent with the average speed analysis above, the journey time results for JTR 2 show that the increase in demand included in the forecast scenarios does not significantly affect the operation of the A149 route, with only a slight increase in journey times in the Do Minimum scenario, relative to the Base year, and a more significant increase in the Do Something scenarios (with and without mitigation).

5.19 The additional delay in the Do Something scenarios, in both directions, is focused on the southern section, which includes the Norwich Road (B1150) junction with the A149. In the northbound direction, the overall journey time is 24 seconds higher in the Do Something scenario and 26 seconds higher for the Do Something with Mitigation, relative to the Do Minimum. In the southbound direction, the overall journey time in the Do Something is 30 seconds higher than the Do Minimum and 35 seconds higher for the Do Something with Mitigation, relative to the Do Minimum.

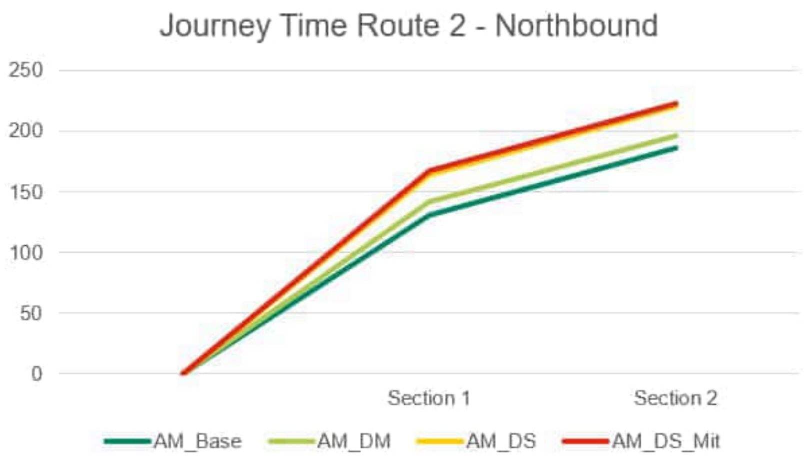


Figure 5-7 – Journey Time 2 Northbound AM

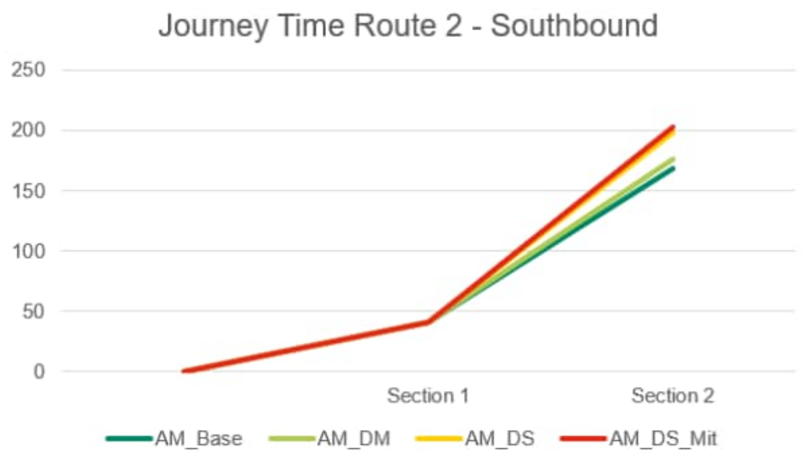


Figure 5-8 – Journey Time 2 Southbound AM

Journey Time Route 8 – B1150, A149, and B1145

5.20 Figure 5-9 below shows Journey Time Route (JTR) 8, along the B1150, A149 and B1145.

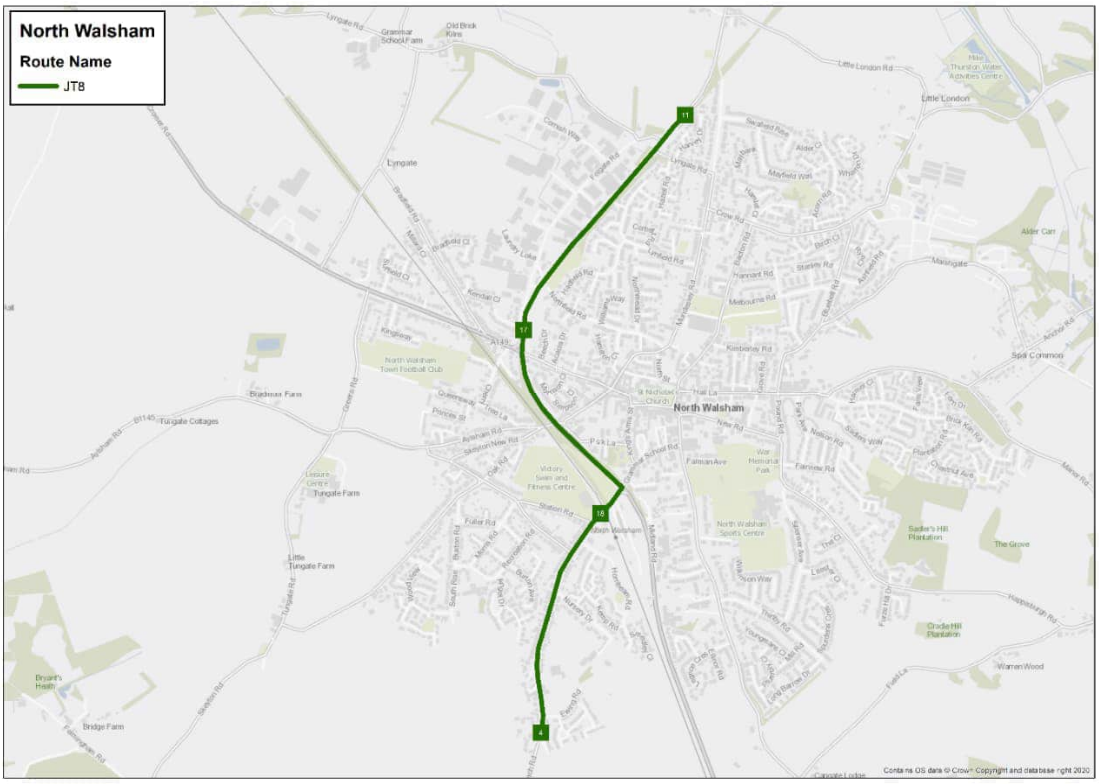


Figure 5-9 – Journey Time Route 8 Diagram

5.21 Figure 5-10 and Figure 5-11 show the modelled results for the Base and all Forecast scenarios in the AM peak hour, for Journey Time Route 8.

5.22 The northbound journey times on JTR 8 in the forecast models are higher than the Base, especially on the two southernmost sections, which include the effects of the congestion at the A149/Norwich Road/Grammar School Road Junction. The overall journey time on this route for the Do Minimum is 400 seconds, with the journey times for the Do Something and the Do Something with Mitigation 40 seconds and 41 seconds higher respectively.

5.23 There is a smaller difference between the journey times on JTR 8 southbound between the different scenarios, with the Do Something and Do Something with Mitigation models have a journey time 26 seconds higher (for both scenarios) across the route compared to the Do Minimum.

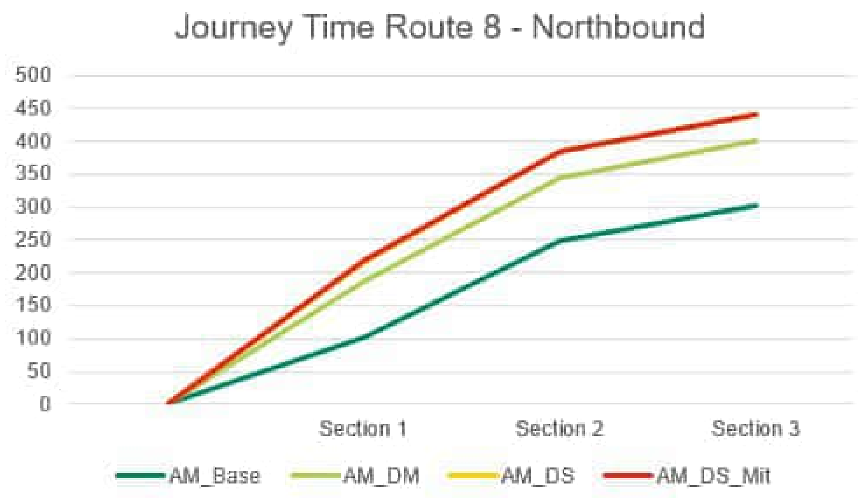


Figure 5-10 – Journey Time 8 Northbound AM

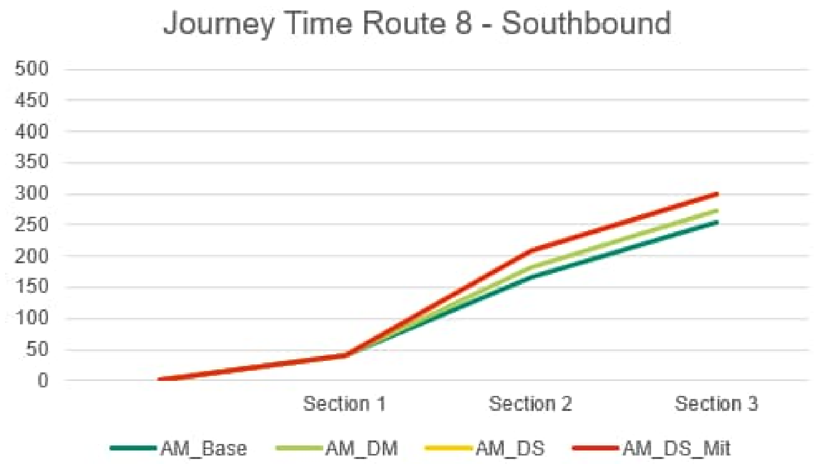


Figure 5-11 – Journey Time 8 Southbound AM

PM Peak Hour Results

5.24 This section presents the results for the modelled network in the PM peak hour for all modelled scenarios. It includes an analysis of total delay, average speed results and journey times within the modelled area.

Network Performance – PM Peak

5.25 The Network Performance results, and average speed plots have been extracted from the models to assess the operation of the overall network. These results show the overall delays for each scenario to enable comparison of the performance of the network in each scenario.

Average Delay

5.26 Average delay, including latent delay, has been extracted from the models in seconds per vehicle for the PM peak. The average delay is higher in all forecast year scenarios when compared to the base year, where there is an average delay of 76 seconds per vehicle. There is an averaged delay of 129 seconds per vehicle in the Do Minimum, while the Do Something and Do Something with Mitigation models have an average delay of 115 and 125 seconds per vehicle respectively.

5.27 The increase in average delay in the Do Something with Mitigation scenario is caused by routing changes in the area resulting from the proposed mitigation scheme. The results are shown in Figure 5-12 below.

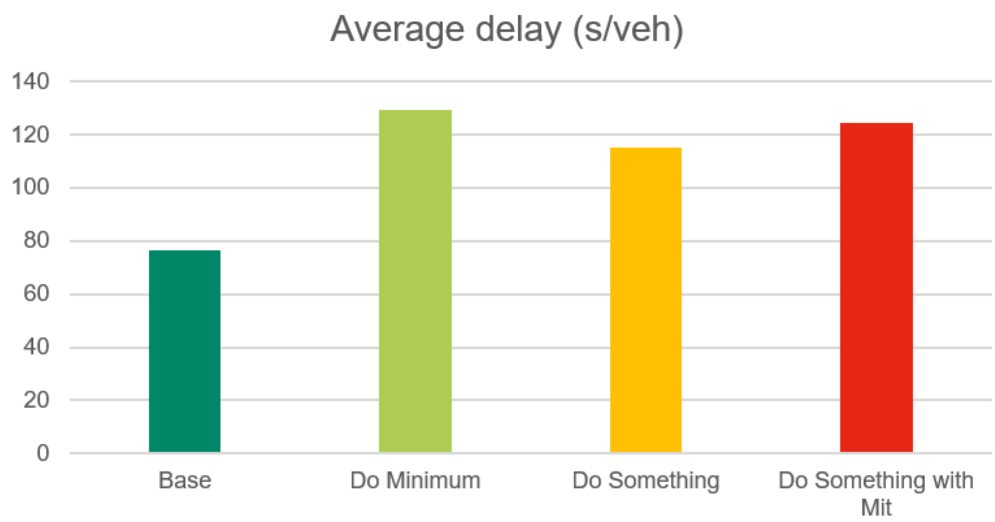


Figure 5-12 – PM Average Delay Per Vehicle (In Seconds)

5.28 The PM forecast models have an average of 3 vehicles in latent demand. This result is considered to be caused by vehicles trying to join the network just as the model is finishing and is, therefore, considered negligible.

Average Speed Plots

5.29 The average speeds have been plotted on the network for the Base and Forecast PM models Figure 5-13 to Figure 5-16.

5.30 A comparison between the PM base year speed plots and the speed plots for the forecast models indicates that the main low speed areas across the network remained consistent (darker blue areas) differing only in magnitude.

5.31 There are slow speeds in the Do Minimum scenario along the B1150 Norwich Road northbound, approaching the A149 / Norwich Road / Grammar School Road signalised junction. The Do Something scenario speed plot is similar with queues along the B1150 Norwich Road, but despite the increased number of trips, the average speed is similar due to the addition of the Link Road, which reduces the number of vehicles using B1150 Norwich Road.

5.32 The Do Something with Mitigation scenario shows a very similar operation to the Do Something scenario, with only a slight reduction in speeds on Aylsham Road and the B1150 Norwich Road. The decrease in speeds on Aylsham Road is caused by the mitigation scheme, as the introduction of the signals means vehicles need to stop. The reduction in speeds on the B1150 Norwich Road is due to more vehicles choosing this route as due to the additional delay on Aylsham Road.

5.33 The operation of other key locations identified in the model, such as Cromer Road, or the A149/ B1150 junction are broadly consistent with the existing traffic conditions in all the forecast models.

Figure 5-13 – PM Base Speeds

Figure 5-14 – PM Do Minimum 2036 Speeds

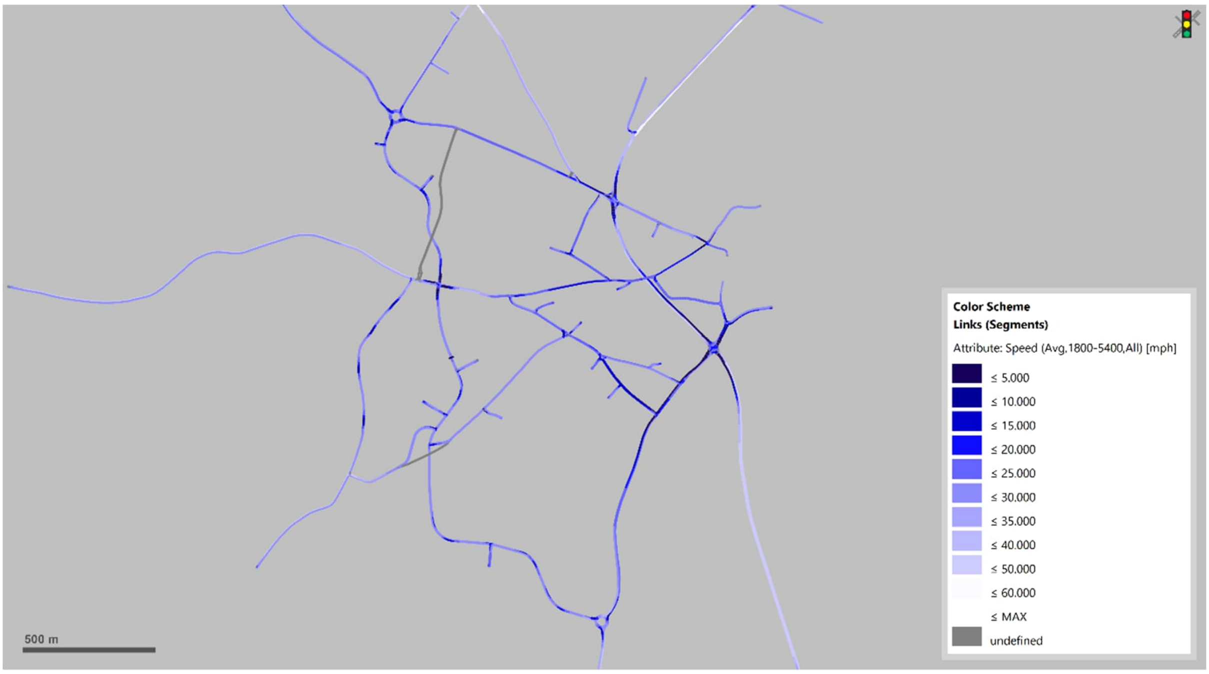


Figure 5-15 – PM Do Something 2036 Speeds

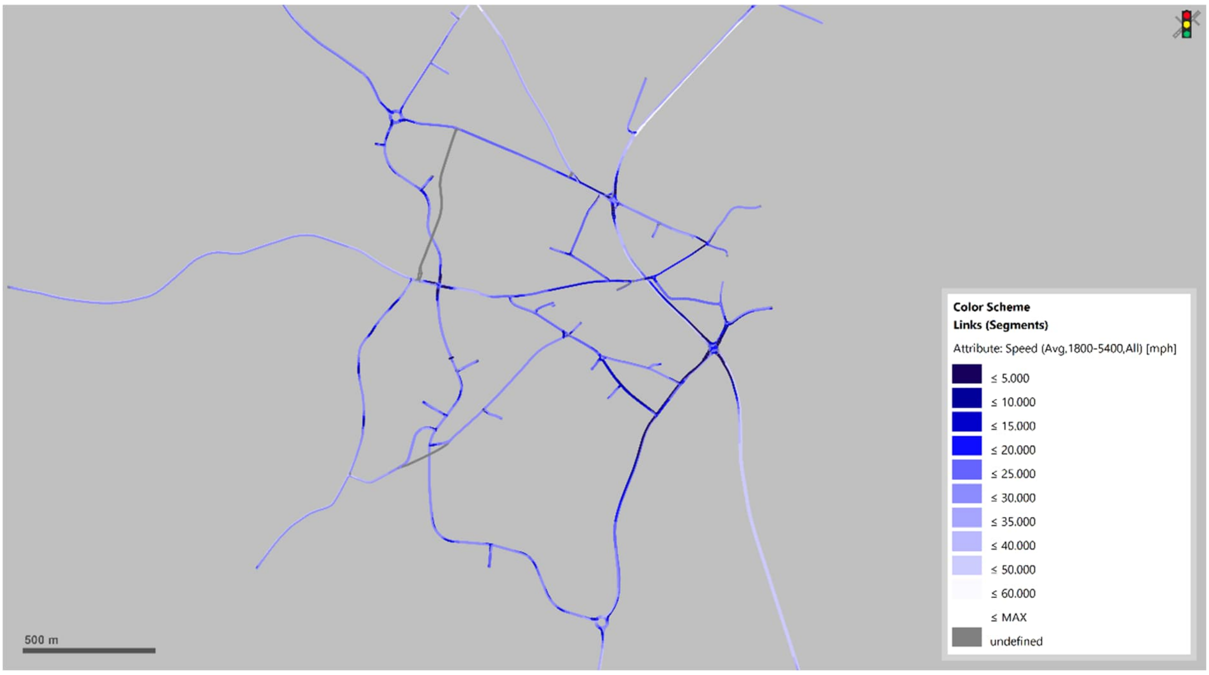


Figure 5-16 – PM Do Something with Mitigation 2036 Speeds

Journey Times – PM Peak

5.34 As part of the performance assessment carried out in the present study, the key journey time routes have been analysed to compare delays across the forecast scenarios in the AM peak hour.

5.35 Figure 5-17 and Figure 5-20 shown in the PM peak section show the key journey time routes selected within the model area, Journey Time Route 2 (A149 and B1145), and Journey Time Route 8 (B1150 Norwich Road, A149, and B1145).

Journey Time Route 2 – A149 and B1145

5.36 Figure 5-17 below shows Journey Time Route (JTR) 2, along the A149 and B1145.

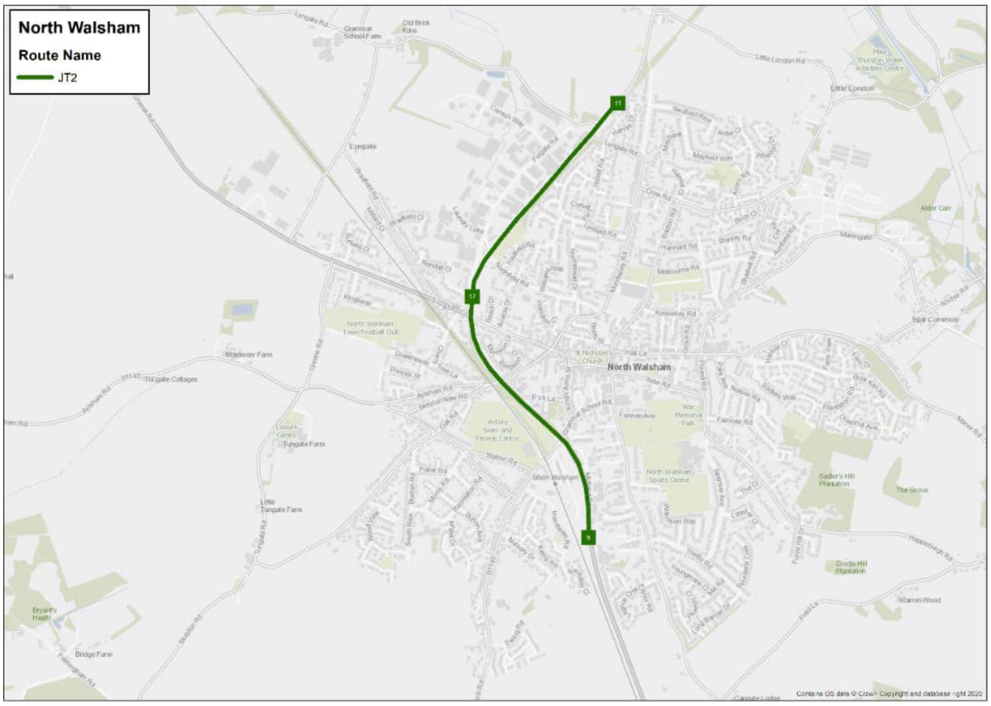


Figure 5-17 – Journey Time Route 2 Diagram

5.37 Figure 5-18 and Figure 5-19 show the modelled results for the Base and forecast scenarios in the PM peak hour, for Journey Time Route 2.

5.38 The increased demand in the Do Something and Do Something with Mitigation models translates to an increased delay on the northbound approach to the A149/Norwich Road/Grammar School Road junction. This junction cannot accommodate the forecast demand in the 2036 Do Minimum PM, so is further over capacity when the development trips are added. The Do Something shows an increase in journey time of 39 seconds, relative to the Do Minimum, while the Do Something with Mitigation show an increase of 44 seconds.

5.39 The journey time results are not significantly different between the Do Minimum and Do Something for JTR 2 southbound on the northern section of the route; there are higher journey times in the Do Something scenario, relative to the Do Minimum on the southern section of the route, but in the Do Something with Mitigation scenario the overall journey times are only slightly higher than the Do Minimum.

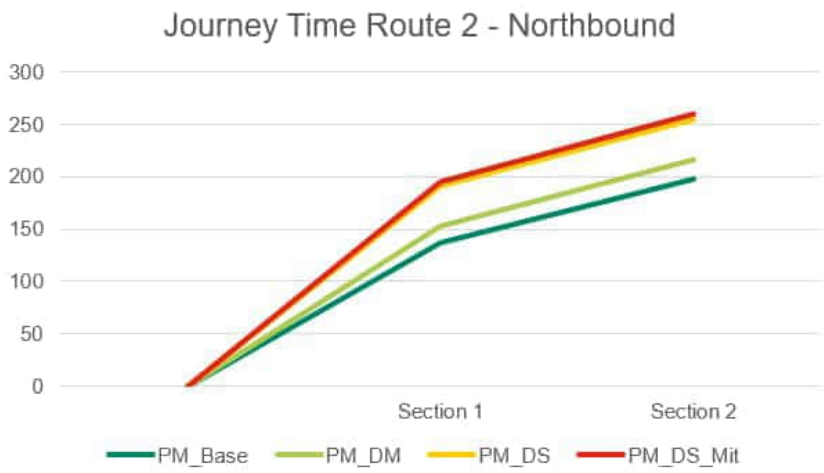


Figure 5-18 - Journey Time Route 2 Northbound PM

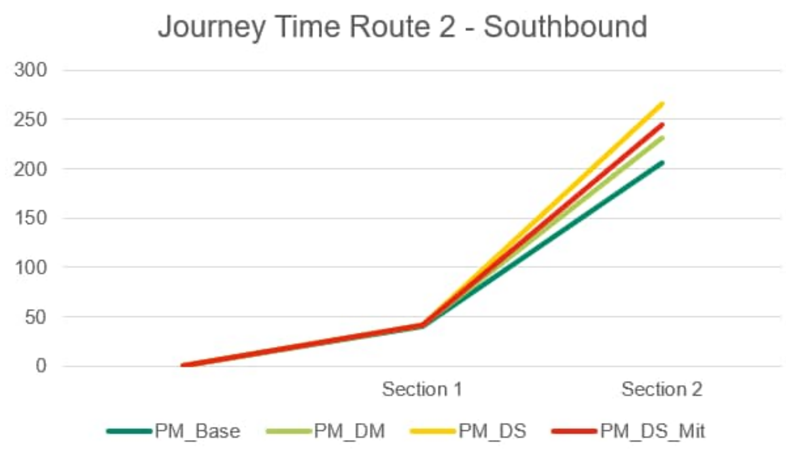


Figure 5-19 Journey Time Route 2 Southbound PM

Journey Time Route 8 – B1150, A149, and B1145

5.40 Figure 5-20 below shows Journey Time Route (JTR) 8, which runs along the B1150, A149 and B1145.

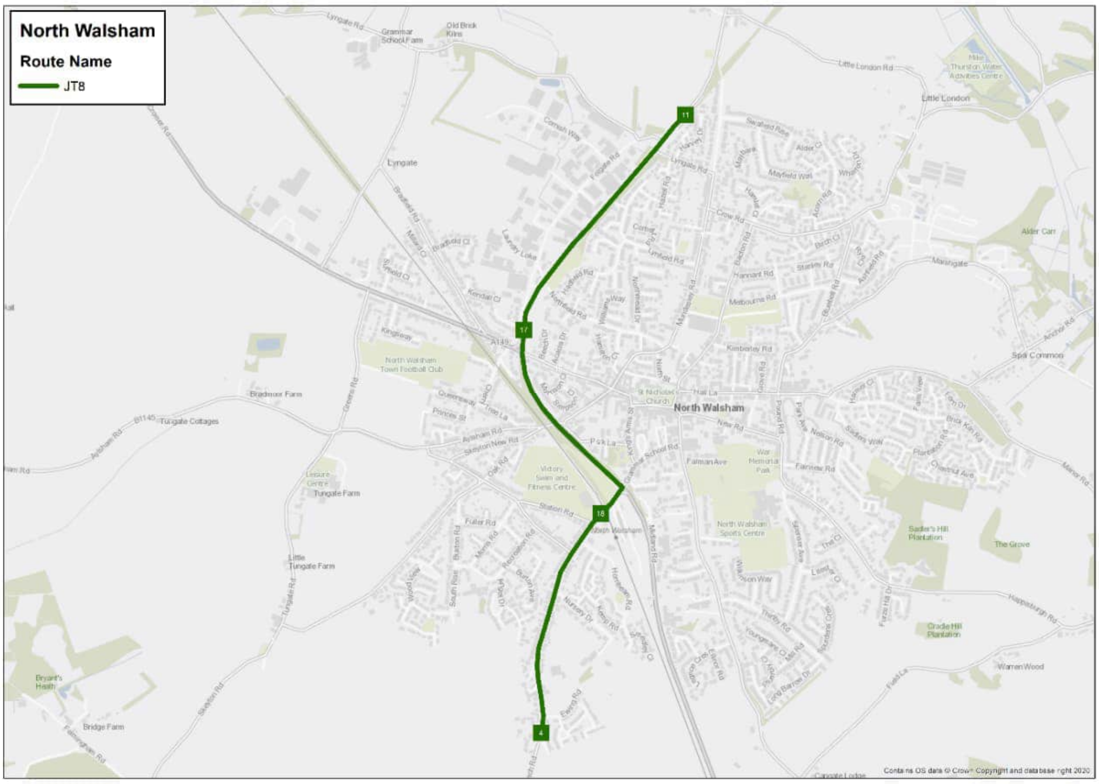


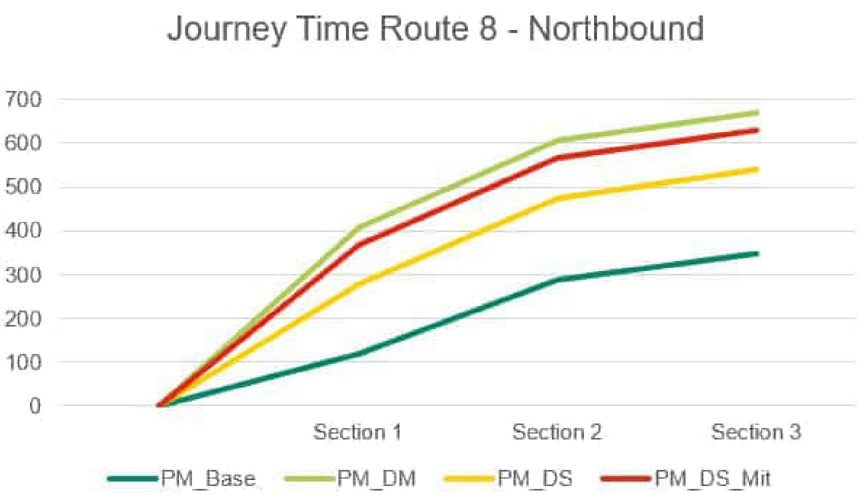
Figure 5-20 – Journey Time Route 8 Diagram

5.41 Figure 5-21 and Figure 5-22 show the modelled results for the Base and forecast scenarios in the PM peak hour, for Journey Time Route 8.

5.42 The JTR 8 northbound journey times in the 2036 forecast models are higher than the Base year, especially on the two southernmost sections, which include the effects of the congestion in the A149/Norwich Road/Grammar School Road junction. The overall Do Something journey time is 130 seconds faster than the Do Minimum and the Do Something with Mitigation is 38 seconds faster. It can be observed that despite the increase in trips from the NWWUE, the Link Road relieves some of the congestion on the B1150 Norwich Road.

5.43 In the Do Something with Mitigation scenario, vehicles which are deterred from routing along Aylsham Road due to the mitigation, add to the already congested B1150 Norwich Road route, increasing the journey times through the junction. However, the journey time is still faster than the Do Minimum scenario.

5.44 There is a smaller difference on JTR 8 southbound between the different scenarios: the Do Something is 32 seconds slower than the Do Minimum, while Do Something with Mitigation is 9 seconds slower than the Do Minimum.



5.1

Figure 5-21 – Journey Time 8 Northbound PM

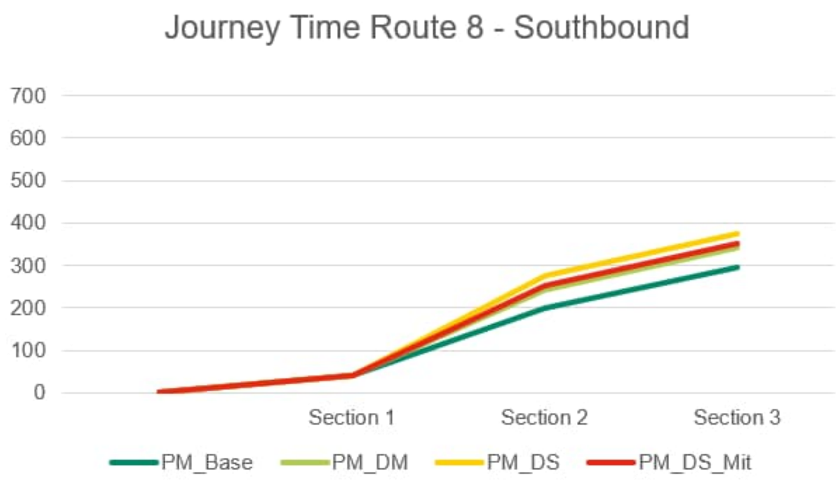


Figure 5-22 – Journey Time 8 Southbound PM

6. Junction Analysis

Introduction

6.1 This section presents the analysis of results for the junctions within the study area which have been identified from the survey data/observations in the model area as having the most significant impact on network operation.

Key Junctions

6.2 The key locations are defined as follows and can also be seen in Figure 6-1 below:

- 1 - Cromer Road / A149 / B1145 Junction;
- 2 - Cromer Road / Aylsham Road / Mundesley Road Junction;
- 3 - B1150 Norwich Road / A149 Junction; and
- 4 - Norwich Road / Millfield Road Junction.

6.3 These locations have been analysed individually in the models to extract queue and delay results for the Do Minimum, Do Something, and Do Something with Mitigation scenarios, to provide an assessment of the NWWUE development impact.

6.4 The junction analysis results have been extracted from the Forecast models for each junction. The Millfield Road junction has been run independently with the signals at B1150 Norwich Road / A149 / Grammar School Road being deactivated so that queues and delays can be accurately attributed to this junction.

6.5 It should be noted that the operation of some of these key locations depends on variable factors such as on-street parking and courtesy/give-way behaviours, which have been modelled and calibrated to observed queuing patterns/ levels of delay.

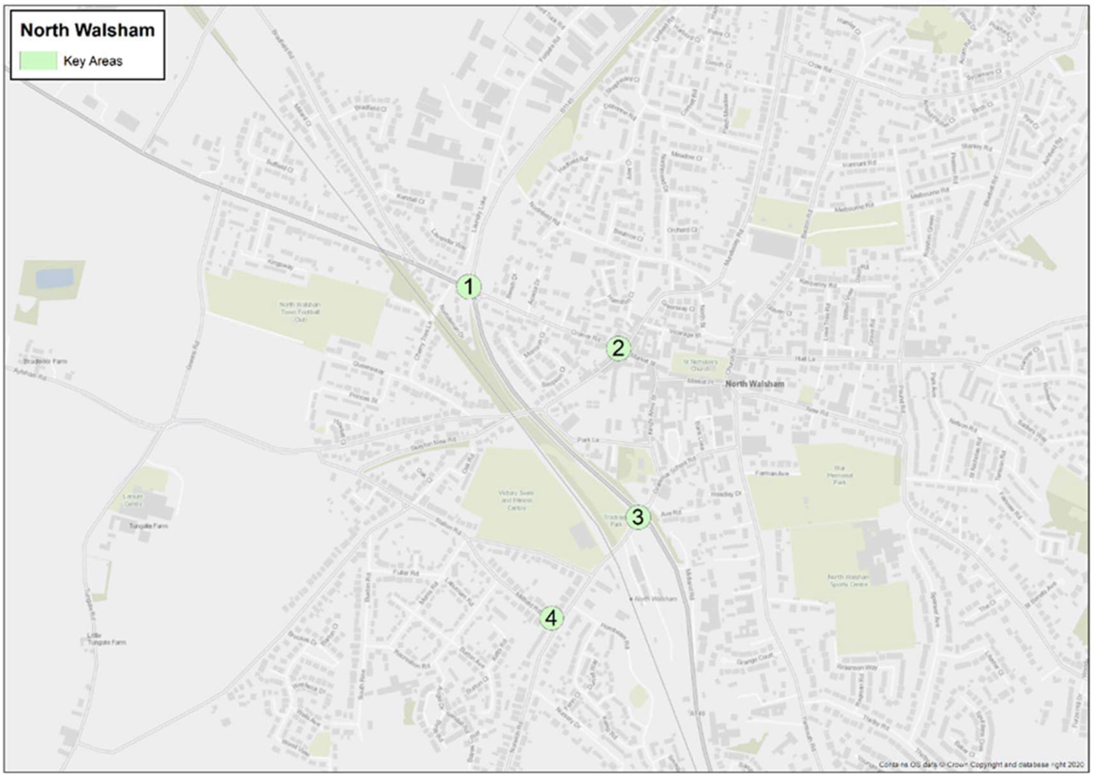


Figure 6-1 – Key Junctions in North Walsham Model Area

Cromer Road / A149 / B1145 Junction (1)

6.6 Figure 6-2 and Figure 6-3 show the queues and delays in the AM and PM peak hours at the Cromer Road / A149 / B1145 junction. The queue results are set out in the top junction layout and the delays are in the bottom junction layout.

6.7 The model results show that the NWWUE development demand included in the AM and PM Do Something / Do Something with Mitigation scenarios results in only a negligible increase in queues and delays at the junction.

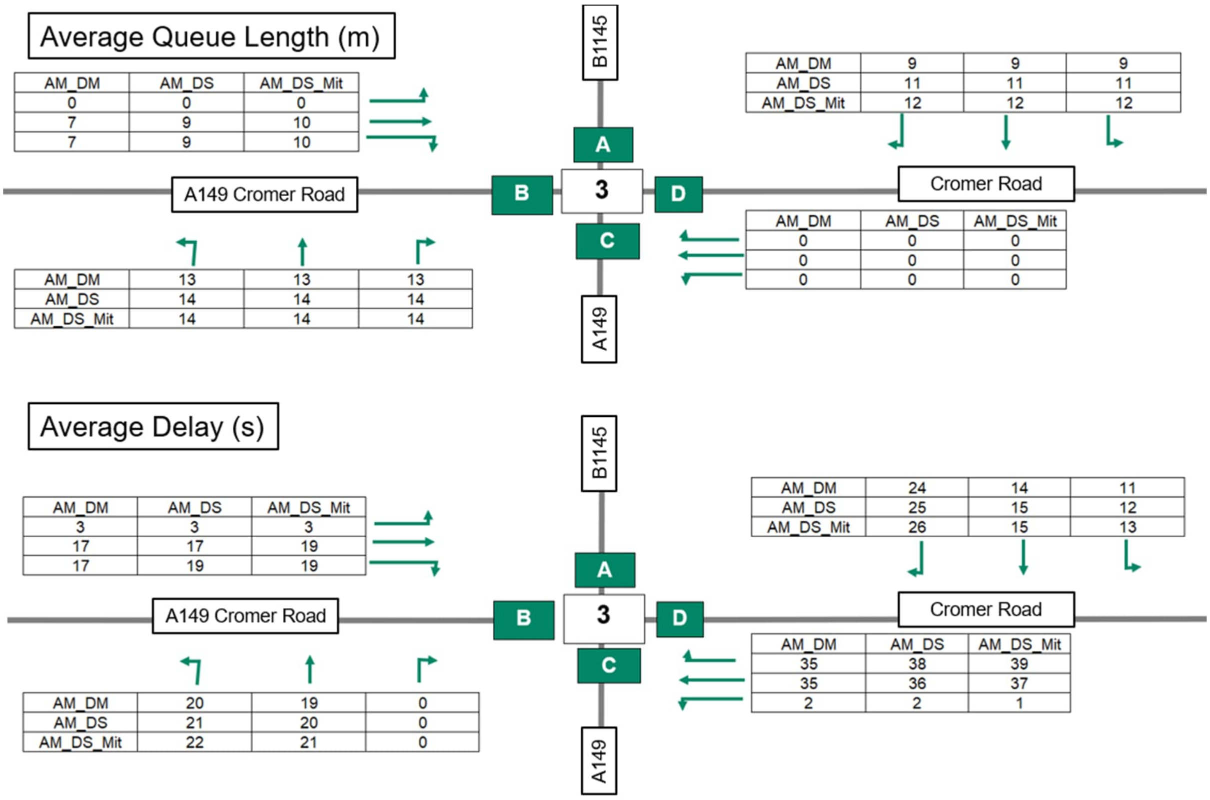
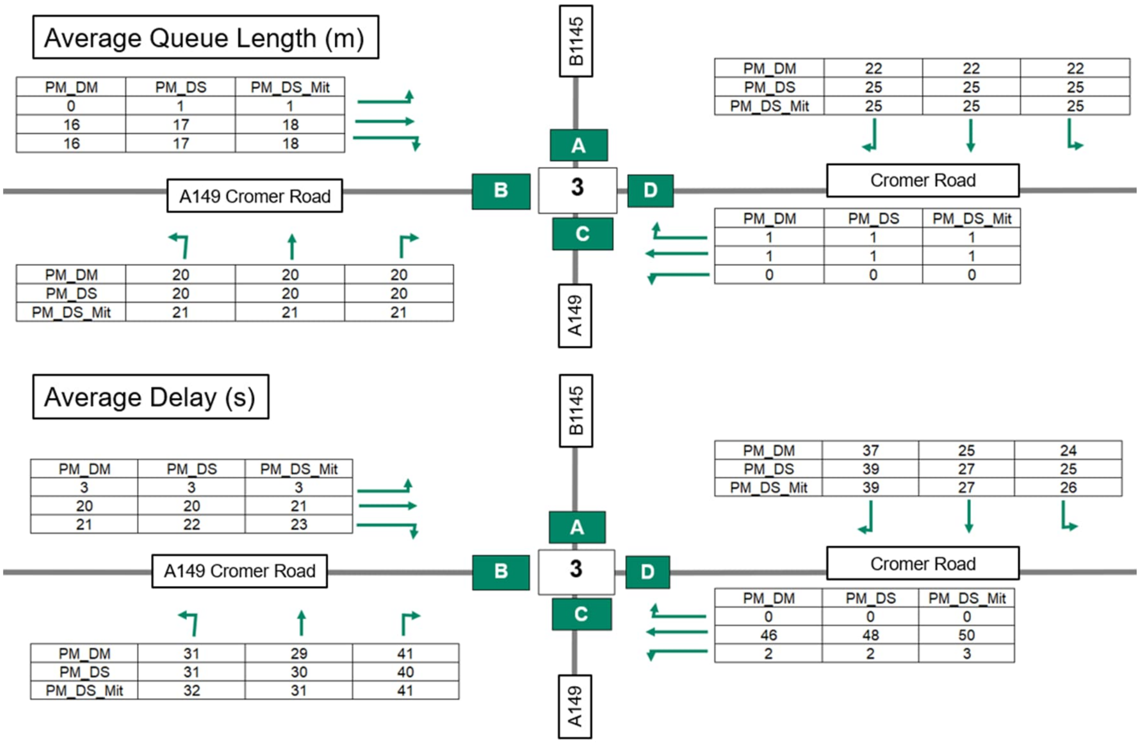


Figure 6-2 – Queues in metres and delay in seconds - AM Peak



Average Queue Length (m) – A149 Cromer Road (B)

PM_DM	PM_DS	PM_DS_Mit
0	1	1
16	17	18
16	17	18

Average Queue Length (m) – B1145 (A)

PM_DM	22	22	22
PM_DS	25	25	25
PM_DS_Mit	25	25	25

Average Queue Length (m) – Cromer Road (D)

PM_DM	PM_DS	PM_DS_Mit
1	1	1
1	1	1
0	0	0

Average Queue Length (m) – A149 (C)

PM_DM	20	20	20
PM_DS	20	20	20
PM_DS_Mit	21	21	21

Average Delay (s) – A149 Cromer Road (B)

PM_DM	PM_DS	PM_DS_Mit
3	3	3
20	20	21
21	22	23

Average Delay (s) – B1145 (A)

PM_DM	37	25	24
PM_DS	39	27	25
PM_DS_Mit	39	27	26

Average Delay (s) – Cromer Road (D)

PM_DM	PM_DS	PM_DS_Mit
0	0	0
46	48	50
2	2	3

Average Delay (s) – A149 (C)

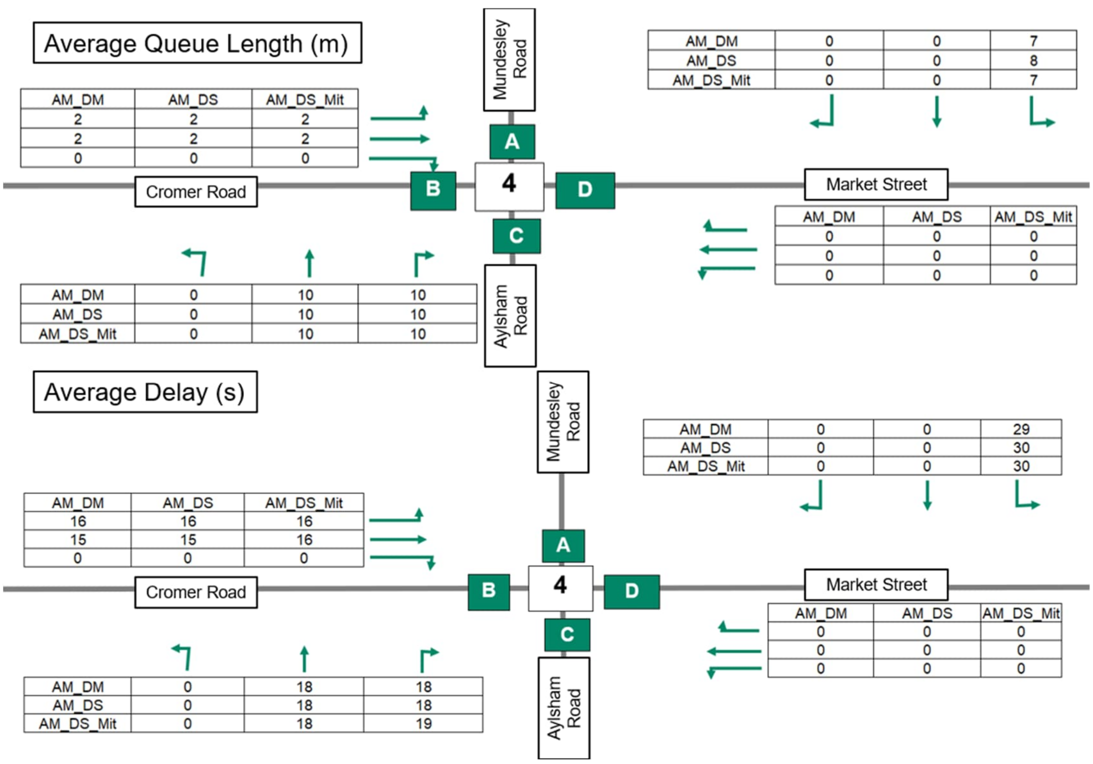
PM_DM	31	29	41
PM_DS	31	30	40
PM_DS_Mit	32	31	41

Figure 6-3 – Queues in metres and delay in seconds - PM Peak

Cromer Road / Aylsham Road / Mundesley Road Junction (2)

6.8 Figure 6-4 and Figure 6-5 show the queues and delays in the AM and PM peak hours at the Cromer Road / Aylsham Road / Mundesley Road junction. The queue results are set out in the top junction layout and the delays are in the bottom junction layout.

6.9 The model results show that the NWWUE development demand included in the AM and PM Do Something / Do Something with Mitigation scenarios results in only a negligible increase in queues and delays at the junction.



Average Queue Length (m) – Cromer Road (B)

AM_DM	AM_DS	AM_DS_Mit
2	2	2
2	2	2
0	0	0

Average Queue Length (m) – Mundesley Road (A)

AM_DM	0	0	7
AM_DS	0	0	8
AM_DS_Mit	0	0	7

Average Queue Length (m) – Market Street (D)

AM_DM	AM_DS	AM_DS_Mit
0	0	0
0	0	0
0	0	0

Average Queue Length (m) – Aylsham Road (C)

AM_DM	0	10	10
AM_DS	0	10	10
AM_DS_Mit	0	10	10

Average Delay (s) – Cromer Road (B)

AM_DM	AM_DS	AM_DS_Mit
16	16	16
15	15	16
0	0	0

Average Delay (s) – Mundesley Road (A)

AM_DM	0	0	29
AM_DS	0	0	30
AM_DS_Mit	0	0	30

Average Delay (s) – Market Street (D)

AM_DM	AM_DS	AM_DS_Mit
0	0	0
0	0	0
0	0	0

Average Delay (s) – Aylsham Road (C)

AM_DM	0	18	18
AM_DS	0	18	18
AM_DS_Mit	0	18	19

Figure 6-4 – Queues in metres and delay in seconds - AM peak.

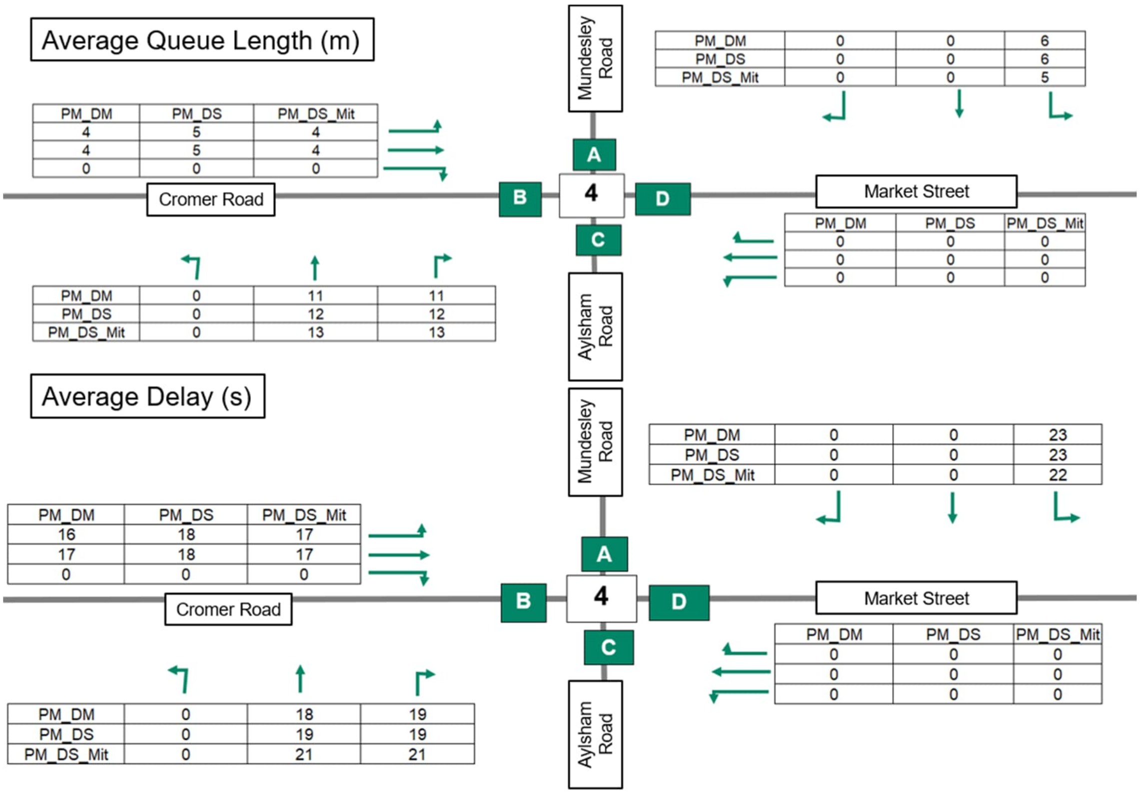


Figure 6-5 – Queues in metres and delay in seconds - PM peak

B1150 Norwich Road / A149 Junction (3)

6.10 Figure 6-6 shows the queues and delays at the signalised junction between Norwich Road and A149 (North Walsham Bypass) in the AM peak hour. The queue results are set out in the top junction layout and the delays are in the bottom junction layout.

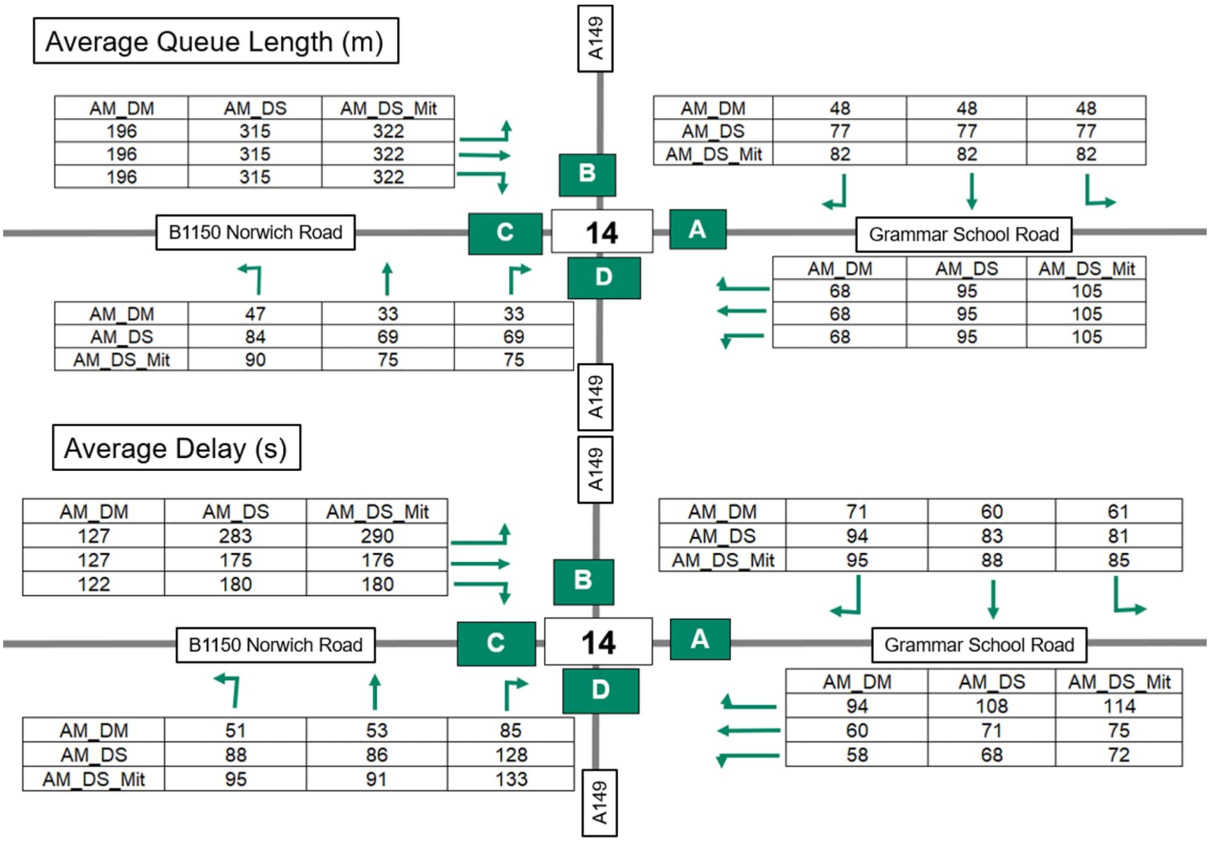
6.11 The junction analysis results show that the A149/Norwich Road/Grammar School Road junction does not provide enough capacity to accommodate the forecasted demand in the AM Do Something / Do Something with Mitigation, resulting in significant queues and delays approaching the junction, with Norwich Road being the most affected.

6.12 When comparing the Do Minimum with the Do Something scenario, the addition of the NWWUE development trips in the AM Do Something scenario results in an increase in delay of approximately 150 seconds approaching the junction from the west for the left-turn, though this reduces to approximately 50-60 seconds for the straight-ahead and right-turn movements. The main capacity issue is for the left-turn movement from Norwich Road to the A149 northbound; due to the extensive queuing on this approach the left-turn flare struggles to be accessed, as vehicles need to change lanes twice, and is therefore inefficiently utilised and there is also limited green time allocated to the left-turn movement.

6.13 The increase in delay noted above in the Do something scenario relative to the Do Minimum is also reflected in longer queues. Queues increase by approximately 120 metres on the Norwich Road approach. The queues generated at the A149/ Norwich Road/Grammar School Road junction reach the Norwich Road/ Millfield Road junction reducing gap availability for the vehicles from Millfield Road to access Norwich Road northbound.

6.14 When comparing the Do Something scenario with the Do Something with Mitigation, it can be observed that the mitigation scheme causes a small, but consistent increase in queues and delays at all arms of the junction. This is caused by the mitigation making Aylsham Road a less attractive route and vehicles rerouting through this junction.

6.15 The increase in delay at the other arms and movements is significantly lower at approximately 10 to 20 seconds on the remaining three arms.



Average Queue Length (m)

AM_DM	AM_DS	AM_DS_Mit
196	315	322
196	315	322
196	315	322

AM_DM	48	48	48
AM_DS	77	77	77
AM_DS_Mit	82	82	82

AM_DM	47	33	33
AM_DS	84	69	69
AM_DS_Mit	90	75	75

AM_DM	AM_DS	AM_DS_Mit
68	95	105
68	95	105
68	95	105

Average Delay (s)

AM_DM	AM_DS	AM_DS_Mit
127	283	290
127	175	176
122	180	180

AM_DM	71	60	61
AM_DS	94	83	81
AM_DS_Mit	95	88	85

AM_DM	51	53	85
AM_DS	88	86	128
AM_DS_Mit	95	91	133

AM_DM	AM_DS	AM_DS_Mit
94	108	114
60	71	75
58	68	72

Figure 6-6 – Queues in metres and delay in seconds - AM peak.

6.16 Figure 6-8 shows the queues and delays at the signalised junction between Norwich Road and A149 for the PM peak hour.

6.17 As in the AM peak, the junction analysis results show that the A149/Norwich Road/Grammar School Road junction does not provide enough capacity to accommodate the demand in any of the forecast scenarios, resulting in significant queues and delays approaching the junction, especially in Norwich Road.

6.18 The addition of the NWWUE development trips and link road in the Do Something scenario results in an approximate 10-second reduction in delay approaching the junction from B1150 Norwich Road. There are, however, increases in delay of approximately 30-50 seconds in the remaining three arms.

6.19 When comparing the Do Minimum scenario to the Do Something, the average queue length along B1150 Norwich Road was reduced by approximately 80 metres in the Do Something scenario. However, the A149 arms and Grammar School Road arm increased by approximately 50-60 metres. Delays follow similar suit as there is a decrease in the B1150 Norwich Road but an increase in the rest of the arms. This is caused by the routing allowed by the Link Road. Additionally, this effect seems to be also caused by the signals at the junction, which respond differently to the different arrival patterns.

6.20 When comparing the Do Something scenario to the Do Something with Mitigation scenario it can be observed that the mitigation causes more delay, which results in more vehicles routeing through the B1150 Norwich Road junction, increasing delay in this location. This changes the arrival patterns at the junction, meaning these is less queueing on the A149 southbound but an increased queue on Norwich Road in the Do Something with Mitigation.

6.21 The routing patterns in the PM peak are mainly formed by vehicles travelling to North Walsham town centre from the main access points (Norwich road and A149). The Link Road together with Aylsham Road provides a suitable alternative route that allows some of these vehicles to reach the town centre and avoid the delays at Norwich road A149 junction. In Figure 6-7, shows the different routes in blue, orange, and green.

6.22 It should be noted that the additional delay in Aylsham Road created by the proposed mitigation makes both routes (Link Road in blue and Millfield Road in orange) less attractive, reducing the number of vehicles that choose this route over the B1150 Norwich Road / A149 junction (green in the figure).

6.23 This difference between Do Something and Do Something with Mitigation is not apparent in the AM peak due to the different routing patterns and the tidal nature of flows.

Figure 6-7 Alternative routes into North Walsham town centre from the south.

6.24 Changes in delay and queues on Grammar School Road and the A149 Northbound are negligible between the Do Something and the Do Something with Mitigation.

6.25 The difference in queues and delays between the Do Minimum and Do Something is lower than in the AM Peak, due to higher congestion levels in the PM Do Minimum scenario and the different travel patterns generated by the NWWUE development.

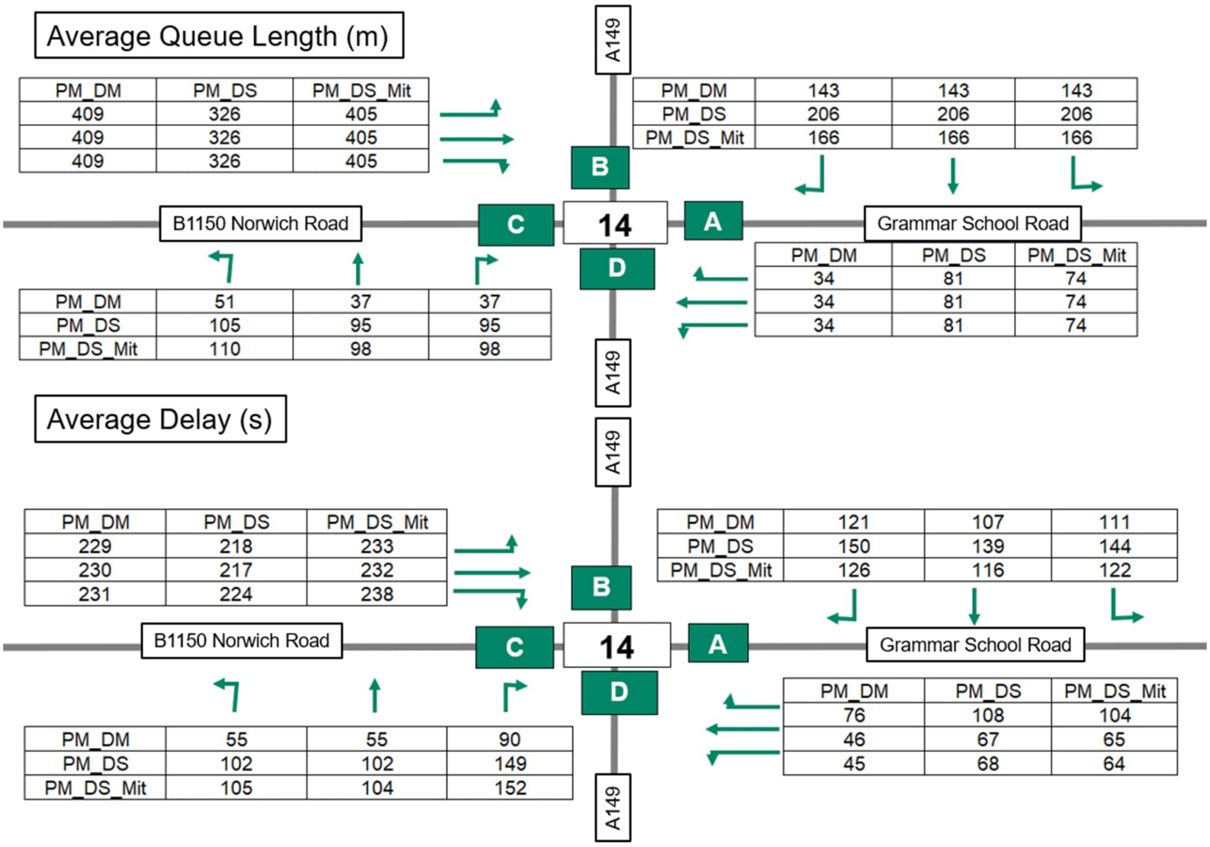


Figure 6-8 – Queues in metres and delay in seconds - PM peak

Norwich Road / Millfield Road Junction (4)

6.26 Figure 6-9 shows the queues and delays at the signalised Norwich Road/ Millfield Road junction for the AM peak hour. The queue results are set out in the top junction layout and the delays are in the bottom junction layout.

6.27 The results show no significant impact on this junction in the AM and PM peaks as the queues and delays are relatively stable after additional trips from the NWWUE development. It should be noted that the operation of this junction is likely to be affected by the queues generated at the A149/Norwich Road/Grammar School Road junction.

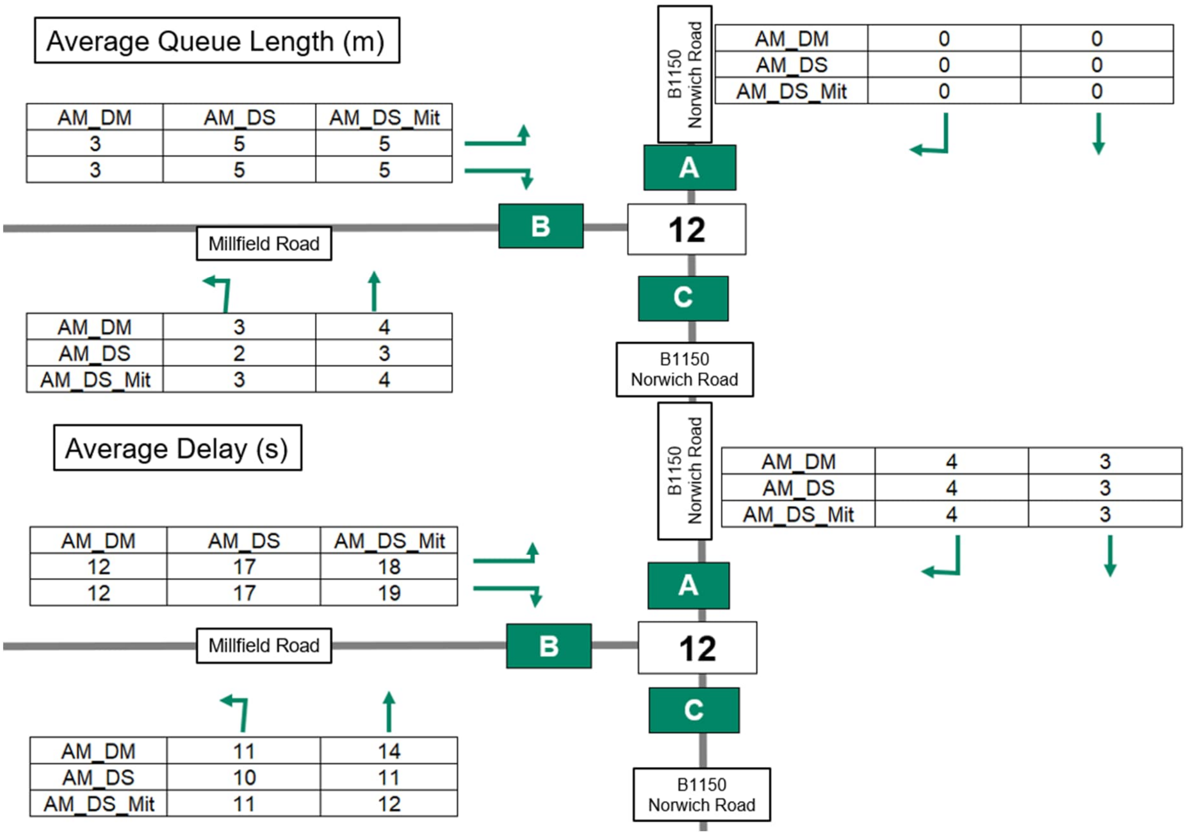


Figure 6-9 – Queues in metres and delay in seconds - AM peak.

6.28 Figure 6-10 shows the queues and delays at the Norwich Road/ Millfield Road junction in the PM peak hour.

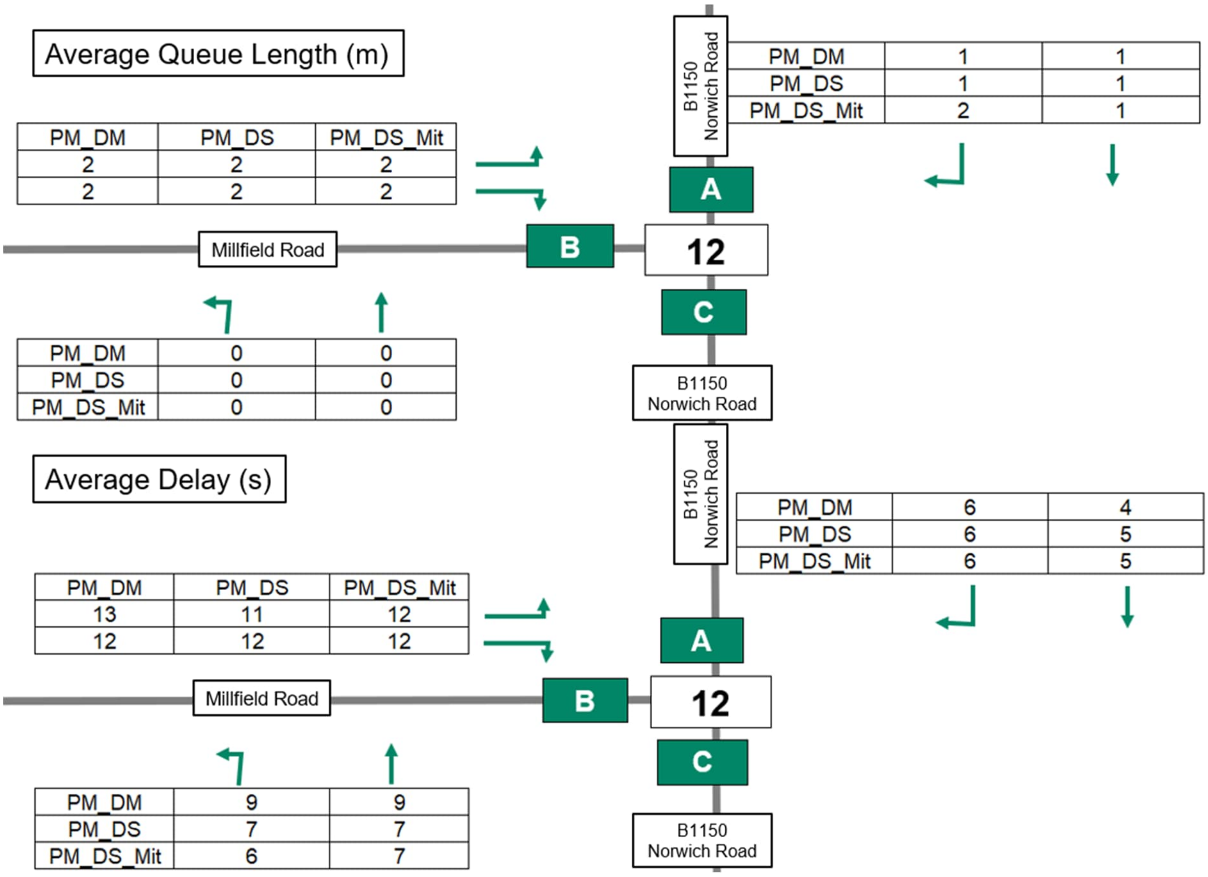


Figure 6-10 – Queues in metres and delay in seconds - PM peak

7. Conclusions

7.1 The forecast Vissim models have been developed and updated to represent the 2036 future year scenarios for the Do Minimum (future growth without North Walsham Western Urban Extension (NWWUE) but including the proposed infrastructure changes at the B1150 / A149 signalised junction) and Do Something (with NWWUE). A further Do Something with Mitigation model has also been developed to include the Aylsham Road one-way signalised junction under the bridge. The comparison of the Do Something and Do Minimum has been made to assess the impact of the NWWUE development.

7.2 The models show that the Norwich Road / A149 signalised junction struggles to accommodate the forecasted demand, resulting in longer queues and delays on all approaches which can impact other junctions such as the Norwich Road / Millfield Road junction. While there is an increase in queue and delay in the AM peak, in the PM peak, the Do Something model has a shorter queue length and lower delay when compared to the Do Minimum PM. The Do Something with Mitigation PM peak has a similar queue length and delay as the Do Minimum PM model.

7.3 The Do Something with Mitigation models increase slightly queue lengths and delays at other locations in the network, such as Aylsham Road with the Link Road junction, due to the mitigation reducing the attractiveness of the Aylsham Road underpass. However, these rerouting effects are considered negligible when comparing the Do Something and Do Something with Mitigation scenarios.

7.4 The model operation and results from the other key locations identified in the area, such as Aylsham Road or the Cromer Road/ B1145 signalised junction, show that the additional NWWUE trip generation in the 2036 forecast year will not significantly increase queues and delays at these locations.

8. Appendix A – Demand Development

External Residential Trips – AM Peak

Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
1																														16	4	8	2			
2																														9	2	5	1			
3																														0	0	0	0			
4																														42	11	21	5			
5																														14	4	7	2			
6																														12	3	6	1			
7																																				
8																																				
9																														5	1	3	1			
10																														3	1	1	0			
11																																				
12																														5	1	3	1			
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24																																				
25																														3	1	2	0			
26																														2	0	1	0			
27																														1	0	1	0			
28																														0	0	0	0			
29																														0	0	0	0			
30	45	26	1	118	38	33			15	8		15													9	5	3	1	1							
31	12	7	0	31	10	9			4	2		4													2	1	1	0	0							
32	22	13	0	58	19	17			8	4		8													5	2	2	0	0							
33	5	3	0	14	4	4			2	1		2													1	1	0	0	0							
34																																				
35																																				
36																																				

Internal Residential Trips – AM Peak

Zone	30	31	32	33	34	35	36
30					87	7	7
31					23	2	2
32					43	4	4
33					10	1	1
34	31	8	16	4			
35	3	1	1	0			
36	3	1	1	0			

External Residential Trips – PM Peak

Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
1																														40	11	20	5			
2																														23	6	12	3			
3																														1	0	0	0			
4																														104	28	52	12			
5																														34	9	17	4			
6																														30	8	15	3			
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9																														13	4	7	2			
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24																																				
25																														8	2	4	1			
26																														4	1	2	0			
27																														3	1	1	0			
28																														1	0	0	0			
29																														1	0	0	0			
30	22	13	0	58	19	16			7	4		7													4	2	1	0	0							
31	6	3	0	15	5	4			2	1		2													1	1	0	0	0							
32	11	6	0	29	9	8			4	2		4													2	1	1	0	0							
33	3	1	0	7	2	2			1	0		1													1	0	0	0	0							
34																																				
35																																				
36																																				

Internal Residential Trips – PM Peak

Zone	30	31	32	33	34	35	36
30					2	3	3
31					1	1	1
32					1	1	1
33					0	0	0
34	4	1	2	0			
35	5	1	2	1			
36	5	1	2	1			

Employment Trips (Car/LGV) – AM Peak

Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
1																																		2	14	14
2																																		1	6	6
3																																		0	0	0
4																																		2	15	15
5																																		2	10	10
6																																		1	9	9
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30																																				
31																																				
32																																				
33																																				
34	0	0	0	0	0	0				0				0								0														
35	3	1	0	3	2	2				1				1								1														
36	3	1	0	3	2	2				1				1								1														

Employment Trips (HGV) – AM Peak

Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
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Employment Trips (Car/LGV) – PM Peak

Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
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36	10	4	0	11	7	6				4				5								5														

Employment Trips (HGV) – PM Peak

Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
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Coltishall and Horstead Forecast Model Report

The Client ESCO Developments, Flagship Housing Group and Lovell Partnerships

22nd September 2023

Delivering a better world

Quality information

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Revision History

Revision	Revision date	Details	Authorized	Name	Position

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Tables

1. Introduction

Background

1.1 ESCO Developments, Flagship Housing Group and Lovell Partnerships ('The Client Group') have commissioned AECOM to develop Vissim forecast models of the villages of Coltishall and Horstead to assess the future operation of the road network and the potential impact of the North Walsham Western Urban Extension (NWWUE).

1.2 The Vissim models have been developed for the 2036 year to assess the impact of the NWWUE development and predict the future traffic conditions in the model area. The growth in traffic demand and the additional demand generated by the NWWUE has been calculated in line with the Draft Transport Assessment (TA) developed by AECOM.

1.3 This Forecast Modelling Report documents the development of the models from the base year scenario and presents the results of the future year assessments.

Base Vissim Model

1.4 The 2022 Vissim Base model for Coltishall and Horstead has been used as a starting point to develop the forecast scenarios. AECOM developed and validated the Vissim Base model in late 2022.

1.5 The Base model was successfully calibrated and validated to replicate the existing operation during the traffic surveys, for the Coltishall and Horstead modelled area, as shown in Figure 1-1. Further details regarding the Base model operation and the calibration and validation results can be found in the Vissim Local Model Validation Report (LMVR) for Coltishall and Horstead.

Figure 1-1 Coltishall and Horstead Vissim Model Area

1.6 The forecast year models have been developed for the 2036 forecast year. The models were developed for the Weekday AM and PM peak hours, defined as 07:45 – 08:45 and 16:30 – 17:30. Fifteen-minute warm-up and cool-down periods have also been modelled to saturate the network with traffic, before the evaluated peak hour, and allow journeys to complete after the peak hour.

Model Purpose

1.7 The forecast models have been used to assess the operation of the network in 2036 in line with the forecast assumptions contained in the Transport Assessment for the NWWUE. Three different scenarios: 'Do Minimum', 'Do Something', and 'Do Something with Mitigation' have been developed for the 2036 forecast year. Definition of these scenarios and the changes they include from the base modelling can be found in Table 2-1.

1.8 The operation of the Do Minimum model was used as a benchmark to assess the impact of the trips generated by the NWWUE which were included in the Do Something scenarios.

Report Structure

1.9 The remainder of the report is structured as follows:

- Section 2 outlines the development of the forecast models and scenarios that have been tested;
- Section 3 describes the demand development methodology for the future year;
- Section 4 describes the assignment methodology;
- Section 5 presents and analyses the forecast modelling results;
- Section 6 presents and analyses the operation of the key areas; and
- Section 7 provides a summary and concludes the forecast modelling.

2. Forecast Model Development

Overview

2.1 The Coltishall and Horstead forecast models were coded using the same version of Vissim 21.00-12 (64-bit) used to develop the 2022 Base models. This section outlines the changes made to the Base models to build the forecast models.

2.2 Three forecast model scenarios were developed:

- 2036 'Do Minimum' model for AM and PM peak periods;
- 2036 'Do Something' model for AM and PM peak periods; and
- 2036 ‘Do Something with Mitigation’ model for AM and PM peak periods.

2.3 The networks and demand flows used for each of the scenarios are set out in Table 2-1 below.

Table 2-1 Forecast Scenarios

Scenario	Network	Demand
2036 Do Minimum	Base Model network	2022 Base * 2022-2036 Growth Factor
2036 Do Something	Base Model network	2036 Do Minimum + NWWUE 2036 Demand
2036 Do Something with Mitigation	Base Model network + Right-turn lane on Norwich Road + Removal of on-street parking on High Street	2036 Do Minimum + NWWUE 2036 Demand

Network Coding

2.4 There are no proposed changes to the network in the 2036 Do Minimum and Do Something scenarios, so all modelling features - such as the desired speed decisions, reduced speed areas, public transport and priority rules remain consistent with the Base models.

2.5 The Do Something with Mitigation scenario includes a network change along B1150 Norwich Road, where a 20-metre right turn pocket is introduced to avoid right turners to the B1354 Church Street blocking northbound traffic on B1150 Norwich Road. The general layout of this infrastructure change can be seen in Figure 2-1 below.

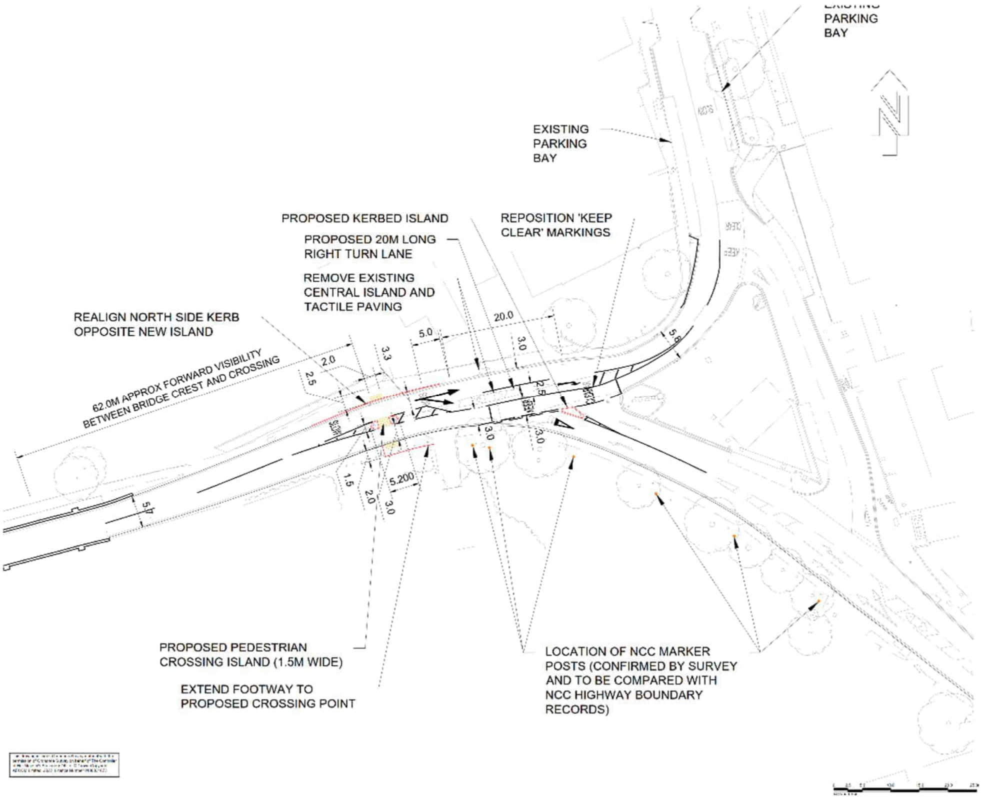

Figure 2-1 B1150 Norwich Road Proposed Infrastructure Change Layout

2.6 The Do Something with Mitigation scenario also includes removal of on-street parking along High Street in the PM peak. The PM base model includes a section of carriageway where traffic cannot pass in both directions at the same time, to replicate observed behaviour caused by the on-street parking. This is not included in the AM peak base year as this behaviour/ parking was not observed, with traffic flowing freely along this section. The presence of parked cars can be seen in Figure 2-2, in an image taken from Google StreetView. This image shows that cars are parked on both sides of the street, which limits the road space available for vehicles to pass. In addition, Figure 2-3 shows a still taken from the in-vehicle footage used to survey journey times in the PM period, which shows how parked cars impede the free flow of traffic in both directions.

Figure 2-2 Parked cars on High Street

Figure 2-3 PM queuing on High Street, from floating car footage

2.7 It should be noted that the links at the edges of the forecast models have been extended to allow the models to capture the full extent of longer queues caused by the increased traffic volumes in future years. These are only theoretical extensions, so the full extent of the delay is reported in the results, however, this does not represent any change to the modelled area.

3. Future Year Demand

Introduction

3.1 The forecast demand included in the Vissim models has been derived from the Transport Assessment (TA) developed by AECOM.

Zoning

3.2 Since the forecast models do not include any significant network changes from the base models, the zoning system developed for the Vissim Base models remains unchanged in the forecast scenarios.

3.3 A map of the zones from the forecast scenarios has been reproduced below in Figure 3-1.

Figure 3-1 Vissim Forecast Model Zone Map

Demand Methodology

3.4 The forecast Vissim demand matrices were derived using the growth factors and the trip distribution from the TA developed by AECOM. A complete list of the development demand matrices can be found in Appendix A.

3.5 Table 3-1 shows the growth factors derived from the Trip End Model Presentation Program (TEMPro) for each forecast year. These have been taken from the TA. These growth factors were applied to the base model demand matrices to uplift traffic volumes for the Do Minimum scenarios.

Table 3-1 Growth Factors

Vehicle Type	2036 AM	2036 PM
Car	1.084	1.080
LGV	1.084	1.080
HGV	1.050	1.050

3.6 The NWWUE trip generation and trip distribution assumptions included in the TA have been used to derive the number of additional trips and routes through Coltishall and Horstead associated with the NWWUE. Table 3-2 details the additional development-related trips included in the Do Something and Do Something with Mitigation models which would travel through Coltishall and Horstead on their journey to and from the development. Full details of the forecast demand changes can be found in Appendix A.

Table 3-2 WUE Development Demand

Development Demand	2036 AM	2036 PM
Car / LGV	260	251
HGV	0	0

3.7 It should be noted that the development trip totals were provided split into two vehicle types: Cars/Light Good Vehicles (LGVs) and Heavy Goods Vehicles (HGVs). However, the Vissim models categorise Cars and LGVs as separate vehicle types. To account for this, Car and LGV proportions were calculated from the base matrix and used to split the development demand.

3.8 The development of additional demand from Zone 4 to itself included in the figures provided by the TA was manually reduced to 0 in the Vissim model. These trips were determined to be U-turns that would realistically occur outside the modelled area.

3.9 The absolute demand changes for each Origin-Destination (OD) pair were applied by vehicle class (Cars, LGVs and HGVs) to the base peak hour matrices from the Vissim base model to develop the Forecast demand matrices.

3.10 The forecast peak hour matrices were profiled into 15-minute periods using the same profiles used in the Vissim base model matrices to develop each 15-minute matrix, creating six matrices for each vehicle type.

4. Model Assignment and Evaluation

4.1 The assignment methodology used in the forecast models has been kept consistent with the base models and as set out in the LMVR.

4.2 The evaluation results are based on the average of 20 simulation runs with different random seeds. Different random seeds randomise the release of vehicles into the network, resulting in a different chain of events, replicating daily variability.

5. Model Results

Introduction

5.1 This section presents the analysis of results for the Base, Do Minimum, Do Something, and Do Something with Mitigation forecast scenarios. The results were extracted for the following models:

- Base (2022) – AM and PM peak hours;
- Do Minimum (2036) – AM and PM peak hours;
- Do Something (2036) – AM and PM peak hours; and
- Do Something with Mitigation (2036) – AM and PM peak hours.

5.2 The analysis in the following section has been divided into the AM and PM peak hours which have unique characteristics. A detailed analysis of the critical areas in the network is provided in Section 6.

AM Results

5.3 This section presents results for the full modelled network in the AM period and includes an analysis of average delay, plots of average speeds and journey times within the modelled area.

Network Performance – AM Peak

5.4 The Network Performance results and average speed plots have been extracted from the models to assess the operation of the overall network. These results provide the overall delays for each scenario to enable comparison of the performance of the network in each scenario.

Average Delay

5.5 Figure 5-1 shows the average delay per vehicle within the network for the four scenarios for the AM peak hour.

5.6 The graph shows that there is a large increase in average delay per vehicle in the Do Minimum, Do Something, and Do Something with Mitigation scenarios, when compared to the base scenario. The Do Minimum scenario increases to an average of 118 seconds per vehicle from 84 seconds per vehicle in the Base. While the Do Something scenario has the greatest average delay, increasing to 236 seconds per vehicle. However, when the mitigation is in place, the average delay is reduced to 141 seconds per vehicle, so the mitigation is predicted to offset most of the impact of the additional NWWUE trips, so the development would only increase delay by 23 seconds on average.

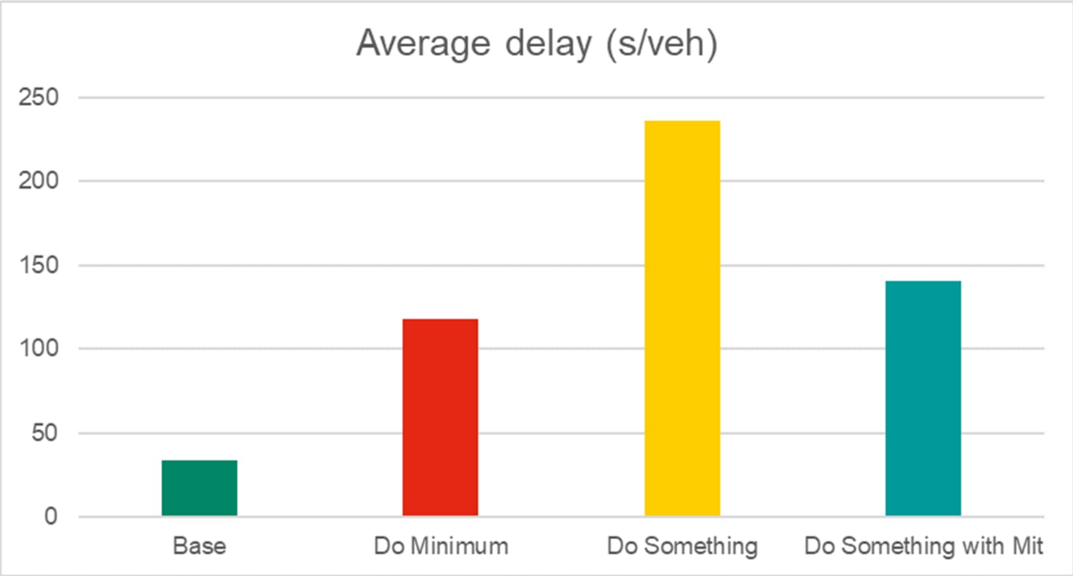

Figure 5-1 Average AM Delay

Average Speed Plots

5.7 The average speed results have been plotted on the modelled network for the AM Base and the three AM forecast scenarios and these are shown in Figure 5-2 through to Figure 5-5.

5.8 The increase in NWWUE demand included in the Do Something scenario increases queues through Coltishall, as shown in Figure 5-4. A significant proportion of this congestion originates from the right turn from Norwich Road to the B1354, just before the garage; the increase in southbound traffic volumes significantly reduces the gaps available for right-turning vehicles, blocking the eastbound and northbound movements. The speeds are higher in the Do Something with Mitigation scenario, due to the provision of a right-turn pocket, allowing traffic to flow more freely on the B1150 Norwich Road northbound.

Figure 5-2 Base AM Average Speeds

Figure 5-3 2036 AM Do Minimum Speeds

Figure 5-4 2036 AM Do Something Speeds

Figure 5-5 2036 AM Do Something with Mitigation Speeds

Journey Time Results – AM Peak

5.9 Journey time data has been extracted for the forecast model for the two journey time routes which were validated in the base model. The results have been used to compare delays across the forecast scenarios for the AM peak hour. Figure 5-6 shows the two journey time routes defined within the model area.

Figure 5-6 Coltishall and Horstead Routes

5.10 Journey Time Route (JTR) 1 is along the B1150 Station Road and High Street to the junction of the B1150 and B1354 to the south of the Petrol Filling Station (PFS) in the centre of Coltishall. Journey Time Route

(JTR) 2 extends along the B1150 Norwich Road from the junction with Green Lane, over the river bridge and along the B1354 to the junctions with Kings Road.

5.11 Figure 5-7 to Figure 5-10 show the modelled results for the Base and all forecast scenarios in the AM peak hour, for the defined routes.

5.12 The journey time results for the forecast models are broadly similar for all routes when compared to the Base. For the JTR 1 in the northbound direction, the Do Minimum, Do Something and Do Something with Mitigation scenarios have similar journey times to the Base in both directions, although the Do Something journey times are slightly longer overall.

5.13 The journey times for JTR 2 westbound are also broadly similar for all forecast scenarios, although there is an increase of just under 20 seconds in the Do Something scenarios.

5.14 The journey times on JTR 2 eastbound are consistent with the average speed analysis above, with significant increase in journey times in the Do Something scenario, relative to the Do Minimum due to blocking back from the right turn into the B1354, which results in longer queues. However, it can be seen than the provision of the right turn pocket in the Do Something with Mitigation scenario, significantly reduces journey times, bringing them down to a similar level to the Do Minimum scenario.

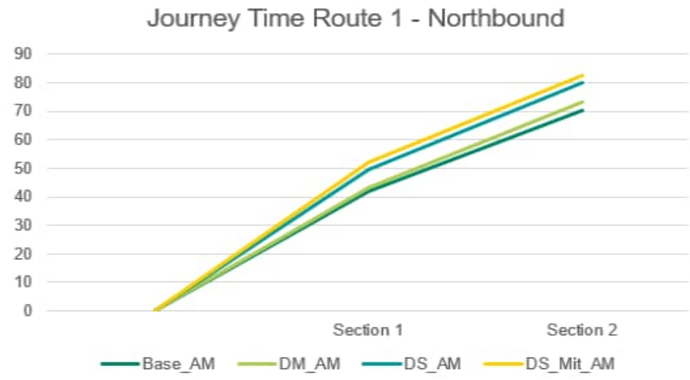

Figure 5-7 Journey Time Route 1 – Northbound

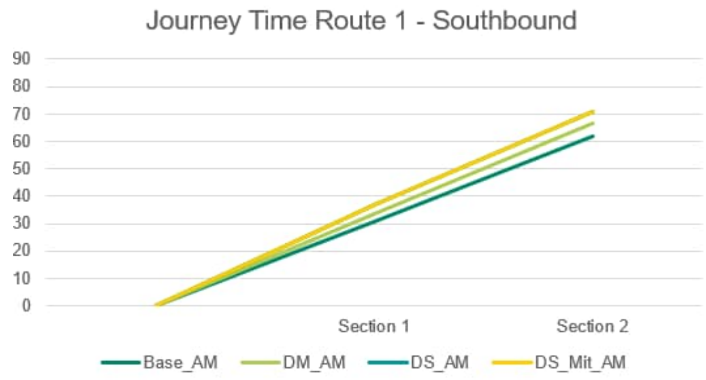

Figure 5-8 Journey Time Route 1 – Southbound

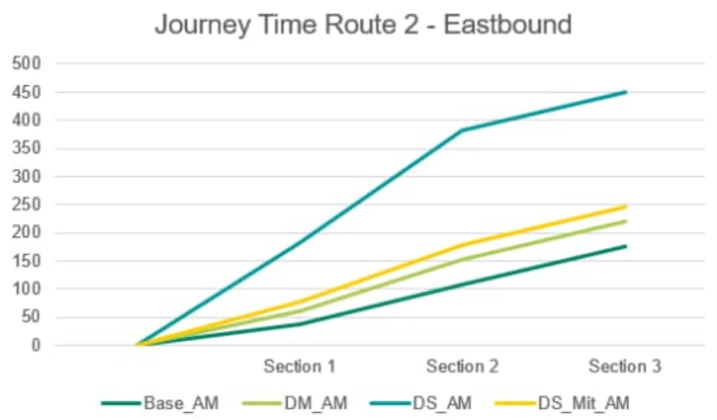

Figure 5-9 Journey Time Route 2 – Eastbound

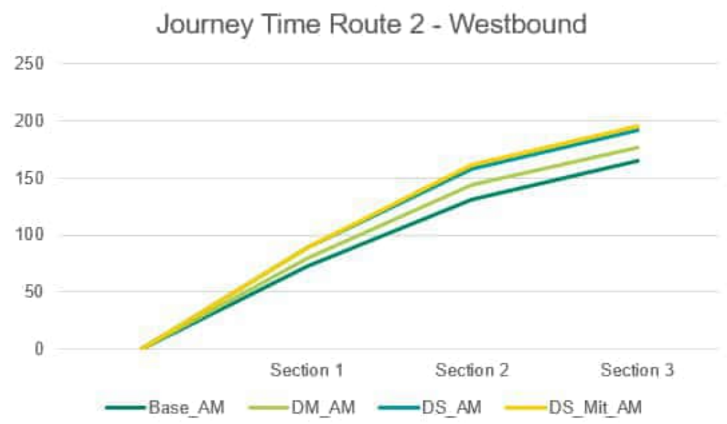

Figure 5-10 Journey Time Route 2 – Westbound

PM Results

5.15 This section presents the network performance results for the modelled network in the PM peak hour. It includes an analysis of average delay, average speed results and journey times within the modelled area as a whole.

PM – Overall Network Performance

5.16 The Network Performance results and average speed plots have been extracted from the model to assess the operation of the entire network. These results provide an overview of the delays in each scenario for comparison.

Average Delay

5.17 Figure 5-13 shows the average delay per vehicle within the network across the four PM scenarios.

5.18 The graph shows there is a significant predicted increase in delay in the Do Minimum scenario relative to the Base year, with delay increasing from 48 seconds per vehicle to 145 seconds per vehicle. When the additional NWWUE trips are added this delay increases to 321 seconds per vehicle. The main causes of this additional delay is queuing at the parked cars (observed in the PM scenario and modelled in the base year) which allow only one direction of traffic to pass at a time.

5.19 The average delay per vehicle is reduced to 137 seconds per vehicle in the Do Something with Mitigation scenario, showing that the proposed mitigation offsets the impact of the development traffic in the PM peak, with average delay below the level in the Do Minimum.

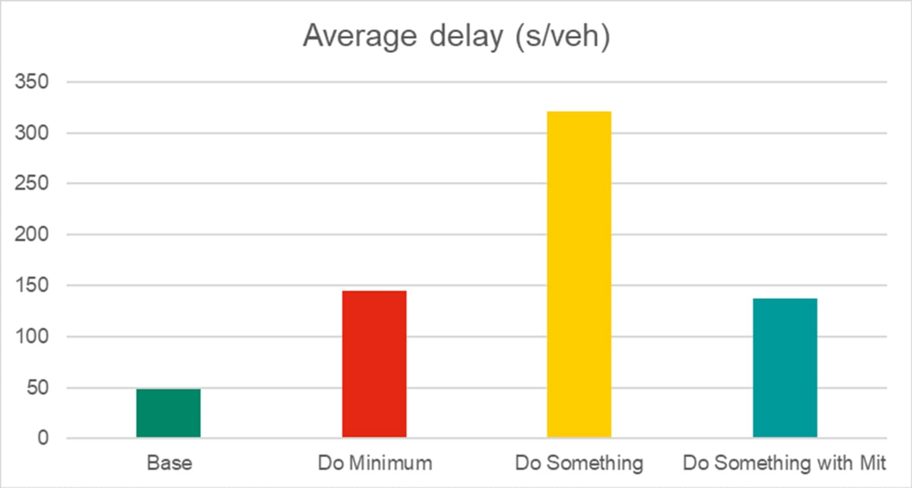

Figure 5-11 Average PM Delay

Average Speed Plots

5.20 The average speed results for the Base PM models and the three forecast scenarios are shown in Figure 5-12 to Figure 5-15 below.

5.21 The speed plots show how the additional demand added in the Do Minimum, Do Something and Do Something with Mitigation scenarios increases the queue lengths (red and dark red areas) in the network, especially along the High Street area.

5.22 The results show how the additional demand added to each scenario gradually increases the queue lengths (red and dark red areas) in the network, especially along the High Street area, as shown in Figure 5-14. This queue along the B1150 is caused by a section of the High Street effectively being a single lane due to on-street parking in the PM peak. Furthermore, over 90% of the NWWUE development trips that travel through Coltishall do so via the High Street, resulting in queues building up along the B1150.

5.23 It should be noted that the operation of this movement was highlighted as a capacity pinch point in the base model. The operation and cooperative behaviour along the one-way section of the High Street is dependent on the arrival patterns and demand levels in northbound and southbound directions.

5.24 The Do Something with Mitigation scenario assumes that parking restrictions will avoid vehicles parking on street in this short section of the High Street which has such a significant impact on two-way flow. The models predict that the queues and delay along High Street would be reduced significantly, increasing the speeds of vehicles along that route.

Figure 5-12 Base PM Speeds

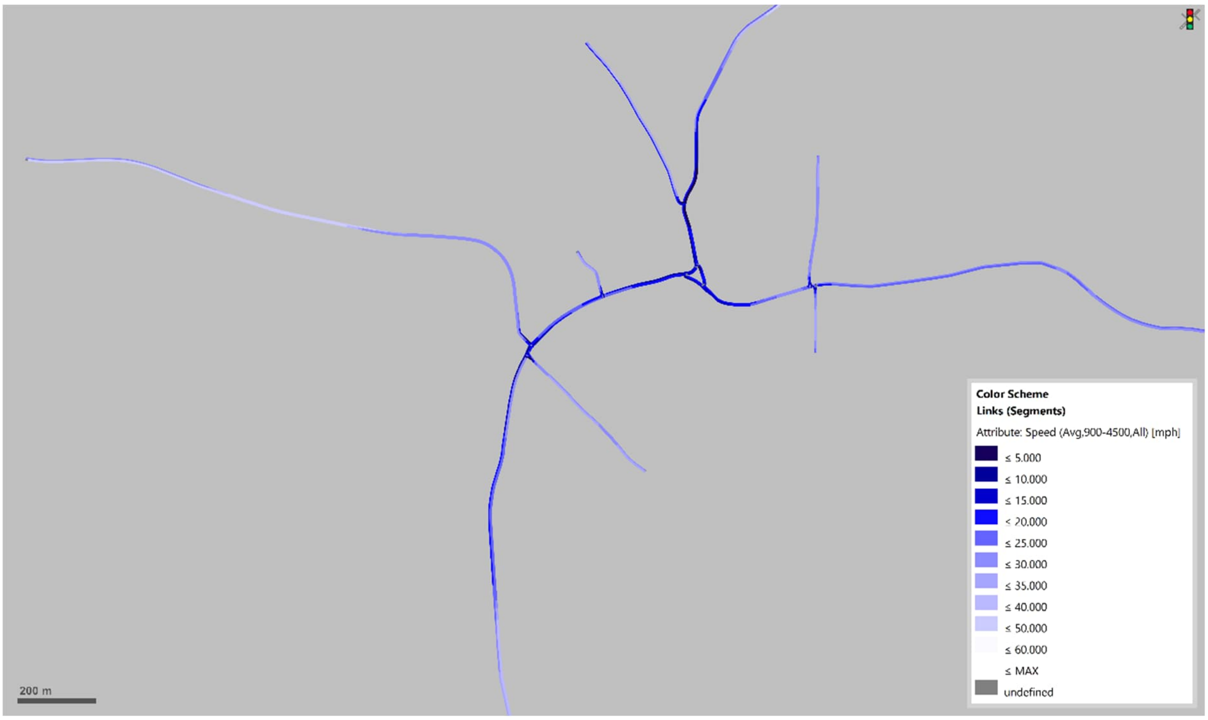

Figure 5-13 2036 PM Do Minimum Speeds

Figure 5-14 2036 PM Do Something Speeds

Figure 5-15 2036 PM Do Something with Mitigation Speeds

Journey Time Results – PM Peak

5.25 Modelled journey times have been extracted for the two routes which were validated in the base model and compared across scenarios. These are shown in Figure 5-6.

5.26 Figure 5-16 to Figure 5-19 show the modelled results for all the forecast scenarios along the base year journey time routes in the model.

5.27 The journey time results show that the operation of High Street, where traffic cannot pass in both directions at once at the parked cars, has an impact on the results for Journey Time Route (JTR) 1 (northbound and southbound) in the Do Minimum and Do Something scenarios, with the delay increasing as traffic volumes increase.

5.28 In the northbound direction, the journey time is 103 seconds in the Do Minimum and 60 seconds higher in the Do Something. In the Do Something with Mitigation scenario, where the on-street parking on the High Street is restricted, the journey time is reduced and is 17 seconds faster than the Do Minimum.

5.29 Similarly, in the southbound direction, the 2036 Do Minimum results show that it will take 161 seconds to travel along the full route. The journey times along this route are predicted to increase significantly in the Do Something scenario, as a result of the additional development demand. However, the model results show that the two way operation due to removal of parked cars in the Do Something with Mitigation scenario will completely offset the development impact, reducing the journey times along this route to only 67 seconds.

5.30 For JTR 2 eastbound the removal of on-street parking also has a positive effect, reducing the Do Something with Mitigation journey time to a similar level as the Do Minimum scenario.

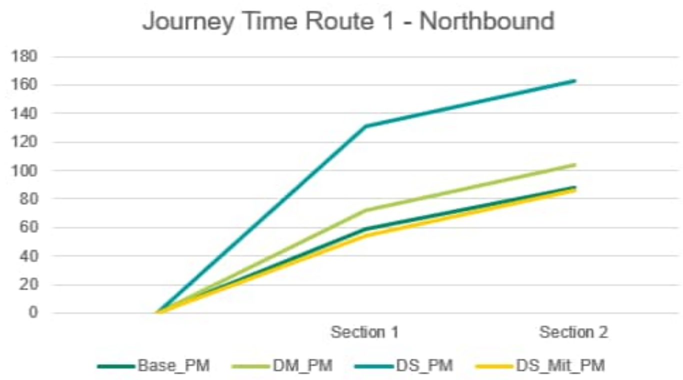

Figure 5-16 Journey Time Route 1 – Northbound

Figure 5-17 Journey Time Route 1 – Southbound

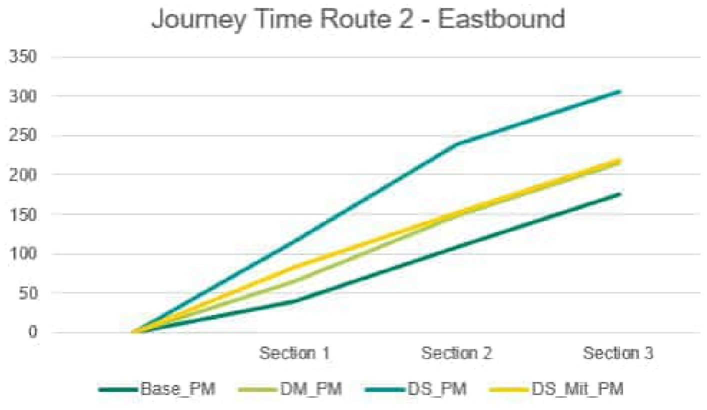

Figure 5-18 Journey Time Route 2 – Eastbound

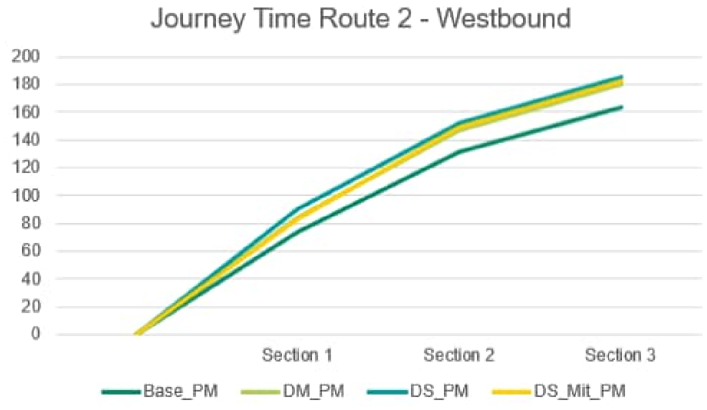

Figure 5-19 Journey Time Route 2 – Westbound

6. Junction Analysis

Introduction

6.1 Figure 6-1 below shows the key junctions/ locations identified from the survey data/ observations in the model area that most impact network operation.

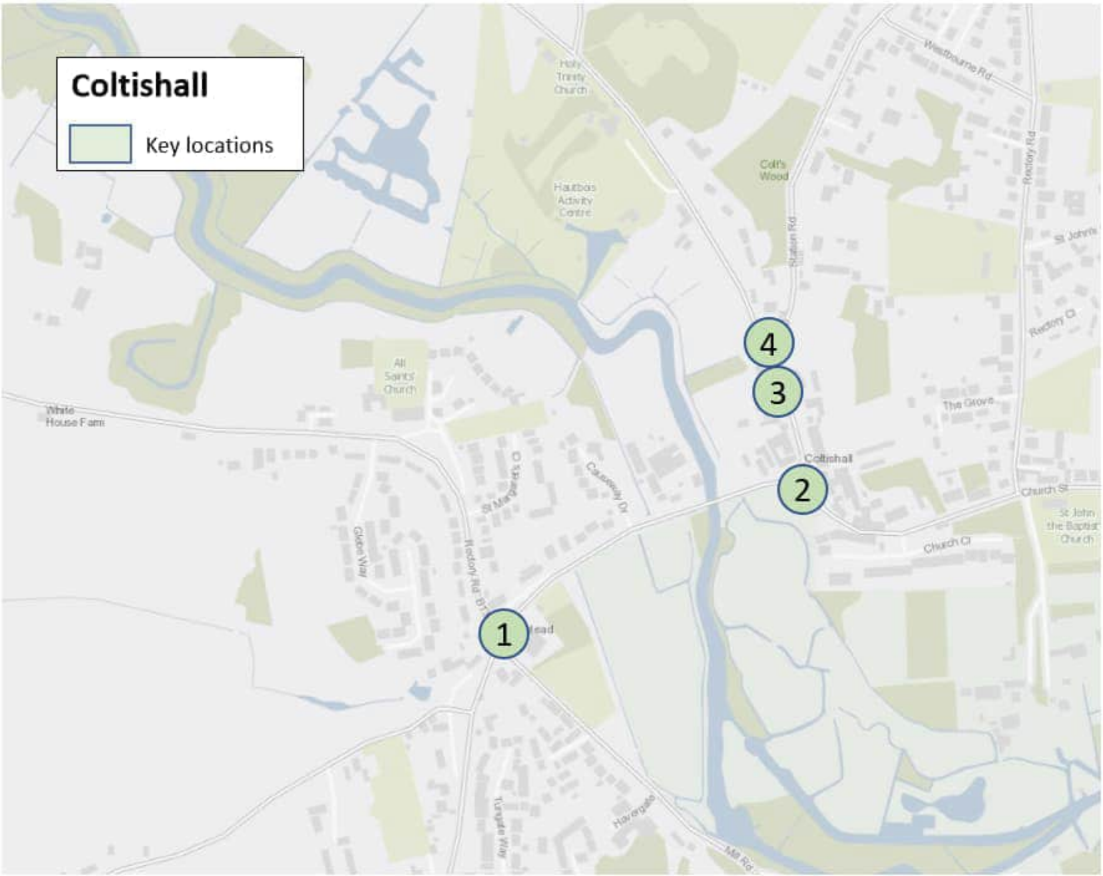

Figure 6-1 Key locations in Coltishall and Horstead

6.2 The key locations are defined as follows:

1.Rectory Road/ B1150 roundabout;

2. High Street/ B1354 gyratory at the Petrol Filling Station;

3. High Street at the war memorial; and

4. High Street / Great Hautbois Road priority junction.

6.3 These locations have been analysed individually in the models to extract queue and delay results for the Do Minimum, Do Something and Do Something with Mitigation scenarios, to provide an assessment of the NWWUE development impact.

6.4 It should be noted that the operation of some of these critical locations depends on variable factors such as on-street parking and courtesy/give-way behaviours, which have been modelled and calibrated to observed queuing patterns/ levels of delay.

Rectory Road / Norwich Road Roundabout (1)

6.5 Figure 6-2 shows the queues and delays at the AM peak hour at the Rectory Road / Norwich Road Roundabout. The queue results are set out in the top junction layout and the delays are in the bottom junction layout.

6.6 The model results show that the NWWUE development demand included in the Do Something scenario results in a small increase in queues and delays at the junction.

6.7 It is worth noting that this delay and queue have been analysed with this junction operating in isolation – the full model results show that the queue from B1150 Norwich Road at the gyratory would impact this junction in some scenarios.

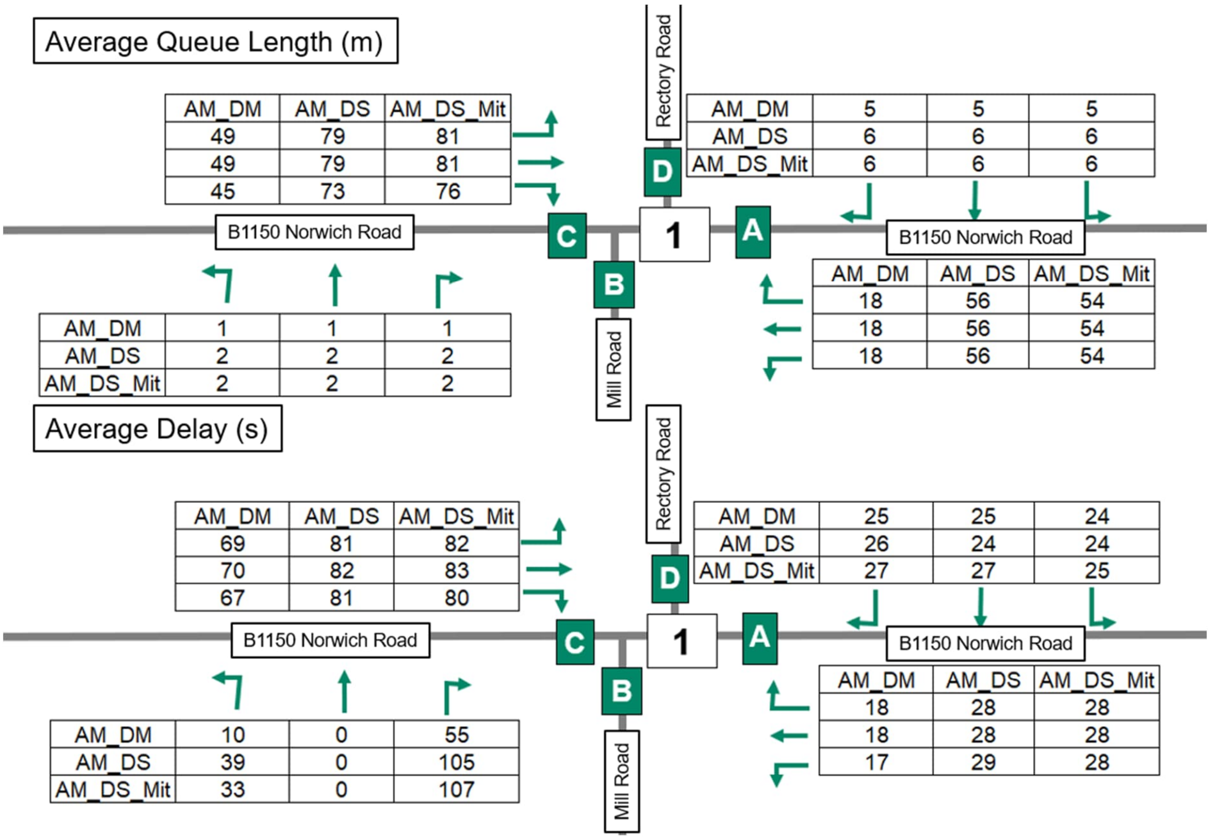

Figure 6-2 Queues in metres and delay in seconds - AM peak

6.8 Figure 6-3 shows the queues and delays in the PM peak hour at the Rectory Road / Norwich Road mini-roundabout.

6.9 The model results show that the NWWUE development demand included in the Do Something scenario results in approximately 30 seconds more delay on Norwich Road northbound. The delay increase is also reflected in a longer section of slow-moving traffic approaching the roundabout, approximately 100 metres in length. The queues and delay in the Do Something with Mitigation scenario are similar.

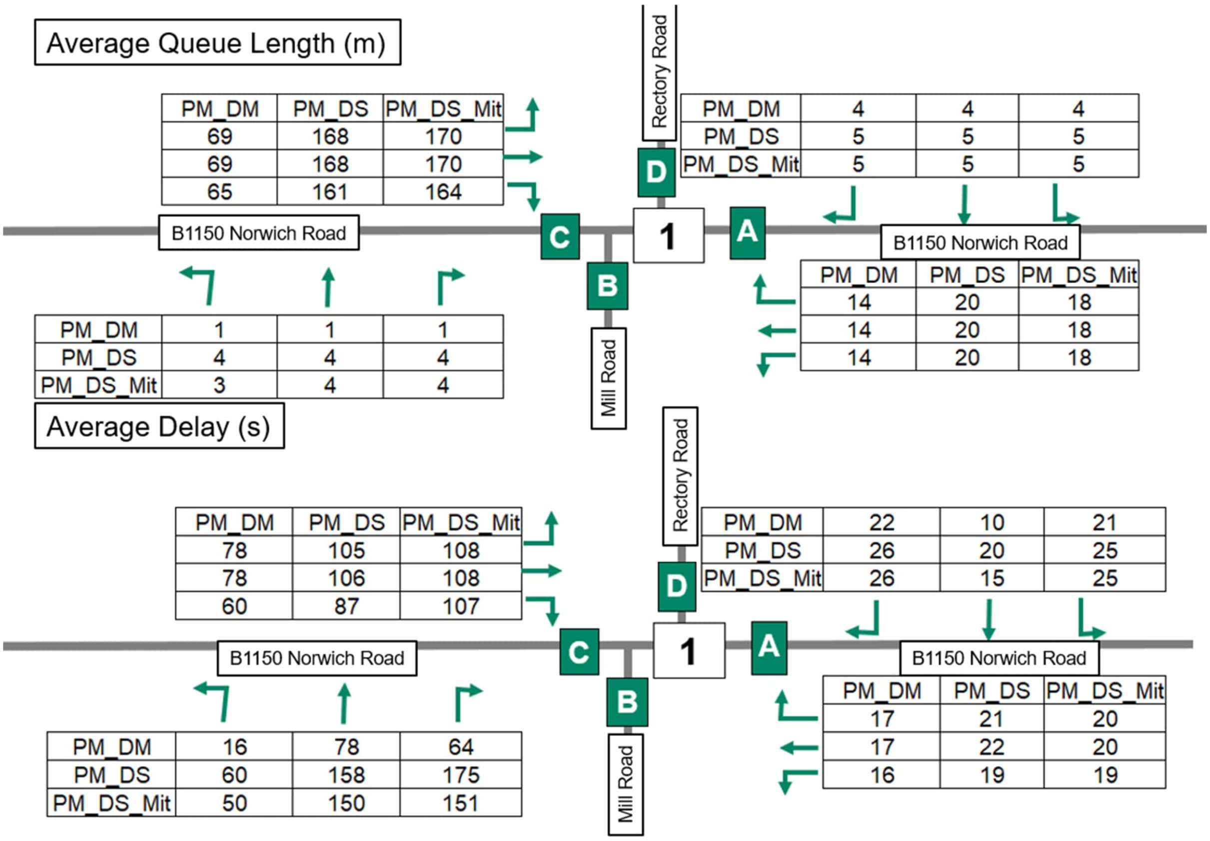

Figure 6-3 Queues in metres and delay in seconds - PM peak

Norwich Road and B1354 Gyratory (PFS) (2)

6.10 Figure 6-4 shows the queues and delays at the gyratory between Norwich Road and B1354 in the AM peak hour.

6.11 The model results show that the NWWUE development trips in the Do Something scenario result in approximately 80 seconds more delay on the eastbound approach to the gyratory. The increase in delay is also reflected in longer queues, approximately 390 metres in length, on the eastbound approach.

6.12 The junction analysis results show that the right turn from Norwich Road to the B1354, just before the Petrol Filling Station (PFS), is over capacity with the Do Something forecast trips. The additional southbound traffic volumes in this scenario result in fewer gaps for right turners, so right turners block vehicles travelling ahead.

6.13 The results for Do Something with Mitigation scenario, where a right turn pocket is provided, has a similar queue length and delay as the Do Minimum scenario along B1150 Norwich Road eastbound, effectively mitigating the impacts of the NWWUE development.

6.14 There are no significant increases or reductions in delay across the other arms.

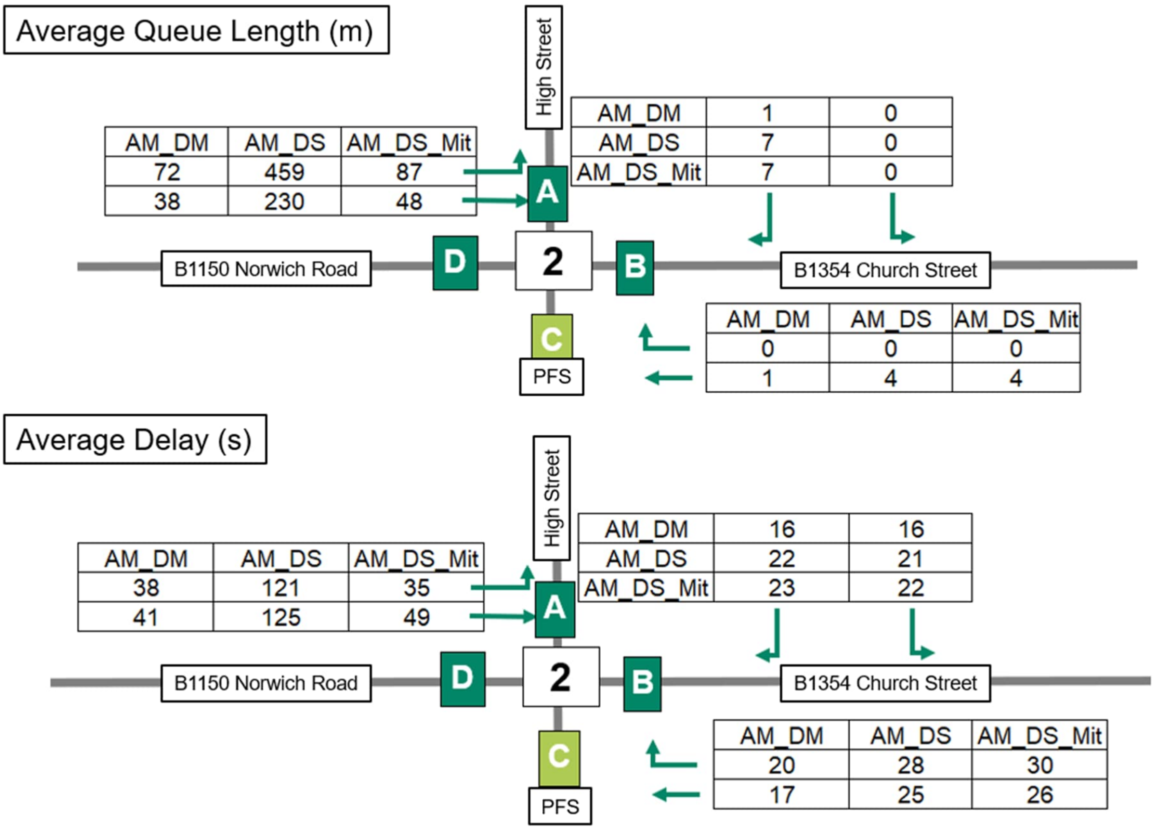

Figure 6-4 Queues in metres and delay in seconds - AM peak

6.15 Figure 6-5 shows the queues and delays at the gyratory between Norwich Road and B1354 (PFS) in the PM peak hour.

6.16 The model results show that the NWWUE development demand in the Do Something scenario increases queues and delays along B1150 Norwich Road eastbound by approximately 150 metres and 40 seconds respectively. The Do Something with Mitigation scenario, however, reduces the queues and delays to lower levels that in the Do Minimum scenario; the mitigations (right turn pocket and removal of on-street parking o the High Street), effectively mitigate the impacts of both the NWWUE and the projected growth in the area.

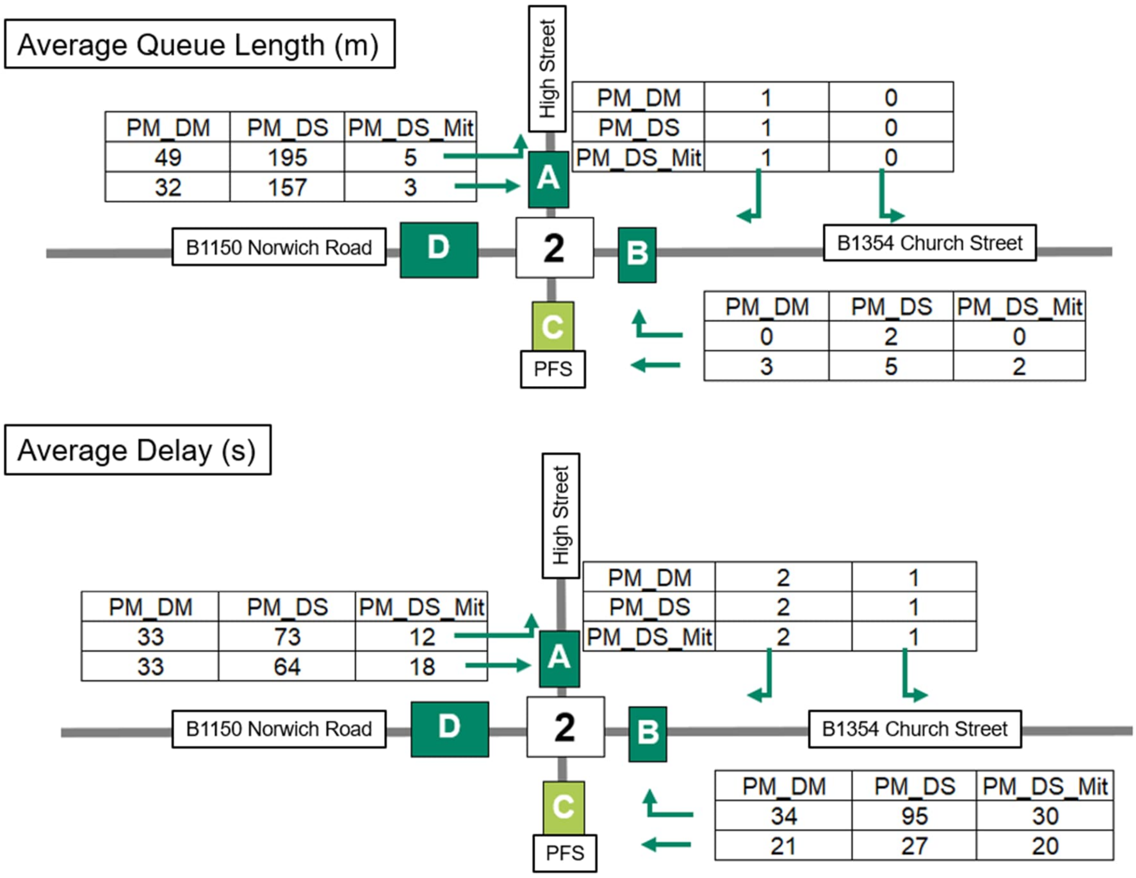

Figure 6-5 Queues in metres and delay in seconds - PM peak

High Street (3)

6.17 Figure 6-6 shows the queues and delays at High Street northbound and southbound in the AM peak hour.

6.18 There are no queues and no significant delays in any scenarios, which is consistent with the Base model where there are no vehicles parked on-street in the AM causing vehicles to give way.

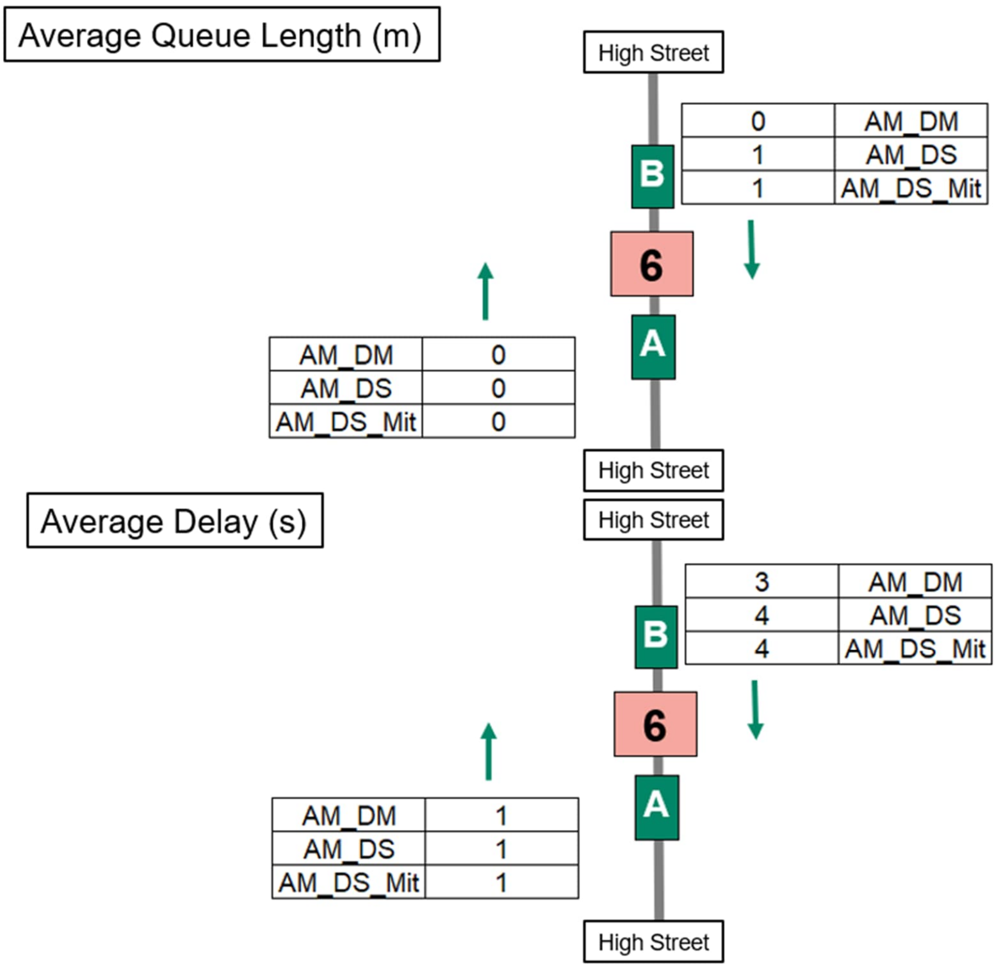

Figure 6-6 Queues in metres and delay in seconds - AM peak

6.19 Figure 6-7 shows the queues and delays on the High Street in the PM peak hour.

The Do Minimum model results show a southbound queue of approximately 120 metres long and 108 seconds of delay caused by the section where two way flow isn't possible, which is caused by the on-street parking.

6.20 The Do Something scenario shows a significant increase in the queues and delays due to the NWWUE development demand along this route. It should be noted that due to the cooperative nature of the calibrated driving behaviour in the model where parking limits capacity, the increase in queue lengths is not directly related to the direction of the flow.

6.21 The Do Something with Mitigation scenario, which removes the on-street parking on High Street, removes all restrictions along the road therefore allowing traffic to flow freely without having to give way. This means that there are average queue lengths of one metre and an average delay of 14 seconds along the southbound movement.

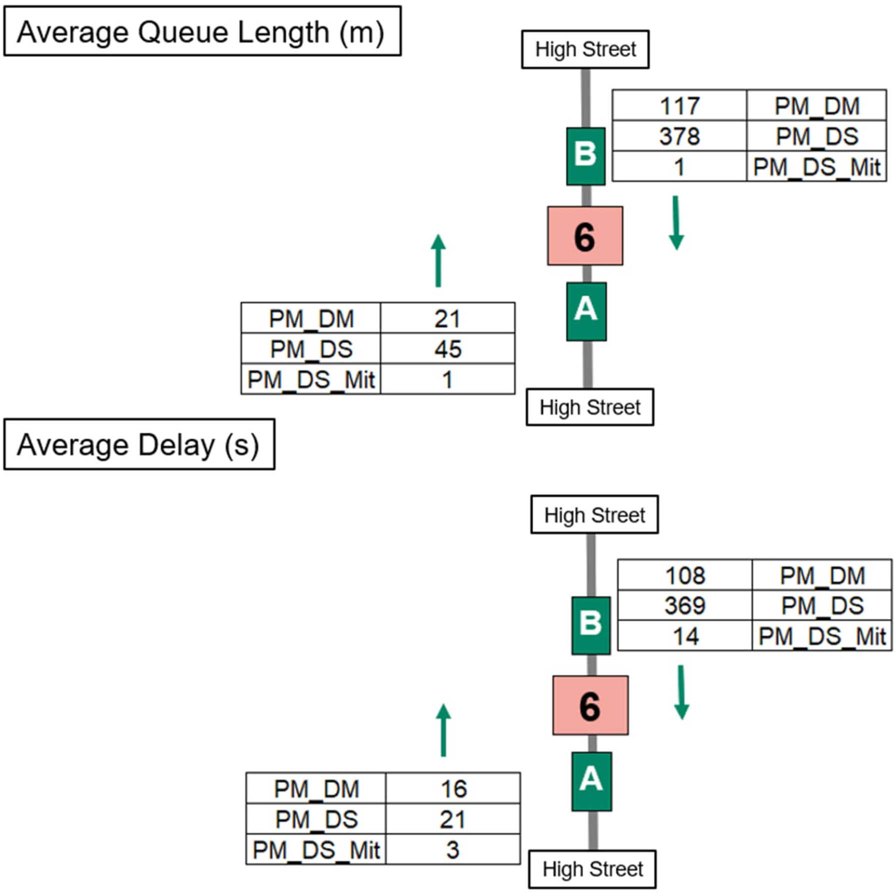

Figure 6-7 Queues in metres and delay in seconds - PM peak

High St / Gt Hautbois Rd / Station Rd Junction (4)

6.22 Figure 6-8 shows the queues and delays at the High Street / Great Hautbois Road / Station Road priority junction in the AM peak hour.

6.23 There are no average queues along High Street or Great Hautbois Road and an insignificant average queue length on Station Road in any of the forecast scenarios. There is a slight increase in delay and queue lengths from the Do Minimum to Do Something scenario along the Station Road arm, but this junction is predicted to operate within capacity when assessed in isolation.

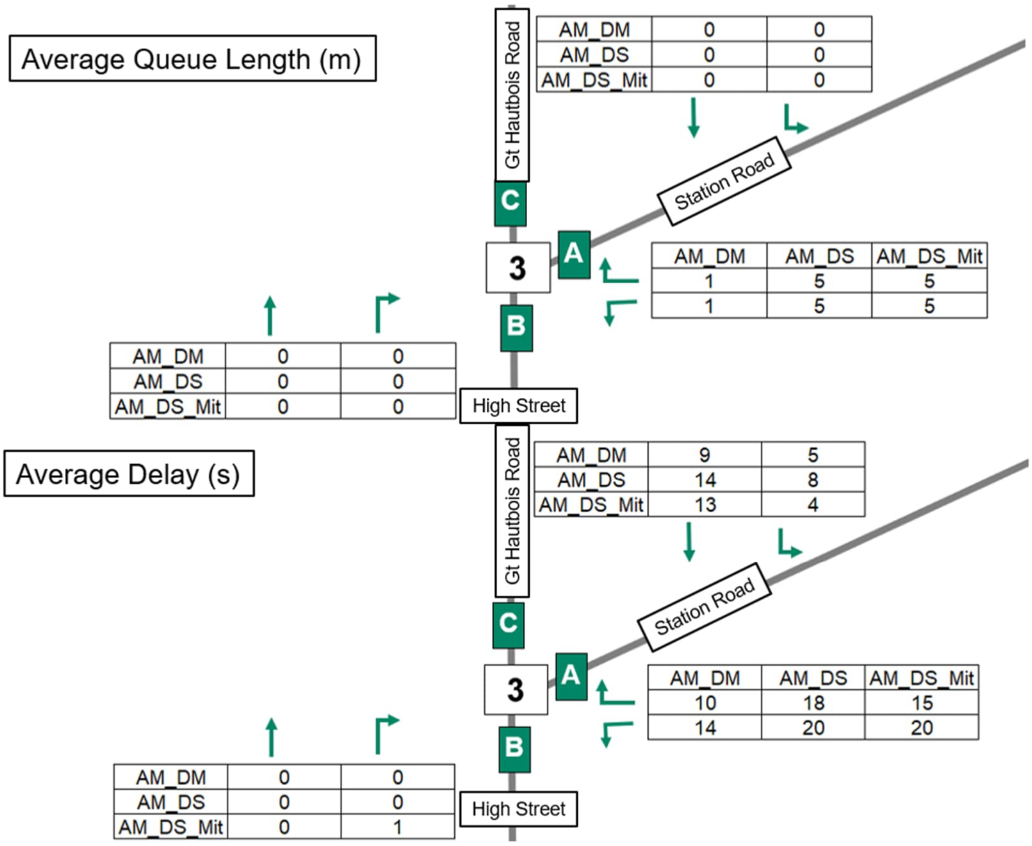

Figure 6-8 Queues in metres and delay in seconds - AM peak

6.24 Figure 6-9 shows the queues and delays on the High Street in the PM peak hour for the different scenarios tested. There is a slight increase in delay on Great Hautbois Road, however the junction operates within capacity when assessed in isolation.

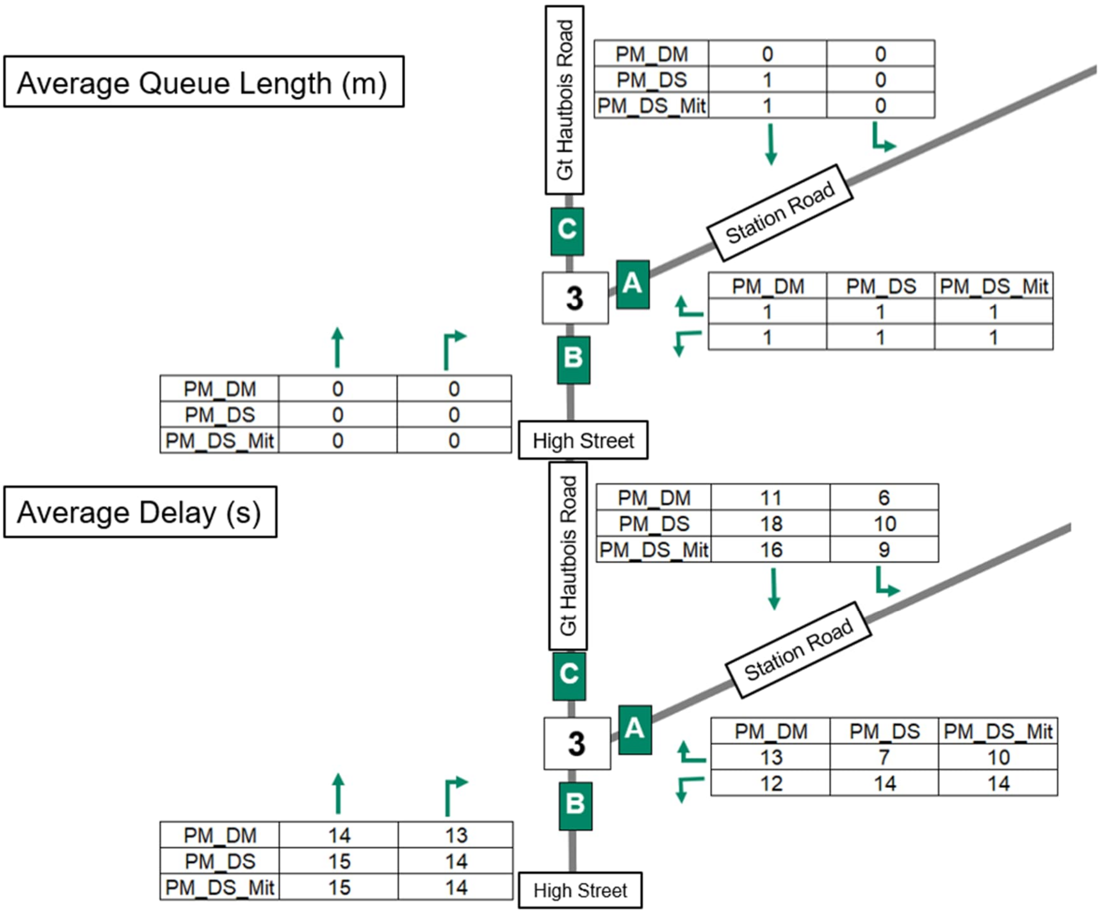

Figure 6-9 Queues in metres and delay in seconds - PM peak

7. Conclusions

7.1 The 2036 forecast Vissim models were developed to assess future network conditions and the impact of the North Walsham Western Urban Extension (NWWUE) development.

7.2 The predicted demand growth and the additional demand generated by the NWWUE taken from the Transport Assessment (TA) was added to the 2022 Vissim Base model demand to calculate the Vissim forecast demand for all the modelled scenarios.

7.3 The analysis of the modelling results has highlighted two key locations in Coltishall where increased queuing and delay are predicted in 2036 without the NWWUE development (the Do Minimum scenario). The models predict that these queues and delays will be significantly worsened as a result of the increase in traffic from the NWWUE.

7.4 Mitigations were identified and tested in the Do Something with Mitigation scenario: provision of a right turn pocket into the B1354 from Norwich Road to avoid blocking of the Norwich Road and removal of on street parking on a short stretch of the High Street to allow two-way movement. The models predict that almost all the development impact observed in the Do Something scenario in the AM and PM peaks would be mitigated for and that the performance of the network through Coltishall and Horstead would be similar to the Do Minimum scenario with the mitigations in place.

Appendix A – Demand Development Matrices

Table 7-1 2036 AM Forecast Demand

Zone	1	2	3	4	5	6	7	8	9	Sum
1				0.6						0.6
2				2.5						2.5
3										0.0
4	0.4	0.7		2.8		1.5			188.3	193.7
5										0.0
6				1.1						1.1
7				0.6						0.6
8										0.0
9				61.4						61.4
Sum	0.4	0.7	0.0	69.0	0.0	1.5	0.0	0.0	188.3	

Table 7-2 2036 PM Forecast Demand

Zone	1	2	3	4	5	6	7	8	9	Sum
1				0.4						0.4
2				0.6						0.6
3										0.0
4	0.7	2.9		2.9		1.3			71.8	79.6
5										0.0
6				1.4						1.4
7				0.4						0.4
8										0.0
9				168.6						168.6
Sum	0.7	2.9	0.0	174.3	0.0	1.3	0.0	0.0	71.8	

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Appendix G – Stage 1 Road Safety Audit Report and Designers Response

NORTH WALSHAM WESTERN EXTENSION: B1150 NORWICH RD CYCLE IMPROVEMENTS & AYLSHAM RD SHUTTLE WORKING

STAGE 1 SAFETY AUDIT

REPORT REF: B1150/025
August 2023

Report Prepared for: AECOM

Report Author: **Nevil Calder** BSc(Hons) CEng MICE MCIHT MSoRSA NH Cert Comp

Report Status:

Issue	Status	Purpose	Name/Signature	Date
1	Stage 1 Safety Audit Report	Client issue	Nevil Calder N Calder ……………………	22/08/23
2	Designer's Response	Designer response to Safety Issues raised	…Bevin Carey…. Bevin Carey ……….	29/09/23
Choose an item.	Choose an item.	Choose an item.	…………………… ……………………	

INTRODUCTION

This report contains the results of a Stage 1 Safety Audit carried out on the above scheme. The Audit was carried out at the request of AECOM on behalf of Norfolk County Council Growth and Development. A formal Audit Brief was not provided.

The Audit Team is independent of the project design team and has had no involvement with the project. The Audit Team membership was as follows:-

Nevil Calder BSc(Hons) CEng MICE, MCIHT, MSoRSA (Audit Team Leader)	Principal Engineer Highway Safety WSP
Kevin Allen BEng (Hons), I Eng, MCIHT, MSoRSA (Audit Team Member)	Project Engineer Network Safety + Sustainability Norfolk County Council

The Audit took place via online conferencing on 16 August 2023. The audit comprised an examination of the supplied documentation (see Appendix A) and a site inspection by the Audit Team Leader on 22 August 2023 at 10:20 which lasted around 30 minutes. During the site visit the weather was sunny and the road surface dry. Traffic flows were moderate and generally free flowing.

The terms of reference are as described in Community and Environmental Services Highways Service Manual Procedure SP03-07-P01. The Auditors have examined and reported only on the road safety implications of the scheme within the main report.

The proposal involves traffic management improvements in North Walsham in connection with the western urban extension of the town. The audited scheme comprises provision of shared-use foot/cycleway on approach to the railway station on Norwich Rd, together with introduction of signalised shuttle working on an existing narrow section of Aylsham Rd and foot/cycleway provision. The latter also involves a short length of one-way restriction on Skeyton New Road at its junction with Aylsham Rd.

The auditors have reviewed the five year (to end Mar 2023) collision record for the location. During this period there were 4 personal injury collisions (1 serious, 3 slight) recorded in vicinity of the Norwich Rd scheme but they appear to have no bearing on the proposals. There were no recorded collisions in vicinity of the Aylsham Rd proposals.

A comments section has been included in Appendix B. The issues noted are not necessarily safety issues. They relate either to wider network implications, safety issues identified outside the scope of the audited scheme or suitability of a particular design choice.

ITEMS RAISED AT PREVIOUS AUDIT

The Audit Team are not aware of any previous audit of this scheme.

ITEMS RAISED AT THIS STAGE 1 AUDIT

1.0 General

1.1 Problem – vehicle collisions with NMUs

Location – Aylsham Rd proposed signalised NMU crossings

The proposed location of 'toucan style' crossings within the signalised shuttle length is not one the Audit Team has met before. While the indicative signal staging is simple, the inter-green timings and mid-shuttle vehicle detection are not clear. The location of the signal controlled NMU crossings some 50m after the vehicle stop lines will require sufficient time for vehicles to clear the crossings before NMUs can safely receive a green signal. The Audit Team wonder whether such long clearance times might lead to driver adaptation? Also, since the vehicle stop lines are remote from the signal crossings; would a driver who overruns the start of vehicle red or is then delayed by some unforeseen event, subsequently stop 50m later at the NMU crossing's red signal without a further stop line? Any failure to stop would pose a risk of vehicle/NMU collision

Recommendation – that proposals for vehicle detection, inter-green timings and stop line location are subject to early design discussion with traffic signals specialists to ensure safe operation.

Designer's Response:

The vehicle detection, inter-green timings and stop line locations are to be implemented where appropriate at as part of the next stage of design.

Network Management Decision:

2.0 Alignment

2.1 Problem – vehicle/cycle overtake collisions

Location – Aylsham Rd under the rail bridge

The length of shuttle working is such that some drivers following an on-road cyclist may be tempted to overtake within it. The Audit Team note that proposed carriageway width under the rail bridge varies between 3.2m and approx. 4.5m. This could lead to driver misjudgement and inadequate safe overtaking clearance, resulting in collision.

Recommendation – that the carriageway width is regularised, avoiding tapering widths between 3.2 and 4.0m.

Designer's Response:

The carriageway width within the shuttle working length is to be reviewed once a Topo survey has been carried out, and the tapered width reduced in length to minimise the risk of collision between vehicles overtaking cyclists.

Edge of lane markings on the northern side of the carriageway are to be retained but realigned to achieve a clear width of 3.2m along the shuttle one way signalled working length and to guide high HGV's into the middle of the road when going under the arched rail bridge.

Network Management Decision:

2.2 Problem – tail-end collisions

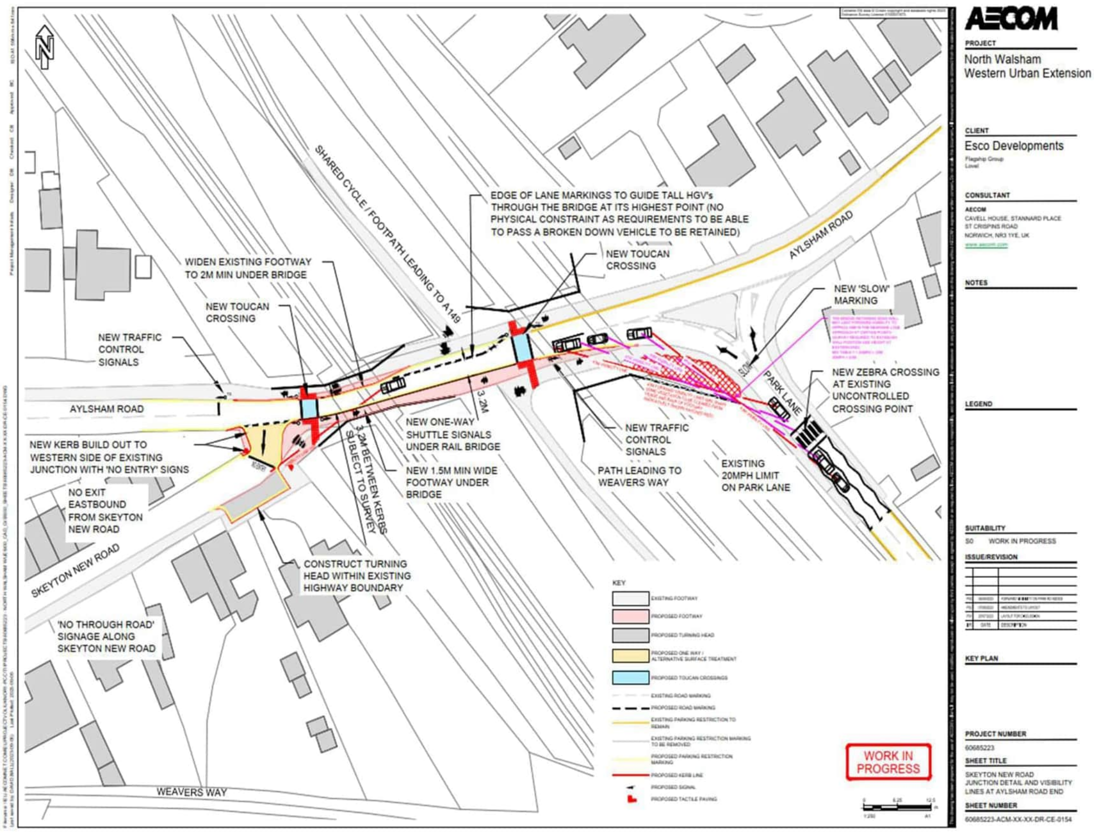
Location – Park Lane into Aylsham Rd westbound

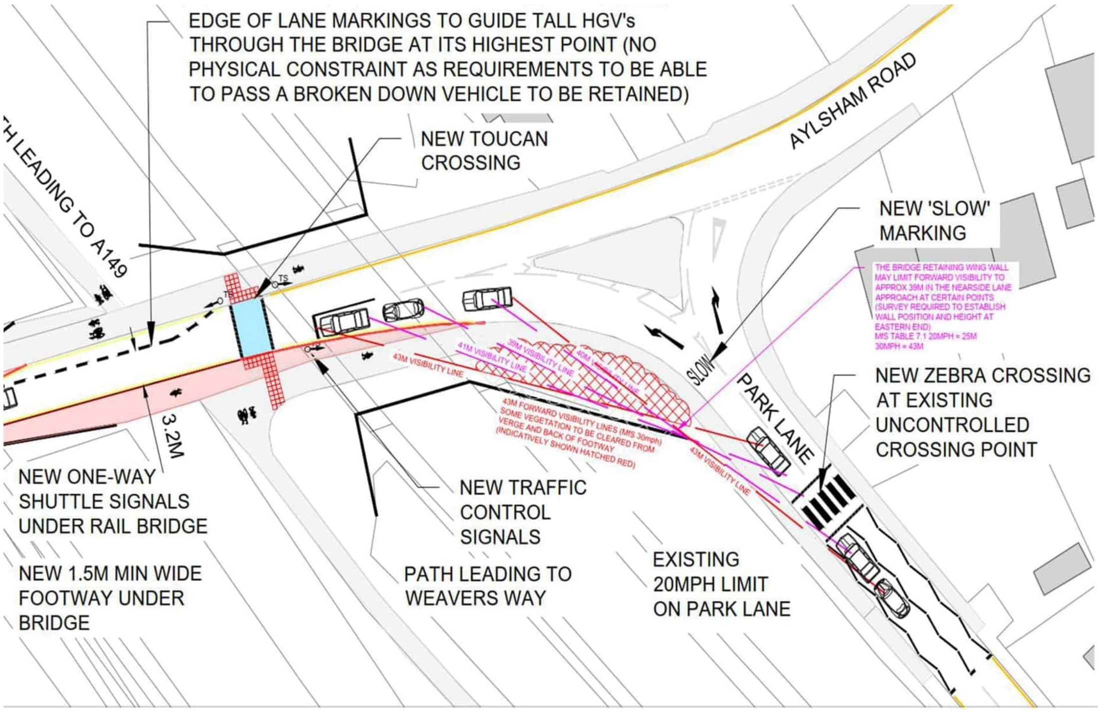
Traffic leaving the Park Lane gyratory into Aylsham Rd westbound may encounter stationary traffic at the proposed signals. A forward visibility splay of 25m is proposed here which is appropriate for speeds of 20mph. However the Audit Team consider that actual traffic speeds on this one-way un-calmed approach may be somewhat higher, leading to a risk of tail-end collision.

Recommendation – that the proposed visibility splay should be based on actual measured traffic speeds.

Designer's Response:

As suggested by the RSA1 comment above, a higher traffic speed of say 30mph would require a forward stopping sight distance of 43m. If the existing vegetation is adjacent to the railway embankment and retaining wall is trimmed back it may be possible to achieve the required 43m forward visibility. This would reduce down to approx 39m over a short distance where the existing bridge retaining wall would obstruct visibility. The exact position, length and height of the wall will require further survey work to establish achievable forward visibility although at present the visibility is greatly reduced by poorly maintained and overgrown vegetation.





We also propose the introduction of a zebra crossing at the existing drop kerb and tactile paved crossing on Park Lane would provide priority for pedestrians over vehicles and also help reduce traffic speeds on the present 20mph speed restricted approach to Aylsham Road, whilst also providing a new facility to access the cycle route and the surgery on Park Lane.

Network Management Decision:

3.0 Junctions

3.1 Problem – junction collisions

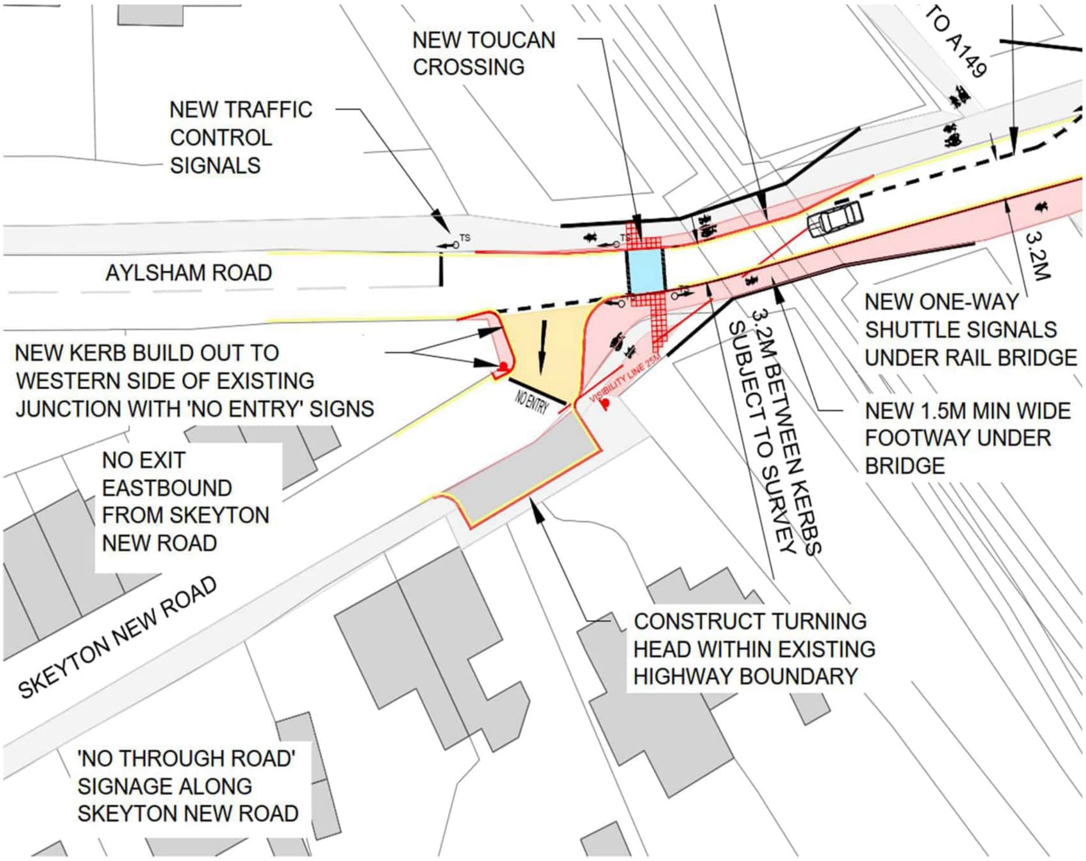
Location – Skeyton New Road one-way plug

The short length of one-way southbound operation may leave it prone to abuse. This concern is exacerbated by lack of any carriageway width restriction on the northbound side. This could result in northbound drivers emerging at the junction in collision with other traffic.

Recommendation – that the one-way section of the junction is redesigned, perhaps with a western kerbline build-out, to better deter northbound abuse of the restriction.

Designer's Response:

The junction of Skeyton New Road with Aylsham Road has been reviewed and the western side build-out widened to allow for new 'No Entry' signs facing northbound traffic. It is also proposed that access only signage is adopted on either end of Skeyton New Road.



Network Management Decision:

4.0 Non-motorised Users

4.1 Problem – collisions between NMUs and access traffic

Location – Norwich Road - RS Timber access/rail station access

The proposed RS Timber access bellmouth appears to be unnecessarily wide, increasing pedestrian and cycle exposure when crossing it, while the refuge area between this and the station access is insufficiently wide to shelter a crossing cyclist. This increases the risk of NMU collision with turning/exiting traffic.

Recommendation – that the accesses are redesigned to better protect NMUs crossing them.

Designer's Response:

Noted. Detailed design works will be undertaken in relation to the proposals in this location including a Topo survey and highway boundary information. Careful consideration of the needs of all users will be needed. Where possible the RS Timber Works access will be narrowed increasing the protected areas for pedestrians and cyclists.

Network Management Decision:

4.2 Problem – vehicle/pedestrian collisions

Location – Norwich Road rail station access junction

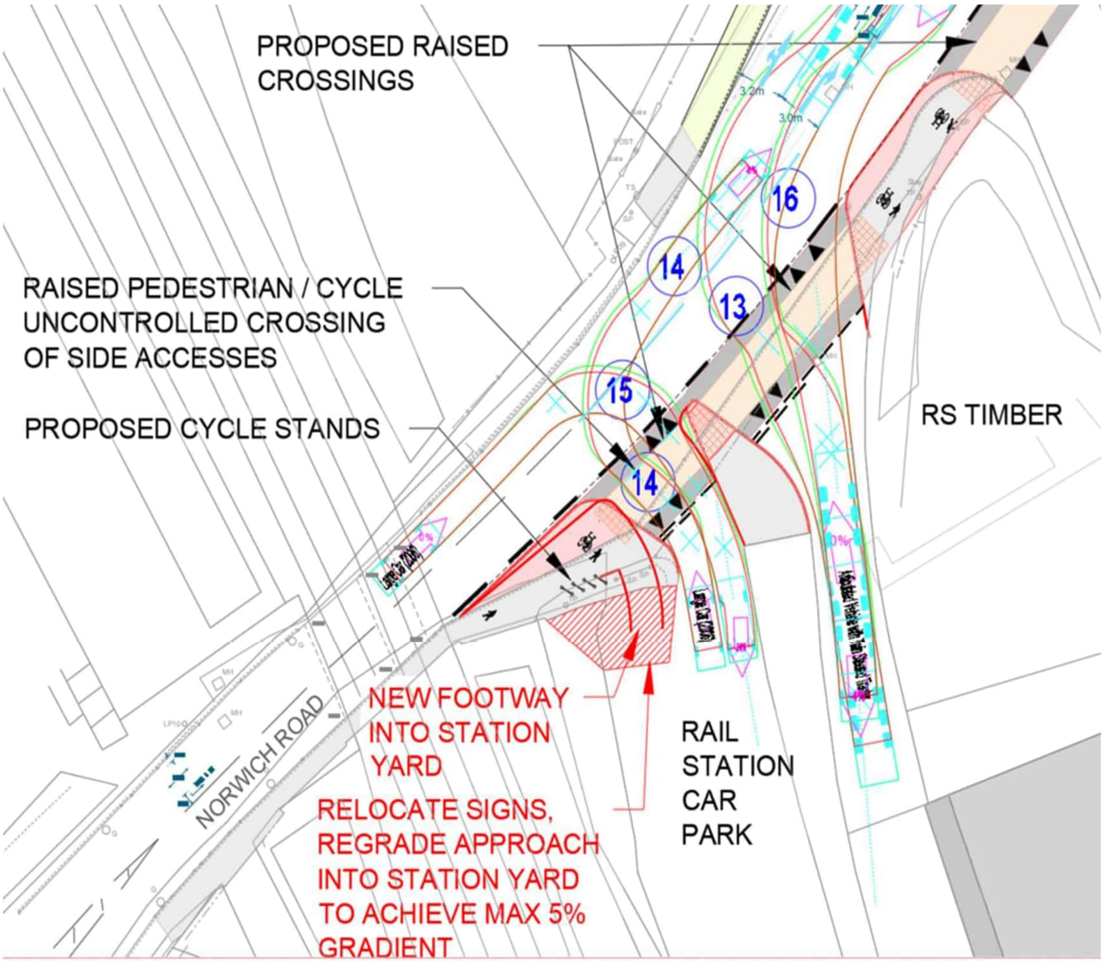
The proposal appears to perpetuate the existing situation where pedestrians accessing/exiting the rail station must share the access carriageway with vehicular traffic at the junction. This exposes them to risk of collision with turning traffic and is likely to be intimidating for some.

Recommendation – that a footway should extend at least around the bellmouth area to protect pedestrians until clear of the junction area.

Designer's Response:

The available width of the existing station access is limited by the entrance to RS Timber to the north east and existing railway station signs and cabinet equipment to the south west.

The entrance could be improved to provide a separate footway for pedestrians if the existing signs and above ground cabinet equipment were relocated, however it is assumed that these features are beyond the limits of the highway boundary, and as such would require the railway companies permission. There is a large level difference between the station access and the adjacent footpath which would mean that the station access would require regrading into the station parking area again beyond the highway boundary. See extract from the proposed layout drawing 60685225-ACM-XX-XX-DR-CE-0155 below with a schematic alternate kerb layout showing a separate footway, this or similar options to be explored during detail design stage.

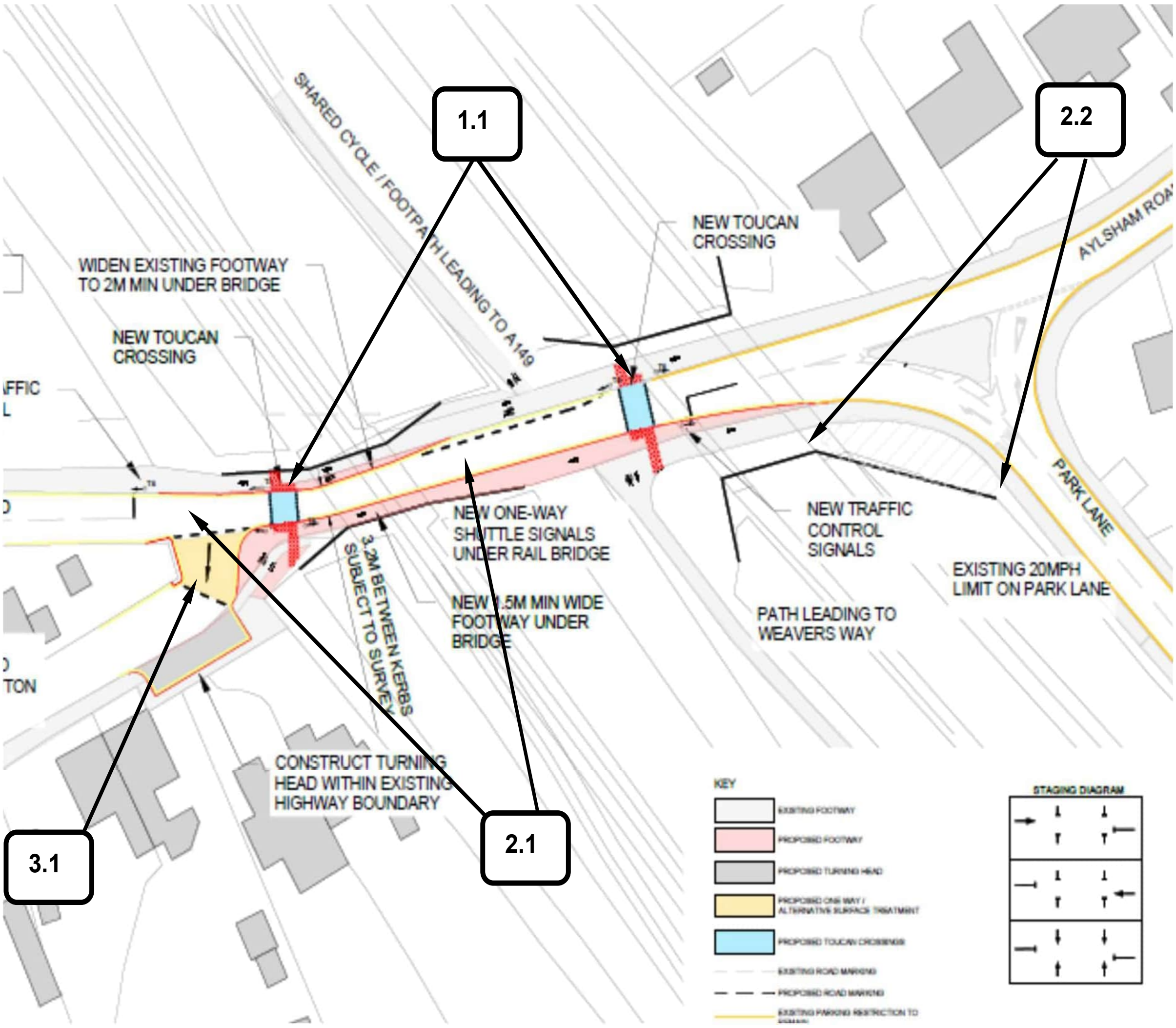


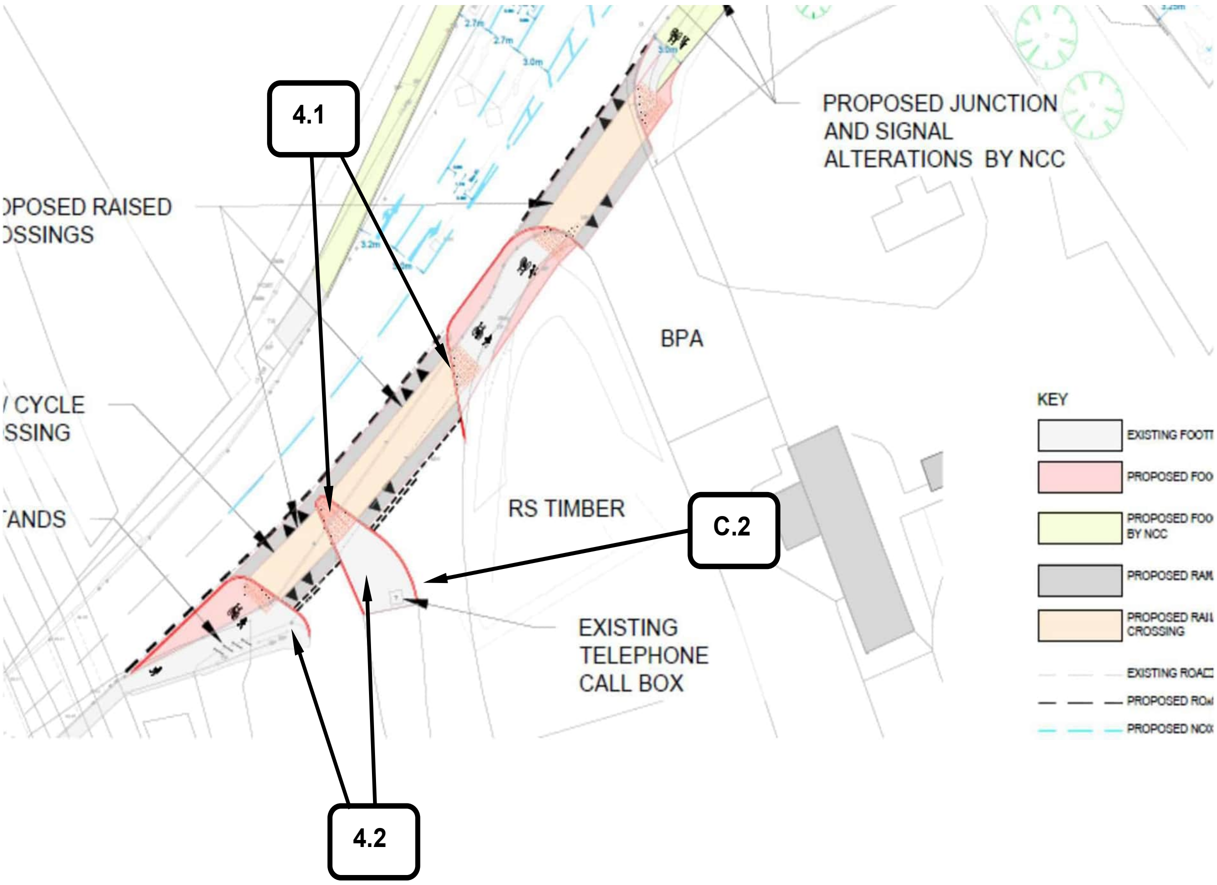
Network Management Decision:

5.0 Signs, Lighting and Markings

5.1 No comment

6.0 Problem Location Plans




4.1
PROPOSED JUNCTION AND SIGNAL ALTERATIONS BY NCC
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4.2

AUDIT TEAM STATEMENT

We certify that this audit has been carried out in accordance with Norfolk County Council Community and Environmental Procedure SP03-07-P01

Signed (ATL)	N Calder	Nevil Calder
Dated	22 August 2023	
Signed	K.J. Allen	Kevin Allen
Dated	22 August 2023	

APPENDIX A: Audit Brief

The following documents were submitted for this Road Safety Audit:

Document Ref.	Scale (if applicable)	Title
60685223-ACM-XX-XX-DR-CE-0154 P02		Skeyton New Rd Junction Detail
60685223-ACM-XX-XX-DR-CE-0152 P02		Skeyton New Rd Visibility Lines
60685223-ACM-XX-XX-DR-CE-0153 P01		Skeyton New Rd Vehicle Turning Paths
60685223-ACM-XX-XX-DR-CE-0155 P01		Norwich Rd Cycle Provision
60685223-ACM-XX-XX-DR-CE-0156 P01		Norwich Rd Vehicle Turning Paths
Forecast Traffic Data		
5 yr road accident details		

No Departures from Standard were notified

APPENDIX B: Comments

C.1 The Audit Team note that visibility at the western end Skeyton New Rd is currently restricted by adjacent hedge and weed growth which has been allowed to encroach right up the carriageway edge. Although this is an existing situation, some increased use of the junction will arise from the proposed one-way plug at the other end of Skeyton New Rd. Discussion with the local highway authority is suggested with a view to remedial measures to improve visibility.

Designer's Response:

Accepted. This will be discussed with the Highway Authority as part of delivery of the works on Skeyton New Road at the next stage of design.

C.2 On Norwich Road the 'existing telephone call box' noted on the drawings at the station access no longer exists.

Designer's Response:

Noted

Norfolk County Council

NORTH WALSHAM WESTERN EXTENSION:
B1150 COLTISHALL TRAFFIC MANAGEMENT

STAGE 1 SAFETY AUDIT

REPORT REF: B1150/026
August 2023

Report Prepared for: AECOM

Norfolk County Council

Report Author: **Nevil Calder** BSc(Hons) CEng MICE MCIHT MSoRSA NH Cert Comp

Report Status:

Issue	Status	Purpose	Name/Signature	Date
1	Stage 1 Safety Audit Report	Client issue	Nevil Calder ……N Calder………….	22/08/23
2	Designer's Response	Designer response to Safety Issues raised	…Bevin Carey…. Bevin Carey	27/09/23
Choose an item.	Choose an item.	Choose an item.	……………………. …………………….	

INTRODUCTION

This report contains the results of a Stage 1 Safety Audit carried out on the above scheme. The Audit was carried out at the request of AECOM on behalf of Norfolk County Council Growth and Development. A formal Audit Brief was not provided.

The Audit Team is independent of the project design team and has had no involvement with the project. The Audit Team membership was as follows:-

Nevil Calder BSc(Hons) CEng MICE, MCIHT, MSoRSA (Audit Team Leader)	Principal Engineer Highway Safety WSP
Kevin Allen BEng (Hons), I Eng, MCIHT, MSoRSA (Audit Team Member)	Project Engineer Network Safety + Sustainability Norfolk County Council

The Audit took place via online conferencing on 16 August 2023. The audit comprised an examination of the supplied documentation (see Appendix A) and a site inspection by the Audit Team Leader on 22 August 2023 at 09:30 which lasted around 30 minutes. During the site visit the weather was sunny and the road surface dry. Traffic flows were moderate and generally free flowing. Speeds varied depending on traffic flow but were frequently observed to be above 20mph.

The terms of reference are as described in Community and Environmental Services Highways Service Manual Procedure SP03-07-P01. The Auditors have examined and reported only on the road safety implications of the scheme within the main report.

The proposal involves traffic management improvements in Coltishall in connection with the planned western urban extension of North Walsham. The audited scheme involves provision of a right turn lane at the junction of B1150 and B1354 including relocation of a pedestrian refuge, together with provision of bus stop markings on Church St approx. 100m to the north.

The auditors have reviewed the five-year (to end Mar 2023) collision record for the location. During this period there were 2 personal injury collisions (both slight) recorded in the vicinity of the scheme. One involved centreline crossover on the bend just north of the B1354 junction, reflecting the narrow carriageway there. The other occurred at the bridge to the west but appears anomalous, involving manoeuvring to give precedence to an emergency vehicle.

A comments section has been included in Appendix B. The issues noted are not necessarily safety issues. They relate either to wider network implications, safety issues identified outside the scope of the audited scheme or suitability of a particular design choice.

ITEMS RAISED AT PREVIOUS AUDIT

The Audit Team are not aware of any previous audit of this scheme.

ITEMS RAISED AT THIS STAGE 1 AUDIT

1.0 General

1.1 No comment

2.0 Alignment

2.1 Problem – kerb strikes/loss of control or head-on collisions

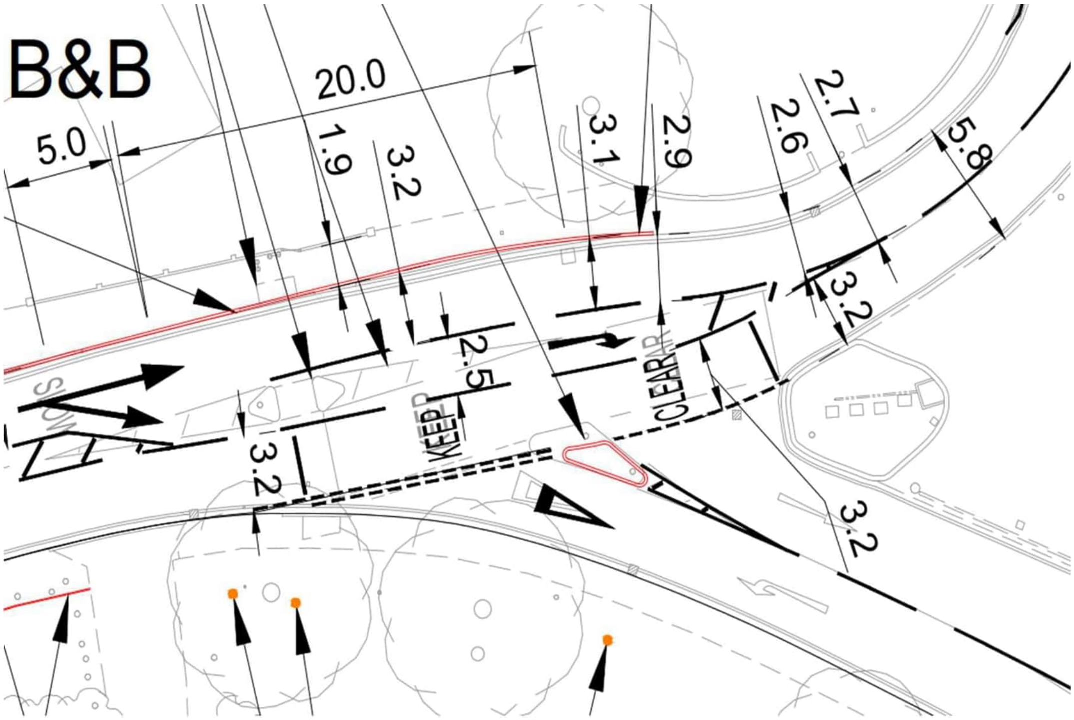
Location – B1150 westbound at proposed RTL

The RTL layout reduces the width of the westbound through-lane where it passes the western corner of the filing station. There is a low brick wall here immediately at the carriageway edge (see photo), raising concern over vehicle edge strikes with potential for loss of control. Alternatively, drivers' natural 'edge-shyness' may cause them to overrun the RTL resulting in head-on collision with an eastbound vehicle entering it.

Recommendation – that the westbound through-lane should be a minimum of 3.2m adjacent to the low brick wall of the filling station and 3m elsewhere. The swept paths suggest that the proposed RTL might be shortened slightly at its eastern end to facilitate this.

Designer's Response:

The Westbound through lane width has been reviewed and the design adjusted to achieve the suggested 3.2m width adjacent to the low height wall on the boundary of the service station.



Network Management Decision:

2.2 Problem – kerb strikes/loss of control

Location – B1150 westbound at proposed refuge island

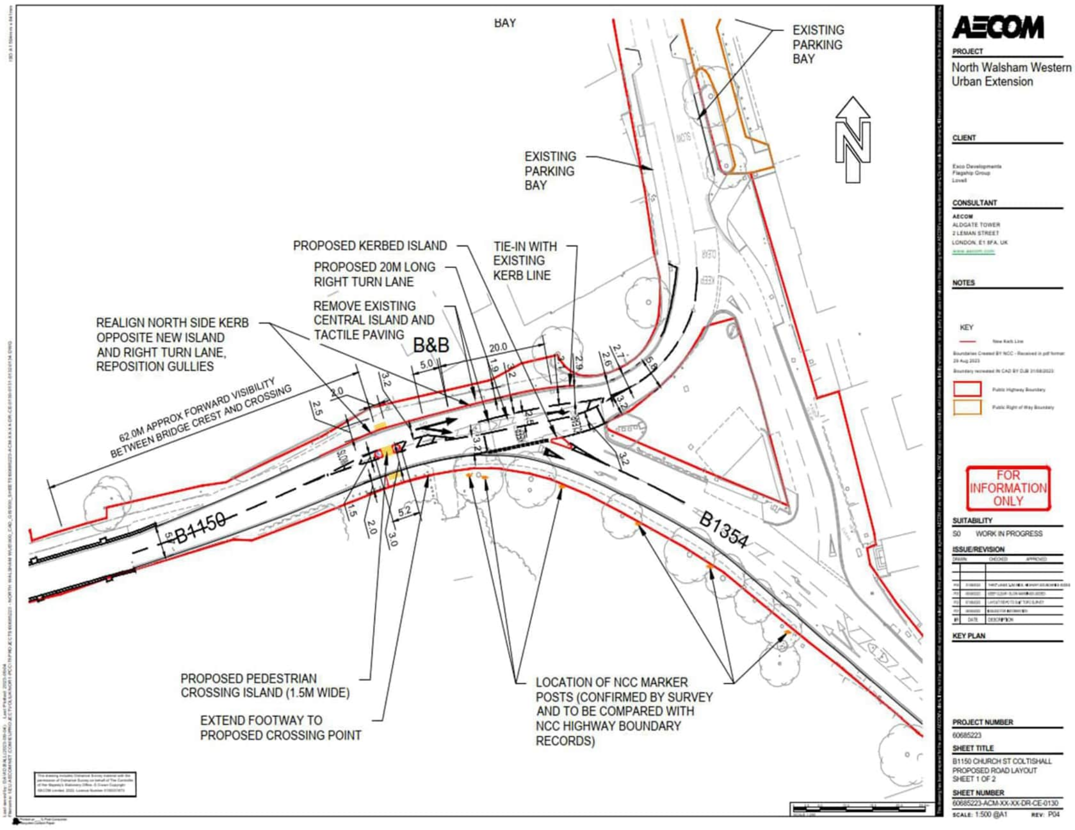
The proposal indicates a westbound through-lane width of only 3m between kerbs where it passes the refuge island. On a classified road this is considered inadequate (despite the 20mph speed limit), raising the risk of vehicle kerb strikes with potential for loss of control.

Recommendation – that the through-lanes adjacent to the refuge island should be a minimum of 3.2m between kerbs

Designer's Response:

The through lane widths adjacent to the proposed pedestrian refuge island have been increased to 3.2m as recommended by para 2.2 above.

To achieve 3.2m wide through lanes each side of the pedestrian refuge, the existing northern kerb line has been shifted northwards as indicated in the extract below. The revised drawing 60685223-ACM-XX-XX-DR-CE-0130-P04 also shows the recently acquired NCC Highway boundary details.



Network Management Decision:

3.0 Junctions

3.1 No comment

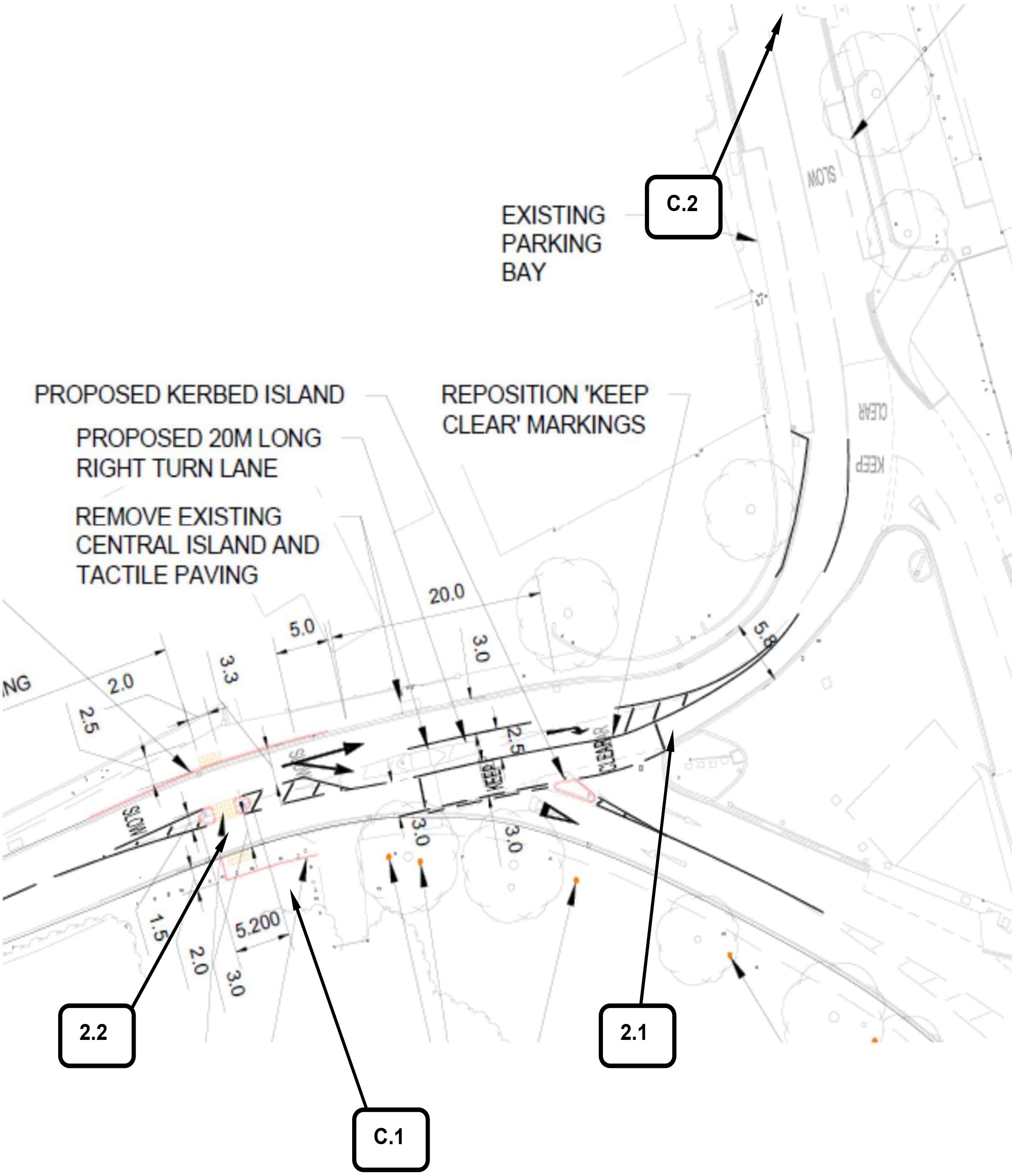
4.0 Non-motorised Users

4.1 No comment

5.0 Signs, Lighting and Markings

5.1 No comment

6.0 Problem Location Plan



AUDIT TEAM STATEMENT

We certify that this audit has been carried out in accordance with Norfolk County Council Community and Environmental Procedure SP03-07-P01

Signed (ATL)	N G Calder	Nevil Calder
Dated	22 August 2023	
Signed	K.J. Allen	Kevin Allen
Dated	22 August 2023	

APPENDIX A: Audit Brief

The following documents were submitted for this Road Safety Audit:

Document Ref.	Scale (if applicable)	Title
60685223-ACM-XX-XX-DR-CE-0130 P03	1:500	Proposed Road Layout (1 of 2)
60685223-ACM-XX-XX-DR-CE-0133 P01	1:500	Proposed Bus Stop
60685223-ACM-XX-XX-DR-CE-0131 P04	1:250	Vehicle Tracking (1 of 3)
60685223-ACM-XX-XX-DR-CE-0134 P03	1:250	Vehicle Tracking (2 of 3)
60685223-ACM-XX-XX-DR-CE-0135 P04	1:250	Vehicle Tracking (3 of 3)
Forecast Traffic Data		
5 yr road accident details		

No Departures from Standard were notified

APPENDIX B: Comments

C.1 The swept path shown for a tanker exiting the pump house to the west (turning left) overruns an area of third party land to the west of the access. This may not therefore be practicable, rendering the manoeuvre impossible with the proposed refuge location. It is suggested that this be discussed with Anglian Water at an early stage to confirm the viability of the proposal.

Designer's Response:

The tanker provision to the pump house facility is to be discussed in detail with Anglian Water.

C.2 It was noted that Dwg 0133 omits a section of existing on-street parking bays on the eastern side just south of the war memorial.

Designer's Response:

Noted that existing on-street parking bay was missing from drawing. This has now been added to Drg …1033-P02.

Template Version #11 09/14
KJA

Appendix H – Indicative Phasing Strategy

North Walsham WUE – Indicative Transport Phasing Strategy

Project number	Client name	Subject	Date
60685223	ESCO Developments Limited, Lovell Partnerships Limited, Flagship Housing Group	North Walsham WUE Indicative Transport Phasing Strategy	December 2023
Prepared by	**Checked by**	**Verified by**	**Approved by**
T Jones	C Brooks	B Carey	C Brooks

Revision History

Revision	Revision date	Details	Authorised	Name	Position
1.0	18/12/23	Draft	BC	B Carey	Regional Director
2.0	18/12/23	Draft following Client input	BC	B Carey	Regional Director
3.0	19/12/23	Final following NCC comment.	BC	B Carey	Regional Director
4.0	04/01/24	Minor Change – Final Version	BC	B Carey	Regional Director

Introduction

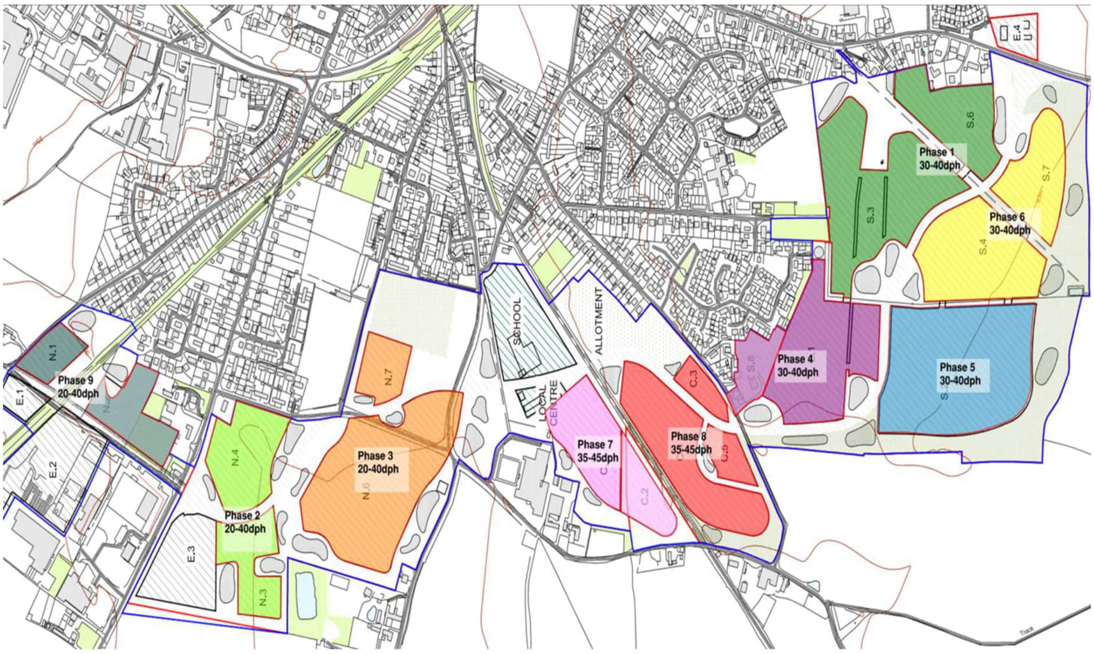
1.1 AECOM have been appointed by ESCO Developments, Lovell Partnerships, and Flagship Housing Group to provide transport planning advice to accompany a land allocation submission for the provision of a mixed use development on land to the west of North Walsham, Norfolk for the North Norfolk District Council Local Plan 2016-2036.

1.2 The aim of this Technical Note (TN) is to set out the order, and priority for delivery of the transport mitigation strategy as identified in the Transport Assessment for the proposed allocation. This should be read in conjunction with the Draft Transport Assessment, prepared by AECOM and dated December 2023. In this document each transport measure and the phase it relates to is set out along with the reasoning for allocating it to that phase.

Phasing

1.3 The indicative phasing diagram is shown in **Figure 1** and shows the expected phasing of residential development plots. The phasing for the employment, school, and local centre land uses is yet to be determined. The development will begin with the build out of Phase 1 and continue sequentially, finishing with Phase 9.

Figure 1 – Indicative Phasing Diagram



Source: North Walsham Urban Extension Phasing & Key Information, Lovell Partnerships, November 2023

1.4 The recommended phasing of the transport infrastructure identified in the Transport Assessment for the proposed allocation is set out in **Table 1** below.

Table 1 – Phasing

Proposed Phases	On or Off-Site	Measure	Reasoning
1	Off-Site	Coltishall traffic management measures: • Bus stop cage on B1150 High Street. • B1150 / B1354 junction improvements.	To mitigate construction traffic impacts in Coltishall.
1	Off- Site	Horstead traffic management measures: • Speed reducing signage at village entry. • Keep Clear box at Frettenham Road. • Investigation of highway capacity improvements at the B1150 Rectory Road Junction.	To mitigate construction traffic and capacity impacts in Horstead.
1, 4, 5, 6	On-Site	Link Road 1st Section: • B1150 Norwich Road to Skeyton Road. • B1150 Norwich Road / Link Road Roundabout. • Closure of Skeyton Road to traffic at the point it crosses the link road.	To provide access to Phases – operational and construction
1	On-Site	Travel Hub On Plot infrastructure: • Bus stands and turning area. • Cycle parking	To encourage public transport trips between the site, the town, and Norwich.
1	On-Site	Upgrade of existing ProW to a 3m cycleway + 2m footway between B1150 Norwich Road and Link Road.	To enable walking and cycling access between these plots and the town and railway station.
1	Off- Site	Delivery of pedestrian crossing facilities in Coltishall and Horstead	To improve safe crossing of the B1150 within Coltishall and Horstead during construction and operational phases.
1	Off-Site	Railway Station Access Scheme: • Improved and resurfaced access for pedestrians and cyclists. • Cycle parking.	To improve the walking and cycling facilities at the station.
1	Off-Site	Mobility Corridor 3 Scheme: • Improvements to the pedestrian and cyclist facilities at the A149 / B1150 junction. • Shared surface provision and upgrades between Weavers Way and railway station. • Upgrade of existing crossing on B1150 near railway station.	To enable walking and cycling access between these plots and the town.

Proposed Phases	On or Off-Site	Measure	Reasoning
2	On Site	Haul Road between B1150 and Aylsham Road.	To mitigate construction impacts.
2, 3	On-Site	Link Road 2nd Section: • A149 Cromer Road to Aylsham Road. • A149 Cromer Road / Link Road Roundabout • Stopping up of Greens Road (Phase 3 only)	To provide access to Phases – operational and construction
2	Off-Site	Mobility Corridor 1 Scheme: • Pedestrian crossing upgrade on A149 Cromer Road and provision on Greens Road.	To enable walking access between these plots and the town.
3	Off-Site	Mobility Corridor 2 Scheme (Aylsham Road): • Aylsham Road / Skeyton New Road / Park Lane Signalisation Scheme • Two toucan crossings, widened pedestrian and cycle route, zebra crossing on Park Lane.	To enable walking and cycling access between these plots and the town, and to improve HGV access in North Walsham.
7,8, School & Local Centre	On-Site	Link Road 3rd Section: • Aylsham Road to Skeyton Road (completion of Link Road) • Signalised junction at Aylsham Road / Link Road junction.	To mitigate construction traffic impacts on Aylsham Road and Greens Road. To mitigate traffic impacts in North Walsham and enable new walking, cycling and vehicular trips. To provide access to plots.
3	Off-Site	Mobility Corridor 2 Scheme (Weavers Way): • Upgrade Weavers Way between the allocation and Station Road to 3m cycleway + 2m footway. • Upgrade Weavers Way between Station Road and Aylsham Road to 3m shared surface and widening of pinch points. • Realignment and provision of tiger crossings across Skeyton New Road and Station Road.	To enable walking and cycling access between these plots and the town.
4&8	Off-Site	Mobility Corridor 3 Scheme: • Shared surface provision and upgrades between Weavers Way and railway station.	To enable walking and cycling access between these plots and the town.
3	On-Site	Upgrade Weavers Way	To enable walking and cycling access between these plots and the town.
9	On-Site	Widening of Bradfield Road from A149 Cromer Road to Rail Bridge.	To enable walking, cycling and vehicular access to these plots from A149 Cromer Road.
1 to 9	On-Site	Bus stops.	To encourage public transport trips between the site and the town.
1 to 9	Off-Site	Rerouting of existing bus services to Travel Hub and on-site bus stops.	To encourage public transport trips between the site, the town and Norwich.
1 to 9	Off-Site	Bus service improvements in line with the NCC Bus Service Improvement Plan.	To encourage public transport trips between the site, the town and Norwich.

Conclusion

1.5 This TN sets out the order, and priority for delivery of the transport mitigation strategy to support the allocation in the Local Plan Examination and to inform any future planning applications. This is based on the current anticipated phasing order for the development.

1.6 This indicative phasing plan will be used to inform the viability appraisal and phasing discussions at planning stage. The detail of phasing will be determined at planning stage through further assessment of the phase impacts and liaison with the Highway Authorities.

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Appendix C – AECOM North Walsham WUE – Indicative Transport Phasing Strategy

North Walsham WUE – Indicative Transport Phasing Strategy

Project number	Client name	Subject	Date
60685223	ESCO Developments Limited, Lovell Partnerships Limited, Flagship Housing Group	North Walsham WUE Indicative Transport Phasing Strategy	December 2023
Prepared by	Checked by	Verified by	Approved by
T Jones	C Brooks	B Carey	C Brooks

Revision History

Revision	Revision date	Details	Authorised	Name	Position
1.0	18/12/23	Draft	BC	B Carey	Regional Director
2.0	18/12/23	Draft following Client input	BC	B Carey	Regional Director
3.0	19/12/23	Final following NCC comment.	BC	B Carey	Regional Director
4.0	04/01/24	Minor Change – Final Version	BC	B Carey	Regional Director

Introduction

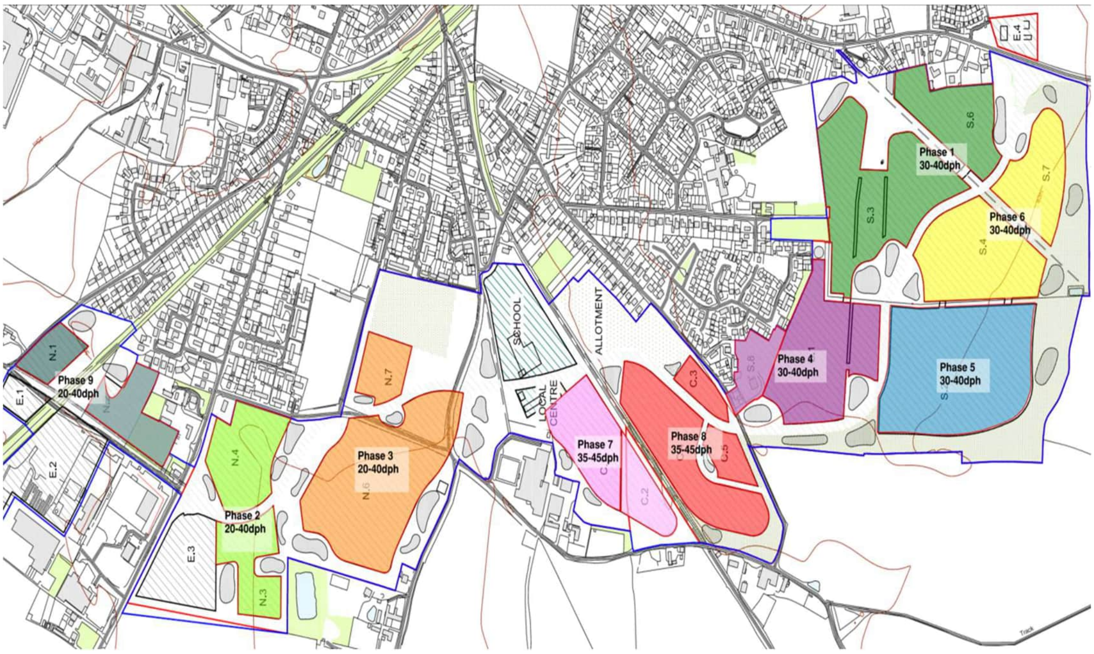
1.1 AECOM have been appointed by ESCO Developments, Lovell Partnerships, and Flagship Housing Group to provide transport planning advice to accompany a land allocation submission for the provision of a mixed use development on land to the west of North Walsham, Norfolk for the North Norfolk District Council Local Plan 2016-2036.

1.2 The aim of this Technical Note (TN) is to set out the order, and priority for delivery of the transport mitigation strategy as identified in the Transport Assessment for the proposed allocation. This should be read in conjunction with the Draft Transport Assessment, prepared by AECOM and dated December 2023. In this document each transport measure and the phase it relates to is set out along with the reasoning for allocating it to that phase.

Phasing

1.3 The indicative phasing diagram is shown in **Figure 1** and shows the expected phasing of residential development plots. The phasing for the employment, school, and local centre land uses is yet to be determined. The development will begin with the build out of Phase 1 and continue sequentially, finishing with Phase 9.

Figure 1 – Indicative Phasing Diagram



Source: North Walsham Urban Extension Phasing & Key Information, Lovell Partnerships, November 2023

1.4 The recommended phasing of the transport infrastructure identified in the Transport Assessment for the proposed allocation is set out in **Table 1** below.

Table 1 – Phasing

Proposed Phases	On or Off-Site	Measure	Reasoning
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Appendix D – WSP Drawings of Northern Extension to WLR

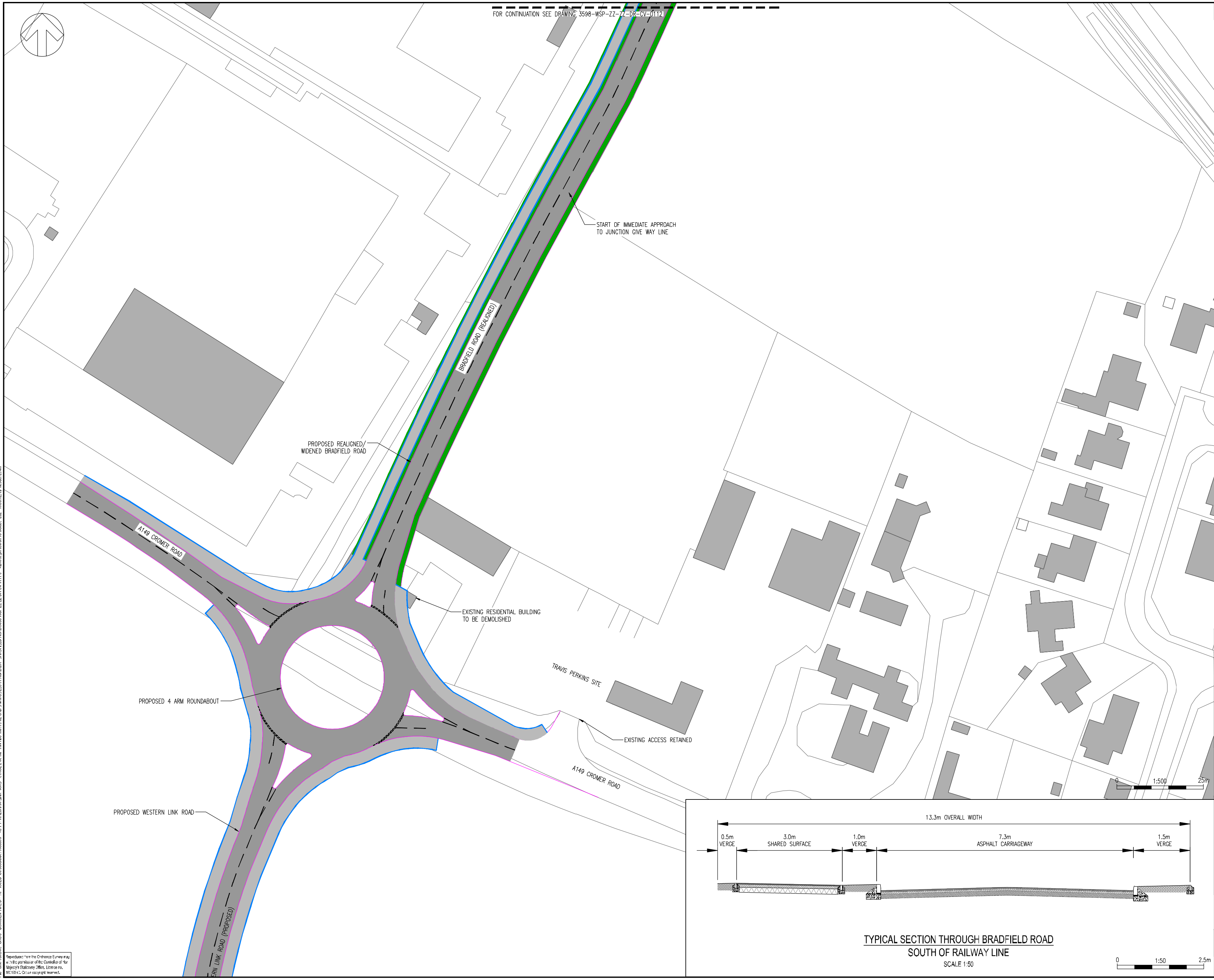
DO NOT SCALE

KEY

- PROPOSED KERB
- PROPOSED ROAD MARKINGS
- PROPOSED CONCRETE FOOTWAY EDGING
- PROPOSED NEW CARRIAGEWAY
- PROPOSED SHARED USE PATH
- PROPOSED VERGE

NOTES

1. THIS GENERAL ARRANGEMENT IS NOT TO BE USED FOR CONSTRUCTION. IT IS A COMPOSITE DRAWING SHOWING THE SPATIAL RELATIONSHIP BETWEEN THE PROPOSED AND EXISTING FEATURES IN TWO DIMENSIONS.
2. AS NO TRAFFIC DATA OR JUNCTION MODELING INFORMATION IS AVAILABLE, THE CAPACITY AND PERFORMANCE OF THE ROUNDABOUT LAYOUT AS SHOWN HAS NOT BEEN ASSESSED AND IS THEREFORE SUBJECT TO FURTHER REVIEW AND AMENDMENT.
3. DRAINAGE INFRASTRUCTURE AND ASSOCIATED LAND FOR NEW LINK ROAD IS EXCLUDED FROM CURRENT SCOPE AND IS TO BE DETERMINED.



UNTIL TECHNICAL APPROVAL HAS BEEN OBTAINED FROM THE RELEVANT LOCAL AUTHORITIES OR STATUTORY BODIES, IT SHOULD BE UNDERSTOOD THAT ALL DRAWINGS ARE ISSUED AS PRELIMINARY AND NOT FOR CONSTRUCTION. SHOULD THE CONTRACTOR AND / OR EMPLOYER COMMENCE WORK PRIOR TO APPROVAL BEING GIVEN, IT IS ENTIRELY AT THEIR OWN RISK.

REV	DATE	BY	DESCRIPTION	CHK	APP
P01	15/10/2021	LMM	FIRST ISSUE		

DRAWING STATUS:
S0 - WORK IN PROGRESS

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wsp.com

CLIENT:
NORFOLK COUNTY COUNCIL

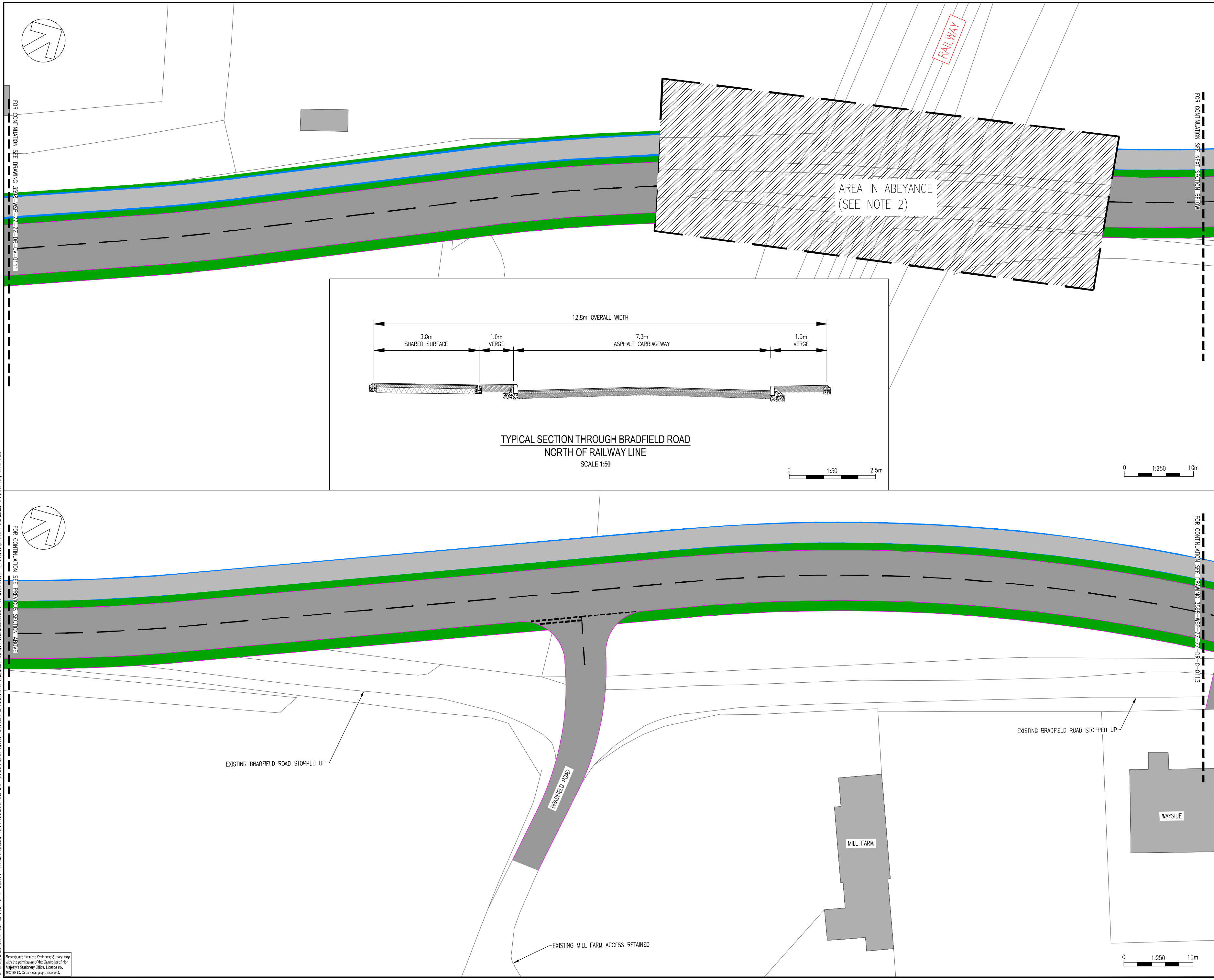
ARCHITECT:

SITE/PROJECT:
NORTH WALSHAM
LINK ROAD STAGE 2
FEASIBILITY STUDY

TITLE:
CROMER ROAD TO CORNISH WAY
SHEET 1 OF 4

SCALE @ A1:	CHECKED:		APPROVED:
1:500	ACC		AG
PROJECT No:	DESIGNED:	DRAWN:	DATE:
70083598	LMM	LMM	October 2021

DRAWING No: 3598-WSP-ZZ-ZZ-DR-CV-0111
REV: P01



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2. REFER TO STAGE 2 FEASIBILITY STUDY (CHAPTER 1) FOR FURTHER INFORMATION REGARDING AREA IN ABEYANCE.
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REV	DATE	BY	DESCRIPTION	CHK	APP
P02	26/11/2021	LMM	NOTE 2 AND AREA IN ABEYANCE NOTE AMENDED		
P01	15/10/2021	LMM	FIRST ISSUE		

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ARCHITECT:

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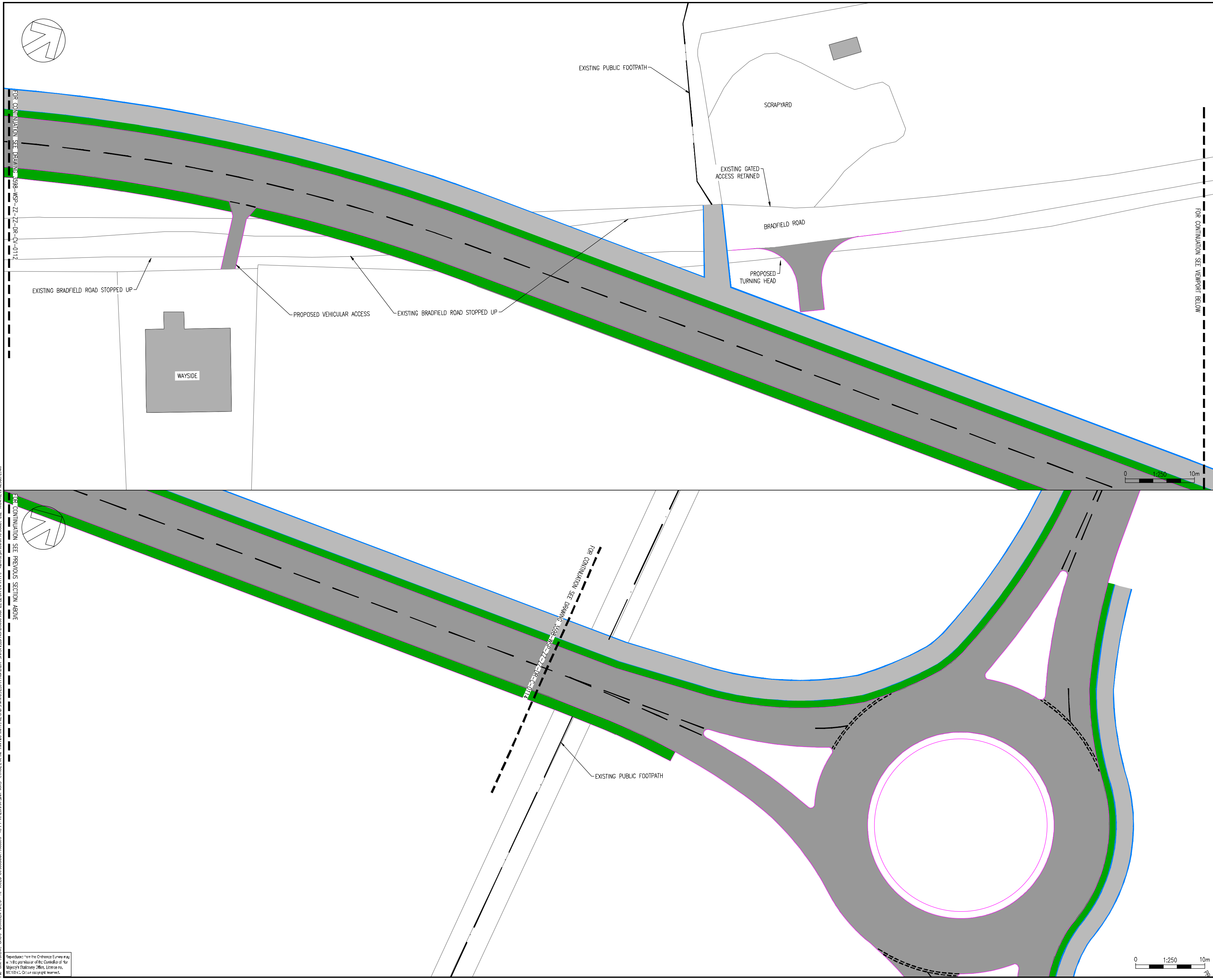
TITLE: CROMER ROAD TO CORNISH WAY SHEET 2 OF 4

SCALE @ A1: 1:250	CHECKED: ACC	APPROVED: AG
PROJECT NO: 70083598	DESIGNED: LMM / DRAWN: LMM	DATE: October 2021
DRAWING No: 3598-WSP-ZZ-ZZ-DR-CV-0112		REV: P02



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CLIENT: NORFOLK COUNTY COUNCIL

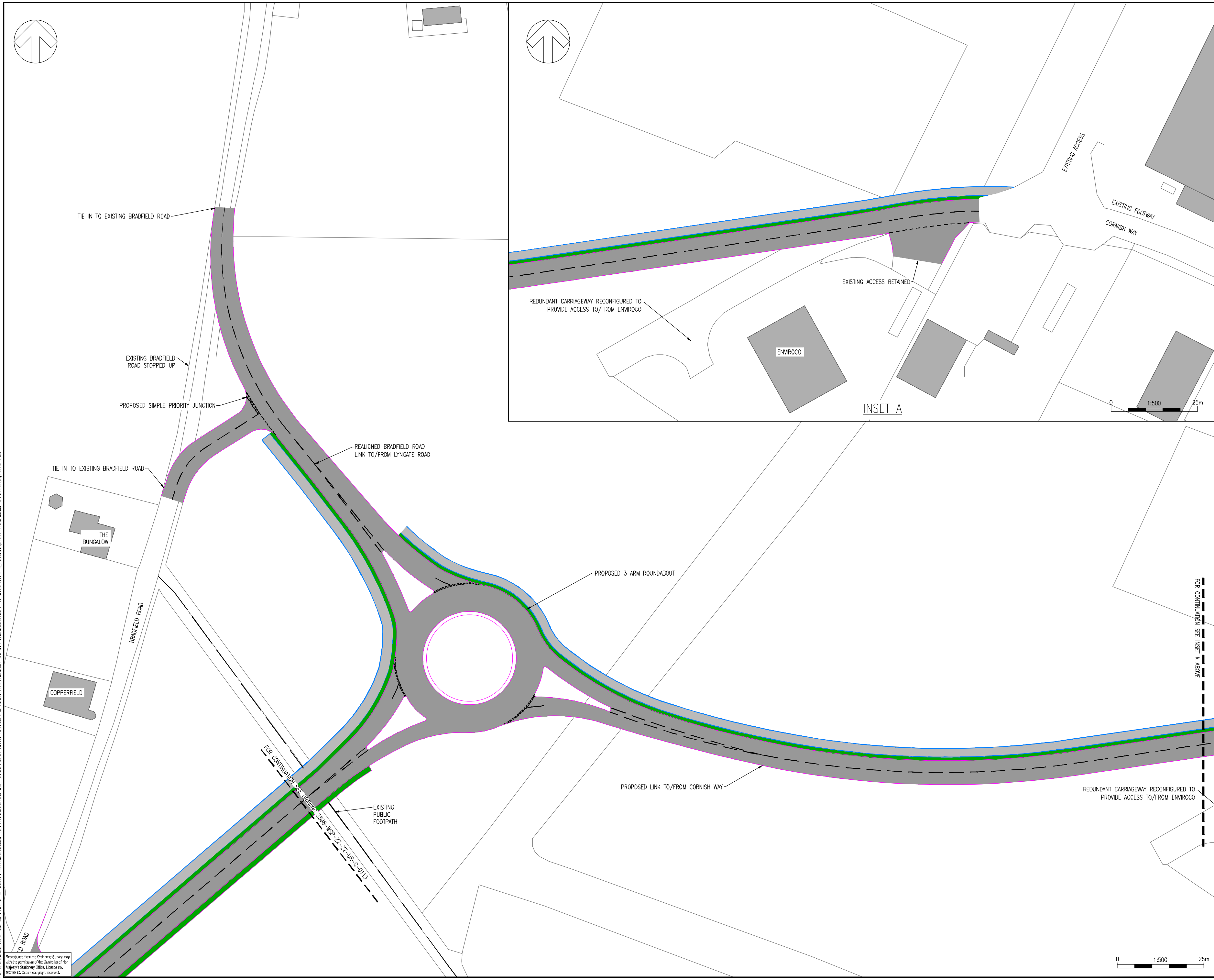
ARCHITECT:

SITE/PROJECT: NORTH WALSHAM LINK ROAD STAGE 2 FEASIBILITY STUDY

TITLE: CROMER ROAD TO CORNISH WAY SHEET 3 OF 4

SCALE @ A1: 1:250	CHECKED: ACC	APPROVED: AG
PROJECT NO: 70083598	DESIGNED: LMM / DRAWN: LMM	DATE: October 2021

DRAWING No: 3598-WSP-ZZ-ZZ-DR-CV-0113 REV: P01



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REV	DATE	BY	DESCRIPTION	CHK	APP
P02	26/11/2021	LMM	ENVIROCO JUNCTION NOTES UPDATED		
P01	15/10/2021	LMM	FIRST ISSUE		

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wsp.com

CLIENT: NORFOLK COUNTY COUNCIL

ARCHITECT:

SITE/PROJECT: NORTH WALSHAM LINK ROAD STAGE 2 FEASIBILITY STUDY

TITLE: CROMER ROAD TO CORNISH WAY SHEET 4 OF 4

SCALE @ A1: 1:500	CHECKED: ACC	APPROVED: AG
PROJECT NO: 70083598	DESIGNED: LMM / DRAWN: LMM	DATE: October 2021

DRAWING No: 3598-WSP-ZZ-ZZ-DR-CV-0114 REV: P02

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