
Option Appraisal Report

A47 Dualling Study

July 2018

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Options Appraisal Report

Cambridgeshire and Peterborough Combined Authority

July 2018

This document and its contents have been prepared and are intended solely for the Cambridgeshire and Peterborough Combined Authority's information and use in relation to the A47 Dualling Study.

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Executive Summary

This document presents an assessment of options to address capacity, safety and economic development challenges and opportunities along the A47 corridor between the A16 and Kings Lynn, to enable a preferred option to be selected.

Nationally, the A47 is a key route into East Anglia, and connects Norwich and Norfolk with the East Midlands and critically the A1, and carries a large amount of heavy goods traffic. Locally the A47 provides direct access between Peterborough, Wisbech and Kings Lynn. Beyond these settlements, the area is lowly populated and is largely agricultural, consequently this section of the A47 is a key commuter route for people travelling into and out of these settlements for employment on a daily basis.

The long distance regional trips (and particularly heavy good vehicles) generate a consistent flow of traffic along the route, and when this is mixed with commuter traffic the local network comes under substantial strain and congestion is common, particularly on the approaches to key junctions such as the A47 / A141 Guyhirn Roundabout and the A47 / A1101 Elm High Road Roundabout.

Need for intervention and associated challenges

The need for intervention and the associated challenges can be summarised as follows:

- The A47 is a strategic route linking both the A1 and Peterborough with Kings Lynn, Norwich and beyond and also provides a key link for communities along the corridor and in particular Wisbech.
- The A47 highway is of inconsistent standard, comprising a mix of dual, older and modern single carriageway. Currently the A47 offers relatively slow and inconsistent journey times along its route and for connections of key population centres.
- Wisbech has poor transport links to the region and the rest of the country, arguably contributing to its isolation and deprivation;
- Due to the nature of the existing A47 corridor, carriageway standards and setting with a significant number of direct access' the corridor has safety issues leading to incidents;
- The Combined Authority has set a bold vision to double the GVA of the local authority whilst accelerating the growth of local housing, which is hindered by infrastructure constraints;
- The A47 corridor is generally set within a rural, agricultural landscape with environmentally sensitive surrounds in terms of habitat, archaeological potential, and flood risk. Any dualling or transport intervention needs to recognise this environmental context.

The A47 corridor scheme primary objectives are summarised as follows:

- **Improving journey times along the A47:** To address current congestion and delay, reduce journey times and improve reliability on the A47 and on local routes impacted by the A47
- **Providing increased capacity:** To cater for future travel demand between Kings Lynn, Wisbech and Peterborough
- **Rebalancing the economic growth across Cambridgeshire and Peterborough.** To encourage investment in higher value employment sectors in the north of Cambridgeshire, Peterborough and in Norfolk
- **Contributing to the growth of Cambridgeshire and Peterborough.** To ensure employment and housing growth along the A47 corridor can be accommodated

Option generation and assessment

The process of scheme development began in 2003 with an initial multi-modal study and was and evolved in 2014 through a series of workstreams, Council activities, reports and workshops.

Within the scope of the A47 study and development of the Strategic Outline Business Case and Options Appraisal Report the A47 scheme corridor has been split into four individual route sections to assess the potential dualling of the A47. The following twelve options were identified as being worthy of further assessment following development of an initial twenty sectional route options developed through 2015 to 2018.

Section	Option	Description
Section 1 (A16 to Thorney Bypass)	1.1	Dual carriageway immediately to the north of the existing A47
	1.2	Part online and offline dual carriageway to the north of the existing A47 (predominantly following path of disused railway)
	1.4	As Route 1.1 as a one-way single carriageway for eastbound traffic, utilising existing carriageway for westbound traffic
Section 2 (Thorney Bypass to Guyhirn)	2.2	Dualling of the A47 to the south of the existing A47
	2.3	Dualling of the A47 to the north of the existing A47
	2.4	Offline dualling Thorney to Wisbech north of Guyhirn village
Section 2 to 4 (Thorney Bypass to Walton Highway)	2.5	Offline single carriageway Thorney to Walton Highway running to the north of Wisbech
	2.6	Offline dualling Thorney to Walton Highway running to the north of Wisbech
Section 3 (Guyhirn to Wisbech)	3.2	Dualling of the A47 south / east of the existing alignment
	3.3	Dualling of the A47 south / east of the existing alignment, tying in east of Redmoor Roundabout (B198).
	3.4	Hybrid of Routes 3.2 and 3.3
Section 4 (Wisbech Bypass)	4.1	Online dualling of the A47

Each of these options has been assessed against criteria relating to Strategic, Value for Money, Financial, Delivery and Commercial themes, in line with the Government's 'Five Cases Model'¹, and reflecting the Government's Transport Appraisal Guidance (WebTAG) and local priorities.

Performance of options

The relative performance of each of the options is summarised below, along with comparisons of the challenges and benefits which need to be considered to progress the scheme through the Outline Business Case Stage of development.

Following the development and assessment of the sectional route options further analysis and in coordination with the project steering group, three Route Options have been developed combining the benefits of a corridor solution. The three Route Options take sectional options in combination from the three western sections of the corridor, balancing the impacts, benefits and support the scheme objectives, from the detailed assessments.

All three options utilise sectional Option 1.2 within the first section between the A16 and Thorney Bypass. The Routes then separate in three directions with Route A taking a northerly bias, and Route B crossing the River Nene close to White Hall. Route C takes a southerly bias interfacing with Guyhirn Junction being a combination of sectional Options 2.2, 3.4 and 4.1.

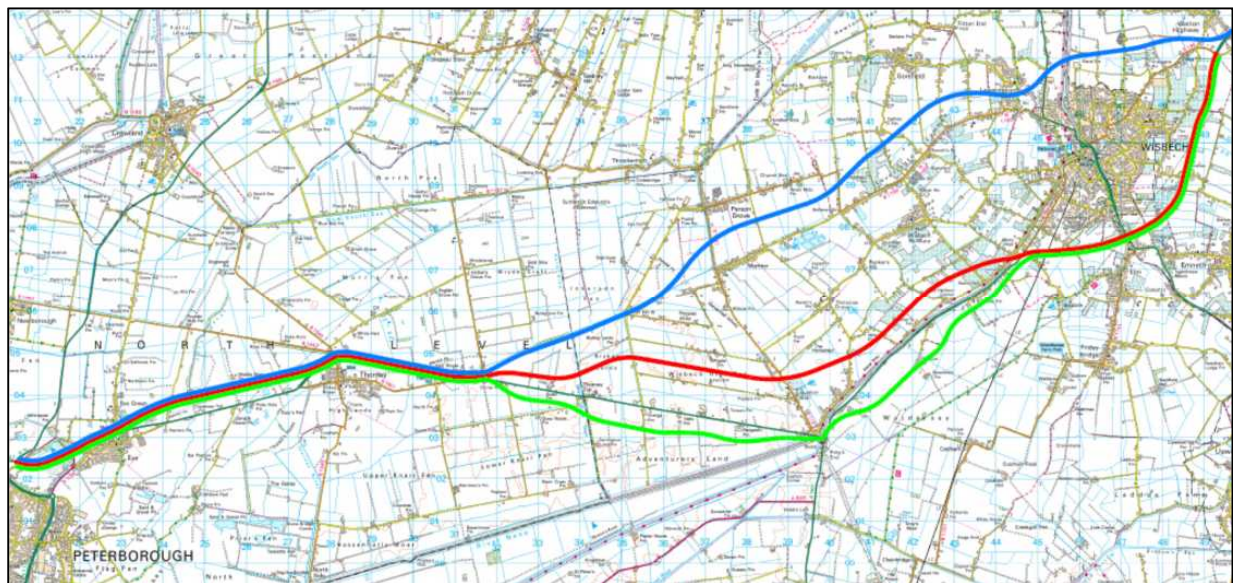


Figure A: Overview of Route Options

¹ Public Sector Business Cases using the Five Case (Green Book Toolkit), HM Treasury. (http://www.hm-treasury.gov.uk/data_greenbook_business.htm)

	Colour	CAPEX	OPEX	PVC	PVB	NPV	BCR
Route A	Blue	£304.2M	£5.4M	£309.6M	£648.7M	£339.1M	2.10
Route B	Red	£292.8M	£4.6M	£297.4M	£705.7M	£408.3M	2.37
Route C	Green	£337.0M	£4.9M	£341.9M	£619.9M	£278.0M	1.81

*Capex – Capital Costs

*PVC – Present Value of Costs

*BCR – Benefit to Cost Ratio

Opex – Operational Costs

PVB – Present Value of Benefits

All Costs in Millions (M)

Route Option A consists of combining the sectional options 1.2 and 2.6, running along the initial western section of the A47 and diverting north around the town of Wisbech. The majority of the route is offline from Thorney Bypass and as such supports easier buildability and construction opportunities than online widening. The Route passes north of Wisbech however is constrained dissecting Leverington and Walton Highway where land acquisition and severance may inversely impact community support. The Option delivers a high BCR at 2.1 and supports the north eastern developments and objectives in proximity to Wisbech.

Route Option B is initially of a similar alignment and standard to that of Option A however maintains a section of online widening west of Thorney Bypass before shifting offline before interfacing again north of Elm. The Route consists of sectional options 1.2, 2.4 and 4.1 and is the least expensive on construction however does have the added challenge of the largest extent of online widening that will impact local traffic conditions around Thorney junction and between Wisbech during construction. This Route also runs closest to the River Nene and SSSI, similarly has the potential risk of impact on the significant overhead power cables close to Begdale. The alignment supports the economic and growth aspirations to the south and west of Wisbech which combined with the lower cost aspect of the Route supports the best BCR of the three Route Options at 2.37.

Route Option C is the largest value scheme and longest Route option diverting south from Thorney Bypass, interfacing with Guyhirn Junction and continuing west around Wisbech. The Route is developed from the combination of sectional options 1.2, 2.2, 3.4 and 4.1 making it the longest and most expensive Option. However the Option alignment substantially supports the economic and housing growth aspirations to the lower western quadrant of Wisbech. The offset between satisfying the scheme objectives and imperatives is noted in the reduced BCR of 1.81 due to the increase in cost. Challenges with the Route are noted and need consideration with respect to environmental constraints in proximity to the SSSI and River Nene and also significant utilities which may require accommodation of diversionary works.

The following assumptions have been made in the assessment of the Route Options:

- Growth scenarios include for high growth and in accordance with the housing (30,000 new homes) and employment aspirations within the Local Plan and Combined Authority objectives;
- Maintenance costs are included and are based on values taken from the QUADRO user manual;

- Scheme opening year has been taken as 2026 and a horizon year assessment based on 2041;
- Transport user benefits have been calculated for a 60-year appraisal period in line with WebTAG
- Optimism Bias has been applied at 44%, as recommended by WebTAG for this stage of assessment

The three route options are all considered viable in terms of a Strategic, Value for Money, Financial, Delivery and Commercial context.

The Route Options would be procured either through entry on to Highways England's RIS 2 Programme or through a DfT funded procurement exercise, most likely through an OJEU tendering process with an ECI ECC Contract.

Introduction

Purpose of the Study and need for intervention

The overall aim of the A47 Dualling Study is to develop a Business Case for dualling of the entire length of the A47 between the A16 to the east of Peterborough and Walton Highway to the east of Wisbech (see Figure 1.1 below). This document as an Options Assessment Report (OAR) presents an assessment of shortlisted options for consultation, to dual the A47.

Role of the Options Assessment Report

The OAR is the first stage in developing solutions to identified problems within a locality. Its role is to collate all feasible options and evaluate these against a common benchmark and identify the overall best solutions and value for money.

The OAR forms part of the wider evidence base of the overall transport appraisal process to inform the design making process, as is illustrated in Figure 1.1.

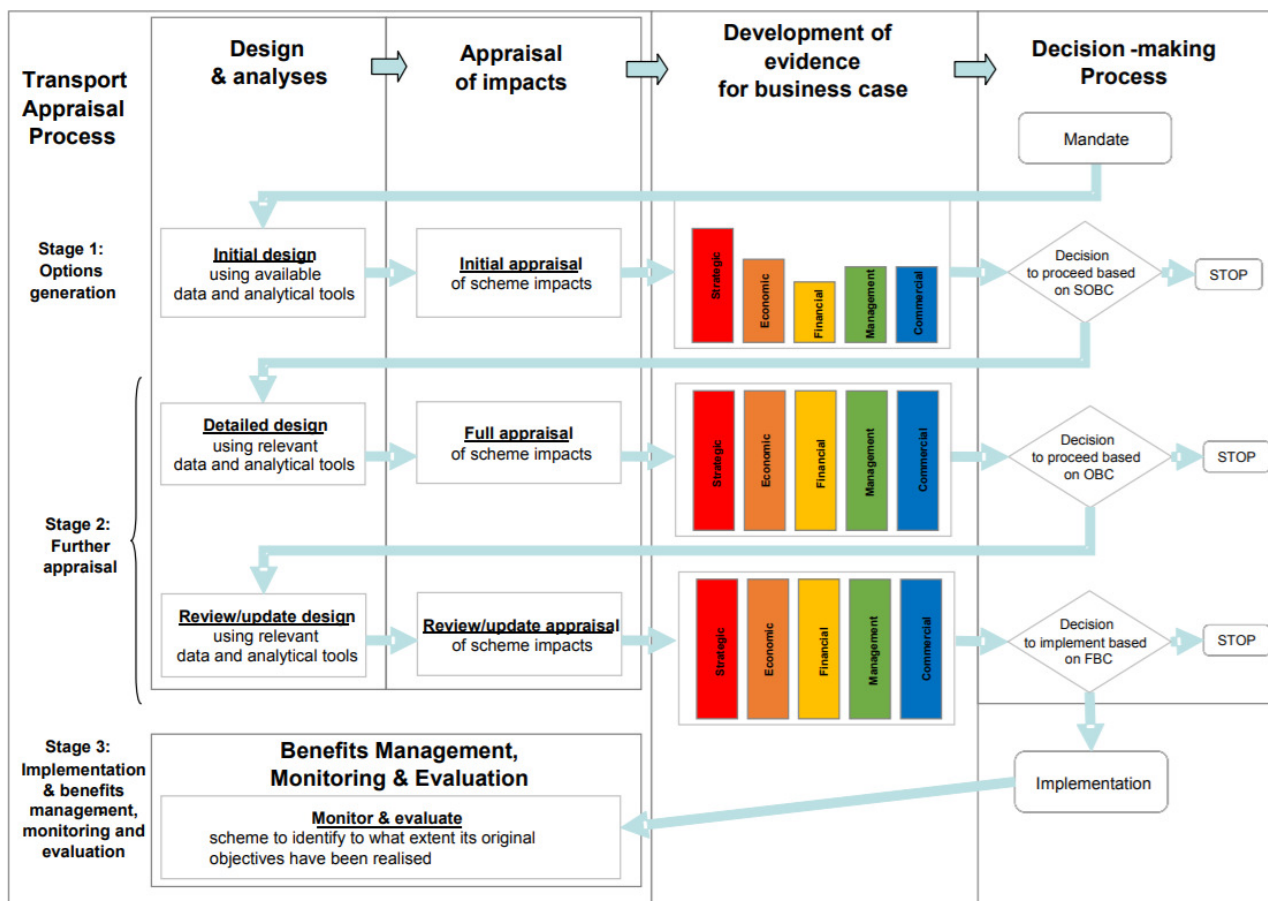


Figure 0.1: Overview of the Transport Appraisal Process²

² Source: WebTAG 'Guidance for the Technical Project Manager' (DfT: May 2018)

Details of the relationship between the OAR and the next stages of appraisal are detailed in the recently updated WebTAG ‘Guidance for the Technical Project Manager’ (DfT: May 2018) document. The guidance describes that the OAR documents the preferred and discarded options, and process undertaken. A secondary outcome is to set out the scope of further work required to fine tune the appraisal of preferred options leading in to the development of Appraisal Specification Report (ASR).

Scheme Objectives

The objectives of the A47 dualling improvements are:

- To address current congestion and delay, reduce journey times and improve reliability on the A47 and on local routes impacted by congestion on the A47.
- To provide conditions that encourage inward investment in higher value employment sectors in the north of Cambridgeshire, Peterborough and in Norfolk
- Improve access from the north of Cambridgeshire and from Norfolk to Peterborough the strategic road and rail networks to and from national markets;
- To ensure the infrastructure is in place to support employment and housing growth in accordance with the Local Plan and Combined Authority aspirations along the A47 corridor;
- Provide for future travel demand between Kings Lynn, Wisbech and Peterborough.

The objectives outlined above have been developed in partnership with the Cambridgeshire and Peterborough Combined Authority (CPCA) in support of their development aspirations. These are designed to be SMART.

- **Specific** to meeting the policy aspirations of the County in relation to economic growth, sustainable development, environmental betterment and social inclusion
- **Measurable** against a set baseline to monitor performance against set goals
- **Assignable** to the scheme and the relatable impacts brought about by its introduction
- **Relevant** to addressing the objectives of the policy agenda of the County; and
- **Time-based** to ensure tangible benefits are secured within project deadlines and policy framework timeframes.

To ensure objectives are met over the lifespan of the scheme and policy frameworks, future monitoring and evaluation, should funding be awarded, will be developed to ensure realisation of the benefits of the scheme.

Scheme Extents and Study Area

The study area is located in the northwest of East Anglia and is a key gateway into the region. The section of the A47 corridor considered within this study passes through Peterborough, Cambridgeshire and Norfolk.

The A47 runs across the East Midlands and East of England forming part of the Strategic Route Network (SRN) between its junction with the A1 west of Peterborough through Kings Lynn, Norwich, and Great Yarmouth before terminating at Lowestoft. In England, the highway authority for the SRN is Highways England (HE), acting on behalf of the Secretary of State for Transport.

The A47 also connects smaller communities along its route such as Thorney and Wisbech, as shown in **Error! Reference source not found.2** below.

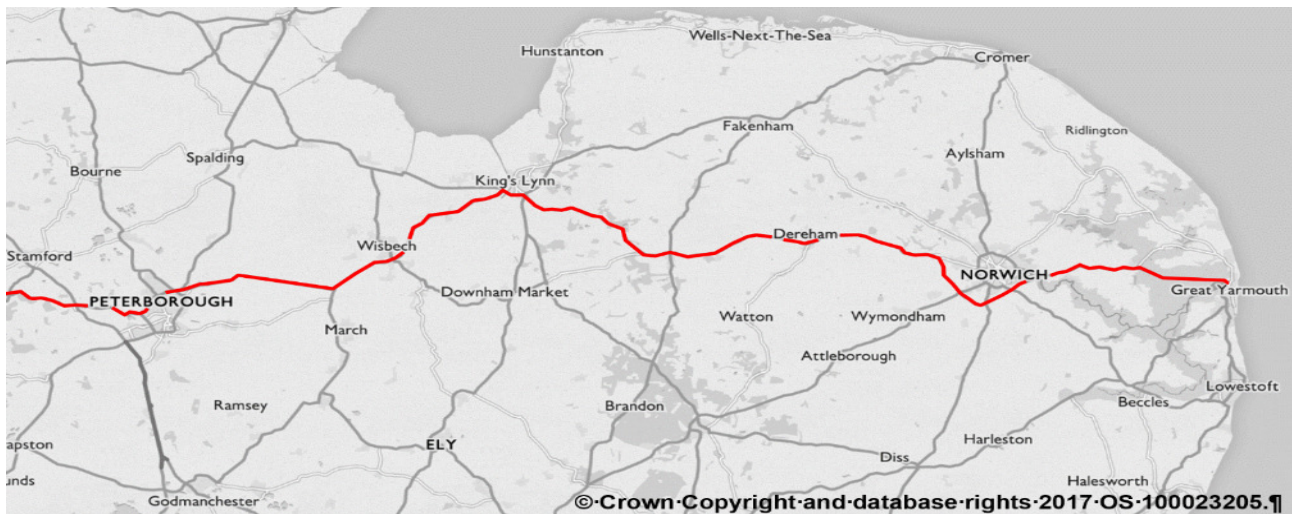


Figure 0.2: The A47 Corridor between Peterborough and Great Yarmouth

The A47 has been periodically diverted and upgraded to accommodate traffic growth and development along its route. The Wisbech Bypass was completed in 1984, running between the B198 Cromwell Road Junction to the south and the Lynn Road Junction to the north east, diverting the A47 route to the south and east of Wisbech town centre. The Walpole Highway/ Tilney High End Bypass opened in 1996, diverting the A47 and creating a 6-mile section of dual carriageway between Wisbech and Kings Lynn. Additionally, Thorney Bypass opened in 2005 creating a 3-mile section of dual carriageway around Thorney Village to relieve local congestion.

As a result of these and other interventions, the A47 between the A1 in the west and its junction with the A17 in the east is of variable standard, comprising a mixture of single and dual carriageway roads, with both at grade and grade-separated junctions at a number of locations along its route. The route can be broken down into a number of links as shown below:

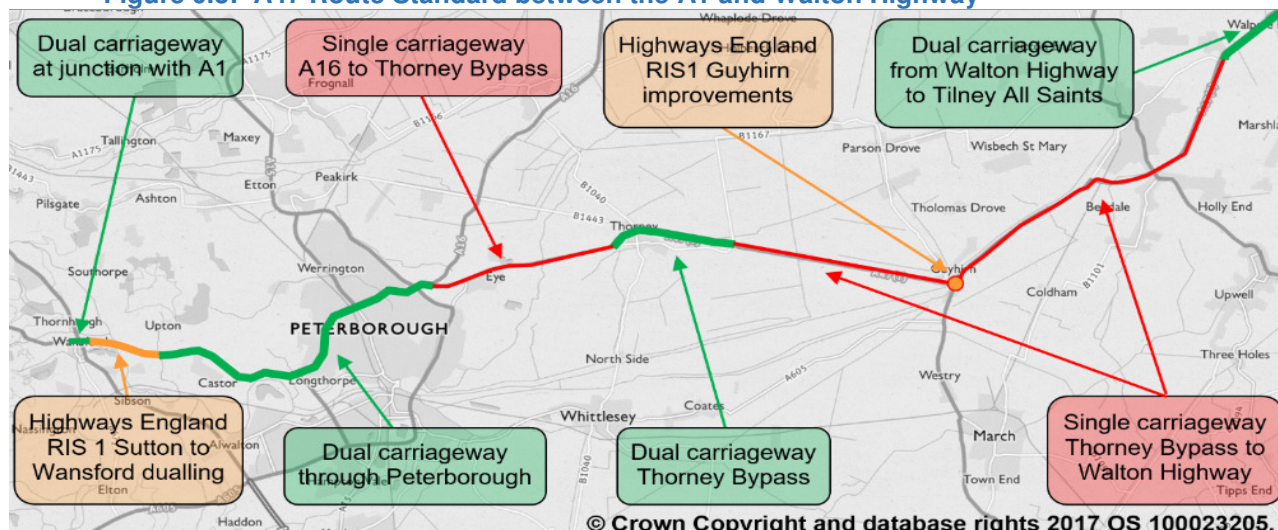
- A1 Wansford – Sutton: Older style S2 AP
- Sutton – A16: Dual Carriageway
- A16 to Former A1073: Modern WS2 AP
- Former A1073 – Thorney Bypass: Older style S2 AP
- Thorney Bypass: Dual Carriageway
- Thorney Bypass to Guyhirn: Older style S2 AP
- Guyhirn to Wisbech: Older style S2 AP
- Wisbech Bypass: Modern S2 AP
- Wisbech to Walton Highway: Older style S2 AP
- Walton Highway to Tilney All Saints: Dual Carriageway
- Tilney All Saints to A17 Kings Lynn: Older style S2 AP

Key:

S2 AP – Normal 2 lane all-purpose carriageway (~7.3m)

WS2 AP – Wide Single all-purpose carriageway (~10m)

Figure 0.3: A47 Route Standard between the A1 and Walton Highway



For the urban centres and areas around Peterborough, Wisbech and Kings Lynn, as well as villages along the A47 corridor, the A47 provides the most direct and practical route for travel between these locations. The majority of the local highway network surrounding these areas consists of local access routes between rural villages linking to the A47. This means longer distance journeys and journeys between Peterborough, Fenland and Kings Lynn are likely to require vehicles to travel via the A47. Whilst there is currently no direct train line linking these locations, there is a reasonably high quality X1 Bus services linking these communities via the A47.

Previous Studies and Information

A number of strategic transport and highway studies have been undertaken of the A47 within the defined study area and the wider A47 route over recent years. These include but not limited to the following:

- Norwich to Peterborough Multi-Modal Study (2003)
 - A47 Alliance, A47 Peterborough and Cambridgeshire, Case for Improvement Evidence and Wider Economic Benefits (2014)
 - A47 Alliance Route Strategy (2014)
 - A47 Thorney to Walton Highway – Initial Option Assessment (2015)
<https://www.cambridgeshire.gov.uk/transport-funding-bids-and-studies/transport-studies/>
- A47/ A12 Corridor Feasibility Study, Phase 1, 2 and 3 Reports (2015).

These studies, including their conclusions and recommendations, were considered when reviewing baseline conditions, options and subsequent assessment of the dualling of the A47.

Report Structure

In line with best practice for the production of an OAR, this report will consist of the following sections, with the aim of providing a comprehensive overview of baseline traffic, transport and development conditions across the study area:

- Chapter 1: Introduction
- Chapter 2: Current and Future Situation – summarising socio-economic characteristics; and local transport network. This chapter provides context for problems and constraints in the area, and establishes the need for intervention;
- Chapter 3: Initial Option Generation and Sift – describes the initial option development and sift based on key objectives and parameters;
- Chapter 4: Assessment of Short Listed Options – describes the shortlisted 12 options and development of the three key route options which have been identified for further consideration;
- Chapter 5: Detailed Assessment of Short Listed Options – describes the assessment based on the 'Five Cases Model' criteria – Strategic, Value for Money, Financial, Delivery, and Commercial. It also presents supporting commentary and highlights the discriminatory factors across the options.
- Appendices

All supporting appendices are included at the rear of the report.

Current and Future Situation

Introduction

This chapter seeks to establish the current situation along the A47 corridor and the implications of maintaining the 'status' quo into the future, without intervention. This section also describes the geographical context across the different administrative boundaries and provides an analysis of the socio-economic context of these areas.

This data establishes the baseline demographic conditions which will inform future development and appraisal of the proposed A47 Dualling Scheme.

2011 Census data has been obtained for the following census metrics:

- Age Structure;
- Method of Travel to Work;
- Location of usual residence and place of work by method of travel to work;
- Car Ownership; and

Index of Multiple Deprivation (IMD) Data (2015) was obtained from Ministry of Housing Communities and Local Government

Geographical Context

The A47 is a trunk road linking Peterborough to Kings Lynn and beyond as well as communities along the corridor. It provides a crucial East-West link between the East Coast ports and the East Anglian economy and the wider UK economy. Despite this importance it is a relatively slow route and suffers from a lack of capacity, compounded by slow moving HGVs and agricultural vehicles, and little opportunity for overtaking.

The majority of the region's main transport corridors are experiencing high traffic growth and capacity is constrained, with regular peak time congestion on key routes and especially close to key employment or service centres found in Cambridge, Peterborough and the market towns. Travel demand is expected to grow by 23% across the Combined Authority area to 2031, with increases of 28% in Cambridge and 30% in Peterborough forecast.

The A47 is the most important east-west route in the north of the Combined Authority area, and carries up to 42,000 vehicles a day around Peterborough, and around 22,000 vehicles a day on the single carriageway stretch around Wisbech. The mix of functions and the varying quality of the route leads to delays and to unreliable journey times. Significant levels of growth along the route, especially the housing and employment developments at Wisbech, will be delayed without improvements to the A47.

Growth

The Greater Cambridgeshire area is forecast to experience significant job and population growth over the next twenty years. For large parts of the area this represents a continuation of past trends.

Cambridgeshire is the fastest growing county in the country with over 77,000 new houses planned to 2031. This in turn will drive further economic growth and demand to travel.

The driver for this growth is Cambridge, which is now a world centre for high technology, biomedical research and knowledge based industries. This in turn is creating extreme housing pressures in Cambridge and so the majority of the new housing to supply the workers for the Cambridge economy will be outside of the City itself, particularly to the north of Cambridgeshire.

The A47 corridor scheme will be a vital contributor to the economic health of Wisbech, growth ambition linked with an additional 30,000 homes by 2031 and indeed the Cambridge economy, supporting its contribution to wider government objectives on economic growth.

Key Note: *The A47 is a key transport corridor of local, regional, national and international importance: It facilitates the movements of workers and freight goods both within the locality and through it.*

Statutory Bodies and Partnerships

Cambridgeshire, Peterborough and surrounding areas have a well-established, strong and diverse economy. To ensure continued growth and development of the Greater Cambridgeshire and Peterborough area is managed effectively, a number of funding and administrative bodies have been formed to direct inward investment and sustain a higher than UK average level of growth.

The following sub-sections outline these institutions, their policy agendas and the importance of the A47 corridor in relation to the meeting their respective objectives.

Greater Cambridgeshire Greater Peterborough Local Enterprise Partnership

The LEP played a key role in shaping development and funding decisions across the authority area. The vision and priorities of the LEP are set out in their Strategic Economic Plan (SEP) which contains several ambitions to removal barriers to economic growth including provision of ‘a transport network, fit for an economically high growth area that helps to facilitate sustainable growth and enhance prosperity.’

The Greater Cambridge Greater Peterborough (GCGP) LEP area is one of the UK’s fastest growing and most dynamic areas and makes a strong contribution to the UK, in the form of £30 billion gross value added (GVA) per annum. However, transport constraints represent a key challenge to supporting housing and employment growth and continued economic prosperity.

Many of the constraints on business and housing growth concern transport including:

- Road and rail ‘bottlenecks’ causing congestion and unreliable journey times
- Limitations on the capacity of the rail network
- Barriers to the delivery of housing for local workers
- Limited public transport in rural areas
- East-west connectivity across the LEP area, and beyond
- Potential for mode shift towards sustainable travel modes which are not fully realised
- Access issues in relation to Stansted and Luton Airports as well as Heathrow and Gatwick airports

With sections of the region's transport network already operating at capacity, the SEP identified the importance of investment in selected pinch point improvements on the highway network, which are key to unlocking housing and economic growth.

Cambridgeshire and Peterborough Combined Authority

The Cambridgeshire and Peterborough Combined Authority (CPCA) was formed in November 2016 following an agreement to pursue a devolution deal for the area from central government. Key ambitions of the CPCA include:

- £170 million to deliver new homes over a 5-year period in Peterborough and Cambridgeshire which includes affordable, rented and shared ownership housing;
- £20 million a year funding over 30-years to boost growth in the region;
- Responsibility for chairing a review of 16+ skills provision;
 - To double the size of the local economy;
 - To accelerate house building rates to meet local and UK need;
 - To deliver outstanding and much needed connectivity in terms of transport and digital links;
 - To provide the UK's most technically skilled workforce;
 - To transform public service delivery to be much more seamless and responsive to local needs; and
 - To grow international recognition for our knowledge based economy.

The A47 plays a key role in supporting the economic aspirations of the CPCA by facilitating the movement of goods and services, but more importantly by strengthening the economic agglomeration tendencies between skills centres along the corridor. Knowledge economies are highly dependent on these linkages between and access to highly skilled labour markets. Ensuring knowledge 'spillovers' are maintained and enhanced is vital in facilitating collaboration in knowledge intensive industries and services.

Key Note: Developing the sub-regional economy into a world-class economic hub is a key aim of regional institutions and requires the necessary infrastructure to enable this growth to fully exploit the knowledge economy.

Local Authority Areas

Three Local Authority areas cover the majority of land and local highway routes across the wider study area. A summary of these local authority areas can be found in the following sub-sections.

Peterborough City Council

Peterborough City Council (PCC) is a unitary authority within the geographical county of Cambridgeshire. As mentioned above, PCC now forms a key strategic partner in the Cambridgeshire and Peterborough Combined Authority and the Local Enterprise Partnership.

The City of Peterborough is a medieval city with a population of 183,600 residents, with a wider catchment of over 800,000 people. It is set to be England's fastest growing city by 2025.

Peterborough is the UK's top commuter city and has a vibrant workforce with a younger working population than the UK average. It has a pioneering skills vision which matches training provision with the needs of city businesses to ensure the local workforce is skilled in areas demanded by industry.

An Origin-Destination flow diagram of 2011 Census Location of usual residence and place of work by method of travel to work data produced for Peterborough is summarised in Figure 2-1. This indicates a significant net daily inflow of 13,164 people commuting from surrounding districts to work in Peterborough, particularly from South Kesteven, Huntingdonshire and Fenland.

Figure 2.1: Peterborough 2011 Census Origin-Destination Journey to Work Flows



The A47 runs east-west across Peterborough, and forms a section of a ring road around the city. Continuing east, the A47 runs towards Thorney before entering Fenland.

Fenland District Council

Fenland District Council (FDC) forms the local authority for Fenland within the wider county of Cambridgeshire. FDC represents a rural, sparsely populated district to the north of Cambridgeshire. The district is generally rural in character, with the majority of the population confined to a number of market towns including Wisbech, March, Chatteris and Whittlesey. Wisbech is the largest settlement within the district, located in north east corner towards the border with Norfolk.

An Origin-Destination flow diagram of 2011 Census Location of usual residence and place of work by method of travel to work data produced for Fenland is shown in Figure 2-2. This indicates a net outflow of commuters from Fenland to surrounding areas, most notably to Peterborough being the largest significant settlement within reasonable commuting distance. A significant number of people also journey to work in Kings Lynn and West Norfolk (KL&WN).

Figure 2.2: Fenland 2011 Census Origin-Destination Journey to Work Flows

The A47 runs across the north of the district, running in an east-west direction before to the east of the Guyhirn roundabout junction, and in a north-east to south-west direction between Guyhirn and Wisbech. Given the location of this route, and the lack of other strategic roads across Fenland, it is likely that people originating in Fenland in towns such as Wisbech and March are likely to use the A47 to commute to both Peterborough and KL&WN destinations.

Kings Lynn and West Norfolk Borough Council

Kings Lynn and West Norfolk (KL&WN) Borough Council represents the local authority for the Kings Lynn area within the wider county of Norfolk. Similar to Fenland, KL&WN represents a relatively rural district, with the majority of the population located in local market towns such as Kings Lynn and Downham Market, with Kings Lynn accounting for 55% of all employment within the borough and acts as its principle economic driver. The district also has established manufacturing and tourism industries.

An Origin-Destination flow diagram of 2011 Census Location of usual residence and place of work by method of travel to work data produced for KL&WN is shown in Figure 2-3. As was the case for Fenland, KL&WN has a net outflow of commuters to other districts, a significant proportion of which commute to and from Fenland. A significant number of people also commute to KL&WN from Fenland.

Figure 2.3: KL&WN 2011 Census Origin-Destination Journey to Work Flows

The A47 runs across the centre of the district, continuing from Fenland around Wisbech in a north-east to south west direction before meeting the A17 south of Kings Lynn. The A47 also runs in an east-west direction away from Kings Lynn towards East Anglia. It is likely, therefore, that those commuting both to and from KL&WN would utilise the A47 for such journeys as it provides a direct and convenient route between significant locations across both areas.

Analysis of the census data indicates that the A47 is a key corridor in facilitating the movement of the commuters into employment centres.

Key Note: Analysis of the NOMIS TTW areas indicates that the A47 is a key corridor in facilitating the movement of the commuters into centres across employment sectors.

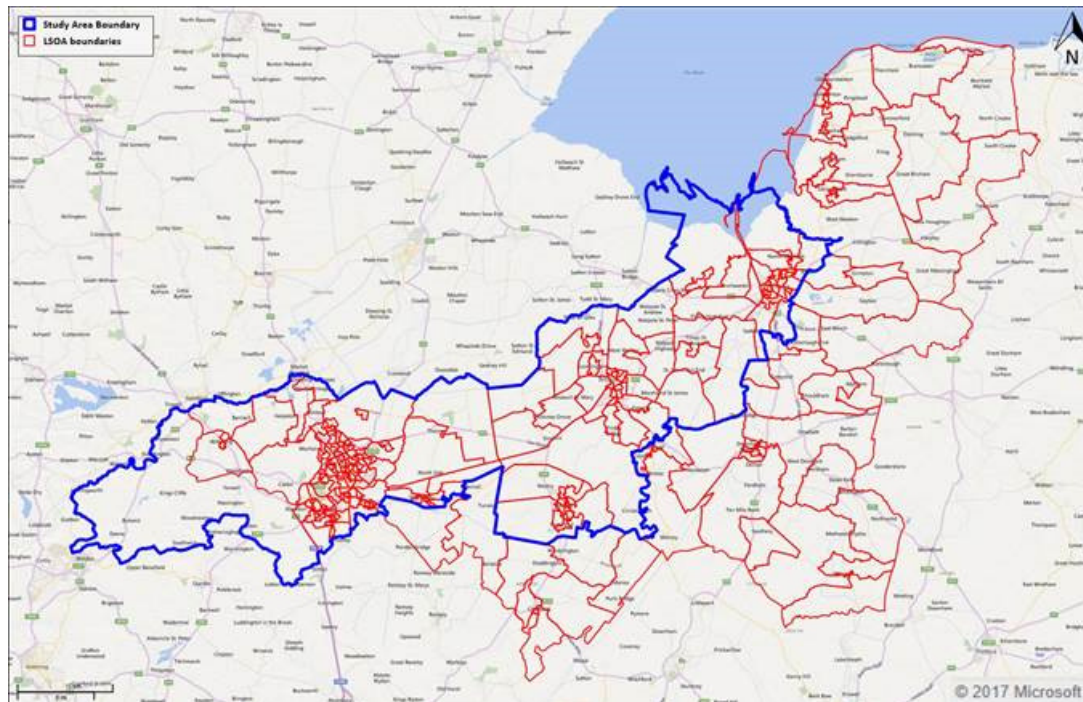
Current Socio-economic and demographic characteristics

Understanding the socio-economic and demographic characteristics of the corridor are important in understanding travel behaviours and demands. The following sub-sections outline key population and travel statistics for the three local authority areas.

Population Distribution

Population density across the study area is illustrated in Figure 2.4, with the study area boundary highlighted in blue. The study area itself contains a mix of Middle Super Output Areas (MSOA) and Lower Super Output Areas (LSOA) geographic boundaries.

For comparative purposes LSOAs across PCC, FDC and KL&WN have been presented (highlighted in red) to represent relative population density. Highly contrasting population densities can be seen across the study area, with the majority of the population located within Peterborough and Market Towns such as Kings Lynn, March and Wisbech and settlements further down the settlement hierarchy.

Figure 2.4: Relative Study Area Population Distribution

Age Structure

Across MSOAs and LSOAs within the study area, the variation in mean age is illustrated in Appendix J. This indicates a lower mean population age across more urban areas around Peterborough and around Kings Lynn. Higher mean population age values are shown across Fenland around Wisbech and in KL&WN surrounding Kings Lynn.

The proportion of the total population across the East of England Region aged 16 and under is 18.96% as shown in appendices. The demographic analysis shows that more urban areas such as Peterborough and Kings Lynn tend to have the greater proportion of people aged under 16, with lower proportions in the surrounding rural areas. Comparatively, the proportion of the total population across the East of England Region aged 65 and over is 17.52%. Appendix J defines the areas within the study area which have a higher proportion of the population aged 65 and over relative to the East of England, identifying a greater proportion of the population over 65 are generally across rural areas, away from urban centres. This provides a contrasting picture to the analysis of the proportion of younger people.

Key Note: Population statistics indicate that younger age groups tend to reside within the urban centres, however higher age groups tend to live in the more rural areas. This may indicate that highly skilled Professionals in the 35-55 age cohort will commute longer distances.

Method of Travel to Work

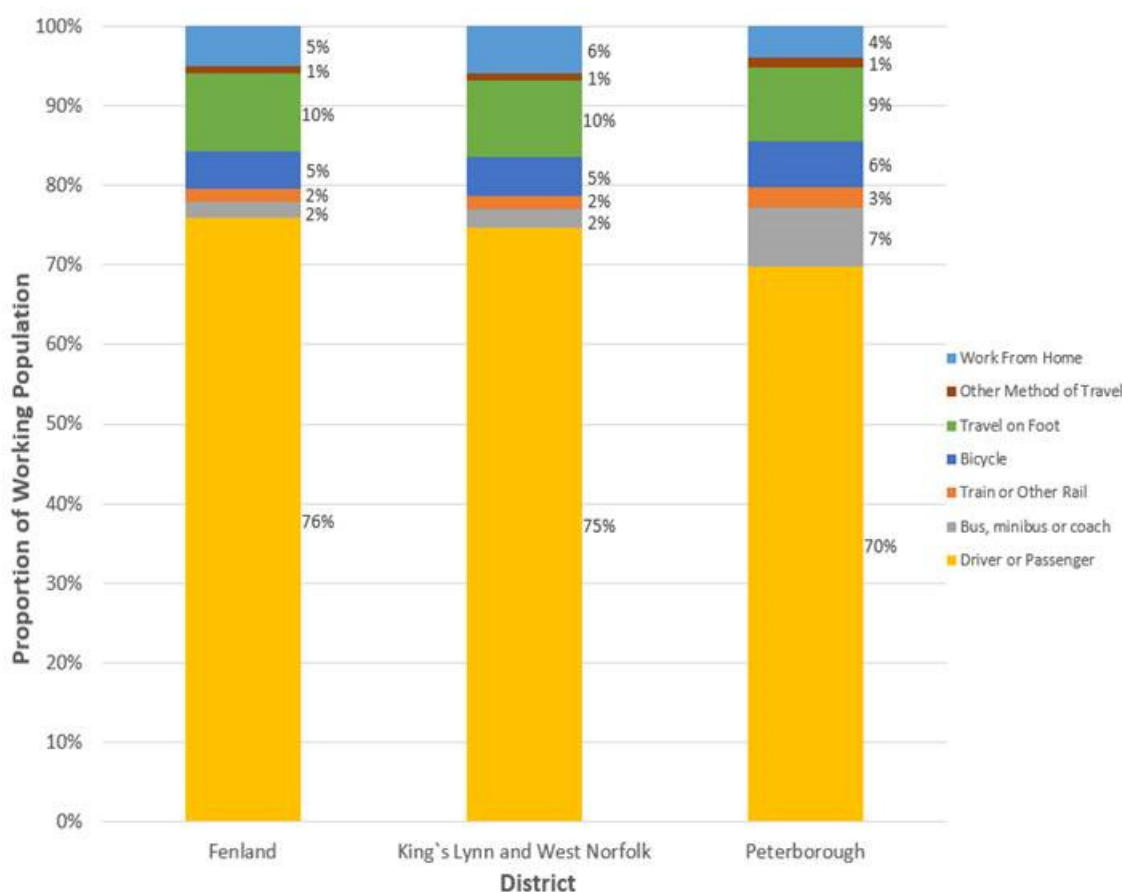
Using 2011 Census Method of Travel to work data, Figure 2.5 illustrates the proportion of each transport mode used as the preferred method of travel to work. The data indicates that there is little variation across the study area between methods of travel to work. The most notable difference is shown in bus use, with approximately 2% of the working population preferring the bus across Fenland and Kings Lynn, compared to 7% in Peterborough. These compare to an East of England regional average of 4% and a national average of 7%.

The proportion commuting by train is also low across all three districts, each district with a proportion below 4%. These values are well below the regional average of 8% and the national average of 9%.

It is clear that journeys as either a car driver or car passenger forms the most common travel mode for commuter journeys. The relative proportions of the working age population utilising a car as a method of travel to work is between 70% and 76% across the study area. These values are above the regional average proportion of 68% and the national average proportion of 64%.

The proportion of people walking and cycling to work are relatively similar across each of the three districts, and are roughly in line with national and regional average values.

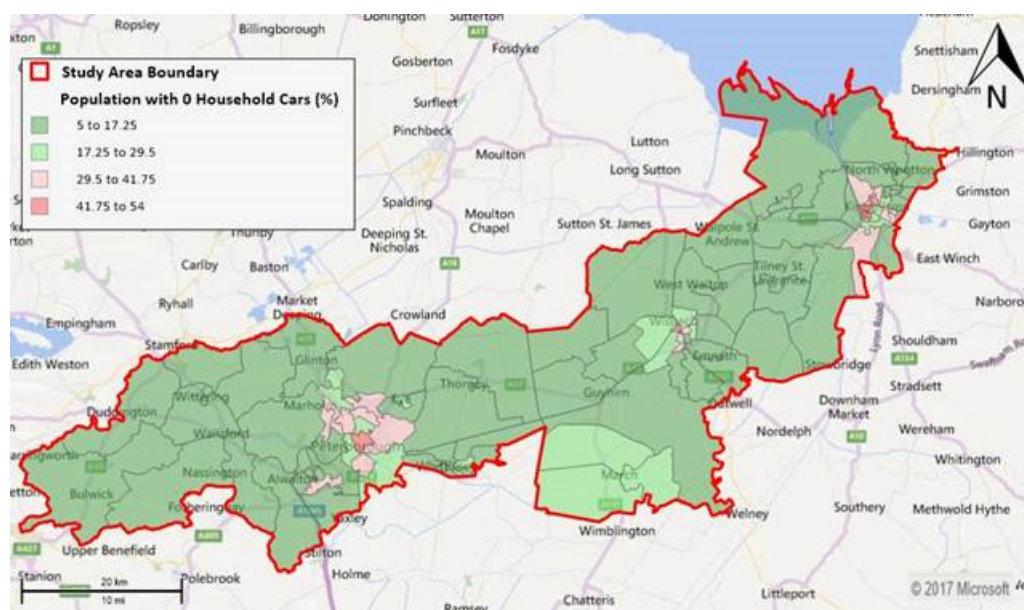
Figure 2.5: Relative Method of Travel to Work by District



Car Ownership

Across MSOAs and LSOAs within the defined Study Area, the variation in relative car ownership is illustrated in Figure 2.6. This highlights the proportion of the population of each MSOA and LSOA with zero cars in their household. A contrasting spatial distribution across the study area is shown, with a relatively high proportion of the population with access to at least one car across rural areas. Low car availability is observed in urban centres, particularly around Peterborough, Wisbech and Kings Lynn.

Figure 2.6: Relative Study Area Distribution of households with no Access to a Car



The proportion of the population across the East of England Region with zero cars per household is 18.5%. Figure 4 in Appendix J illustrates the areas within the study area which have a higher proportion of the population with zero access to a personal car than the East of England average, indicating the majority of the study area has an above average number of households with access to a car. The areas highlighted as having an above regional average proportion of the population with zero access to a car are confined to urban areas, with areas below the regional average across generally rural areas, where levels of dependency on car travel is likely to be higher.

Key Note: Analysis of TTW and car ownership statistics indicate that car ownership is higher than the regional and national average. Rural areas have the highest rates of ownership across the study area and urban areas the lowest.

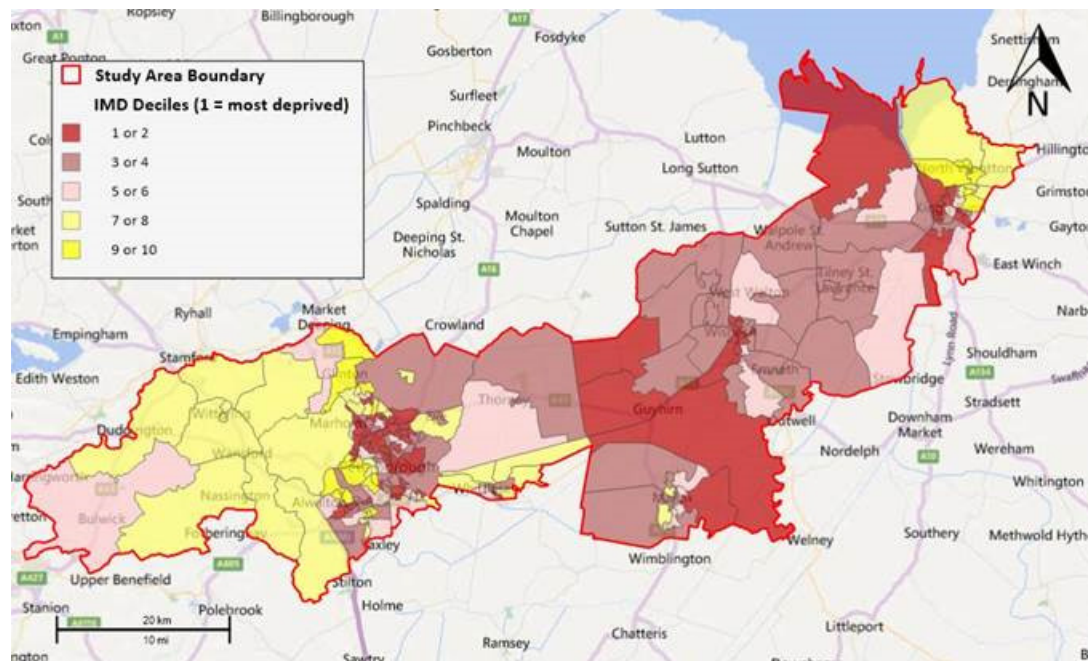
Index of Multiple Deprivation Data

Levels of economic deprivation across the study area have been estimated using the 2015 Index of Multiple Deprivation (IMD) obtained from the Department for Communities and Local Government (DCLG).

This data is available at LSOA level across England. LSOAs are ranked from 1 (most deprived) to 32,844 (least deprived). IMD data is also split into deciles (1 to 10), representing the most deprived 10%, 20% or 30% (and so on) of areas across England.

Within the study area, relative levels of deprivation are estimated using IMD deciles as shown in Figure 2.7.

Figure 2.7: Relative Study Area Distribution of IMD Deciles across each LSOA



As can be seen, many LSOAs towards the centre of Peterborough are amongst the 10% and 20% most deprived nationally as defined by deciles 1 and 2. Other areas considered amongst the most deprived nationally are shown across rural Fenland around Guyhirn and towards the east of the study area south and west of Kings Lynn.

Areas considered to be the least deprived nationally are found at the eastern and western edges of the study area. Notable areas considered amongst the least deprived nationally include residential areas to the west of Peterborough and areas to the north and east of Kings Lynn.

Transport Characteristics & Current Traffic Conditions

Road

The relevant transport characteristics for the A47 corridor are described below. The annual average daily traffic flows have been calculated for the A47 for the following sections and are shown in the table below:

- A16 to Thorney Bypass
- Thorney to Guyhirn
- Guyhirn to Wisbeck
- Wisbeck to Kings Lynn

Table 1: AADT on A47 in 2016³

From/To	Direction	2016 AADF 24 Hour*
A16 to Thorney	EB	12,159
	WB	12,688
	Total	24,847
Thorney/Guyhirn	EB	10,988
	WB	10,795
	Total	21,783
Guyhirn/Wisbeck	EB	9,629
	WB	10,179
	Total	19,808
Wisbeck/Kings Lynn	EB	10,482
	WB	10,557
	Total	21,039

*Supplemented with 2017 data for A16 to Thorney

At this level of the flow, DMBR Vol 5, section1, part 3, TA46/97 would suggest a Dual Carriageway (All Purpose) type of road to accommodate the observed level of flow, as illustrated in Figure 2.8.

Figure 2.8: Recommended Flow Ranges for New Rural Road links⁴

Carriageway Standard	Opening Year AADT	
	Minimum	Maximum
S2	Up to 13,000	
WS2	6,000	21,000
D2AP	11,000	39,000
D3AP	23,000	54,000
D2M	Up to 41,000	
D3M	25,000	67,000
D4M	52,000	90,000

The A47 currently suffers from a large number of commercial vehicle movements and congestion with slow moving HGV's and agricultural vehicles. Also there is a lack of diversions routes which adds to traffic delays due to incidents.

³ Source: DfT WebTRIS website, accessed 5th July 2018.

⁴ Source: DMRB <http://www.standardsforhighways.co.uk/ha/standards/dmr/vol5/section1/ta4697.pdf>

Future Road & Traffic Conditions

Traffic flows on the A47 are expected to increase significantly between 2016 and 2026, with an expected 19.66% increase over 10 years⁵. Calculated AADT flows are presented in Table 2 below.

Table 2: Estimated AADT on the A47 in 2017⁶

From/To	Direction	2026 AADF 24 Hour
Thorney/Guyhirn	EB	13,148
	WB	12,917
	Total	26,065
Guyhirn/Wisbech	EB	11,522
	WB	12,180
	Total	23,702
Wisbech/Kingslynn	EB	12,543
	WB	12,633
	Total	25,176

At this level of the flow, DMBR Vol 5, section1, part 3, TA46/97 would suggest a carriageway type of Dual Carriageway (All Purpose) to accommodate the observed level of flow.

In 2014 the Government published Highways England Road Investment Strategy (RIS) setting out a £15.1 billion investment for 2015-2020 to improve journeys on England's motorways and major A roads through schemes identified to tackle congestion, support economic growth, provide better connections and journey times. The RIS included a package of six schemes to improve journeys on the 115 mile section of the A47 between Peterborough and Great Yarmouth. Within the six schemes, improvements proposed involve converting almost 8 miles of single carriageway to dual carriageway and making improvements to junctions across the route to relieve congestion, improve capacity and the reliability of journey times for drivers.

In relation to schemes within the defined Study Area, the following schemes have been proposed along the A47:

- **A47 Wansford to Sutton dualling:** The section of the A47 between Wansford and Sutton is still currently single carriageway. This is seen to act as a bottleneck, resulting in congestion, increased journey times and a poor road safety. The proposed scheme is expected to relieve congestion, reduce journey times and encourage economic growth; and
- **A47/ A141 Guyhirn Junction Improvements:** The junction between the A47 (and the A141 (March Road) at Guyhirn currently experiences high levels of congestion and long delays. The proposed scheme is expected to increase the size of the

⁵ Source: TEMPro data

⁶ Source: DfT WebTRIS website, accessed 5th July 2018.

existing junction to relieve congestion, reduce journey times and encourage economic growth.

Rail

Currently there is no rail line running through the A47 corridor route connecting Peterborough, Wisbech and Kings Lynn directly.

To the south of the A47, stations are located at Peterborough, Whittlesea, March and Ely, ultimately continuing to Norwich. Between Peterborough and March services run with an approximate 60-minute frequency, with a journey time of 15 minutes. This service is a cross country service operated by East Midland Trains between Liverpool and Norwich. Journey times between Peterborough and Norwich are approximately 90 minutes.

Rail travel between Peterborough and Kings Lynn requires users to change services at Ely to the south of the study area, travelling via Downham Market, with a total journey time of approximately 85 minutes. There is currently no railway station serving Wisbech.

Table 3 highlights the number of passengers using these stations in 2016 and the level of growth over a 5-year period.

Table 3: ORR Estimate of Station Usage: Total entries and Exits for 2012/13 to 2016/17⁷

Station Name	2012-13	2013-14	2014-15	2015-16	2016-17
Peterborough	4,290,598	4,398,491	4,596,144	4,697,874	4,774,744
Whittlesea	23,494	26,938	26,102	28,456	30,474
March	350,246	357,864	378,586	386,610	395,950
Ely	1,878,426	1,976,134	2,068,240	2,131,818	2,209,350
Total	6,542,764	6,759,427	7,069,072	7,244,758	7,410,518

This indicates that rail usage has increased 13.3% in the last 5 years.

Key Note: The A47 corridor carries a substantial number of travellers and is operating above the DMRB guidance of 21,000 AADT flow for the current Wide Single carriageway type, with traffic flows expected to increase significantly in the future. Rail passenger numbers have also increased significantly over the last 5 years suggesting the capacity of both road and rail is reaching its design limits.

Future Rail Conditions

Rail trips in Cambridgeshire are expected to increase by 6.4%⁸ from 2016 to 2026, indicating a significant increase in rail patronage. Table 4 highlights the increase in rail trips between 2016/2017 and 2026/2027

⁷ Source: ORR <http://orr.gov.uk/statistics/published-stats/station-usage-estimates>

⁸ Source: TEMpro dataset v7.2 for Cambridgeshire County Council area selection.

Table 4: TEMPro forecast rail trip increase: 2016/2017 – 2026/2027

Station Name	2016-17	2026-2027
Peterborough	4,774,744	5,080,328
Whittlesea	30,474	32,424
March	395,950	421,291
Ely	2,209,350	2,350,748
Total	7,410,518	7,884,791

The ongoing Wisbech Railway Project is currently reviewing options to reopen the disused Bramley railway line between March and Wisbech, and reinstate rail services between Wisbech, March and Cambridge. A new rail link is considered necessary to support the Wisbech Garden Town (WGT) proposals and associated levels of housing development. In July 2017 FDC recently secured £3.2m funding for GRIP-3 study to test engineering options for reopening the railway line. The proposals also have support of the recently elected GCGP Metro Mayor.

It is anticipated that the reopening of the rail link would significantly improve connectivity and would unlock other economic benefit.

Key Note: *Whilst localised improvements are expected to be implemented in the near future, demand growth for road and rail travel is expected to increase on an already congested network.*

Future Development Proposals

Introduction

This section describes and reviews the local planning and development proposals across each of the three districts within the study area. Information is based on information and targets contained within relevant local plan documents, specific site allocation details as well as additional development information provided directly by local authorities feeding in to this study.

Key Local Plan Site Allocations and Proposed Developments

Peterborough City Council (PCC)

The Peterborough Local Development Framework (Peterborough Core Strategy Development Plan Document) adopted in 2011 covers the plan period to 2026. This document provides a summary of the overall priorities and objectives for PCC. These are as follows:

- Growth that is viable, deliverable and accompanied by appropriate infrastructure;
- Sustainable development that contributes to Peterborough's ambition to be the Environment Capital of the UK; and
- Improvements in the quality of life of people and communities through new development, regeneration, the provision of services and facilities, and the protection and enhancement of our heritage and environmental assets.

The **Regional Spatial Strategy (RSS)** for the east of England covers the Peterborough area. This requires PCC to make provision for 25,000 new properties between 2001 and 2021. It also includes an indicative target of 20,000 additional jobs over the same time period.

The **Local Development Framework Document** also outlines a requirement for a further 7,171 dwellings between 2021 and 2026. To help PCC achieve its growth aspirations and housing targets, the document outlines a number of housing and employment strategic site allocations across the authority area as sites for proposed development.

According to the latest available housing monitoring report published by PCC for March 2017, a total of 7,652 dwellings have been completed since 2009, with 19,649 remaining to meet its housing requirement. Table 5 provides a breakdown of these figures, and provides the locations of completions since 2009 and expected locations of future development.

Table 5: PCC Historical and Proposed Future Housing Development

Location	Minimum requirement at 2009 (to 2026)	Completions and Committed 2009 - 2017	Proposed Future Development Sites to 2026
City of Peterborough			
City Centre	4,300	1418	2,343
District Centres	1,300	391	1,118
Remaining Peterborough Urban Area	4,400	2506	2,139
Proposed Urban Extensions			

Hampton	4,100	1040	3,569
Paston Reserve	1,200	371	963
Norwood	2,300	0	2,300
Stanground South	1,500	1196	515
Great Haddon	5,300	0	5,960
Other Locations/ Villages within PCC authority Area			
Key Service Centres	600	432	330
Limited Growth Villages	450	205	381
Small Villages	50	70	21
The Countryside	0	23	10
Totals	25,500	7,652	19,649

PCC are currently preparing a new updated local plan document for the period to 2036, currently undergoing public consultation which is due for submission in early 2018. This proposes an additional site allocation located at Land to the north of Castor and Ailsworth (Great Kyne), with an indicative 2,500 proposed dwellings.

Fenland District Council (FDC)

The current FDC Local Plan (adopted May 2014) outlines the districts policies and broad locations for growth to the year 2031. In its vision statement, the FDC local plan states that:

“Between 2011 and 2031, Fenland will be a growing district, growing by 11,000 new homes, meeting the housing needs of all our communities. There will be increased employment opportunities across the district and a bolstered tourism economy, and existing businesses will be encouraged to expand. Growth in homes and jobs will be closely linked to each other, with new infrastructure such as schools, roads, health facilities and open space provision planned and provided at the same time as the new buildings.”

In relation to housing, Policy LP4 – Housing emphasizes a target for new housing of 11,000 properties across FDC by 2031. These are split over the areas found in Table 6 below, predominantly over the district’s four main market towns as well as a number of other locations in rural areas and villages.

Table 6: FDC Local Plan Statutory Housing Targets

Total	District Total	Wisbech	March	Chatteris	Whittlesey	Other Locations
	11,000	3,000 + 550 in KL&WN	4,200	1,600	1,000	1,200

In relation to strategic site allocations, the FDC Local Plan outlines a number of specific policies at key locations for housing and employment development in the years to 2031, each with the potential to act as a trip generator or attractor for the A47. Specific site allocations and broad locations for growth across the study area and wider FDC area identified within the Local Plan are detailed as follows:

- Wisbech (Policy LP8):
 - East Wisbech Urban Extension (900 dwellings + 550 houses in KL&WN);
 - South Wisbech Urban Extension (housing and employment);
 - West Wisbech Urban Extension (approximately 750 dwellings and employment); and
 - Nene Waterfront and Port (approximately 300 dwellings and employment).
- March (Policy LP9):
 - South-East March Urban Extension (600 dwellings);
 - South-West March Urban Extension (500 dwellings);
 - West March Urban Extension (2000 dwellings); and
 - March Trading Estate (employment use).
- Chatteris (Policy LP10):
 - East Chatteris (300 dwellings);
 - South Chatteris (850 dwellings and some employment); and
 - North Chatteris (100 dwellings and employment).
- Whittlesey (Policy LP11):
 - Land North and South of Eastrea Road (mixed use including approximately 500 dwellings).

In relation to employment, the FDC Local Plan expects a net increase of 7,200 jobs over the period 2011 to 2031, representing a significant increase in employment opportunities in line with growth aspirations.

Kings Lynn and West Norfolk Borough Council (KL&WN)

The KL&WN Site Allocations and Development Management Policies Plan (adopted 2016) complements the Local Authority's Core Strategy Document, allocating specific land and site allocations to deliver the requirements of Core Strategy development aspirations. The KL&WN Core Strategy (adopted 2011) sets out the spatial planning framework for the Borough up to 2026 and provides guidance on the location and scale of development.

The Core Strategy provides for 16,500 houses across the borough between 2001 and 2026. Between 2001 and 2013, total completions and outstanding committed development (sites with planning permission) totaled 10,155. The Site allocations and Development Management Policies Plan details site allocations which provide for a total of 6,294 dwellings. The document also expects additional development of approximately 222 dwellings per year across KL&WN based on historical trends from windfall site provision, taking total predicted housing growth of 9,180 dwellings from 2013 to 2026.

In relation to the defined study area and in relation to expected trip generation along the A47, the following developments specifically defined within the KL&WN Site Allocations and Development Management Policies Plan are likely to influence forecast traffic growth along the route:

- Kings Lynn Area, including West Lynn (1426 dwellings); and
- Knights Hill, East of Kings Lynn (up to 650 dwellings).

In addition, the following figures are given for additional development across KL&WN in settlements surrounding Kings Lynn and in rural areas:

- Main settlements and settlements adjacent to Kings Lynn (including the 550 houses located within the East Wisbech Urban Extension) = 5199 dwellings; and
- Rural areas and villages = 1095 dwellings.

Across the three local authorities, significant levels of housing and employment growth are expected up to 2026 and beyond. Should no intervention occur, the resulting impact on the A47 is likely to increase delays and congestion along the route, impacting the public, employers, economic growth and deteriorating the current environmental conditions along the route.

Key Note: *Across the three local authority areas, significant development proposals are planned along the A47 corridor which are likely to exacerbate existing issues and worsen traveller experiences on a carriageway which is currently operating above its DMRB guidance limits.*

Wisbech Access Study

In 2014 the GCGP LEP acquired Growth Deal funding to commission the Wisbech Assess Study, a large scale options assessment of multiple highway and junction interventions around Wisbech. The purpose of the study was to review the capability to cope with and facilitate 3500 additional homes and 2500 employment opportunities as part of the proposed FDC local plan. Phase 1 of the study was published in August 2017 and reviewed a number of potential options for the following locations:

- Cromwell Road;
- Elm High Road;
- Freedom Bridge Roundabout;
- Wisbech Bus Station;
- A New River Nene River Crossing to the south-west of Wisbech;
- A new proposed Western Link Road;
- Wisbech Southern Access Road;
- The A47 East Junction; and
- The A47 South Junction.

As a result of the study, an estimated £10.5m package of intervention options has been put forward including proposed improvements at a number of key junctions.

Wisbech Garden Town (WGT) Proposals

Proposals for WGT have emerged since the adoption of both FDC and KL&WN Local Plans and identified site allocations and broad locations for growth. Proposals for WGT involve a construction of an additional 10,000 to 12,000 dwellings and supporting community and retail facilities, in addition to those proposed in the FDC Local Plan.

It is hoped the high levels of deprivation in the area will be reversed through the provision of housing, access to jobs and training, generated by investment and economic growth. It is expected that significant investment in local and strategic infrastructure, local facilities and flood defence will be required to successfully deliver the full proposals for WGT. This would be in addition to the funding and investment to that proposed by HE and by the Wisbech Access Study. The proposed dualling of the A47 is one such investment that may ensure successful delivery of WGT proposals.

In June 2017, the CPCA provided £6.5 million in funding to progress the WGT to the next stage of its development, which will be used to test the viability of the proposals and investigate feasibility issues surrounding flood risk, land acquisition and transport infrastructure. It is expected that this will take two years to complete.

Key Note: *Improvement of the A47 corridor has the opportunity to significantly improve traveller experience and facilitate regional and national institution policy objectives.*

Intervention Objectives and High level Goals

Introduction

The previous chapter summarises the challenges which establish the need for intervention, and describes how these challenges may perpetuate in the absence of any intervention.

A set of intervention objectives have been identified which form a key element of the appraisal process and the basis for demonstrating the strategic case for each option developed. It also identifies how these objectives address the challenges identified, and demonstrates that the objectives are consistent with the wider policy framework.

Cambridgeshire and Peterborough Combined Authority Objectives

The CPCA has set the following objectives:

- Doubling the size of the local economy;
- Accelerating house building rates to meet local and UK need;
- Delivering outstanding and much needed connectivity in terms of transport and digital links;
- Providing the UK's most technically skilled workforce;
- Transforming public service delivery to be much more seamless and responsive to local need;
- Growing international recognition for our knowledge based economy; and
- Improving the quality of life by tackling areas of deprivation

Transport investment is recognised as playing a critical role in meeting these objectives through:

- Increasing network capacity (both road and rail);
- Improving connectivity, particularly around access to employment and housing;
- Unlocking new developments;
- Improving journey time and/or journey time reliability; and
- Providing greater mode choices such as walking and cycling, private car and public transport

The Combined Authority has subsequently agreed a methodology for prioritising infrastructure investment based on specific criteria which aligns with the key principles of a 5-case Business Case model (Strategic, Economic, Financial, Management) as set out below:

Table 7 – Combined Authority Criteria to Prioritise Infrastructure Investment

Case	Criteria
Strategic	<ul style="list-style-type: none"> • Reduce congestion • Unlock housing and jobs
Economic	<ul style="list-style-type: none"> • Scale of impact • Value for money
Financial	<ul style="list-style-type: none"> • Other funding sources / contributors
Management	<ul style="list-style-type: none"> • Delivery certainty • Project risks • Stakeholder support

The Combined Authority's Strategic Case assessment criteria can be considered the Core Objectives behind delivering infrastructure investment.

Scheme Objectives

A transport scheme can have both primary and secondary objectives. The primary objectives are the fundamental outputs of why the scheme is being promoted and therefore must be achieved whereas secondary objectives are other outputs that are achieved along the way, but are not necessary to the success of the scheme. The secondary objectives tend to be delivered as a consequence of delivering the primary objectives, as a causal chain effect.

The primary objectives therefore represent the transport outcomes required by the scheme:

A47 Primary Objectives

The Primary Objectives of dualling the A47 are:

- **Wider economic benefits:** Provide conditions that encourage inward investment in higher value employment sectors in the north of Cambridgeshire and in Norfolk
- **Improve connectivity:** Improve connectivity between the north of Cambridgeshire and Norfolk to Peterborough, the strategic road and rail networks and to national markets
- **Encourage homes and jobs:** Ensure that the planned employment and housing growth along the A47 corridor is promoted, whilst providing for future travel demand between Kings Lynn, Wisbech and Peterborough
- **Tackle congestion and improve journey time reliability:** Tackle congestion and address journey time reliability on the A47 and on local routes impacted by the traffic and congestion on A47

The table below shows how the comparison between the A47 scheme objectives and the Combined Authorities objectives.

Table 8 – A47 Scheme Objectives compared to Combined Authority Objectives

A47 Scheme Objective	Combined Authority Objective
<ul style="list-style-type: none"> • Improve connectivity 	<ul style="list-style-type: none"> • Improve connectivity
<ul style="list-style-type: none"> • Encourage jobs and homes 	<ul style="list-style-type: none"> • Unlock new developments , particularly around access to employment and housing
<ul style="list-style-type: none"> • Wider economic benefits 	
<ul style="list-style-type: none"> • Tackle congestion and improve journey time reliability 	<ul style="list-style-type: none"> • Increase network capacity • Improving journey time and/or journey time reliability

Secondary Objectives

The Secondary Objectives include:

- **Improve road safety:** Reduce personal injury accidents and improve personal security amongst all travellers
- **Improve community health:** by increasing cycling and walking and reducing transport related pollution
- **Sustainable travel:** Increase opportunities for travel, both local and inter-regional, by sustainable transport modes
- **Protect and enhance the environment:** maintain local distinctiveness and conserve natural resources

- **Promote social inclusion:** by ensuring that members of the community can access facilities

Measures of Success

The outcomes from the A47 scheme can be assessed and monitored in a number of ways against the primary objectives, as identified in the table below:

Table 9 – A47 Dualling: Measures of Success

Objective	Outcome	Method of Assessment
Wider economic benefits	<ul style="list-style-type: none"> • Reduced congestion along the A47 and at key junctions between Peterborough and Kings Lynn and • Continued/ increased level of investment in Peterborough, Cambridgeshire and West Norfolk. 	<ul style="list-style-type: none"> • Traffic and travel surveys along the A47 corridor • Census and journey to work statistics for 2021 and 2031 • Employment and salary statistics • Employment sector surveys
Improve Connectivity	<ul style="list-style-type: none"> • Reduced congestion and delay along the A47 corridor and at key junctions • Improved journey times and journey time reliability along the A47 corridor between Peterborough and Wisbech • Maintain and improve accessibility by all modes to key destinations and local settlements along the A47 corridor between Peterborough and Kings Lynn 	<ul style="list-style-type: none"> • Traffic and travel surveys along the A47 corridor • Residents survey undertaken by the relevant Local Authority • Census and journey to work statistics for 2021 and 2031
Encourage homes and jobs	<ul style="list-style-type: none"> • Ensure successful delivery of committed and statutory development across Peterborough, Cambridgeshire and West Norfolk • Improved job and employment prospects along the A47 corridor and in surrounding areas 	<ul style="list-style-type: none"> • Traffic and travel surveys along the A47 corridor • Local authority housing monitoring reports • Residents survey undertaken by the relevant Local Authority • Census and journey to work statistics for 2021 and 2031 • Employment and salary statistics • Employment sector surveys
Tackle congestion and improve journey time reliability	<ul style="list-style-type: none"> • Reduced congestion and delay along the A47 corridor and at key junctions • Improved journey times and journey time reliability along the A47 corridor between Peterborough and Wisbech 	<ul style="list-style-type: none"> • Traffic and Travel Surveys along the A47 corridor

Summary

This section has outlined the current situation experienced by travelers along the A47 corridor. It has outlined the policy context within which the options appraisal will be undertaken and highlighted the issues to be addressed by the shortlist of schemes to be taken forward.

Furthermore, it has highlighted the expected transport issues in the future, provided details of the expected future developments that will impact the transport network and described the scheme objectives and goals.

Problem

The issues and problems along the A47 corridor within the scheme extent can be summarised as:

- **Communities reliant on the A47:** The A47 is an important trunk road linking Peterborough to Kings Lynn and beyond as well as the communities along its route
- **Poor transport links:** The A47 is a mix of dual and single carriageway standards, with slow overall journey times and reaching capacity in parts. Slow journey times are compounded by slow moving HGV and agricultural vehicles
- **Lack of diversion routes:** The A47 has is a lack of adequate diversion routes, which compounds traffic delay following closures due to incidents
- **Communities:** Some of the communities along the A47 between Peterborough and Kings Lynn are some of the most economically deprived areas within the county, compounded by the isolation caused by poor transport links

Defined A47 Scope

The scope of the project is to dual the remaining sections of the A47 to ensure a continuous dual carriageway between the A1 and Kings Lynn, with the primary objectives of:

- Increasing wider economic benefits
- Improving connectivity
- Encouraging houses and jobs
- Reducing Traffic delay and congestion

The following section of the report outlines the options developed to mitigate and enhance the corridor, with those expected not to be feasible, or not adequately addressing the issues identified in the above section, being removed from the initial “sift” of options.

Initial Option Generation and Sift

Introduction

This chapter describes the option generation, considerations, assessment and sifting process which has taken place to date, and describes the options which have been identified for further consideration to a second stage

Option Generation and Assessment

The figure below summarises the evolution of the development of twenty options for intervention, through a series of formal and informal decisions, reports, consultations and internal regular meetings. Detailed constraint and option drawings can be found in Appendix A and H.

Figure 3.1 Twenty Strategic Options



Option Development Strategy

For the purpose of this study and report an approach of splitting the route under consideration in to four sections has been applied. Within the framework we have then developed and assessed options through a three phase approach, these being:

- Phase 1 – An initial options assessment against a series of scheme objectives to identify a shortlist of options to be taken forward for detailed assessment;
- Phase 2 – Detailed assessment of the shortlisted options, including concept highway design, costing, value for money assessment, geotechnical, environmental and flood and;
- Phase 3 – Development of potential route options based on the Phase 2 assessment of section interventions. Route options developed based on synergies of alignment, constraint mitigation, cost and optimized benefits

Phase 1 of the study is based on the DfT's Early Assessment Summary Table (East) and a 'long list' of potential options has been scored against objectives and the following areas:

- Strategic Case;
- Economic Case (Value for Money);
- Management Case (Delivery), and;
- Financial Case.

The Strategic Case drew its objectives from local, regional and national transport policy, whilst objectives for the Economic, Management and Financial Case were taken from the EAST framework were considered appropriate.

This assessment framework was used to score each of the options in a workshop attended by key stakeholders. From this assessment, a short list of options was produced, and these options were taken forward to a more detailed assessment in Phase 2.

Phase 2 of the study developed each of the options progressed from Phase 1 to a concept design level, considered flood risk and construction issues, and calculated a benefit to cost ratio (BCR) for each of the options in isolation.

Similarly Phase 3 of the study develops the short listed options in to Route options providing route corridors between the A16 and Kings Lynn. The routes were initially split in to four sections acknowledges that there may be a concentrated benefits in improving particular sections of the route in a phased approach. Through the development of the section options however the overarching benefits of route intervention have become apparent and therefore three Route Options have been identified and BCR's calculated for consideration.

Phase 1 Initial Option Development and Assessment

Phase 1 Assessment Narrative

The Phase 1 initial option assessment considered a ‘long list’ of potential highway improvements along the route. A series of scheme objectives were identified based on the DfT’s Early Assessment Summary Table (EAST) and review of a local, regional and national policy documents. Each of the options were scored against the scheme objectives in a workshop with technical specialists and built on the previous options study. From this assessment, a ‘short list’ of twelve options was identified for progression to a more detailed assessment in Phase 2 of the study.

Scheme Parameters

Scheme options have been developed based on DMRB core principles with respect to cross-section, link type, horizontal and vertical link design, roundabout, slip road and junction design.

Assessment on junction capacity has shown that the junction strategy for dualling of the A47 at this stage should be that all junctions are at-grade with key junctions formed as roundabouts. Further detailed assessment should be considered to review justification for grade separated junctions, although passive designs may be considered for future-grade separation.

Highway standards departures assessment has not been completed at this stage of scheme development.

Policy Review and Option Identification

Objectives were identified based on the standard Government priorities used within the DfT’s Early Assessment Summary Table (EAST), and which have been categorised based on HM Treasury 5 case business case principles (strategy, economy [value for money], delivery [management], financial and commercial). The commercial case has not been included in this study as it focuses largely on scheme funding which is considered to be speculative for this level of study and scheme development.

Section 1 – A16 to Thorney Bypass

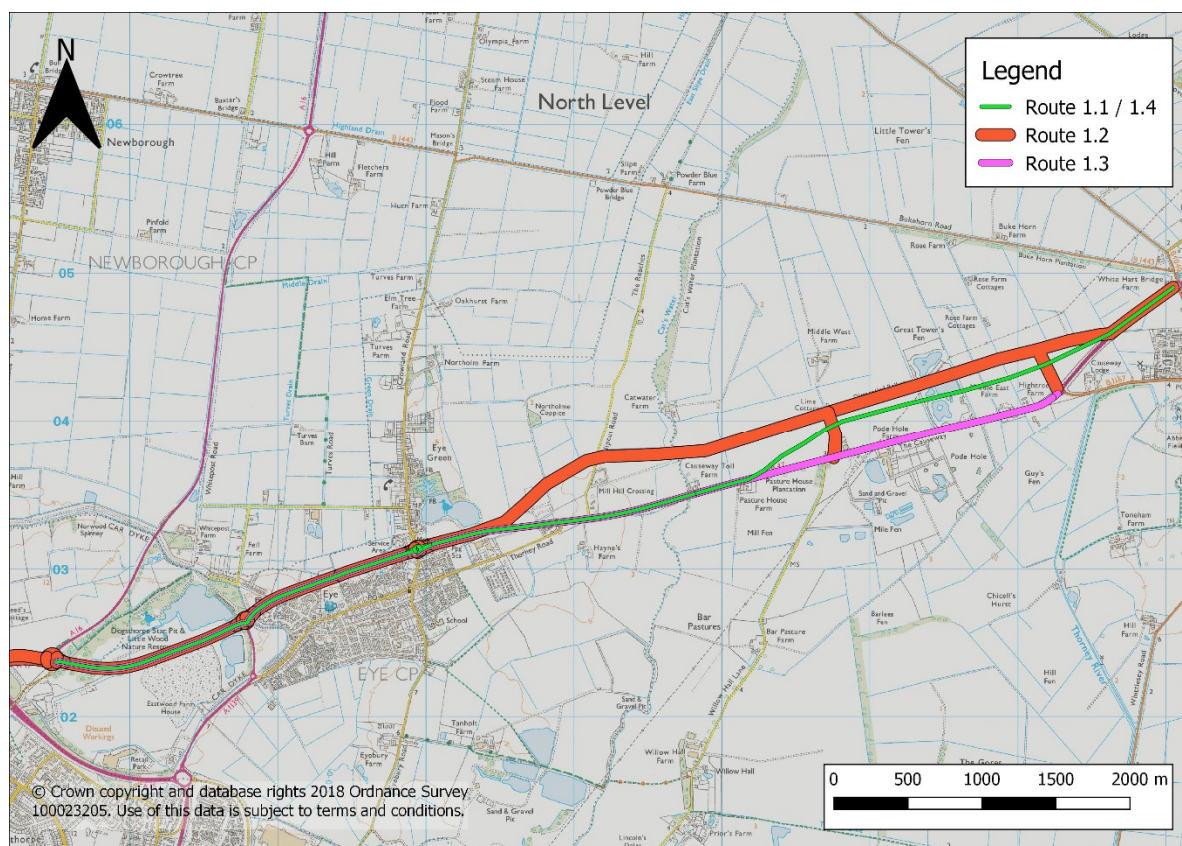
Section 1 runs between the A47 and A16 roundabout at Peterborough in the west and ties into the A47 Thorney Bypass in the east between the roundabouts between the A47/B1167 and A47/B1040. The existing A47 alignment takes an almost straight line between these two locations. There are two existing roundabouts positioned along this route providing access to the village of Eye. In addition, there are a small number of residential and agricultural premises fronting onto the existing highway, as well as Pode Hole Quarry which has direct access onto the A47.

Four sectional route options have been identified:

- **Option 1.1:** Online widening proceeded by dual carriageway construction immediately to the north of the existing A47
- **Option 1.2:** Part online and offline dual carriageway construction to the north of the existing A47 (predominantly following path of disused railway)
- **Option 1.3:** Full online dual carriageway to the north of the existing A47

- **Option 1.4:** As Route 1.1 with one way new build carriageway for eastbound traffic, utilising existing carriageway for westbound traffic

Figure 3.2: Section 1 (A16 to Thorney Bypass)



Sectional Route Option Description			
1.1 (Green D/Carriageway)	1.2 (Red)	1.3 (Pink)	1.4 (Green S/Carriageway)
Length: 8,096m	Length: 7,868m	Length: 7,022m	Length: 8,096m
No of junctions: 6	No of junctions: 5	No of junctions: 4	No of junctions: 6
No of bridges: 2	No of bridges: 2	No of bridges: 2	No of bridges: 2
No of culverts: 15	No of culverts: 7	No of culverts: 5	No of culverts: 15

Section 2 – Thorney Bypass to Guyhirn Junction

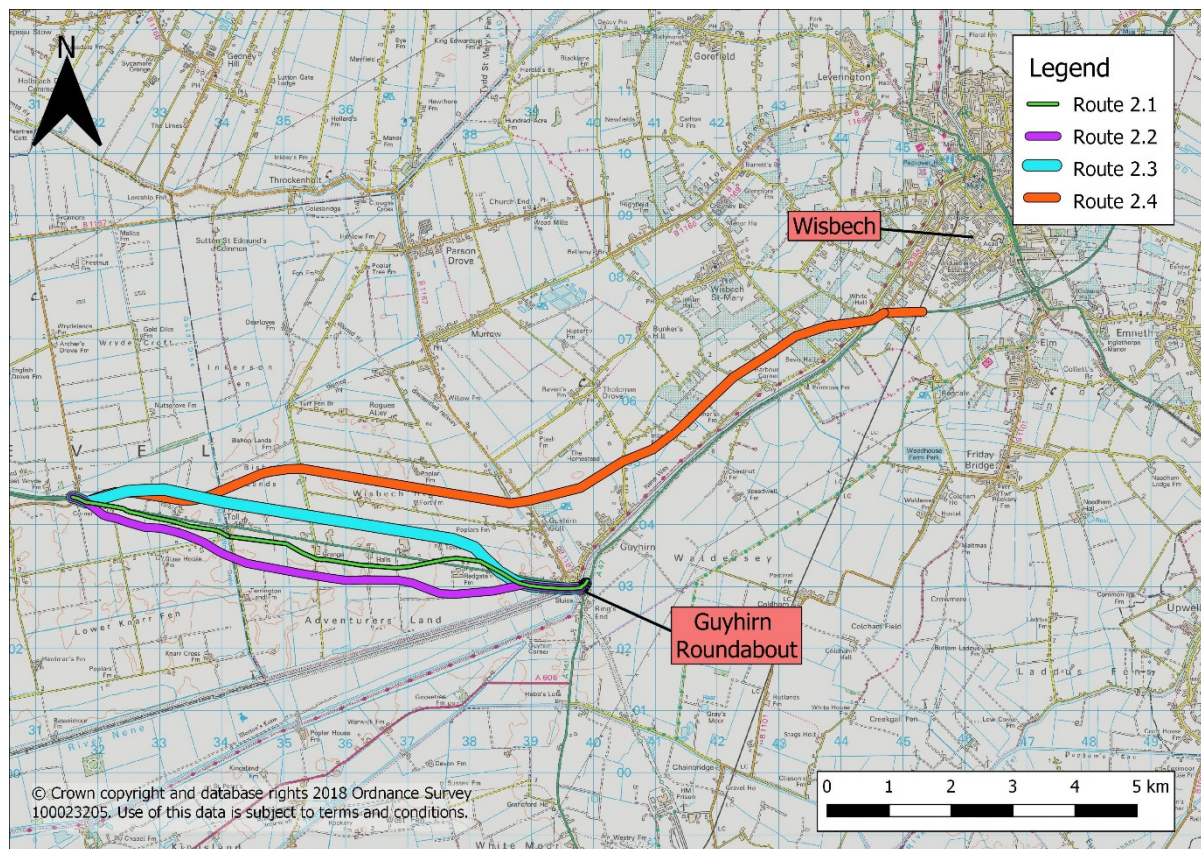
Section 2 runs between the dual carriageway section of A47 at Thorney to the west and Guyhirn roundabout between the A47 and A141 to the east. The existing A47 carriageway takes a direct straight line between these two locations and has a number of residential, agricultural and industrial premises fronting onto the highway. Immediately to the west of Guyhirn roundabout, the A47 crosses the River Nene, and running in a south westerly direction along the River Nene from the roundabout is a SSSI which forms a major constraint. All routes have been designed to avoid encroachment onto this SSSI. Highways England are progressing a scheme to upgrade the existing Guyhirn roundabout to increase capacity. Routes 2.1 - 2.3 in this section are considered to tie into this Highways England

scheme. The whole of section 2 is located within flood zone 3, and the existing carriageway levels along this section should as a minimum be maintained. It is however anticipated that the road levels will need to be increased to satisfy climate change projections.

Four sectional route options have been identified:

- **Option 2.1:** Online dualling of the A47
- **Option 2.2:** Dualling of the A47 south of the existing A47
- **Option 2.3:** Dualling of the A47 north of the existing A47
- **Option 2.4:** Offline dualling Thorney to Wisbech north of Guyhirn village

Figure 3.3: Section 2 (Thorney Bypass to Guyhirn)



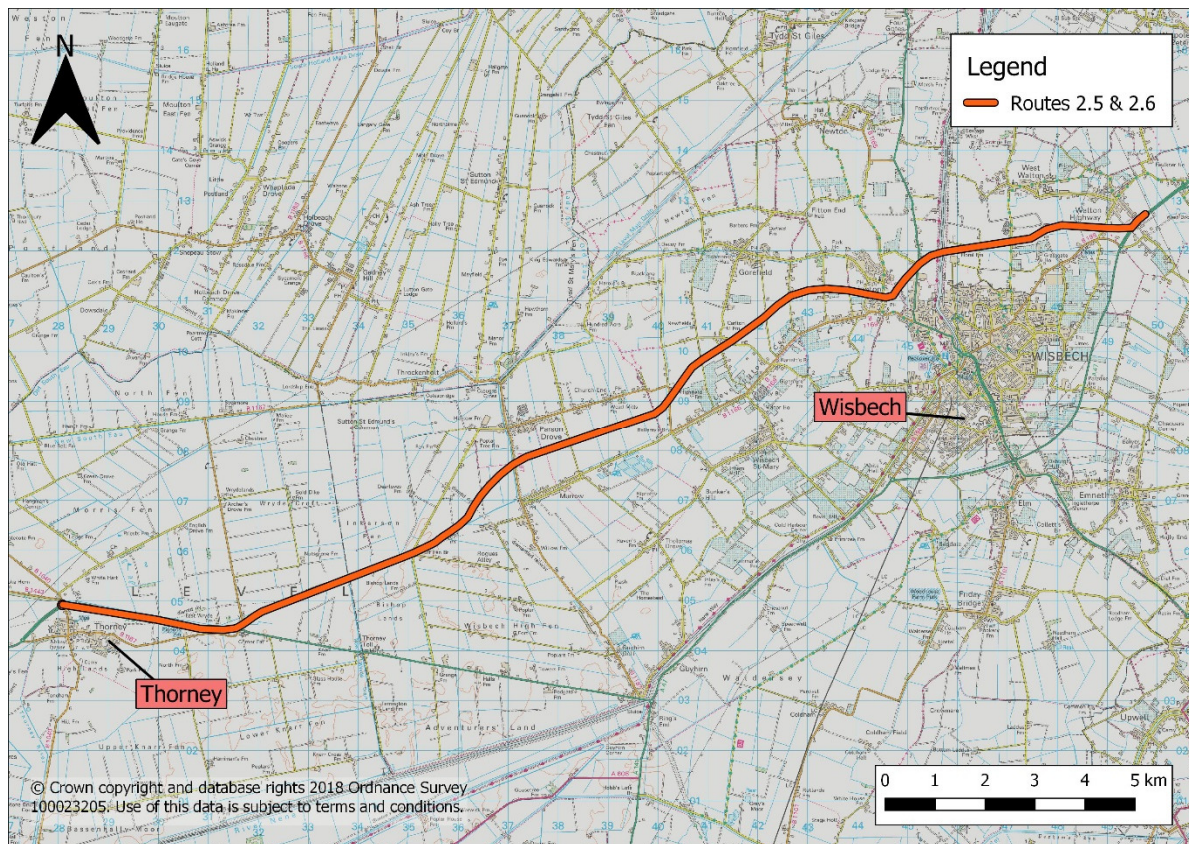
Sectional Route Option Description			
2.1 (Green)	2.2 (Purple)	2.3 (Blue)	2.4 (Orange)
Length: 8,464m	Length: 8,474m	Length: 8,462m	Length: 14,593m
No of junctions: 5	No of junctions: 4	No of junctions: 3	No of junctions: 3
No of bridges: 6	No of bridges: 6	No of bridges: 6	No of bridges: 7
No of culverts: 17	No of culverts: 16	No of culverts: 26	No of culverts: 24

Two further sectional route options have been identified:

- **Option 2.5:** Offline single carriageway Thorney to Walton Highway running to the north of Wisbech

- **Option 2.6:** Offline dualling Thorney to Walton Highway running to the north of Wisbech

Figure 3.4: Section 2 to 4 (Thorney Bypass to Walton Highway)



Sectional Route Option Description	
2.5 (Orange – S/Carriageway)	2.6 (Orange – D/Carriageway)
Length: 21,721m	Length: 21,721m
No of junctions: 5	No of junctions: 5
No of bridges: 14	No of bridges: 14

Section 3 – Guyhirn to Wisbech

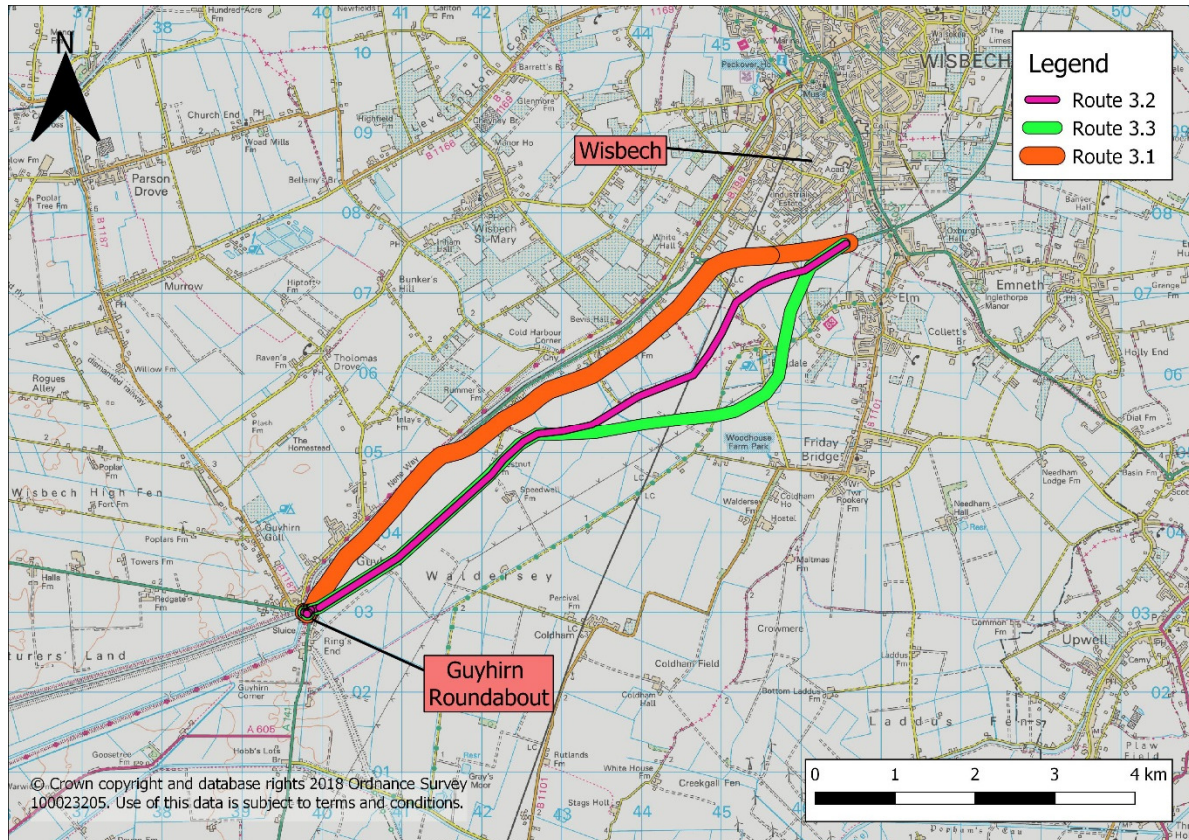
Section 3 runs between the Guyhirn roundabout between the A47 and A141 to the south, and the roundabout between the A47, B198 and Redmore Lane at Wisbech to the north. Highways England are progressing a scheme to upgrade the existing Guyhirn roundabout to increase capacity. All sectional route options within section 3 are considered to tie into the Highways England schemes.

The existing A47 alignment runs parallel to the River Nene between these two locations. There are a number of side roads from the existing alignment serving residential and agricultural premises. There are environmental constraints along the river to the west; therefore all options along this section do not encroach any land to the west of the existing A47 alignment.

Seven sectional route options have been identified and are described and shown below:

- **Option 3.1:** Online dualling of the A47
- **Option 3.2:** Dualling of the A47 south / east of the existing alignment
- **Option 3.3:** Dualling of the A47 south / east of the existing alignment, tying in east of Redmoor Roundabout

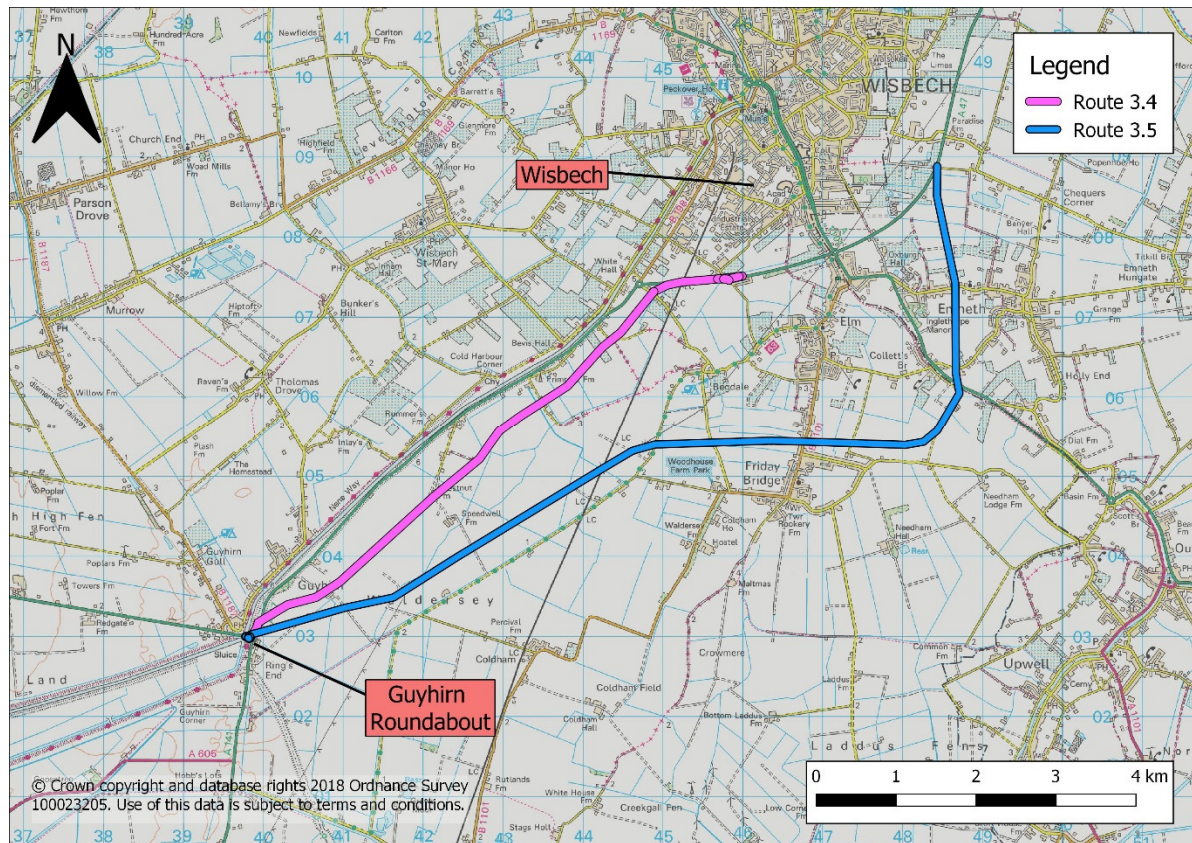
Figure 3.5: Section 3 (Guyhirn to Wisbech)



Sectional Route Option Description		
3.1 (Red)	3.2 (Purple)	3.3 (Green)
Length: 7,545m	Length: 8,587m	Length: 8,915m
No of junctions: 3	No of junctions: 3	No of junctions: 3
No of bridges: 5	No of bridges: 7	No of bridges: 7
No of culverts: 7	No of culverts: 13	No of culverts: 19

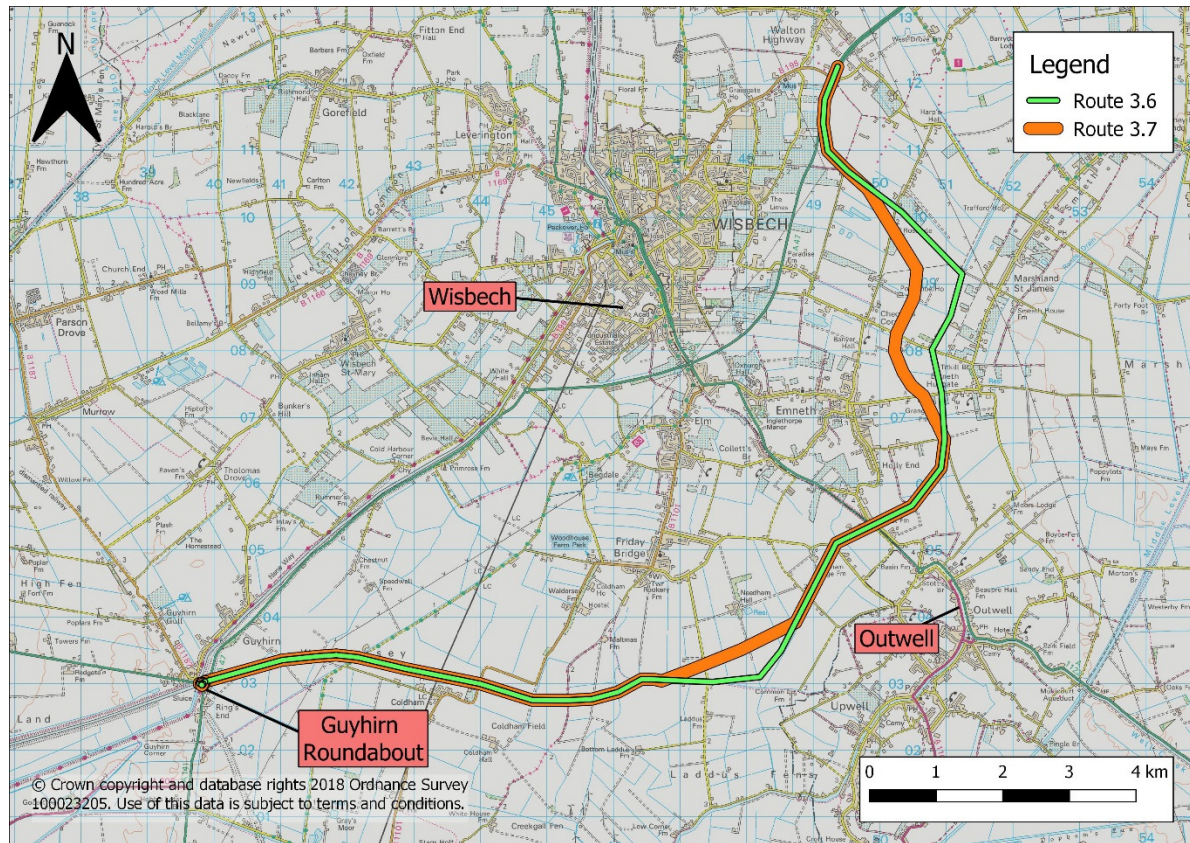
- **Option 3.4:** Hybrid of Routes 3.1, 3.2 and 3.3
- **Option 3.5:** Offline dualling of the A47 between Guyhirn and Walton Highway running south of Elm but north of Emneth and Friday Bridge

Figure 3.6: Section 3 (Guyhirn to Wisbech)



Sectional Route Option Description	
3.4 (Purple)	3.5 (Blue)
Length: 7,582m	Length: 13,275m
No of junctions: 3	No of junctions: 3
No of bridges: 4	No of bridges: 5
No of culverts: 18	No of culverts: 24

- **Option 3.6:** Offline dualling of the A47 between Guyhirn and Walton Highway running south of Emneth and Friday Bridge
- **Option 3.7:** Similar to Route 3.6 with minor alignment variations

Figure 3.7: Section 3 (Guyhirn to Wisbech)

Sectional Route Option Description	
3.6 (Green)	3.7 (Orange)
Length: 18,971m	Length: 19,438m
No of junctions: 3	No of junctions: 3
No of bridges: 10	No of bridges: 10
No of culverts: 32	No of culverts: 32

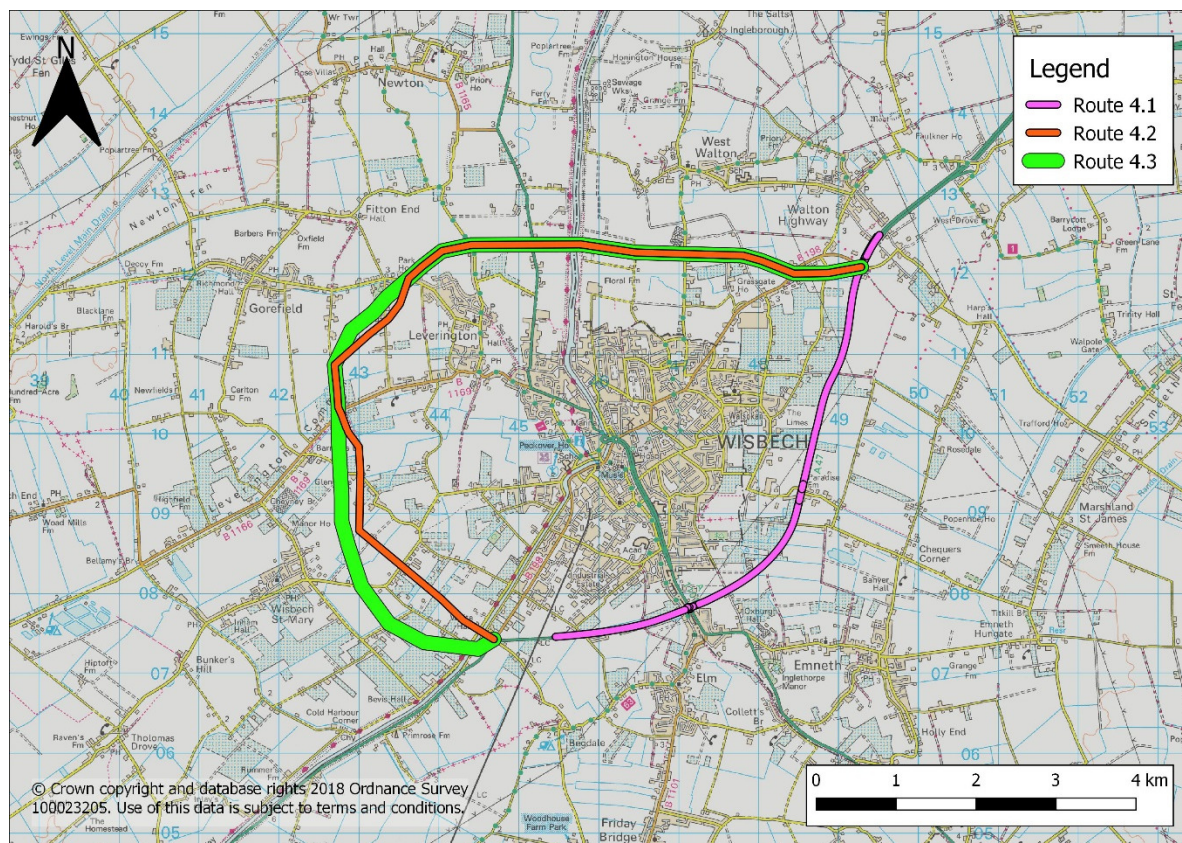
Section 4 – Wisbech Bypass

Section 4 runs between the roundabout between the A47, B198 and Redmore Lane at Wisbech to the south and the roundabout between the A47 and Lynn Road to the north. From this point northwards, the A47 is dual carriageway. The existing A47 runs around the perimeter of the town of Wisbech and within this section are a number of existing and proposed junctions link into the town of Wisbech. All land between the town of Wisbech and the existing A47 alignment has been earmarked for future growth as part of Wisbech Garden Village; this area forms a major constraint through this section. In addition, overhead electric cables supported by pylons cross the existing A47 at three separate locations along this section. Over 50% of this section is located within flood zone 3, and based on recommendations embankments will need to be maintained and potentially increased to account for future climate change projections.

Three sectional route options have been identified and are described below:

- **Option 4.1:** Online dualling of the A47
- **Option 4.2:** Northern Orbital of Wisbech, tying in with the A47 at its junctions with the B198 (Redmoor and Lynn Road junctions)
- **Option 4.3:** Variation on Route 4.2

Figure 3.8: Section 4 (Wisbech Bypass)



Sectional Route Option Description		
4.1 (Pink)	4.2 (Orange)	4.3 (Green)
Length: 6,991m	Length: 11,625m	Length: 12,952m
No of junctions: 5	No of junctions: 4	No of junctions: 4
No of bridges: 1	No of bridges: 9	No of bridges: 10
No of culverts: 5	No of culverts: 18	No of culverts: 29

Sifting Process

An Early Assessment and Sifting Tool (EAST) was undertaken for all initial options in accordance with the following primary categories:

- **Economic;** growth, carbon emissions, social-distributional impacts and regions, local environment, wellbeing, expected value for money category
- **Managerial;** implementation timetable, public acceptability, practical feasibility, quality of the supporting evidence, key risks

- **Financial;** affordability, capital cost, revenue cost, cost profile, overall cost risk, other costs
- **Commercial;** flexibility of option, funding path, income generation

An assessment was also conducted on the initial options based on the Combined Authorities Strategic Case assessment as follows:

- **Strategic;** reduce congestion, unlock housing and jobs
- **Economic;** scale of impact, value for money
- **Financial;** other funding sources / contributors
- **Management;** delivery certainty, project risks, stakeholder support
- Buildability

With the results from the workshop and sifting tools the options have been scored against each of the objectives on a seven-point scale from +3 to -3, as follows:

+3	major benefit at a regional level
+2	major benefit at a more local level or more minor benefit at a regional level
+1	minor benefit at a local level
0 neutral	No impact
-1	minor disbenefit or negative impact at a local level
-2	major disbenefit at a more local level or more minor benefit at a regional level
-3	major disbenefit at a regional level

The results can be viewed below with those choices being shortlisted highlighted in grey:

Route Options	Strategic		Economic		Financial	Management			Buildability	Total	VFM	Comments
	Reduce congestion	Unlock housing and jobs	Scale of impact	Value for money	Other funding sources / contributors	Delivery certainty	Project risks	Stakeholder support	Buildability			
1.1 Yellow	3	3	3	2	2	3	2	2.50	3	23.5	47	
1.2 Purple Dotted	3	3	3	2	2	2	1	-1	1	16	32	Buildability
1.3 Pink Dotted	3	3	3	2	2	1	1	0	0	15	30	
1.4 Yellow & Purple Dotted	3	3	3	1	2	2	1	0	1	16	16	Buildability
2.1 Red	3	3	3	2	2	1	0	-2	0	12	24	Buildability / Stake holder Support
2.2 Green	3	3	3	2	2	2	2	2	3	22	44	
2.3 Purple	3	3	3	2	2	2	1	1	1	18	36	
2.4 Brown	3	3	3	2	1	1	2	2	3	20	40	Can't be readily phased
2.5 Light Blue (Single Carriageway)	3	3	3	2	2	1	2	2	3	21	42	Phased Build
2.6 Light Blue (Dual Carriageway)	3	4	3	2	1	1	2	2	3	21	42	Phased Build
3.1 Red Dotted	3	3	3	2	2	-2	-1	-1	-1	8	16	
3.2 Claret	3	3	3	2	2	2	2	2	3	22	44	
3.3 Claret Dotted	3	3	3	2	2	2	1	1	2	19	38	Doesn't deliver Housing Growth
3.4 Black	3	4	3	2	2	2	2	2	3	23	46	
3.5 Dark Blue	3	1	2	2	1	2	1	-1	2	13	26	Doesn't deliver Housing Growth
3.6 Lime Green	2	1	1	0	1	2	3	0	3	13	0	Doesn't deliver Housing Groth
3.7 Pink	2	1	1	0	1	2	3	0	3	13	0	Doesn't deliver Housing Groth
4.1 Light Blue Dotted	3	3	3	3	2	2	2	1	2	21	63	
4.2 Dotted Orange	1	1	2	1	1	1	0	1	1	9	9	Poor policy fit
4.3 Orange	1	2	2	1	1	1	0	1	1	10	10	Poor policy fit

Benefit Cost Ratio

The table below summarises the analysis of monetised costs and benefits (AMCB). The costs and benefits are calculated based on the following:

- Scheme cost (2018 prices)
- Risk and optimism bias adjusted cost (2018 prices excl. VAT)
- Risk and optimism bias adjusted cost in 2010 prices
- Discounted Risk and optimism bias adjusted cost in 2010 prices
- Discounted Risk and optimism bias adjusted cost in 2010 market prices

User Benefits (PVB) for the initial BCR are based on vehicle user time savings (excluding passenger service vehicles), and include two tests:

- Core test: based on TEMPRO 7.2 Government Forecast
- Sensitivity test: based on 50% increased growth and delay resulting from increased growth aspirations

OPTION	PVC	PVB	NPV	BCR
1.1	£72,747,885	£86,410,917	£13,663,032	1.19
1.2	£65,634,038	£89,697,415	£24,063,377	1.37
1.3	£35,608,742	£102,108,304	£66,499,562	2.87
1.4	£52,111,957	£81,421,090	£29,309,133	1.56
2.1	£128,065,399	£117,773,534	–£10,291,865	0.92
2.2	£127,495,835	£117,733,714	–£9,762,120	0.92
2.3	£134,543,269	£117,693,857	–£16,849,412	0.87
2.4	£173,256,311	£248,979,075	£75,722,764	1.44
2.5	£164,834,152	£316,252,792	£151,418,640	1.92
2.6	£243,973,641	£330,741,099	£86,767,457	1.36
3.1	£79,964,967	£62,881,725	–£17,083,242	0.79
3.2	£99,324,086	£45,414,260	–£53,909,826	0.46
3.3	£95,889,473	£39,915,864	–£55,973,609	0.42
3.4	£90,232,537	£62,261,479	–£27,971,058	0.69
3.5	£127,061,687	£212,931,899	£85,870,212	1.68
3.6	£177,993,176	£123,161,492	–£54,831,685	0.69
3.7	£181,647,783	£115,801,453	–£65,846,329	0.64
4.1	£58,506,564	£125,716,406	£67,209,842	2.15
4.2	£149,520,049	£57,331,978	–£92,188,071	0.38
4.3	£163,988,768	£13,309,609	–£150,679,158	0.08

PVC = Present Value of Costs (2010 Market Prices)

PVB = Present Value of Benefits (2010 Market Prices)

NPV = Net Present Value (2010 Market Value)

BCR – Benefit to Cost Ratio

Table 10 – A47 Dualling Options: Benefit to Cost Ratios (Sensitivity Test)

Qualitative assessment of benefits

The appraisal of the identified options for dualling the A47 indicates a range of BCRs which suggest that the options identified could be shortlisted to include only those options which offer medium or high value for money based on the Department for Transport value for money categories:

- Very High: BCR greater than or equal to 4
- High: BCR between 2 and 4
- Medium: BCR between 1.5 and 2
- Low: BCR between 1 and 1.5
- Poor: BCR between 0 and 1
- Very Poor: BCR less than or equal to 0

It should be noted that BCRs are only one measure of benefit and the strategic importance of the potential routes in providing a corridor unlocking Norfolk and in particular the ports to the midlands and the wider national markets, in addition to improving local links, should also be considered.

Results and Key Themes from Initial Option Assessment

The results show that the bypass options score negatively, largely because they achieved a detrimental score on social and distributional impacts including severance on villages. Although the bypass options provide benefits in terms of offline construction and the potential for unlocking development opportunities, they potentially poor use of the existing infrastructure and have a significant impact on the local environment, including landtake.

The options between Thorney and Wisbech all score positively, largely because of their potential to unlock housing, they have the opportunity to improve gateways to Wisbech, significantly improving access to services and the options are considered to be publicly acceptable with few contentious features.

In summary the results of the assessment show that all the routes would be equally viable except for:

- **Option 1.3:** is unlikely to receive stakeholder support due to its impact on existing properties as well as traffic disruption during its construction;
- **Options 2.1 and 3.1:** is unlikely to receive stakeholder support due to its impact on existing properties as well as traffic disruption during its construction;
- **Options 3.5, 3.6 and 3.7:** fail to deliver housing growth around Wisbech, due to their routing to the south of the town; and
- **Options 4.2 and 4.3:** fail to reduce existing congestion on the A47 Wisbech bypass (being a longer and therefore unattractive route) and likely to offer poor value for money.

It should also be noted that:

- **Options 2.4, 2.5 and 2.6** cannot be readily phased. The whole route would have to be built in a single build before significant benefits could be realised, in comparison

with Thorney to Guyhirn as Phase 1 (Option 2.2 or 2.3) and Guyhirn to Wisbech as Phase 2 (Option 3.2, 3.3 or 3.4):

- **Option 2.6** has the biggest potential to unlock Wisbech Garden Town and maximise wider economic benefits

Table 11 – Summary of Sectional Options to be assessed in further detail

Section	Option	Description
Section 1 (A16 to Thorney Bypass)	1.1	Dual carriageway immediately to the north of the existing A47
	1.2	Part online and offline dual carriageway to the north of the existing A47 (predominantly following path of disused railway)
	1.4	As Route 1.1 as a one-way single carriageway for eastbound traffic, utilising existing carriageway for westbound traffic
Section 2 (Thorney Bypass to Guyhirn)	2.2	Dualling of the A47 to the south of the existing A47
	2.3	Dualling of the A47 to the north of the existing A47
	2.4	Offline dualling Thorney to Wisbech north of Guyhirn village
Section 2 to 4 (Thorney Bypass to Walton Highway)	2.5	Offline single carriageway Thorney to Walton Highway running to the north of Wisbech
	2.6	Offline dualling Thorney to Walton Highway running to the north of Wisbech
Section 3 (Guyhirn to Wisbech)	3.2	Dualling of the A47 south / east of the existing alignment
	3.3	Dualling of the A47 south / east of the existing alignment, tying in east of Redmoor Roundabout (B198).
	3.4	Hybrid of Routes 3.2 and 3.3
Section 4 (Wisbech Bypass)	4.1	Online dualling of the A47

Detailed Assessment of Short-listed Options

Introduction

Following the assessment of the initial options, shortlisted options have been developed and assessed against the 'Five Cases Model' criteria, in line with the Government's Transport Appraisal Guidance (WebTAG Unit 2.1.2c) and Highways England business case approach.

Locally specific criteria, including environment and ecology, and land use (impact on farming and local businesses) are also considered given their particular significance in the area.

Ecological and Environmental Assessment

Environmental impacts include those where the physical expression of the option is paramount, that is Landscape, Heritage, Biodiversity and Water Environment, and those where the impact arises from changes in the traffic flows and their characteristics, namely Air Quality, Greenhouse Gases and Noise.

A Routes Ecology Desk Study Summary (EDSS) has been compiled from data provided by Cambridgeshire and Peterborough Environmental Records Centre (CPREC) within a 2km corridor around the various route options and use of the Multi Agency Geographical Information for the Countryside (MAGIC, 2008) for information on UK and European protected sites and important sites, including;

- Sites of Special Scientific Interest (SSSI);
- Special Protection Areas (SPA);
- Special Areas of Conservation (SAC);
- Ramsar sites;
- National Nature Reserves (NNR);
- Local Nature Reserves (LNR);
- Areas of Outstanding Natural Beauty (AONB);
- Ancient Semi-natural Woodland (ASNW) and
- Mapped Biodiversity Priority Habitats.
- Establish if any European Protected Species Licenses have been granted within 2km of the scheme corridor
- Review of Local Biodiversity Action Plans.

The above resources and Ordnance Survey maps were studied to locate any ponds or water bodies within 500 metres of the scheme and its options. A search for internationally designated sites within 5km of the scheme footprint was also undertaken.

Existing Ecological Data and Information Summary

The following designated sites are present within the A47 Scheme Corridor search area;

International sites:

- Nene Washes Special Protection Area (SPA)
- Nene Washes Special Area for Conservation (SAC)

- Nene Washes Ramsar

National sites:

- Nene Washes Site of Special Scientific Interest (SSSI)
- Dogsthorpe Star Pit SSSI
- Eye Gravel Pit SSSI
- Eye Green Gravel Pit SSSI
- Rings End Local Nature Reserve (LNR)
- Dogsthorpe Star Pit LNR

Local sites:

- Nene Washes Counter Drain County Wildlife Site (CWS)
- Willock Farm Orchard CWS
- River Nene CWS
- Leverington Gull CWS
- Garners Orchard CWS
- Cat's Water Drain CWS
- Eye Gravel Pit CWS
- Eyebury Road Pits CWS
- Hundreds Farm Drain CWS
- Little Wood CWS and
- Middle Drain CWS

Protected species:

Records for European protected species including otters, bats and great crested newts were returned by CPREC. Similarly records for nationally protected species including water voles, badgers, reptiles and fish were also returned by CPREC.

Over 40 Schedule 1 bird species records were returned by CPREC within the A47 Scheme corridor study area with the following species most likely to be encountered;

- Barn owl
- Kingfisher
- Cetti's Warbler
- Marsh harrier
- Hen Harrier
- Bittern
- Crane
- Bearded Tit
- Bewick swan
- Whooper swan
- Fieldfare
- Redwing

In summary, the Scheme Corridor and Route Options proposed for the A47 improvements comprises numerous habitats and designated sites all of which already support or could support a number of

protected species. Further information through thorough survey is required to identify the location and extent of populations of important faunal species and habitats before a final decision is made on the preferred route option. The likely surveys required are shown below;

- Extended Phase 1 habitat survey;
- Phase 2 surveys which are likely to require surveys for the following species/groups;
- Bats (initial ground level assessments of trees (any time), internal/external surveys of buildings and other suitable structures (any time but best in Jan/Feb for hibernation roosts) and activity surveys May – Sept/Oct);
- Great crested newts (initial Habitat Suitability Assessments with possible follow up surveys March – June);
- Otters (any time but spring is optimum);
- Water voles (April – Sept/Oct);
- Badgers (Any time but best in winter);
- Barn owl (roost and nest site surveys (various timings);
- Breeding birds (April, May, June);
- Wintering birds (Nov, Dec, Jan, Feb);
- Reptiles (April -Sept/Oct);
- Aquatic invertebrates (April – June);
- White-clawed crayfish (July - October depending on method);
- Fish;
- National Vegetation Classification surveys on sites of botanical interest, most likely to be in designated sites (timing dependant on habitats present); and
- Habitats Regulations Assessment (HRA) / Appropriate Assessment (AA)

Geotechnical Assessment

A Routes Geo-Assessment (GA) has been compiled following the typical format for a geotechnical Preliminary Sources Study Report (PSSR). The desk based assessment has sought to determine the likely geological strata present beneath the various proposed Routes for the new A47 dual-carriageway scheme and highlight any potential geotechnical and/or geoenvironmental issues that may arise from them.

The Geo-Assessment identifies areas of known or potential impact by man, such as infilled sand and gravel pits or quarries, which would also impact upon highway design and construction. Where potential geotechnical and/or geoenvironmental hazards have been identified for the proposed Routes, these will support production of a specific Geotechnical Risk Register at a later stage.

General Description

At the time of report production, the land within the A47 Scheme Corridor generally comprises open agricultural arable land used for growing various crops throughout the seasons. The area is typified by large flat and open fields, subdivided by open ditches/dykes and occasionally hedgerows containing mature trees. The field system is connected by a network of farm lanes and minor roads typically known as ‘Droves’, which regularly run alongside or cross the numerous open ditches and dykes over culverts or small bridges. The western sections of the proposed route options, between the A16/A47 Roundabout and Eye, passes in close proximity to former sand and gravel extraction pits.

The River Nene flows near northeastwards through the area of interest and in the past has been straightened to the southwest of Wisbech to flow in navigable channels with a major bridge crossing at Guyhirn, located near central along the existing A47. Route specific topographical surveys have not been reviewed as a part of this assessment, however, in general the proposed Routes are located within a flat part of the UK with natural elevations along the Routes typically varying between approximately 0m above Ordnance Datum (mOD) and around 3mOD. The western end of the area of interest, rises from the low-lying elevations to between 5mOD at Eye and 12mOD at the A16/A47 roundabout. Elevations vary slightly away from the western end of the routes, where flood or highway embankments are present.

Sources of Information Used

The Geo-Assessment for the A47 Scheme Corridor has been based upon the following information:

- The Coal Authority Interactive Map, online resource;
- BGS Geological Mapping:

I, Map Sheet 158 'Peterborough', dated 1984, published at 1:50,000 scale;

II, Map Sheet 159 'Wisbech', dated 1995, published at 1:50,000 scale; and

III, Digital Geological Map of Great Britain (DiGMapGB-50); available as a Web Map Service.

- Historical Maps from <https://www.old-maps.co.uk> and <http://maps.nls.uk>
- Google Earth satellite imagery and ground level streetview, dated 2000 to present day.

Geology

The BGS geological map data indicates that the majority of the Scheme Corridor is covered by the superficial deposits of the Terrington Beds and/or Barroway Drove Beds. These recent deposits extend from Wisbech in the east to approximately 1.5km west of Thorney village centre, on the existing A47 route. Typically, the Terrington Beds comprise firm and stiff silty clay/clayey silts and loose to medium dense fine sands, forming a 'firm crust' over the very soft and soft organic clays and silts of the Barroway Drove Beds. The Barroway Drove Beds contains laterally impersistent lenses, seams and more substantial layers of peat (known as the Nordelph Peat) within it, which can vary in thickness from 1mm to 3m and generally appear as a dark brown and black fibrous peat with remnant intact reeds. These deposits are shown to have been cut through by numerous more recent former, eastwards and northwards draining, water channels, known locally as 'Roddons', which have become infilled with silt and fine sand over time.

The underlying solid geology strata are shown to be of the Oxford Clay Formation in the west of the Scheme Corridor and the West Walton Formation/Amphill Clay (undifferentiated) in the eastern part, with the boundary falling approximately below the village of Guyhirn. All of the solid geology strata typically consist of stiff to hard fissured clay with occasional concretionary limestone nodules, known locally as 'Doggers', and intermittent competent limestone bands.

The BGS mapping does not indicate the presence of any significant geological faulting within the majority of the Scheme Corridor. A single near east to west trending fault (the Tinwell-Marholm Fault) is shown running through the western extent, from approximately 500m north of Thorney village centre to around 800m north of the A16/A47 roundabout. The main fault is downthrown to the north

with an approximate displacement of 35m, with the secondary fault downthrown to the south with a displacement of about 25m.

BGS Exploratory Hole Records

The BGS hold historical exploratory hole records indicate that the superficial stratum ground profile is varied in both composition and distribution (laterally and with depth) reflecting the changeable ground conditions.

Coal Authority Records, Other Man-Made and Natural Cavities

The A47 improvement Route options and their immediate surrounds have been reviewed using the Coal Authority (CA) Interactive Map, which indicates that the Scheme Corridor is not located within an area of coal reserves or former coal mining activities. Therefore, the risk posed to the area of interest from either surface or below ground coal mining activities is considered to be negligible.

Existing Data and Information Summary

In summary, the area of interest for the proposed A47 Routes is typified by a cover of superficial deposits, which are very variable in composition and distribution, both laterally and with depth. These deposits include very soft organic clays, compressible peat and very loose and loose silts and sands, which are formed in narrow channels and more open depositional features, and therefore ground conditions can change significantly in relatively short distances, especially where deposits are cut by Roddons. The western end of the proposed Routes around Eye and west of Thorney, has a localised cover of River Terrace Deposits and March Gravels Member, which have been worked locally in the past. The whole of the Scheme Corridor is shown to be underlain at varying depth by Jurassic clays of the Oxford Clays, West Walton Formation and Ampthill Clay.

Historically the western part of the Scheme Corridor has been worked locally for sand and gravel (aggregate) deposits and clay for brick making with associated buildings, mineral railways and elevated ropeways. Further mainline railway lines, with associated stations, sidings and bridges were present, but have since been dismantled, and the current A47 alignment follows the historical railway lines in places.

Geo-Assessment of Route Options

For each Route alignment the published BGS geological records have been consulted and reviewed with the BGS database of historical exploratory whole records consulted. Each proposed A47 route alignments, generally passing from west to east has been assessed in turn for the likely geological conditions present, which will inform a Route option specific Geotechnical Risk Register at a later stage.

Shortlisted Options and Detailed Assessment

Section 1 – A16 to Thorney Bypass Description

In addition to the constraints described and accounted for in the initial option assessment, overhead electric cables supported by pylons cross the existing A47 at one location within this section. Most of this section lies outside of the flood zone with only a short length of the A47 at the eastern extent lying within. Due to the proximity of the area to flood zone 3, it is anticipated that road levels will need to be maintained and possibly raised to account for future climate change projections.

All options within this section involve upgrading the westernmost 2.5km of existing carriageway from single to dual carriageway, between the A47/A16 roundabout at Peterborough and the A47/Crowland Road roundabout at Eye. There are no existing premises along this section, meaning that construction will require little demolition. There is however an existing pedestrian overbridge within which will need to be replaced as the current span is not sufficient to accommodate a 4-lane dual carriageway.

Option 1.1

Option 1.1 takes an alignment that runs neatly along field boundaries to the north, taking the A47 away from properties fronting directly onto the existing highway, however the alignment does run close to agricultural premises set back from the A47. The route ties in along Thorney bypass to the north of the A47/B1167 roundabout. Route 1.1 is considered as a dual carriageway arrangement. The proposal also offers two links back to the existing alignment, one serving Pode Hole Quarry, and the other back to the B1167 roundabout.

With the route being predominantly offline, the buildability is considered good however there is an area of pond land that the route passes close to, so environmental constraints and localised issues with construction may be encountered.

Land Ownership

The wide existing carriageway and wide verges suggest that the online section of the route could be largely constructed within existing highway land. There is a pinch-point at the roundabout with Crowland road where the highway land narrows, and land acquisition may be required. The offline section of the route runs generally along existing field boundaries to reduce land severance.

Utilities

A major strategic gas main crosses under the proposed alignment at chainage 3800. At this stage the depth is unknown, but the main runs beneath the existing carriageway. Levels may need to be raised slightly in this area to deal with flood risk so risk of diversionary work required to main is considered to be low. Further clarification from gas undertaker required.

The alignment runs beneath overhead power cables and between steel pylons at chainage 6300. Proximity to pylons and cables will need to be considered when designing the detailed alignment at this location. Risk of diversionary required to power is considered low. There are also two lines of overhead power cables supported by wooden masts that the route crosses where local diversionary works may be required at these locations.

Listed Buildings and other considerations

There are a number of listed buildings located within the nearby villages of Eye and Thorney that will not impact the route. There is a listed building located north of the A47/B1040 roundabout, however it is unlikely that this will be impacted as only minor works will be required to this roundabout.

At the pinch-point at the roundabout with Crowland road, a cemetery to the south forms a boundary with the highway which will required detailed consideration at further stages. Similar consideration will also be required for the area of pondland at approximate chainage 6400.

Buildability/Flexibility/Phasing

The first 3km of this route is to be constructed on-line, which will have a negative effect on buildability where extensive traffic management will be required, being difficult to implement and will impact programme. Diversionary routes are possible to bypass this section, but will take traffic through the village of Eye which will have a severe impact on journey times and cause congestion in the village. Night time closures may be an option. The remaining route is to be built off line which will enable easier buildability.

The online section of the route has the potential to be phased however this is not possible with the offline section as there are no intermediate checkpoints.

Timescale for Delivery

The route is the longest within Section 1 and therefore the largest in terms of construction effort. The offline section will be able to be built efficiently as there are no significant constraints on this element of the build. However, the traffic management constraints on the 3km on-line section will have an impact on the timescale

Ecology and Environment

A number of species of flora, fauna are evident along the route with specifically a SSSI located to the north of the A47 along the first 1.3km of the route. Widening along this section will need to be to the south of the existing alignment to avoid encroaching on the SSSI.

Flood Risk

Most of the alignment within this section lies within flood zone 1, and therefore will require little to no action. The final 2km of the alignment option lies partly within flood zone 2, but predominantly flood zone 3. As a minimum, the existing carriageway levels will need to be maintained through this section, and it is anticipated that the embankment heights may require raising to ensure that climate change projections are met.

Affordability

This option demonstrates a higher cost option through section 1 when compared with the other two options (£46.1M versus £41.5M and 33.3M respectively). This is due to only part of the route remaining on line, and not widening the entire length of existing A47. Additional junctions are required to link back to the quarry and the roundabout with the B1167, The Causeway which adds cost to the scheme.

Key Option Challenges

- Flood risk impact on the required road levels and excessive embankments required at the eastern end. Considered low risk at this stage.
- Overhead power cables require diversionary works. Considered low risk at this stage.
- Gas main may require diversionary works. Considered low risk at this stage.
- Land acquisition impacting cost and programme. Considered medium risk at this stage.

Option 1.2

Option 1.2 involves widening an additional 1km of the existing A47 from the A47/Crowland Road roundabout, moving eastwards. The remainder of the alignment then involves constructing a new dual carriageway to the north of the existing alignment and south of Option 1.1, tying in along Thorney Bypass to the north of the A47/B1167 roundabout. Again, the route takes the A47 away from properties fronting directly onto the existing highway, whilst the existing road can remain open to provide access. However, this option will have greater impact on agricultural premises that are set-back from the existing alignment and will cause land severance, leading to potentially lower stakeholder support.

The alignment also crosses through an area of pond land to the north of the existing route which may impose environmental constraints, as well as pose difficulties during construction.

Land Ownership

The wide existing carriageway and wide verges along the first 3km of the alignment suggest that this section of the route can be largely constructed within existing highway land. The carriageway and verges are much narrower along the remainder of the alignment, and land acquisition may be required for widening the rest of the route.

Utilities

A major strategic gas main crosses under the proposed alignment at chainage 3800 and requires further detailed assessment as noted for Option 1.1. The alignment runs beneath overhead power cables and between steel pylons at chainage 5790 where the carriageway may need to be widened to the north at this location to avoid clashing with the steel pylon to the south. Risk of diversionary works being required considered low at this stage.

There is one line of overhead power cables supported by wooden masts that crosses the alignment. The carriageway will need to be widened to the north at this location to avoid clashing with the wooden mast to the south of the carriageway. Local diversionary works may be required at this location.

The alignment also runs beneath overhead power cables and between steel pylons at chainage 6300. The proximity to pylons and cables will need to be considered when designing the detailed alignment at this location. The risk of diversionary required to power is considered low at this stage.

Listed Buildings and other considerations

There are a number of listed buildings located within the nearby villages of Eye and Thorney that are considered not to be impacted at this stage. There is however a pinch-point at the roundabout with Crowland road where a cemetery to the south forms a boundary with the highway and will need consideration at later stages.

To the west of the roundabout between the A47 and The Causeway at Thorney, there are properties fronting onto the A47 on both sides of the carriageway. Land acquisition may be required but the properties themselves can be avoided. New accesses will need to be provided that link back to the roundabout to the east. Similarly Pod Hole Quarry fronts onto the existing A47 along the alignment and access will need to be provided.

Buildability/Flexibility/Phasing

The entire alignment is to be constructed on-line, which will have a potential negative effect on buildability. The existing A47 is the main route between Peterborough and locations in the east with principal diversionary routes generally significant detours in geography and distance on lower classification of roads. Traffic management will be difficult along this route and will impact on the programme by extended the potential build period.

Despite the buildability issues, the online nature of the alignment lends itself better to potentially phase construction. Depending on the requirements, the alignment could be phased in a number of ways due to the number of checkpoints and interfaces along the section.

Timescale for Delivery

The route is shorter than Option 1.1, and therefore less work is required to complete construction. However, as the route is entirely online, the traffic management and space constraints will have a severe impact on programme. Night time working may be an option that could be explored to help accelerate the programme.

Ecology and Environment

A number of species of flora, fauna are evident along the route with specifically a SSSI located to the north of the A47 along the first 1.3km of the route. Widening along this section will need to be to the south of the existing alignment to avoid encroaching on the SSSI.

Flood Risk

Most of the route lies within flood zone 1, and therefore will require little to no intervention. The final 1km of the alignment however lies partly within flood zone 2, but predominantly flood zone 3. As a minimum, the existing carriageway levels will need to be maintained through this section, and it is anticipated that the embankment heights may require raising to ensure that climate change projections are met.

Affordability

This option demonstrates a lower cost option through section 1 when compared with Option 1.1. The reduced cost of £41.5M is due to the route remaining on line, and not widening the entire length of existing A47. This option also makes use of the existing dual carriageway section between the B1167 and the B1040 which means that the total length of this option is less than Option 1.1.

Key Option Challenges

- Flood risk impact on the required road levels and excessive embankments required at the eastern end. Considered low risk at this stage.
- Overhead power cables require diversionary works. Considered low risk at this stage.
- Gas main may require diversionary works. Considered low risk at this stage.
- Land acquisition impacting cost and programme. Considered medium risk at this stage.

Option 1.4

Option 1.4 follows the same alignment predominantly as Option 1.1 and has similar constraints and considerations. The alignment ties in along Thorney bypass to the north of the A47/B1167 roundabout. Route 1.1 is considered as a dual carriageway arrangement, whilst route 1.4 is considered as a single carriageway when compared to the dual carriageway specification of Option 1.1. The carriageways are based on single direction traffic using the existing and proposed carriageways independently

Overall the construction extent and value is lower than Options 1.1 and 1.2 and the impact on the constraints, adjacent properties and land is less. Works to utilities and the impacts on flora and fauna will still be required but the impacts are seen as low consideration at this stage.

With the route being predominantly offline, the buildability is good. There is an area of pond land that the route passes close to, so environmental constraints and localised issues with construction may be encountered.

Affordability

This option demonstrates a lower cost option through section 1 when compared with Option 1.1 and 1.2. The reduced cost of £33.3M is due to the route utilizing the existing A47 carriageway for one direction over a substantial length of the alignment. This does however have the disbenefit of works being required to the majority of the existing A47 within Section 1 which may impact programme, congestion and delays for a period.

Key Option Challenges

- Flood risk impact on the required road levels and excessive embankments required at the eastern end. Considered low risk at this stage.
- Overhead power cables require diversionary works. Considered low risk at this stage.
- Gas main may require diversionary works. Considered low risk at this stage.
- Minimised land acquisition impacting cost and programme. Considered medium risk at this stage.
- Programme and delivery hybrid with online and offline construction activities.

Section 2

Section 2 runs between Thorney Bypass (existing dual carriageway) to the west and Guyhirn roundabout between the A47 and A141 to the east. The existing A47 carriageway takes a direct straight line between these two locations and has a number of residential, agricultural and industrial premises fronting onto the highway, particularly around Thorney Toll located approximately half way along Section 2.

Immediately to the west of Guyhirn roundabout, the A47 crosses the River Nene. A SSSI runs in a south westerly direction along the River Nene to the south of the existing A47 carriageway, forming a major constraint on sectional options in this location. All routes have been designed to avoid encroachment onto this SSSI. Highways England have developed a scheme to upgrade the existing

Guyhirn roundabout to increase capacity⁹. All proposed route options in this section have been considered to tie into the Highways England scheme.

The whole of Section 2 is located within flood zone 3, and based on assessment the existing carriageway levels along this section should as a minimum be maintained. It is however anticipated that the road levels will need to be increased to satisfy climate change projections and standards.

Option 2.2

Option 2.2 is located south of the existing A47 alignment and utilises a small degree of the existing carriageway, imposing less impact on existing properties along the existing route, whilst the option also runs neatly along existing field boundaries, reducing land severance. A number of accommodation bridges are required to provide access to isolated properties to the south, where access is currently only provided from the existing A47. This option doesn't offer much opportunity to utilise significant amounts of the existing carriageway and consequentially has a slightly higher cost however, due to the location away from existing residential, agricultural and industrial premises improves buildability and should receive better stakeholder support. The alignment running to the south of the A47 will also have low communal severance between the existing alignment and population centres located to the north.

Land Ownership

The alignment lies entirely outside of the existing highway boundary loosely following field boundaries to the south of the existing A47. Unfortunately this is not possible along the entire route and land severance is unavoidable. Due to the nature of the option, land will need to be acquired for the entire footprint of the option

Utilities

A major strategic gas main crosses under the proposed alignment at chainage 3700. The depth is currently unknown but the main runs beneath the existing A47 carriageway. The risk of diversionary work required to main is considered medium at this stage and the levels can be built up locally in this area if required. Further clarification from gas undertaker will be required if the option or alignment is progressed.

Listed Buildings and other considerations

There are a number of properties to the south of the existing A47, including a pumping station, that are only accessible from the existing A47. As the alignment crosses these access points, new means of access will need to be provided in the form of either an at grade access of the new carriageway, or an accommodation bridge over the new carriageway.

The route will tie into the existing A47 at the River Nene crossing and the proposed works to upgrade the existing A47/A141 roundabout at Guyhirn.

Buildability/Flexibility/Phasing

The route is predominantly offline, which makes for favourable buildability with little to no direct impact to the existing A47. The existing carriageway can remain open during the majority of the

⁹ <https://highwaysengland.citizenspace.com/he/a47-guyhirn-junction-improvement/>

construction work. Due to the nature of the alignment being offline it is not suited to being phased as there are no intermediate checkpoints along this route which are viable for use.

Timescale for Delivery

The Option is similar to Option 2.3 in length and being offline will be able to be built efficiently as there are no significant constraints on this element of the build. However, the traffic management constraints at the tie-ins will have an impact on the timescale.

Ecology and Environment

A SSSI is located to the south of the River Nene close to the proposed route at the eastern tie-in at Guyhirn. The proposal remains outside of the SSSI and therefore is expected to have minimal impact however detailed assessment will be required.

Flood Risk

The entire alignment option lies within flood zone 3, and is therefore at high risk of flooding. As a minimum, the existing carriageway levels will need to be maintained and matched by the new carriageway through this section. It is also anticipated that the embankment heights may require raising to ensure that climate change projections are met.

Affordability

This option demonstrates a lower cost option through section 2 when compared with the other two options (£81.5.1M versus £86M and £110.3M respectively). This is due to the option being the shortest within Section 2 and the majority of the option being new offline construction.

Key Option Challenges

- Flood risk impact on the required road levels and excessive embankments required at the eastern end. Considered low risk at this stage.
- A major Gas main may require diversionary works. Considered medium risk at this stage.
- Land acquisition impacting cost and programme. Considered medium risk at this stage.
- Potential SSSI impact on proposals and mitigation measures. Considered low risk at this stage pending further surveys and alignment design.

Option 2.3

Option 2.3 has been considered as an option running to the north of the existing A47 alignment. This option utilises initially of the existing carriageway, which will remain open to provide access to properties along the existing A47 and isolated properties to the south. The Option is able to follow the field boundaries along the alignment, reducing land severance. The alignment does however impact on residential, agricultural and industrial premises to the north of the A47, whilst also impacting on the wider highway network. For these reasons, the stakeholder support may not be as high with this route when compared to Option 2.2. In addition, the proposed alignment will segregate properties along the existing A47 from villages to the north. Due to the impact on the wider highway network and the proximity to residents, phasing potential and general buildability is not seen to be as good as Option 2.2.

Land Ownership

The route is predominantly offline following an initial section after Thorney Bypass junction, and therefore land acquisition for the first part of the alignment will be limited as some of the construction can be carried out within highways land. The route stays close to the existing A47 and runs close to the back of properties that currently front onto the existing A47. Therefore, the alignment runs through the middle of adjacent fields and land severance is a consequence of this.

Utilities

Existing overhead power cables supported by wooden masts run parallel along the existing A47, and cross the carriageway in places along the alignment. Localised diversionary works may be required at various locations along the route however the risk is considered low due to the nature of the masts and level of supply estimated at this stage of scheme development.

Listed Buildings and other considerations

An abandoned pumping station is accessed from the existing A47 and is a listed building. The Option runs behind this building and is considered not to impact. The Option also crosses the abandoned rail line at the north tie in with the existing A47, where provision for the structure over the rail line is to support the plans to reopen the rail line has been included in the considerations.

The route will tie into the Highways England proposed scheme to upgrade the A47/A141 Guyhirn roundabout in the south.

Buildability/Flexibility/Phasing

The first 3km of the alignment can be built on line which will have an impact on buildability. Traffic flow will need to be predominantly maintained as diversionary routes in this area are excessive and take traffic significantly away from the desire line involving lower classifications of road with a smaller cross section and may therefore be unfit for HGVs. Night time working could be explored but may not be possible depending on the ecological constraints associated with the land around the River Nene.

The offline section can be constructed easily without interrupting the traffic on the existing A47 and the existing A47/B198 roundabout can remain unaffected throughout the majority of construction.

There is limited scope to phase this Option as there are limited intermediate checkpoints and there is the potential delay to the construction of the proposed rail bridge depending on timescales of the project to reopen the rail line. There are also options being considered to terminate the rail line to the south of the proposed alignment, and therefore no structure will be required.

Timescale for Delivery

Similar to Option 2.2 at 8.4Km in length and being predominantly offline will this option should be able to be built efficiently as there are no significant constraints on this element of the build. However, the traffic management constraints at the tie-ins and the initial online section will have an impact on the timescale.

Ecology and Environment

A number of ecologically sensitive areas are located between the existing A47 and the River Nene. The proposed route does not encroach substantially into this area and is therefore expected to have minimal impact.

Flood Risk

The majority of the Option lies within flood zone 3 with some small areas lying within flood zone 2, and is therefore at high risk of flooding. As a minimum, the existing carriageway levels will need to be maintained through this section, and it is anticipated that the embankment heights may require raising to ensure that climate change projections are met. Flood risk advises that breach modelling should be completed to determine embankment heights.

The existing A47 is generally built on embankment through this area, and the land around the A47 is lower therefore the carriageway through this section will need to be built on embankment.

Affordability

This option is similar to Option 2.2 demonstrates a lower cost option through section 2 when compared with Option 2.4 (£86M versus £110.3M respectively). This is due to the option being of a similar length to Option 2.2 and the majority of the option being new offline construction with an initial online section at Thorney Bypass.

Key Option Challenges

- Impacts of the potential rail project on requirements for a structure over rail line. This is considered a medium risk at this stage.
- Ecological and environmental constraints associated with the sites adjacent to the River Nene. Considered to be low risk at this stage.
- Flood risk having an impact on the required road levels with large embankments and significant imported fill being required for construction. Considered to be high risk.
- Land acquisition impacting cost and programme/public objection to land severance. Considered to be medium risk at this stage.

Option 2.4

Option 2.4 includes sections 2 and part of section 3, tying into the A47/B1167 roundabout to the west, and the A47/B198 roundabout to the east. This option takes a more direct route between these two locations, when compared with the existing A47 alignment. The alignment runs through the north end of Guyhirn village, and remains to the west of the River Nene. A new structure over the Nene is required where the route crosses adjacent to the A47/B198 roundabout tie in, west of Elm. As the route bypasses the Guyhirn roundabout, a junction is proposed with the B1187 at Guyhirn which would provide a link through to the A141 road to March, whilst the existing A47 remaining open will also provide a link.

Due to the isolated nature of much of the route, the buildability is seen as good, however there is limited scope to phase the construction. In addition, much of the alignment avoids impacting on existing properties. The alignment were possible west of Guyhirn runs along field boundaries, avoiding land severance. However, the alignment does cut through the north end of Guyhirn which

will result in communal severance. Due to the offline nature and the new river crossing, this Option is seen as an expensive alternative within the section.

Land Ownership

The route is predominantly offline following an initial section after Thorney Bypass junction however enters into a more urban and constrained environment approaching Guyhirn Junction. Land acquisition for the first part of the alignment will be limited however a wider footprint around the River Nene crossing and on approach to Guyhirn is potentially required. The majority of construction can be completed offline reducing land take for the core section of the alignment. The alignment dissects a number of fields to be north of the existing A47 and runs close to the back of properties that currently front onto the existing A47 therefore land severance is a consequence of this.

Utilities

A number of smaller utilities are impacted along the alignment however at the western end there is potential for impact to the existing overhead power cables close to Guyhirn junction. Consideration is required as to the detailed alignment, river crossing and Guyhirn junction interface as the power cables are a major supply and substantial cost to divert. Localised diversionary works may be required at various locations along the alignment however the risk is considered low however at the western end of the section the risk is considered high for impact to the major power lines.

Listed Buildings and other considerations

A number of what can be considered medium considerations are required in the viability of this Option and its alignment with respect to listed buildings and potential impacts. The intermediate section west of the River Nene will require further detailed consideration.

Buildability/Flexibility/Phasing

From Guyhirn roundabout the alignment can be built offline for the majority of its length which will have a positive impact on buildability. Traffic flows can be maintained on the existing A47 however a number of side road and adjoining road link diversions will be required.. Night time working will be required at the interfaces and junction tie ins. Construction over the River Nene will need to be coordinated with ecological constraints and also any impact on the major power lines in the proximity to the eastern end of the section will also need detailed consideration.

There is limited scope to phase this Option as there are limited intermediate checkpoints and there is the potential delay to the construction.

Timescale for Delivery

At 14.9km and the longest option for Section 2 of 2.1 to 2.4 length the option does benefit from being predominantly offline until the tie in west of Elm, this option should be able to be built efficiently. There is added complication with the construction of the major river crossing however this may be mitigated by the type of structure and form of construction proposed i.e. built offline and launched in to place. However, the traffic management constraints along the side roads for local and farm access will be significant.

Ecology and Environment

A number of ecologically sensitive areas are located between the existing A47 and the River Nene. The proposed route encroaches into these area's and will have a direct impact on and over the river therefore the impact is expected to be moderate to significant.

Flood Risk

The majority of the Option lies within flood zone 3 with some small areas lying within flood zone 2, and is therefore at high risk of flooding. As a minimum, the existing carriageway levels will need to be maintained through this section, and it is anticipated that the embankment heights may require raising to ensure that climate change projections are met. Flood risk advises that breach modelling should be completed to determine embankment heights

Special consideration will need to be given to construction adjacent to, and in the locality to the main bridge crossing this will include construction form, maintenance, access and impact on the current flood characteristics in the area.

Affordability

This option is the most expensive of options 2.1 to 2.4 due to its length and significant structure required. It is seen as a higher cost option for this section when compared to the other options (£86M versus £110.3M respectively). Benefits are seen by the option being offline and having minimal impact on existing A47 traffic prior during construction and on opening.

Key Option Challenges

- Impacts due to working in proximity to, and construction of a significant structure over, the River Nene. This is considered a medium risk at this stage.
- Ecological, environmental and flood constraints associated with the sites adjacent to the River Nene. Considered to be medium risk at this stage.
- Affordability due to its length and structural requirements and therefore impact on the cost benefit ratio.
- Land acquisition impacting cost and programme/public objection to land severance. Considered to be medium risk at this stage.

Section 3

Option 3.2

Section Option 3.2 has been considered as alternative option to 3.1 and is located further east of the existing A47 alignment. The alignment runs along field boundaries and existing watercourses along the first half of the route, minimising land severance. A number of accommodation bridges will however be required.

The alignment proceeds to bypass the village of Begdale, remaining west of the village, and is consequentially able to form a junction linking to Wisbech in closer proximity to the existing A47/B198 roundabout. However, to maintain standard horizontal geometry, the route requires a skew structure over the abandoned rail line. The alignment requires consideration the existing pylons which has an impact on the buildability.

Land Ownership

The route is predominantly offline following an initial section after Guyhirn junction, and therefore land acquisition for the first part of the alignment will be limited as some of the construction can be carried out within highways land. The route stays close to field boundaries and the existing A47 to mitigate where possible land severance.

Utilities

Existing overhead power cables and pylons are in close proximity to the alignment and cross the carriageway in places along the alignment. Localised diversionary works may be required at various locations along the route however the risk is considered low due to the nature of the proximity of the pylons to the main alignment. Detailed assessment and discussion at the next stage of development will be key.

Listed Buildings and other considerations

Due to its alignment the option does not directly impact any specific listed buildings and runs in proximity to the abandoned rail line at the north tie in with the existing A47, where provision for the structures over or adjacent to the rail line may need to be considered if plans to reopen the rail line progress.

Buildability/Flexibility/Phasing

The alignment is predominantly offline and therefore can be built with minimized impact on the existing A47 traffic flow. The existing flows will need to be predominantly maintained as diversionary routes in this area will generally involve mitigation for lower classifications of road with a smaller cross section. Night time working could be explored at these locations but may not be possible depending on the ecological constraints and properties near Begdale.

There is limited scope to phase this Option as there are no significant intermediate checkpoint. The alignment offer good buildability, however it does represent a more expensive options when compared with option 3.1 due to being unable to utilise significant lengths of the existing carriageway.

Timescale for Delivery

Similar to Option 3.3 at 8.6Km in length and being split between online and offline construction will constrain construction for the online section requiring traffic management and diversions. Were offline, the alignment will be easier to construct in the northern extent of the section. However, the traffic management constraints at the tie-ins and the initial online section will have an substantial impact on the timescale.

Ecology and Environment

A number of ecologically sensitive areas are located between the existing A47 and the River Nene. The proposed route does not encroach substantially into this area and is therefore expected to have minimal impact.

Flood Risk

The Option lies within both flood zone 1 and 3 and is therefore at high risk of flooding. As a minimum, the existing carriageway levels will need to be maintained through this section and it is in an area

benefitting from flood defences. Despite the area benefitting from flood defences, breach and overtopping will require mitigation. As a minimum, the existing carriageway levels will need to be maintained through this section, and the embankment heights may require raising to ensure that climate change projections are met

Affordability

This option is the most expensive of the Options in Section 3 taken forward at this stage at £63M when compared with Options 3.3 and 3.4 respectively (£61m and £57.5m). This is due to the option being longer and some of the option being online with difficult tie-ins at both extents. Also flood defenses and mitigation is significant for this option.

Key Option Challenges

- Ecological and environmental constraints associated with the option in proximity to the River Nene. Considered to be low risk at this stage.
- Flood risk having a significant impact on the required road levels with large embankments and significant imported fill being required for construction. Considered to be high risk.
- Land acquisition impacting cost and programme/public objection to land severance. Considered to be medium risk at this stage due to the option being offline through its core length.

Option 3.3

Section Option 3.3 has been considered as alternative option to 3.2 and is located further east to Option 3.2 and existing A47 alignment. The alignment dissects field boundaries and existing watercourses impacting land severance. A number of accommodation bridges and side road diversions will be required.

The alignment proceeds to cut through the village of Begdale, east of the village, and forms a junction on the outskirts of Elm in proximity to the existing A47/B198 roundabout. The alignment requires a skew structure over the abandoned rail line. The alignment has consideration for the existing pylons with a minimum of two crossings which has an impact on the buildability.

Land Ownership

The route is predominantly offline and therefore land acquisition for the first part of the alignment will be limited as some of the construction can be carried out within highways land. The route dissects a large number of field boundaries and the existing impacting land severance and conflicts with a number of properties in the village of Begdale.

Utilities

Existing overhead power cables and pylons are in close proximity to the alignment and cross the carriageway in places along the northern extent of the alignment. Localised diversionary works may be required at various locations along the route with the risk considered medium due to the nature of the proximity of the pylons to the main alignment. Detailed assessment and discussion at the next stage of development will be key.

Listed Buildings and other considerations

Due to its alignment the option does not directly impact any specific listed buildings and runs in proximity to the abandoned rail line at the north tie in with the existing A47, where provision for the structures over or adjacent to the rail line may need to be considered if plans to reopen the rail line progress.

Buildability/Flexibility/Phasing

The alignment is predominantly offline and therefore can be built with minimized impact on the existing A47 traffic flow. The existing flows will need to be predominantly maintained as diversionary routes in this area will generally involve mitigation for lower classifications of roads which are impacted near Chestnut Farm and Begdale. Night time working could be explored at these locations but may not be possible depending on the ecological constraints and properties near Begdale.

There is limited scope to phase this Option as there are no significant intermediate checkpoints. The alignment offers medium buildability as considerations are required around the populated areas of Begdale. It does represent a more expensive option when compared with option 3.1 due to being unable to utilise significant lengths of the existing carriageway.

Timescale for Delivery

Similar to Option 3.2, Option 3.3 is 8.9Km in length and the longest section option in this section with minimum length utilizing the existing carriageway. Construction at the tie-ins and extent of existing carriageway will be constrained requiring traffic management and diversions. Additional traffic management will be required around the village of Begdale and may lead to delay in accommodation works and mitigation during construction over and above that required for Options 3.2 and 3.4.

Ecology and Environment

A number of ecologically sensitive areas are located between the existing A47 and the River Nene. The proposed route does not encroach substantially into this area and is therefore expected to have minimal impact.

Flood Risk

The Option lies within both flood zone 1 and 3 similar to Option 3.2 and is therefore at high risk of flooding. As a minimum, the existing carriageway levels will need to be maintained through this section and it is in an area benefitting from flood defences. Despite the area benefitting from flood defences, breach and overtopping will require mitigation. As a minimum, the existing carriageway levels will need to be maintained through this section, and the embankment heights may require raising to ensure that climate change projections are met

Affordability

This option is the mid-range cost Option within this section at £61M when compared with Options 3.2 and 3.4 respectively (£63.2m and £57.5m). This is due to the option being mid length however impacting Begdale significantly. Flood defenses and mitigation similar to Option 3.2 are significant for this option.

Key Option Challenges

- Ecological and environmental constraints associated with the option in proximity to the River Nene. Considered to be low risk at this stage.
- Flood risk having a significant impact on the required road levels with large embankments and significant imported fill being required for construction. Considered to be high risk.
- Land acquisition impacting cost and programme/public objection to land severance. Considered to be high risk at this stage due to the option being offline through its core length and dissecting Begdale village.

Option 3.4

Section Option 3.4 can be seen as a hybrid of Options 3.1, 3.2 and 3.3 with very close alignment to all three Options being fully offline. The alignment crosses a number of field boundaries however has low impact on the general constraints in Section 3 other than farms, land and to a small degree properties at the northern extent and tie in. A small number of accommodation bridges and side road diversions will be required.

The alignment requires a skew structure over the abandoned rail line and ties in to the existing carriageway in proximity to the existing Industrial Estate on the outskirts of Wisbech. The alignment has consideration for the existing pylons with minimum crossings which has an impact on the buildability.

Land Ownership

The route is predominantly offline and therefore land acquisition will be substantial with little construction can be carried out within highways land. The route dissects a large number of field boundaries and impacts Speedwell, Chestnut and Primpton farms with land severance and conflicts with a number of properties at the northern extent.

Utilities

Existing overhead power cables and pylons are in close proximity to the alignment however are not seen to have a significant impact. Localised diversionary works may be required at a small number of locations along the route with the risk considered low due to the proximity of the pylons to the main alignment. Detailed assessment and discussion at the next stage of development will however be key.

Listed Buildings and other considerations

Due to its alignment the option does not directly impact any specific listed buildings and runs in proximity to the abandoned rail line at the north tie in with the existing A47.

Buildability/Flexibility/Phasing

The alignment is predominantly offline and therefore can be built with minimized impact on the existing A47 traffic flow. The existing flows will be predominantly maintained. Minor diversionary will be required involving mitigation for lower classifications of roads which are impacted near Chestnut Farm and Begdale. Night time working could be explored at these locations and also in proximity to

the Industrial Estate at the northern extent but may not be possible depending on the ecological constraints and farming properties along the alignment.

There is limited scope to phase this Option as there are no significant intermediate checkpoints. The alignment offers medium buildability as considerations are required around the populated areas of Begdale. It does represent a cheaper option when compared with option 3.2 and 3.3 due to shortest in length and minimised traffic impact on the existing A47.

Timescale for Delivery

Similar to Options 3.2 and 3.3, Option 3.4 is 7.5Km in length and the shortest section option in this section being fully offline. Construction at the tie-ins and extent of existing carriageway will be constrained requiring traffic management and diversions. Additional traffic management will be required around the Wisbech southern tie in and may lead to delay in accommodation works and mitigation during construction over and above that required for Options 3.4

Ecology and Environment

A number of ecologically sensitive areas are located between the existing A47 and the River Nene. The proposed route is closer to these areas than Options 3.2 and 3.3 with a medium encroachment and therefore a medium risk impact is expected.

Flood Risk

The Option lies within both flood zone 1 and 3 similar to Option 3.2 and is therefore at high risk of flooding. As a minimum, the existing carriageway levels will need to be maintained through this section and it is in an area benefitting from flood defences. Despite the area benefitting from flood defences, breach and overtopping will require mitigation. As a minimum, the existing carriageway levels will need to be maintained through this section, and the embankment heights may require raising to ensure that climate change projections are met

Affordability

This option is the cheapest cost Option within this section at £57.5M when compared with Options 3.2 and 3.3 respectively (£63.2M and £61M). This is due to the option being shortest length however with little impact to a number of constraints. Flood defenses and mitigation similar to Option 3.2 are however significant for this option.

Key Option Challenges

- Ecological and environmental constraints associated with the option in proximity to the River Nene. Considered to be low risk at this stage.
- Flood risk having a significant impact on the required road levels with large embankments and significant imported fill being required for construction. Considered to be high risk.
- Working and impacts close to the Wisbech Industrial Estate. Considered medium at this stage.
- Land acquisition impacting cost and programme/public objection to land severance. Considered to be high risk at this stage due to the option being offline through its core length.

Section 4

Option 4.1

Section Option 4.1 is the online dualling of the A47 round the south eastern orbital of Wisbech. The Option utilizes the existing carriageway with a mix of widening to one side and both sides dependent on the corridor constraints. New and improved junctions are formed along the route to maximize access. The alignment minimizes land severance.

The alignment proceeds to tie in at Walton and forms an improved junction at its northern extent. Buildability is a key concern with the high traffic volumes on the existing highway which will impact programme, buildability and cost.

Land Ownership

The route is predominantly online therefore land acquisition should be minimal however detailed assessment at the junctions and tie-ins will be required as additional land may be required or require junction design departures to be developed. Widening of the existing route will impact traffic flow and additional temporary land may be required and needs to be considered.

Utilities

Existing utility impacts will be maintained however with online widening of the existing carriageway additional works for bridging or existing protection and diversionary works may be required. Detailed assessment will be needed. A major strategic gas main crosses under the proposed alignment at approx. chainage 15,000. The depth is currently unknown, but the main runs below ground. The risk of diversionary work required to main is low, but road levels can be raised locally to avoid clashing with any gas infrastructure. Further clarification from the gas undertaker will be required as soon as practical.

Listed Buildings and other considerations

Due to its alignment the option does not directly impact any specific listed buildings however it does runs close to listed buildings at between Gorefield and Leverington. The developed design will need to account for this, and risk of impacting the buildings are low.

Buildability/Flexibility/Phasing

The alignment is online and therefore benefits from using the existing carriageway however will directly impact the existing A47 traffic flow. The existing flows will need to be maintained with significant traffic management and diversions generally involving lower classifications of roads. Night time working will need to be explored along the alignment.

There is limited scope to phase this Option due to the nature of using the existing carriageway and impact in terms of traffic management. It does represent a cost effective Option in terms of pure new build construction but this is balanced with the traffic management costs.

Timescale for Delivery

Option 4.1 is 4 to 5Km shorter in length than Options 4.2 and 4.3 respectively and does not require new structures over the River Nene however does impact the existing A47 therefore the online construction benefits are balanced against extensive traffic management and disruption.

Ecology and Environment

A number of ecologically sensitive areas are located in proximity however due to its online nature the impacts are not seen as a significant risk at this stage.

Flood Risk

The Option lies within both flood zone 1 and 3 and is therefore at high risk of flooding. As a minimum, the existing carriageway levels will need to be maintained through this section and it is in an area benefitting from flood defences. As a minimum, the existing carriageway levels will need to be maintained through this section, and widened embankment height may require raising to ensure that climate change projections are met.

Affordability

This option is the cheapest of the Section 4 Options at £37.5M due to the Option using the existing carriageway and being of shorter length. Flood defenses and traffic flow and traffic management will be significant for this option.

Key Option Challenges

- Ecological and environmental constraints associated with the option are considered to be low risk at this stage.
- Flood risk having a significant impact on the required widened road levels with large embankments and significant imported fill being required for construction. Considered to be medium risk.
- Land acquisition is seen as minimal risk at this stage due to the option being online.
- Traffic management, flow and disruption is seen as potentially high risk for this option but balanced against the land costs and severance impacts of the other Section 4 options.

Route Options

A number of section intervention options for the A47 corridor between Peterborough and Walton Highway have been proposed which have been sifted and reviewed over a 2 stage process as describing in the earlier sections of this report. Upon review during the sift process, to optimize potential benefits for the corridor, the surrounding road network and key destinations such as Kings Lynn and Norfolk the individual section options across different sections have been compiled into three overall interventions options for the whole A47 corridor. These are summarised as follows:

- Route A: Route 1.2 + Route 2.6;
- Route B: Route 1.2 + Route 2.4 + Route 4.1; and
- Route C: Route 1.2 + Route 2.2 + Route 3.4 + Route 4.1.

Each of the three route options has been developed based on assessment of the key parameters, benefits and dis benefits below:

- Land Ownership;
- Utility Impact;
- Flood Risk;
- Listed Buildings and other considerations
- Timescales for Delivery;
- Ecology and Environment;
- Buildability and Phasing;
- Affordability; and
- Key Challenges

Each route has then been assessed relative to the do minimum scenario for both the 2026 and 2041 future forecast years. The relative user benefits of each option has then been assessed using the DfTs Transport User Benefit Analysis (TUBA) software with forecasts across a 60-year appraisal period. User benefits from journey time savings and forecast reductions in delay have been monetised similar to the section option detailed analysis and compared against estimated scheme costs to give a route BCR.

Economic appraisal of each route option, including the estimation of scheme costs and the monetisation of the forecast benefits, has been conducted in line with WebTAG.

The appraisal results listed in Table overleaf detail the relative BCR values for each of the three proposed route options, as well as the Present Value of Benefits (PVB). As detailed in WebTAG guidance, all prices are discounted to the department's base year. These are presented for the core, high and low growth scenarios and also show the BCRs for both alternative growth sensitivity tests which consider the development of an additional 10,000 and 30,000 dwellings around Wisbech and along the A47 corridor.

The analysis indicates all options to have a BCR value of above 1.5 in the core scenario, with Route B indicating the greatest value for money. Alternative Growth Sensitivity Test One, which considers the development of an additional 10,000 dwellings for WGT, increases the BCRs across each route to above 2.0, with increased number of users benefiting from journey time savings along dual carriageway sections of the A47.

A significant increase in BCR values can be seen for Alternative Growth Sensitivity Test Two across each do something route option. This is a consequence of significant congestion arising within the do minimum model.

The predicted rises in delay are unlikely to occur to the scale predicted and the scheme benefits would not be so significant. The results of Alternative Growth Sensitivity Test Two do however indicate that significant transport infrastructure improvements would be required to support the levels of growth applied with Option A generating the best BCR in both Alternative Growth Scenarios.

Table 12 – Summary of Route Option Analysis

Value	Intervention Route Options (values in £'000)		
	Low Growth Scenario		
	Route Option A	Route Option B	Route Option C
PVB	£279,445	£286,787	£295,896
BCR	1.30	1.44	1.25
	Core Growth Scenario		
	Route Option A	Route Option B	Route Option C
PVB	£345,537	£352,081	£362,775
BCR	1.61	1.77	1.53
	High Growth Scenario		
	Route Option A	Route Option B	Route Option C
PVB	£400,288	£403,352	£414,258
BCR	1.87	2.03	1.75
	Alternative Growth Sensitivity Test One (Core + WGT)		
	Route Option A	Route Option B	Route Option C
PVB	£485,848	£464,991	£480,450
BCR	2.27	2.34	2.03
	Alternative Growth Sensitivity Test Two (Core + WGT + 20k Additional)		
	Route Option A	Route Option B	Route Option C
PVB	£4,550,932	£3,353,217	£4,094,752
BCR	21.25	16.84	17.28

Route Summary Assessment

Introduction

An assessment of the three Route Options against the ‘Five Cases Model’ criteria (see Table 13 below), in line with the Government’s Transport Appraisal Guidance has been completed. The summary assessment presents supporting commentary and highlights the factors and potential impacts across the routes.

Case	Description
Strategic Case	The extent to which the option aligns with national and local policies, as well as the intervention-specific objectives.
Value for Money Case	The option’s impact on public accounts and indicative benefit cost ratio, plus the option’s suitability against economy, environment, and social impacts (as set out in the Department for Transport’s Appraisal Summary Table).
Financial Case	Consideration of issues relating to implementation cost, maintenance and operating costs, and funding assumptions.
Delivery Case	Complexity of scheme delivery, public and stakeholder support and acceptability.
Commercial Case	Funding, procurement routes, level of market interest.

A full description and detail of each of the Case and supporting Appraisal Summary tables is included in Appendix M.

Appendices

Appendix A – Initial Constraints
Appendix B – Initial Route Options
Appendix C – Initial Alignment Corridor Options Section 1
Appendix D – Initial Alignment Corridor Options Section 2
Appendix E – Initial Alignment Corridor Options Section 3
Appendix F - Initial Alignment Corridor Options Section 4
Appendix G – Detailed Constraints
Appendix H – Detailed Route Options
Appendix I – Detailed Junction Visuals
Appendix J – Socio Demographic Assessment
Appendix K – Environment and Ecological Assessment
Appendix L – Geotechnical Assessment & Risk
Appendix M – Business Case Route Assessment Tables