A38 Derby Junctions
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A38 Derby Junctions

Development Consent Order 202[ ]

Transport Assessment Report

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1 Introduction

1.1 Overview

1.1.1 The A38 from Birmingham to the M1 (at Junction 28) is a strategic route of national importance. Where the A38 passes through Derby, delays and associated queuing occur at three roundabout junctions (locations shown in Figure 1.1) to the west and north of Derby city centre.

1.1.2 The junctions experiencing delay and queuing are:

- A38/A5111 (Kingsway) roundabout;
- A38/A52 (Markeaton) roundabout;
- A38/A61 (Little Eaton[1]) roundabout.

1.1.3 It is proposed to address the delays and queuing with a scheme to grade separate the A38 at all three junctions.

Figure 1.1: Location of Scheme junctions

[1] Historically, the A38/A61 'Little Eaton' roundabout was sometimes referred to as 'Abbey Hill' Roundabout.

1.2 Reason for the Scheme

1.2.1 **Efficient network management:** The A38 is part of the Strategic Road Network (SRN). As such, it carries many inter-urban car trips and freight trips when compared to those routes maintained by the local highway authorities.

1.2.2 The A38, where it passes through Derby, also fulfils several other functions. For example, the A38 crosses the River Derwent flood plain and provides one of a limited number of opportunities for road vehicles to cross the River Derwent. Thus, the length of the A38 between the Kingsway and Little Eaton junctions not only provides for strategic trips but also carries trips between local origins and destinations.

1.2.3 The consequences of doing nothing are that:

- Queues and delays on local roads around Derby would become worse as traffic demand continues to increase.
- The A38 would maintain its relative unattractiveness to long-distance strategic trips, and hence discourages both car and freight trips to use this length of the strategic road network in peak traffic flow periods.

1.2.4 **Road safety:** As the three scheme junctions are at-grade, long-distance and heavy-goods vehicle (HGV) trips using the strategic road network come into conflict with local intra-urban trips and pedestrian and cyclist movements. These conflicts are a risk to road safety that would not exist if the junctions were grade-separated.

1.2.5 **Facilitating economic growth:** The Derby Local Plan identifies the A38 as key to economic and development growth in the Derby area. Derby and its immediate surrounding area is expected to accommodate significant housing and employment growth. As a result, the traffic demands on the A38 are expected to increase more quickly than the national average.

1.2.6 Whilst the strategic economic plan is being taken forward independently from transport infrastructure improvement schemes, the A38 improvement scheme will facilitate this regeneration.

1.2.7 **Public transport:** The A38 grade separation proposals also form one of the key bus corridor improvement measures within the “Derby Local Transport Plan, LTP3 2011-2026” LTP3 strategy. The bus corridors crossing the A38 are supported by the A38 improvements.

1.3 Scheme objectives

1.3.1 The objectives of the scheme are:

Criteria	Objective
Economy	• To reduce delays and increase reliability of journeys on the strategic corridor. • Assist in bringing forward development and regeneration opportunities in the surrounding area and immediately adjacent to the scheme. • To minimise traffic disruption due to construction works and incidents. • To achieve optimal whole-life cost, taking into account future maintenance, operation and disruption to users.
Environment	• To minimise impacts on both the natural and built environment, including designated landscape/ biodiversity features. • To seek to mitigate impacts on air quality or noise. • To ensure effective measures are in place to protect watercourses from pollutant spillage on the highway. • To investigate and to encourage the use of environmentally friendly operations and products throughout the project life cycle.
Society	• To improve the safety for all road users. • To manage the safety for road workers in accordance with the requirements of GG104 – Standard for the Safety Risk Assessment on the Strategic Road Network and the Health and Safety at Work 1974 Act to be So Far As Is Reasonably Practicable (SFAIRP). • To improve safety for residents in the vicinity of the junctions. • To facilitate integration with other transport modes where applicable. • To ensure a consistent high standard of signing relating to the junctions. • To reduce severance by maintaining or providing appropriate facilities for crossing and travelling along the route for pedestrians and cyclists.
Public Accounts	• To be affordable and represent High Value for Money according to Department for Transport appraisal criteria.
Scheme Specific	• Improve integration by supporting the local transport plan. • Facilitate regional development and growth in Derby City and its surrounding areas and increase capacity of the strategic road network to absorb growth.

1.4 Principles of grade separation

1.4.1 The proposed A38 Derby Junctions, hereafter referred to as the 'Scheme', seeks to replace the three existing A38 junctions at Kingsway, Markeaton and Little Eaton with grade-separated junctions.

1.4.2 A grade separated junction is one in which two routes are separated by height (either using a bridge or an underpass) with slip roads allowing access between the two, rather than a standard roundabout or signalised junction. Grade separated junctions generally allow traffic to move with fewer interruptions, particularly for traffic on the main line. In addition, fewer interactions between vehicle movements reduce the risk of collisions.

1.4.3 In the vicinity of the scheme, an example of a grade separated junction is that of the A38 and A6 ('Palm Court' roundabout), which is located between the Markeaton and Little Eaton junctions.

1.5 Project's transport stakeholders

1.5.1 The Scheme is being promoted by Highways England, with support from the local highway authorities: Derby City Council (DCiC) and Derbyshire County Council (DCC).

1.5.2 Highways England is the highway authority for the strategic road network, a government-owned company with responsibility for the operation and management of the motorways and trunk roads in England. Highways England is responsible to the Department for Transport (DfT).

1.5.3 For the Little Eaton junction, DCC is the local highway authority and Erewash Borough Council (EBC) is the 'host' planning authority. As such, both authorities have been consulted on the Scheme's design.

1.5.4 For the Kingsway and Markeaton junctions, DCiC is the local highway authority, who is responsible for the operation and management of the local highway network (i.e. all roads in the area of these two junctions with the exception of the A38). DCiC is also the 'host' planning authority and has been involved in the development of the Scheme as a local key stakeholder working with Highways England.

1.5.5 The following have been consulted as neighbouring authorities to one of the junction improvements: DCC, DCiC, Amber Valley Borough Council, EBC and South Derbyshire District Council.

1.6 Policy & strategy context

1.6.1 As noted in Section 2.2, the Scheme has been in development for a number of years, after being included in the 2001 Road-Based Studies. A number of multi-modal and road-based studies were commissioned in 2001 to find solutions to various national transport problems. A road-based study was commissioned to investigate the A38 transport problem through Derby because the only solutions were clearly perceived to be road-based options.

1.6.2 The resulting road-based solution was included within policy and strategy documents at both a national and local level.

1.6.3 **National level:** The National Policy Statement for National Networks (NPSNN) was published in December 2014. The NPSNN sets out the need for development of Nationally Significant Infrastructure Projects (NSIP). The NPSNN also provides planning guidance for promoters of a national road network NSIP and will be used by the Secretary of State as the primary basis (unless unlawful or in breach of international obligations) for making decisions on their development consent applications.

1.6.4 Sitting alongside the NPSNN are the investment programmes for the road and rail networks and the business plans (delivery plans) prepared by the relevant delivery body. These provide detailed articulation of the Government's funding strategy and the investment priorities for the road and rail networks over forthcoming periods.

1.6.5 The Scheme is included within Highways England's first *Road Investment Strategy: 2015/16 to 2020/21* (RIS1) overview document. The Investment Plan for the Midlands (£1.8 billion invested from 2016-2012) includes the statement: "*Grade separation of three junctions in Derby will mean the A38 will become a full Expressway from North Derbyshire to the West Midlands*". The Scheme is listed "C8" and placed within the category "Committed – previously announced".

1.6.6 Highways England is aiming to convert a number of A-road dual carriageways into motorway-like experiences for their customers. Highways England is developing its plans for 'Expressway' standard routes and these will be a new approach to A-roads to be delivered from 2020 onwards. Since RIS1 was published, the potential for converting the A38 to an 'Expressway' has been examined further. The section-length of the A38 between the Kingsway junction and the Little Eaton junction was constructed in 1981-1982 and the dual carriageway was designed to an urban design standard through the built-up area of Derby. As such, the existing horizontal alignment, vertical alignment and pavement widths fall short of the emerging standards for 'Expressway' routes. To upgrade this length of the A38 through Derby to 'Expressway' standards would likely incur a cost greater than available within the RIS2 Investment Plan for the Midlands. The grade separated junctions that constitute the Scheme have not been designed to meet 'Expressway' standards; although it is noted that the grade separation of junctions is one of the aspirational requirements of the 'Expressway' standard.

1.6.7 The NPSNN recognises that the construction and operation of a scheme can have a variety of impacts on the surrounding transport infrastructure. In this regard, the policies set out in local plans are relevant and the local highways authorities should be consulted on the assessment of transport impacts.

1.6.8 **Local level:** The Derby Local Plan Core Strategy (January 2017) includes the following statements:

"5.24.1 In order to deliver a safe, sustainable and efficient transport network it will be necessary to implement a range of different transport infrastructure projects and actions. Some of these will be to address existing problems on the network, some will be to facilitate growth, and some will be to improve and protect the network of pedestrian and cycle routes that cross the City. The schemes in question will not just be implemented by the City Council. ***Partner organisations such as Highways England and Network Rail will also implement schemes such as the A38 Junctions Grade Separation Scheme and electrification of Midland Mainline****."*

"5.24.4 The A38 carries heavy flows of north-south long-distance traffic. Also, where it passes through Derby, significant volumes of local traffic cross or join and leave the A38. This results in congestion and delays at the A38/A5111 Kingsway roundabout, the A38/A52 Markeaton roundabout and the A38/A61 Abbey Hill roundabout. Highways England has carried out improvements to these junctions as part of their national 'pinch point' scheme. These have served to improve traffic flow. ***Longer term proposals also exist for the 'grade separation' of these three roundabouts.*** *There is no definite timescale for this work, but it is anticipated that it will be in the lifetime of the plan. The Council will ensure that any land needed to implement these schemes will be protected."*

1.6.9 The *Derby Local Transport Plan 3* (2011 2026) includes the following statements:

"2.23 The A38 is an important regional route that provides a strategic link between Derby and other major towns and cities. It is important that proposals for a scheme to grade separate junctions along the A38 at Abbey Hill, Markeaton and Kingsway are implemented in the future. The A38 Derby Junctions scheme would separate local and long-distance traffic reducing delays and congestion allowing us to better manage our local network and improve linkages across the A38 for public transport, pedestrians and cyclists. If the scheme cannot be funded and delivered it is likely that any future development to the west of the city will be severely restricted."

"4.13 Congestion on the trunk road network in Derby has a significant influence upon local route choice and traffic patterns. For example, the A38 carries around 45,000 vehicles per day between Markeaton Island and the A6 Duffield Road Junction (National Road Traffic Estimates). This traffic converges with the significant volumes of local traffic crossing, joining and leaving the A38. This results in congestion and recurrent delay at three at-grade roundabout junctions to the west and north of Derby city centre, namely the A5111 Kingsway Roundabout, A52 Markeaton Roundabout and A61 Abbey Hill Roundabout."

"4.15 The Highways Agency has proposed a scheme to grade separate three A38 Derby Junctions. Grade separation would provide significant congestion relief and road safety benefits as well as improving facilities for pedestrians and cyclists. The scheme is in development but will not be implemented until the period after 2015. Without the grade separation there will be significant constraints on development in the north and west of the city."

"6.30 The A38 Derby Junctions Grade Separation scheme, a Highways Agency scheme, is critical to facilitating housing growth to the west of the city. The scheme has already been identified as both a sub-regional and local priority. Its delivery will be subject to funding availability for schemes of this scale but is scheduled to take place after 2015."

1.7 Purpose and structure of report

1.7.1 This report forms the Transport Assessment (TA) supporting the Development Consent Order (DCO) application submission.

1.7.2 The *Guidance on Transport Assessment* (GTA, Department for Transport, DfT, 2007) states that "a TA is a comprehensive and systematic process that sets out transport issues relating to a proposed development. It identifies what measures will be taken to deal with the anticipated transport impacts of the scheme and to improve accessibility and safety for all modes of travel."

1.7.3 Although now withdrawn, the GTA continues to form the de facto standard for writing a TA (albeit that it is mainly focused on land-use developments such as housing or employment sites, rather than highway infrastructure schemes).

1.7.4 To develop the Scheme, a series of transport technical reports have also been prepared (as referenced within this TA) and these are available separately. However, the main purpose of this report is to summarise the content of these technical reports into a single, stand-alone report for general consumption. It identifies how the scheme will operate when opened, and construction phases are also considered.

1.7.5 The report is structured in the following way:

- Section 2: Baseline conditions (the existing conditions) are described.
- Section 3: Describes the development of the baseline traffic model.
- Section 4: Describes the calculation of the forecast future traffic conditions and the performance of the proposed junctions.
- Section 5: Consideration is given to Road Safety.
- Section 6: Consideration is given to the effects on walking and cycling.
- Section 7: Consideration is given to the effects on public transport.
- Section 8: Details of public consultation is provided.
- Section 9: Assessment of the scheme's construction phase is outlined.
- Section 10: Summary and conclusions.

2 Baseline conditions

2.1 Overview

2.1.1 The purpose of this section is to describe the existing highway network, and the information that has been obtained to model the existing highway conditions. The history of the route and the scheme is also considered.

2.2 Scheme history

2.2.1 The Scheme has been in development over a long period of time, as is shown in the timeline given in Table 2.1.

Table 2.1: Scheme timeline

Year	Detail
1983	A new dual carriageway was constructed to the north and west of Derby to carry the A38. The three scheme junctions were implemented as at grade roundabouts.
2002	A road-based study, commissioned in 2001, considered options for the three junctions on the A38. This included a public consultation in July 2002.
2003	The Secretary of State for Transport announced support for the grade separated junctions scheme in principal.
2003 to 2005	Further design and development works were undertaken, including further public consultation on proposed options for grade separation.
2004	Interim improvements (carriageway widening and traffic signals) were made to each of the three junctions.
2008	Review of earlier option development work and full cost examination. Scheme was put on hold following economic downturn.
2014	Short term improvements (known as 'pinch point' schemes) implemented at Little Eaton and Markeaton junctions.
2014 to 2016	Work re-commenced on long-term improvements with a review of options for public consultation.
2015	Public Consultation of grade separation options
January 2018	Preferred route announcement
September to October 2018	Statutory public consultation

2.3 Existing junction layouts

2.3.1 The Kingsway, Markeaton and Little Eaton roundabouts are at-grade roundabout junctions with varying levels of signalisation. The most recent traffic signalisation improvements were to the Markeaton and Little Eaton junctions; referred to as the 'Pinch Point' schemes that were opened-to-traffic at the end of 2014.

2.3.2 The Kingsway Roundabout is the junction between the A38 and the A5111 southern ring road. Kingsway is an elongated roundabout, as shown in Figure 2.1. The A38 (northbound) entry was signalised in 2004, but all other entries operate under priority control with two-lane entries.

Figure 2.1: Kingsway roundabout

2.3.3 The Markeaton roundabout is the junction between the A38 and the A52, which links the west of Derby to the city centre. Markeaton is a four-arm roundabout junction, as shown in Figure 2.2. Three of the entries, except A52 East (Ashbourne Road), were converted to traffic-signal control as part of the 2014 'Pinch Point' improvements. Pedestrian crossings are present on three of the four approach roads; the pedestrian crossing of the four directional A38 carriageways are traffic signal controlled and the crossings of the A52 East (Ashbourne Road) are zebra crossings. There are also 3-lane to 2-lane merges on the two A38 exits and a 2-lane to 1-lane merge on both the exit to A52 East (Ashbourne Road towards Derby city centre) and to the A52 Westbound (towards Ashbourne). There is also an exit-only arm into the Markeaton Park's car park. In the west quadrant there is a fuel filling station (Esso) and a fast food restaurant (McDonald's) that benefit from direct access and egress onto both the A38 South northbound carriageway and the A52 West.

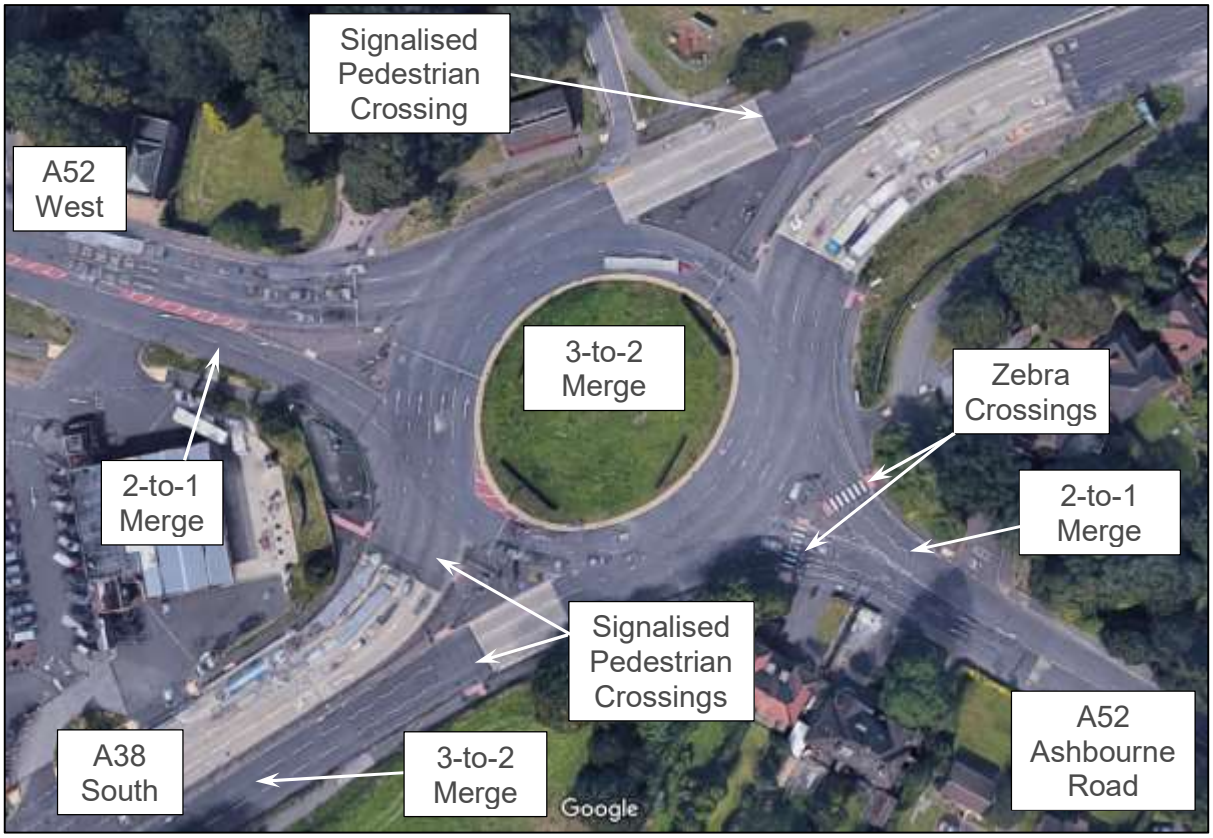


Figure 2.2: Markeaton roundabout

2.3.4 The Little Eaton roundabout is the junction between the A38 and the A61. This roundabout provides the main route into Derby city centre from the north. Little Eaton is a five-arm roundabout junction, as shown in Figure 2.3. Three of the four entries are signalised, with the remainder (Ford Lane and B6179 Alfreton Road) operating under priority control. A bypass lane has been provided so that traffic routeing from the A38 North to the A61 Alfreton Road southbound is not subject to delays at the traffic signals.

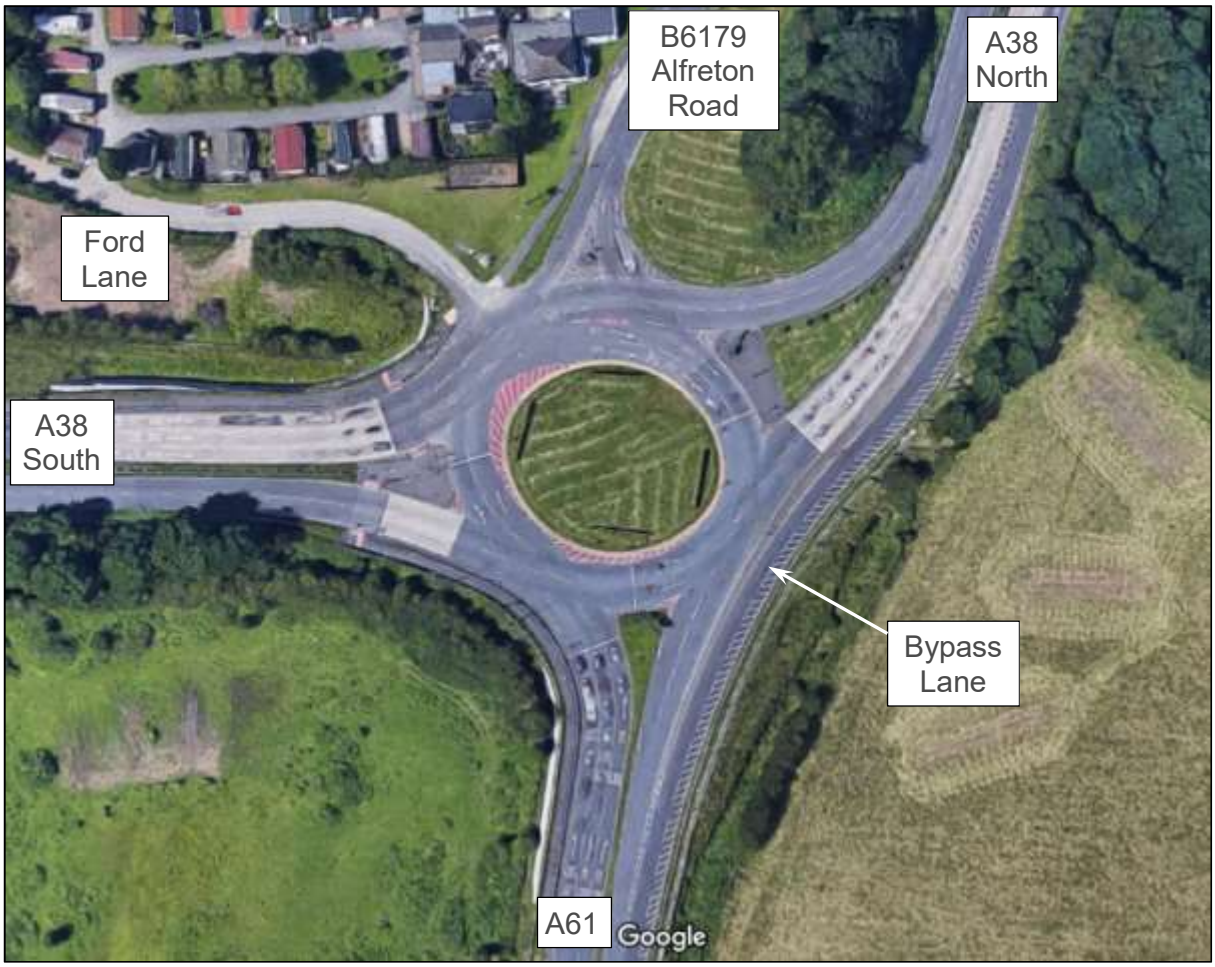


Figure 2.3: Little Eaton roundabout

3 Baseline traffic model

3.1 Approach to traffic modelling

3.1.1 As noted in Section 1, the A38 is used for both strategic and local trips. Notwithstanding this, some of the potential local trips that could make use of the A38 might be avoiding it, because of the congestion and delays. A capacity improvement of the junctions could therefore attract existing road users into the A38 route corridor. It is also possible that the quicker journey times could also induce new trips onto the highway network. For these reasons, traffic modelling of the A38 has been undertaken to fully test the potential impacts and benefits of the proposed improvements.

3.1.2 A traffic model was developed to support the appraisal of the highway improvements and then validated in accordance with the DfT's WebTAG guidance. The Scheme's local traffic model was developed to assess the likely changes in traffic flow and highway network performance that could be attributable to the Scheme, and how the highway network would operate if the Scheme was not brought forward. In the first instance, however, it was important to demonstrate that the traffic model replicated exiting traffic conditions prior to it being used for forecasting future conditions.

3.1.3 Industry-standard (SATURN[2]) software was used to develop the traffic model. SATURN is a traffic assignment and simulation package that allows for the modelling of delays on links and the vehicle interactions at junctions. An overview of how SATURN operates is provided at the end of this section (Figure 3.4).

3.1.4 The highway network contained within the SATURN model is based on the Derby Area Transport Model (DATM), which was commissioned by DCiC and has been continuously maintained and improved since 2006. For the purpose of modelling the housing growth planned in and around the Derby area, DCiC extended DATM into adjacent districts to cover the Greater Derby area. This version of the highway network is referred to as the Greater Derby Transport Model (GDTM).

3.1.5 The geographic coverage of the Scheme's traffic model was not confined to the immediate geographical area around the A38. The local traffic model, built to support the appraisal of the Scheme, covers a broad enough area such that it can identify the traffic impacts of the Scheme on both the local and strategic road networks. It is likely that some re-routeing would occur as a result of grade-separating the three A38 junctions and providing the additional highway network capacity. The existing delays on A38 may be dissuading some people from using the A38 who then use competing routes instead. These competing routes could be as far afield as the A42, M42 and M1 or could be local roads such as Markeaton Lane. The grade separation of the three junctions would remove this existing deterrence and, with the Scheme, these trips would then re-route back into the A38 corridor.

[2] SATURN stands for "Simulation and Assignment of Traffic to Urban Road Networks". The software was developed by the Institute of Transport Studies, University of Leeds..

3.1.6 For this study, the GDTM model was extended to cover other parts of Great Britain. Given that the A38 is part of the SRN, it was important to represent the full length of strategic trips. In this regard, the traffic model is able to represent potential transfers into the A38 corridor from competing strategic routes, for example, the route using the A42/M42/M1 for strategic trips between Birmingham and Leeds.

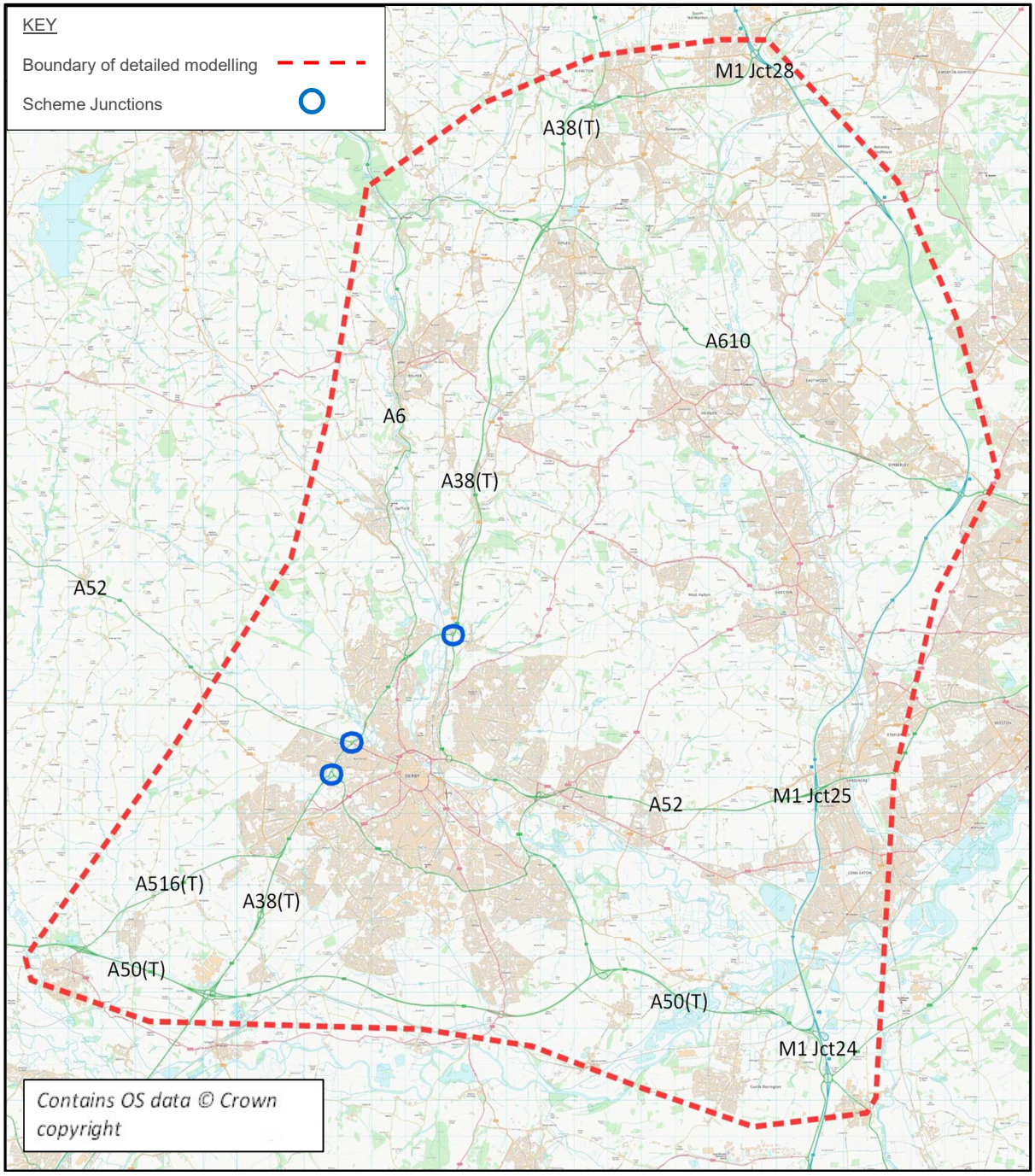


Figure 3.1: Area of detailed modelling

3.1.7 The area of detailed modelling is indicated in Figure 3.1. This modelled area included the whole of the Derby unitary authority area, the M1 between junction 28 and junction 24 to the east, and towns such as Alfreton, Heanor, Ilkeston, Sandiacre and Borrowash. Strategic and major roads were also included in this area of detailed modelling including: the A38(T) north-south corridor, A52, A52(T), A610, A6, A516, A5111 and A50(T).

3.1.8 To reproduce the observed (for a baseline year of 2015) traffic flows and routes choices within the area of detailed modelling, the DATM was updated using the following datasets:

- **Traffic signal timings:** The study area contains 16 signalised junctions that are considered 'key' junctions or congestion 'hot spots'. Average signal timings in each of the busy modelled time periods (i.e. AM peaks, Inter-Peak, and PM peaks) were observed by DCiC's engineers and these were then coded into the highway model's network as fixed time plans. The timings were observed for each of the 16 signal-controlled junctions listed below:
  - A601 Stafford Street/A601 Ford Street/A52 Friar Gate.
  - A601 Mercian Way/A601 Stafford Street/A516 Uttoxeter New Road/Curzon Street.
  - A601 Ford Street/A52 Agard Street.
  - A52 Friar Gate/Ashbourne Road/Uttoxeter Old Road.
  - A52 Friar Gate/Bridge Street.
  - A6 Garden Street/Kedleston Road/Duffield Road (Five Lamps).
  - A6 Quaker Way/Lodge Lane.
  - A6 Quaker Way/St Helens Street.
  - The Pentagon island: – A52 Eastgate/A61 Sir Frank Whittle Road.
  - The Pentagon island: – A52/Chequers Road.
  - A601 Traffic Street.
  - A601 St Alkmund's Way/A6 Station Approach/A601 The Cock Pitt.
  - A601 Traffic Street/A601 Bradshaw Way/A5194 London Road/London Road (Roundabout).
  - A601 Bradshaw Way/A601 Lara Croft Way/A514 Osmaston Road (Roundabout).
  - A601 Lara Croft Way/A601 Mercian Way/A5250 Burton Road/Osmaston Road roundabout.
  - A5111 Osmaston Park Road/A51111 Harvey Road/A514 Osmaston Road (Mitre Island).

- **Traffic counts:** Actual volumes of trips using the highway network within the modelled area were obtained from the following sources:
  - Twenty six counts supplied by DCiC were not undertaken specifically for the Scheme. These included count monitoring stations for annual DfT reporting, those undertaken for Connecting Derby (a package of transport interventions for central Derby, including the completion of the Inner Ring Road to the south of the City) and to support private development.
  - One hundred and eight Automatic Traffic Counts (ATCs) commissioned specifically for this study and undertaken over fourteen days between Tuesday 24 February 2015 and Monday 17 March 2015 inclusive.
  - Eleven manual (or radar) observed link counts undertaken on one day between Tuesday 24 February and 17 March 2015.
  - Twelve manual-classified turning counts at junctions undertaken on Tuesday the 3 March 2015 between 07:00 and 19:00.
- **Trafficmaster data:** journey time data has been calculated for routes within the study area using anonymised data supplied by Trafficmaster plc from around 100,000 probe vehicles across Britain that are equipped with global positioning system devices. These devices record speed and location information which is collated, digitally mapped, and matched to the road network. The routes for which data was analysed is shown within Figure 3.2.
- **Mobile phone movement data:** Anonymised mobile phone movement records were provided by Telefonica as processed and aggregated datasets. The datasets were based on the tracking of 'probes', where a probe is the result of an electronic/wireless communication between a mobile phone and the nearby transmitter masts. A communication can be actively initiated by a phone call or the exchange of data, or passively initiated by the mobile phone hand-shaking with local transmitter masts. A probe event locates the mobile phone to a particular cell (area) around a transmitter mast. Each travelling mobile phone traces a path, i.e. like a breadcrumb trail, as it transfers from cell to cell during its journey along the transport network. These probe paths can be used to generate the trip movements of the phone and hence its user.

3.1.9 The data described above was used to load the traffic model with the correct volumes of trips, and also describe how these trips are currently routeing across the network (i.e. in terms of origin/destination, overall trip length and journey time).

3.1.10 A summary of the method to create the baseline model is provided in Figure 3.3.

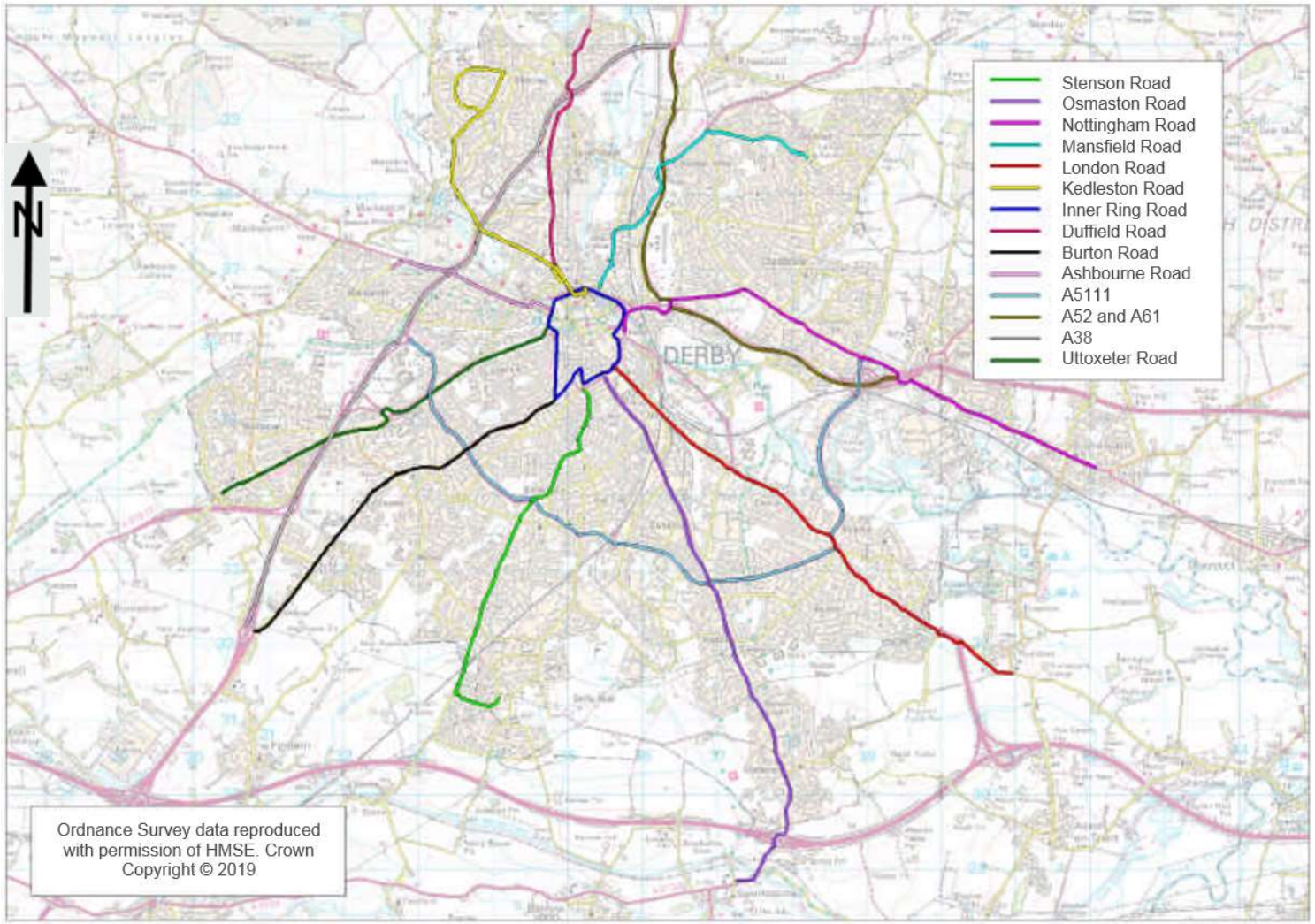


Figure 3.2: Journey time routes

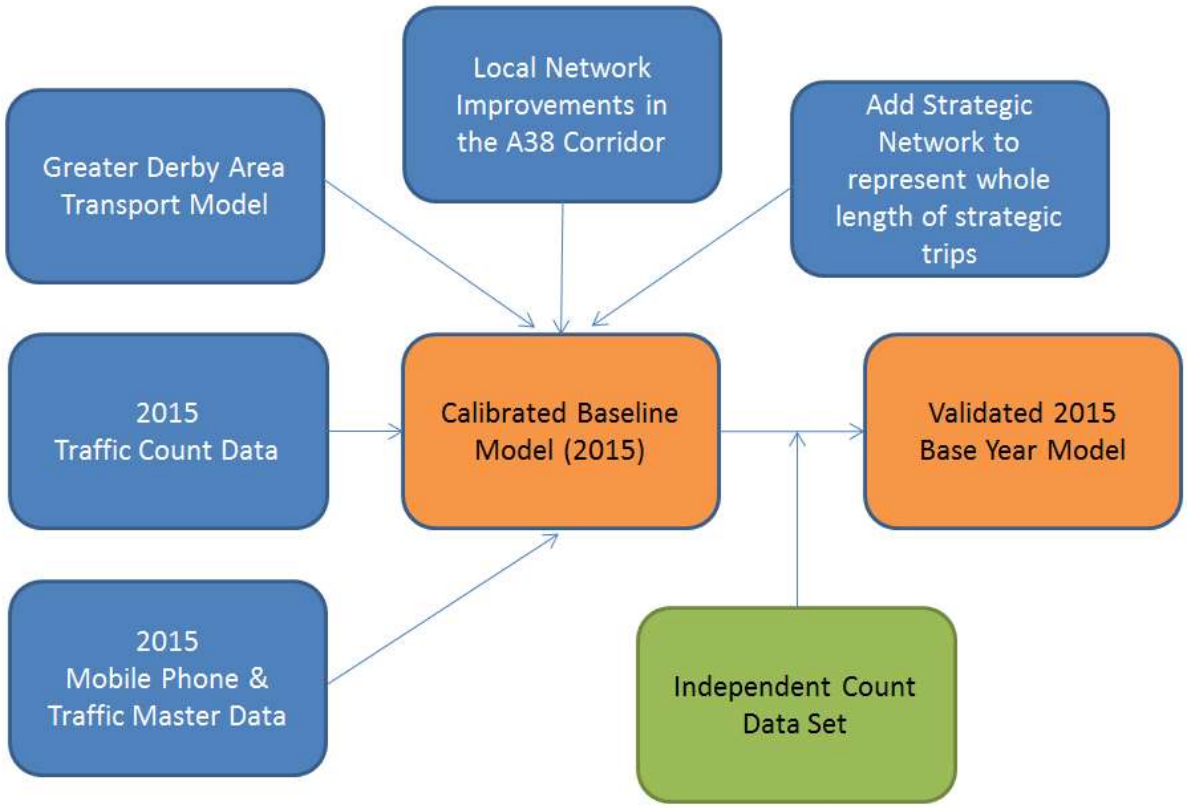


Figure 3.3: Production Of baseline traffic model

3.1.11 The validation of the traffic model against existing conditions was reported in a *Local Model Validation Report (LMVR)* and a subsequent *LMVR Addendum*[3].

3.1.12 The LMVR provides further details of the building of the model, the model parameters used, the performance of the model against observed conditions, the potential applications for the model, and the model's strengths and weaknesses. The LMVR and LMVR Addendum concluded that the model provided a robust foundation from which to assess the Scheme.

[3] An LMVR Addendum was issued at PCF Stage 3 because the earlier work undertaken at PCF Stage 2 identified that those traffic model zones representing the residential area around Ford Lane could be improved.

What is a SATURN model?

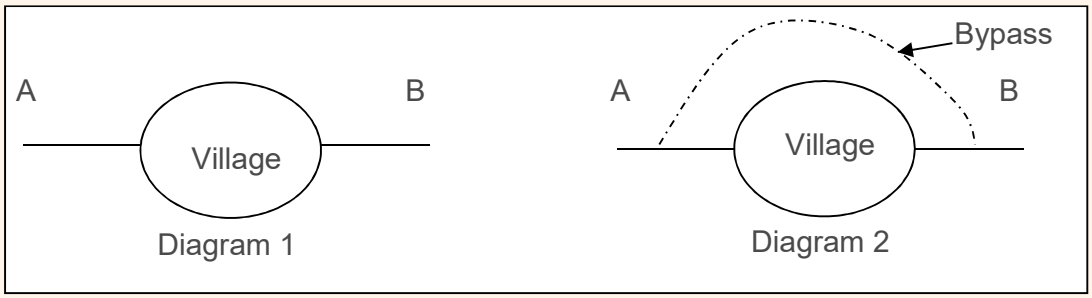
SATURN (*Simulation and Assignment of Traffic in Urban Road Networks*) is a computer software package used to forecast changes in traffic associated with development or road schemes. It has been used to support many large infrastructure schemes and is a DfT approved tool. A SATURN model has two components:

- A **Supply Network:** which is a representation of the highway network including its roads and junctions; and
- A **Demand Matrix:** which is a representation of the individual vehicles which would seek to route through the network.

The purpose of the SATURN model is to predict which specific route vehicles will choose to travel from their respective origins to their respective destinations given:

- Changes to the Supply Network (i.e. as new roads are opened, or junctions improved); and
- Changes to the Demand Matrix (i.e. as traffic levels increase (or decrease) in the future).

For example:



In Diagram 1, traffic from A to B would route through the village centre, as it is their only choice.

In Diagram 2, the choice of route has increased. Vehicles could either use the bypass or continue to route through the village centre. Importantly, as more traffic uses the bypass, congestion in the village centre would decrease, and this may make it a faster route for some traffic given the shorter distance.

SATURN solves the problem of 'how much traffic would use each route available'. It bases these choices on journey cost and distance.

Figure 3.4: SATURN model operation – general principles

4 Future year traffic forecasts

4.1 Overview

4.1.1 The purpose of this section is to identify the performance of the highway network in the future, both 'with' and 'without' the Scheme. It includes a description of the proposed improvements to the A38 junctions at Kingsway, Markeaton and Little Eaton.

4.2 Future year scenarios

4.2.1 Two future year forecasts have been prepared:

- 'Do-Minimum' – i.e. there are no improvements to the Kingsway, Markeaton and Little Eaton junctions. Traffic growth occurs into the future as is described later in this section. Transport interventions that are more than likely to be implemented were included.
- 'Do-Something' – i.e. the junction improvements are introduced at Kingsway, Markeaton and Little Eaton. Traffic growth occurs into the future as for the 'Do-Minimum' case, as is described later in this section.

4.2.2 The future year forecasts were prepared for an Opening Year (2024), an intermediate year (2031) and a Design Year (2039):

4.3 Modelling the 'Do-Minimum' case

4.3.1 **Method:** The number of trips on the highway network is likely to grow whether or not the A38 Derby Junction scheme is introduced, and there are also likely to be changes (e.g. junction improvements) to the highway network outside of the scope of the Scheme.

4.3.2 To forecast the future traffic demand, information has been obtained from the Department of Transport, Highways England, DCiC and DCC regarding:

- Planned changes to the highway network.
- Forecast changes in trip demand.

This has then been used to modify the Scheme's Base Year Traffic Model, as per

4.3.3 Figure 4.1, to produce the 'Do-Minimum' future year highway networks.

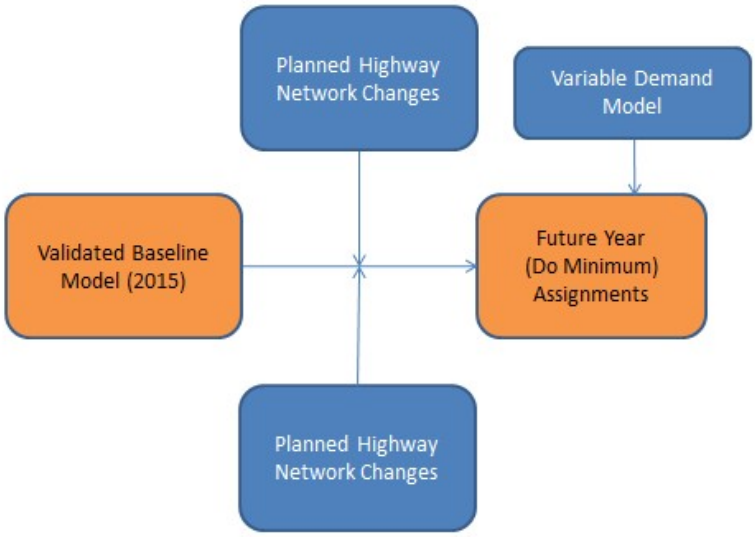


Figure 4.1: Production of the 'Do-Minimum' (2039) forecast assignments

4.3.4 **Planned changes to the highway network:** The Scheme is not the only highway improvement scheme proposed within the area of detailed modelling. To include the impact of the existing planned programme of work, the following schemes have been included in the future year highway model as modifications to the traffic model's 2015 baseline highway network:

a. Land at Hackwood Farm – junction at Station Road and Radbourne Lane coded as a roundabout from a priority junction.

b. Hollybrook Way – traffic signals coded at Chain Lane, Burton Road, Pastures Hill and Hillsway junction (2024).

c. Rykneld Road – traffic signal junctions coded at Rykneld Way (2024).

d. Kingsway Hospital – roundabout at access to Kingsway Retail Park recoded as a signalised roundabout (2024).

e. Land West of Mickleover – Etwall Road/Hospital Lane junction recoded as a roundabout to accommodate the new development's access (2024).

f. East Midlands Intermodal Park – westbound on-slip recoded to include new roundabout and junction configuration (2024).

g. Wyvern Way/Derwent Parade – roundabout recoded as traffic signals (2024).

h. Lily Street Farm, Derby Road, Alfreton – new traffic signal junction (2024).

i. T12 link Road – additional link road coded in model (2024).

j. South Derby Link Road (2031).

k. East Midlands Gateway – changes to junction 24 of the M1, A50 A453 link road, Kegworth Bypass (2024).

l. Land North of Mansfield Road, Breadsall Hill Top – priority junction recoded as a roundabout for development access (2024).

4.3.5 **Forecast changes in trip demand:** The future demand for travel within the model study area will be affected by several key factors. These include:

- Changes in employment levels;
- Changes in population and the number of households; and
- Changes in the level of car ownership.

4.3.6 The impacts of these factors are incorporated in the NTEM (National Trip End Model).

4.3.7 Information contained within the NTEM database has been extracted in the form of forecast year trip-end growth projections for travel (including by car, LGV and HGV), thus allowing local area traffic models (including the A38 Derby Junctions traffic model) to be developed on a consistent basis with regard to future year national growth.

4.3.8 Specific developments were modelled in the districts of Amber Valley, Derby City, Erewash and South Derbyshire. The information for the specifically modelled development sites, within the area of detailed modelling, were identified from the following information sources:

a. South Derbyshire, Five-year Housing Supply, June 2015.
b. Amber Valley Sustainability Appraisal of the Amber Valley Local Plan (Part One).
c. Amber Valley Borough Draft Local Plan, March 2017.
d. Amber Valley Borough Council, Five-year Housing Land Supply 2016-2021;
e. Derby City Core Strategy 2008-2028.
f. South Derbyshire Draft Local Plan 2008-2028.
g. Meetings with DCiC – October 2015, February 2017.

4.3.9 The highway improvements associated with the East Midlands Freight Distribution Centre at M1 junction 24 were represented. This development is predominantly in North West Leicestershire and was specifically modelled because it is a NSIP that might have a traffic impact on the Scheme. A transport assessment was available on the Planning Inspectorate's website.

4.3.10 The 'Do-Minimum' traffic forecast model includes the forecast responses in travel behaviour as a result of representing the above specifically-modelled development sites. This is an outcome of applying the variable demand model (VDM[4]) process.

[4] Variable Demand Modelling seeks to identify the level of induced trips/supressed trips that is likely to result from a change in travel opportunity. The basis for VDM is contained within DfT's transport analysis guidance (refer Unit M2, paragraph 2.2.3), which states that "the benefit from schemes can be substantially altered by changes in demand arising from the scheme. Any scheme potentially encourages more use of the transport network and hence may affect congestion levels - in the case of highway schemes over the entire journey distances travelled by the traffic through it."

4.3.11 Table 4.1 provides a summary of the number of dwellings and quantum of development floorspace that is proposed to be developed to 2039 (from the 2015 baseline).

Table 4.1: Summary of dwellings and employment within the uncertainty log

	Number of Dwellings	Employment (square-metres)
2024		
Amber Valley	4,633	59,787
Derby	10,995	412,300
Erewash	307	21,206
South Derbyshire	10,485	1,265,106
Total	**26,421**	**2,315,817**
2031		
Amber Valley	8,789	187,787
Derby	15,406	658,300
Erewash	3,107	21,206
South Derbyshire	12,875	1,321,941
Total	**40,177**	**2,746,652**
2039		
Amber Valley	8,789	187,787
Derby	16,406	684,300
Erewash	6,325	293,706
South Derbyshire	13,875	1,321,941
Total	**45,395**	**3,045,152**

4.4 Modelling the 'Do-Something' case

4.4.1 To produce the 'Do–Something' (2039) forecast (Figure 4.2), the 'Do–Minimum' traffic forecasting model was further developed to include the A38 improvements at the Kingsway, Markeaton and Little Eaton junctions. The 'Do-Something' model has been prepared to answer the following types of question:

- Are all three junction improvements economically justified?
- What is the optimum layout option at Kingsway?
- What is the optimum layout option at Markeaton?
- What is the optimum layout option at Little Eaton?
- How should access from the A38 into Mackworth be maintained?
- How should accesses to local facilities and adjacent land be retained?
- Should the Ford Lane local access be retained?

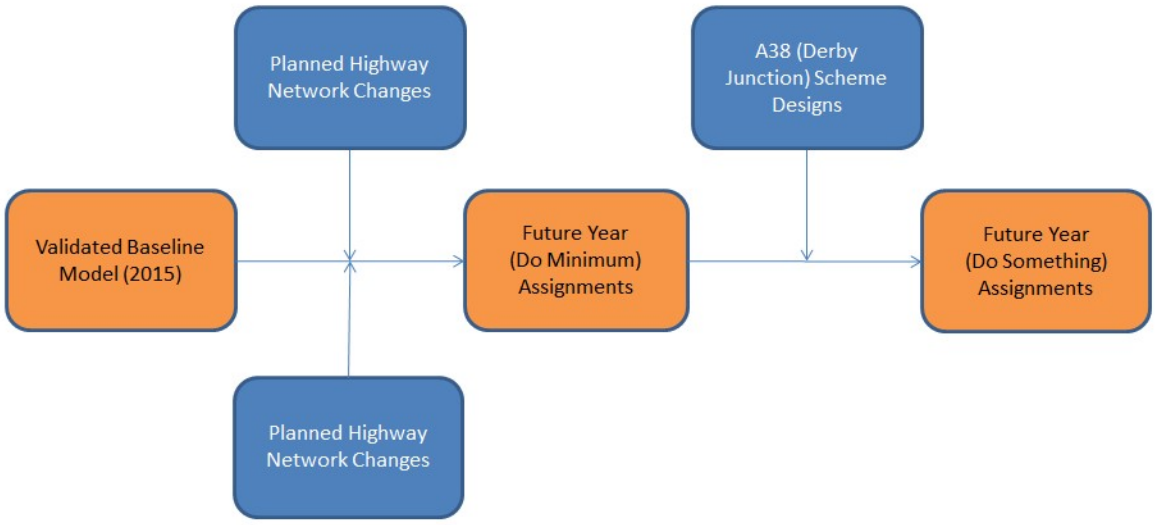


Figure 4.2: Production of the 'Do-Something' (2039) traffic model

4.4.2 The key features of the Scheme, which were coded into the 'Do-Something' traffic forecasting models, are:

a. Lower the A38 to pass underneath the modified Kingsway and Markeaton junctions;

b. Widen the A38 to three lanes in each direction between the Kingsway and Kedleston Road junctions; and

c. Build two new bridges to carry the A38 traffic over the modified roundabout at the Little Eaton junction.

4.4.3 At the **Kingsway junction** (Figure 4.3):

a. The A38 will be lowered to pass underneath the modified junction in a new underpass with two new roundabouts and a new bridge to carry traffic over the lowered A38.

b. New slip roads will be built between the A38 and the new (ground level) roundabouts to allow people to join and leave the A38 and use the local roads.

c. The A38 will be widened to three lanes in each direction between the Kingsway junction and Markeaton junction, with the speed limit increased from 40mph to 50mph. The two existing bridges that carry the A38 northbound and southbound carriageways over Brackensdale Avenue would be widened to accommodate the additional lanes.

d. A new pedestrian and cycle route would be provided across the new bridge in the centre of the junction to link the residential areas and the National Cycle Route west of the A38 with the A5111 and the Kingsway Retail Park.

e. For safety reasons, there would no longer be access to or from the A38 at the Brackensdale Avenue and Raleigh Street junctions. Instead, there would be access from Kingsway Park Close. Of the alternatives access options considered at the public consultations, this option would impact less on the local community, in particular, the properties on Greenwich Drive South and reduced severance impacts to the adjacent area of public open space. The Kingsway Park Close access option also provides a more direct access to the A38 for commercial traffic using the Kingsway Industrial Park, so keeping these larger vehicles away from residential areas.

f. The uncontrolled pedestrian crossing of the A38 dual carriageway between Thurcroft Close and Greenwich Drive North would be removed for safety reasons. Alternative pedestrian routes would be via Brackensdale Avenue or the signal-controlled crossings of the slip roads at new Markeaton junction.

4.4.4 At the **Markeaton junction** (Figure 4.4):

a. The A38 would be lowered to pass underneath a modified signalised roundabout in a new underpass with two new bridges to carry the A52 traffic across the lowered A38. The lowered A38 carriageways would be three lanes in each direction with a speed limit of 50mph.

b. New slip roads would be built between the lowered A38 and the enlarged new roundabout at ground level to allow people to join and leave the A38 and use the local roads.

c. The A38 would also be widened to three lanes in each direction between Markeaton junction slip roads and the Kedleston Road slip roads, with the speed limit increased from its existing 40mph to 50mph.

d. Signal controlled crossings would be provided to allow pedestrians and cyclists to safely navigate the junction.

e. The existing pedestrian footbridge over the A38 would be replaced. The new bridge would provide improved access for all pedestrian, cyclist and disabled users.

f. The zebra crossing of A52 Ashbourne Road would be replaced by a traffic signal-controlled crossing.

g. A revised access would be provided to Sutton Close and the two properties on Ashbourne Road.

h. The existing entrance to Markeaton Park from the roundabout would be closed.

i. An improved entrance and exit to the park would be provided from the A52 West. This would be at a new signalised junction which would also change the way people currently access the petrol station and McDonald's.

4.4.5 At the **Little Eaton junction** (Figure 4.5):

a. Two new bridges would be built to carry the A38 traffic on a flyover over the roundabout.

b. The existing roundabout would be extended to the south and new slip roads would be built to allow road users to join and leave the A38 and other local roads. The dedicated A38 to A61 southbound segregated lane would be retained.

c. The existing bridge over the railway would be widened to carry the new southbound A38 carriageway and southbound merge slip road. The existing flood arch would also be widened.

d. The existing national speed limit on the A38 will be retained, although an advisory 50mph limit will be displayed in advance of the curved horizontal alignment through the junction.

e. All existing footways and cycleways would be maintained. Where necessary they would be re-routed around the new roundabout. Signal controlled crossings would be provided to assist pedestrians and cyclists in crossing the A38 slip roads on the west side of the new roundabout.

f. For safety reasons, vehicle access to and from the A38 northbound carriageway at Ford Lane would be closed permanently. Access to the local business Talbot Turf would be via Ford Lane from the A6 Duffield Road. This is likely to require minor alterations to the layout of the junction between Ford Lane and Lambourn Drive.

g. The Ford Lane River Derwent bridge will be assessed and would be upgraded, if necessary, to ensure it has capacity to carry the lorries from Talbot Turf.

h. The existing A6 Duffield Road/Ford Lane junction could be traffic signal controlled to assist with the control of any additional trips that could divert through this junction as a result of the closure of the A38 access.

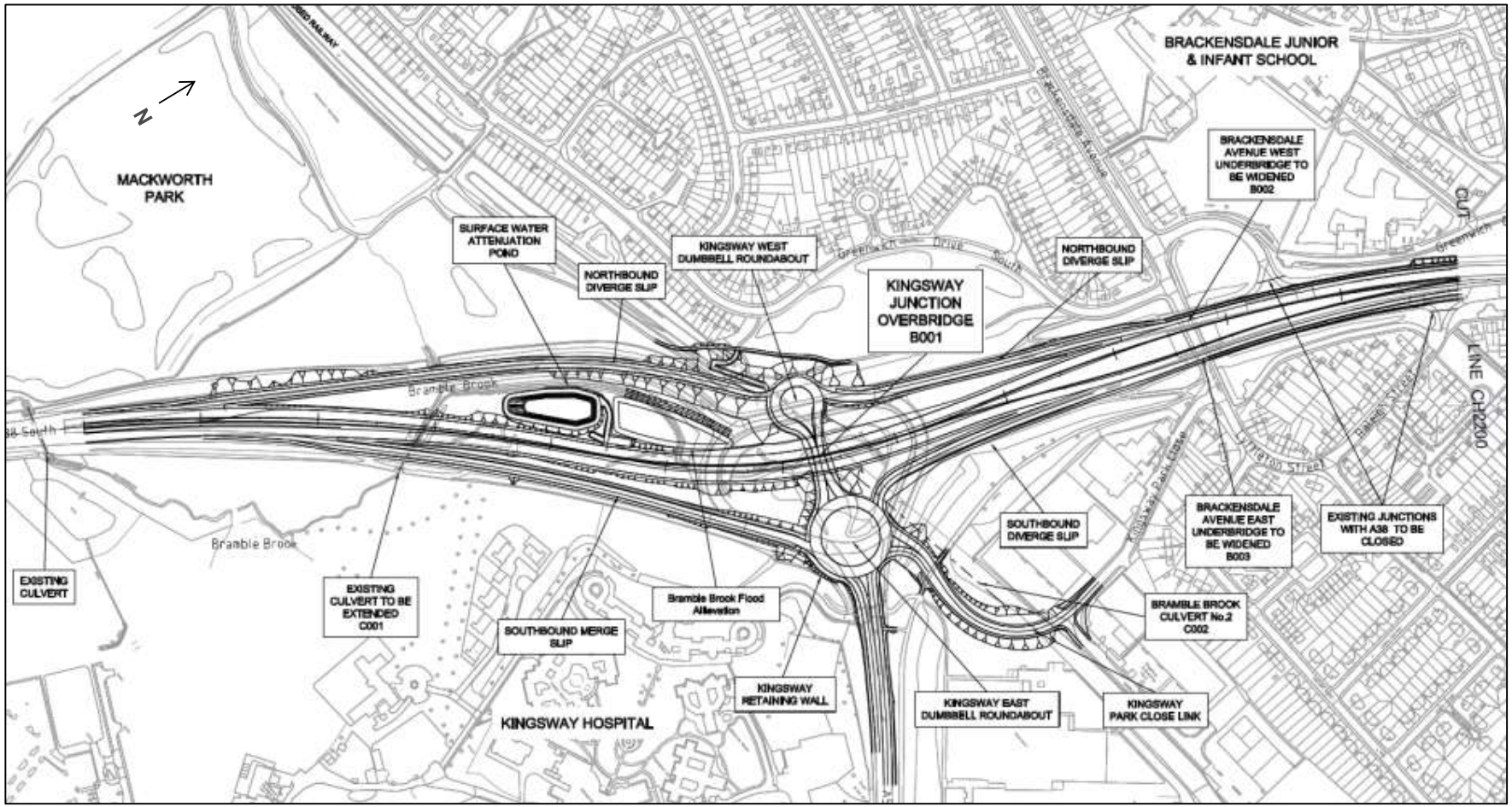


Figure 4.3: Improvements at Kingsway junction

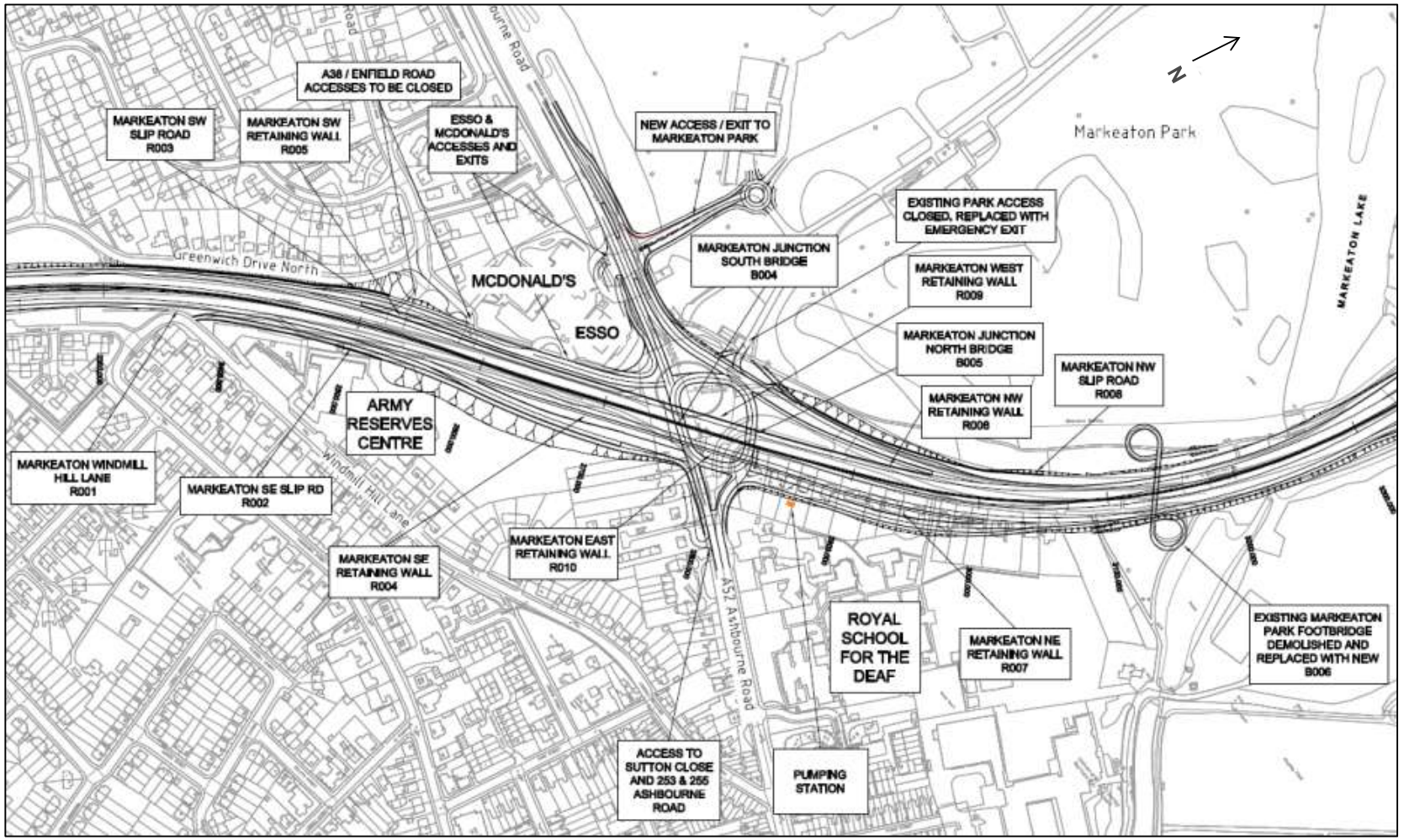


Figure 4.4: Improvements at Markeaton junction

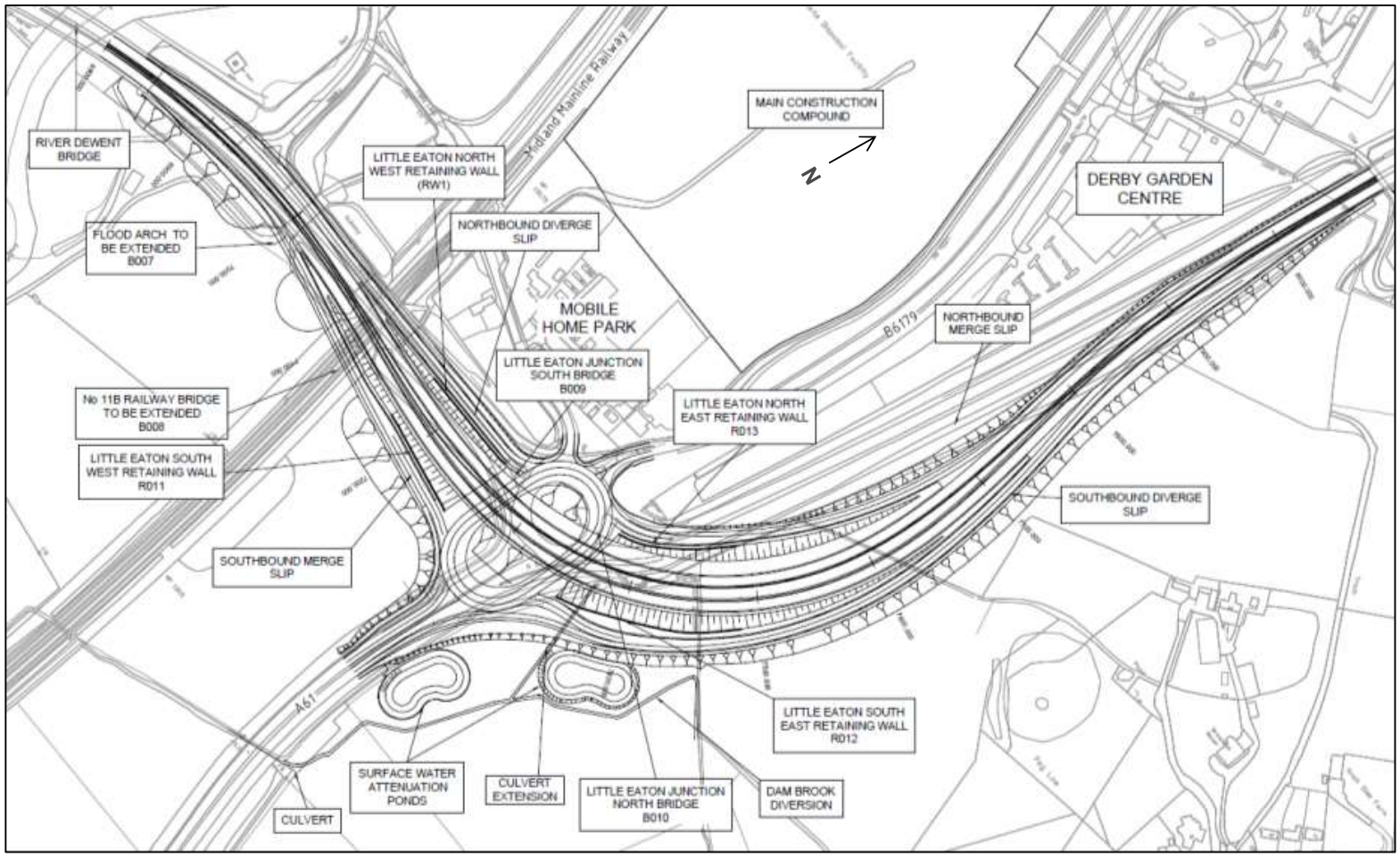


Figure 4.5: Improvements at Little Eaton junction

4.5 Forecast changes in traffic flows

4.5.1 The total trips within the base, 'Do–Minimum' and 'Do-Something' future year trip matrices are shown in Table 4.2 as all vehicles in units of passenger car units (PCU) per hour. This shows the total number of trips assigned to the traffic model (not how they are routeing on specific roads, which is provided later). This table is shown to illustrate the level of growth forecast across the model area (and prior to the application of the variable demand forecasting process).

Table 4.2: Matrix totals (PCU per hour)

Time Period	Base Year (2015)	Future Year (2039)	Growth (2039/2015)
AM1	285,252	347,072	21.7%
AM2	362,675	443,720	22.3%
IP	276,637	341,162	23.3%
PM1	384,184	463,642	20.7%
PM2	392,619	474,280	20.8%
EV	187,863	224,404	19.5%

Time periods modelled:

AM1	07:00 – 08:00;	PM1	16:00 – 17:00;
AM2	08:00 – 09:00;	PM2	17:00 – 18:00;
IP (Inter-Peak) average hour	10:00 – 16:00;	EV (Evening) average hour	19:00 – 22:00.

4.5.2 These trip matrices, which contain the origin to destination information, were assigned onto the highway networks. A variable demand modelling process was used. This method will induce some additional trips where travel times (costs) would improve and conversely will suppresses trips where travel times (costs) would worsen compared with Base Year conditions. The assignment process also includes a route choice mechanism for every trip, which is an iterative process that accounts for the delays caused by all the other users who will also be making journeys through the highway network.

4.5.3 The forecast Annual Average Daily Traffic (AADT[5]) on key routes throughout the Derby area are presented in Figure 4.6 to Figure 4.12. Traffic flows are presented for both the 'Do-Minimum' and 'Do-Something' case forecasts. The changes in flow, "Diff", as a consequence of the A38 Derby Junctions Scheme, are presented in the bottom boxes.

[5] AADT is the total volume of vehicle traffic of a highway or road for a year divided by 365 days. This gives a total quantum of traffic on an 'average' day.

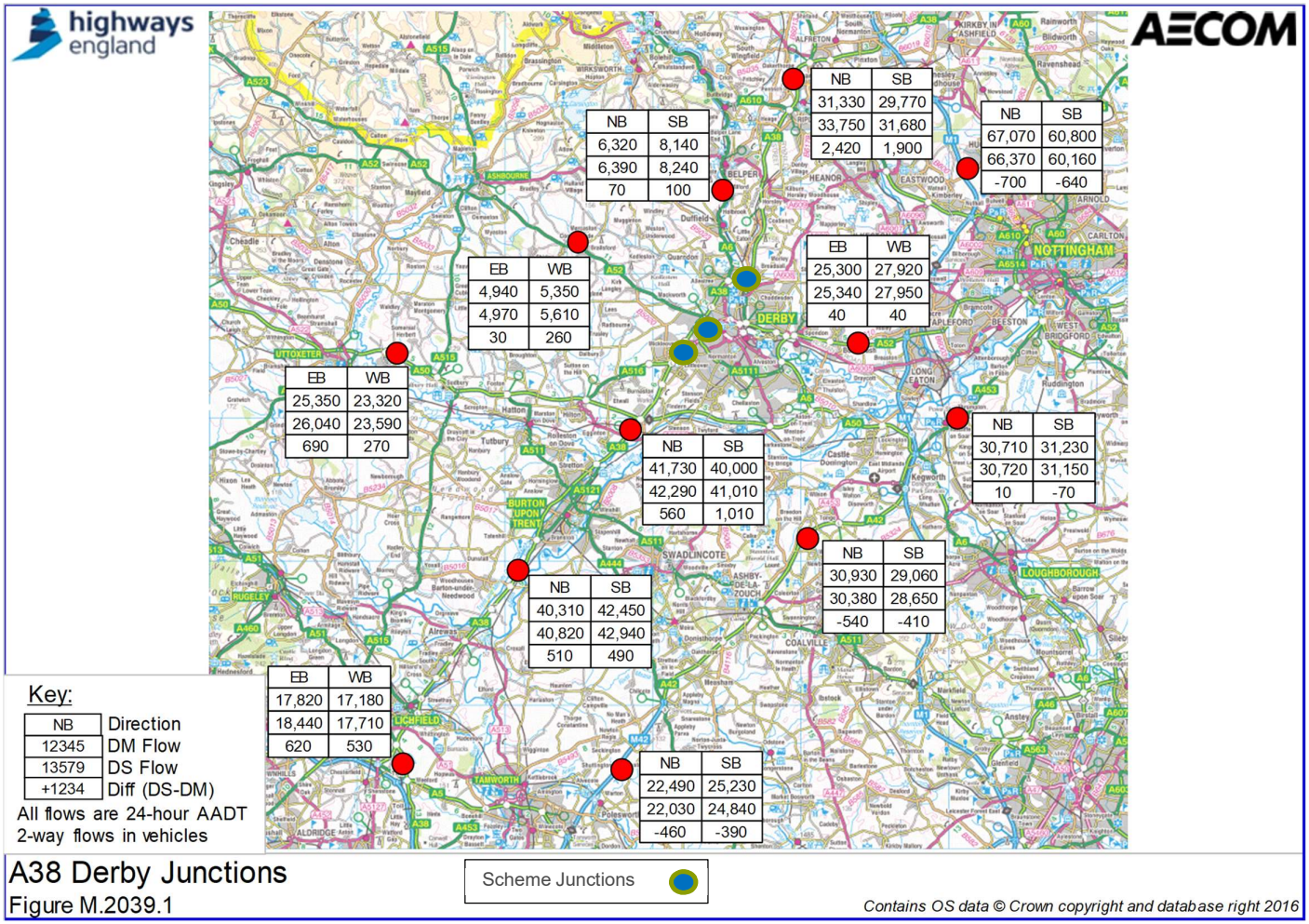


Figure 4.6: AADT flows – wider area (2039)

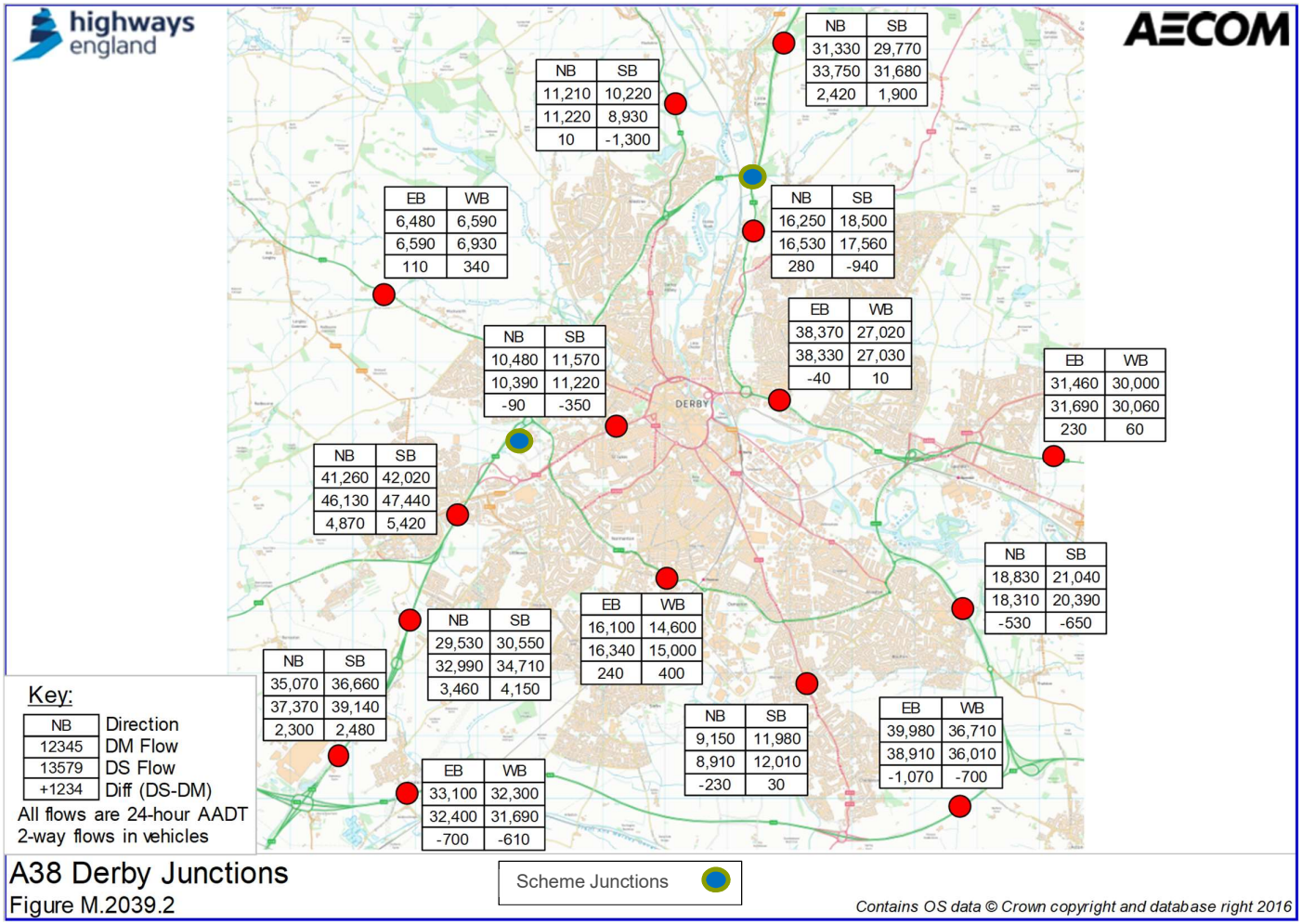
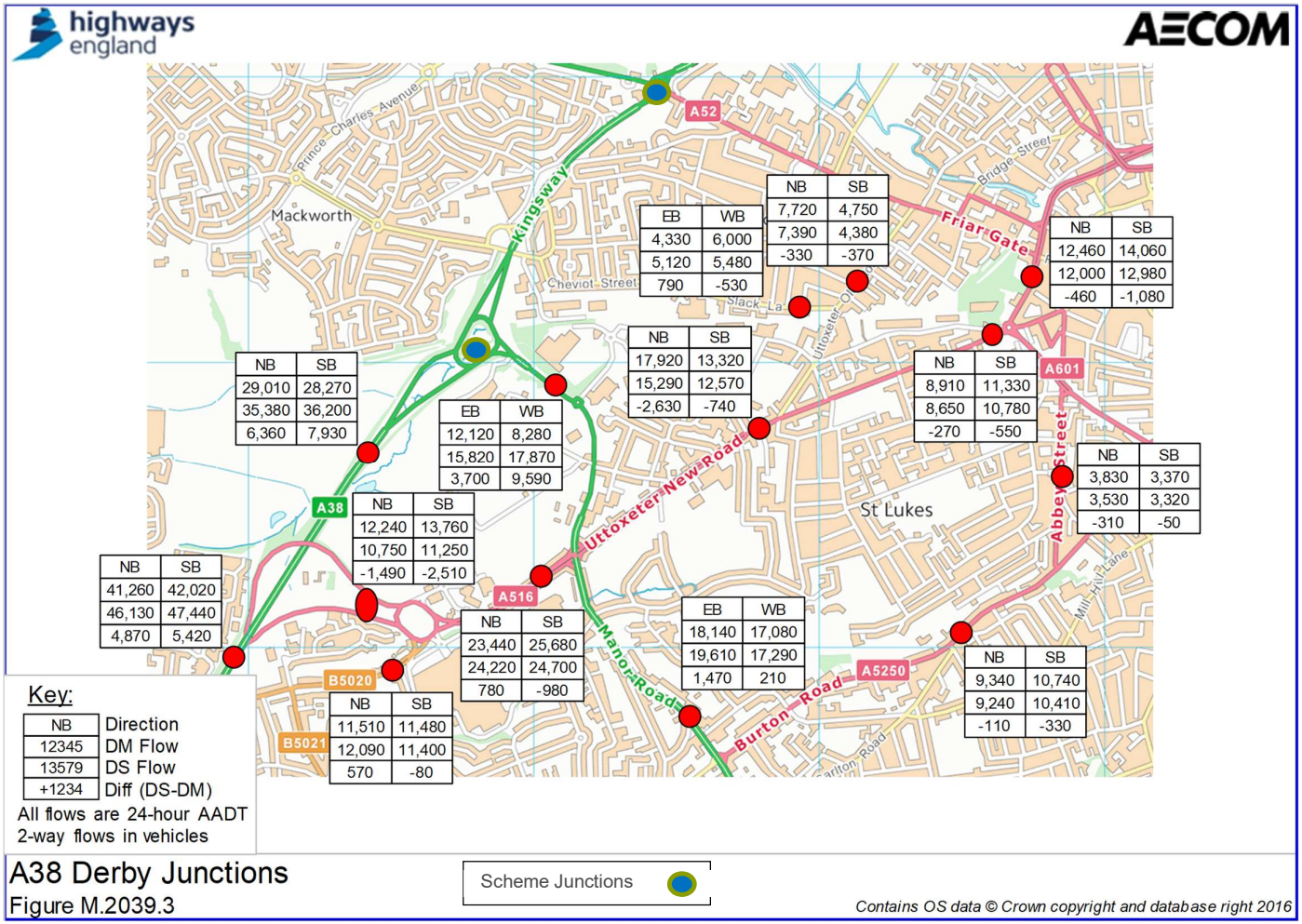


Figure 4.7: AADT flows – study area (2039)



NB	SB
29,010	28,270
35,380	36,200
6,360	7,930

EB	WB
4,330	6,000
5,120	5,480
790	-530

NB	SB
7,720	4,750
7,390	4,380
-330	-370

NB	SB
12,460	14,060
12,000	12,980
-460	-1,080

NB	SB
17,920	13,320
15,290	12,570
-2,630	-740

EB	WB
12,120	8,280
15,820	17,870
3,700	9,590

NB	SB
8,910	11,330
8,650	10,780
-270	-550

NB	SB
3,830	3,370
3,530	3,320
-310	-50

NB	SB
12,240	13,760
10,750	11,250
-1,490	-2,510

NB	SB
41,260	42,020
46,130	47,440
4,870	5,420

NB	SB
23,440	25,680
24,220	24,700
780	-980

EB	WB
18,140	17,080
19,610	17,290
1,470	210

NB	SB
9,340	10,740
9,240	10,410
-110	-330

NB	SB
11,510	11,480
12,090	11,400
570	-80

Figure 4.8: AADT flows – study area: west of the city centre (2039)

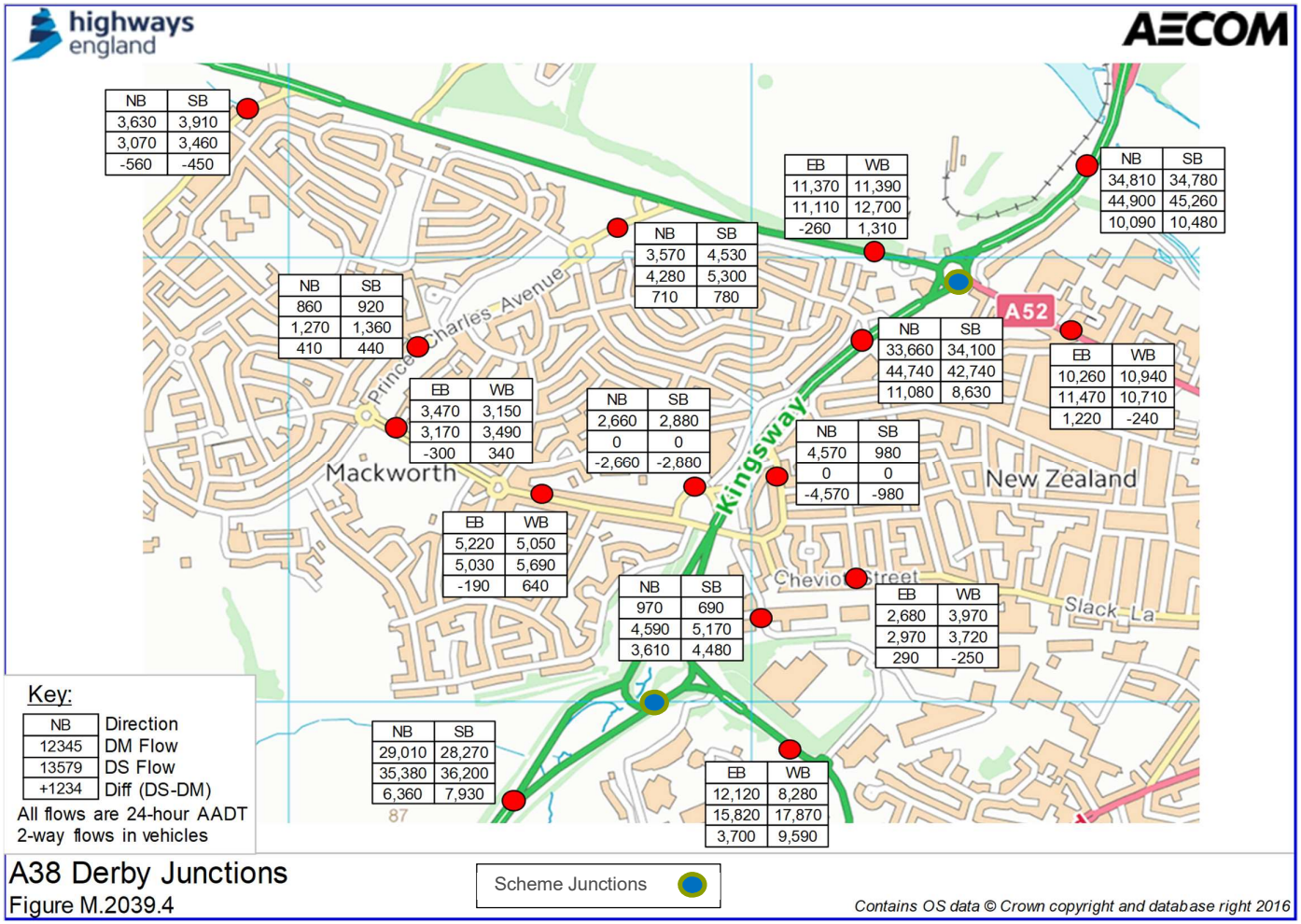


Figure 4.9: AADT flows – study area: Kingsway and Markeaton (2039)

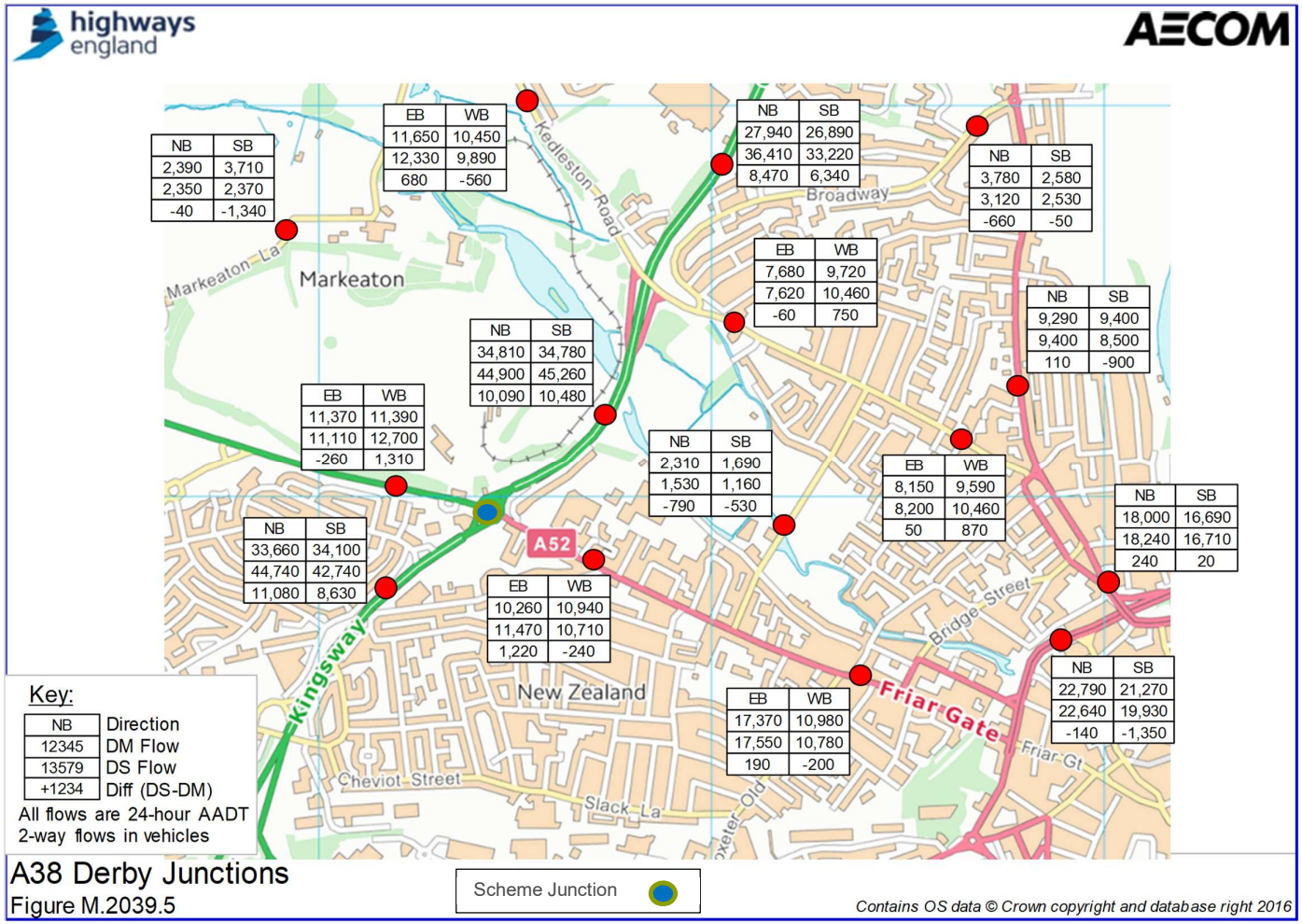


Figure 4.10: AADT flows – study area: Markeaton (2039)

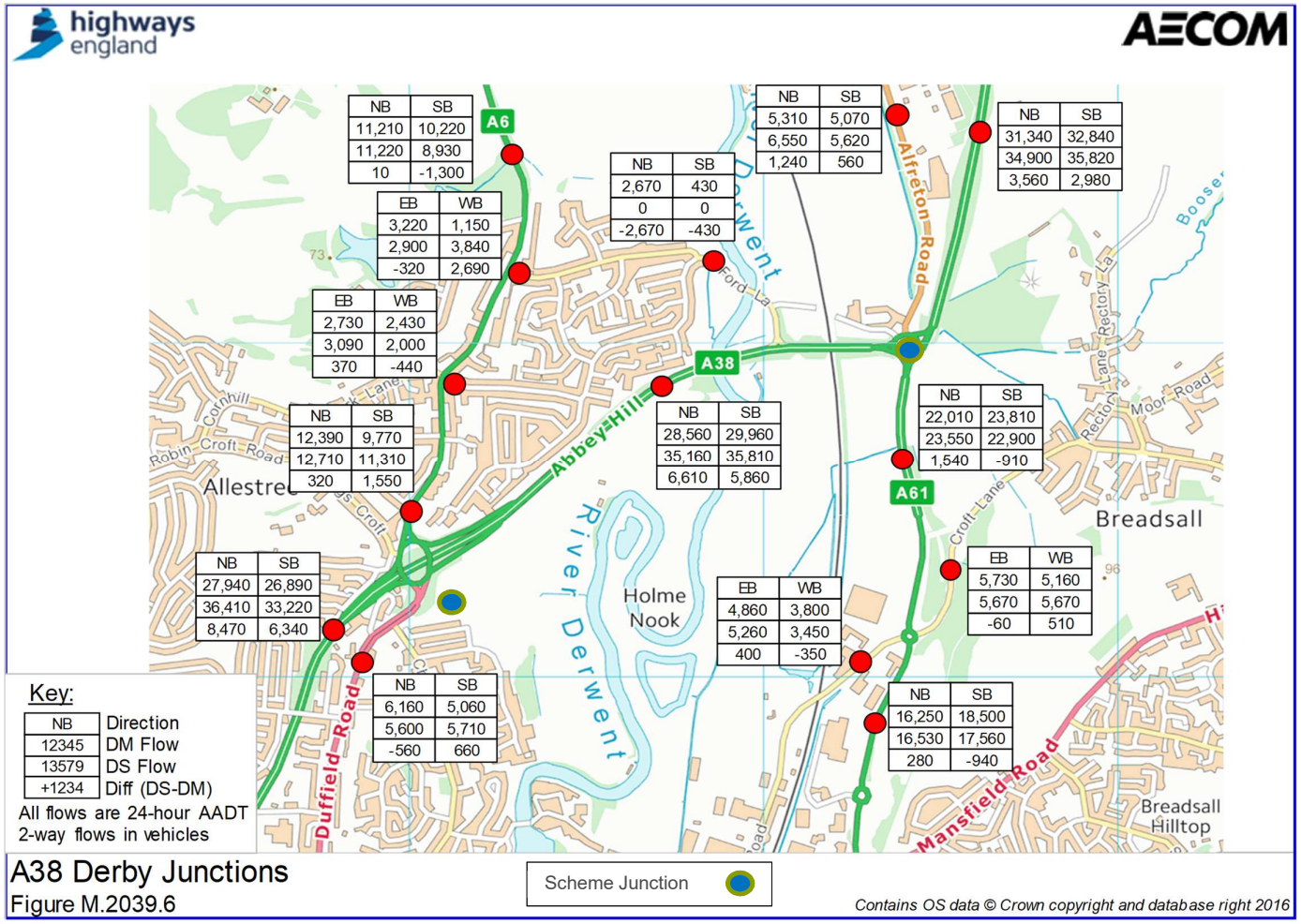


Figure 4.11: AADT flows – study area: Palm Court and Little Eaton (2039)

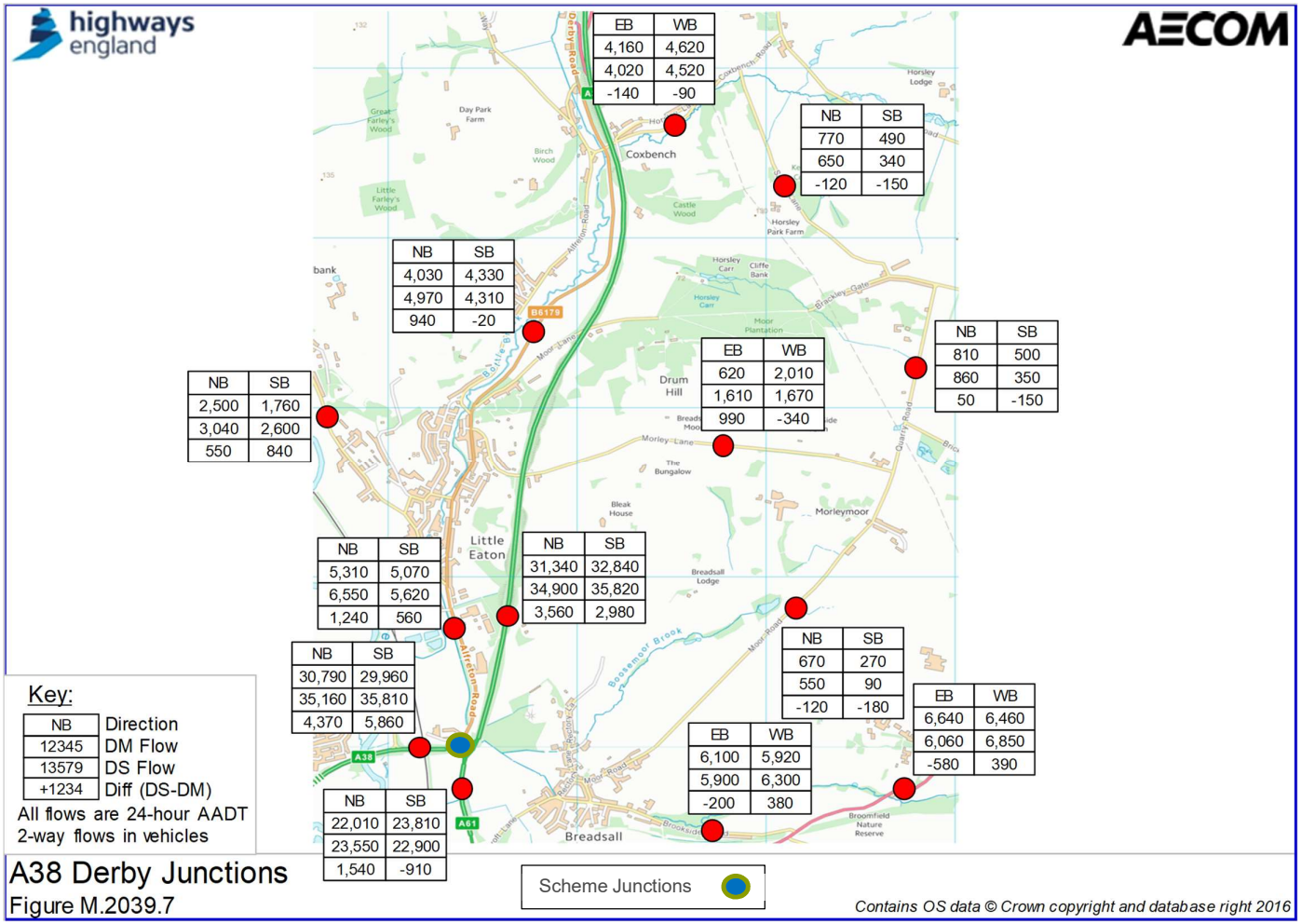


Figure 4.12: AADT flows – study area: north of Scheme (2039)

4.6 Performance of highway network without the Scheme

4.6.1 **Kingsway:** A technical report was produced in February 2018 which investigated the remaining capacity of the existing Kingsway Roundabout. This included for the redevelopment of the nearby Kingsway Hospital site and associated proposals to provide a fully traffic signal-controlled roundabout and widen the A5111 entry to three lanes.

4.6.2 The normally acceptable maximum Degree of Saturation (DoS) for traffic signal-controlled roundabouts is 90% to 95%. The other essential factor to consider is the Mean Maximum Queue (MMQ) value. The MMQ value should not exceed 2/3 of the available queuing capacity of the link (Queue Limit), as this can lead to queues forming, which block the roundabout exits, causing a gridlock situation to occur on the roundabout or impacting upon the operation of upstream junctions on the network.

4.6.3 For the proposed fully traffic signal-controlled roundabout, the predicted DoS for multiple traffic signal-controlled lanes exceed 90% to 95% in both the AM and PM peak periods (with the highest DoS being 115% and 124% in the AM and PM peak periods, respectively). Furthermore, predicted MMQs would significantly exceed the available queue limits, leading to a potential gridlock situation at the roundabout in both the AM and PM peak periods. As such, a fully signalised roundabout would not have sufficient queue storage capacity at this location for the forecast traffic flows.

4.6.4 **Little Eaton & Markeaton:** Between 2011 and 2013, the recognition of an existing capacity shortfall at the A38 Derby Junctions led to the investigation of low-cost improvements that could be implemented under the Government's Pinch Point fund. This fund was aimed at addressing bottlenecks on the local highway network, which were perceived to be impeding economic growth. The 'pinch point' funding was intended for those schemes that could be delivered quickly and with immediate benefit.

4.6.5 The two 'pinch point' schemes comprised:

- Little Eaton Roundabout – localised widening to three lanes on the A38(T) northbound and A61 approaches, widening of the north circulatory carriageway to four lanes, widening of the A61 exit, realignment of the B6179 approach and conversion of the roundabout to full-time signalisation.
- Markeaton Roundabout – localised widening of the A38(T) southbound approach to four lanes along with the downstream circulatory and partial signalisation of the roundabout.

4.6.6 At the time, it was recognised that the implementation of the 'pinch point' schemes would impact on the transport benefits that could be realised through the eventual grade separation of the three A38 Derby Junctions. This is because the 'pinch point' schemes partly relieved the existing delays, thus making the future year reference case (against which the grade separation scheme would be judged) less congested than otherwise would be the case.

4.6.7 To develop the 'Pinch Point' improvements, the Markeaton junction was assessed in a Scheme Option Testing report of August 2011 prepared by consultants Halcrow. The introduction to this report makes clear that the 'pinch point' schemes were not a replacement for the grade separation scheme: *"A number of new developments have been committed within the immediate area which will affect the operation of the existing highway network. These developments will further impact on an already congested network and affect journey times and reliability. A major scheme, to grade separate these junctions, has been deferred and the purpose of this study is to identify a cost efficient, smaller scale interim solution."*

4.6.8 Indeed, the interim nature of the improvements is reflected in the assumptions contained within the modelling used to appraise the schemes: The modelling assumptions were:

- The scheme assessment year was 2013;
- Background traffic growth was applied from 2011 to 2013 (with traffic increased by approximately 1.3% over this period); and
- Committed developments (in addition to background traffic growth) were those at Radbourne Lane and Manor Kingsway Hospital.

4.6.9 The Scheme Option Report (Halcrow, 2011) identified that:

- *"[The improvement of Markeaton roundabout] provides … delay benefits …The additional lane on the northern arm and southbound circulatory improves overall capacity. However, one of the main problems on the network, the A52 (eastbound) exit blocking, still remains. This cannot be easily resolved, but the signal design on the eastbound circulatory allows for the exit towards Derby to be designated for two lanes. This should provide a small capacity increase on this critical link."*
- *"The proposed interim improvements to the Little Eaton and Markeaton roundabouts provide benefits to the local highway network, especially at Little Eaton in the PM peak (albeit with little forecast traffic growth). However, the improvements at Markeaton would be sensitive to changes in the pattern of traffic flow and future traffic growth, due to short queue-storage areas on the circulatory carriageway."*

4.6.10 **Summary:** Previous transport analysis and scheme design has shown that there are no at-grade solutions which would provide sufficient capacity to accommodate future levels of forecast demand, nor remove existing delays at the three scheme junctions.

4.7 Performance of the highway network with the Scheme

4.7.1 **Kingsway:** The proposed layout at Kingsway includes two roundabouts to allow the transfer of trips between the A38 and local routes leading to the A38. One roundabout would be located on each side of the A38 mainline (see Figure 4.3). As such, ARCADY software, which is a tool recommended by the DfT to be used to calculate the capacity of roundabout junctions, has been used to confirm the operational analysis of this designed layout.

4.7.2 ARCADY software has been run using a synthesised, peak one-hour profile and provided outputs in the form of Ratios of Flow to Capacity (RFC) and queue length (Q) measured in passenger car units (PCU). A synthesised hourly traffic-flow profile includes a 12.5% mid-peak 'surge' to robustly test the performance of the junction.

4.7.3 A worst-arm RFC value of 0.85 during any time segment is used as the target for new junction designs because this minimises the chance that queuing will occur at a new junction on opening. For existing junctions, RFC values above 0.85 are likely to produce queues that increase slowly. Above an RFC value of 1.0, a junction is more than likely to be at capacity (with resulting larger increases in queue length).

4.7.4 Table 4.3 summarises the results of the ARCADY analysis for the Kingsway roundabouts.

Table 4.3: Performance of the proposed Kingsway junctions, 2039 design year

Junction	AM (08:00 – 09:00)		PM (17:00 – 18:00)	
	RFC	Q	RFC	Q
Western Roundabout	0.32	0.5	0.58	1.4
Eastern Roundabout	0.66	1.9	0.41	0.7

Notes: RFC = Ratio of Flow to Capacity. RFC is a measure of the demand at the junction in relation to its ability to accommodate the demand flow, reported on a worst-arm basis.
Q = Mean Maximum Vehicle Queue, reported on a 'worst arm' basis in Passenger Car Units;
i.e. 1 car = 1 PCU; 1 HGV = 2 PCU.

4.7.5 The results in Table 4.3 show that the proposed roundabouts would operate below the 0.85 target RFC in the forecast design year.

4.7.6 **Markeaton:** A technical note was produced in September 2018 to provide a detailed assessment of proposed traffic signal designs at the Markeaton junction. The proposed Markeaton junction's traffic signal design was appraised for capacity using TRANSYT software.

4.7.7 At a traffic signal junction, one of the main difficulties encountered is to ensure that lane lengths are sufficient to allow vehicles to queue safely on the approaches to each of the red signal aspects.

4.7.8 The traffic flow patterns and the volume changes on each approach arm have been examined for each modelled peak time period; i.e. both of the AM time periods (AM1: 07:00-08:00 & AM2: 08:00-09:00) and both of the PM time periods (PM1: 16:00-17:00 & PM2: 17:00-18:00). Comparing each of the peak hours' TRANSYT results, the largest queues on links would occur in the AM1 peak hour and in the PM1 peak hour.

4.7.9 Queueing traffic at the junction has been measured as the MMQ and Peak Queue. The MMQ is the average, over a one-hour period, of the maximum number of vehicles that would be queueing (i.e. at the end of a red-light signal) at a traffic signalled junction's stop line.

4.7.10 The biggest MMQ is on the link from A52 West back as far as the Park Access junction. This queue would then extend back along the A52 to the west of the Park Access junction in the AM1 peak.

4.7.11 The second biggest queue would be on the A52 East approach (out of the city centre) in the PM1 peak hour. The vehicles queuing on this approach link would be stored on the A52 Ashbourne Road and would not cause any blocking of the roundabout.

4.7.12 The A52 (Ashbourne Road) routeing into Derby city centre is capacity constrained. In the AM1 and AM2 peak periods, vehicles are frequently observed to block-back from the A52 Ashbourne Road and into the A38 Markeaton junction. This would not change with the Scheme. However, the lane marking layout of the new signalised roundabout has been designed specifically to store the queue of vehicles into the city centre in one of the lanes, whilst the adjacent lanes are able to distribute vehicles destined for other directions (i.e. not heading into the city centre).

4.7.13 **Little Eaton:** The proposed layout at Little Eaton would enlarge and replace the existing roundabout junction. As such, the junction has been modelled using ARCADY.

4.7.14 Table 4.4 summarises the results of the ARCADY analysis.

Table 4.4: Performance of the proposed Little Eaton junction, 2039 design year

Scenario	AM (08:00 – 09:00)		PM (17:00 – 18:00)	
	RFC	Q	RFC	Q
Design 2039	0.83	4.3	0.71	2.4

Notes: RFC = Ratio of Flow to Capacity. RFC is a measure of the demand at the junction in relation to its ability to accommodate the demand flow, reported on a worst-arm basis.
Q = Mean Maximum Vehicle Queue, reported on a 'worst arm' basis in Passenger Car Units; i.e. 1 car = 1 PCU; 1 HGV = 2 PCU.

4.7.15 The results in Table 4.4 show that the proposed junctions would operate below the 0.85 target RFC in the design year.

4.7.16 In the AM1 and AM2 peak periods, vehicles are frequently observed to block-back from A61 Alfreton Road & A61 Frank Whittle Road due to the capacity limitations of the roundabout junctions at Croft Lane, Hampshire Road roundabout and the A52 "Pentagon Island".

4.7.17 The left-turn bypass lane would be retained in the design of the new Little Eaton junction. The blocking-back observed in the AM1 and AM2 peak hours would be stored on this left-turn bypass lane and would not impede those southbound strategic trips using the A38 corridor.

4.7.18 The queue into Derby along the A61 Alfreton Road – Frank Whittle Road, mainly on occasions during the AM periods, might also block-back onto the new Little Eaton roundabout's circulatory carriageway. The grade separation of this junction with the Scheme would mean that the northbound strategic trips using the A38 corridor would not be impeded by the queue of vehicles waiting to travel along the radial route towards Derby's city centre.

4.8 Impact on journey times (network-wide)

4.8.1 The impact of the Scheme on journey times for the 14 routes extracted from the traffic forecasting models (shown in Figure 4.13 overleaf) are presented in Table 4.5 to Table 4.10.

4.8.2 Table 4.5 to Table 4.10 show the total journey time along each route (except Journey Time Route 13 along the A38) for the 2015 Base Year Model, and the 2039 'Do-Minimum' and 'Do-Something' forecasts for each modelled time-period.

4.8.3 Journey Time Route 13 follows the A38 corridor and passed through the three Scheme-junctions. Therefore, the journey times extracted along this journey time route are presented in more detail in Section 4.9 and in the subsequent tables for each of the modelled weekday time periods.

4.8.4 The journey times are provided in minutes and seconds.

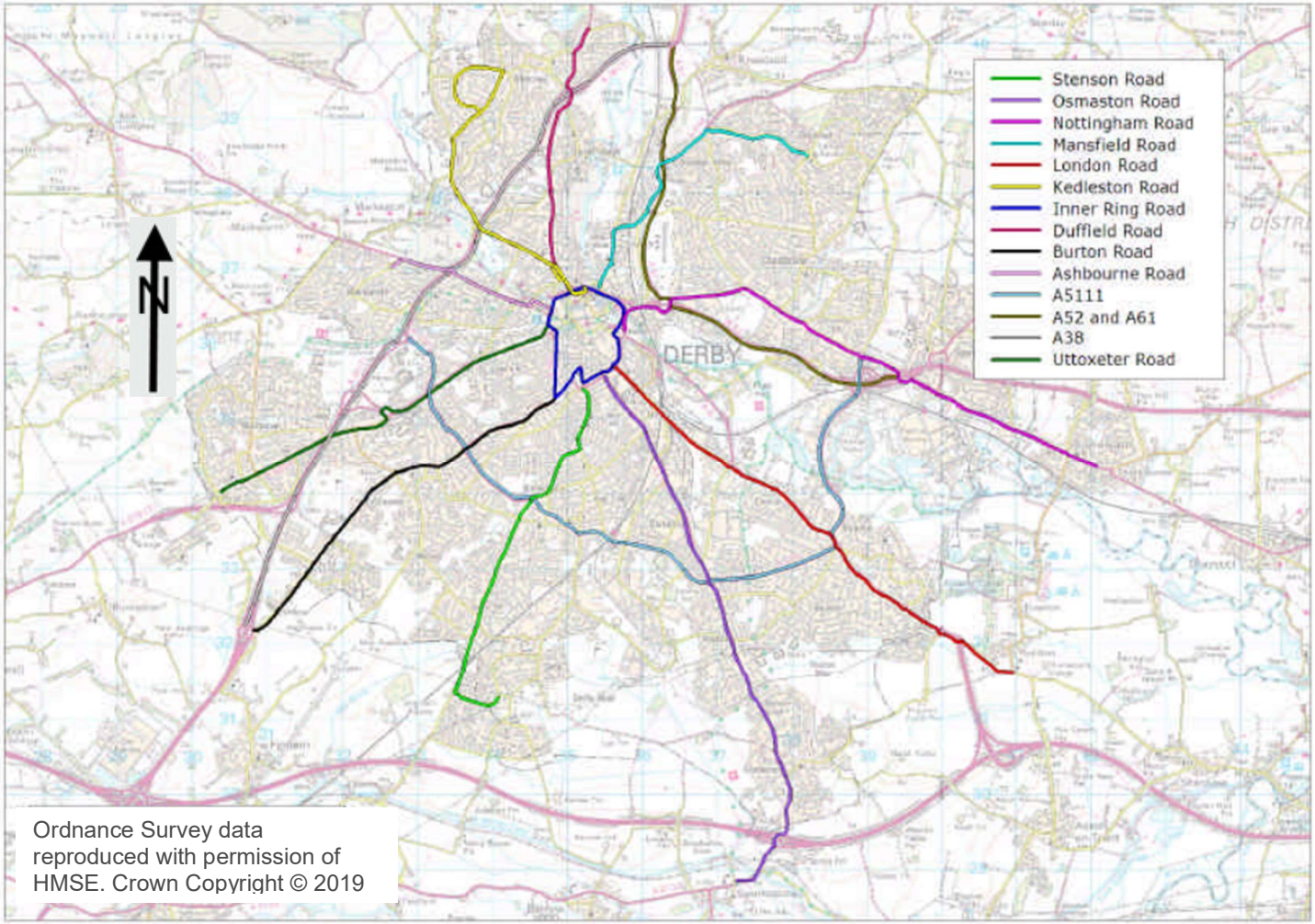


Figure 4.13: Journey time routes

Table 4.5: Journey times - AM1 (minutes:seconds)

JT Route	Description	2015 Base Year Model	2024 DM	2024 DS	2024 diff (DS-DM)	2039 DM	2039 DS	2039 diff (DS-DM)
Route 1 NB	Stenson Road NB	11:11	11:29	11:21	-00:08	11:51	11:39	-00:12
Route 1 SB	Stenson Road SB	11:18	11:27	11:31	00:03	12:01	12:00	-00:01
Route 2 NB	Osmaston Road NB	13:48	14:33	14:29	-00:03	15:57	15:52	-00:05
Route 2 SB	Osmaston Road SB	14:38	14:41	14:39	-00:02	15:18	15:15	-00:03
Route 3 EB	Nottingham Road EB	11:48	12:09	12:12	00:03	13:05	12:56	-00:10
Route 3 WB	Nottingham Road WB	13:59	15:01	14:45	-00:16	17:25	17:07	-00:18
Route 4 NEB	Mansfield Road NEB	06:53	07:01	06:57	-00:04	07:13	07:16	00:03
Route 4 SWB	Mansfield Road SWB	10:29	12:19	12:37	00:18	14:15	15:21	01:06
Route 5 SEB	London Road SEB	11:12	12:54	12:54	00:00	13:28	13:29	00:01
Route 5 NWB	London Road NWB	11:16	11:23	11:17	-00:06	13:26	12:58	-00:28
Route 6 SB	Kedleston Road SB	10:28	11:03	11:13	00:10	13:10	12:29	-00:41
Route 6 NB	Kedleston Road NB	08:58	10:14	09:35	-00:38	10:05	10:06	00:01
Route 7 CW	Inner Ring Road CW	09:23	09:56	09:52	-00:03	10:16	10:10	-00:05
Route 7 ACW	Inner Ring Road ACW	09:26	09:28	09:22	-00:06	09:35	09:36	00:01
Route 8 NB	Duffield Road NB	04:43	04:46	04:59	00:13	04:49	05:05	00:16
Route 8 SB	Duffield Road SB	08:15	08:58	08:28	-00:30	10:21	10:05	-00:17
Route 9 NEB	Burton Road NEB	12:51	15:02	15:02	00:00	15:21	15:11	-00:10
Route 9 SWB	Burton Road SWB	11:07	12:04	11:59	-00:05	12:11	12:08	-00:03
Route 10 EB	Ashbourne Road EB	07:00	08:09	08:20	00:11	09:06	09:03	-00:03
Route 10 WB	Ashbourne Road WB	04:46	05:00	04:49	-00:11	05:14	04:55	-00:19
Route 11 CW	A5111 CW	21:07	22:26	19:53	-02:33	24:42	21:22	-03:20
Route 11 ACW	A5111 ACW	18:24	19:36	20:35	00:59	20:34	21:27	00:53
Route 12 NWB	A52 and A61 NWB	12:39	13:33	12:50	-00:43	15:08	14:23	-00:45
Route 12 SEB	A52 and A61 SEB	11:39	12:46	11:20	-01:26	15:03	12:49	-02:14
Route 14 EB	Uttoxeter Road EB	10:49	11:50	11:44	-00:06	12:27	11:59	-00:29
Route 14 WB	Uttoxeter Road WB	09:03	09:13	09:03	-00:10	09:13	09:06	-00:06

Table 4.6: Journey times - AM2 (minutes:seconds)

JT Route	Description	2015 Base Year Model	2024 DM	2024 DS	2024 diff (DS-DM)	2039 DM	2039 DS	2039 diff (DS-DM)
Route 1 NB	Stenson Road NB	13:24	14:10	14:06	-00:04	15:42	15:21	-00:22
Route 1 SB	Stenson Road SB	12:55	13:20	13:21	00:01	13:38	13:42	00:04
Route 2 NB	Osmaston Road NB	20:26	21:03	20:43	-00:20	23:31	23:13	-00:18
Route 2 SB	Osmaston Road SB	16:58	17:33	17:36	00:03	19:05	19:15	00:09
Route 3 EB	Nottingham Road EB	15:04	16:34	16:25	-00:09	18:58	18:28	-00:29
Route 3 WB	Nottingham Road WB	23:26	26:12	25:40	-00:31	33:25	32:28	-00:56
Route 4 NEB	Mansfield Road NEB	07:53	08:35	09:10	00:35	09:46	10:57	01:10
Route 4 SWB	Mansfield Road SWB	20:06	22:45	23:40	00:55	26:46	28:09	01:23
Route 5 SEB	London Road SEB	14:46	17:40	17:42	00:03	19:43	19:41	-00:02
Route 5 NWB	London Road NWB	16:55	16:59	16:41	-00:19	23:45	23:33	-00:12
Route 6 SB	Kedleston Road SB	12:30	13:10	14:10	01:00	15:46	16:50	01:04
Route 6 NB	Kedleston Road NB	12:46	13:06	13:00	-00:06	13:01	13:14	00:13
Route 7 CW	Inner Ring Road CW	10:53	11:58	11:51	-00:06	12:40	12:06	-00:35
Route 7 ACW	Inner Ring Road ACW	12:46	12:20	12:20	00:01	12:54	12:42	-00:12
Route 8 NB	Duffield Road NB	05:37	05:41	05:58	00:17	05:49	06:09	00:20
Route 8 SB	Duffield Road SB	10:22	12:02	11:57	-00:05	14:46	14:42	-00:03
Route 9 NEB	Burton Road NEB	14:56	17:38	17:22	-00:16	19:24	18:45	-00:40
Route 9 SWB	Burton Road SWB	12:51	13:57	13:55	-00:02	14:35	14:41	00:06
Route 10 EB	Ashbourne Road EB	11:02	13:36	12:05	-01:31	16:07	13:45	-02:23
Route 10 WB	Ashbourne Road WB	05:23	06:01	05:34	-00:27	06:27	05:39	-00:48
Route 11 CW	A5111 CW	23:10	25:25	23:36	-01:49	30:18	26:35	-03:44
Route 11 ACW	A5111 ACW	18:51	20:04	21:53	01:49	22:15	24:04	01:48
Route 12 NWB	A52 and A61 NWB	18:23	18:03	17:19	-00:44	21:41	21:14	-00:27
Route 12 SEB	A52 and A61 SEB	14:54	17:48	14:26	-03:22	20:42	17:20	-03:22
Route 14 EB	Uttoxeter Road EB	12:26	15:03	14:41	-00:22	16:47	16:06	-00:41
Route 14 WB	Uttoxeter Road WB	10:35	10:38	10:36	-00:02	10:55	10:50	-00:04

Table 4.7: Journey times – IP (minutes:seconds)

JT Route	Description	2015 Base Year Model	2024 DM	2024 DS	2024 diff (DS-DM)	2039 DM	2039 DS	2039 diff (DS-DM)
Route 1 NB	Stenson Road NB	12:50	13:04	13:02	-00:01	13:25	13:26	00:01
Route 1 SB	Stenson Road SB	12:37	12:48	12:47	-00:01	13:10	13:07	-00:03
Route 2 NB	Osmaston Road NB	15:55	16:20	16:19	-00:01	17:07	17:05	-00:02
Route 2 SB	Osmaston Road SB	16:19	16:29	16:26	-00:03	16:57	16:54	-00:03
Route 3 EB	Nottingham Road EB	13:08	13:16	13:15	-00:01	13:30	13:29	-00:02
Route 3 WB	Nottingham Road WB	14:02	14:19	14:17	-00:02	14:46	14:44	-00:02
Route 4 NEB	Mansfield Road NEB	07:27	07:31	07:30	-00:01	07:40	07:39	-00:02
Route 4 SWB	Mansfield Road SWB	07:18	07:26	07:24	-00:02	07:46	07:40	-00:05
Route 5 SEB	London Road SEB	12:18	12:28	12:27	-00:01	12:48	12:47	-00:01
Route 5 NWB	London Road NWB	13:08	12:29	12:29	00:00	12:47	12:47	00:00
Route 6 SB	Kedleston Road SB	11:25	11:48	11:43	-00:06	12:12	12:03	-00:09
Route 6 NB	Kedleston Road NB	11:10	11:32	12:00	00:28	12:06	12:32	00:26
Route 7 CW	Inner Ring Road CW	10:20	10:40	10:40	00:00	11:03	11:03	00:00
Route 7 ACW	Inner Ring Road ACW	11:03	10:56	10:54	-00:02	11:17	11:11	-00:06
Route 8 NB	Duffield Road NB	05:28	05:31	05:47	00:17	05:36	05:55	00:19
Route 8 SB	Duffield Road SB	05:57	06:00	06:03	00:03	06:09	06:15	00:06
Route 9 NEB	Burton Road NEB	12:41	14:14	14:11	-00:04	14:47	14:41	-00:06
Route 9 SWB	Burton Road SWB	12:12	13:05	12:56	-00:09	13:19	13:08	-00:11
Route 10 EB	Ashbourne Road EB	06:29	06:51	07:01	00:10	07:10	07:30	00:20
Route 10 WB	Ashbourne Road WB	05:14	05:55	05:40	-00:15	06:19	05:59	-00:20
Route 11 CW	A5111 CW	21:31	22:04	20:17	-01:47	23:28	21:35	-01:54
Route 11 ACW	A5111 ACW	17:10	18:17	18:15	-00:02	19:08	18:59	-00:09
Route 12 NWB	A52 and A61 NWB	09:19	10:12	09:48	-00:24	11:22	11:09	-00:13
Route 12 SEB	A52 and A61 SEB	06:46	07:12	06:58	-00:14	08:19	07:50	-00:29
Route 14 EB	Uttoxeter Road EB	12:08	12:28	12:20	-00:08	12:58	12:45	-00:13
Route 14 WB	Uttoxeter Road WB	10:17	10:22	10:16	-00:06	10:43	10:24	-00:19

Table 4.8: Journey times - PM1 (minutes:seconds)

JT Route	Description	2015 Base Year Model	2024 DM	2024 DS	2024 diff (DS-DM)	2039 DM	2039 DS	2039 diff (DS-DM)
Route 1 NB	Stenson Road NB	13:08	13:29	13:27	-00:02	13:50	13:53	00:02
Route 1 SB	Stenson Road SB	13:17	13:29	13:24	-00:05	14:01	13:50	-00:11
Route 2 NB	Osmaston Road NB	17:51	19:15	19:15	00:00	20:21	20:33	00:12
Route 2 SB	Osmaston Road SB	17:51	18:02	17:58	-00:03	19:31	19:27	-00:04
Route 3 EB	Nottingham Road EB	13:40	14:08	14:15	00:06	15:44	15:33	-00:11
Route 3 WB	Nottingham Road WB	14:05	14:18	14:31	00:12	14:50	15:03	00:13
Route 4 NEB	Mansfield Road NEB	07:56	08:07	08:50	00:43	08:54	09:31	00:38
Route 4 SWB	Mansfield Road SWB	07:30	07:38	07:38	00:00	08:16	08:02	-00:15
Route 5 SEB	London Road SEB	13:30	14:34	14:27	-00:07	16:12	16:08	-00:05
Route 5 NWB	London Road NWB	13:06	12:42	12:43	00:01	13:07	13:11	00:05
Route 6 SB	Kedleston Road SB	12:33	12:31	12:26	-00:05	12:40	12:55	00:15
Route 6 NB	Kedleston Road NB	13:10	13:41	13:50	00:09	14:39	14:37	-00:02
Route 7 CW	Inner Ring Road CW	11:10	11:44	11:34	-00:09	12:29	12:17	-00:12
Route 7 ACW	Inner Ring Road ACW	12:06	12:02	11:56	-00:06	12:48	12:34	-00:14
Route 8 NB	Duffield Road NB	05:44	05:50	06:07	00:17	06:00	06:20	00:20
Route 8 SB	Duffield Road SB	06:09	06:18	06:20	00:02	06:44	06:53	00:09
Route 9 NEB	Burton Road NEB	13:03	14:31	14:23	-00:08	15:15	14:52	-00:22
Route 9 SWB	Burton Road SWB	12:52	14:23	14:00	-00:24	14:51	14:20	-00:31
Route 10 EB	Ashbourne Road EB	06:44	07:00	07:39	00:40	07:29	08:12	00:43
Route 10 WB	Ashbourne Road WB	07:30	07:55	07:38	-00:17	09:22	08:13	-01:09
Route 11 CW	A5111 CW	28:03	30:03	24:20	-05:43	33:08	25:54	-07:14
Route 11 ACW	A5111 ACW	19:53	20:57	21:27	00:30	22:29	23:00	00:31
Route 12 NWB	A52 and A61 NWB	12:31	13:56	12:35	-01:21	15:54	14:03	-01:51
Route 12 SEB	A52 and A61 SEB	07:57	08:13	08:09	-00:04	09:50	09:40	-00:10
Route 14 EB	Uttoxeter Road EB	13:07	13:39	13:29	-00:10	13:54	13:47	-00:08
Route 14 WB	Uttoxeter Road WB	10:59	11:37	11:09	-00:28	12:18	11:33	-00:45

Table 4.9: Journey times - PM2 (minutes:seconds)

JT Route	Description	2015 Base Year Model	2024 DM	2024 DS	2024 diff (DS-DM)	2039 DM	2039 DS	2039 diff (DS-DM)
Route 1 NB	Stenson Road NB	12:58	13:20	13:17	-00:02	14:00	13:49	-00:11
Route 1 SB	Stenson Road SB	13:30	14:00	13:56	-00:05	15:16	15:02	-00:14
Route 2 NB	Osmaston Road NB	17:54	19:33	19:28	-00:05	21:14	21:03	-00:12
Route 2 SB	Osmaston Road SB	17:36	18:18	18:10	-00:07	21:09	21:01	-00:08
Route 3 EB	Nottingham Road EB	13:55	14:57	15:09	00:11	18:02	17:26	-00:35
Route 3 WB	Nottingham Road WB	13:59	14:15	14:37	00:22	15:33	15:41	00:08
Route 4 NEB	Mansfield Road NEB	09:08	10:24	09:58	-00:26	11:48	11:24	-00:25
Route 4 SWB	Mansfield Road SWB	07:42	07:55	07:57	00:02	09:01	08:46	-00:15
Route 5 SEB	London Road SEB	14:11	15:40	15:35	-00:04	19:48	19:25	-00:23
Route 5 NWB	London Road NWB	13:03	12:46	12:48	00:01	13:17	13:20	00:04
Route 6 SB	Kedleston Road SB	11:40	11:56	12:08	00:12	11:57	12:11	00:14
Route 6 NB	Kedleston Road NB	13:17	14:17	14:15	-00:02	15:48	14:58	-00:50
Route 7 CW	Inner Ring Road CW	11:11	12:08	12:02	-00:06	13:23	13:04	-00:19
Route 7 ACW	Inner Ring Road ACW	12:19	12:17	12:21	00:04	13:23	13:11	-00:12
Route 8 NB	Duffield Road NB	05:45	05:54	06:15	00:21	06:05	06:23	00:18
Route 8 SB	Duffield Road SB	06:05	06:12	06:15	00:03	06:22	06:29	00:07
Route 9 NEB	Burton Road NEB	12:58	14:30	14:25	-00:05	15:26	15:14	-00:11
Route 9 SWB	Burton Road SWB	13:51	15:38	15:23	-00:16	16:55	16:10	-00:45
Route 10 EB	Ashbourne Road EB	06:54	07:08	07:16	00:08	07:24	07:33	00:09
Route 10 WB	Ashbourne Road WB	06:41	08:21	07:37	-00:44	10:42	08:51	-01:51
Route 11 CW	A5111 CW	28:23	31:36	24:03	-07:33	36:38	26:57	-09:41
Route 11 ACW	A5111 ACW	20:27	22:17	22:26	00:09	24:19	24:57	00:38
Route 12 NWB	A52 and A61 NWB	12:36	14:28	13:59	-00:28	18:53	17:26	-01:27
Route 12 SEB	A52 and A61 SEB	08:52	09:31	09:00	-00:30	10:46	10:37	-00:09
Route 14 EB	Uttoxeter Road EB	13:16	14:05	13:30	-00:35	14:48	13:55	-00:53
Route 14 WB	Uttoxeter Road WB	10:55	11:58	11:24	-00:34	13:28	12:13	-01:15

Table 4.10: Journey times – EV (minutes:seconds)

JT Route	Description	2015 Base Year Model	2024 DM	2024 DS	2024 diff (DS-DM)	2039 DM	2039 DS	2039 diff (DS-DM)
Route 1 NB	Stenson Road NB	11:06	11:14	11:14	00:00	11:18	11:18	00:00
Route 1 SB	Stenson Road SB	11:30	11:37	11:37	00:00	11:48	11:47	-00:00
Route 2 NB	Osmaston Road NB	12:33	12:48	12:48	00:00	12:52	12:54	00:02
Route 2 SB	Osmaston Road SB	12:44	12:54	12:54	00:00	12:58	12:59	00:00
Route 3 EB	Nottingham Road EB	11:15	11:17	11:17	00:00	11:21	11:21	00:00
Route 3 WB	Nottingham Road WB	11:32	11:33	11:33	00:00	11:36	11:36	00:00
Route 4 NEB	Mansfield Road NEB	06:40	06:42	06:42	00:00	06:44	06:44	00:00
Route 4 SWB	Mansfield Road SWB	06:28	06:29	06:29	00:00	06:30	06:30	00:00
Route 5 SEB	London Road SEB	10:13	10:16	10:16	00:00	10:17	10:17	00:00
Route 5 NWB	London Road NWB	10:23	10:10	10:10	00:00	10:12	10:11	-00:00
Route 6 SB	Kedleston Road SB	08:43	08:46	08:48	00:02	08:49	08:52	00:02
Route 6 NB	Kedleston Road NB	08:54	09:09	09:17	00:09	09:16	09:25	00:09
Route 7 CW	Inner Ring Road CW	08:43	08:44	08:44	00:00	08:49	08:48	-00:00
Route 7 ACW	Inner Ring Road ACW	08:50	08:45	08:44	-00:01	08:50	08:49	-00:01
Route 8 NB	Duffield Road NB	04:36	04:36	04:49	00:12	04:37	04:49	00:12
Route 8 SB	Duffield Road SB	05:00	05:01	05:00	-00:00	05:01	05:01	00:00
Route 9 NEB	Burton Road NEB	11:08	12:00	12:01	00:01	12:02	12:02	00:01
Route 9 SWB	Burton Road SWB	10:23	11:31	11:30	-00:01	11:33	11:31	-00:01
Route 10 EB	Ashbourne Road EB	05:02	05:09	05:08	-00:01	05:17	05:16	-00:01
Route 10 WB	Ashbourne Road WB	04:23	04:39	04:44	00:05	04:47	04:51	00:04
Route 11 CW	A5111 CW	16:40	17:16	17:16	00:01	17:21	17:20	-00:02
Route 11 ACW	A5111 ACW	14:50	15:26	15:25	-00:00	15:30	15:31	00:00
Route 12 NWB	A52 and A61 NWB	06:18	06:24	05:48	-00:36	06:34	05:57	-00:38
Route 12 SEB	A52 and A61 SEB	05:40	05:42	05:40	-00:03	05:47	05:44	-00:03
Route 14 EB	Uttoxeter Road EB	09:34	09:39	09:42	00:03	09:45	09:44	-00:01
Route 14 WB	Uttoxeter Road WB	08:56	09:04	09:11	00:07	09:08	09:07	-00:01

4.8.5 In the 2039 AM1 time-period (Table 4.5), 19 out of the 26 routes experience a decrease or no change in journey time between the 'Do-Minimum' and 'Do-Something'. These decreases range from 0:01 minutes to 3:20 minutes decrease. Seven of the 26 routes increase in journey time between the 'Do-Minimum' and 'Do-Something', with this ranging from 0:01 minutes to 1:06 minutes.

4.8.6 In the 2039 AM2 time-period (Table 4.6), 17 out of the 26 routes experience a decrease or no change in journey time between the 'Do-Minimum' and 'Do-Something'. These decreases range from 0:02 minutes to 3:44 minutes. Nine out of the 26 routes increase in journey time between the 'Do-Minimum' and 'Do-Something' with this ranging from 0:04 minutes to 1:48 minutes.

4.8.7 In the 2039 IP time-period (Table 4.7), 21 out of the 26 routes experience a decrease or no change in journey time between the 'Do-Minimum' and 'Do-Something'. These decreases range from 0:01 minutes to 1:54 minutes. Five out of the 26 routes increase in journey time between the 'Do-Minimum' and 'Do-Something', with this ranging from 0:01 minutes to 0:26 minutes.

4.8.8 In the 2039 PM1 time-period (Table 4.8), 16 out of the 26 routes experience a decrease or no change in journey time between the 'Do-Minimum' and 'Do-Something'. These decreases range from 0:02 minutes to 7:14 minutes. Ten out of the 26 routes increase in journey time between the 'Do-Minimum' and 'Do-Something' with this ranging from 0:02 minutes to 0:43 minutes.

4.8.9 In the 2039 PM2 time-period (Table 4.9), 19 out of the 26 routes experience a decrease or no change in journey time between the 'Do-Minimum' and 'Do-Something'. These decreases range from 0:08 minutes to 9:41 minutes. Seven out of the 26 routes increase in journey time between the 'Do-Minimum' and 'Do-Something' with this ranging from 0:04 minutes to 0:38 minutes.

4.8.10 In the 2039 EV time-period (Table 4.10), 20 out of the 26 routes experience a decrease or no change in journey time between the 'Do-Minimum' and 'Do-Something'. These decreases range from 0:01 minutes to 0:38 minutes. Six out of the 26 routes increase in journey time between the 'Do-Minimum' and 'Do-Something' with this ranging from 0:01 minutes to 0:09 minutes.

4.8.11 There results demonstrate network wide improvements – not just on the A38 Corridor.

4.9 Impact on journey times (strategic A38 route corridor)

4.9.1 Table 4.11 to Table 4.16 show the northbound journey times along sections of the A38 between its junction with Rykneld Road near Littleover and its junction at Coxbench (Journey Time Route 13 on Figure 4.13).

4.9.2 These results relate to strategic trips using the A38 route corridor.

Table 4.11: A38 Northbound journey times - AM1 (minutes:seconds)

A38 Northbound	2015 Base Year Model	2024 DM	2024 DS	2024 diff (DS-DM)	2039 DM	2039 DS	2039 diff (DS-DM)
A38/Rykneld Road: top of slip -> A516	01:59	02:04	02:08	00:04	02:08	02:14	00:06
A516 -> Kingsway: exit from rbt	01:23	02:11	01:33	-00:38	03:04	01:43	-01:21
Kingsway: exit from rbt -> Markeaton: exit from rbt	02:10	02:15	01:06	-01:09	02:18	01:11	-01:07
Markeaton: exit from rbt -> Palm Court: diverge	02:13	02:17	01:45	-00:32	02:23	01:55	-00:28
Palm Court: diverge -> Ford Lane: diverge	00:56	00:57	01:02	00:05	00:59	01:07	00:08
Ford Lane: diverge -> Little Eaton: exit from rbt	00:32	00:34	00:53	00:19	00:37	00:57	00:20
Little Eaton: exit from rbt -> Coxbench: diverge	02:34	02:39	02:28	-00:11	02:48	02:37	-00:11
Total	11:47	12:57	10:55	-02:02	14:16	11:44	-02:31

Table 4.12: A38 Northbound journey times - AM2 (minutes:seconds)

A38 Northbound	2015 Base Year Model	2024 DM	2024 DS	2024 diff (DS-DM)	2039 DM	2039 DS	2039 diff (DS-DM)
A38/Rykneld Road: top of slip -> A516	01:58	02:04	02:22	00:18	02:06	02:29	00:23
A516 -> Kingsway: exit from rbt	05:36	06:49	02:03	-04:46	08:50	02:30	-06:20
Kingsway: exit from rbt -> Markeaton: exit from rbt	02:08	02:09	01:13	-00:56	02:10	01:17	-00:53
Markeaton: exit from rbt -> Palm Court: diverge	02:18	02:22	01:54	-00:29	02:27	02:02	-00:25
Palm Court: diverge -> Ford Lane: diverge	00:54	00:55	01:03	00:08	00:56	01:05	00:10
Ford Lane: diverge -> Little Eaton: exit from rbt	00:30	00:30	00:53	00:22	00:32	00:56	00:23
Little Eaton: exit from rbt -> Coxbench: diverge	02:27	02:29	02:25	-00:05	02:34	02:31	-00:02
Total	15:50	17:19	11:52	-05:27	19:34	12:50	-06:44

Table 4.13: A38 Northbound journey times – IP (minutes:seconds)

A38 Northbound	2015 Base Year Model	2024 DM	2024 DS	2024 diff (DS-DM)	2039 DM	2039 DS	2039 diff (DS-DM)
A38/Rykneld Road: top of slip -> A516	01:53	01:56	01:56	00:01	02:00	02:02	00:02
A516 -> Kingsway: exit from rbt	01:02	01:08	01:18	00:10	01:34	01:26	-00:08
Kingsway: exit from rbt -> Markeaton: exit from rbt	01:56	02:05	01:00	-01:06	02:16	01:04	-01:12
Markeaton: exit from rbt -> Palm Court: diverge	02:02	02:10	01:35	-00:35	02:20	01:42	-00:38
Palm Court: diverge -> Ford Lane: diverge	00:53	00:55	00:56	00:02	00:57	01:00	00:03
Ford Lane: diverge -> Little Eaton: exit from rbt	00:32	00:34	00:48	00:14	00:38	00:52	00:14
Little Eaton: exit from rbt -> Coxbench: diverge	02:27	02:32	02:19	-00:13	02:40	02:29	-00:11
Total	10:46	11:20	09:53	-01:27	12:23	10:34	-01:50

Table 4.14: A38 Northbound journey times - PM1 (minutes:seconds)

A38 Northbound	2015 Base Year Model	2024 DM	2024 DS	2024 diff (DS-DM)	2039 DM	2039 DS	2039 diff (DS-DM)
A38/Rykneld Road: top of slip -> A516	01:56	02:00	02:02	00:02	02:04	02:09	00:05
A516 -> Kingsway: exit from rbt	01:12	01:40	01:25	-00:14	02:57	01:35	-01:22
Kingsway: exit from rbt -> Markeaton: exit from rbt	02:11	02:17	01:06	-01:11	02:18	01:11	-01:07
Markeaton: exit from rbt -> Palm Court: diverge	02:21	02:26	01:47	-00:39	02:28	01:57	-00:31
Palm Court: diverge -> Ford Lane: diverge	00:57	00:58	01:03	00:05	00:59	01:09	00:11
Ford Lane: diverge -> Little Eaton: exit from rbt	01:48	02:39	01:00	-01:39	03:40	01:09	-02:31
Little Eaton: exit from rbt -> Coxbench: diverge	02:45	02:48	02:55	00:07	02:53	03:17	00:24
Total	13:10	14:47	11:18	-03:29	17:19	12:28	-04:51

Table 4.15: A38 Northbound journey times - PM2 (minutes:seconds)

A38 Northbound	2015 Base Year Model	2024 DM	2024 DS	2024 diff (DS-DM)	2039 DM	2039 DS	2039 diff (DS-DM)
A38/Rykneld Road: top of slip -> A516	01:56	01:59	02:00	00:01	02:01	02:07	00:06
A516 -> Kingsway: exit from rbt	01:11	01:30	01:23	-00:07	03:06	01:31	-01:35
Kingsway: exit from rbt -> Markeaton: exit from rbt	02:06	02:09	01:04	-01:05	02:12	01:09	-01:03
Markeaton: exit from rbt -> Palm Court: diverge	02:14	02:16	01:40	-00:36	02:16	01:49	-00:26
Palm Court: diverge -> Ford Lane: diverge	00:55	00:55	00:58	00:03	00:55	01:02	00:07
Ford Lane: diverge -> Little Eaton: exit from rbt	00:53	01:41	00:53	-00:48	03:39	00:58	-02:42
Little Eaton: exit from rbt -> Coxbench: diverge	02:40	02:46	02:37	-00:09	02:51	02:52	00:00
Total	11:55	13:16	10:34	-02:42	17:00	11:27	-05:34

Table 4.16: A38 Northbound journey times – EV (minutes:seconds)

A38 Northbound	2015 Base Year Model	2024 DM	2024 DS	2024 diff (DS-DM)	2039 DM	2039 DS	2039 diff (DS-DM)
A38/Rykneld Road: top of slip -> A516	01:49	01:50	01:50	00:00	01:50	01:50	00:00
A516 -> Kingsway: exit from rbt	00:57	00:57	01:10	00:13	00:58	01:10	00:13
Kingsway: exit from rbt -> Markeaton: exit from rbt	01:34	01:35	00:53	-00:42	01:38	00:53	-00:45
Markeaton: exit from rbt -> Palm Court: diverge	01:49	01:50	01:24	-00:26	01:51	01:24	-00:27
Palm Court: diverge -> Ford Lane: diverge	00:51	00:51	00:51	00:00	00:51	00:51	00:00
Ford Lane: diverge -> Little Eaton: exit from rbt	00:27	00:27	00:44	00:17	00:28	00:44	00:16
Little Eaton: exit from rbt -> Coxbench: diverge	02:17	02:18	02:04	-00:13	02:19	02:05	-00:14
Total	09:43	09:47	08:55	-00:52	09:54	08:58	-00:56

4.9.3 Due to the geometry within the new Scheme, some of the intermediate timing have slightly altered position in the 'Do-Something' highway network compared with the 'Do-Minimum'. However, the start and end points are the same for both cases, and therefore the overall journey distances may be directly compared.

4.9.4 The total journey time along the A38 northbound decreases in all time periods and forecast years between the 'Do-Minimum' and 'Do-Something'. The largest decrease in total journey time along the A38 northbound is 6:44 minutes in the 2039 AM2 time-period.

4.9.5 On the A38 northbound carriageway in the 2039 AM time periods, the largest decrease in journey times, between the 'Do-Minimum' and the 'Do-Something' cases, would be 6 minutes 20 seconds for the length between the A516 slip roads and the A5111 Kingsway (northbound exit from the roundabout). This time saving would be a direct result of improving the Kingsway junction.

4.9.6 In the 2039 IP and EV time periods, the largest decrease in journey times would be the section between Kingsway (northbound exit from the roundabout) to Markeaton (exit from the roundabout). This time saving would be a direct result of grade separating the Markeaton junction.

4.9.7 In the 2039 PM time periods, the A38 length between the Ford Lane Diverge to Little Eaton (northbound exit from the roundabout) would experience the largest decrease in journey time between the 'Do-Minimum' and 'Do-Something' cases. This time saving would be a direct result of grade separating the Little Eaton junction.

4.9.8 Table 4.17 to Table 4.22 show the A38 southbound journey times between Coxbench and Rykneld Road near Littleover (Journey Time Route 13 on Figure 4.13).

Table 4.17: A38 Southbound journey times - AM1 (minutes:seconds)

A38 Southbound	2015 Base Year Model	2024 DM	2024 DS	2024 diff (DS-DM)	2039 DM	2039 DS	2039 diff (DS-DM)
Coxbench: merge -> Little Eaton: exit from rbt	04:03	04:26	04:24	-00:02	04:46	04:31	-00:15
Little Eaton: exit from rbt -> Palm Court: diverge	00:55	00:57	00:46	-00:11	00:59	00:48	-00:11
Palm Court: diverge -> Markeaton: exit from rbt	05:02	05:24	02:50	-02:34	06:18	03:09	-03:09
Markeaton: exit from rbt -> Kingsway: exit from rbt	02:09	02:14	01:38	-00:36	02:20	01:49	-00:31
Kingsway: exit from rbt -> A516	00:47	00:48	00:35	-00:13	00:49	00:39	-00:10
A516 -> A38/Rykneld Road: top of slip	01:55	01:57	02:02	00:06	02:00	02:10	00:10
Total	14:50	15:46	12:16	-03:30	17:12	13:06	-04:06

Table 4.18: A38 Southbound journey times - AM2 (minutes:seconds)

A38 Southbound	2015 Base Year Model	2024 DM	2024 DS	2024 diff (DS-DM)	2039 DM	2039 DS	2039 diff (DS-DM)
Coxbench: merge -> Little Eaton: exit from rbt	05:38	06:27	04:16	-02:11	08:04	04:35	-03:30
Little Eaton: exit from rbt -> Palm Court: diverge	00:52	00:53	00:48	-00:05	00:54	00:54	00:01
Palm Court: diverge -> Markeaton: exit from rbt	06:43	07:16	02:43	-04:33	08:31	02:59	-05:32
Markeaton: exit from rbt -> Kingsway: exit from rbt	01:52	01:56	01:30	-00:26	02:00	01:37	-00:23
Kingsway: exit from rbt -> A516	00:45	00:45	00:32	-00:13	00:46	00:35	-00:11
A516 -> A38/Rykneld Road: top of slip	01:53	01:54	02:01	00:07	01:56	02:07	00:11
Total	17:43	19:11	11:50	-07:21	22:11	12:47	-09:25

Table 4.19: A38 Southbound journey times – IP (minutes:seconds)

A38 Southbound	2015 Base Year Model	2024 DM	2024 DS	2024 diff (DS-DM)	2039 DM	2039 DS	2039 diff (DS-DM)
Coxbench: merge -> Little Eaton: exit from rbt	03:10	03:18	03:11	-00:07	03:30	03:22	-00:08
Little Eaton: exit from rbt -> Palm Court: diverge	00:50	00:52	00:37	-00:14	00:54	00:40	-00:14
Palm Court: diverge -> Markeaton: exit from rbt	02:33	02:40	02:18	-00:22	02:52	02:26	-00:26
Markeaton: exit from rbt -> Kingsway: exit from rbt	01:48	01:54	01:20	-00:34	02:09	01:26	-00:43
Kingsway: exit from rbt -> A516	00:45	00:46	00:30	-00:15	00:47	00:33	-00:15
A516 -> A38/Rykneld Road: top of slip	01:52	01:55	01:56	00:01	01:59	02:02	00:03
Total	10:58	11:23	09:52	-01:31	12:12	10:29	-01:43

Table 4.20: A38 Southbound journey times - PM1 (minutes:seconds)

A38 Southbound	2015 Base Year Model	2024 DM	2024 DS	2024 diff (DS-DM)	2039 DM	2039 DS	2039 diff (DS-DM)
Coxbench: merge -> Little Eaton: exit from rbt	03:15	03:22	03:19	-00:03	03:35	03:33	-00:01
Little Eaton: exit from rbt -> Palm Court: diverge	00:52	00:53	00:38	-00:15	00:56	00:41	-00:15
Palm Court: diverge -> Markeaton: exit from rbt	02:43	02:56	02:24	-00:32	03:31	02:32	-01:00
Markeaton: exit from rbt -> Kingsway: exit from rbt	02:05	02:13	01:32	-00:41	02:21	01:40	-00:41
Kingsway: exit from rbt -> A516	00:47	00:49	00:34	-00:15	00:51	00:38	-00:13
A516 -> A38/Rykneld Road: top of slip	01:56	02:01	02:03	00:03	02:07	02:13	00:06
Total	11:37	12:13	10:30	-01:43	13:20	11:16	-02:04

Table 4.21: A38 Southbound journey times - PM2 (minutes:seconds)

A38 Southbound	2015 Base Year Model	2024 DM	2024 DS	2024 diff (DS-DM)	2039 DM	2039 DS	2039 diff (DS-DM)
Coxbench: merge -> Little Eaton: exit from rbt	03:24	03:35	03:27	-00:09	04:11	03:44	-00:27
Little Eaton: exit from rbt -> Palm Court: diverge	00:53	00:56	00:40	-00:16	01:00	00:43	-00:17
Palm Court: diverge -> Markeaton: exit from rbt	02:45	03:02	02:27	-00:35	04:16	02:37	-01:39
Markeaton: exit from rbt -> Kingsway: exit from rbt	02:04	02:14	01:32	-00:42	02:21	01:43	-00:39
Kingsway: exit from rbt -> A516	00:48	00:50	00:35	-00:15	00:52	00:41	-00:12
A516 -> A38/Rykneld Road: top of slip	01:57	02:04	02:07	00:03	02:11	02:16	00:06
Total	11:51	12:40	10:48	-01:53	14:51	11:44	-03:07

Table 4.22: A38 Southbound journey times – EV (minutes:seconds)

A38 Southbound	2015 Base Year Model	2024 DM	2024 DS	2024 diff (DS-DM)	2039 DM	2039 DS	2039 diff (DS-DM)
Coxbench: merge -> Little Eaton: exit from rbt	02:50	02:51	02:57	00:06	02:53	02:58	00:06
Little Eaton: exit from rbt -> Palm Court: diverge	00:46	00:47	00:34	-00:13	00:47	00:34	-00:13
Palm Court: diverge -> Markeaton: exit from rbt	02:18	02:20	02:07	-00:13	02:22	02:08	-00:14
Markeaton: exit from rbt -> Kingsway: exit from rbt	01:27	01:30	01:13	-00:17	01:32	01:14	-00:19
Kingsway: exit from rbt -> A516	00:43	00:44	00:28	-00:16	00:44	00:28	-00:16
A516 -> A38/Rykneld Road: top of slip	01:49	01:50	01:50	00:00	01:51	01:51	00:00
Total	09:54	10:00	09:08	-00:52	10:09	09:13	-00:56

4.9.9 Due to the geometry of the new Scheme, some of the intermediate timing points within the traffic model have slightly altered position in the 'Do-Something' highway network compared with the 'Do-Minimum'. However, the start and end points of each journey time route are in the same place for both cases and therefore the overall journey distance may be directly compared.

4.9.10 The total journey time along the A38 southbound would decrease in all time periods and in all forecast years between the 'Do-Minimum' case and the 'Do-Something' case. The largest decrease in total journey time along the A38 southbound is 9 minutes 25 seconds in the 2039 AM2 peak hour.

4.9.11 The largest decrease in journey time on the A38 southbound between 'Do-Minimum' case and 'Do-Something' case, in the 2039 AM1 and PM1 time periods, would be for the length between the A6 "Palm Court" diverge to the Markeaton junction (southbound exit from the roundabout). This time saving would be a direct result of grade separating the Markeaton junction.

4.9.12 In the 2039 IP, PM1 and EV time periods, the largest decrease in journey time would be on the length between the Markeaton southbound exit from the roundabout and the Kingsway southbound exit from the roundabout. This time saving would be a direct result of grade separating the Kingsway junction.

4.10 Summary

4.10.1 Forecast traffic model assignments, both with and without the scheme's junction improvements, have been used to identify the performance of the network. The proposed scheme-junctions would operate satisfactorily, and journey times would improve as a result of the Scheme.

4.10.2 Historic efforts to improve the performance of the junctions whilst retaining their at-grade character have now been exhausted. No at-grade improvement exists that would provide sufficient capacity to accommodate the future year traffic forecasts.

5 Road safety

5.1 Data sources

5.1.1 The *Guidance on Transport Assessment* states that a TA should "establish the current personal injury accident records for the most recent three-year period, or five years if this is considered to be more appropriate."

5.1.2 Road safety collision records have been obtained for the three-year period from 1 September 2014 to 31 August 2017 inclusive.

5.1.3 The data obtained relates to those collisions that resulted in a personal injury and which were reported to the police. This data (known as STATS19 statistics) is generally recognised to be the most complete record of road collisions occurring on the local highway network. For the avoidance of doubt, and as is normal practice, they do not include statistics from collisions resulting in "damage-only" to vehicles, or which were not reported to the police.

5.1.4 Each collision resulting in a personal injury is classed as either 'Slight', 'Serious' or 'Fatal' by the police depending on the most serious injury resulting from the collision (i.e. a collision resulting in two 'Slight' injuries and one 'Serious' injury would be classified as a 'Serious' collision). Definitions, given in Road Accidents Great Britain (published by the DfT), are as follows:

- Slight: An injury of a minor character such as a sprain (including neck whiplash injury), bruise or cut which are not judged to be severe, or slight shock requiring roadside attention. This definition includes injuries not requiring medical treatment.
- Serious: An injury for which a person is detained in hospital as an "in-patient", or any of the following injuries whether or not they are detained in hospital: fractures, concussion, internal injuries, crushing, burns (excluding friction burns), severe cuts, severe general shock requiring medical treatment and injuries causing death 30 or more days after the accident. An injured casualty is recorded as seriously or slightly injured by the police on the basis of information available within a short time of the accident. This generally will not reflect the results of a medical examination but may be influenced according to whether the casualty is hospitalised or not. Hospitalisation procedures will vary regionally.
- Fatal: Human casualties who sustained injuries that caused death less than 30 days after the accident. Confirmed suicides are excluded.

5.2 Observed collisions and vulnerable users

5.2.1 Details of recorded collisions and the resulting casualties at each of the Scheme junctions (including the approach and exit links within 100m of the junction) were obtained. Table 5.1 details these observed collisions from three years of STATS19 records. This table also categorises these casualties into the six vulnerable road user groups.

Table 5.1: Recorded PIC and casualties at Scheme junctions – 3-year totals

Junction	Observed personal injury collisions (PIC)	Casualties						
		All casualties	Children (<16)	Young male drivers (16-25)	Older people (70+)	Pedestrians	Cyclists	Motor-cyclists
Kingsway	11	14	0	2	3	0	0	0
Markeaton	23	28	2	1	2	1	5	1
Little Eaton	15	20	2	2	2	0	0	3

5.2.2 Table 5.2 shows the observed PIC (as shown in Table 5.1) and then calculates the expected numbers of casualties that should occur over three years at each junction, for each of the six vulnerable user groups, based upon national collision statistics.

Table 5.2: Recorded PIC and expected casualties (using national rates)

Junction	Observed personal injury collisions (PIC)	Casualties Expected (2014 national casualty rates applied to observed PIC)						
		All casualties	Children (<16)	Young male drivers (16-25)	Older people (70+)	Pedestrians	Cyclists	Motor-cyclists
Kingsway	11	15	1	0	1	2	1	2
Markeaton	23	31	3	0	2	4	3	3
Little Eaton	15	20	2	0	1	3	2	2

5.2.3 Over the three years of interrogated accident data, the number of young male drivers and older people casualties is slightly higher than expected at Kingsway and Little Eaton junctions. The number of cyclist casualties at the Markeaton junction is slightly higher than expected.

5.2.4 The total number of casualties and the number of casualties in the vulnerable groups for: children, pedestrian and motorcyclists were either the same or less than would be expected, compared to national averages for these junction types.

5.2.5 The number of pedestrian casualties is less than expected at all three junctions.

5.2.6 These differences are not statistically significant. The conclusion is that, at the Scheme's junctions, the observed casualty rates among vulnerable groups are currently no higher than is to be expected.

5.3 Analysis of observed collisions by route corridor

5.3.1 The Scheme would attract traffic onto the A38 strategic route corridor and away from less suitable local roads nearby. Therefore, in addition to the savings in road traffic collision at the Scheme's junctions themselves, there would also be reductions in the number of road traffic collisions on these nearby local roads.

5.3.2 Details of recorded collisions and the resulting casualties were obtained for the three-year period from 2015 to 2017 along the route corridors where traffic flows are likely to change as a result of the Scheme. The route corridors assessed were:

a. A5111 Corridor, Kingsway to Stenston Road Roundabout.

b. A52 Corridor, Radbourne Lane to A601 (Inner Ring Road).

c. Kedleston Road corridor, Askerfield Avenue to A6.

d. A6 Corridor, Burley Lane to A601 (Inner Ring Road).

e. A61/B6179 Corridor, Little Eaton Village to A52 Pentagon Island.

f. A38 Corridor, Coxbench to A516 diverge from A38.

These route corridors are shown in

5.3.3 Figure 5.1.

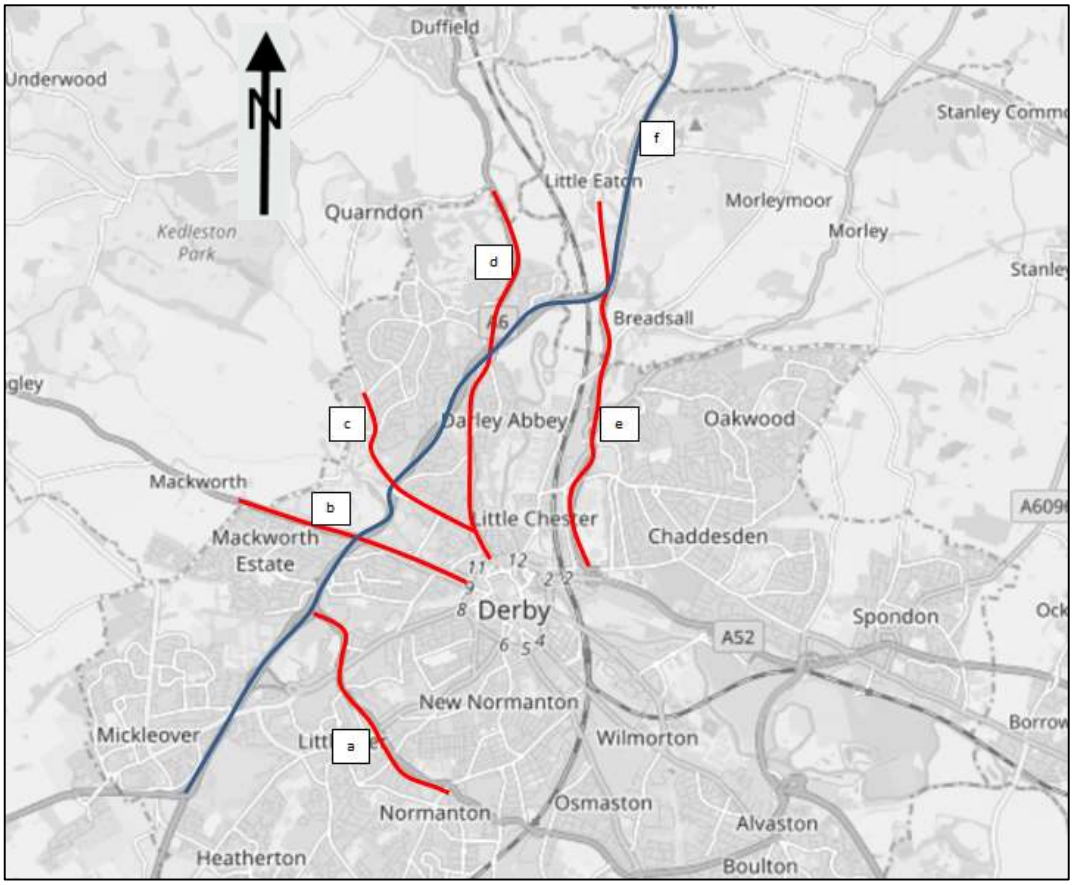


Figure 5.1: Route corridor collision records

5.3.4 The road traffic collision analyses of these route corridors exclude those collisions at the three A38 Derby Junctions (i.e. at Kingsway, Markeaton & Little Eaton), which are included in the analyses in Section 5.3.15 below.

5.3.5 Table 5.3 shows the total numbers of recorded Personal Injury Collisions (PIC) and the resulting casualties on each of six defined route corridors, five of which are perpendicular to the A38 and the sixth is along the A38 itself. Each corridor

is defined by an area of impact for the road, which includes lengths of nearby roads connected with that corridor.

Table 5.3: Recorded personal injury collisions & casualties by route corridor

	Accidents	Casualties						
Route corridor	Observed PIC	All casualties	Children (<16)	Young male drivers (16-25)	Older people (70+)	Pedestrians	Cyclists	Motor-cyclists
A5111 *	103	148	14	12	7	16	14	7
A52 *	66	71	7	10	1	15	14	8
Kedleston Rd	29	38	6	4	3	9	4	8
A6	34	43	1	1	6	3	6	6
A61/B6179 *	68	78	4	7	5	11	12	8
A38 *	64	92	2	9	8	0	3	8
* Corridor excludes collisions at the A38 Derby Junctions: i.e. Kingsway, Markeaton and Little Eaton								

5.3.6 Table 5.4 calculates the expected numbers of casualties by applying the national rates of casualties per PIC to the observed number of PIC (i.e. copied from Table 5.3) on each route corridor. Where the observed values in Table 5.3 significantly exceed the corresponding expected values in Table 5.4, these are highlighted in red in Table 5.3: where the observed values are significantly less than the expected values, these are highlighted in green in Table 5.3.

Table 5.4: Expected casualties (using national rates) by route corridor

	Accidents	Casualties						
		Expected (2014 national casualty rates applied to observed PIC)						
Route corridor	Observed PIC	All casualties	Children (<16)	Young male drivers (16-25)	Older people (70+)	Pedestrians	Cyclists	Motor-cyclists
A5111 *	103	137	12	2	9	18	14	15
A52 *	66	88	8	1	6	11	9	9
Kedleston Rd.	29	39	3	1	3	5	4	4
A6	34	45	4	1	3	6	5	5
A61/B6179 *	68	90	8	1	6	12	9	10
A38 *	64	85	7	1	6	11	9	9
* Corridor excludes collisions at the A38 Derby Junctions: i.e. Kingsway, Markeaton and Little Eaton								

5.3.7 In most cases, the casualty numbers for vulnerable groups are lower on the key route corridors affected by the Scheme than expected from a consideration of the national average rates.

5.3.8 On the A38 route corridor, while the overall rate of casualties per PIC is higher than the national average, the rates for ‘children’, ‘pedestrian’, and ‘cyclist’ are lower. However, collisions involving young male drivers and older people are higher than are expected.

5.3.9 This indicates that, in the period 2015-2017, while some individual A38 links have had greater numbers of casualties in the vulnerable groups than would be expected from national average rates per PIC, the trend for the route corridor as a whole (which is more statistically robust because of the larger sample size) compares favourably with national average rates.

5.3.10 On the A5111 corridor, the overall rate of causalities is higher than national averages. There were more casualties in the ‘children’ and ‘young male drivers’ vulnerable groups than expected. Four of the young male driver casualties were located at the A5111/Stenson Road roundabout. Other than this, no other clusters were observed.

5.3.11 On the A52 corridor, there were more casualties in the 'young male drivers', 'pedestrians' and 'cyclists' vulnerable groups than would be expected. However, overall causalities and collisions involving 'children', 'older people' and 'motorcyclists' were found to be less than expected from national averages.

5.3.12 Along the Kedleston Road corridor, overall casualty numbers were found to be less than national averaged based on observed PIC. PICs involving 'older people' and 'cyclists' are comparable with national averages, while accidents involving 'children', 'young males', 'pedestrians' and 'motorcyclists' were found to be higher than expected.

5.3.13 Within the A6 corridor, total casualties were marginally less than national averages. 'Children' and 'Pedestrians' casualties are less than expected. 'Older People' are over-represented.

5.3.14 On the A61 Frank Whittle Road-B6179 Little Eaton corridor, there were more 'young male drivers', 'cyclist' casualties than are to be expected. 'Children', 'older people', 'pedestrians' and the overall volume of casualties are lower than expected from an analysis based upon national road traffic collision statistics.

5.3.15 A broad spread of road traffic collision records, over the three-year period, from 1 September 2014 to 31 August 2017 inclusive, has been identified along the scheme length of the A38 and the impact areas within the A38 corridor. Concentrations of collisions were identified at the major junctions along the route. Concentrations of accidents involving cyclists, young male drivers and pedestrians were also identified within parts of the study area.

5.3.16 Historic collisions involving vulnerable groups in the A38 corridor were generally below national averages, except for accidents involving young male drivers, which were above the national averages.

5.4 Prediction of collision savings

5.4.1 Based on UK-wide statistics, it is possible to predict how many PIC could be expected at a given junction based on the form of junction and the volume of traffic that is using the junction.

5.4.2 Highways England maintains modelling software called COBALT (Cost and Benefit to Accidents – Light Touch) to appraise the predicted changes in personal injury collisions across a whole highway network. The COBALT software appraises the monetary benefits of the road traffic collision savings in accordance with the DfT's Transport Analysis Guidance; WebTAG. The COBALT software used outputs from the Scheme's traffic forecasting models and therefore the results consider the effects of both reassignment and induced trips.

5.4.3 The predicted PIC for both the 'Do-Minimum' case and for the 'Do-Something' case were evaluated over a period of 60 years from the year that the Scheme would be open to traffic; i.e. from 2024 to 2083. The savings in PIC are the difference between the Do-Something and the Do-Minimum cases.

5.5 Predicted collision savings on area-wide road safety

5.5.1 The Scheme would attract increased flows into the A38 corridor and also increase flows on some roads linked directly to the A38 corridor (e.g. the A5111 Kingsway). This additional traffic flow could result in an increase in the number of road-traffic collisions in the A38 corridor itself. However, there would be fewer road traffic collisions overall because:

i. traffic flows would reduce on those routes parallel to the A38.

ii. accidents at the Scheme's junctions would reduce due to the grade-separation of the A38 through traffic from the local traffic movements and vulnerable user movements.

5.5.2 The change in numbers of casualties for vulnerable road-user groups would reduce. This would result in a **moderate beneficial** impact for cyclists and **slight beneficial** impacts for the other vulnerable road-user groups. This results in an overall **slight beneficial** road safety impact for vulnerable road-users.

5.5.3 The total monetised social cost of personal injury collisions for the 'Do-Minimum' and 'Do-Something' cases within the defined study area, in 2010 market prices and discounted to a 2010 present value year, are shown in Table 5.5. The total road safety benefit of the Scheme was evaluated, using the DfT's casualty costs provided in their WebTAG guidance, and is **£54.8 million** as shown in Table 5.5.

Table 5.5: Evaluation of road collision savings

DM	DS	Savings
£899.0	**£844.1**	**£54.8**

Monetised values are £ millions, in 2010 market prices and discounted to a 2010 present value year.

5.5.4 The number of PIC and the number of causalities saved is presented in Table 5.6.

Table 5.6: Collision and casualty savings (over 60 years)

		Area-wide DM	Area-wide DS	Predicted Savings
Number of PIC		17,272	15,876	1,396
Causalities	Fatal	301	293	8
	Serious	2,673	2,538	135
	Slight	20,983	19,251	1,732

5.5.5 Over the 60-year evaluation period, the Scheme would save 1,396 personal injury collisions across the whole highway network. These collision savings would include savings of eight fatalities and 135 serious casualties (i.e. a saving of 143 killed and seriously injured).

6 Sustainable transport walking and cycling

6.1 Overview

6.1.1 The purpose of this section is to describe how existing walk and cycle routes have been incorporated into the Scheme and where changes to walk and cycle routes would be made.

6.2 Pedestrian and cycle routes

6.2.1 This section looks at the Scheme impacts on walking and cycling. The impacts are examined for the area around each of the three junctions in turn: i.e. Kingsway, Markeaton and Little Eaton.

6.2.2 **Kingsway:** The Scheme at Kingsway is shown in Figure 6.1, with pedestrian/cycle features highlighted.

6.2.3 National Cycle Network (NCN) Route 68 and Local Cycle Network (LCN) Route 54 would be diverted, with an additional length of approximately 10m. This change would be due to their horizontal re-alignment around the new Kingsway roundabout.

6.2.4 A new footpath & cycleway would be introduced as part of the grade separation of the Kingsway junction. As a result, there would be a reduction in walking distance and a reduction in the existing severance caused by the A38. There would be a roughly 525m reduction in distance for those who currently have to route on foot/cycle via Brackensdale Avenue but who would in future be able to use the proposed uncontrolled crossings of the south-facing slip roads.

6.2.5 The access road between Brackensdale Avenue and the A38 northbound carriageway, near to Greenwich Drive North, would be closed and removed as part of the Scheme. Much of this land would be replaced by new greenspace. The existing footway would be upgraded to a combined footway/cycleway; making use of the land formerly used by the Access road that would be closed.

6.2.6 The junction of Raleigh Street and the A38 Southbound carriageway would be closed and stopped up as part of the Scheme. Although the walking & cycle route would remain broadly similar in terms of distance, users would benefit from the removal of conflicts with A38 traffic turning into and out of Raleigh Street. This reduction would result in a benefit for non-motorised users as the crossing was previously uncontrolled. Elderly and disabled users would particularly benefit as it would be much easier to use this route.

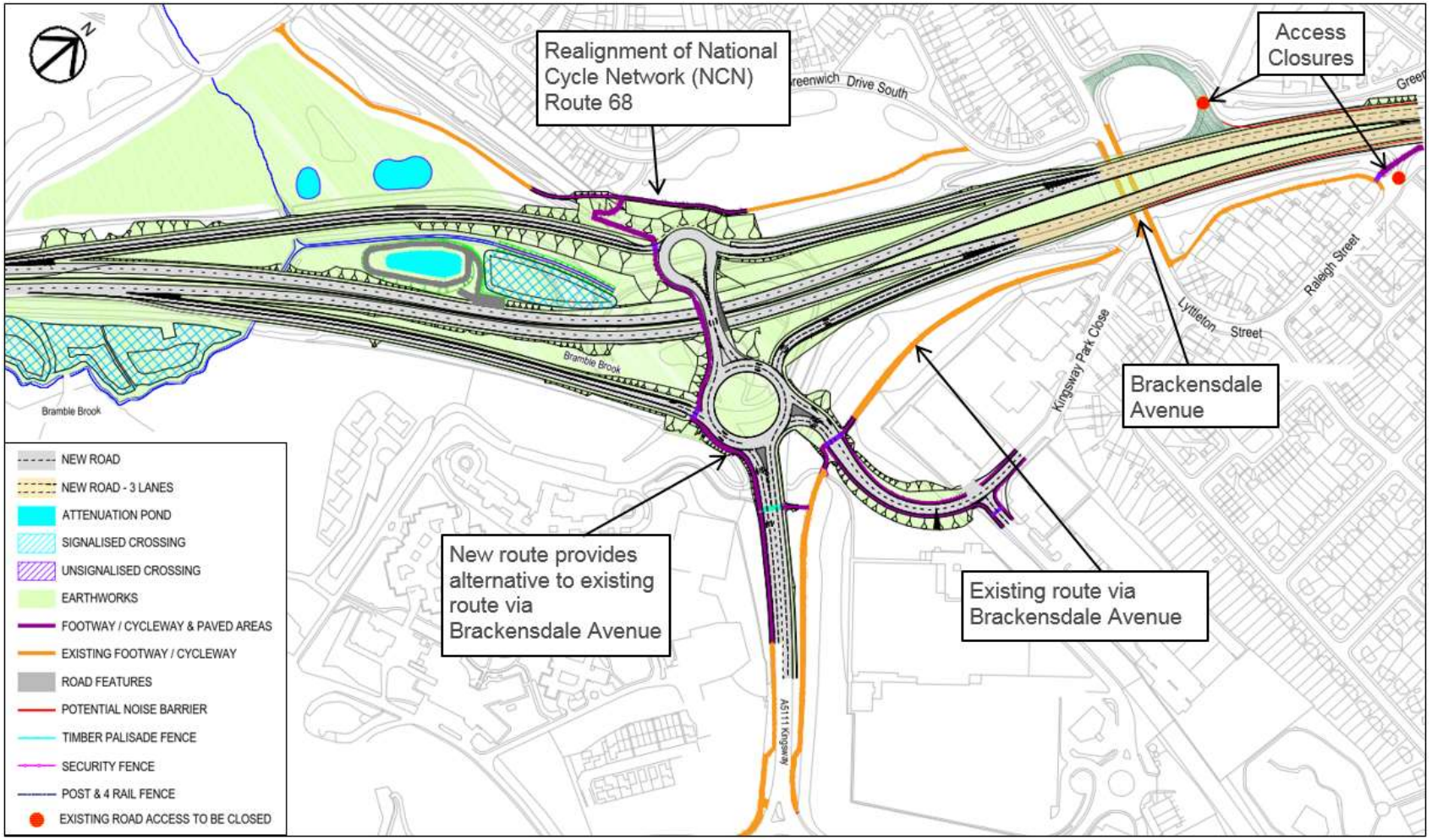


Figure 6.1: Kingsway junction arrangements

6.2.7 The existing high traffic flows along the A38 deter use of the existing uncontrolled crossing that is located between Kingsway and Markeaton junctions (serving pedestrian movements between Thurcroft Close and Greenwich Drive North). As a result of high traffic flows on the A38 dual carriageway, pedestrians often need to wait for long periods of time to find a suitable gap in the A38 traffic flow and to cross the two-lane dual carriageway. This crossing was originally established to serve the bus stops on each side of this A38 crossing, which stops are now dis-used. The crossing is lightly used by pedestrians, including children, some of who are en-route to Brackensdale Primary School (although the school discourages its use on safety grounds).

6.2.8 With the Scheme, the A38 carriageways would be widened, speed limits would be increased from 40mph to 50mph and this length of the A38 would contain vehicles joining and leaving the Markeaton south-facing slip roads and the Kingsway north-facing slip roads.

6.2.9 As a safety measure, therefore, the Scheme would remove the current uncontrolled crossing point. Pedestrians would be directed via the underpass to the south (at Brackensdale Avenue), which is the nearest alternative route, or to the controlled crossings of the south-facing slip roads that would be provided at the grade separated Markeaton junction. There would also be a benefit to pedestrians given that the existing access roads, on the east and west side of the A38, would be closed thereby removing the potential for conflicts with adjacent vehicles.

6.2.10 Pedestrian and cyclist surveys were carried out on Friday 15 June 2018 by Road Data Services Ltd. The surveys confirmed the assumption that this crossing is infrequently used, due to the issues highlighted above. Between 7am and 7pm, 61 people used the crossing, including seven children; of which, 21 crossings took place between 7am and 10am and 14 crossings took place between 4pm and 7pm. No elderly or physically disabled people were observed to cross the A38 during this survey.

6.2.11 The proposed diversion route would be a maximum of 670m increase in walking distance between Thurcroft Close and Greenwich Drive North. It is noted that many of the pedestrian trips would not involve a diversion of this length; because the actual increase in the pedestrian journey length would depend upon the origin and destination of each pedestrian trip.

6.2.12 **Markeaton:** The scheme at Kingsway is shown in Figure 6.2, with the pedestrian/cycle features highlighted.

6.2.13 The Markeaton Roundabout would be grade separated as part of the Scheme with the A38 vertically aligned below the existing ground level. Figure 6.2 indicates the proposed new junction arrangement and the proposed footways and cycleways.

6.2.14 As part of the Scheme, the roundabout would be enlarged. All the crossings would become traffic-signal controlled. Some roads would be wider and others (e.g. the slip roads) would be narrower than the existing roads crossed. The overall walking distances on the east side would remain similar. On the west side, there would be an increase of approximately 10m due to the alignment of the new footways. However, these changes would be offset by the benefit that all

non-motorised users would be crossing roads carrying lower traffic flows and would have the assistance of traffic-signal-controlled crossings.

6.2.15 On A52 East (Ashbourne Road), with its high flows, the additional signal-controlled crossings (one crossing per half-carriageway) would be an overall benefit.

6.2.16 Markeaton Park footbridge would be replaced by a new footbridge with a very similar specification as the existing footbridge but would have a longer bridge span to accommodate the widened A38 carriageway. Overall walking lengths would remain unchanged.

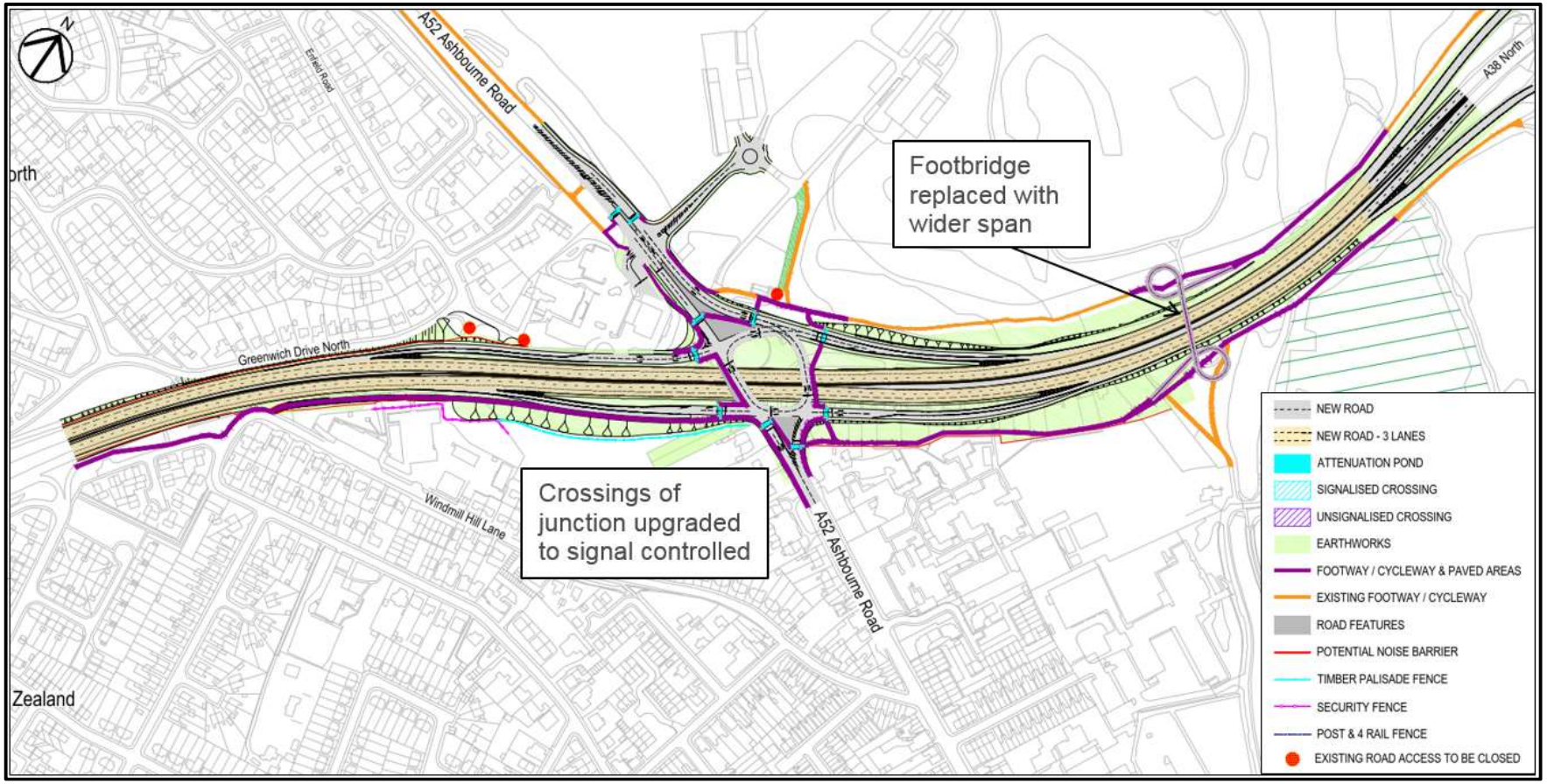


Figure 6.2: Markeaton junction arrangements

6.2.17 **Little Eaton:** At the Little Eaton junction (Figure 6.3), the A38 would be changed to a flyover across the existing roundabout. The existing toucan crossings of the A38 carriageways, located to the west of the Little Eaton roundabout, would become redundant. The new design would include a footway/cycleway under the flyover with traffic-signal controlled crossings provided across the new west-facing slip roads.

6.2.18 The pedestrian walking distances would increase slightly by around 5 meters and pedestrians would benefit from crossing roads that have lower traffic flows; i.e. there are lower flows on the slip roads to be crossed compared to the flows on the main A38 carriageway as crossed now. The overall walking lengths would remain the same.

6.2.19 The existing footpath on the east side of Little Eaton junction links to the footway on the B61 Alfreton Road. With the Scheme, the footpath would follow the fence line around the water storage/attenuation ponds and environmental areas that are situated to the south-east of the new roundabout. This would be a more direct route than taken by the existing footpath. With the Scheme, the walk-length between the common points would be 515m, which is a reduction of around 90m. This would be a benefit to walkers.

6.2.20 The Derwent Valley Heritage Way passes under the A38 to the west of Little Eaton roundabout. There would be no change to overall trip length; however, the length of the underpass would be extended southwards to accommodate the increased road width over it.

Figure 6.3: Little Eaton junction arrangements

6.3 Summary

6.3.1 The proposed changes to crossing locations of the A38 would create some increases and some decreases in the walking and cycling distances; but are considered to be not material impacts.

6.3.2 Overall the improvements would provide safer and easier road-crossings for pedestrians and cyclists and would provide a more pleasant environment.

7 Sustainable transport: public transport

7.1 Overview

7.1.1 The appraisal of public transport accessibility focuses on access to employment, services and social networks. This considers the accessibility needs of different groups of people, considering a wide range of factors, including journey times to reach key destinations, service frequencies and the provision of accessible boarding at bus stops.

7.1.2 The impact of the Scheme on public transport services, which cross through the Scheme area, and its general impact on access to public transport are reviewed in this section.

7.1.3 While this section focuses on the public transport aspect of accessibility, broader accessibility issues have also been considered throughout the Scheme.

7.2 Impact of the Scheme

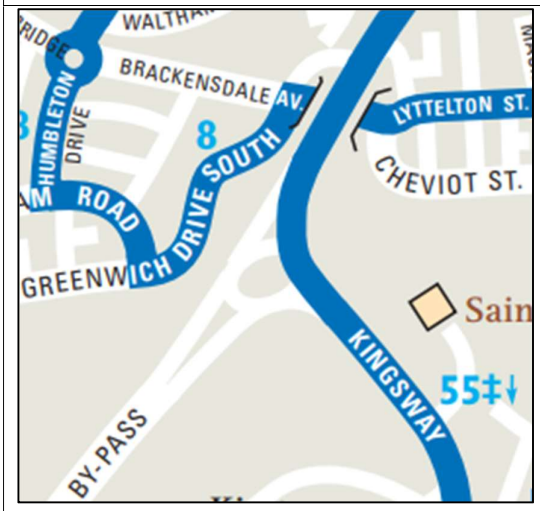
7.2.1 The Little Eaton, Markeaton and Kingsway junctions are key radial-route crossings of the A38 for a number of bus services.

7.2.2 The services shown in Table 7.1 operate across the A38 at the junctions included within the Scheme. Extracts of the relevant parts of the local bus route maps are shown in Figure 7.1.

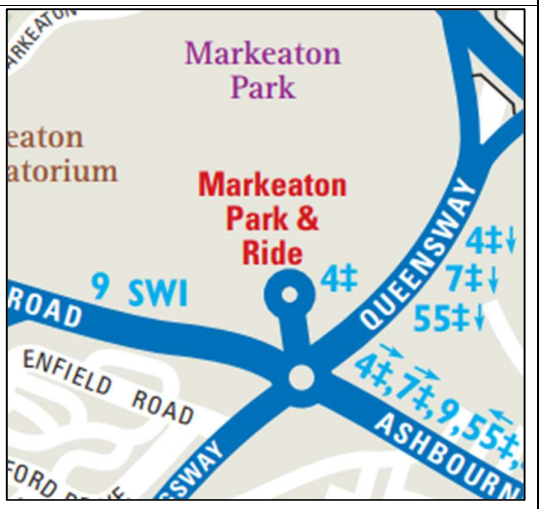
Table 7.1: Bus services using Kingsway, Markeaton and Little Eaton roundabouts

Location	Name of Service(s)*
Kingsway roundabout	Number 55 “Notts + Derby” Service
Markeaton roundabout	Number 9, Number 5, Number 55, Demand Responsive Transport (DRT) and SWI (Ashbourne to Derby)
Little Eaton roundabout	6x, 7.1, 9.1, 9.2, 9.3, AMB (Derby to Hucknall), CMT. (Derby to Chesterfield.)
*All bus service information was taken from www.derbysbus.info	

Bus services at Kingsway Roundabout



Bus services at Markeaton Roundabout



Bus services at Little Eaton Roundabout

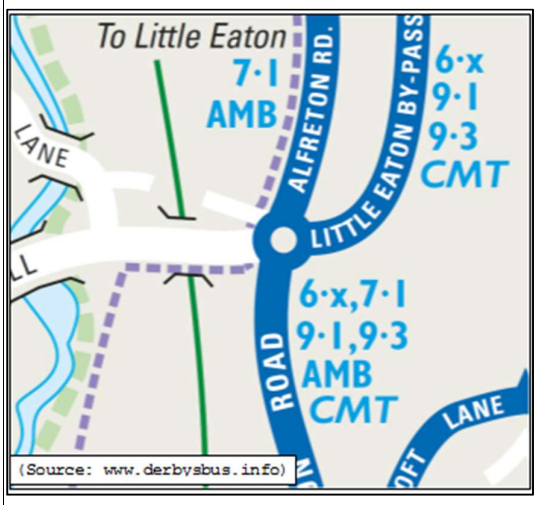


Figure 7.1: Bus services at the three Scheme junctions

7.2.3 The bus service Notts & Derby No. 4 (Derby University – Markeaton – Derby University) uses a stop in the south-eastern corner of Markeaton Park, which is currently accessed from the A38 just north of the Markeaton Roundabout and exits onto the A52. The closure of the access from the Markeaton Roundabout under the Scheme would require this route to use alternative access arrangements, however it is envisaged that this would not necessitate other changes to the route or timetable.

7.2.4 This change with the Scheme is illustrated in Figure 7.2. The length of the route from Markeaton Roundabout to the Markeaton Park mini roundabout would be reduced slightly from 220m to 200m. As described above, this should have minimal impact on routing and timetabling, requiring no change to bus services and frequencies.

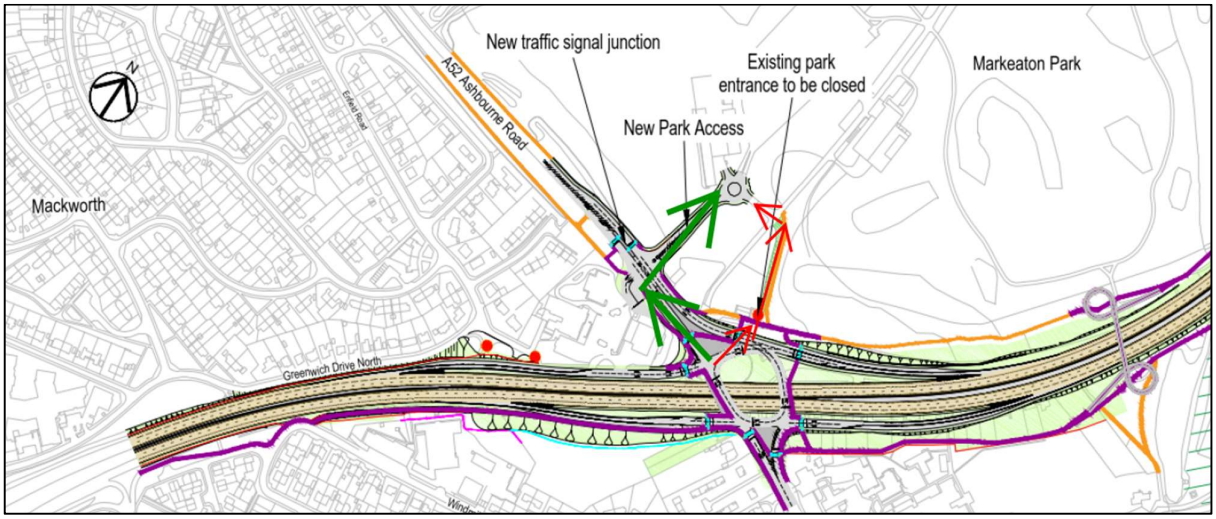


Figure 7.2: Markeaton Park layout changes

7.2.5 Other than the minor modification to access to Markeaton Park noted above, it is expected that the Scheme would not lead to any changes in routings or timings of public transport services within the impact area. Any reductions in the existing vehicle-queueing delays at the Markeaton junction would also benefit bus passengers and improve the reliability of bus services.

7.2.6 There would be very minor relocation of waiting facilities at four locations. Three of these are illustrated in Figure 7.3. The road layout would change the access to Markeaton Park in a small way. Three existing bus-stops marked “2”, “3” & “4”, would be relocated less than 30m from their current location. No impact is foreseen on accessibility to these shelters.

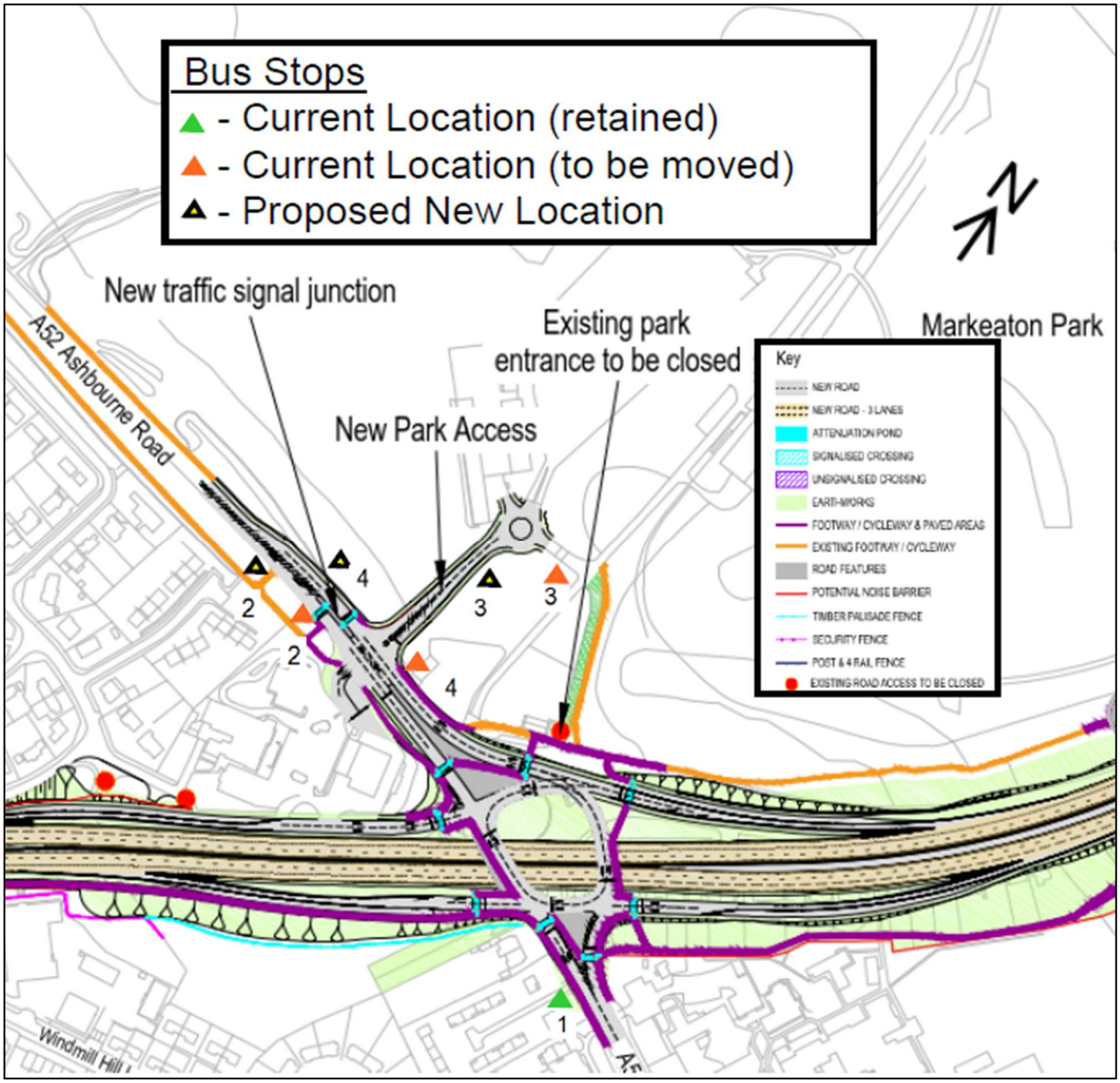


Figure 7.3: Markeaton roundabout bus stops

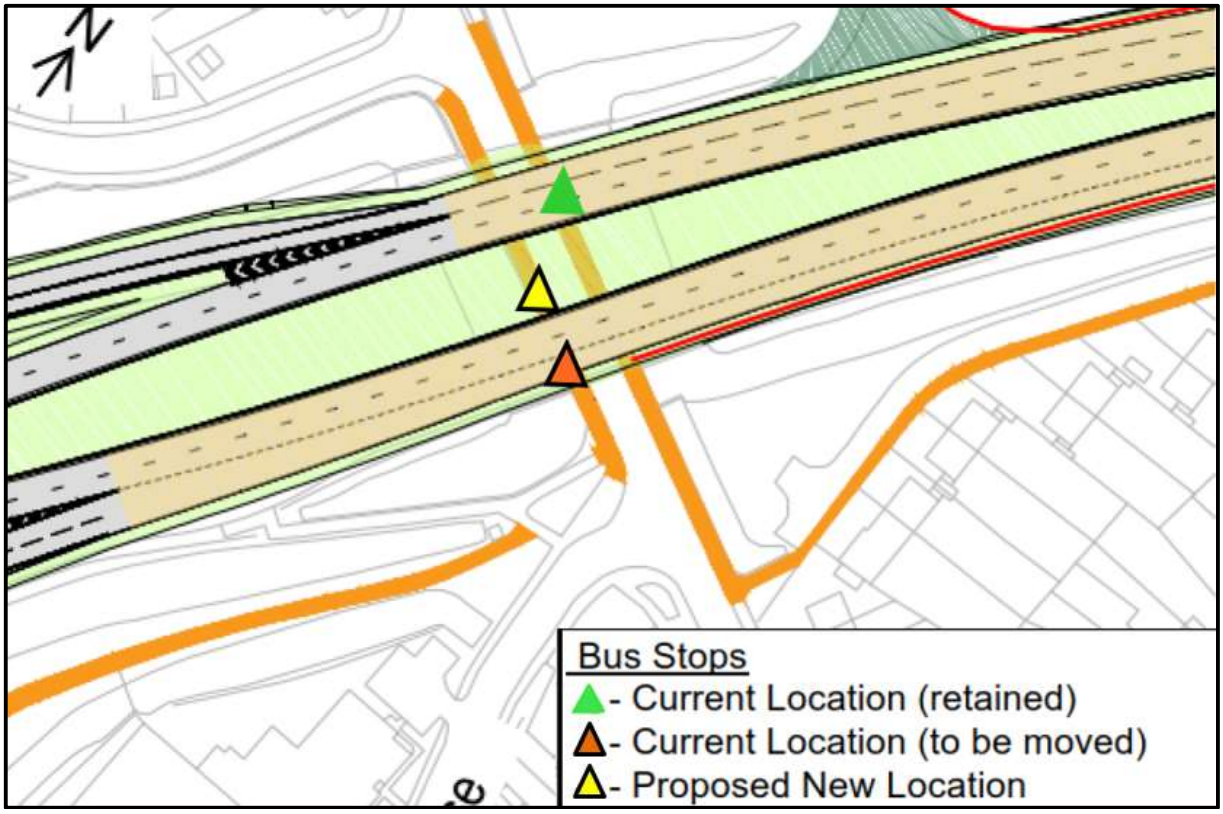


Figure 7.4: Brackensdale Avenue bus stops

7.2.7 Under the A38 bridges on Brackensdale Avenue, there are two bus stops. The southeast-bound stop would remain unchanged with the Scheme. The northwest-bound stop would be moved north by around 5m to 10m to move it away from the junction of Brackensdale Avenue and Kingsway Park Close. These changes are illustrated in Figure 7.4.

7.3 Summary

7.3.1 During the construction phase, bus services would face an inevitable increase in journey times. After the Scheme has been completed, all services would be able to follow the same routes (subject to minor distance changes due to the new road layout) whilst benefiting from the grade separation of junctions where bus routes cross the A38.

8 Public consultation

8.1 Overview

8.1.1 Two main rounds of public consultation were conducted with regards to the most recent design work associated with the Scheme. The first of these was an early design Non-statutory consultation undertaken in 2015. The second was the full Statutory Consultation, which occurred from 7 September to 18 October 2018. An earlier public consultation was also undertaken in 2003 prior to the scheme being put on hold. The transport assessment outcomes of these consultation events are summarised in this section.

8.1.2 In addition, this section also considers two specific issues raised at the consultation, being the impact on traffic from Mackworth and the arrangements for Ford Lane.

8.1.3 A timeline of the consultation events is illustrated in Figure 8.1.

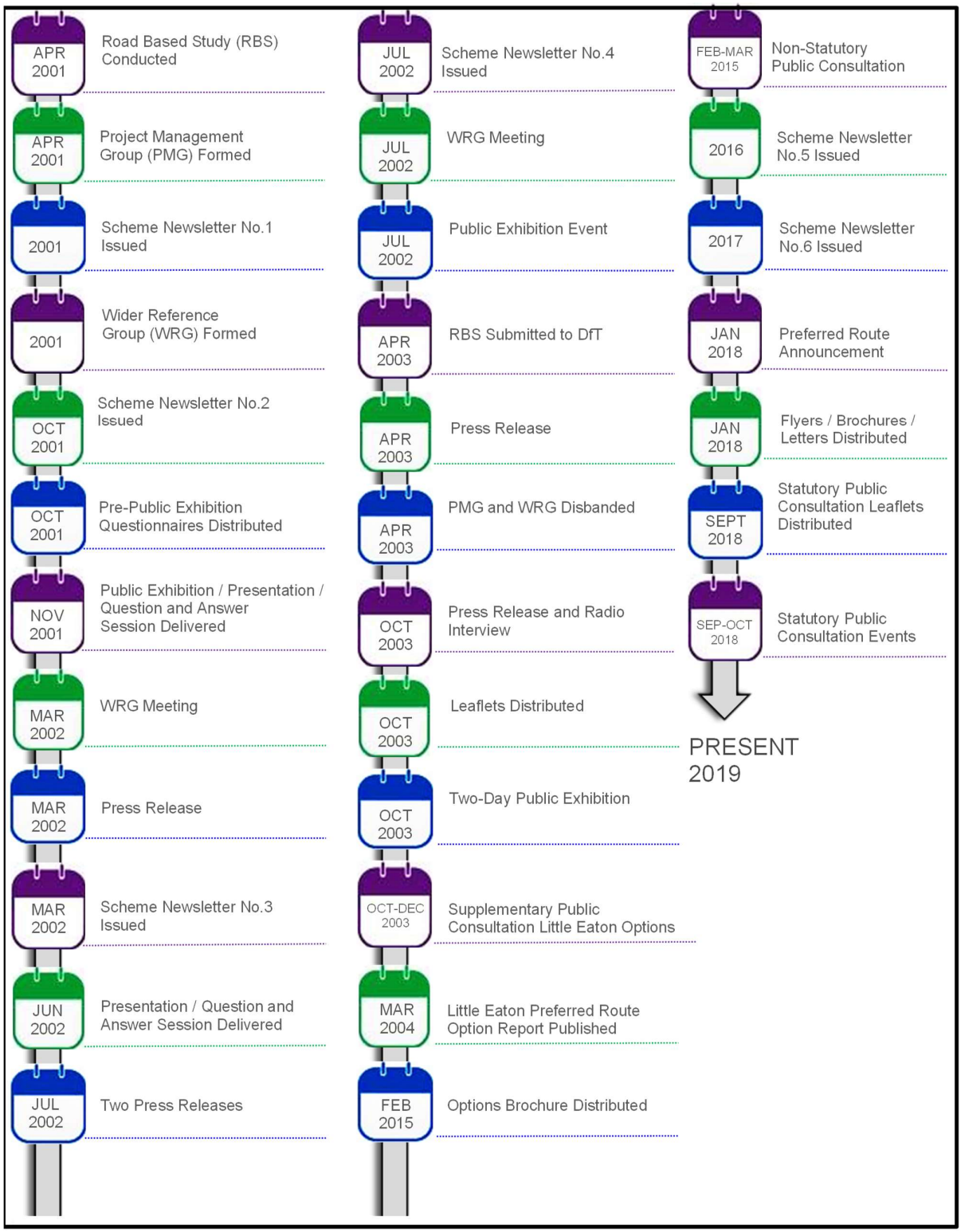


Figure 8.1: Consultation timeline 2001-2018

8.2 2015 Consultation

8.2.1 Highways England's best practice is to hold a non-statutory consultation at the early phases of a scheme's development, to ensure that public views are incorporated into the developing scheme's design at an early stage.

8.2.2 The 2015 consultation was held between 2 February 2015 and 13 March 2015. The main exhibition event was held at the University of Derby on Friday 6 February 2015 and Saturday 7 February 2015. Supplementary exhibitions were held at Breadsall Memorial Hall, Little Eaton Village Hall and Mackworth Youth and Community Centre. The events were publicised through a combination of leaflet drops, formal letters and press releases as well as through the Highways England's website, local community groups and large local employers. Display boards were erected, and consultation questionnaires were placed in local libraries and at the DCiC offices.

8.2.3 The exhibitions were attended by approximately 1,200 visitors. In total 739 responses were received comprising 699 questionnaires and 40 letters. 41% of questionnaires were received online via the project's Survey Monkey pages.

8.2.4 Overall, 81% of consultees agreed with the need for improvements to the junctions, 17% disagreed and 2% did not provide a response.

8.2.5 Of the 17% that disagreed, the main reason cited was that the recent improvement works as part of the 'pinch point' scheme was sufficient. (As noted in Section 3, the 'pinch point' scheme was delivered as a short-term solution to the congestion experienced at the Markeaton and Little Eaton junctions).

8.2.6 As part of the 2015 consultation, Highways England received further ideas on possible options. These included:

- Little Eaton – Option 2, as previously published during 2003 public consultation process.
- Little Eaton – Option 3A, as proposed by Breadsall Parish Council.
- Little Eaton – Southern Sweep Option as proposed by Cllr. Abey Stevenson.
- Kingsway – alternative eastern roundabout layout as proposed by Consultee J.

8.3 2018 Consultation

8.3.1 The purpose of the 2018 statutory consultation was to make sure that the local community, the residents, local interest groups, businesses, visitors and road users, had the opportunity to fully understand the Scheme and comment on the updated proposals for the Scheme included in the preferred route announcement

8.4 Traffic impacts at Ford Lane

8.4.1 As a result of queries and comments from the consultation, more detailed analysis of traffic impacts was conducted in two areas of Derby: Ford Lane and Mackworth. As such, this section considers these areas in more detail.

8.4.2 Around Ford Lane, three junctions have been reviewed as shown in Figure 8.2:

- Derwent Avenue/A6 Duffield Road junction (labelled '1');
- Ford Lane/A6 Duffield Road junction (labelled '2');
- Ford Lane/A38 Abbey Hill junction (labelled '3').

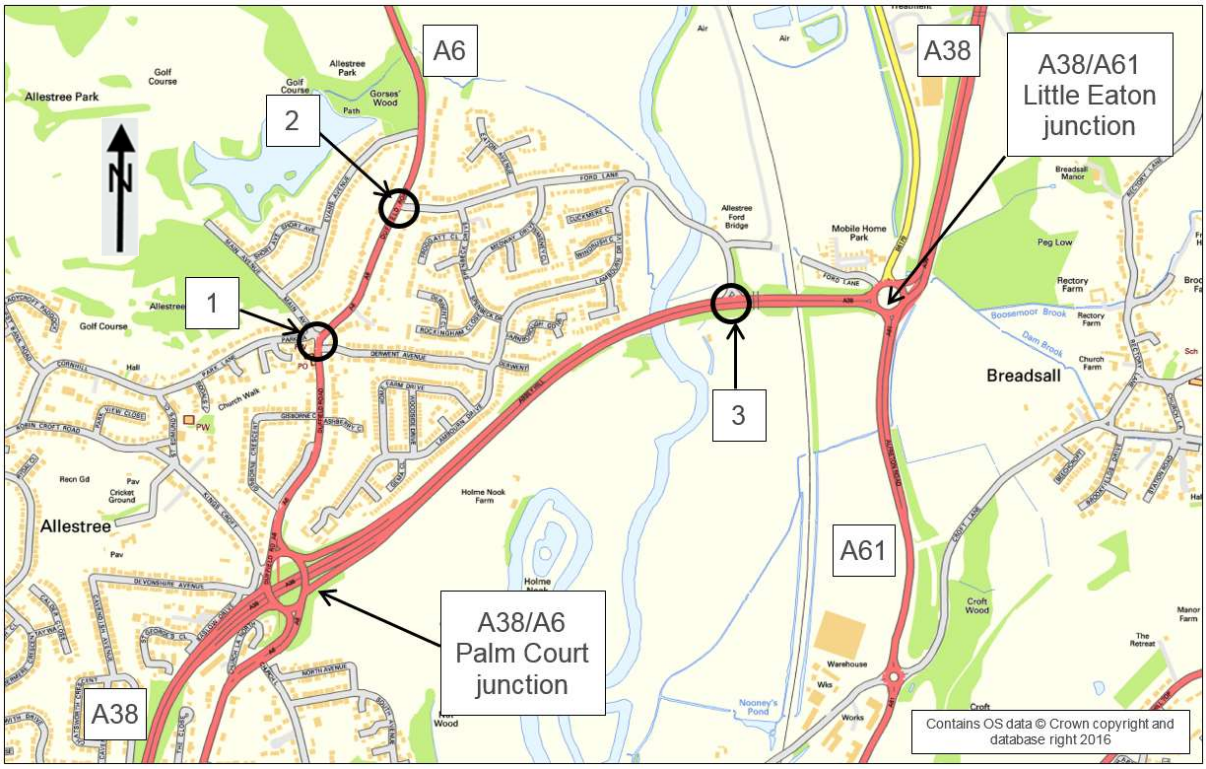


Figure 8.2: Location plan

8.4.3 Immediately to the west of the Little Eaton Junction, Ford Lane is connected to the A38 northbound carriageway with a left-in/left-out priority-controlled junction. Ford Lane provides a quicker route between the A6 North (including trips from origins like Belper, Duffield, and Quarndon) to the A61 Alfreton Road and then onwards to the destinations of Derby city centre, to A52 East (Nottingham) and to the M1 motorway. These trip movements are considered undesirable by some local residents because they increase traffic flows on the length of Ford Lane through a residential area. The northern end of Ford Lane is protected from heavy goods vehicle movements by an Environmental Weight Restriction (except for access to adjacent land).

8.4.4 The Scheme would grade separate the A38 route over the top of the A61 Alfreton Road/B6179 Little Eaton junction. The A38 northbound diverge-slip road to the Little Eaton junction's roundabout would extend back westwards and across the Ford Lane/A38 access. For reasons of geometric layout, highway standards and road safety, the existing Ford Lane direct access onto and off the A38 northbound carriageway would need to be closed.

8.4.5 This removes the opportunity for through movements between the A6 North and the A38, via Ford Lane, potentially reducing flows for some turning movements at the A6/Ford Lane junction. However, this road closure would also remove one of the three points of access to, and egress from, the residential area of Allestree located to the east of the A6. As a result, trips associated with this residential area and using the two A6 junctions (A6/Ford lane and A6/Derwent Avenue) would increase.

8.4.6 Analysis of the junctions has shown that:

- The A6/Ford Lane would be over-capacity and may require some form of mitigation strategy. A potential improvement to the A6/Ford Lane junction might be to install traffic signals at the junction.
- The A6/Derwent Avenue would perform well with little queueing. As such, no mitigation is proposed at this location.

8.5 Traffic impacts in Mackworth

8.5.1 Forecasts of the two-way link flows and turning movement flows at junctions within Mackworth were extracted from the Scheme's traffic model for a number of roads and at a number of junctions within Mackworth.

8.5.2 The junctions considered, shown in Figure 8.3, are:

- Kingsway Park Close with Brackensdale Avenue (labelled '1').
- Prince Charles Avenue with the A52 Ashbourne Road (labelled '2').
- Radbourne Lane with Aldersgate (labelled '3').
- Radbourne Lane with Moorgate (labelled ''4').

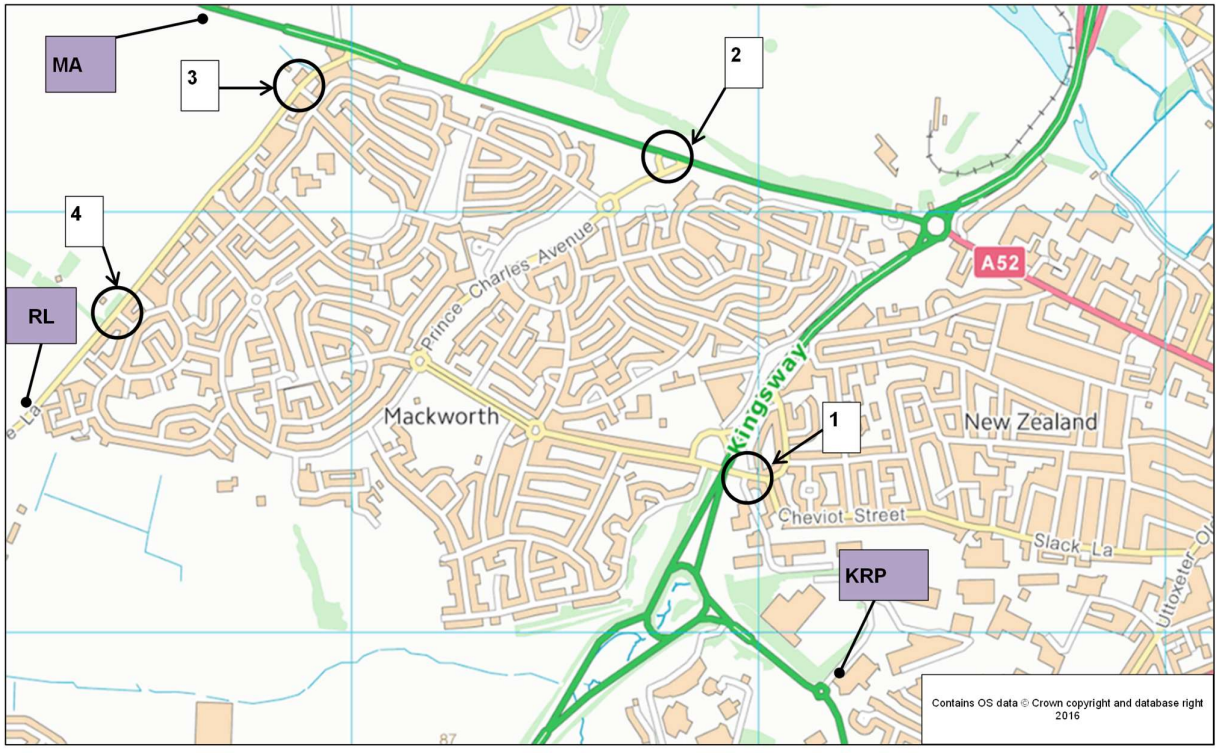


Figure 8.3: Mackworth study junctions

8.5.3 Journey times have also been extracted from the traffic forecast models between Kingsway Retail Park (KRP) and the Mundy Arms (MA) public house on the A52, and between the Kingsway Retail Park and the new housing development off Radbourne Lane (RL), which is accessed by a new roundabout constructed on Radbourne Lane.

8.5.4 **Scheme details in Mackworth:** With the Scheme (the 'Do-Something' case) the two existing local accesses between Mackworth and the A38 Kingsway would be stopped-up. The left-in/left-out junctions between Brackensdale Avenue and the A38 northbound carriageway would be closed. The existing left-in/left-out junction between Raleigh Street and the A38 southbound carriageway would also be closed.

8.5.5 With the Scheme, Kingsway Park Close would provide the replacement local access between Mackworth and the A38; via the improved A38/A5111 Kingsway junction. This layout was presented as 'Option K2' at the 2015 Public Consultation.

8.5.6 With the Scheme, the existing A38/A52 Markeaton junction would be improved. The A38 strategic road would be grade separated under the new roundabout in a 'trough' structure. The new A38/A52 roundabout would be approximately at ground level and would be controlled by traffic signals. The access to Markeaton Park and to the Esso and McDonald's sites would be controlled at a traffic signal junction on the A52 West approach.

8.5.7 **Junction capacity and potential mitigation:** At the junction of Kingsway Park Close and Brackensdale Avenue there would be an increase in the number of vehicles in all of the assessed peak periods due to the Scheme. This would be a direct result of Kingsway Park Close becoming the local access route to and from the A38.

8.5.8 At this Kingsway Park Close junction, a traffic signal solution has been investigated that would operate within capacity. However, a detailed design would need to be developed and appraised if a decision is taken to implement this junction layout type.

8.5.9 Note that the traffic flows on both Markeaton Lane and Radbourne Lane would decrease in the 'Do-Something' case, compared to the 'Do-Minimum' case, in all of the assessed peak periods, except in the AM periods northbound. In the AM1 and AM2 peak hours, a marginal increase in vehicles is indicated in the northbound direction on Markeaton Lane. However, overall there would be a decrease in the volume of two-way flows on this road.

8.5.10 At both the Radbourne Lane/Aldersgate junction and Radbourne Lane/Moorgate junction the number of vehicles would decrease in all the assessed peak periods between the 'Do-Minimum' and 'Do-Something' cases.

8.5.11 The A52/Prince Charles Avenue junction would also experience a decrease in the number of vehicles in the AM1 peak. A marginal increase in the number of vehicles would be seen in the AM2, PM1 and PM2 peak hours. It is concluded that the forecast changes would not have a material effect on the operation of the A52/Prince Charles Avenue junction and do not warrant an improvement to this junction.

8.5.12 **Journey time:** In both the 'Do-Minimum' and 'Do-Something' it would be quicker to route via the A38 for a trip starting from the Kingsway Retail Park and destined for a point on the A52 Ashbourne Road near to the Mundy Arms.

8.5.13 For a trip between the new housing development site on Radbourne Lane and the Kingsway Retail Park, it would be quicker to route through Mackworth than to use the A38 and A52. However, the Scheme would make the A38 and A52 more attractive as a route choice using a consideration of travel times. As a result, there is probability that some trips may be persuaded to change their route away from Mackworth and travel using the A38/A52. However, if these trips are choosing routes based on minimum generalised costs, which is how route choices are made within the traffic model, then these trips are likely to continue to route through Mackworth in a similar manner to the 'Do-Minimum' case. As such, the Scheme would not have a detrimental traffic impact on Mackworth.

8.6 Summary

8.6.1 The Scheme has been developed following appropriate consultation, with issues raised at events being the subject of further evaluation and assessment.

9 Construction period

9.1 Overview

9.1.1 Road users tend to understand why roadworks must take place, but they are viewed as disruptive and inconvenient. To improve the customer experience, Highways England has developed a vision of how it will manage major road works in the future.

9.1.2 Consideration has been given to the principles described in the vision as part of the development of the Scheme's 'Traffic Management Plan'. The vision describes where Highways England is looking to change our approach to road works.

a. Varying the speed limits so they are appropriate for the work taking place

b. Shortening the length of road works

c. Appropriate use of full road closures and associated diversions

d. Delivering road works quicker

e. Explaining clearly what activities are, or are not, taking place

9.1.3 The purpose of this section is to summarise the construction strategy associated with the Scheme.

9.2 Construction duration

9.2.1 The construction duration of the Scheme was planned on the basis of a three and a half years' construction period (42 months) in consultation with Highways England's appointed buildability advisors. This planned three-and-a half years' construction programme was used as the basis for the traffic modelling and the environmental assessments of the construction period.

9.2.2 Table 9.1 sets out the assumed traffic management constraints used by Highways England's buildability advisors to develop the construction durations for the Scheme.

Table 9.1: Traffic management restrictions assumed

The following traffic management restrictions were considered:	
A38	Two lanes to be maintained from 06:00 to 21:00. At least one lane open between 09:00 and 18:00 Overnight closures permitted, subject to diversion routes being agreed.
Slip roads	Selective closures permitted, subject to full advance warning and diversion routes being agreed.
A61	Two lanes to be maintained during peak hours. At least one lane to be maintained during off-peak and inter-peak hours. Overnight closures permitted, subject to diversion routes being agreed.
A38-A61 left-turn lane	24-hour closures permitted.
A6179	Daytime restrictions to be confirmed. Overnight closures permitted, subject to diversion routes being agreed.
A52	At least one lane to be maintained. Overnight closures permitted, subject to diversion routes being agreed.
A5111	At least one lane to be maintained. Overnight closures permitted, subject to diversion routes being agreed.
The above restrictions could be challenged by the Highways England's buildability advisors when considering opportunities to reduce the Scheme's construction period.	

9.2.3 It is noted that the construction duration is subject to ongoing reviews. The Contractor is to be appointed by Highways England in Summer 2019. One of the Contractor's first tasks will be to review the construction methods, consult with key stakeholders on the availability road space and potential diversion routes and then to review the assumed construction phase durations.

9.2.4 The Environmental Statement [**TR010022/APP/6.1**] (Chapter 2: The Scheme) sets out the project-wide core working hours. These are 07:30 to 18:00 Monday to Friday and 08:00 to 13:00 on Saturdays, with no working on Sundays and Bank Holidays.

9.2.5 Some activities with limited durations, subject to prior agreement with DCiC and EBC environmental health officers (as applicable), are likely to be permitted outside of these hours. There is an onus to demonstrate that the activity would be not environmentally worse than the activities that have been assessed within the Environmental Statement.

9.3 Traffic Management Plan

9.3.1 A Traffic Management Plan (TMP), which at this stage of the project is in outline, has been prepared for the Scheme [**TR010022/APP/7.4**]. This TMP will be developed during the subsequent detailed design stages and with input from the Contractor.

9.3.2 The TMP is required by Highways England to describe the Temporary Traffic Management (TTM) arrangements needed to facilitate the construction of the Scheme. The Traffic Management Plan has been prepared with the aims to have:

- No increase in accidents.
- Protection of vulnerable road users.
- Protection for the workforce from adjacent live traffic during construction of the works.

9.4 Nature of works

9.4.1 The construction works involve implementing the upgrades at each junction simultaneously.

9.4.2 Figure 9.2 includes a high-level Draft Programme defining the main construction phases envisaged at each junction and with the assumed durations assigned.

9.4.3 In order to facilitate the construction works, the traffic management arrangements will need to be phased. The sequence of the construction phases proposed for this Scheme could be changed in order to accommodate the potential constraints of the construction works. Each phase would be able to run concurrently with construction phases at the other junctions.

9.4.4 Descriptions of the construction phases that would be ongoing is provided in the TMP [**TR010022/APP/7.4**] at section 3.2.

9.4.5 As shown in Figure 9.2 each junction's construction programme is divided into phases that run concurrently with the construction of the other junctions. For the purpose of modelling the traffic management of these construction phases, the overall construction was split into eight discreet traffic management (TM) scenarios, each encompassing a combination of junction construction phases at differing levels of completion.

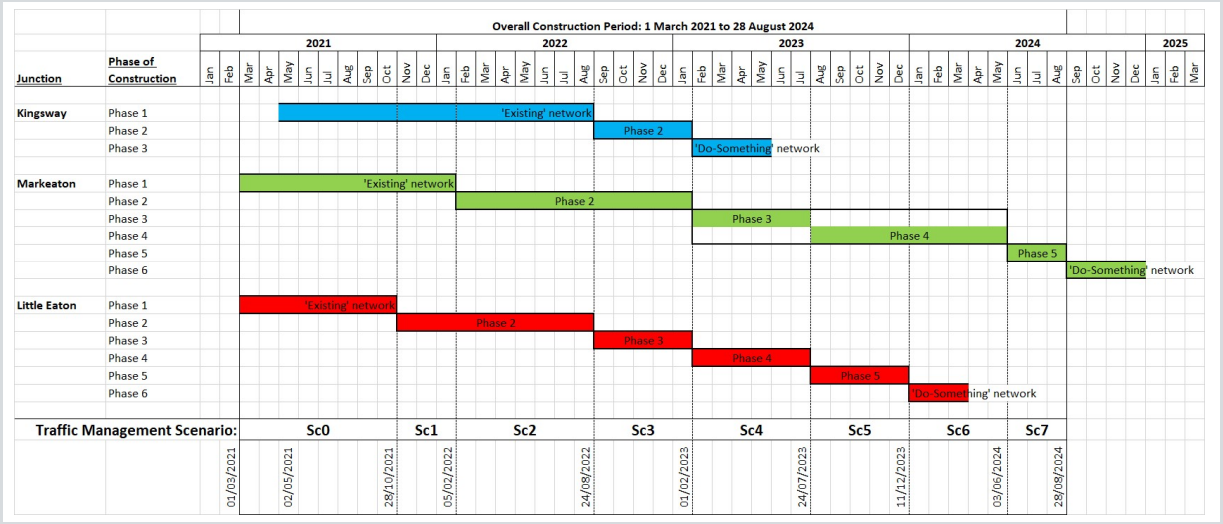


Figure 9.2: Programme of construction phase at each junction

9.5 Restrictions: speed limits

9.5.1 Road works should be designed to minimise the risks to road users and the workforce. A mandatory reduced speed limit (even when enforced) can only be considered a reliable method of providing the required protection to road workers when implemented with physical measures. In all other cases the temporary traffic management should be designed to be safe at the permanent speed limit e.g. provision of safety zones in accordance with the Traffic Signs Manual, Chapter 8, Part 3. For all other situations reduced speed limits are set on whether they are needed for road users' safety.

9.5.2 Where, due to site constraints, it is not possible to design the entire section of road works to be safe at the permanent speed limit designers shall provide evidence to show what alternative construction options were considered to maintain the permanent speed limit and why a lower speed limit is ultimately required.

9.5.3 For the purpose of traffic modelling and assessing the travel times during construction during the early construction phases ('TM Scenario 0') it was assumed that a 40mph temporary speed limit would likely be implemented along the A38 through all three junctions. This would be needed to ensure the safety of road users whilst the preparatory construction work takes place on the land immediately adjacent to the A38.

9.6 Summary

9.6.1 The construction of the A38 Derby Junctions scheme would lead to short-term disruption; however, this would be minimised via the introduction of carefully designed traffic management and the development and implementation of the Traffic Management Plan.

10 Summary and conclusions

10.1.1 The Scheme would grade separate the A38 from the Kingsway, Markeaton and Little Eaton roundabouts. The existing junctions are the sources of delays, and recent improvements have exhausted the potential to improve these within their existing at-grade layout.

10.1.2 The Scheme's development has a long history, with two recent rounds of consultation seeking the views of members of the public. This has resulted in a Scheme that considers local issues (including in the areas of Ford Lane and Mackworth), and also improves upon the existing provision for pedestrians and cyclists. Bus services crossing the A38 would also benefit from the improved junctions and the separation of local and strategic traffic.