A63 Castle Street Improvement, Hull

Scheme Number: TR010016

7.4 Transport Assessment Report

APFP Regulation 5(2)(q)

Planning Act 2008

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

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Infrastructure Planning

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The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

A63 (Castle Street Improvement, Hull) Development Consent Order 20[ ]

TRANSPORT ASSESSMENT REPORT

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CONTENTS

1 INTRODUCTION

1.1 Purpose of this Document

1.1.1 This Transport Assessment Report (this "Report") relates to an application made by Highways England (the "Applicant") to the Planning Inspectorate (The Inspectorate) under section 37 of the Planning Act 2008 (the "2008 Act") for a Development Consent Order (DCO). If made, the DCO would grant consent for the Applicant to undertake the A63 Castle Street Improvement, Hull (the "Scheme"). A detailed description of the Scheme can be found in the **Environmental Statement (Application Document Reference: TR010016/APP/6.1)**.

1.1.2 This Report comprises part of a suite of application documents and is included in compliance with Regulation (5)(2)(q) of the Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 which states:

(q) any other documents considered necessary to support the application.

1.1.3 The purpose of this Report is to provide information about the transport analysis undertaken as part of the development of the Scheme.

1.2 Background

1.2.1 The A63 Castle Street, with existing daily two-way AADT (Annual Average Daily Traffic) flow of around 47,000 vehicles between Clive Sullivan Way and Market Place, is reputed to be the busiest section of road in Humberside.

1.2.2 The A63 Castle Street is a dual carriageway that runs to the south of Kingston-Upon-Hull (referred to as Hull in the remainder of the document) City Centre, close to the River Humber, and forms an important part of the main east to west traffic through route. The route forms a vital link between the M62 motorway, Humber Bridge and A15 with Hull and the docks.

1.2.3 A mixture of local traffic accessing side roads around Market Place and Princes Dock Street, and strategic traffic accessing the Port of Hull and M62, causes problems with weaving and traffic turning onto/ emerging from side roads.

1.2.4 A feature of the road is the large at-grade signalised junction at Mytongate, which links the A63 to Ferensway and the city centre of Hull to the north and to the retail and dock areas to the south via Commercial Road. This junction restricts the through flow of traffic along the A63, Ferensway and the interconnecting roads. The congestion caused by this junction restricts development opportunities within Hull city centre and dockside areas. Other delays are caused at the signalised junction at Market Place and the three pedestrian crossing facilities.

1.2.5 The road acts as a substantial barrier due to congestion and creates severance between the city centre and main shopping areas to the north of the road, the developments, tourist and recreational facilities to the south.

1.3 Planning and Policy Context

1.3.1 This section outlines the national and local policies that are relevant to the proposed Scheme. It provides a summary of the Scheme's compatibility with the relevant planning policy framework and transport strategies.

Planning Act 2008

1.3.2 The Scheme is a Nationally Significant Infrastructure Project (NSIP) under Section 14 of the Act (as amended by the Highways and Railways (Nationally Significant Infrastructure Project)) as it comprises alteration and improvement of a highway.

1.3.3 The proposed Scheme relates to a highway (section 14(1)(h) of the 2008 Act) and in particular it is considered to be a highway improvement NSIP. This is because the proposed Scheme includes lowering the level of an existing highway, constructing bridges over the highway and otherwise improving it in accordance with the definition of "improvement" in the 2008 Act. It also involves the improvement of a highway lying wholly within England for which Highways England is the strategic highway company (section 22(1) and (5) of the 2008 Act) and which is likely to have a significant effect on the environment.

National Planning Policy Framework

1.3.4 The National Planning Policy Framework (NPPF), published by the Department for Communities and Local Government in March 2012, sets out government's economic, environmental and social planning policies for England. These policies articulate a national strategy for sustainable development. Government intends that this vision should be interpreted and applied to meet local aspirations.

1.3.5 Paragraph 19 of the NPPF states that "*The government is committed to ensuring that the planning system does everything it can to support sustainable economic growth. Planning should operate to encourage and not act as an impediment to sustainable growth. Therefore, significant weight should be placed on the need to support economic growth through the planning system*"

1.3.6 An important function of the NPPF is to embed the principles of sustainable development within local plans prepared under it. The NPPF also provides an important and relevant consideration in decisions on NSIPs, but only to the extent relevant to that project.

1.3.7 The proposed Scheme supports the principles of NPPF providing the necessary infrastructure required for the economic growth of Hull.

National Policy Statement for National Networks (NPS NN)

1.3.8 Published by the Department of Transport in December 2014 this document sets out the need and government policies for nationally significant infrastructure rail and road projects for England. It is used by the Secretary of State as the primary basis for making decisions on development consent applications related to such projects.

1.3.9 The NPS NN states the Government will deliver national networks that meet the country's long-term needs; supporting a prosperous and competitive economy and improving overall quality of life, as part of a wider transport system. This means:

- Networks with the capacity and connectivity and resilience to support national and local economic activity and facilitate growth and create jobs.
- Networks which support and improve journey quality, reliability and safety.

National Transport Policy

1.3.10 National emphasis on transport focuses on meeting the goals identified in Delivering a Sustainable Transport System (DaSTS), DfT, 2008.

1.3.11 DaSTS outlines five goals for transport, which focus particularly on the challenge of delivering strong economic growth while at the same time reducing greenhouse gas emissions, as recommended through the Stern Review (Oct 2006) and Eddington Report (Dec 2006).

1.3.12 In the overall process, objectives set achievable targets that reflect the wider goals of Hull City Council (HCC) and its partners to deliver National objectives in terms of:

- Contributing to improved safety, security and health
- Supporting economic growth
- Tackling climate change
- Promoting equality of opportunity
- Improve quality of life and a healthy natural environment

Local Transport Policy

1.3.13 HCCs Local Transport Plan (2011-2026) objectives are aligned with national objectives i.e, "*To provide and develop a safe and efficient transport system that contributes to the social, environmental and economic wellbeing of the residents, businesses and visitors to the City and provides equal opportunities for everyone to access key services using, where possible, 'green' alternatives to the private car."*

1.3.14 The objectives of HCC, Local Transport Plan are as follows:

- To ensure that good levels of accessibility, especially by public transport, are integrated with planned changes to the City in the health, housing, education, and employment sectors.
- To maintain and improve road safety on the City's road network
- To help facilitate the regeneration of the City and the expansion of the Port of Hull in a sustainable manner
- To promote a healthier City through improving air quality and encouraging active travel.

1.4 Reference

1.4.1 Extensive detailed analysis has been undertaken in parallel with this Report which follows Transport Appraisal Guidance (TAG) and has been approved by Highways England specialists.

1.5 Report structure

1.5.1 This Report has been prepared with the following structure:

- Chapter 1 - Introduction
- Chapter 2 – Baseline Data and Model Development
- Chapter 3 – Current Network Performance
- Chapter 4 – Future Network Performance
- Chapter 5 – Road Safety
- Chapter 6 – Non-Motorised Users
- Chapter 7 – Severance
- Chapter 8 – Traffic Management during Construction
- Chapter 9 – Summary and Conclusions
- Glossary

2 BASELINE DATA AND MODEL DEVELOPMENT

2.1 Introduction

2.1.1 This chapter provides the details of baseline data collection and development of highway assignment model which includes

- Model development process
- Forecast years and scenarios
- Local and national growth assumptions
- Local development

2.1.2 A SATURN based highway model was developed for the preliminary design assessment of the proposed Scheme.

2.2 Study Area

2.2.1 The study area, which encompasses the Scheme Footprint, is located within Hull City Centre close to the River Humber. It comprises of the city of Hull. The extent of study area is shown in the Figure 2.1.

Figure 2.1: Study Area

2.2.2 This area is coded with a high level of detail to assess the impacts of the Scheme. All key minor and major roads are modelled. Key roads are considered to be those that carry significant levels of traffic or provide means of access and egress to important developments within the area of detailed modelling.

2.3 Baseline Data Collection

2.3.1 Model development involves an extensive traffic data collection, gathering and processing exercise.

2.3.2 For the development of the Scheme traffic model, a large volume of data was collected through primary traffic surveys which includes, automatic traffic counts (ATCs), classified link counts (CLCs), classified junction counts (CJCs) and road side interview surveys (RSIs) in the proposed Scheme influence area.

2.3.3 Secondary data collection included mobile phone trip matrix data from Telefonica (O2) UK, origin-destination and journey time data from Trafficmaster Ltd, 2011 Census Journey to Work (JtW) data, video classified counts as obtained from HCC and additional automatic traffic counts from TRADS, the Highways England Traffic Flow Data System.

Traffic Count Data

2.3.4 The traffic count data collection programme included volumetric traffic counts i.e. Automatic Traffic Counts (ATC), Classified Link Counts (for 7 days) (CLC), Classified Link Counts (for a day) (CLC), and Classified Junction Counts (CJC).

2.3.5 In addition to the above, video classified count data was obtained from HCC.

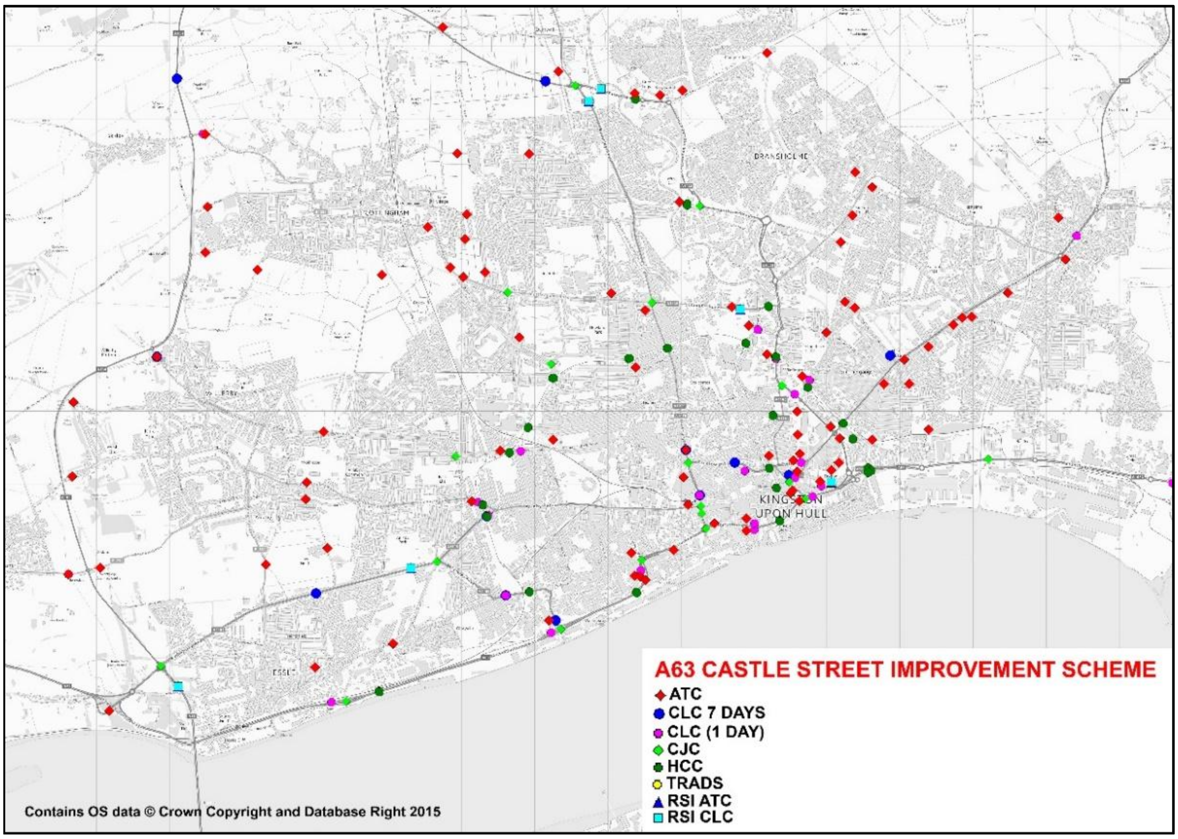
2.3.6 Traffic count data for the motorways was extracted from the TRADS.

2.3.7 A summary of the survey locations is presented in Table 2.1, the locations are also illustrated in Figure 2.2.

Table 2.1: Summary -Traffic count locations

Type	No. of Sites
Automatic Traffic Counts	89
Classified Link Counts (for 7 days)	12
Classified Link Counts (1 day)	24
Classified Junction Counts	19
Video classified count data (HCC)	25
TRADS	36
RSI (ATCs)	6
RSI (CLCs)	6

Figure 2.2: Traffic count locations



Automatic Traffic Counts

2.3.8 89 ATC sites were used for model calibration and validation out of which 63 sites were surveyed in March 2015 and the rest in September/October 2015 to infill any geographical gaps in the combined dataset.

2.3.9 The data was collected for a two-week period for all 24 hours by direction and vehicle type.

Classified Link Counts (Seven day)

2.3.10 A total of 9 sites were selected at which seven-day classified link counts (CLC) in both directions were conducted in March 2015 for a 12-hour period. These comprise of sites, primarily on dual carriageway roads at which it was impractical to fit and maintain automatic traffic count equipment.

Classified Link Count (One day)

2.3.11 24 sites were selected to have one day classified link counts, primarily conducted at locations coincident with the automatic traffic counts (ATCs).

2.3.12 Counts at all sites were undertaken for one day only, from 07:00hrs to 19:00hrs with traffic recorded in both directions.

Classified Junction Counts

2.3.13 A total of 22 road junctions were selected to have one day classified junction counts (CJC). Most of the junction count sites are adjacent to one, if not more automatic traffic count sites, thus enabling the typicality of the one-day count to be verified.

2.3.14 Classified junction turning counts were processed to arrive at the classified link counts.

Video Classified Link Counts (HCC)

2.3.15 HCC provided counts for 25 sites for the month of June 2015.

2.3.16 These were video classified link traffic counts. Traffic counts at all sites were undertaken for one day only, from 07:00hrs to 19:00hrs with traffic recorded in both directions.

Traffic Flow Data System (TRADS)

2.3.17 Highways England maintains, operates and develops TRADS and its associated applications. TRADS holds information on traffic flows at various sites on Highways England Strategic Road Network (SRN).

2.3.18 Automated traffic counts (ATC) for 36 sites were available within the TRADS database within the core study area. This classified traffic count data (based on axle width), excluding weekends and bank holidays, was downloaded and processed for the month of March 2015.

Road side Interview surveys

2.3.19 Road side Interviews (RSI) were commissioned at six sites around Hull in September/October 2015. The surveys were undertaken for twelve hours between 07:00 to 19:00 hours, to cover morning, inter-peak and evening peak periods.

2.3.20 The RSI survey locations were chosen in such a way to supplement and support the travel information already provided by the mobile phone data. Thus, the RSIs were commissioned primarily for deriving:

- Trip purpose proportions/splits;
- Car occupancy information, and;
- Trip length distribution.

Journey Time Survey

2.3.21 The purpose of journey time surveys is to capture the time taken to travel along key routes in the study area. By specifying 'timing points' on the journey time routes, it is possible to determine the location and extent of delay on the highway network.

2.3.22 Trafficmaster Data from January 2015 to March 2015 but filtered by school's term only time was used to validate the modelled journey time.

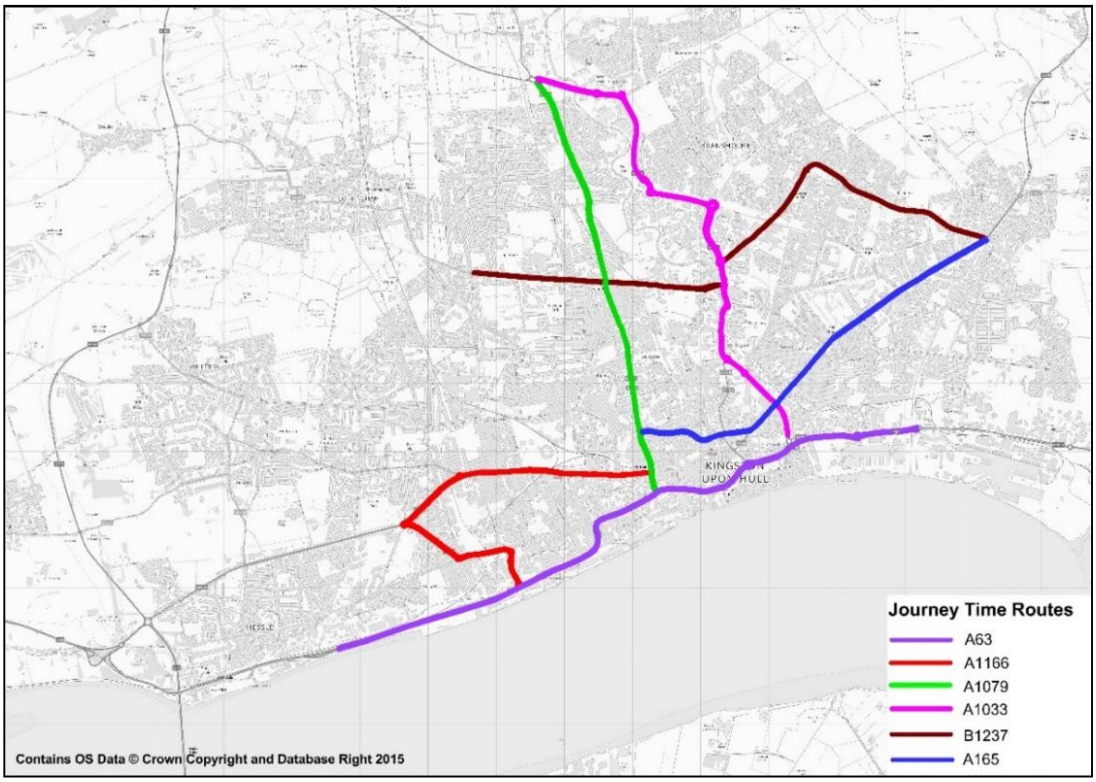
2.3.23 Six separate journey time routes were identified as important for understanding the model performance across the study area. These were generally along key strategic and urban routes and traversing key junctions along these routes.

2.3.24 Table 2.2 lists the routes surveyed for the study. The journey time routes are shown in Figure 2.3.

Table 2.2: Journey Time Survey Routes

Route No.	Route Name	Direction	Length (km)	Route Description		
				From	Via	To
1	A63	EB	9.54	On slip from Prior Way to A63 Mainline EB	Mytongate/ Hessel Road Junction	Hedon Road/ Littlefair road Roundabout
2	A63	WB	9.51	Northern gateway Roundabout	A63 Mainline WB/ Blackfriargate Junction	Off slip to Prior Way from A63 Mainline WB
3	A165	EB	5.78	A165 Freetown Way/ Wright Street	A165 Holderness Road/ Barnsley Street	A165 Holderness Road
4	A165	WB	5.55	Holderness Road	Holderness Road/ Barnsley Street	Freetown Way/ Wright Street
5	A1033	NB	7.66	Mount Pleasant North Roundabout Exit	Stoneferry/West Carr Lane Road junction	Dunswell Roundabout
6	A1033	SB	7.66	Dunswell Roundabout	Stoneferry/West Carr Lane Road junction	Mount Pleasant Road
7	A1079	NB	6.35	Mytongate Junction	Beverley Road/ Sculcoates Lane	Dunswell Roundabout
8	A1079	SB	6.35	Dunswell Roundabout	Beverley Road/ Sculcoates Lane	Mytongate Junction
9	A1166	EB	6.24	Brighton Street A63 Junction Exit	Boothferry/ Anlaby Road	Ferensway/Anlaby Road Junction
10	A1166	WB	6.07	Ferensway/Anlaby Road Junction	Anlaby/Boothferry Road Junction	Brighton Street A63 Junction Exit
11	B1237	EB	8.87	Cottingham Road/ Hall Road	Leads Road/ Sutton Road	Saltshouse Road/ Diadem Grove
12	B1237	WB	8.78	Saltshouse Road/ Diadem Grove	Leads Road/ Sutton Road	Cottingham Road/ Kenilworth Avenue

Figure 2.3: Scheme traffic model - Journey Time Routes



2.4 Transport Demand Modelling and Model Development Area

Base Model

2.4.1 The Scheme traffic modelling system has a 2015 base year and represents the travel conditions for a typical March weekday.

Spatial Detail

2.4.2 The Scheme traffic model covers in detail the whole of the principal urban area.

2.4.3 The model however, extends beyond the wider 'journey to work' catchment and external areas so that it can adequately represent routings and travel choices for longer distance trips to, from and through the sub-region.

2.4.4 TAG (Transport Appraisal Guidance) is guidance provided on how to conduct transport studies and Schemes that require government approval are expected to make use of this guidance. This guidance has been used in the assessment of the Scheme and TAG Unit M3, states that the geographic coverage of highway assignment models needs to:

- allow for the strategic re-routing impacts of interventions;
- ensure that areas outside the main area of interest, which are potential alternative destinations, are properly represented; and
- ensure that the full lengths of trips are represented for deriving costs.

2.4.5 The modelled area therefore needs to be large enough to include these elements, but within the modelled area the level of detailing should vary as follows:

Fully Modelled Area (FMA)

2.4.6 FMA is the area over which proposed interventions have influence, and is further subdivided as:

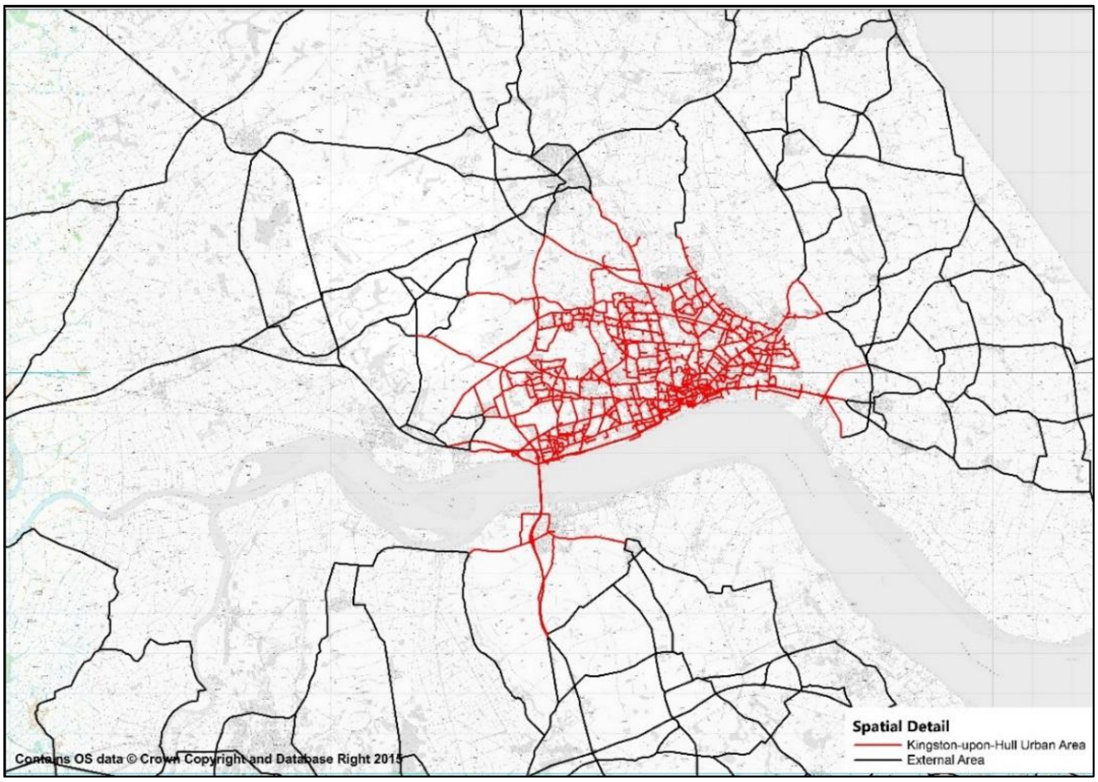
- **Area of Detailed Modelling (ADM):** the area over which significant impacts of interventions are certain and the modelling details in this area would be characterised by: representation of all trip movements, small zones, detailed network and junction modelling (including flow metering and blocking back).
- **Rest of the Fully Modelled Area (RoFMA):** the area over which the impacts of interventions are considered to be quite likely but relatively weak in magnitude and would be characterised by: representation of all trip movements, relatively larger zones and less network detail than for the Area of Detailed Modelling with speed/flow modelling (primarily link-based but possibly also including a representation of strategically important junctions).

External Area (EA)

2.4.7 It is the area where impacts of interventions would be so small as to be reasonably assumed to be negligible and would be characterised by: a network representing a large proportion of the rest of Great Britain, a partial representation of demand (trips to, from and across the Fully Modelled Area); large zones; skeletal networks and simple speed/flow relationships or fixed speed modelling.

2.4.8 Figure 2.4 presents the spatial detail of the Scheme traffic model.

Figure 2.4: Scheme traffic model – Spatial Detail



Network

2.4.9 Using the Ordnance Survey (OS) Integrated Transport Network (ITN); which provides a detailed overview of Great Britain transport infrastructures, a SATURN based highway network has been developed with two levels of detail.

- simulation network representing junctions/links in the urban area of Hull; and
- buffer network representing only links in outer area of the model.

2.4.10 The SATURN buffer and simulation networks are shown in Figure 2.5 and Figure 2.6 respectively.

Figure 2.5: A63 Castle Street Model Buffer Network

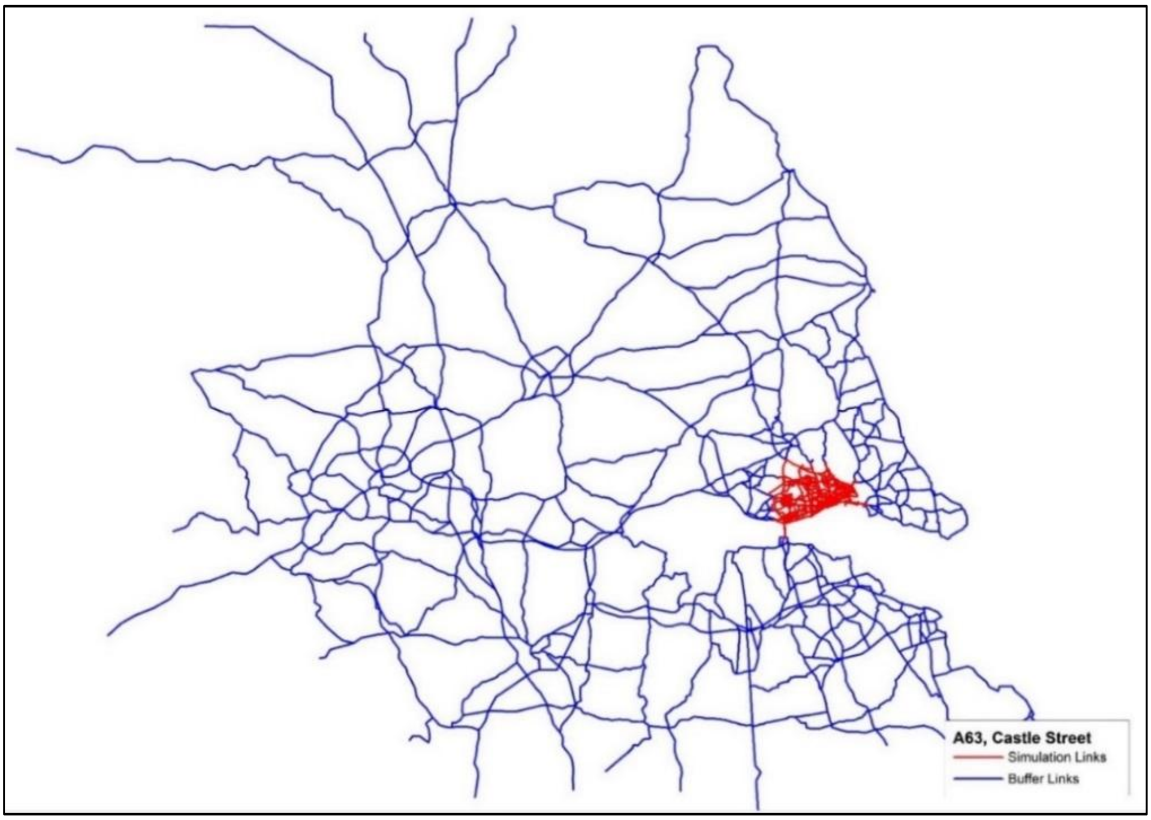
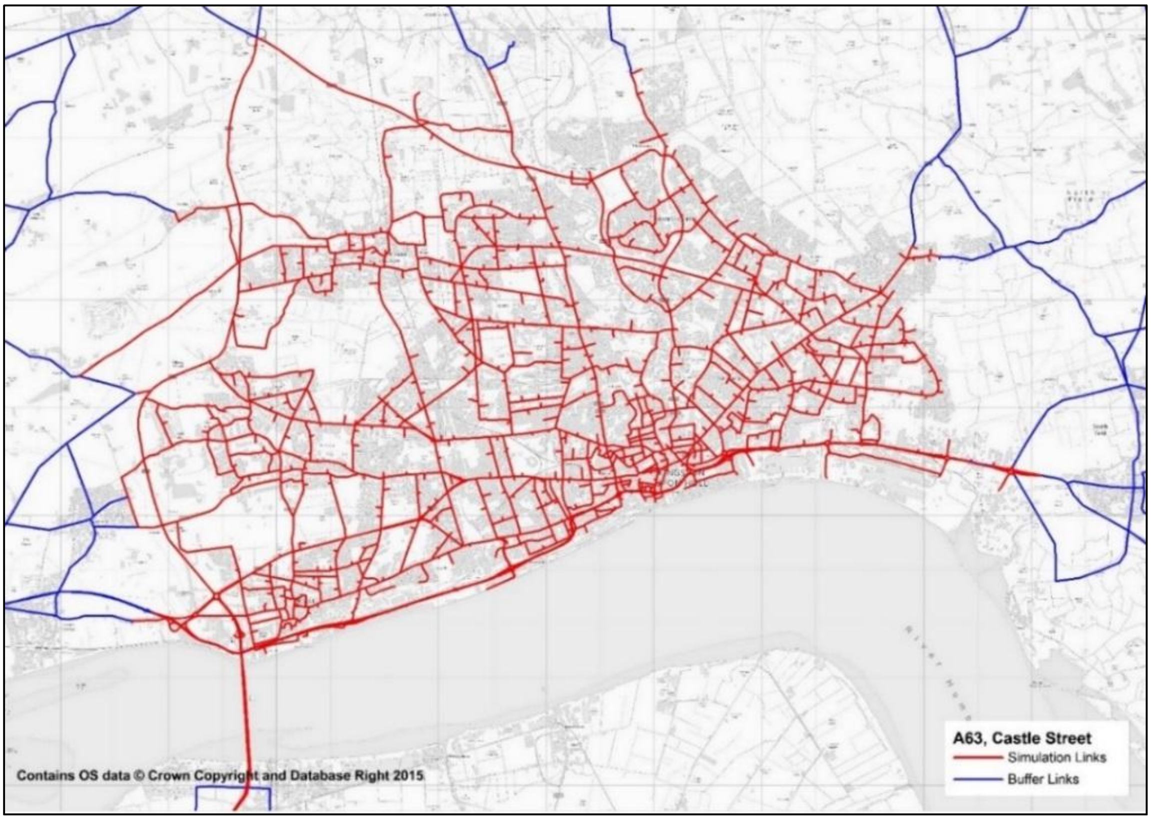


Figure 2.6: A63 Castle Street Model Simulation Network



Zoning

2.4.11 Based on the geographic location, the Scheme traffic model zones were divided into 3 categories, namely; Area of Detailed Modelling (ADM), Rest of Fully Modelled Area (RoFMA) and External Area (EA).

2.4.12 The A63 Castle Street model zoning system was primarily based on the Output Area's (OA) or Lower Super Output Area's (LSOA) whereby, zones become progressively larger using a combination of OAs, LSOAs, individual Middle Super Output Area's (MSOA) or a combination of MSOAs covering whole sub-regions and regions.

2.4.13 Further, to allow for future developments, dummy zones (with zero base year trips) were coded in the base year model.

2.4.14 The A63 Castle Street model zone structure is showed in Figure 2.7 and Figure 2.8.

Figure 2.7: A63 Castle Street – Model Zoning Structure (Hull)

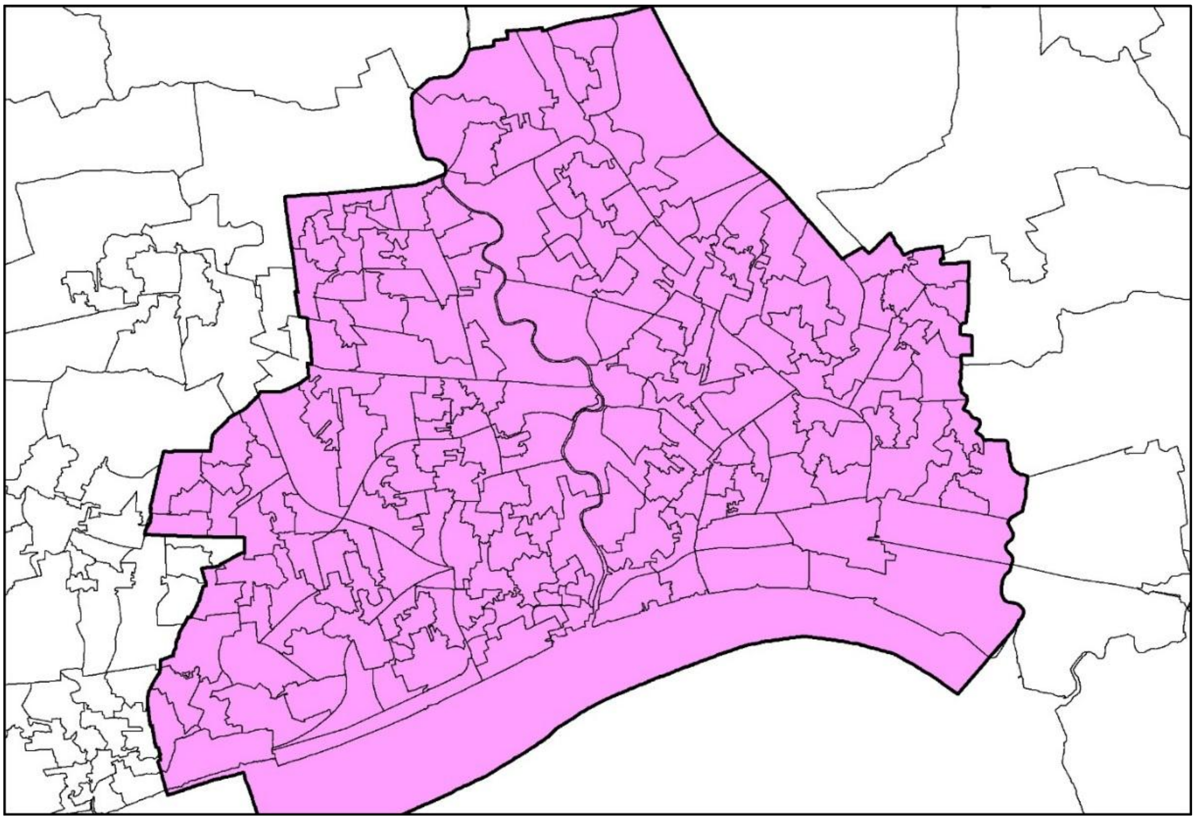
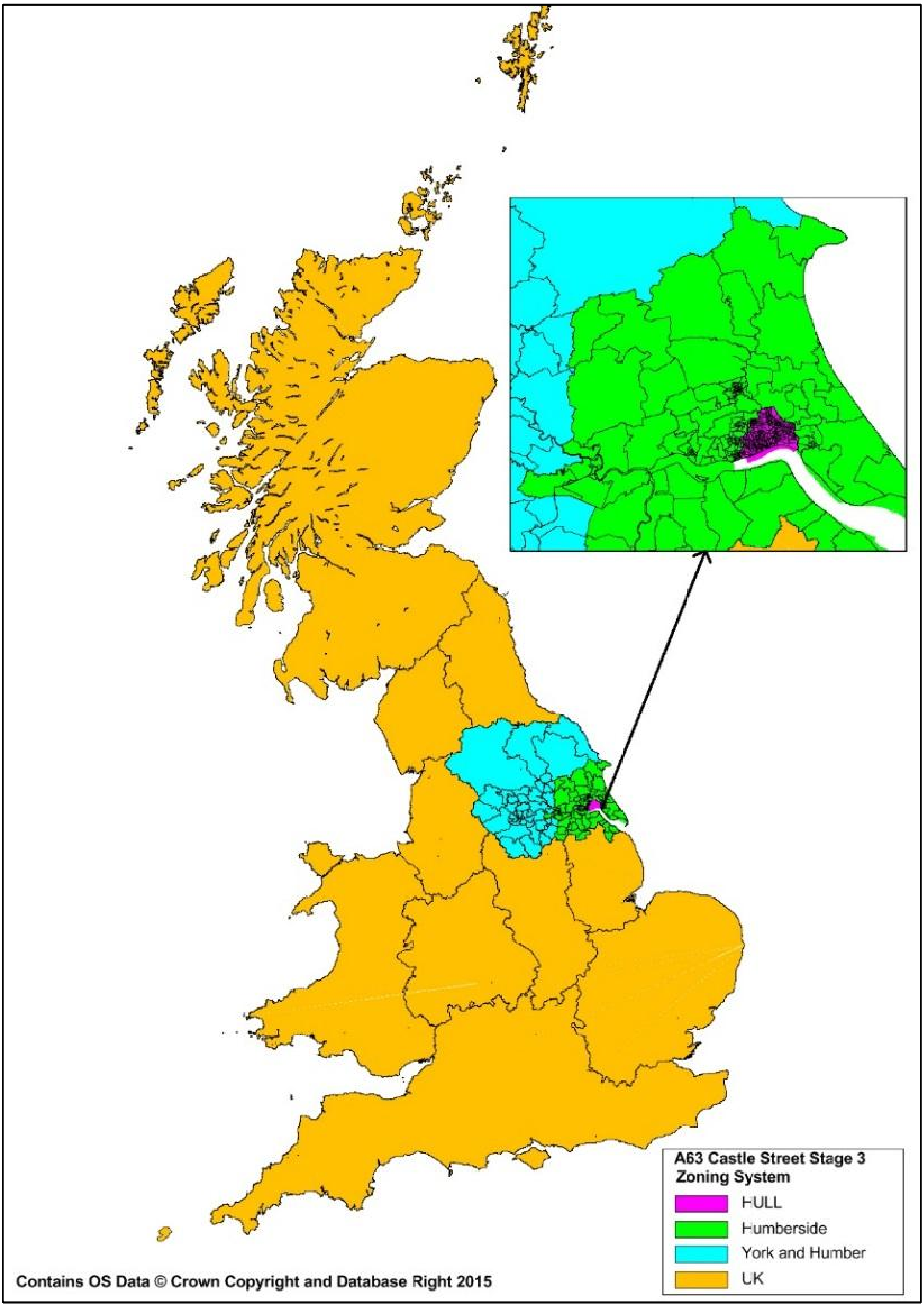


Figure 2.8: A63 Castle Street - Model Zoning Structure



Modelled Time Periods

2.4.15 Three time periods were used in the A63 Castle Street model to address the network performance in congested conditions in different periods of the day. These include the morning and evening peak hours and an average inter-peak hour, the details of which are given below:

- Morning Peak hour: 08:00 – 09:00 hours;
- Average Inter-Peak hour: 10:00 – 16:00 hours; and
- Evening Peak hour: 17:00 - 18:00 hours.

Demand Segmentation

2.4.16 The Scheme traffic model represents the highway demand in three vehicle classes, namely cars, light goods vehicles and heavy goods vehicles.

2.4.17 The car vehicle type is further split by journey purpose into commuting, employer business and other purpose trips to allow for the variation in perceived travel cost.

2.4.18 In summary, there are five demand segments within the A63 Castle Street highway assignment model. This is presented in Table 2.3.

Table 2.3: A63 Castle Street – Demand Segmentation

User Class	Vehicle Type	Journey Purpose
1	Car	Commuting
2	Car	Employer Business
3	Car	Others
4	Light Goods vehicle	
5	Heavy Goods vehicle	

Matrix development

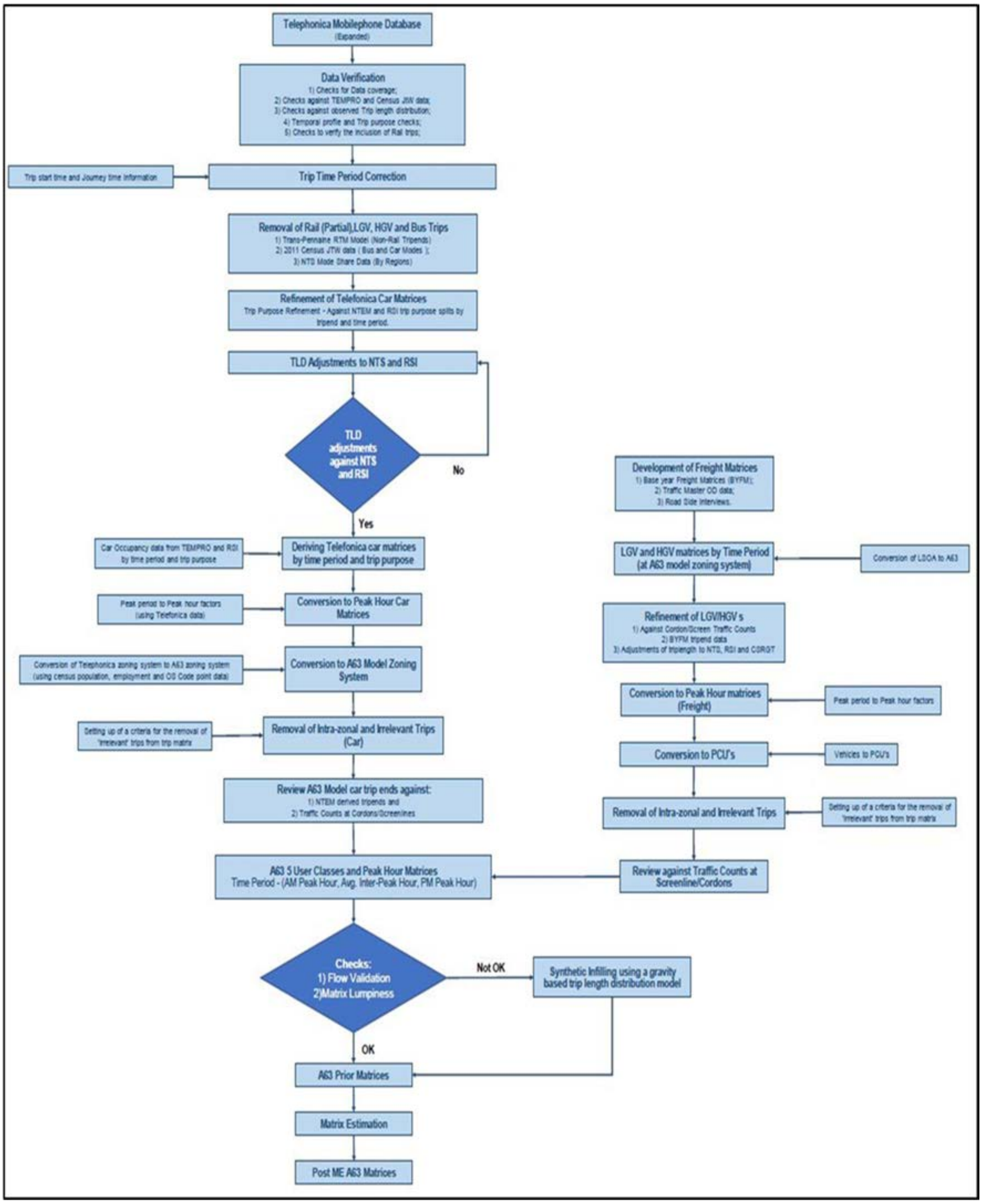
2.4.19 The highway demand matrices were built using a number of data sources.

2.4.20 The following data sources were used for the trip matrix development of cars, light goods vehicles (LGVs) and heavy goods vehicles (HGVs).

- Mobile phone trip database (2015) from the National Trip Matrix Database;
- Road Side Interviews (2015);
- Traffic Counts (2015);
- Trafficmaster OD data (2015);
- Census - Journey to Work (JtW) database (2011).
- National Travel Survey Trip Length distribution (2002-2011);
- Base Year Freight Matrices (BYFM) published by the Department for Transport (2006);
- Continuing Survey of Road Goods Transport (2013); and
- A63 Castle Street Validated Base Year Model (2008).

2.4.21 Figure 2.9 presents the flowchart of the prior matrix building process.

Figure 2.9: A63 Castle Street Highway Model – Matrix Building Methodology



2.4.22 The steps involved in the matrix building process are summarised here:

Step 1: Verification checks of data coverage, trip length distribution, trip purposes, rail trips etc. were conducted on the Telefonica data for building the Scheme traffic model.

Step 2: A time period correction was undertaken to re-distribute the trips from the external area to the appropriate time period in which the trip would actually arrive in the study area.

Step 3: Additional rail trips which were not excluded from the Telefonica trip matrix have been excluded by comparing it with non-rail matrices of Trans-Pennine South (TPS) Regional Transport Model.

Step 4: Bus and freight trips were excluded from the Telefonica matrices to obtain the car trips.

Step 5: After working out the initial car matrices (in person trips), a process to refine and adjust these matrices to the observed/inferred trip purpose splits (from RSIs / National Trip End Model (NTEM)), and to the observed trip length distribution (from RSIs / National Travel Survey (NTS)), was formulated.

Step 6: Car occupancy factors by trip purpose and time period were derived using Trip End Model Presentation Program (TEMPro) (2015) car driver and car passenger information.

Step 7: Peak period to peak hour factors by trip purpose were derived from the 'raw' Telefonica trip dataset which originally were supplied for each hour between 05:00 – 20:00 hrs (and aggregated between 20:00-24:00 hrs and 00:00 to 04:00 hrs).

Step 8: The car matrices split by time period and trip purpose were converted to the A63 model zoning system. This is due to the fact that the Middle Super Output Area (MSOA) zones are too coarse for any intervention to be tested within the study area.

Step 9: The irrelevant zone pairs were identified as the ones which were unlikely to pass through the wider study area boundary (i.e. York and Humber region) and were removed from the developed peak hour trip matrices.

Step 10: A63 Model Trip ends were reviewed against the NTEM and traffic counts (car) with a series of checks to refine the matrices.

Step 11: The light goods vehicles (LGV) and heavy goods vehicles (HGV) matrices were developed using the following data sources:

- Base Year Freight Matrices (BYFM) published by the Department for Transport (2006);
- Trafficmaster OD data (2015);
- Road Side Interviews (2015);
- Traffic Counts (2015);
- Continuing Survey of Road Goods Transport (2013); and
- A63 Castle Street Validated Base Year Model (2008).

Step 12: A four sector definition comprising of Hull, Rest of Humberside, Rest of York and Humber and Rest of UK was used to refine the freight matrices.

Step 13: The LGV and the HGV matrices developed for the modelled peak periods were converted to the modelled peak hour matrices

Step 14: Modelled peak hour freight matrices were converted to Passenger Car Units with PCU factors as suggested by TAG unit M3.

Step 15: A significant number of irrelevant trips in the external-external matrix i.e. trips that are not expected to pass though the wider study area of York and Humber were identified and removed from the Base Year Freight Matrices (BYFM).

Step 16: A final refinement of the Scheme freight matrices involved a comparison and adjustment to the cordon/ screenline traffic counts to ensure that the matrices were consistent with the observed traffic flow.

Step 17: Car matrices by time period and tri-purpose were stacked with the LGV and HGV matrices to obtain the 'A63 prior trip matrix' totals.

Highway Assignment Model

2.4.23 A highway network assignment model provides a representation of the strategic road network and the supporting local network, forming a basis of both the traffic assignment and the derivation of travel times and costs for input to a variable demand model.

2.4.24 The A63 Castle Street model has been developed using the SATURN (Simulation and Assignment of Traffic to Urban Road Networks) suite of programs.

2.4.25 SATURN can operate as either a conventional traffic assignment model or as a combined simulation and assignment model in which junction interactions are represented in detail. SATURN Version 11.3.12U (latest available during the assessment study) has been used for the development of the A63 Castle Street highway assignment model.

Variable Demand Model (VDM)

2.4.26 The A63 demand model uses DIADEM (version 5.0) issued on behalf of the DfT for the purpose of producing the traffic forecasts for the Scheme traffic model.

2.4.27 DIADEM is an incremental hierarchical logit model and works by adjusting an input reference demand matrix according to changes between forecast travel costs and input reference travel costs.

2.4.28 The VDM process consists of a series of iterations between DIADEM and SATURN (assignment model) during which demand matrices are assigned, skimmed cost matrices are extracted and, based on comparative travel costs, the demand matrices are updated.

2.4.29 DIADEM provides a means of achieving convergence between the assignment (supply) and demand models. It is to be noted that equilibrium between the demand and supply models is not found exactly and therefore, a WebTAG specified convergence criteria is used to determine when the solution is close enough to equilibrium.

2.4.30 The VDM for the Scheme traffic model uses trip matrices in the Origin-Destination (OD) format rather than the Production-Attraction (PA) format. This is because the base matrices were originally developed from the mobile phone trip database which formed the basis of 2015 base year model.

2.4.31 There are four variable demand mechanisms in DIADEM, namely; trip frequency, mode choice, trip distribution and time of day choice. However, as discussed above, trip distribution is the only response that was modelled for the Scheme traffic model.

2.4.32 Although cost damping was introduced in DIADEM 5.0 to reduce the sensitivity of long distance trips to demand response, as the A63 model is centered on Hull, cost damping is unlikely to make a significant difference to the outcome of the appraisal and has therefore not been used.

Forecast years

2.4.33 An important initial consideration in model design is the years for which forecasts will be produced. Future year traffic flows are required for the design of the Scheme and for economic and environmental assessment purposes.

2.4.34 The following forecast years have been used in the Scheme traffic model:

- 2025 – Scheme opening year
- 2033 – interim year (for Scheme appraisal)
- 2040 – design year (15 years after Scheme opening year)

Traffic Growth

2.4.35 The growth in demand between the base year and the forecast years is derived from the following sources:

- National long-term population, employment and transport forecasts published by the DfT in NTEM.
- Goods vehicle growth was updated using the latest NTM forecasts; RTF 2015, which were released in March 2015. The RTF factors were extracted for the York and Humber region.
- Local planning data provided by HCC, including identified development sites within Hull.

2.4.36 TAG guidance recommended that growth should be in line with national forecasts within the study area and hence the growth forecasts were calculated using TEMPro (version 7.2), which extracts data from the NTEM version 7.2 dataset published by the DfT.

2.4.37 The traffic modelling process requires the production of a Core Scenario. The Core Scenario is founded on the most unbiased and realistic set of assumptions that form the central case for the scheme. It includes all local developments categorised as ‘near certain’ and ‘more than likely’ as outlined in the TAG Unit M4 (Table A2).

2.5 Local Development

2.5.1 An uncertainty log of the developments with their planning status is required to highlight the local uncertainties and factors likely to affect traffic, revenues and scheme delivery.

2.5.2 Based on consultation with HCC and Highways England, the resultant uncertainty log was produced for the Scheme forecast traffic modelling, a summary of which is shown in Table 2.4.

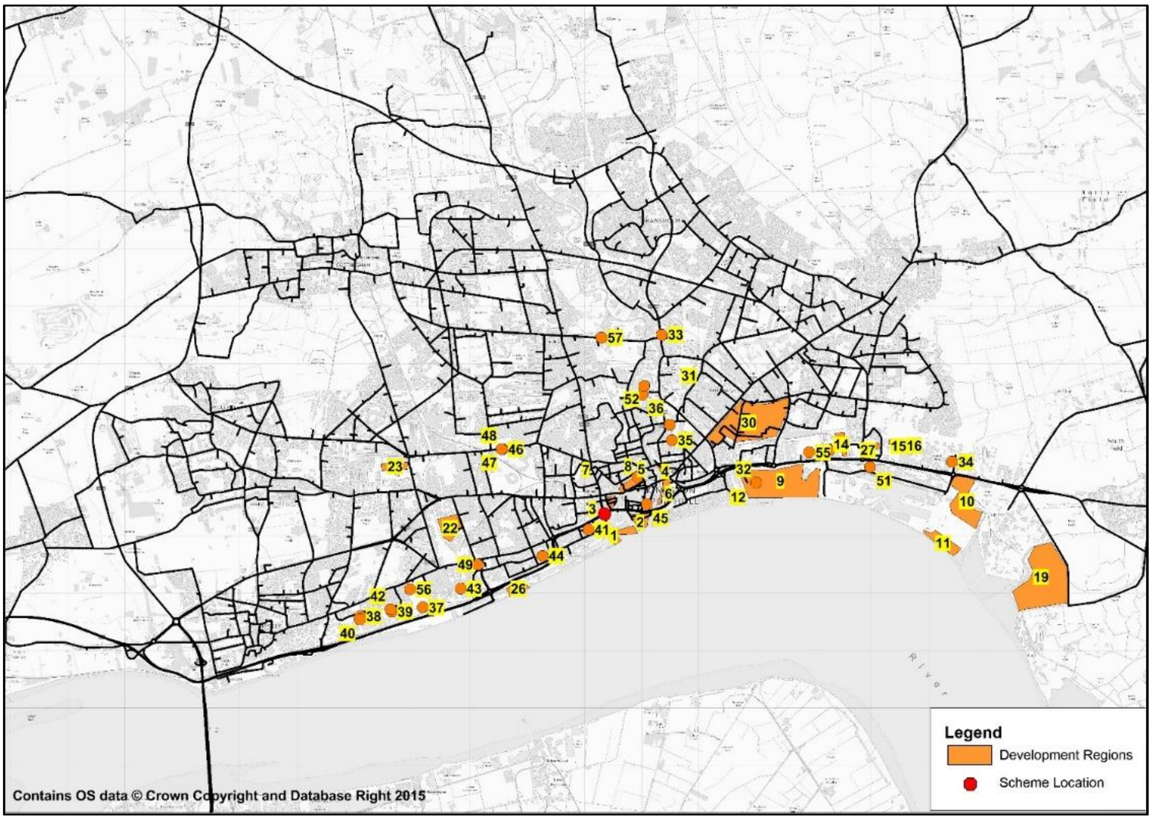
Table 2.4: Uncertainty Log

Development	Map Ref	Land Use Type	Total Size	Uncertainty
Fruit Market	2	B1 Offices	1,000sqm	More than likely
		Residential Units	137	Near certain
Myton Street	3	Leisure D1/D2	9266sqm	Near certain
		Hotel	120 beds	More than likely
Albion Square	5	Residential	100	Near certain
18 Ferensway (former Lexington Ave)	7	Hotel	159	Near certain
UTC, John St.	8	Educational establishment	5056sqm	Near certain
Former Police Station	54	Residential	86	Near certain.
Siemens training facility	32	D1 education and training	2,852sqm	More than likely
Alexandra Dock - LDO	9	B1/B2/B8	41,600sqm	Near Certain
Queen Elizabeth Dock (North) - LDO	10	B2	90,643sqm	More than likely
Queen Elizabeth Dock (south) - LDO	11	B2	58,500sqm	More than likely
Kingston Parklands Business Park	55	B1(b) / B1(c)	3904sqm	Near Certain
		B2/B8	14,396sqm	Near Certain
Burma Drive - Phase 2	14	B1b / B1c / B2	8845sqm	Near Certain
		B8	4355sqm	Near Certain
East End Priory Pk	37	B1/B2/B8	6,686sqm	More than likely
Newington and St Andrews	22	Residential Units	934	Near Certain
Priory Park	38	B1	1302sqm	More than likely
Banner Court	39	B1/B2/B8	1480sqm	More than likely
Priory Pk opp Saltmarsh Ct	42	B1/B2/B8	1820sqm	More than likely
Freightliner Rd (Cavaghan & Gray)	43	B2/B8	5000msq	Hypothetical
King William House	45	Residential	30	Near certain
		A1/A3/A4/A5	1623sqm	More than likely
West Bank Local Plan Ref 399	47	Residential	33	More than likely
West Bank Local Plan Ref 400	48	Residential	64	More than likely

Development	Map Ref	Land Use Type	Total Size	Uncertainty
Lidl Freightliner Rd	49	A1	2470sqm	Near certain
Littlefair Road	50	B2/B8	1700sqm	More than likely
		A1/A3	167sqm	More than likely
Fenners Marfleet Avenue	27	A1 / A3	1070sqm	Near Certain
Holderness Road (AAP) - Refer to HCC Website	30	Residential Units	1885	Near Certain
Reckitts (Extension)	31	B1(b)	12,611sqm	Near Certain
Calvert Lane	23	Residential Units	166	More than likely
Chapman Street	53	B1/B2/B8	2368sqm	Near certain
Paull LDO	19	B2	239,000sqm	More than likely

2.5.3 Figure 2.10 presents the locations of these developments with respect to the Scheme location.

Figure 2.10: Development Proposals – HCC



Highway Infrastructure Schemes

2.5.4 The following highway improvements/schemes were included in the Without Scheme scenario for all the forecast years:

- Localised widening of A1105 Anlaby Road (outside the Hull Royal infirmary).
- Strengthening of Park Street Bridge to 40T i.e. the removal of HGV ban.
- A63 Garrison Road scheme, which is changing the partly signalised roundabout into a signalised hamburger arrangement.

3 CURRENT NETWORK PERFORMANCE

3.1 Introduction

3.1.1 This Chapter provides an outline of base network operations to include the output from the 2015 Base year SATURN model.

3.1.2 It includes overview of the base year flows and journey times along the A63 corridor.

3.2 Overview of Base Year Flows

3.2.1 Figure 3.1 to Figure 3.3 presents the actual flow plots for the modelled time periods across the area of detailed modelling as a sense-check of the magnitude of the traffic flow across Hull.

3.2.2 The traffic flow is seen to be sensible across the study area across all the modelled time periods with flows in excess of 2,500 Passenger Car Units (PCUs) being observed on the A63 across all time periods and traffic flow in the range of around 1,000-2,000 PCUs is observed on segments of all major A roads, namely A165, A1033, A1166 within Hull. The B-roads within Hull, namely, B1231, B1232 are seen having flows in the range of 500-100 PCUs while the unclassified roads have flows less than 500 PCUs. This trend is seen generally to be similar across all time periods; however, the magnitude is less in the inter-peak period.

Figure 3.1: Actual Flows in AM peak (08:00-09:00)

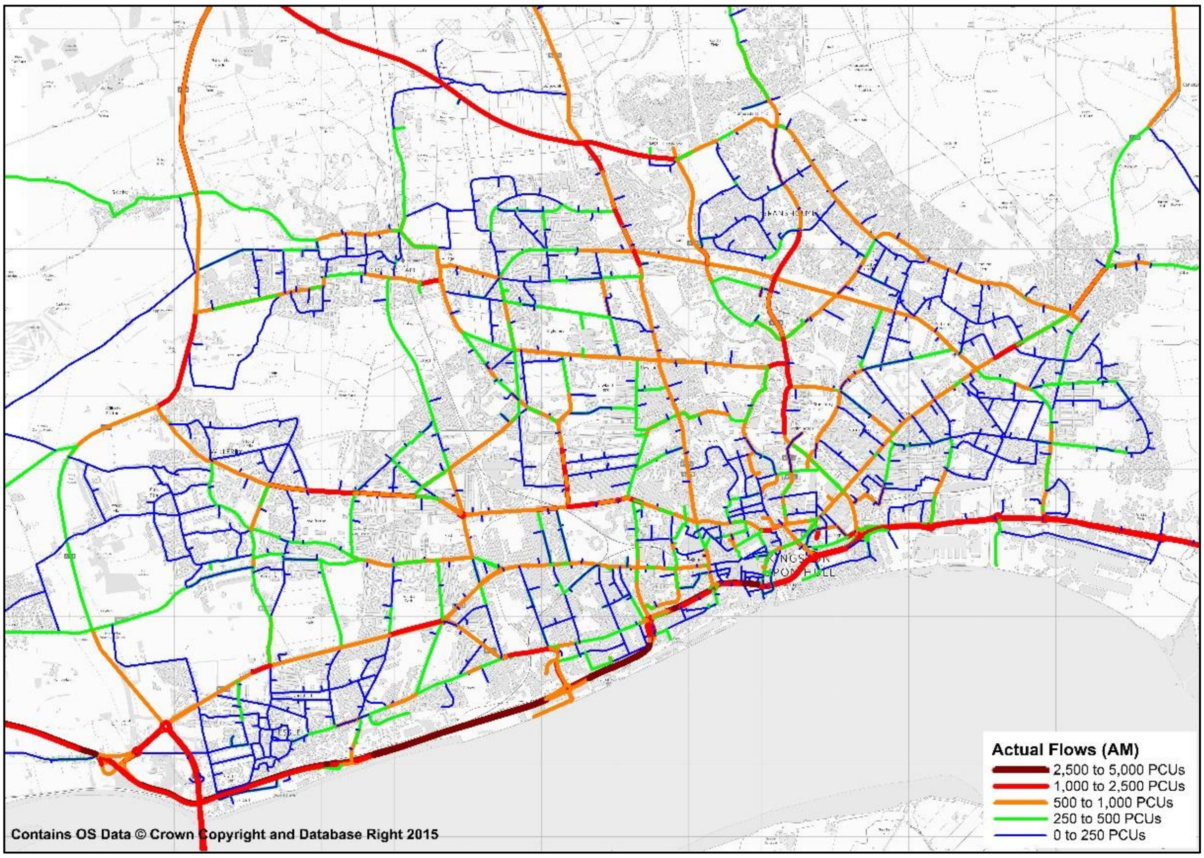


Figure 3.2: Actual Flows in Inter-peak (Average 10:00-16:00)

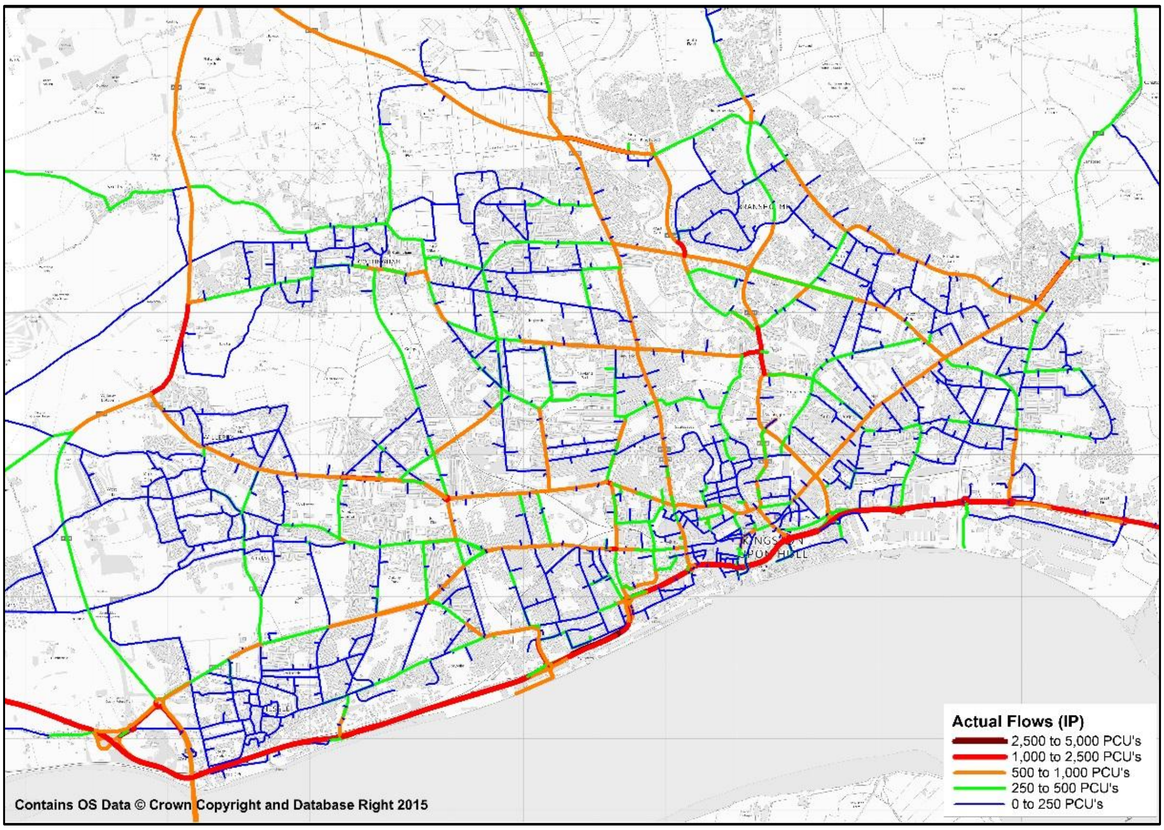
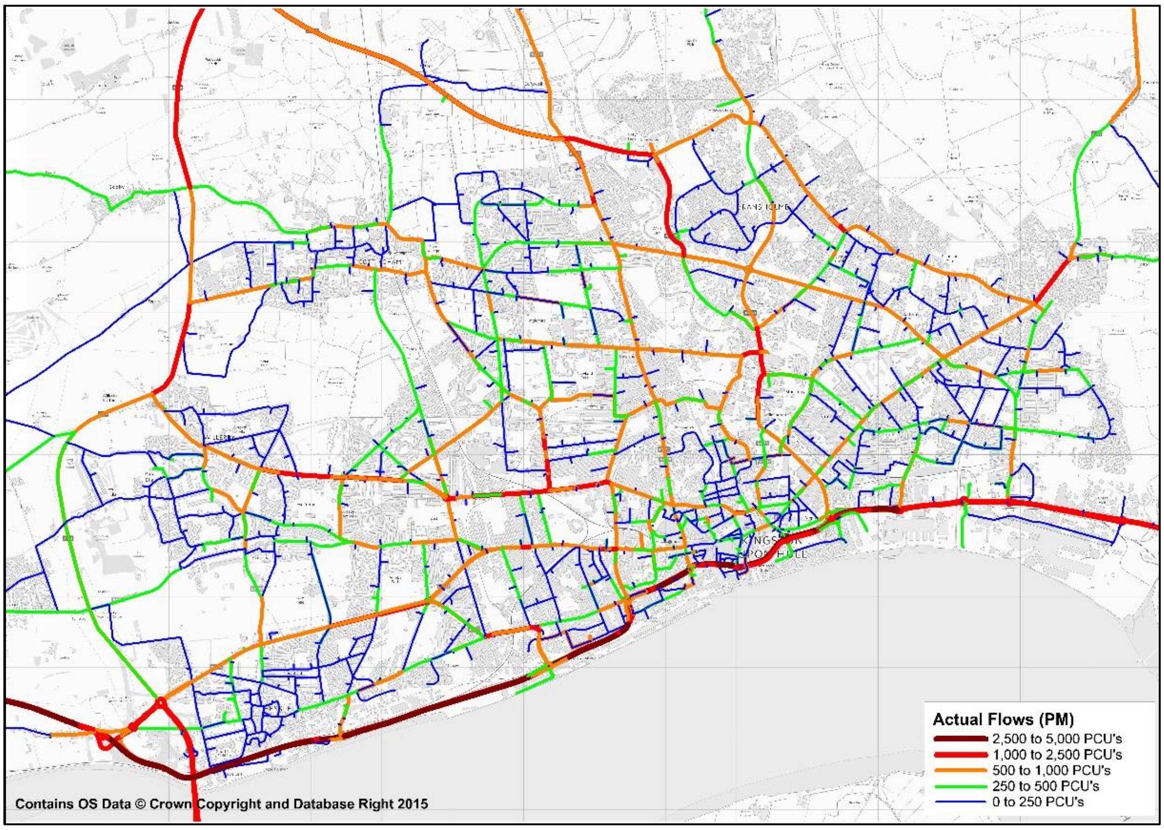


Figure 3.3: Actual Flows in PM peak (17:00-18:00)



3.2.3 A detailed section-wise analysis of AADT flows along A63 Castle Street for base year is presented in Table 3.1.

Table 3.1: AADT Traffic Flow (in veh.) – Base year

Road Section	Dir	2015
A63 Clive-Sullivan Way (Off-slip Brighton St. to On-slip Madeley St.)	EB	25,942
A63 Clive-Sullivan Way (Off-slip Daltry St. to On-slip St. Andrews Quay)	WB	27,550
A63 Clive-Sullivan Way (Off-slip Madeley St. to On-slip Hessle Road)	EB	16,841
A63 Clive-Sullivan Way (Off-slip Hessle Road to On-slip Daltry St.)	WB	17,248
A63 Hessle Road	EB	21,227
	WB	23,144
A63 Castle Street (Mytongate to Myton Bridge)	EB	25,745
A63 Castle Street (Humber Dock St. to Mytongate)	WB	22,462
A63 Castle Street (Myton St. to Princess Dock St.)	EB	24,949
A63 Castle Street (Princess Dock St. to Dagger lane)	EB	24,803
A63 Castle Street (Dagger Lane to Fish St.)	EB	24,956
A63 Castle Street (Fish St. to Vicar lane)	EB	24,956
A63 Castle Street (Vicar Lane to Market Place)	EB	24,956
A63 Castle Street (Market Place to Humber Dock St.)	WB	21,339
A63 Garrison Road	EB	22,765
	WB	17,878

3.3 Overview of Journey Times

3.3.1 Six journey time routes, as per Figure 2.3, were selected covering a wide geographical area with specific consideration to routes from which it is expected that traffic will be affected by the Scheme.

3.3.2 Journey time data was collected from the Trafficmaster GPS data and the link times were extracted using the ITN layer.

3.3.3 The modelled journey times were compared with observed journey time information for each of the six journey time routes (by direction) across all three modelled time periods. The modelled journey times were found to meet the TAG M3.1 acceptability criteria whereby modelled times along routes should be within 15% of observed times (or 1 minute, if higher than 15%) for greater than 85% of routes.

3.3.4 The modelled journey times for each modelled time period and are shown in the Table 3.2.

Table 3.2: Modelled Journey Times

Route No.	Route Description	Direction	Modelled Journey Time (mm:ss)		
			AM	IP	PM
1	A63	EB	13:58	11:38	13:04
2	A63	WB	13:22	11:27	14:05
3	A165	EB	11:36	12:32	14:31
4	A165	WB	14:14	13:56	14:19
5	A1033	NB	13:19	13:06	13:49
6	A1033	SB	13:29	13:12	14:39
7	A1079	NB	15:11	15:33	18:20
8	A1079	SB	16:12	14:55	17:27
9	A1166	EB	13:05	11:59	14:57
10	A1166	WB	12:33	12:17	13:03
11	B1237	EB	16:43	16:34	17:19
12	B1237	WB	18:03	16:28	17:20

4 FUTURE NETWORK PERFORMANCE

4.1 Introduction

4.1.1 Traffic forecasts have been prepared for three future years: 2025, 2033 and 2040 covering the three modelled periods of the AM peak hour, the Inter-peak hour and the PM peak hour.

4.1.2 The A63 Castle Street traffic forecasts represent the most realistic future situation, given the information available on the most likely socio-demographics, economics and transport policies in Hull.

4.1.3 The Without Scheme scenario represents those elements that are either near certain or more than likely to be delivered by either of the forecast years.

4.1.4 The proposed Scheme was assessed using the same reference case and generalised cost assumptions as was used to produce the Without Scheme scenario.

4.1.5 This chapter presents the traffic forecasts and an assessment of the likely future traffic patterns and journey times in the forecast years. This includes the overview of traffic flows, journey times and network statistics for each forecasting scenario, year and time period.

4.2 Overview of Traffic Forecasts

Network Statistics

4.2.1 The impact of the Scheme for the forecast years is summarised by comparisons of the network performance in terms of the travel distance, travel time, average network speed and total delays and performance of the scheme in terms of changes in traffic volumes and journey times across the area of detailed modelling.

4.2.2 Table 4.1 summarises the highway network performance for the area of detailed modelling for the three forecast years. This is a good metric to review as it provides an assessment of the Scheme performance at a localised level.

4.2.3 The impact of the Scheme is seen with the total travel times reducing by around 1.5% across all time periods. Delays were decreasing by as much as 212 pcu-hrs (5.7%) in 2025 AM peak and 210 pcu-hrs (5%) in 2025 PM peak. Forecast years 2033 shows a reduction of around 5% in AM peak and 4% in PM peak period and 2040 shows a similar reduction in delays as that of 2033.

Table 4.1: Network Statistics – Simulation Area

Time Period	Scenario	Travel time (pcu-hrs)	Travel Distance (pcu-kms)	Average Speed (kph)	Delays (pcu-hrs)
2025					
AM Peak	Without Scheme	12,012	427,177	35.6	3,699
	With Scheme	11,802	430,964	36.5	3,487
	Difference	-209.6	3,786.8	0.9	-212
	%Difference	-1.74%	0.89%	2.53%	-5.73%
Inter Peak	Without Scheme	8,829	341,483	38.7	2,255
	With Scheme	8,712	343,378	39.4	2,167
	Difference	-116.6	1,895.1	0.7	-88.6
	%Difference	-1.32%	0.55%	1.81%	-3.93%
PM Peak	Without Scheme	12,596	428,637	34	4,216
	With Scheme	12,408	432,493	34.9	4,006
	Difference	-188.7	3,855.5	0.9	-209.9
	%Difference	-1.50%	0.90%	2.65%	-4.98%
2033					
AM Peak	Without Scheme	13,435	456,997	34	4,484
	With Scheme	13,219	461,211	34.9	4,256
	Difference	-216.1	4,214.4	0.9	-228.2
	%Difference	-1.61%	0.92%	2.65%	-5.09%
Inter Peak	Without Scheme	9,673	367,993	38	2,563
	With Scheme	9,528	370,265	38.9	2,444
	Difference	-144.5	2,272.1	0.9	-119.1
	%Difference	-1.49%	0.62%	2.37%	-4.65%
PM Peak	Without Scheme	14,021	457,555	32.6	5,029
	With Scheme	13,851	462,107	33.4	4,810
	Difference	-169.8	4,551.9	0.8	-218.5
	%Difference	-1.21%	0.99%	2.45%	-4.35%
2040					
AM Peak	Without Scheme	14,830	482,263	32.5	5,328
	With Scheme	14,576	486,598	33.4	5,054
	Difference	-254	4,334.8	0.9	-274
	%Difference	-1.71%	0.90%	2.77%	-5.14%
Inter Peak	Without Scheme	10,449	390,730	37.4	2,870
	With Scheme	10,279	393,044	38.2	2,730
	Difference	-169.8	2,314.7	0.8	-139.9
	%Difference	-1.63%	0.59%	2.14%	-4.87%
PM Peak	Without Scheme	15,246	481,377	31.6	5,729
	With Scheme	15,029	485,646	32.3	5,458
	Difference	-217.1	4,268.7	0.7	-270.8
	%Difference	-1.42%	0.89%	2.22%	-4.73%

Change in Traffic flows

4.2.4 Figure 4.1 to Figure 4.6 present the forecast changes in traffic flows on the highway network with the introduction of the Scheme for two forecast years, scheme opening year and the design year.

4.2.5 The largest changes in highway flow across all three modelled time periods occur within the city centre arising from the Scheme and the diversion of traffic from other routes to the A63.

4.2.6 The eastbound traffic which exited the A63 at the Mytongate roundabout in the Without Scheme scenario, now exits the A63, primarily at Market Place in the With Scheme scenario. The westbound Hull city traffic which, primarily used the A165 Holderness Road and Anlaby Road, before joining the A63 at the Daltry road westbound slip in the Without Scheme model, now joins the A63 carriageway either at Garrison Road roundabout or at Market Place in the With Scheme scenario. The westbound traffic is seen exiting at the westbound slip near Daltry Street in the With Scheme scenario as opposed to the Mytongate exit in the Without Scheme scenario.

4.2.7 A reduction of trips is observed on other roads running parallel to the A63 Castle Street, primarily the A1105 Anlaby Road, Spring Bank and A1079 Beverley Road and A165 Holderness Road.

4.2.8 The majority of changes in flow volumes are less than 100 pcus per hour but with some larger changes (100-500 pcus/hr) around Mytongate on the A63. Outside the city centre, the changes in highway flows are much smaller (i.e. typically less than 25 pcus per hour).

Figure 4.1: Changes in Traffic Flow (With Scheme-Without Scheme) - 2025 AM Peak

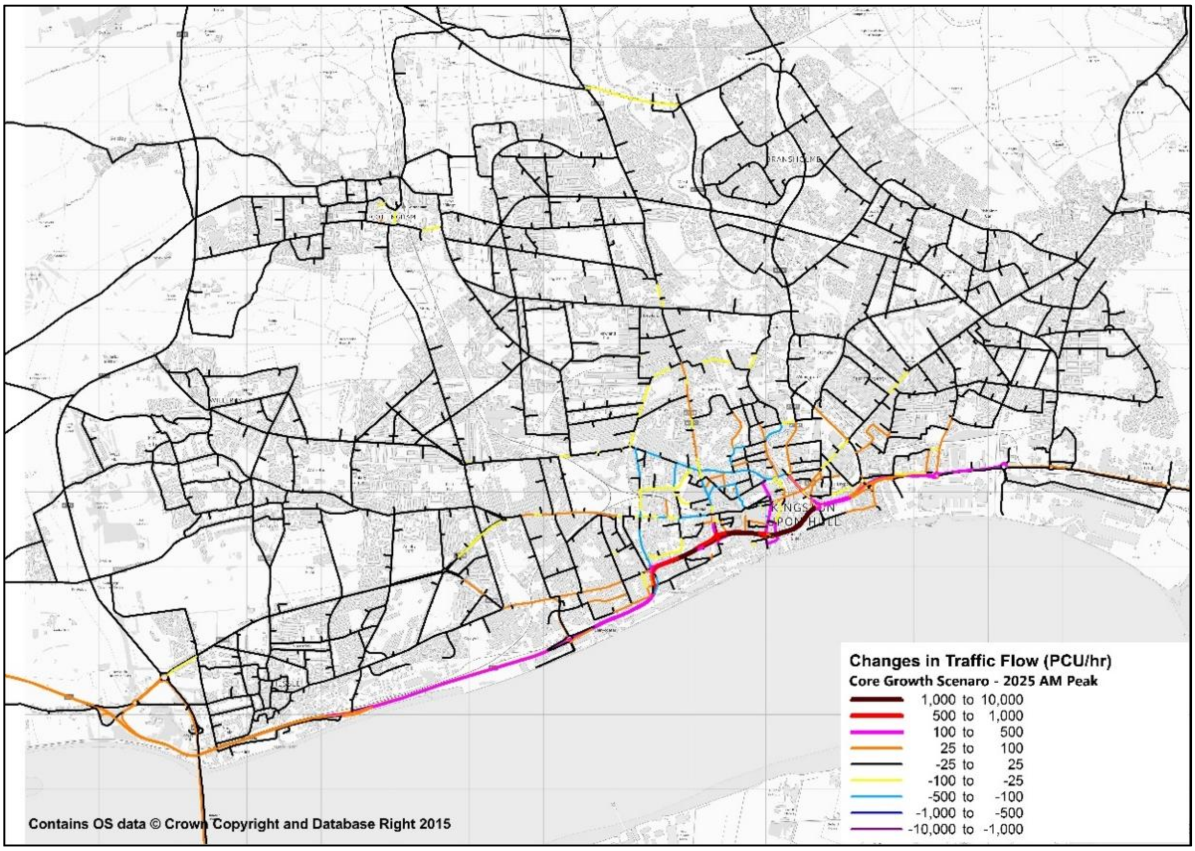


Figure 4.2: Changes in Traffic Flow (With Scheme-Without Scheme) - 2025 Inter-Peak

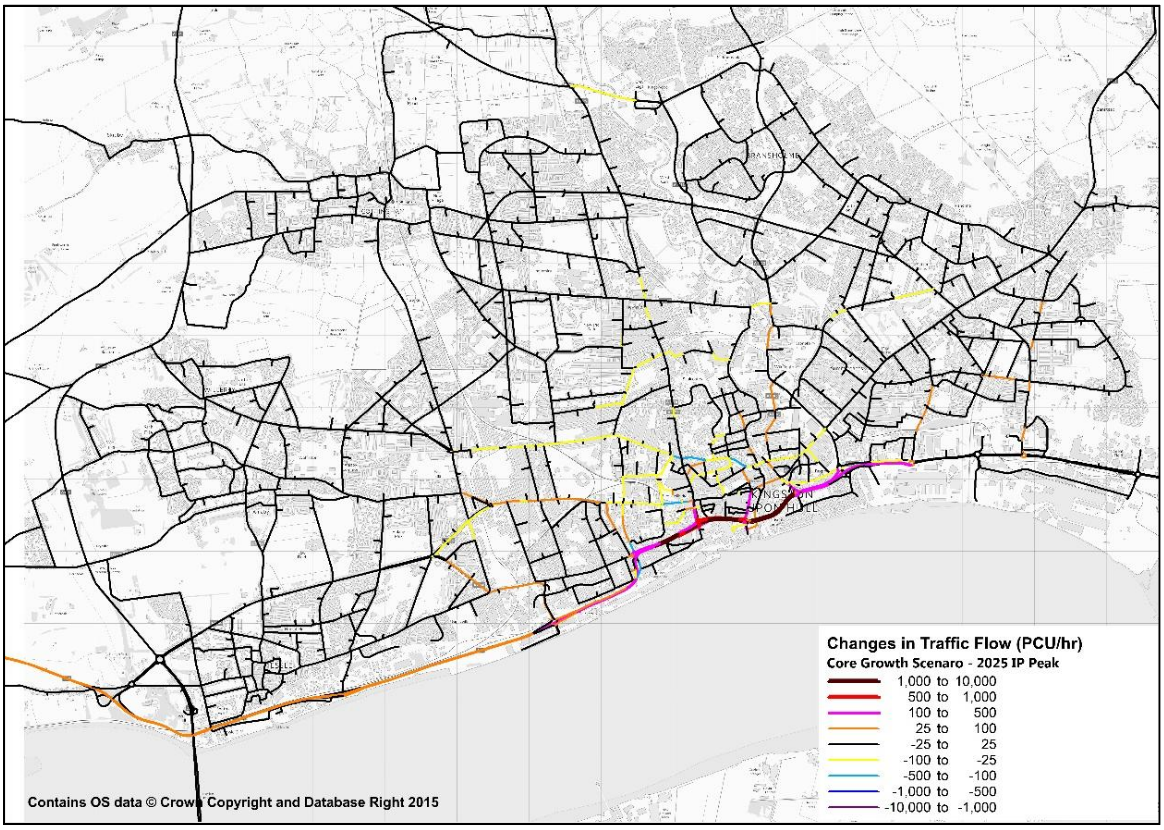


Figure 4.3: Changes in Traffic Flow (With Scheme-Without Scheme) - 2025 PM Peak

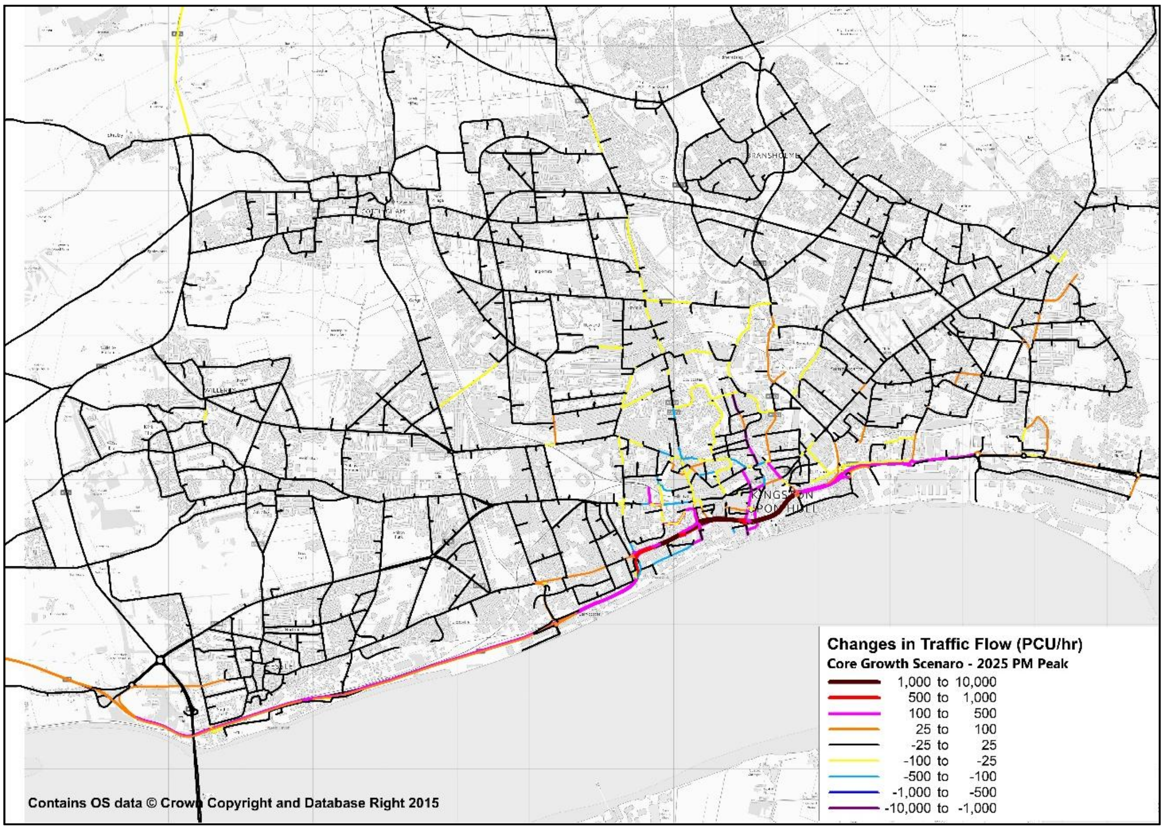


Figure 4.4: Changes in Traffic Flow (With Scheme-Without Scheme) - 2040 AM Peak

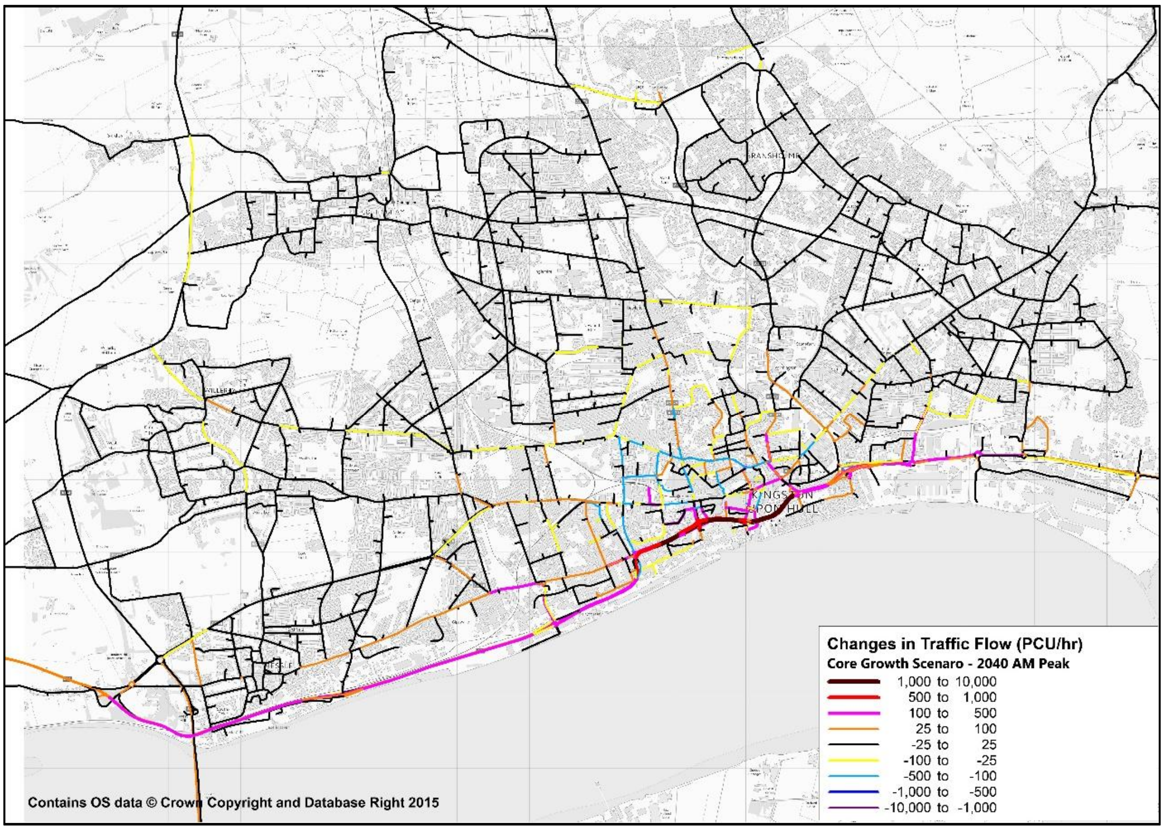


Figure 4.5: Changes in Traffic Flow (With Scheme-Without Scheme) - 2040 Inter Peak

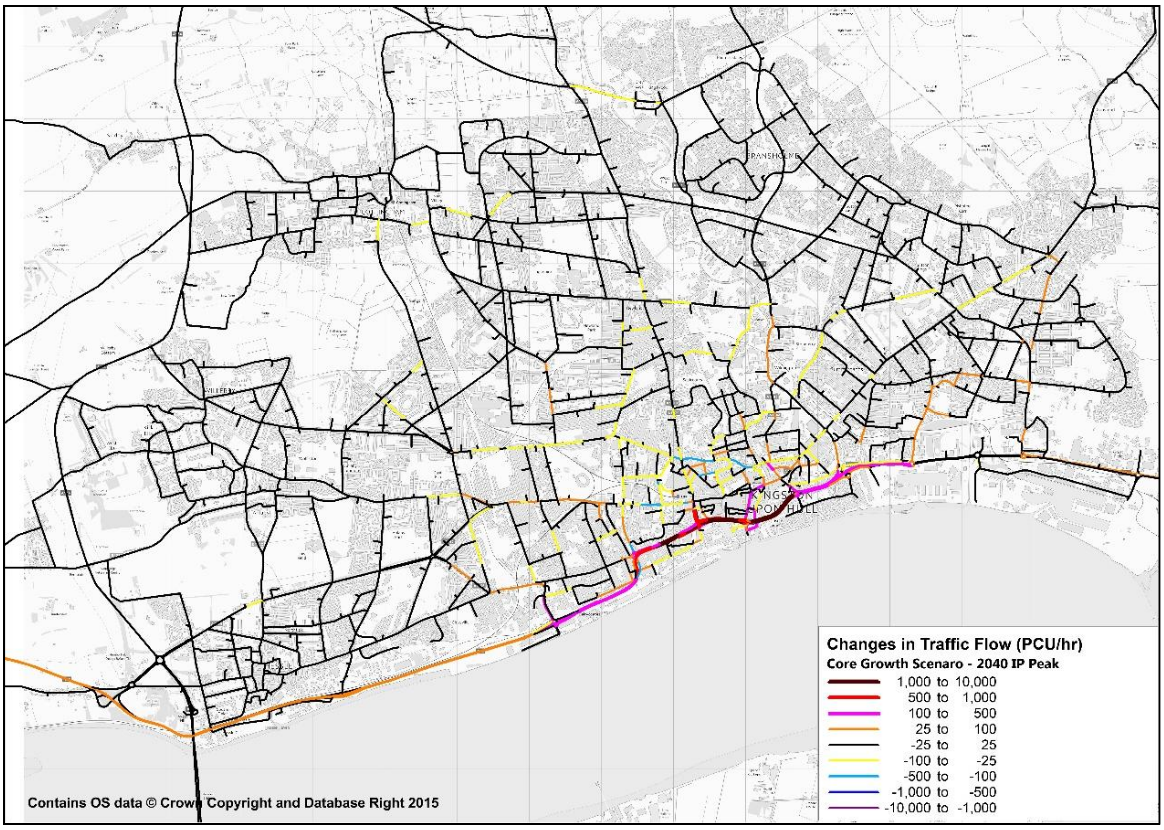
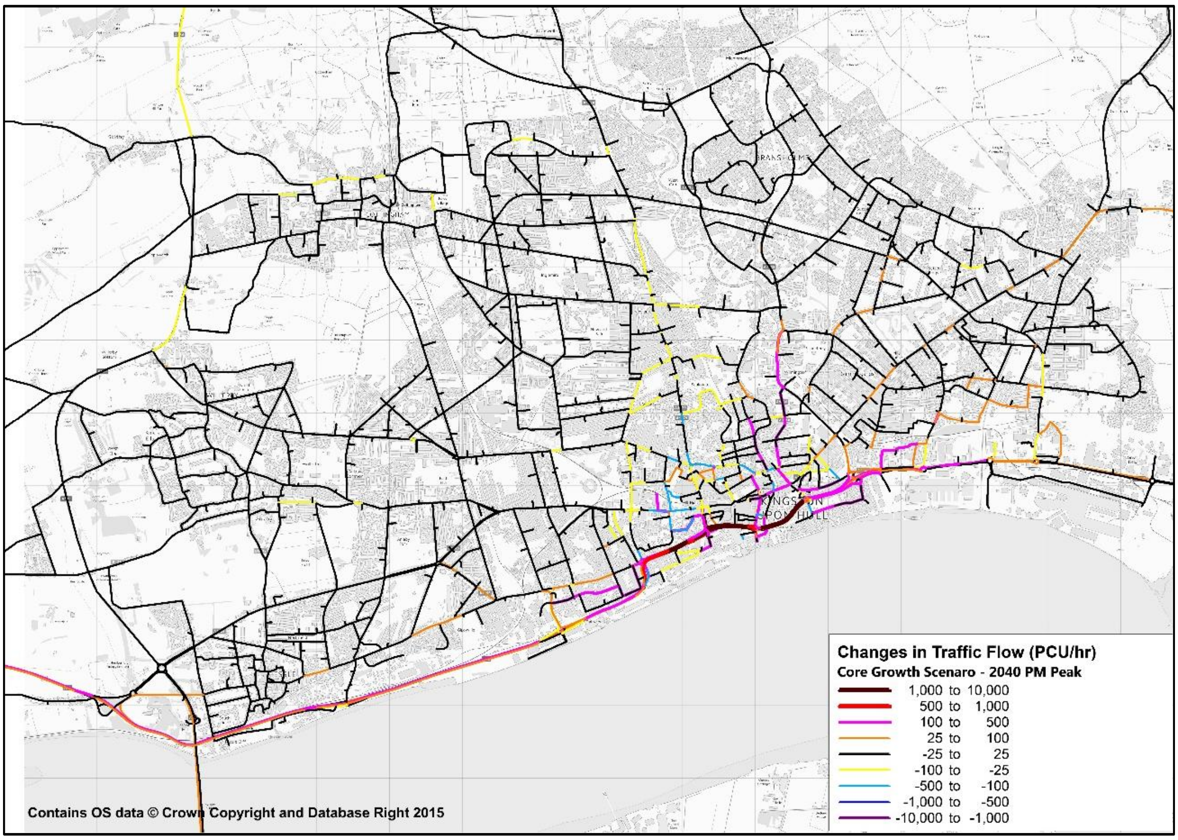


Figure 4.6: Changes in Traffic Flow (With Scheme-Without Scheme) - 2040 PM Peak



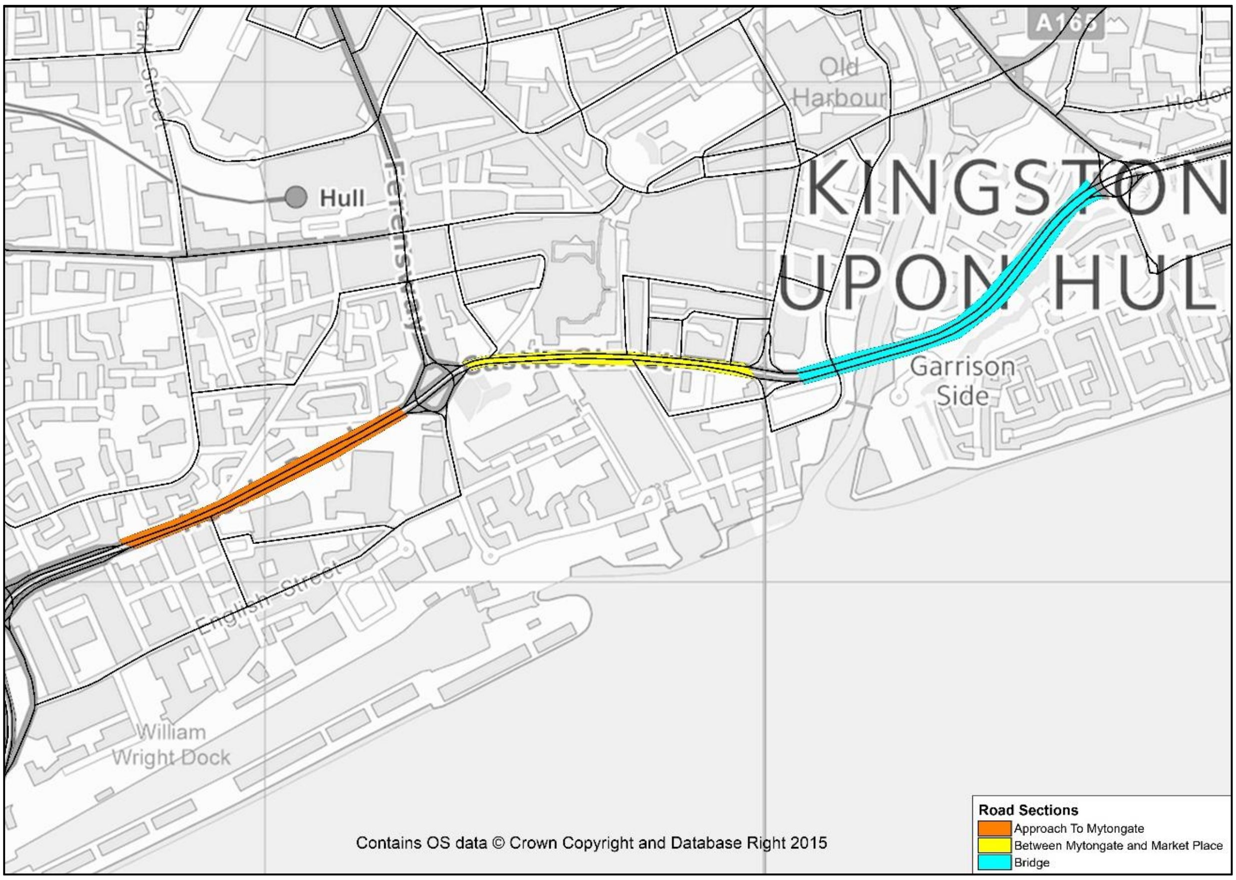
Traffic Flow on A63 Castle Street

4.2.9 A summary table of the actual flows for each section along the A63 is presented in Figure 4.7 presented in detail for the A63 Castle Street in Table 4.2.

4.2.10 The traffic flows from the 2015 base model enable a comparison of forecast traffic flows with current volumes. The most heavily trafficked sections of the A63 around Hull are those between Mytongate and Market Place, with around 5,000 PCUs (two-way trips) travelling during the peak hours. Table 4.2 show little tidality in traffic patterns, with the peak hour volumes being roughly equal in each direction along the A63.

4.2.11 The Without Scheme and with Scheme traffic flows are also presented in Table 4.2 for the AM peak hour, Inter-peak hour and PM peak hour for 2025, 2033 and 2040 forecast years. The forecast traffic flows indicate that, with the Scheme in place, traffic flows would increase on the A63 by about 23% when compared to the corresponding without Scheme scenario. Traffic forecasts for the With Scheme scenario indicate that, in 2040, around 7,200 pcus/hr. (two-way trips) will use the A63 at Mytongate compared to around 5,700 pcus/hr for the corresponding without Scheme scenario.

Figure 4.7: A63 Road Section



4.2.12 It can be seen that the With Scheme flows on the A63 mainline are higher than the Without Scheme flows across all forecast years and time periods;

Table 4.2: Traffic Flows – A63 Castle Street (in pcus/hr.)

Location	Base 2015	2025		2033		2040	
		Without Scheme	With Scheme	Without Scheme	With Scheme	Without Scheme	With Scheme
AM							
EB approach to Mytongate	2,590	2,815	3,372	2,953	3,555	2,995	3,612
EB between Mytongate and Market Place	2,671	2,684	3,427	2,695	3,641	2,697	3,747
EB Bridge	2,310	2,392	2,765	2,434	2,933	2,420	3,010
WB Bridge	1,979	2,251	2,753	2,412	2,903	2,506	3,024
WB between Queen Street and Mytongate	2,259	2,444	3,225	2,539	3,377	2,578	3,494
WB west of Mytongate	2,267	2,470	3,284	2,596	3,443	2,675	3,570
IP							
EB approach to Mytongate	2,119	2,347	2,604	2,529	2,815	2,698	2,957
EB between Mytongate and Market Place	2,242	2,468	2,789	2,606	2,992	2,658	3,142
EB Bridge	2,014	2,190	2,358	2,317	2,538	2,377	2,651
WB Bridge	1,746	1,945	2,214	2,045	2,394	2,165	2,505

Location	Base 2015	2025		2033		2040	
		Without Scheme	With Scheme	Without Scheme	With Scheme	Without Scheme	With Scheme
WB between Queen Street and Mytongate	1,986	2,185	2,593	2,282	2,796	2,379	2,921
WB west of Mytongate	2,051	2,380	2,931	2,513	3,151	2,600	3,251
PM							
EB approach to Mytongate	1,814	2,175	2,585	2,234	2,789	2,360	2,913
EB between Mytongate and Market Place	2,636	2,668	3,528	2,670	3,831	2,681	3,930
EB Bridge	2,517	2,627	3,067	2,712	3,317	2,754	3,374
WB Bridge	1,655	1,824	2,163	1,912	2,269	1,924	2,312
WB between Queen Street and Mytongate	2,082	2,178	2,754	2,237	2,872	2,250	2,900
WB west of Mytongate	2,650	2,709	3,507	2,714	3,403	2,714	3,550

AADT Flows

4.2.13 A detailed section-wise analysis of AADT flows along A63 Castle Street for both Without Scheme and With Scheme for 2025, 2033 and 2040 forecast years is presented in Table 4.3.

4.2.14 Appendix A presents the AADT flows for the core growth scenario along the A63 Castle Street. These indicate that under the Without-Scheme scenario, the traffic flows on the A63 would be expected to be around 40,000 vehicles.

4.2.15 With the new Mytongate grade separated junction in place, the traffic volumes would be expected to increase to around 51,000 vehicles (AADT). By 2040, it is expected that around 56,000 vehicles (AADT) would be likely to use the new section of the A63 Castle Street at Mytongate.

4.2.16 This accounts for an average increase of approximately 29% in the AADT (two-way) traffic flow along the A63 Castle Street with the introduction of a grade separated junction on the stretch between Mytongate and Market Place on the A63.

Table 4.3: AADT Traffic Flow (in veh.) – Core Growth Scenario

Road Section	Dir	2015	2025			2033			2040		
		Base	Without Scheme	With Scheme	% Diff (with scheme -without scheme)	Without Scheme	With Scheme	% Diff (with scheme - without scheme)	Without Scheme	With Scheme	% Diff (with scheme -without scheme)
A63 Clive-Sullivan Way (Off-slip Brighton St. to On-slip Madeley St.)	EB	25,942	28,601	30,032	5%	30,421	32,115	6%	31,416	33,375	6%
A63 Clive-Sullivan Way (Off-slip Daltry St. to On-slip St. Andrews Quay)	WB	27,550	30,231	32,526	8%	32,086	34,343	7%	32,877	35,670	8%
A63 Clive-Sullivan Way (Off-slip Madeley St. to On-slip Hessle Road)	EB	16,841	18,745	20,381	9%	19,935	21,466	8%	20,379	22,034	8%
A63 Clive-Sullivan Way (Off-slip Hessle Road to On-slip Daltry St.)	WB	17,248	20,052	25,650	28%	21,245	27,236	28%	22,329	28,808	29%
A63 Hessle Road	EB	21,227	24,451	28,745	18%	25,977	30,972	19%	27,255	32,122	18%
	WB	23,144	25,929	33,854	31%	26,962	35,229	31%	27,497	36,452	33%
A63 Castle Street (Mytongate to Myton Bridge)	EB	25,745	27,688	32,756	18%	28,330	35,297	25%	28,456	36,568	29%
A63 Castle Street (Humber Dock St. to Mytongate)	WB	22,462	24,443	29,632	21%	25,337	31,579	25%	25,913	32,603	26%
A63 Castle Street (Myton St. to Princess Dock St.)	EB	24,949	26,476	32,756	24%	27,265	35,297	29%	27,460	36,568	33%
A63 Castle Street (Princess Dock St. to Dagger lane)	EB	24,803	26,263	32,756	25%	27,044	35,297	31%	27,204	36,568	34%
A63 Castle Street (Dagger Lane to Fish St.)	EB	24,956	26,263	32,756	25%	27,044	35,297	31%	27,203	36,568	34%
A63 Castle Street (Fish St. to Vicar lane)	EB	24,956	26,263	32,756	25%	27,044	35,297	31%	27,203	36,568	34%
A63 Castle Street (Vicar Lane to Market Place)	EB	24,956	26,263	32,756	25%	27,044	35,297	31%	27,204	36,568	34%
A63 Castle Street (Market Place to Humber Dock St.)	WB	21,339	23,293	29,632	27%	24,220	31,579	30%	24,815	32,603	31%
A63 Garrison Road	EB	22,765	24,304	27,674	14%	25,325	29,818	18%	25,621	30,722	20%
	WB	17,878	20,295	24,272	20%	21,501	26,018	21%	22,375	27,008	21%

4.3 Overview of Journey Times

4.3.1 Information on travel times through the network was extracted from the core scenario traffic forecasts.

4.3.2 Journey times on the A63 from the Priory Way to Little Fair Roundabout as shown in Figure 4.8 were compared for each forecast year and time period. The results can be seen in Table 4.4 below.

Figure 4.8: A63 Castle Street – Journey Time Route

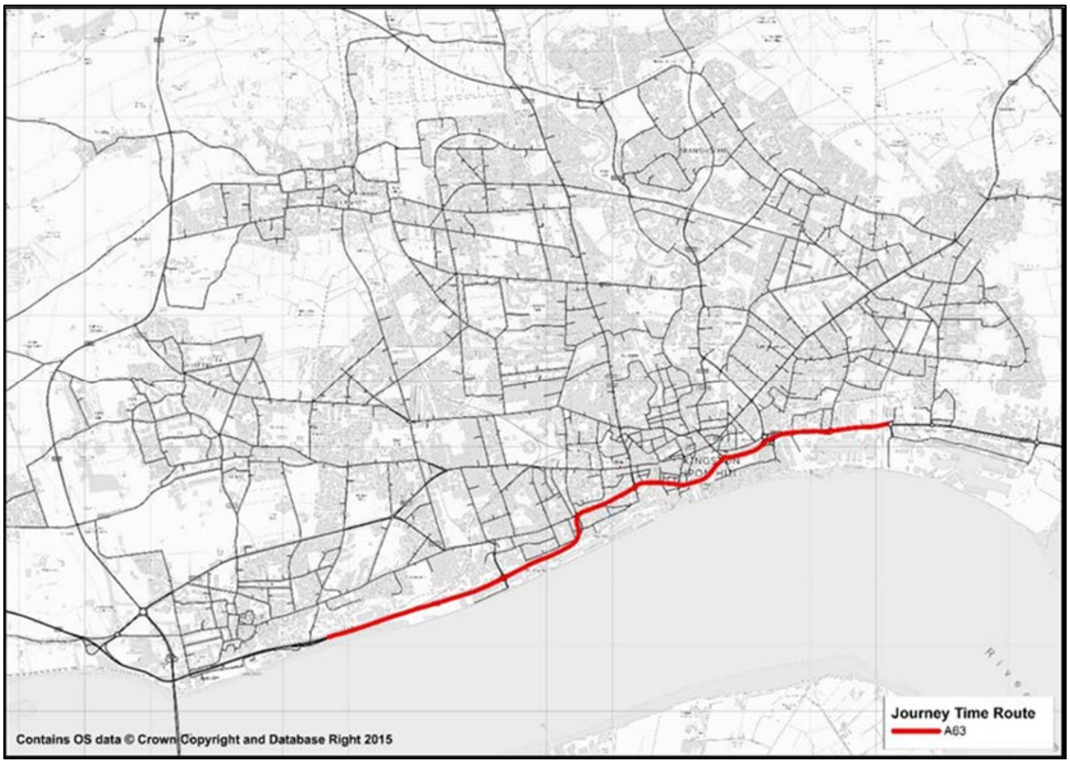


Table 4.4: A63 Castle Street – Modelled Journey Time (in mm:ss) Core Growth Scenario

Forecast Year	Route Direction	AM			IP			PM		
		Without Scheme	With Scheme	Diff.	Without Scheme	With Scheme	Diff.	Without Scheme	With Scheme	Diff.
2025	A63-EB	16:16	13:30	02:46	12:35	11:26	01:09	15:12	12:34	02:38
	A63-WB	13:50	11:23	02:27	12:11	10:27	01:44	14:52	12:35	02:17
2033	A63-EB	17:39	14:44	02:55	13:14	11:52	01:22	16:50	13:43	03:07
	A63-WB	14:47	12:19	02:28	12:52	10:55	01:57	15:41	13:13	02:28
2040	A63-EB	18:35	15:37	02:58	13:38	12:13	01:25	17:46	14:28	03:18
	A63-WB	16:00	13:09	02:51	13:23	11:22	02:01	16:09	14:02	02:07

4.3.3 In all time periods the journey time profiles appear reasonable and logical (i.e. the Without Scheme being the slowest, deteriorating over time, and the With Scheme being the quickest, deteriorating over time).

4.3.4 A63 eastbound direction is seen to be benefiting the greatest as a result of the Scheme with journey times improving by as much as 17% (an improvement of about 3 minutes) as compared to the Without Scheme. A63 westbound direction also shows an improvement in journey of approximately 2 minutes when compared to the Without Scheme scenario in AM and PM peak. While in Inter Peak, the westbound direction is seen to be benefiting the most as a result of the Scheme.

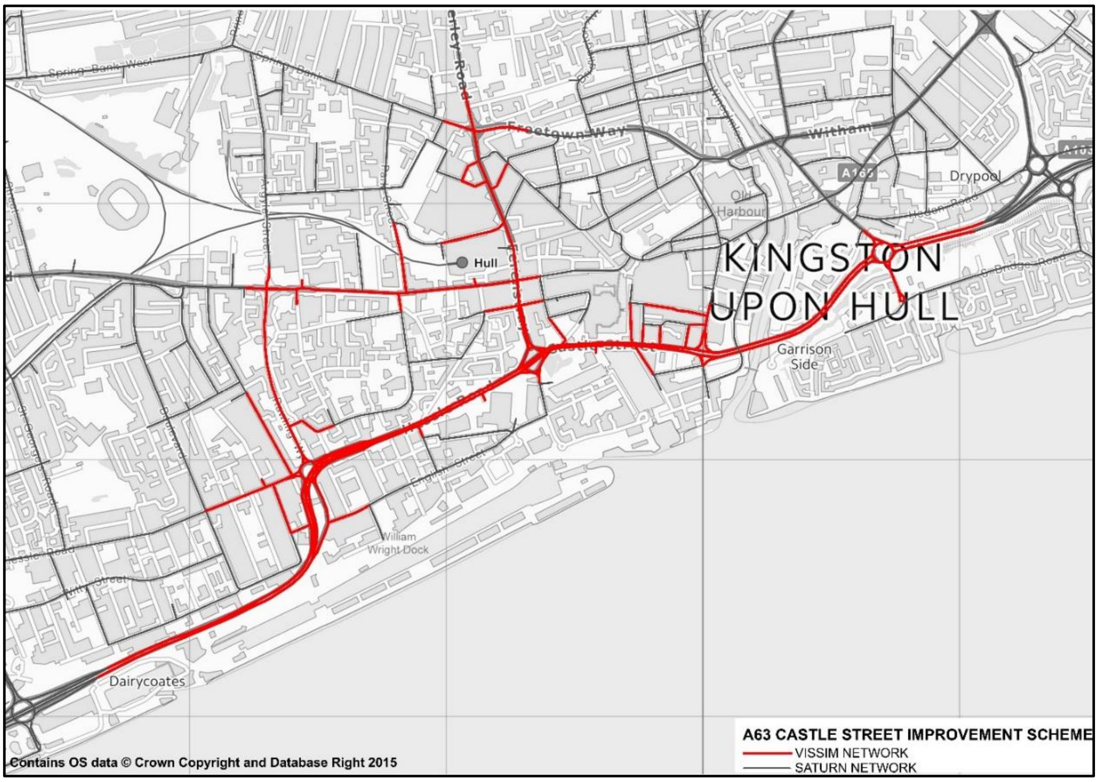
4.4 Operational Assessment

4.4.1 A VISSIM microsimulation model was developed for the Scheme. VISSIM can simulate traffic patterns and this was used for undertaking an operational assessment of the performance of the A63 Castle Street corridor and junctions, with and without the proposed scheme for the forecast years of 2025, 2033 and 2040.

4.4.2 The traffic data used for the development of the microsimulation model were taken from the corresponding A63 Castle Street SATURN based strategic traffic model.

4.4.3 The extent of study area that was considered for the VISSIM modelling is shown in Figure 4.9.

Figure 4.9: Extent of study area for VISSIM modelling



5 ROAD SAFETY

5.1 Introduction

5.1.1 This section provides a summary of existing road safety record on A63 and the forecast impact on accidents over a period of 60 years.

5.1.2 Any transport intervention may alter the road safety in terms of accidents. The estimated difference in the number of accidents and the number of casualties between the Without Scheme and with Scheme scenarios yields a monetary estimate of the accident-related benefits of the proposed transport intervention.

5.1.3 Accident savings resulting from the Scheme were assessed using the DfT's Cost and Benefit to Accidents – Light Touch (COBALT) program (Version 2013.2). This is the software that calculates the impact of accidents as part of the economic appraisal of a road scheme in line with TAG.

5.2 Affected Road Network

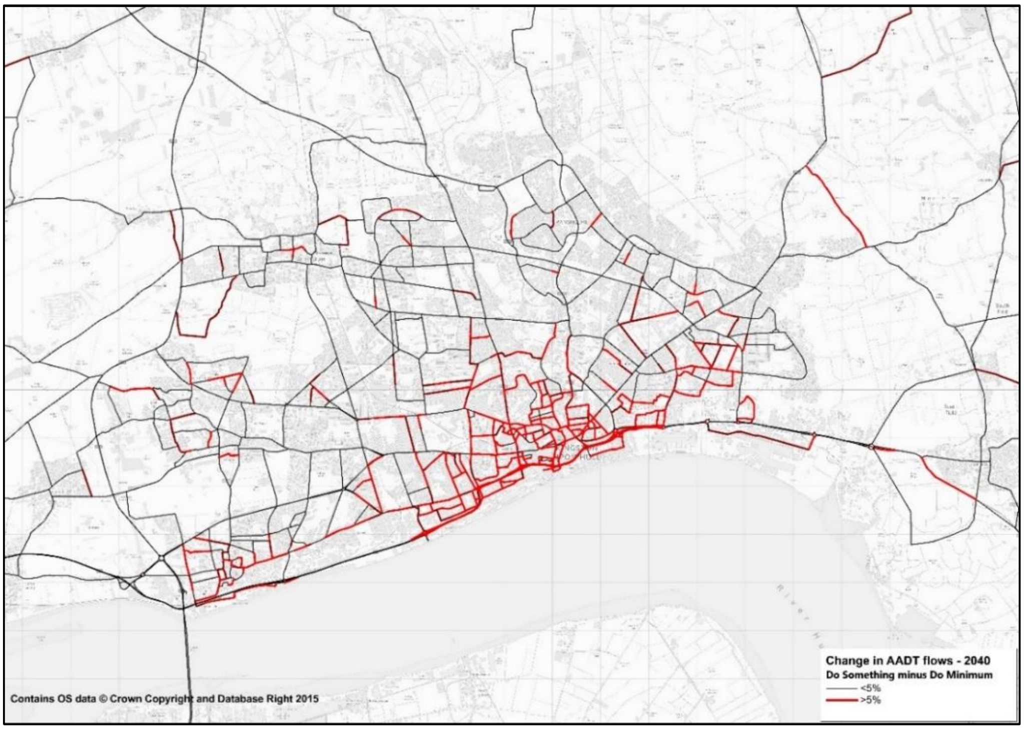
5.2.1 The accident appraisal was only undertaken over a limited impact area. The impact area was taken to be the area within which traffic flow changes are sufficiently significant and which may result in quantifiable future year accident changes.

5.2.2 Guidance states that "*the network should extend far enough from the improvement to include all links on which there is a substantial difference in the assigned traffic flows between without Scheme and with Scheme networks.*"

5.2.3 COBALT assessments were undertaken using local Personal Injury Accident (PIA) data from 2011-2016 on the A63 Castle Street. Default accident rates (national average) were used for the rest of the study area.

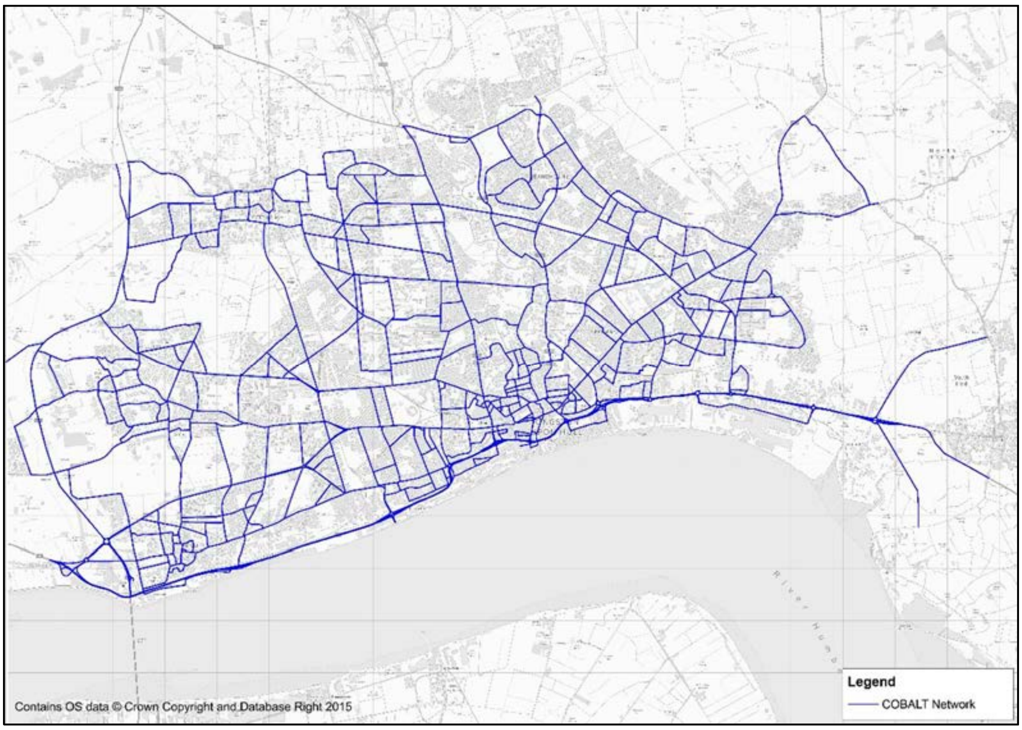
5.2.4 The COBALT study area was selected using criterion of a change in ± 5% in AADT traffic flow (relative difference between without and with Scheme traffic flow) presented in Figure 5.1 below from Scheme traffic model (2040) to obtain the maximum network coverage for the COBALT network.

Figure 5.1: Selecting the COBALT Network



5.2.5 The COBALT network as presented in the Figure 5.2 comprised the Hull city centre and its immediate environment, along with the full length of the A63 within the simulation area of traffic model.

Figure 5.2: COBALT Road Network



5.3 Observed Accident Data

5.3.1 Observed accident data for the latest available complete six-year period (2011-2016) was obtained from the Road Safety Data website, published by the Department for Transport (DfT).

5.3.2 Figure 5.3 presents the casualties recorded in the study area in terms of their severity. Observed annual casualties are shown in Table 5.1.

Figure 5.3: Observed Casualties by Severity (2011-2016)

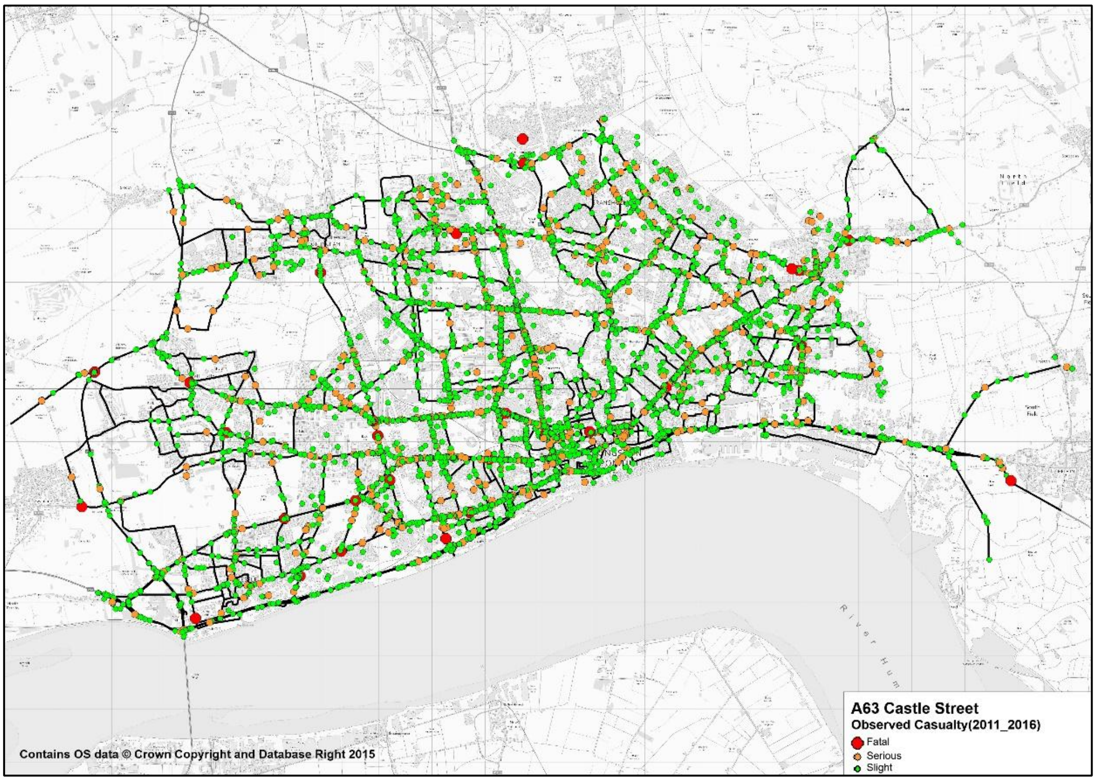


Table 5.1: Observed yearly Casualties

Year	Casualties by Severity			Total	% Total
	Fatal	Serious	Slight		
2011	6	131	1039	**1176**	16.6%
2012	2	140	1081	**1223**	17.3%
2013	8	147	1020	**1175**	16.6%
2014	4	133	1068	**1205**	17.0%
2015	2	116	1022	**1140**	16.1%
2016	10	164	991	**1165**	16.4%
Total	**32**	**831**	**6221**	**7084**	**100.0%**
% Total	0.5%	11.7%	87.8%	**100.0%**	

5.3.3 Figure 5.4 and Figure 5.5 shows the plot of accident locations that occurred along the A63 between 2011 and 2016.

Figure 5.4: Local accident locations (2011-2016) – West of Mytongate JN

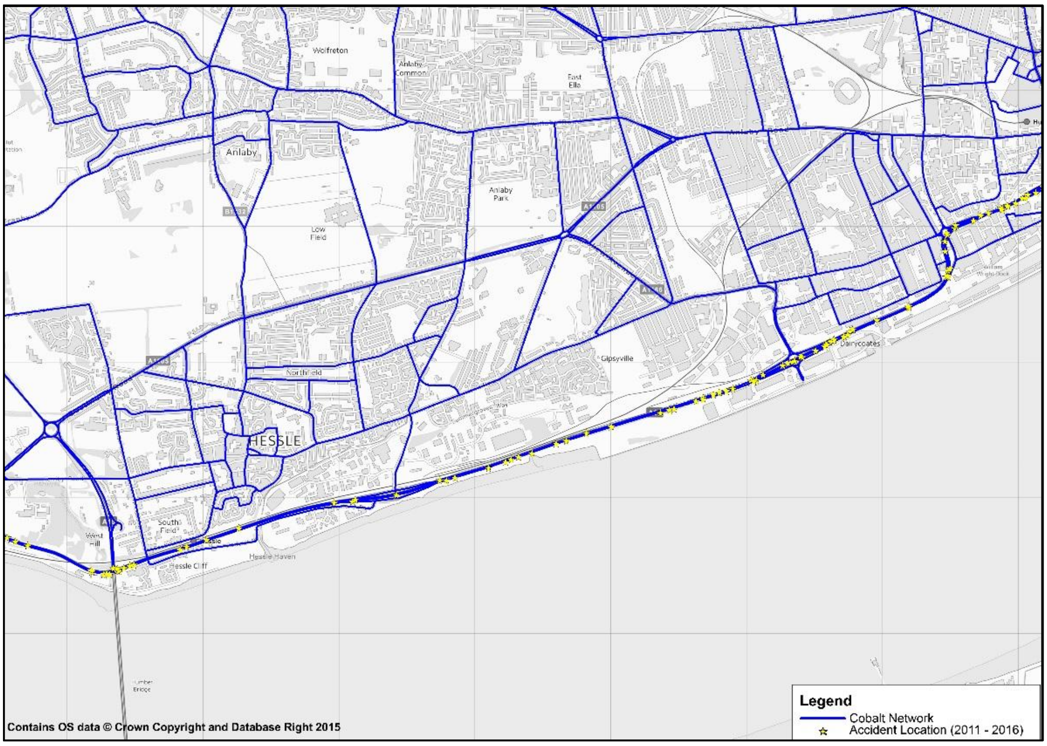
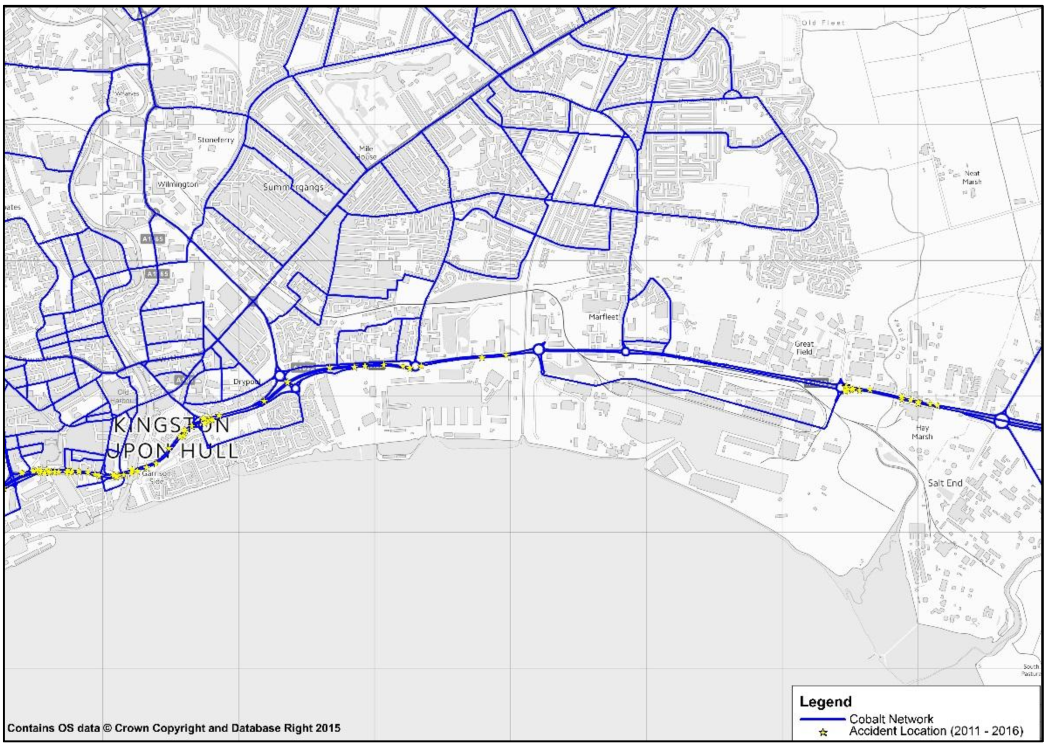


Figure 5.5: Local accident locations (2011-2016) – East of Mytongate JN



5.3.4 Table 5.2 presents the number of local accidents recorded on each section of the A63 Castle Street.

Table 5.2: Observed (Local Accidents) – A63 Castle Street

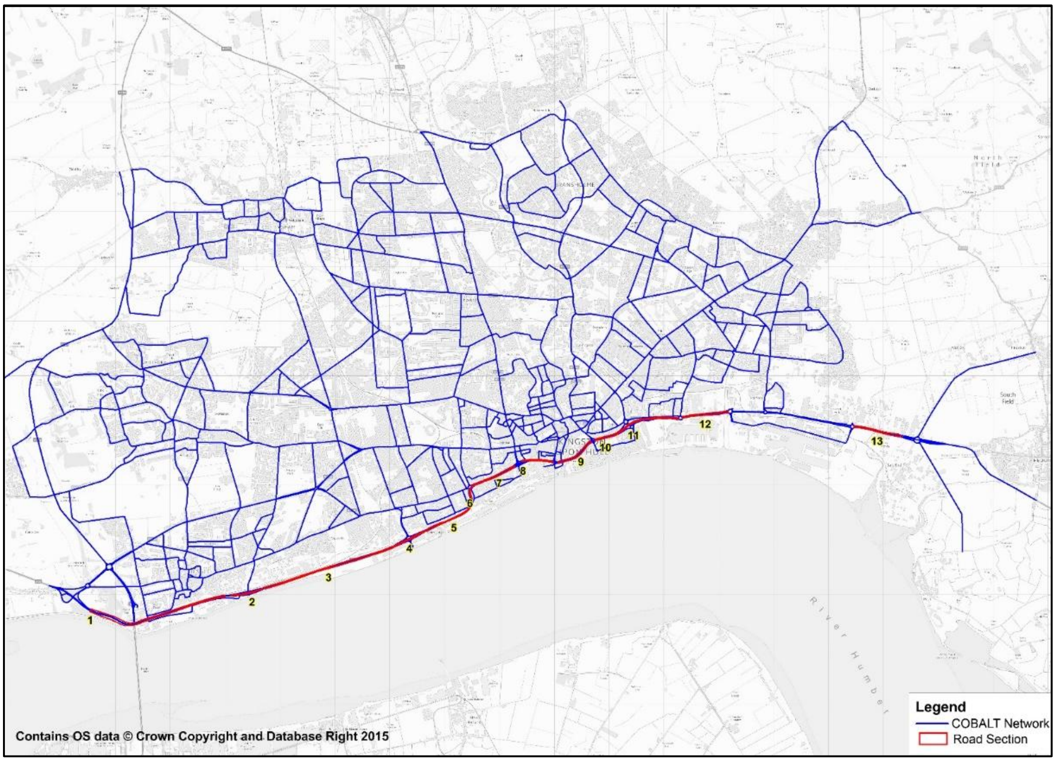
Road Section	Location	Direction	Length (km)	No. of Accidents per year					
				2011	2012	2013	2014	2015	2016
1	A63 Clive Sullivan Way	EB	2.85	5	2	5	2	5	3
	A63 Clive Sullivan Way	WB							
2	A63 Clive Sullivan Way at Priory Way	EB	0.67	0	0	0	1	1	1
	A63 Clive Sullivan Way at Priory Way	WB							
3	A63 Clive Sullivan Way after Priory Way	EB	2.47	7	7	1	2	4	4
	A63 Clive Sullivan Way after Priory Way	WB							
4	A63 Clive Sullivan Way at Brighton Street	EB	0.67	1	5	2	2	6	2
	A63 Clive Sullivan Way at Brighton Street	WB							
5	A63 Clive Sullivan Way after A1166 jn. till slip	EB	0.94	2	3	3	0	0	1
	A63 Clive Sullivan Way after slip till A1166 jn.	WB							
6	A63 Clive Sullivan Way after slip till Hessle jn.	EB	0.61	3	2	2	2	0	2
	A63 Clive Sullivan Way after Hessle jn. till slip	WB							
7	Hessle Road to Mytongate	EB	0.62	3	2	7	3	4	2
	Mytongate To Hessle Road	WB							
8	Mytongate to Market Place	EB	0.58	3	6	4	6	5	4
	Market Place to Mytongate	WB							
9	Market Place to Plimsoll Way	EB	0.75	2	4	3	3	4	1
	Plimsoll Way to Market Place	WB							
10	Plimsoll Way to Garrison road Slip	EB	0.39	3	0	1	1	2	1
	Garrison Road slip to Plimsoll Way	WB							
11	Garrison/Hedon Road to Southcoates Roundabout	EB	1.24	2	2	0	1	1	3
	Southcoates Roundabout to Garrison/Hedon Road	WB							
12	Southcoates Roundabout to Northern Gateway Roundabout	EB	0.85	0	0	0	1	1	1
	Northern Gateway Roundabout to Southcoates Roundabout	WB							
13	Somerden Roundabout to Salt End Roundabout	EB	0.85	3	5	5	1	2	1
	Salt End Roundabout to Somerden Roundabout	WB							

5.4 Accidents Rates

5.4.1 COBALT calculates the number of accidents over 60-year period from either default or observed (local) accident rates.

5.4.2 Observed accident rates were calculated in COBALT from Personal Injury Accident (PIA) data for the section shown in Figure 5.6 for the latest available complete six-year period (2011-2016).

Figure 5.6: A63 Castle Street Road sections



5.4.3 Locally computed accident rates were derived for selected links along A63 Castle Street.

5.4.4 COBALT default accident rates (as specified in COBALT parameter file) were used for the rest of the network.

5.4.5 Table 5.3 summarises the accident rates used for COBALT analysis for each road type and speed limit category.

Table 5.3: Accident Rates

Road Type	Speed (mph)	Default Accident Rate	Local Accident Rate
Modern S2 Roads	30/40	0.532	-
Modern S2 Roads	>40	0.244	-
Modern D2 Roads	30/40	0.553	0.21
Modern D2 Roads	>40	0.107	0.14
Older D2 Roads	30/40	0.599	0.39
Modern D3+ Roads	30/40	0.620	-

5.4.6 COBALT program is run with relevant input and parameter files.

5.5 Accident Analysis Result

5.5.1 Table 5.4 presents the accidents summary over the 60-year appraisal period.

5.5.2 The accidents saved by the Scheme are calculated as a difference between the number of accidents in the Without and the With Scheme scenarios.

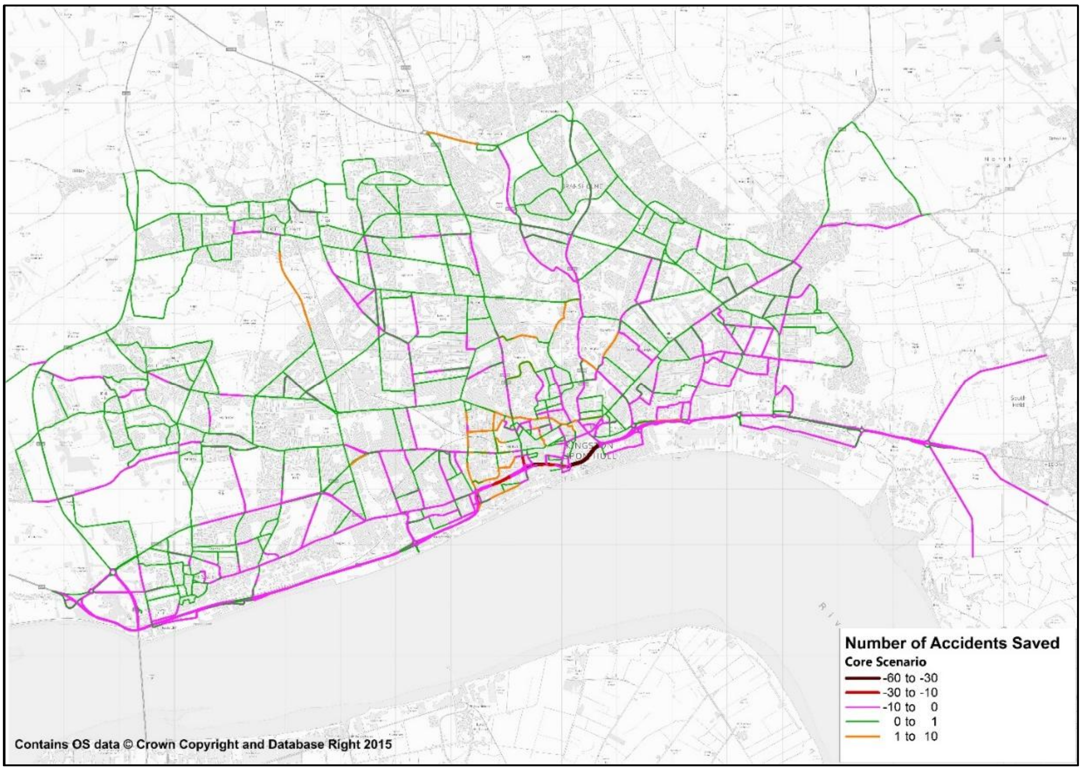
Table 5.4: Accident Savings

Scenario	2025	2033	2040	Appraisal Period (60 Years)
Without Scheme	335	318	316	18,983
With Scheme	333	316	215	18,911
Total Accidents saved by scheme	2	2	1	72

5.5.3 Figure 5.7 presents the change in the number of accidents with the Scheme in place.

5.5.4 Due to the changes on the network structure between the A63 Castle Street without Scheme and the With Scheme scenarios, there is no exact correspondence of the model network between Hessle Road and Market Place on the A63 Castle Street. Hence, the accidents savings on these links represent the actual number of accidents in the respective without Scheme and with Scheme scenarios.

Figure 5.7: Accident Savings - Core Growth Scenario



Casualties

5.5.5 The change in the number of casualties between the With Scheme and without Scheme scenarios are the casualties saved by the Scheme.

5.5.6 Table 5.5 presents a summary of the casualties for the With Scheme and without Scheme scenarios over the appraisal period.

Table 5.5: Casualties – Summary

Scenario	Casualties						Total Casualties saved by Scheme		
	Without Scheme			With Scheme					
	Fatal	Serious	Slight	Fatal	Serious	Slight	Fatal	Serious	Slight
2025	3	40	409	3	40	406	0	0	3
2033	3	38	388	3	38	386	0	0	2
2040	3	38	385	3	38	384	0	0	1
Appraisal Period (60 Years)	161	2,247	23,167	160	2,240	23,077	0	7	91

5.5.7 It is observed that there is reduction in serious and slight injury casualties over the appraisal period with the Scheme in place.

5.5.8 In summary, the Scheme achieves one of its key objectives of improving safety by reducing the numbers of accidents and consequently the number of casualties.

6 NON-MOTORISED USERS

6.1 Overview

6.1.1 For Non-Motorised Users (NMU) during construction, it is anticipated that there would be some residual adverse effects while temporary closures and diversions are in place, resulting in an increase in journey length and a deterioration in journey experience. There would also be a deterioration in the amenity value of routes due to the presence of construction plant and construction noise. Measures to minimise adverse effects for NMUs would be implemented by the Contractor during construction. This would include temporary diversions for NMUs around the work site to be clearly signed and phased, with alternative access arrangements maintained through the full construction period; and all NMU diversions to be hard surfaced, and fenced, braced and fitted with high visibility strips to aid visibility at night for pedestrians and cyclists. In addition, a Community Relations Strategy would be implemented, and the Project delivered in accordance with the Considerate Constructors Scheme. With these measures in place, the balance of effects during construction is considered to be Adverse but Not Significant for NMUs.

6.1.2 Once the Project is operational, some adverse effects would be experienced for NMUs due to the changes to amenity and increase in journey length. The removal of at-grade crossings and their replacement with pedestrian, cycle and disabled user bridges would have the benefit of separating NMUs from vehicle traffic. However, this would increase journey length and inconvenience for some NMUs, particularly those with mobility constraints. However, adverse effects would be partially offset through the provision of upgraded facilities such as the combined footway and cycleway on either side of the A63, a new grade separated crossing at Ferensway and Commercial Road, and the removal of vehicle traffic from some routes. These measures would be of benefit to NMUs making journeys within the study area. The overall effects are considered to be Adverse at worst, and Not Significant.

6.1.3 The full impact on NMUs is covered in the Effects on All Travellers section of the **Environmental Statement** (**Application Document Reference: TR010016/APP/6.1, Chapter 15**).

7 SEVERANCE

7.1 Introduction

7.1.1 Severance impacts are likely to occur where an intervention results in changes to traffic flows, speeds or where interventions introduce or remove barriers to pedestrian movement.

7.2 Step 1: Screening

Table 7.1: Severance screening table

Indicator	(a) Appraisal output criteria	(b) Potential impact	(c) Qualitative comments	(d) Proceed to steps 2a & 2b
Severance	Introduction or removal of barriers to pedestrian movement, either through changes to road crossing provision, or through introduction of new public transport or road corridors. Any areas with significant changes (>10%) in vehicle flow, speed, %HDV content.	Yes	The scheme will introduce and replace pedestrian infrastructure, potentially affecting severance in the area.	Yes

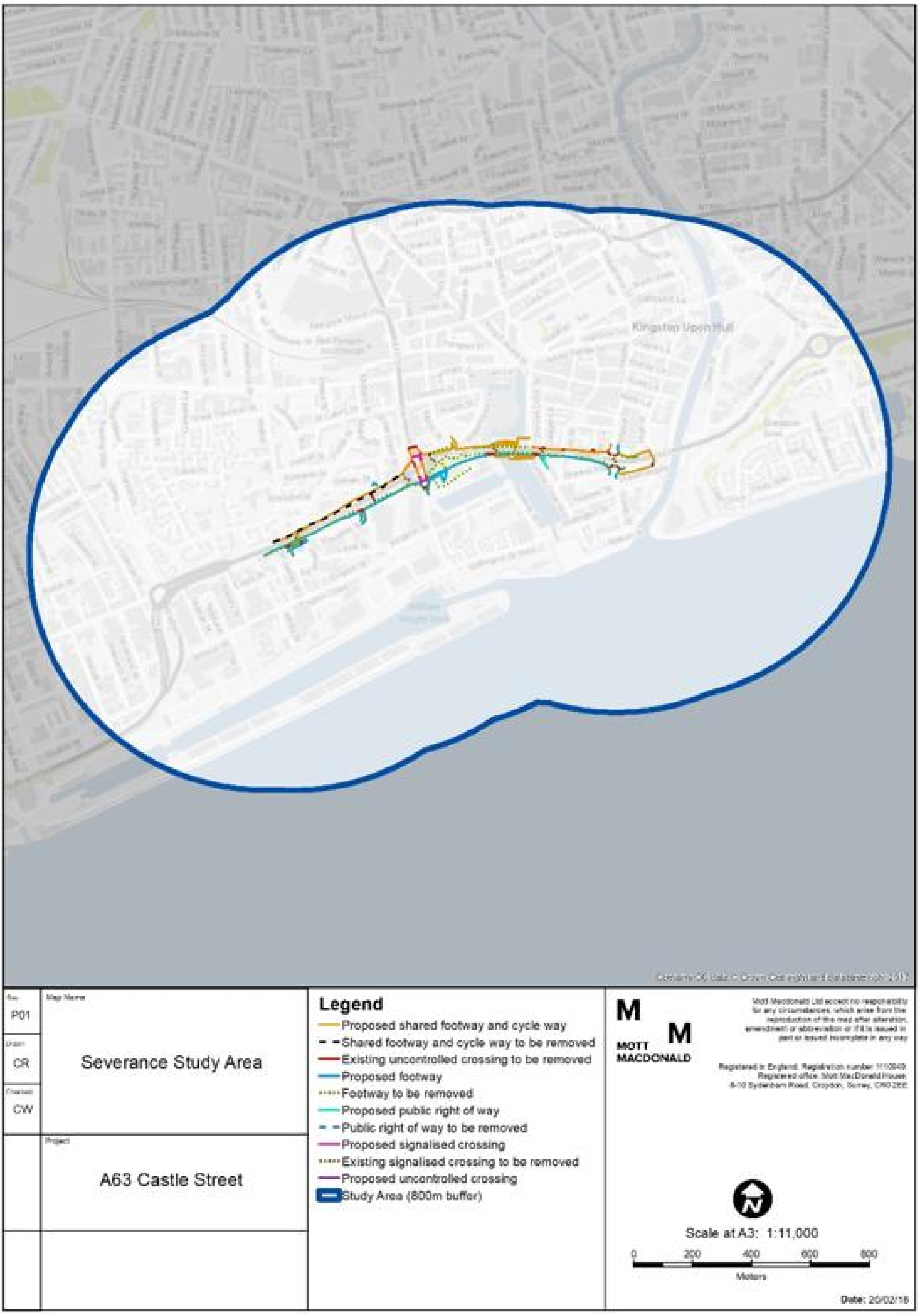
Source: TAG Unit A4.2

7.3 Step 2: Assessment

Step 2a: Confirmation of areas impacted by the intervention

7.3.1 The study area in Figure 7.1 below has been created to more accurately portray the distributional effects of severance surrounding the Scheme. After discussion with the transport appraisal and strategic modelling team at the Department for Transport, it was considered that an 800m buffer zone surrounding the extent of the Scheme works would be appropriate for modelling severance impacts.

Figure 7.1: Severance Study Area



Source: A63 Castle Street Improvement Environmental Statement, Effects on all Travellers Chapter, Mott MacDonald

Step 2b: Identification of social groups in the impact area

7.3.2 WebTAG Unit A4.2 states that the social groups for which distributional severance impacts need to be analysed are:

- children under the age of 16;
- older residents aged 70 and over;
- people with disabilities; and
- no-car households.

7.3.3 Table 7.2 below presents the proportions of children, older people, people with long-term health problems or disabilities (LTHD), and no-car households in the severance impact area in relation to their respective national averages. The study area proportions of those aged under 16 and over 70 are both lower than the national average. Conversely, the study area has higher proportions of people with disabilities and households with no car when compared to the national averages.

Table 7.2: Social group proportions in the severance study area

	Population aged under 16s	Population aged 70 and over	Population with LTHD	No-car households
Study area population	11,321	779	2,208	3,437
Study area proportion	15%	7%	20%	56%
National average (England)	19%	12%	18%	26%

Source: 2016 Mid-Year Estimates and 2011 Census

Step 2c: Identification of amenities in the impact area

7.3.4 Step 2C of the appraisal looks to identify which trip attractors / amenities are located within the impact area. Using Geographic Information System (GIS) software and Ordnance Survey address base data, the following amenities were mapped (see Figure 9 below):

- Education establishments including primary schools and secondary schools
- Facilities used by older people, including hospitals, surgeries and care / nursing homes

7.3.5 The map indicates that there are 15 facilities utilised by children and older people in the severance study area; these are listed within Table 7.3 below. The majority of these facilities (6) are care / nursing homes. There are three schools in the severance study area – two primary schools (Adelaide Primary School and Victoria Dock Primary School) and one secondary school (Hull Trinity House Academy). A large proportion of these amenities are located towards the periphery of the impact area, and pedestrians accessing these facilities are less likely to experience changes in their journeys as a result of the changes in walking infrastructure.

Figure 7.2: Amenities in the severance impact area

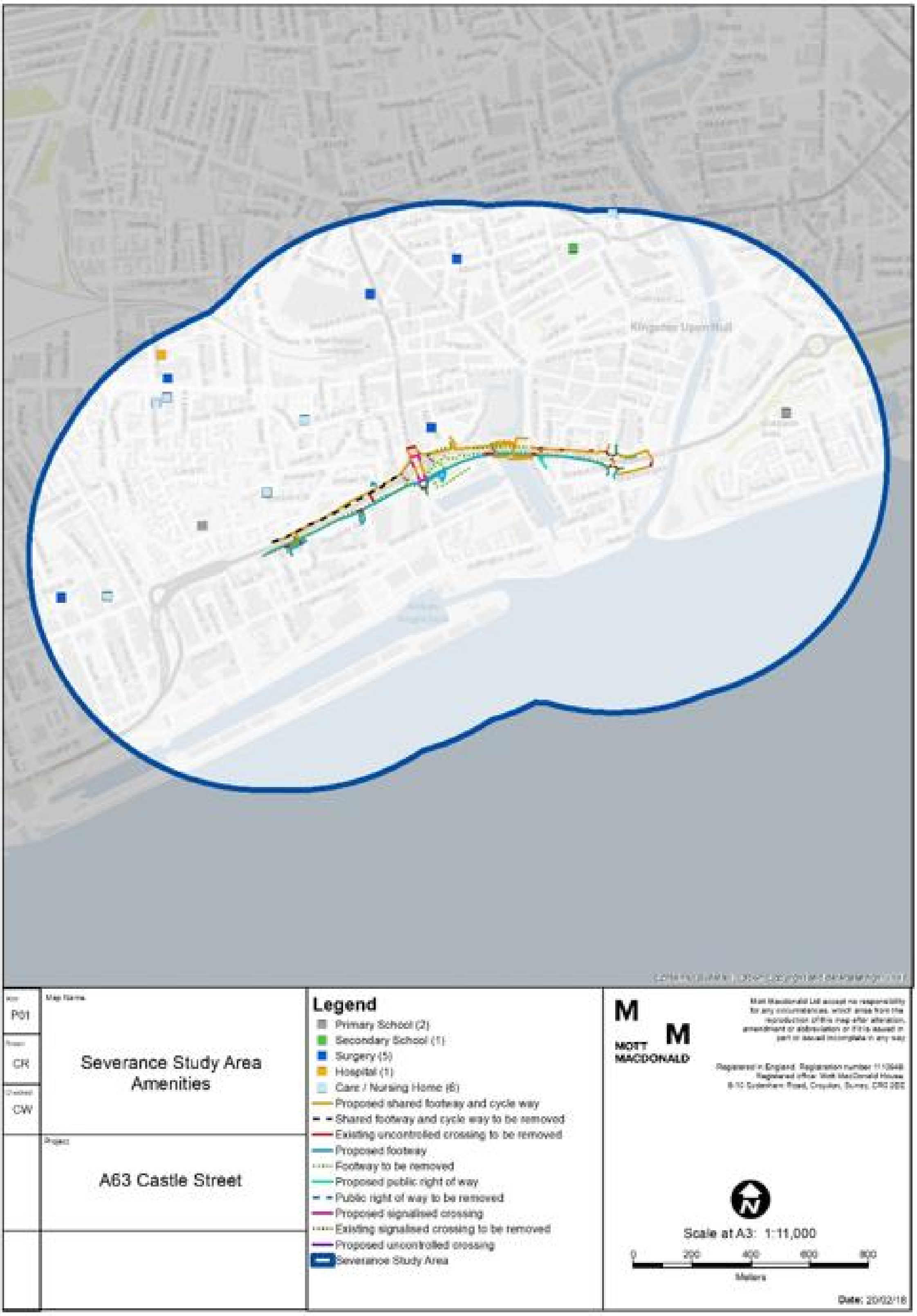


Table 7.3: Amenities in the severance impact area

Amenity	Total
Secondary school	1
Primary school	2
Hospital	1
Surgery	5
Care / Nursing home	6

Source: OS Addressbase Plus

7.4 Step 3: Appraisal of impact

Step 3a: Core analysis of impacts

7.4.1 Geographic Information System (GIS) layers from the Effects on All Travellers in the **Environmental Statement** (**Application Document Reference: TR010016/APP/6.1, Chapter 15**) were utilised to produce current and future pedestrian network layers with associated distance attributes. From these, 800m walking catchments to schools, hospitals and surgeries, and 400m walking catchments to bus stops in the study area were calculated and mapped, as per TAG Unit A4.2 guidance. The changes between current and future walking distances have been used as the basis of assessing the impacts on the social groups potentially affected by severance. These calculations are representative, and present approximate walking distance changes based on the changes to the physical provision of paths and crossings included in the intervention.

7.4.2 Figure 7.3 below shows the amenities and bus stops for which the impact analysis was conducted.

7.4.3 Table 7.4 displays the impacts of severance on the identified social groups, where a change in severance of 0 indicates no impact and that of -1 indicates a slight adverse impact.

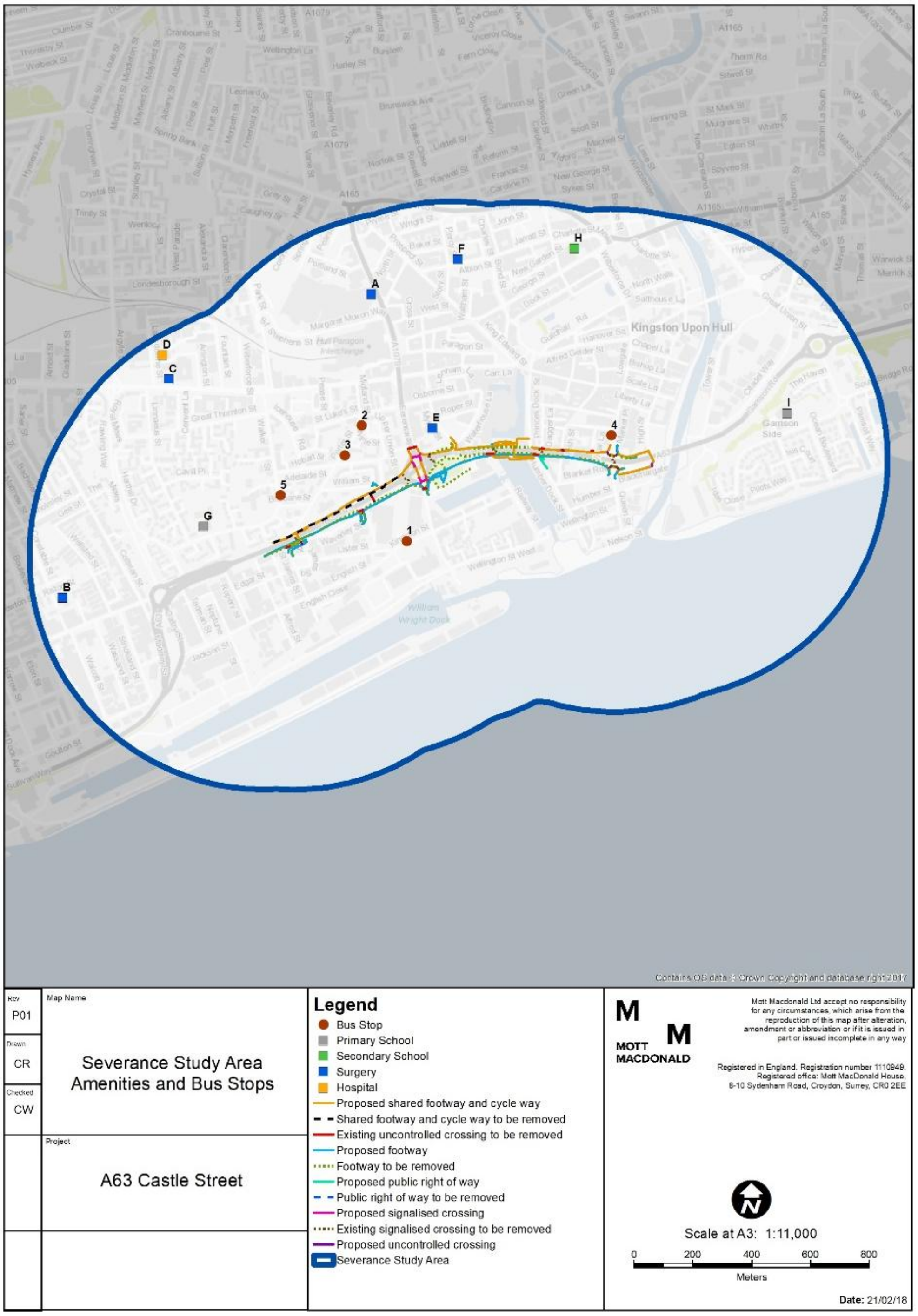
7.4.4 The population affected has only been calculated for those within the 800m and 400m catchments and within the 800m impact area. Negative severance impacts identified for amenity E would be caused by the change of location of the signalised crossings at Mytongate junction. This change would increase the walking distance across the junction.

7.4.5 Negative severance impacts identified for bus stop 4 would result from the removal of the existing signalised crossing at Market Place. This would increase the walking distance required to cross the A63 in this location.

7.4.6 The proposed bridge at Princes Quay and ramp from the A63 to High Street would cause additional difficulties for the elderly, very young, and disabled users due to gradient increases. The overall assessment of severance impacts has therefore been classed as slight adverse.

Summary assessment score: Slight adverse

Figure 7.3: Amenities and bus stops used in impact analysis



Source: OS Addressbase Plus

Table 7.4: Severance impacts on identified social groups

Location		Total population		Young people (<16 years)		Older people (70+ years)		People with disabilities		No-car households	
	Change in severance	No. of people affected	Overall effect*	No. of people affected	Overall effect	No. of people affected	Overall effect	No. of people affected	Overall effect	No. of people affected	Overall effect
Amenity A	0	0	0	0	0	0	0	0	0	0	0
Amenity B	0	0	0	0	0	0	0	0	0	0	0
Amenity C	0	0	0	0	0	0	0	0	0	0	0
Amenity D	0	0	0	0	0	0	0	0	0	0	0
Amenity E	-1	18	-18	3	-3	1	-1	4	-4	6	-6
Amenity F	0	0	0	0	0	0	0	0	0	0	0
Amenity G	0	0	0	0	0	0	0	0	0	0	0
Amenity H	0	0	0	0	0	0	0	0	0	0	0
Amenity I	0	0	0	0	0	0	0	0	0	0	0
Bus stop ID 1	0	0	0	0	0	0	0	0	0	0	0
Bus stop ID 2	0	0	0	0	0	0	0	0	0	0	0
Bus stop ID 3	0	0	0	0	0	0	0	0	0	0	0
Bus stop ID 4	-1	141	-141	3	-3	7	-7	20	-20	48	-48
Bus stop ID 5	0	0	0	0	0	0	0	0	0	0	0

*The overall effect for each social group has been calculated by multiplying the no. of people affected by the change in severance for that location

Source: TAG Unit A4.2

8 TRAFFIC MANAGEMENT DURING CONSTRUCTION

8.1 Introduction

8.1.1 Traffic management works during construction tend to result in changes to journey times and vehicle operating costs. Construction work also has an impact on accidents. These impacts need to be appraised within the economic assessment of a scheme.

8.1.2 Generally, the presence of roadworks results in increased travel costs and hence, the benefits due to construction works are normally negative.

8.1.3 The Scheme would be constructed along the same alignment as the existing alignment, and hence, traffic will inevitably get delayed at certain times during the various construction phases. Delays to traffic can, however, be kept to a minimum by using effective traffic management measures.

8.1.4 This section describes the assessment of the traffic modelling of the construction phases of the Scheme. This includes the overview of traffic flows and journey times for each of the construction.

8.2 Construction Delay Assessment – Methodology

8.2.1 Typically, QUADRO (Queues and Delays at Roadworks) is used to compute the total cost of construction works in terms of time delay, vehicle operating costs and accident costs, as well as incorporating the costs of the roadworks themselves. User dis-benefits are assessed based on queues developing at the roadwork sites or the additional time taken to travel via an alternative route.

8.2.2 A QUADRO assessment would not be suitable for assessing the delays during construction as there were restricted movements proposed at the Mytongate junction during most phases of construction as shown in the Construction Phasing drawings in Appendix B.

8.2.3 The alternative method of assessing construction delay was to use SATURN to code the proposed roadworks (as various construction phases) and then undertake an overall TUBA (Transport Users Benefit Appraisal) assessment of the various construction phases. SATURN will determine the re-routings through use of its least cost algorithms while considering the existing traffic on the network. Although the resulting traffic flows on each link could be used in a link based QUADRO assessment, a more accurate and efficient estimation of the network-wide dis-benefits can be produced from TUBA.

8.2.4 Using the Without Scheme traffic model (2025) as a starting point, the traffic management arrangements in each construction phase were coded in the SATURN model. Based on the traffic management arrangement, 7 construction phases were provided, for which the model was built. As there is no change in network for phase 1 & 2 and phase 4 & 5, the Saturn model will remain same for these phases. Consequently only 5 construction phase Saturn model for three time periods were developed depending upon the traffic management measures making a total of 15 SATURN models to be assessed as shown in Table 8.1.

Table 8.1: Summary – A63 Castle Street Improvement Scheme Construction Phases

Phase		0	1	2	3	4	5	6	7
Programmed Start		**July 2020**	**June 2021**	**March 2022**	**June 2022**	**January 2023**	**May 2023**	**April 2024**	**August 2024**
Duration (months)		**12**	**9**	**3**	**7**	**3**	**12**	**4**	**4**
Section	At Brighton St. Roundabout	• Mainly away from A63 Castle Street, local to A63 side roads, retail car parks, pavement and pedestrian route diversions. • A63 closures to enable crossings to be installed. **N.B.**: Road closures wouldn't require a separate phase, they would be overnight works within existing phases	• Speed limit of 50mph	Same as Phase 1	Same as Phase 2	Same as Phase 3	Same as Phase 4	Same as Phase 5	Same as Phase 6
	After Brighton St. Roundabout Till Hessle Road		• Speed limit of 30mph (EB) and coded speed (WB)	Same as Phase 1	Same as Phase 2	Same as Phase 3	Same as Phase 4	Same as Phase 5	Same as Phase 6
	From Hessle Road Till Mytongate		• Speed limit of 30mph • Pedestrian signal on Hessle road near Porter Street • Lane width reduction around Mytongate Junction • Closure of Ferensway outbound at Mytongate Junction from Osborne Street • Removal of right turn at Mytongate Junction	Same as Phase 1	Same as Phase 2 **Plus**: • Removal of Pedestrian signal on Hessle road near Porter Street	Same as Phase 3	Same as Phase 4	Same as Phase 5	• Speed limit of 30mph • New grade-separated junction at Mytongate with opening of Ferensway outbound and other traffic movements
	From Mytongate Till Myton Bridge		• Speed limit of 30mph • Closure of Vicar Lane, Fish Street, Dagger Lane & Humber Dock Street. • Pedestrian signal on Castle Street near Dagger Lane & at Market Place Junction	Same as Phase 1	Same as Phase 2 **Plus**: • Removal of Pedestrian signal on Castle Street near Dagger Lane & at Market Place Junction • Reduction in lane capacity between Mytongate and Market Street Junction due to Contraflow	Same as Phase 3 **Except**: • Reduction in capacity between Mytongate and Market Street Junction due to Contraflow	Same as Phase 4	Same as Phase 5 **Plus**: • Split of lanes in eastbound direction between Mytongate and Market Place junction	Same as Phase 6 **Except**: • Split of lanes in eastbound direction between Mytongate and Market Place junction

8.3 Overview of Traffic Management Measure

Change in Traffic flows

8.3.1 Table 8.3 presents a comparison of the segmental traffic flows on the A63 Castle Street for the Without Scheme scenario and various construction phases for all modelled time periods.

Table 8.3: Traffic Flows – A63 Castle Street (in pcus/hr.)

Location	Without Scheme	Construction Phase				
		Phase 1-2	Phase 3	Phase 4-5	Phase 6	Phase 7
AM						
EB approach to Mytongate	2,815	2,910	2,910	2,910	2,910	3,303
EB between Mytongate and Market Place	2,684	2,466	2,382	2,562	2,483	3,327
EB Bridge	2,392	2,225	2,219	2,256	2,251	2,705
WB Bridge	2,251	2,462	2,535	2,564	2,564	2,579
WB between Queen Street and Mytongate	2,444	2,590	2,634	2,663	2,663	3,062
WB west of Mytongate	2,470	2,598	2,650	2,670	2,669	3,164
IP						
EB approach to Mytongate	2,347	2,601	2,655	2,708	2,689	2,453
EB between Mytongate and Market Place	2,468	2,258	2,262	2,312	2,293	2,639
EB Bridge	2,190	2,047	2,060	2,082	2,074	2,258
WB Bridge	1,945	1,882	1,936	1,956	1,953	2,088
WB between Queen Street and Mytongate	2,185	2,196	2,229	2,241	2,239	2,461
WB west of Mytongate	2,380	2,243	2,270	2,276	2,277	2,756
PM						
EB approach to Mytongate	2,175	2,800	2,857	2,910	2,893	2,425
EB between Mytongate and Market Place	2,668	2,479	2,427	2,603	2,532	3,381
EB Bridge	2,627	2,560	2,606	2,645	2,630	2,998
WB Bridge	1,824	1,897	2,012	2,037	2,027	2,068
WB between Queen Street and Mytongate	2,178	2,215	2,288	2,304	2,298	2,661
WB west of Mytongate	2,709	2,849	2,859	2,862	2,861	3,342

8.3.2 It is observed that for construction phases 1 to 6, there is a decrease in traffic flow along the eastbound direction to the east side of the Mytongate junction across all the time periods. However, the eastbound traffic on the west side of the Mytongate shows an increase in traffic due to local re-routing.

8.3.3 The westbound traffic is seen to increase on both sides of the Mytongate junction. This could be due to a combination of factors such as banning a majority of the turning movements at the Mytongate Junction and removal of the signalised intersections at the

Mytongate junction. Further, due to the re-routing of traffic resulting from the construction around the Mytongate junction, the traffic which joined the Mytongate junction from the A1079 in the Without Scheme scenario, now joins the A63 at the Garrison Road junction in the construction phase scenarios, thereby contributing to an increase in the westbound traffic on the A63 Castle Street.

8.3.4 As noted above, the construction phase 7 shows an overall increase in the traffic flows along the A63, as it closely represents the With Scheme scenario (except speed reduction between Clive Sullivan Way and Market Place and lane width reduction at the new Mytongate Bridge) having an overall improved junction capacity.

8.4 Overview of Journey Times

8.4.1 Information on travel times through the A63 from the Priory Way to Little Fair Roundabout was extracted from the construction phases for all modelled time periods. The results can be seen in Table 8.4

Table 8.4: A63 Castle Street – Modelled Journey Time (mm:ss) - Construction Phase

	Route	CP1-2	CP3	CP4-5	CP6	CP7
AM	A63-EB	15:37	15:30	15:19	15:24	13:55
	A63-WB	13:14	12:52	12:38	12:38	12:07
IP	A63-EB	12:35	12:33	12:19	12:25	11:50
	A63-WB	11:49	11:34	11:29	11:29	11:17
PM	A63-EB	14:15	14:01	13:39	13:48	13:04
	A63-WB	14:57	14:27	14:22	14:21	13:16

8.4.2 It is observed that each of the construction phases are improving with the travel times decreasing across all time periods.

9 Summary and Conclusions

9.1 Overview

9.1.1 The TA has assessed the impact of the Scheme on the strategic and local highway network and road safety.

9.1.2 The section between Clive Sullivan Way and Market Place on A63 being the busiest road in Humberside acts as a barrier between the Hull City Centre and main shopping areas to the north of the road, the developments, tourist and recreational facilities to the south.

9.1.3 The proposed Scheme consisting of an underpass at Mytongate junction aims at relieving the congestion on A63 and ease the traffic flow between the M62 Motorway and the Humber Bridge to the west and the Port of Hull to the east.

9.1.4 The Scheme aligns with the goals and objectives of several national and local policies such as the National Planning Policy Framework (NPPF), National Policy Statement for National Networks (NPS NN), National Transport Policy and Local Transport Plan 3 of HCC.

9.1.5 Some of the common objectives of these policies and plans include improving the connectivity, enhancing road safety and supporting sustainable economic growth.

9.2 Network performance

Base Network

9.2.1 The strategic SATURN model replicates the base conditions reasonably well across the study area in all the modelled time periods.

9.2.2 Traffic flow is seen to be sensible with higher flows of around 2000pcu's on A63 and on segments of all other major A roads. The B-roads within Hull, namely, B1231, B1232 and other unclassified roads are seen having flows less than 500 PCUs.

Forecast Network

9.2.3 Network summary statistics of the forecast models reveal that the impact of the Scheme is clearly seen with the total network delays decreasing by as much as around 3.5% in 2025 AM peak and PM peak when compared to the corresponding Without Scheme scenario.

9.2.4 The changes in traffic flows (in the forecast years) on the highway network occurring as a result of the introduction of the Scheme suggest that the Scheme tends to attract trips from other roads, primarily the A1079 Beverley Road, A1105 Boothferry Road and B1231 Anlaby Road to the A63.

9.2.5 The journey time analysis suggests that the modelled journey times on the existing A63 would become quicker in both directions as a result of the new grade separated junction at Mytongate on the A63 Castle Street.

9.3 Road Safety

9.3.1 An overall reduction in the number of accidents with the Scheme in place is observed. The majority of accident savings is seen on the improved section of the A63 Castle Street corridor between Mytongate and Market Place.

9.3.2 A reduction in casualties of types serious and slight were observed over the appraisal period with no change in fatal casualties with the scheme in place.

9.3.3 In summary, the Scheme achieves one of its key objectives of improving safety by reducing the numbers of accidents.

9.4 Severance

9.4.1 The proposed bridge at Princes Quay and ramp from the A63 to High Street would cause additional difficulties for the elderly, very young, and disabled users due to gradient increases. The overall assessment of severance impacts has therefore been classed as slight adverse.

9.5 Traffic Management during Construction

9.5.1 It is observed that despite a decrease in the capacity of the A63 due to the narrowing of the lanes and the construction activity at the Mytongate junction, the construction scenarios, in general, accommodate more than 90% of the Without Scheme traffic flows.

9.6 Conclusions

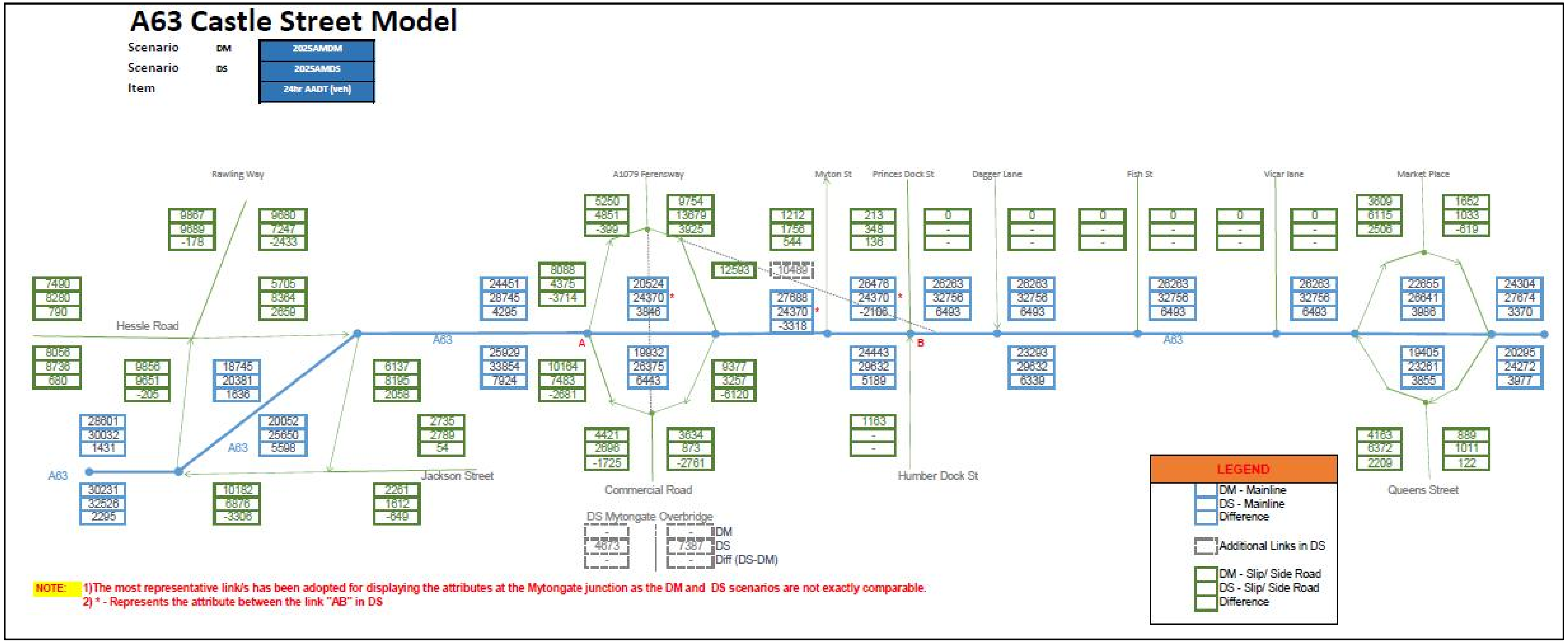
9.6.1 The analysis presented indicates that the Scheme:

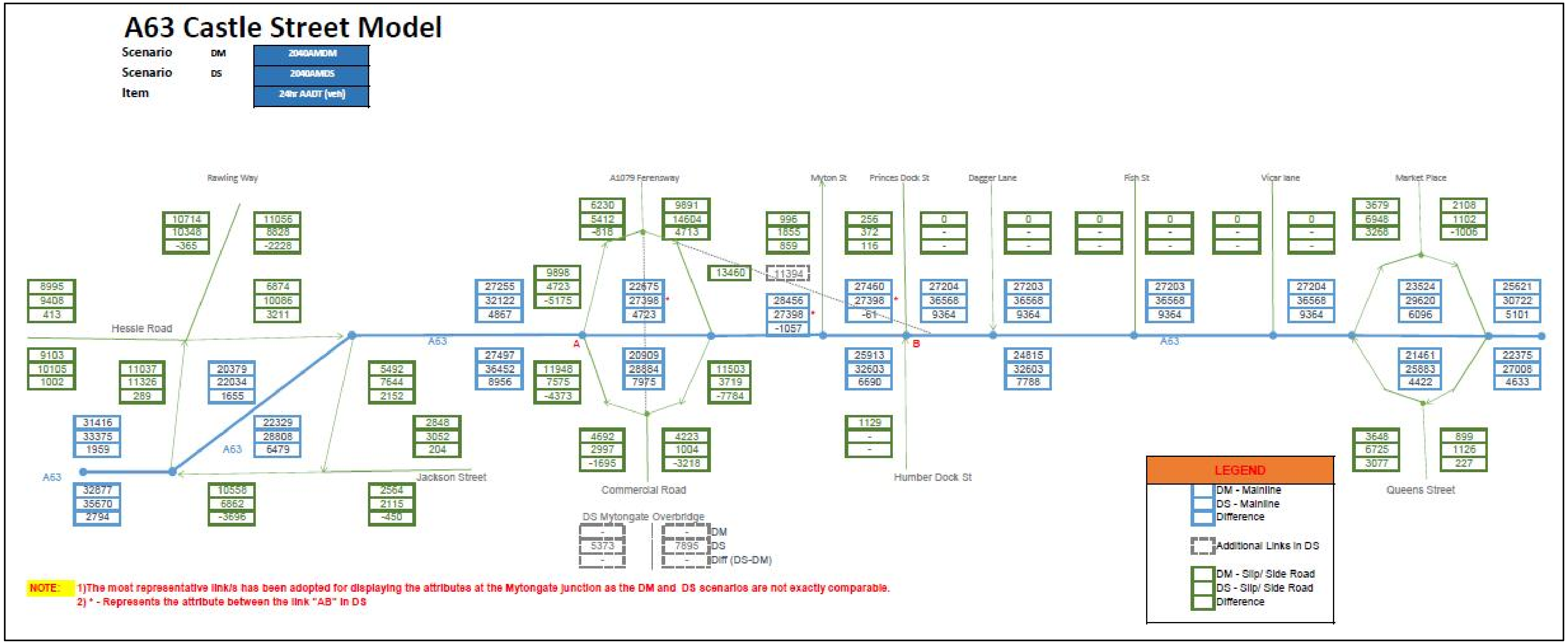
- meets the requirements of government’s transport objectives around economy, social and public accounts;
- aligns with national and local planning policy;
- addresses future traffic demand and creates improved traffic congestion conditions and journey experience for motorists;
- improves road safety and accident rates are forecast to reduce as a result of the Scheme

10 Glossary

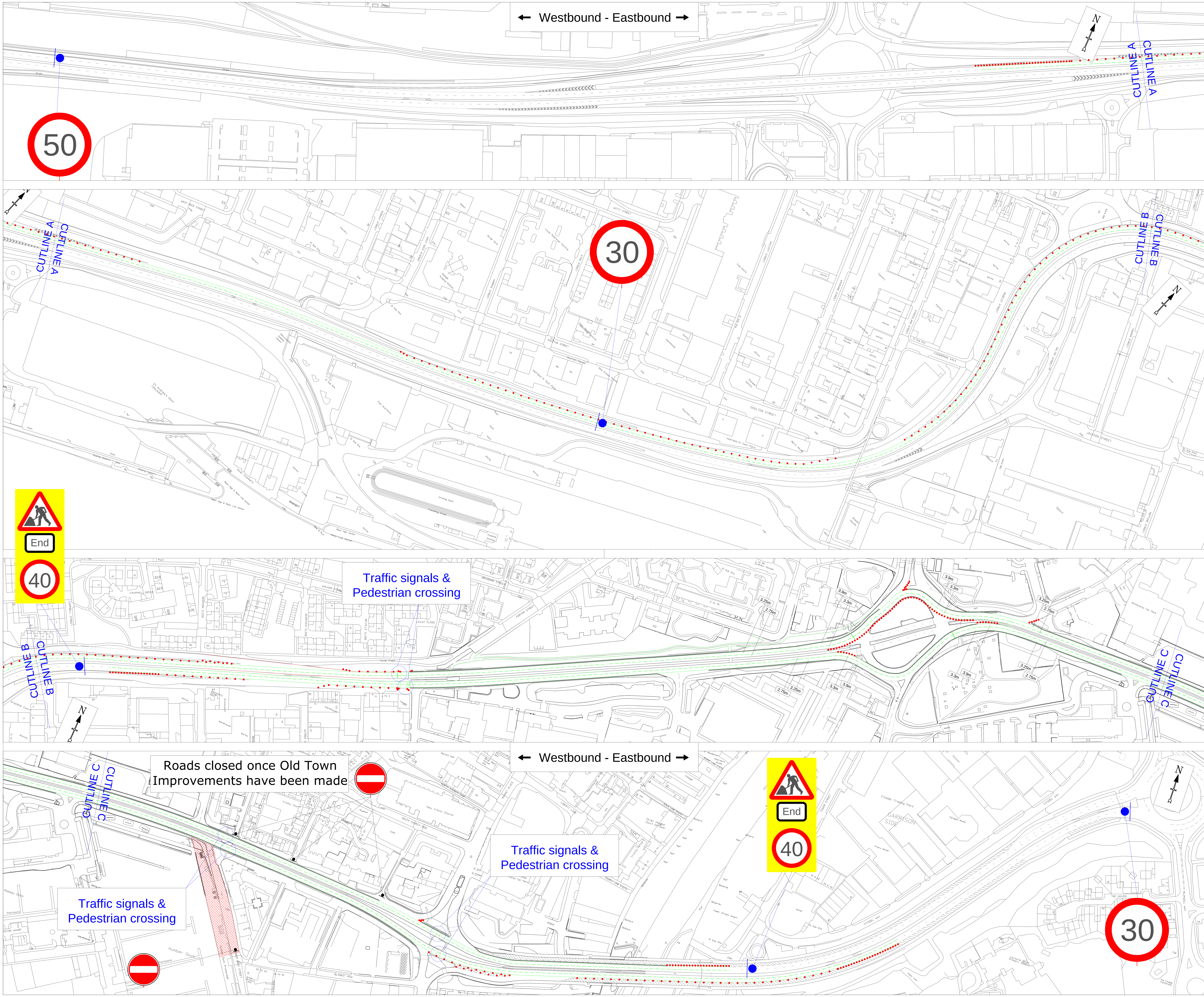
AADT	Annual Average Daily Traffic
ADM	Area of Detailed Modelling
ATC	Automated Traffic Counts
CJC	Classified Junction Counts
CLC	Classified Link Counts
COBALT	Cost and Benefit to Accidents – Light Touch
DaSTS	Delivering a Sustainable Transport System
DCO	Development Consent Order
EA	External Area
FMA	Fully Modelled Area
GIS	Geographic Information System
HCC	Hull City Council
HHJV	Halcrow Hyder Joint Venture
ITN	Integrated Transport Network
LSOA	Lower Super Output Area
LTHD	Long-Term Health problems or Disability
LTP	Local Transport Plan
MSOA	Middle Super Output Area
NPPF	National Planning Policy Framework
NN NPS	National Networks National Policy Statement
NSIP	Nationally Significant Infrastructure Project
NTEM	National Trip End Model
NTS	National Travel Survey
NMU	Non-Motorised User
OA	Output Area
PCU	Passenger Car Unit
pcu/hr	Passenger Car Unit / hour
PIA	Personal Injury Accident
QUADRO	Queues and Delays at Roadworks
RoFMA	Rest of the Fully Modelled Area
RSI	Road Side Interview
TA	Transport Assessment
TAG	Transport Appraisal Guidance
TEMPro	Trip End Model Presentation Program
TPS	Trans-Pennine South
TRADS	Traffic Flow Data System
TUBA	Transport User Benefits Appraisal
WebTAG	(Web based) Transport Analysis Guidance

Appendix A - 24Hr AADT (With Scheme – Without Scheme) – Core Growth Scenario


A63 Castle Street Model
Scenario DM 2025AMDM
Scenario DS 2025AMDS
Item 24hr AADT (veh)
Rawling Way
A1079 Ferensway
Myton St
Princes Dock St
Dagger Lane
Fish St
Vicar lane
Market Place
9867
9689
-178
9680
7247
-2433
7490
8280
790
5705
8364
2659
Hessle Road
8056
8736
680
9856
9651
-205
18745
20381
1636
28601
30032
1431
20052
25650
5598
A63
A63
30231
32526
2295
10182
6876
-3306
6137
8195
2058
2735
2789
54
Jackson Street
2261
1612
-649
A63
24451
28745
4295
8088
4375
-3714
25929
33854
7924
10164
7483
-2681
A
5250
4851
-399
9754
13679
3925
20524
24370 *
3846
19932
26375
6443
9377
3257
-6120
4421
2696
-1725
3634
873
-2761
Commercial Road
12593
10489
1212
1756
544
27688
24370 *
-3318
213
348
136
26476
24370 *
-2106
24443
29632
5189
1163
-
-
B
Humber Dock St
0
-
-
26263
32756
6493
0
-
-
26263
32756
6493
23293
29632
6339
0
-
-
0
-
-
26263
32756
6493
A63
0
-
-
0
-
-
26263
32756
6493
3609
6115
2506
1652
1033
-619
22655
26641
3986
19405
23261
3855
24304
27674
3370
20295
24272
3977
4163
6372
2209
889
1011
122
Queens Street
DS Mytongate Overbridge
-
4673
-
-
7387
-
DM
DS
Diff (DS-DM)
LEGEND
DM - Mainline
DS - Mainline
Difference
Additional Links in DS
DM - Slip/ Side Road
DS - Slip/ Side Road
Difference
NOTE: 1)The most representative link/s has been adopted for displaying the attributes at the Mytongate junction as the DM and DS scenarios are not exactly comparable.
2) * - Represents the attribute between the link "AB" in DS


A63 Castle Street Model
Scenario DM 2040AMDM
Scenario DS 2040AMDS
Item 24hr AADT (veh)
Rawling Way
A1079 Ferensway
Myton St
Princes Dock St
Dagger Lane
Fish St
Vicar lane
Market Place
Hessle Road
A63
Jackson Street
Commercial Road
Humber Dock St
Queens Street
DS Mytongate Overbridge
DM
DS
Diff (DS-DM)
LEGEND
DM - Mainline
DS - Mainline
Difference
Additional Links in DS
DM - Slip/ Side Road
DS - Slip/ Side Road
Difference
NOTE:
1)The most representative link/s has been adopted for displaying the attributes at the Mytongate junction as the DM and DS scenarios are not exactly comparable.
2) * - Represents the attribute between the link "AB" in DS

Appendix B – Traffic Management during Construction Drawings



NOTES:

1,

KEY:

(red dotted line)	1m Traffic cones
(grey line)	Temporary vehicle restraint
(green line)	Temporary road markings

IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, PLEASE NOTE THE FOLLOWING SIGNIFICANT RESIDUAL RISKS

HAZARD/RISK	RATING HIGH/MED/LOW
1, Pedestrian management in and around the construction area's.	HIGH

Preliminary	X	For approval	
For comment		Final Design	

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Checked by: Keith Smith	Date: 23/11/2016
Approved by:	Date:

Original size	A1	Scale	NTS

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Project Title. A63 Castle Street Improvements

Drawing Title. Traffic Management Phasing illustration Phase 1

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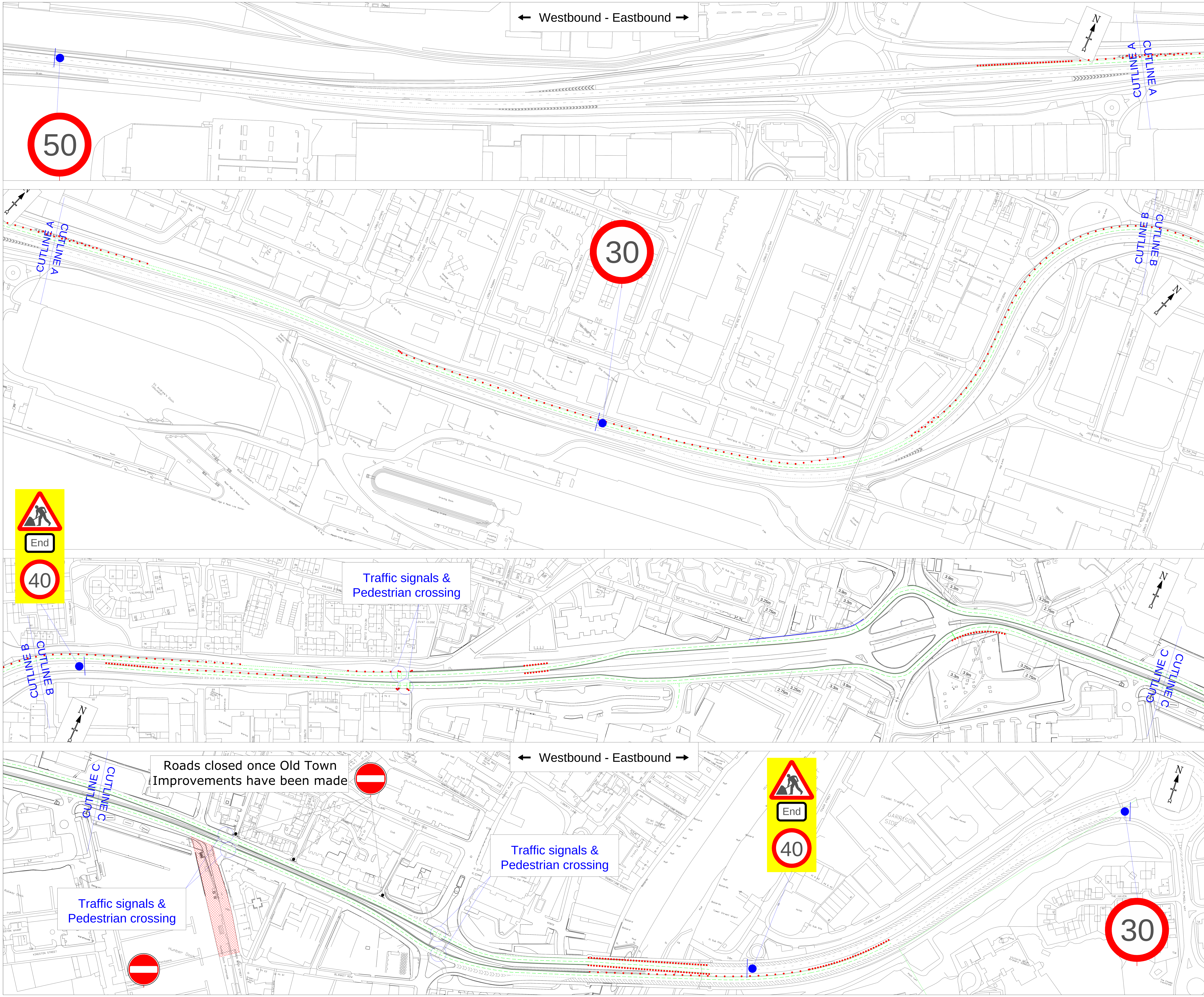
Revision details

Revision	-	Sheet No.	1 of 1

Revised by:	Rev:	Date:
Steve Smith	A	14/03/2017



NOTES:

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KEY:

1m Traffic cones	
High containment barrier	
Temporary vehicle restraint	
Temporary road markings	

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1, Pedestrian management in and around the construction area's.	HIGH

Preliminary	X	For approval	
For comment		Final Design	

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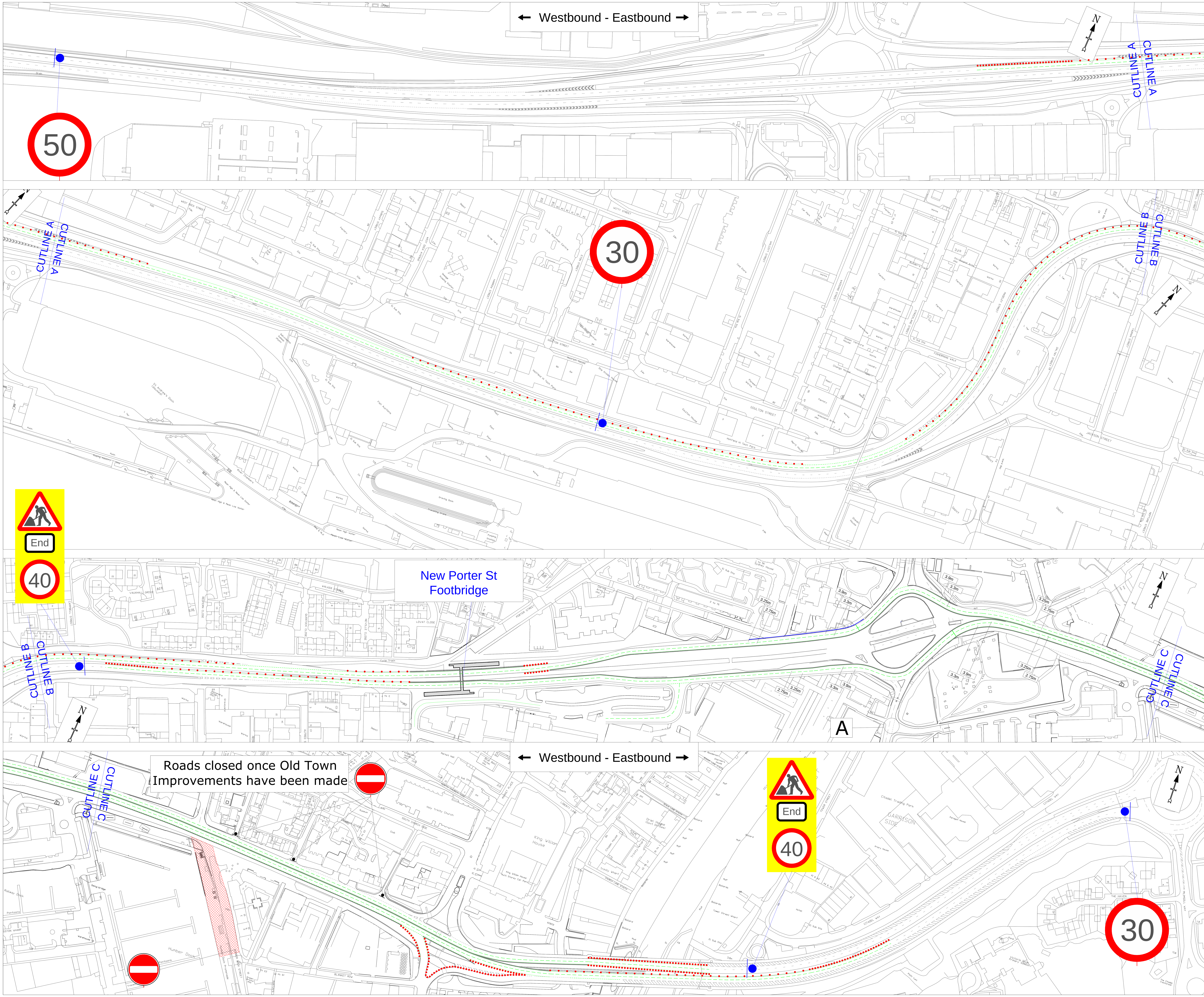

NOTES:

1,

KEY:

- 1m Traffic cones
- High containment barrier
- Temporary vehicle restraint
- Temporary road markings

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1, Pedestrian management in and around the construction area's.	HIGH

Preliminary	X	For approval	
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Drawing Title.
Traffic Management Phasing illustration Phase 3

Drawing No.
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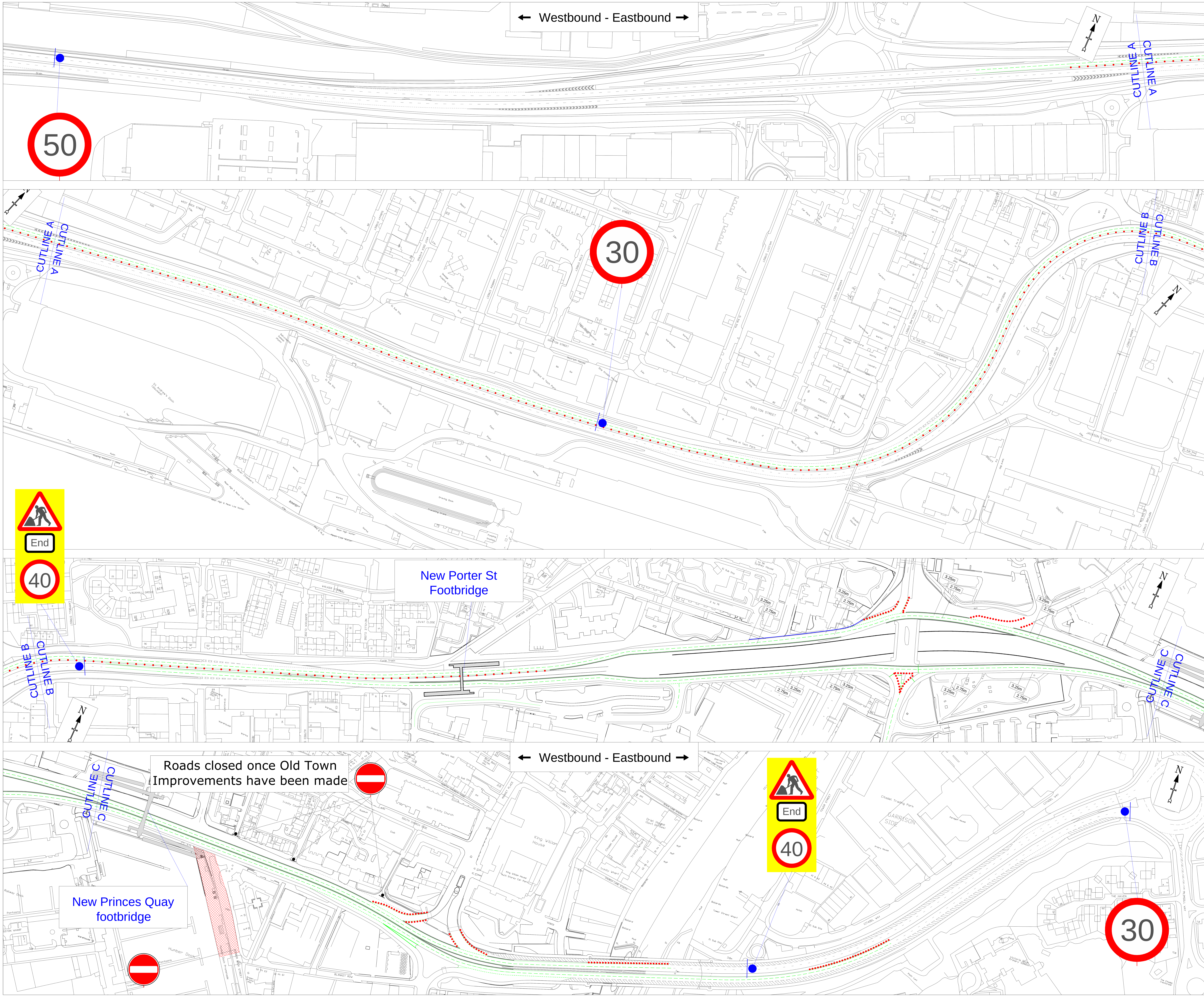

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KEY:

(red dotted line)	1m Traffic cones
(blue line)	High containment barrier
(grey line)	Temporary vehicle restraint
(green line)	Temporary road markings

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HAZARD/RISK	RATING HIGH/MED/LOW
1, Pedestrian management in and around the construction area's.	HIGH

Preliminary	X	For approval	
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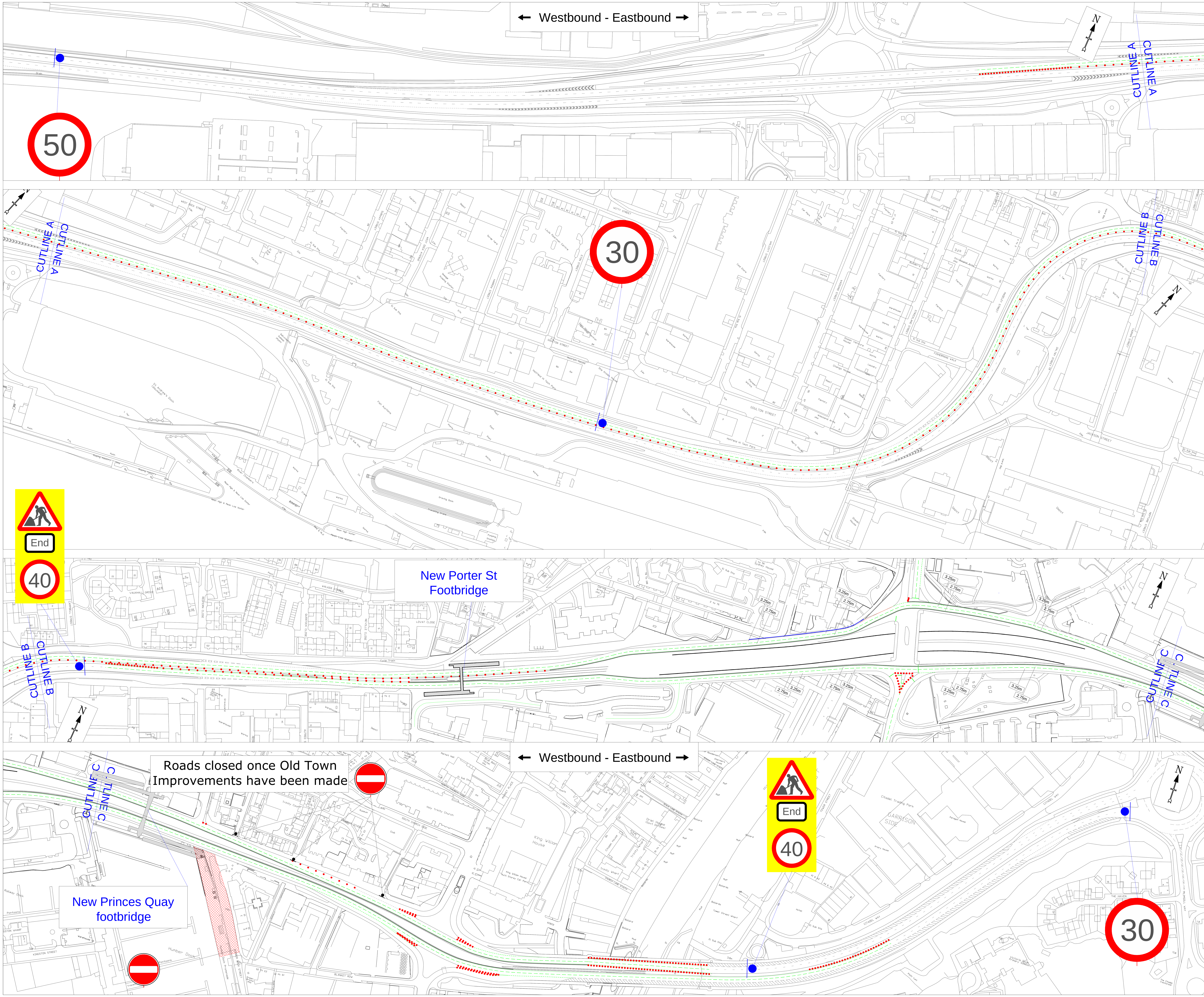

NOTES:

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KEY:

1m Traffic cones	
High containment barrier	
Temporary vehicle restraint	
Temporary road markings	

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1, Pedestrian management in and around the construction area's.	HIGH

Preliminary	X	For approval	
For comment		Final Design	

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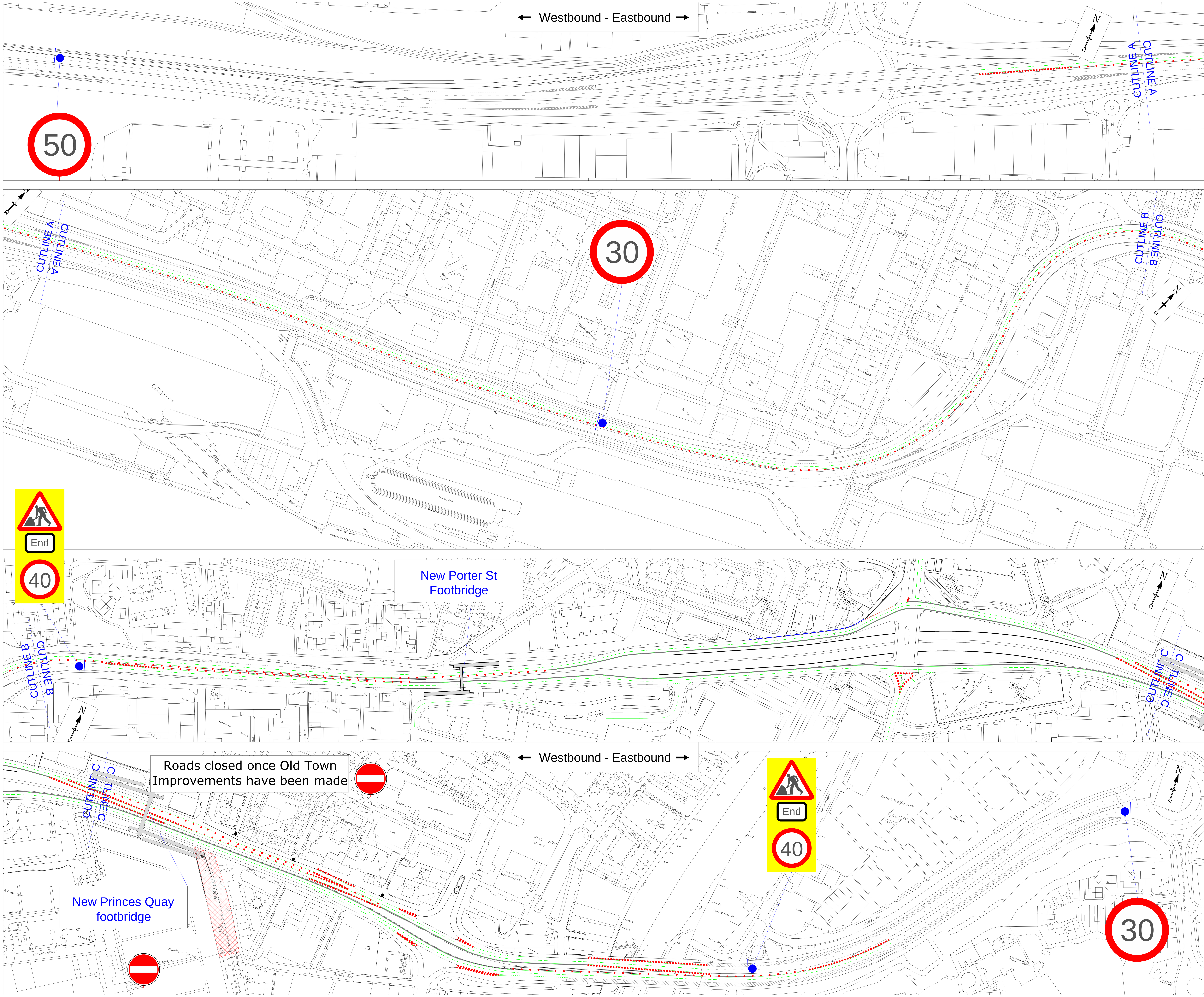

NOTES:

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KEY:

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- Temporary vehicle restraint
- Temporary road markings

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1, Pedestrian management in and around the construction area's.	HIGH

Preliminary	X	For approval	
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Drawing Title. Traffic Management Phasing illustration Phase 6

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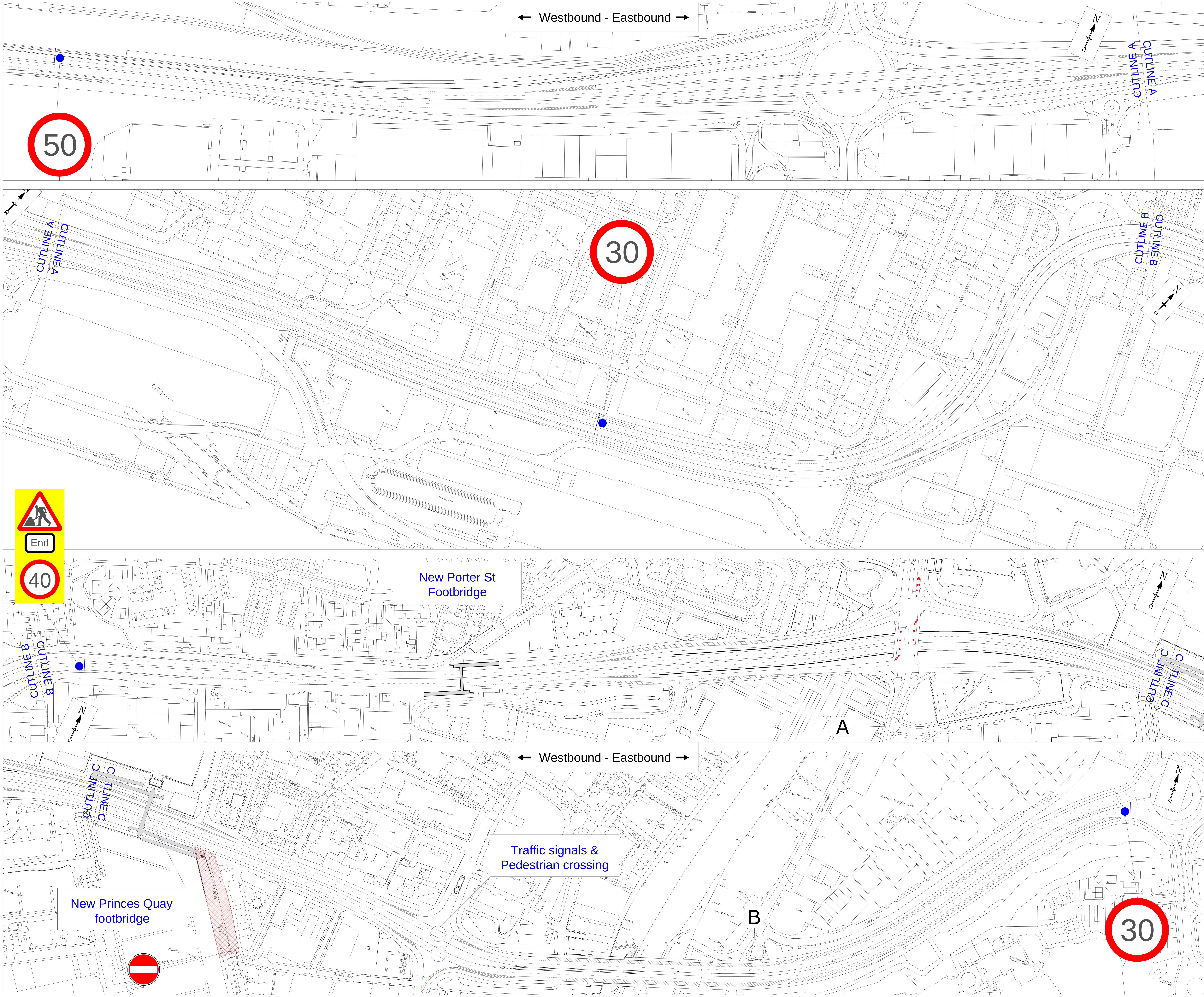

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KEY:

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(blue line)	High containment barrier
(grey line)	Temporary vehicle restraint
(green line)	Temporary road markings

Period:

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1, Pedestrian management in and around the construction area's.	HIGH

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