Norfolk County Council

King's Lynn to Hunstanton Rail Line

Viability Study

70064960-WSP-VS-KLH-001
OCTOBER 2020

PUBLIC

Norfolk County Council

KING'S LYNN TO HUNSTANTON RAIL LINE

Viability Study

VIABILITY STUDY (VERSION 002) PUBLIC

PROJECT NO. 70064960 OUR REF. NO. 70064960-WSP-VS-KLH-001

DATE: OCTOBER 2020

WSP

62-64 Hills Road
Cambridge
CB2 1LA

Phone: +44 1223 558 050

Fax: +44 1223 558 051

WSP.com

QUALITY CONTROL

Issue/revision	First issue	Revision 1	Revision 2	Revision 3
Remarks	Draft 1	Draft 2	HRG comments	
Date	15/04/2020	01/05/2020	09/10/2020	
Prepared by	Adrian McHale Andrew Potter Ed O'Loughlin Nick King Paula Cuthbertson Peter Fagg	Andrew Potter	Paula Cuthbertson	
Signature				
Checked by	Philip Clark	Paula Cuthbertson	Philip Clark	
Signature				
Authorised by	Philip Clark	Philip Clark	Paula Cuthbertson	
Signature				
Project number	70064960	70064960		
Report number	KLH-001_D6	KLH-001_D7		
File Reference	\\uk.wspgroup.com\central data\Projects\700649xx\70064960 - Kings Lynn to Hunstanton Rail Line Feasibility\03 WIP\TP Transport Planning\05 Reports			

CONTENTS

TABLES

FIGURES

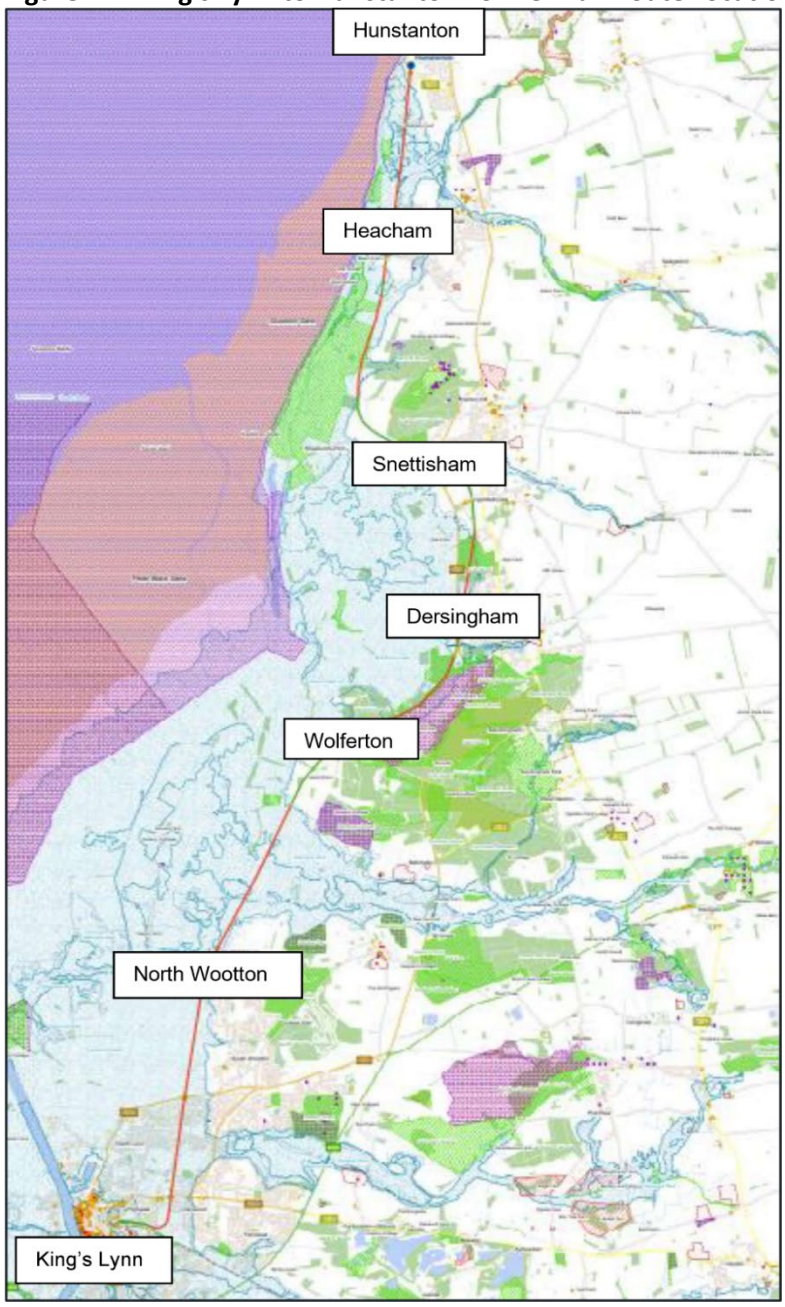
APPENDICES

1. INTRODUCTION

1.1 BACKGROUND

1.1.1 This report was produced by WSP on behalf of Norfolk County Council to consider reopening of the former King's Lynn to Hunstanton rail line, which closed in 1969 (following the Beeching Review). An overview route map is shown in **Figure 1-1.**

Figure 1-1: King's Lynn to Hunstanton Former Rail Route Location Plan



1.1.2 The King's Lynn to Hunstanton Railway Campaign[1] is advocating re-opening this route, although not necessarily on the previous alignment, and has set out a number of benefits that this could bring including easing traffic congestion and bringing environmental, social and economic benefits. In a presentation to County Councillors on the Infrastructure and Development Select Committee, 11 September 2019, the group set out that, in their view, some of the barriers to railway reopening such as cost and development on the old route have been overstated and should be reconsidered.

1.1.3 The campaign group wants to see Norfolk County Council (NCC) policy commitment to reopening the rail route. However, NCC need to understand how feasible re-opening a railway along the historic alignment might be, whether there is likely to be a business case, whether such a railway would indeed achieve the benefits suggested; and also whether there might be more affordable / achievable alternatives which would realise the same or greater benefits.

1.2 PURPOSE OF THE STUDY

1.2.1 The purpose of this desk-top study is to determine the likely merit of the proposal to open and operate a rail service between King's Lynn and Hunstanton. This study is not aiming to produce a *Full Business Case* (FBC), or *Strategic Outline Business Case* (SOBC), for this proposition; instead, the intention is to undertake a high level desktop-based exercise assessing likely passenger demand to derive potential revenue, order of magnitude estimates of Operational Costs (OPEX) and Capital Costs (CAPEX) at a very broad level, which in turn will allow a gross approximation of Benefit to Cost Ratio (BCR) to be derived.

1.2.2 The report has been updated in October 2020 following external review. However, it should be noted that the data contained in this report was obtained prior to the COVID-19 lockdown.

1.3 REPORT STRUCTURE

1.3.1 The remainder of this report is structured as follows:

- Chapter 2: highlights relevant policy applicable to the study area
- Chapter 3: considers the existing conditions on the road and rail networks
- Chapter 4: sets out the development context for the future baseline (to 2036)
- Chapter 5: explains the methodology used for high-level appraisal of route options
- Chapter 6: summarises and reviews the various route options considered, noting physical constraints and potential deliverability issues.
- Chapter 7: reviews the key constraints affecting the study area and how the route options perform (high-level) in terms of minimising risk to the sensitive designated sites along the corridor
- Chapter 8: rail safety and level crossing risk are an important feasibility issues opportunities for minimising risk are considered for the route options
- Chapter 9: benchmarking of the proposed stations on the route against similar nearby stations in the wider east of England to predict high-level revenue and patronage estimates for the route
- Chapter 10: a high-level rail engineering review of the route options is carried out and potential issues that may affect feasibility are identified
- Chapter 11: calculate high-level capital and operational costs for the route options
- Chapter 12: summarises the feasibility and viability study

[1] http://www.hunstantonrail.org.uk/

2 POLICY CONTEXT

2.1 RESTORING YOUR RAILWAY FUND

2.1.1 The Department for Transport (DfT) is inviting MPs, local councils and community groups to propose how they could use funding to reinstate local rail services and restore closed stations. The Restoring your Railway Fund is to be split three-ways to ensure that the DfT can support different projects at different phases:

- **Ideas Fund** - seeking proposals for projects to restore lost rail connections. Proposals should be sponsored by MPs working with local authorities and community groups. Proposals will be put to a panel of experts, with successful ideas offered support from the Ideas Fund to help develop more detailed business cases. There will be at least two rounds offering the opportunity for applications to be submitted;
- **Accelerating existing proposals** - funding is being made available to accelerate the development and delivery of schemes that already have business cases. Funding may also support newer schemes that already have supporting analysis and are seeking a larger sum of support to progress to an Outline Business Case (OBC).
- **Proposals for new or restored stations** - a further £20 million round of the New Stations Fund. The core criteria will be similar to previous rounds (demonstrate value for money; proportion of third party match funding available at the time of the bid; the expected quantity of new rail income generated from station/on-going subsidy; ability to timetable services effectively and likely impact on other passenger transport benefits, and; minimised disruption during delivery)

2.1.2 NCC are currently pursuing a development funding application via the Ideas Fund.

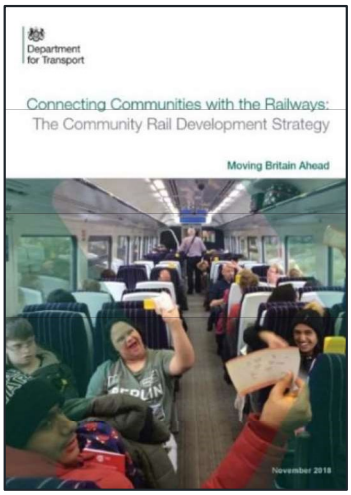
2.2 CONNECTING COMMUNITIES WITH THE RAILWAYS

2.2.1 The DfT published The Community Rail Development Strategy in November 2018. Community rail lines carry over 40 million customers annually and are part of the national rail network. They are supported by community rail partnerships which are community-based organisations working in partnership with Train Operating Companies (TOC), Network Rail, local councils, other community organisations (such as rail user groups), and voluntary groups.

2.2.2 The Community Rail Development Strategy encourages individuals, communities, voluntary organisations and businesses to take responsibility for the issues that matter to them and their communities. The strategy is structured around the following:

- **Helping community rail to flourish** - to successfully deliver the aims of the strategy, community rail groups need to be sustainable and inclusive organisations.
- **Providing a voice for the community** - ensuring community rail groups are independent / effective, highlighting the importance of dialogue with the rail industry.

- **Promoting sustainable and healthy travel** - utilising community rail groups knowledge of local needs / views, rail can be placed at the heart of sustainable journeys.
- **Bringing communities together and supporting diversity and inclusion** - community rail groups can play a pivotal role in building integrated communities.
- **Supporting social and economic development** - community rail groups can assist railways make a greater economic and social impact and support local regeneration.
- **Government's commitment to the delivery of the strategy** - the DfT will ensure that the role of community rail groups in delivery community benefits are promoted, understood and supported.



2.3 KING'S LYNN & WEST NORFOLK BOROUGH COUNCIL LOCAL DEVELOPMENT FRAMEWORK – CORE STRATEGY

2.3.1 The *Core Strategy*, adopted in July 2011, forms part of King's Lynn & West Norfolk Borough Council's (KL&WNBC) *Local Development Framework* (LDF). The Core Strategy sets out the spatial planning framework for the Borough up to 2026 by guiding development and the use of land, steering and shaping new development and setting out the long-term plan for the Borough.

2.3.2 Policy CS11 - Transportation - of the *Core Strategy* recognises that the main mode of transport across the Borough is private vehicles. This generates issues relating to safety, pollution and congestion which affect areas in and around King's Lynn and creates localised issues which are exacerbated during the summer tourist season.

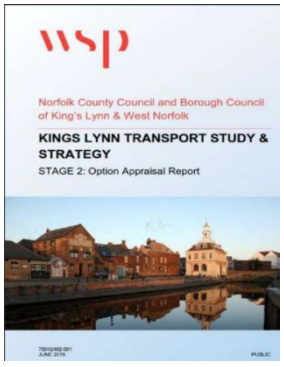
2.3.3 A key transport strategy is to deliver a sustainable transport network which improves connectivity within and beyond the Borough, which also reinforces the role of King's Lynn as a regional transport node. Whilst it is vital that the Borough remains accessible by means of private vehicle, the Core Strategy also encourages the use of more sustainable transport methods and will seek to extend the choice of transport available for communities. KL&WNBC will prioritise improvements to the strategic networks which serve passenger and freight movements and will seek to provide (amongst other things) improvements to rail infrastructure, facilities, and services on the West Anglia Main Line (WAML).

2.4 KING'S LYNN TRANSPORT STUDY & STRATEGY

2.4.1 Further to the LDF, KL&WNBC are working in partnership with NCC to create a specific transport strategy for King's Lynn, covering the period to 2026. The strategy aims to support sustainable economic growth in King's Lynn by improving travel choices for all, whilst also improving air quality and protecting historic areas.

2.4.2 The *King's Lynn Transport Study & Strategy* will concentrate on the short to medium term (five to 15 years), whilst also identifying some long-term aspirations for King's Lynn transport network (beyond 15 years). Stage 2 of *the Transport Study & Strategy* (the Option Appraisal Report), was published in June 2019. In consideration of a King's Lynn to Hunstanton rail line the report concluded that:

"Deliverability: the appraisal of a new rail line would have strict requirements and need significant investment, unlikely to be achievable within the plan timescale." [Table 4.1; 3.4]



2.4.3 However, the subsequent *Consultation Draft Stage 3 Report* (December 2019) considers that:

"The disused railway line between King's Lynn and Hunstanton could be better utilised for pedestrian and cycle use and/or a high-quality public transport corridor." [paragraph 3.3.2]

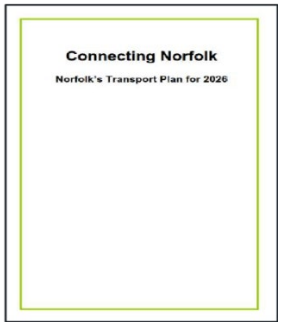
2.4.4 The study also highlights the need for a town-wide parking strategy and reducing demand for town centre parking, potentially via Park & Ride. The need for an over-arching car parking strategy which

encourages the use of public transport, cycle and walking trips is identified as a challenge and a short-term measure. STM17 is proposed to develop a car parking strategy for King's Lynn including an assessment of opportunities for Park & Ride.

2.5 NORFOLK'S TRANSPORT PLAN FOR 2026

2.5.1 *Norfolk's Transport Plan for 2026, published* by NCC and adopted in 2011, describes NCC's policy framework and strategy for transport and is used as a guide for investment priorities. The vision is to create *"a transport system that allows residents and visitors a range of low carbon options to meet their transport needs and attracts and retains business investment in the county."*

2.5.2 Although not responsible for rail services, NCC acknowledges that the WAML, which connects King's Lynn to Cambridge and central London, is a key strategic connection and, working with partners, will support improving services where possible. *Norfolk's Transport Plan for* 2026 also places importance on providing opportunities for sustainable tourism, recognising the benefit of community and heritage rail lines.



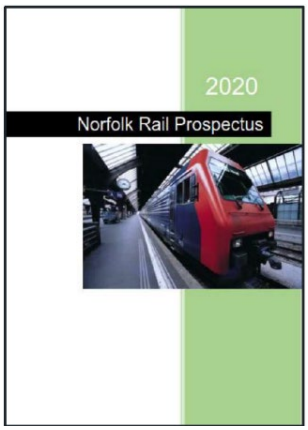
PUBLIC CONSULTATION (JANUARY 2020 TO FEBRUARY 2020)

2.5.3 *Norfolk's Transport Plan for 2026* was adopted in 2011 and since that time key policy objectives have been achieved, new priorities have arisen and there have been significant changes to the way that people travel, and how much. NCC are in the process of updating their *Local Transport Plan* (LTP) to cover the period 2020-2036. In early 2020, NCC held a public consultation in order to gain feedback to understand local peoples' current and future priorities for transport in Norfolk.

2.6 NORFOLK RAIL PROSPECTUS

2.6.1 In conjunction with the public consultation on the LTP, NCC also consulted on the *Norfolk Rail Prospectus*, which is also being updated, in order to reflect the views of local people and stakeholders.

2.6.2 *The Draft Norfolk Rail Prospectus 2020* sets out what NCC feels is required to ensure that rail can serve the needs and expectations of passengers, and to ensure that it continues to support Norfolk's economy whilst also supporting the housing and jobs growth planned.



2.6.3 The Prospectus recommendations are prioritised into three categories:

- Short-term (deliverable / work to commence 2019-2024);
- Medium-term (deliverable / work to commence 2024-2029); and
- Long-term (deliverable post 2029).

2.6.4 The *Draft Norfolk Rail Prospectus 2020* recognises that rail is vital to the success of the county, providing an important link for businesses and leisure trips. Therefore, despite not being responsible for rail services, NCC is engaged in several partnerships pushing for improvements.

2.6.5 The *Draft Norfolk Rail Prospectus 2020* includes the King's Lynn to Hunstanton rail line as a potential avenue for exploration due to proposals raised by the King's Lynn to Hunstanton Railway Campaign. It highlights that, to date, no technical work has been undertaken to examine the viability of re-opening the line. Therefore, NCC has commissioned this *Viability Study* to assess whether there is likely to be a business case for re-opening the route (exploring the original and alternative alignments due to, amongst other things, development and environmental constraints compromising the original route alignment).

2.7 ANGLIA ROUTE STUDY

2.7.1 The *Anglia Route Study*, published by Network Rail in March 2016, seeks to establish the required future capacity and capability of the railway through a systematic analysis of the future requirements of the network. It covers five key corridors, one of which is the WAML, routing between London Liverpool Street and King's Lynn, which has the potential for significant housing and employment growth.

2.7.2 WAC08 indicates that an option is currently being developed which examines lengthening train services on the King's Lynn to Cambridge section to eight carriages. Due to platform length restrictions at Waterbeach, Littleport, Downham Market, and Watlington services operating to these stations are restricted to a four-carriage maximum length. The platform lengthening works commenced in early 2020 and eight-carriage services are expected to be operational by 2021.

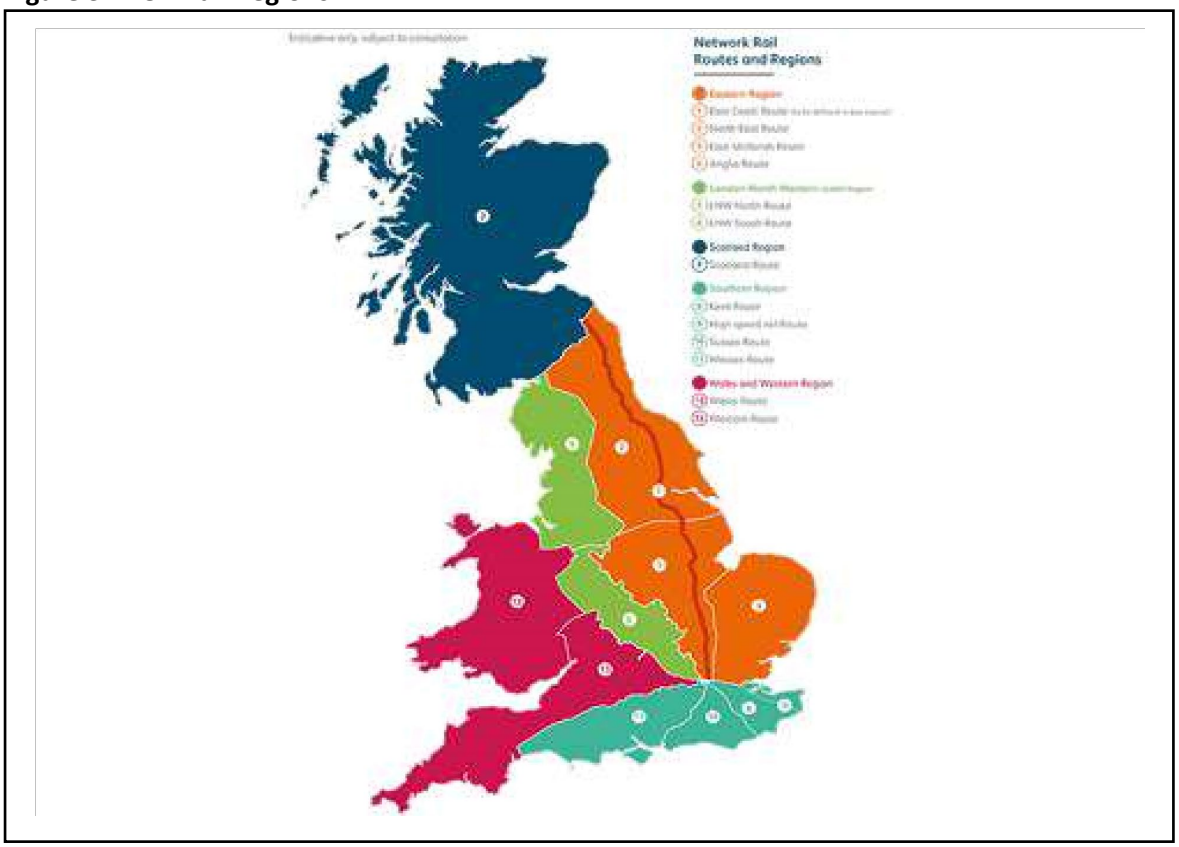
2.7.3 Network Rail is also working with industry partners to understand how any of the off-peak gaps in service between King's Lynn and Cambridge can be filled with a two train per hour pattern (WAC06).

3 EXISTING CONDITIONS

3.1 EXISTING RAIL NETWORK – WIDER CONTEXT

3.1.1 The UK rail network - consisting of 20,000 miles of track, 30,000 bridges, viaducts and tunnels and thousands of signals, level crossings and stations is divided into five principle regions (eastern; north-west and central; Scotland's railway; southern, and Wales and western) as shown indicatively in **Figure 3-1.**

Figure 3-1: UK Rail Regions

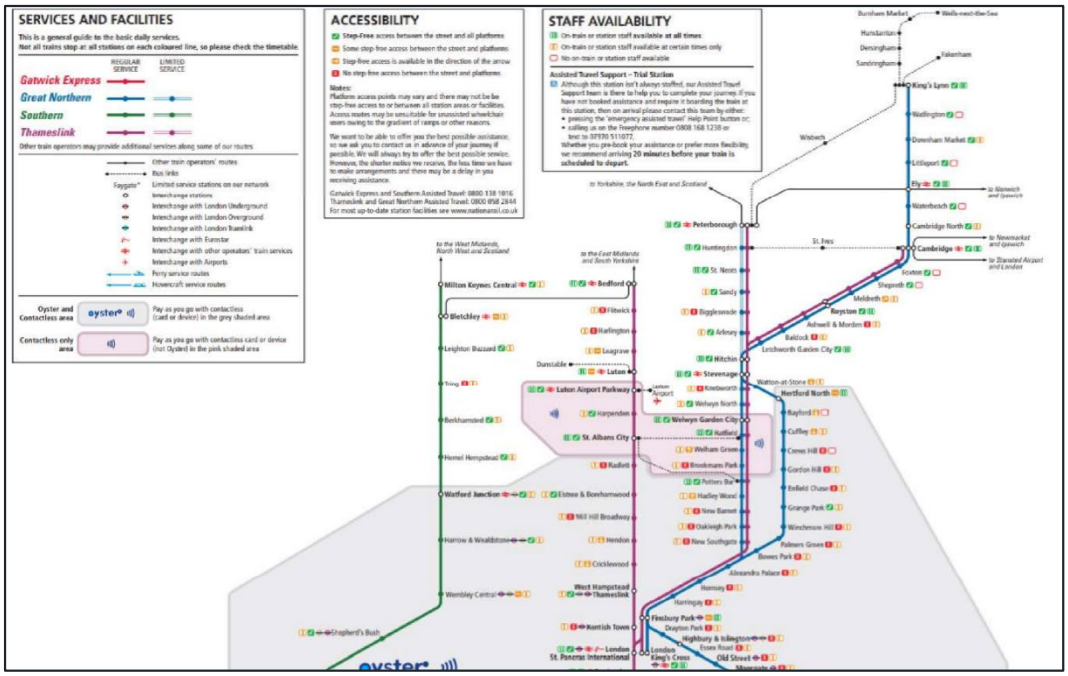


3.1.2 Norfolk is located within Anglia Route, forming part of the wider Eastern Region maintained by Network Rail. Trains services between King's Lynn and London King's Cross are operated by Great Northern and Greater Anglia, with a circa 20-minute to 30-minute frequency in either direction during the weekday morning period (up to 10:00hrs) and northbound during the PM peak period (17:30-20:45hrs). Service run on an hourly basis (in either direction) at other times throughout the day.

3.1.3 As mentioned previously, Network Rail is working with industry partners to provide a regular two train per hour pattern service between King's Lynn and Cambridge; however, infrastructure constraints at Ely are restricting delivery.

3.1.4 Whilst train services terminate at King's Lynn, onwards bus connections to Sandringham, Dersingham, Hunstanton and Wells-next-the-Sea are available. An extract from the Greater Anglia route map is shown in **Figure 3-2** and the full map is contained in **Appendix A.**

Figure 3-2: Rail Route Map Extract (Including Bus Links to Hunstanton)



3.1.5 Whilst existing bus services connect the key destinations along the former rail route, bus journey times are typically relatively slow in comparison with a direct rail line connections. For example the service 36 Coastliner service from Kings Lynn to Hunstanton currently takes about 56-58 minutes to complete the journey calling at the settlements previously served by the former railway.

3.2 FORMER RAIL ROUTE

3.2.1 Until the 1960s trains from London continued to Hunstanton via North Wootton, Wolferton, Dersingham, Snettisham and Heacham rather than terminating at King's Lynn (as shown in **Figure 1-1** on page 1). The line continued to operate as a branch line until its closure in 1969.

3.3 ENVIRONMENTAL CONSTRAINTS

3.3.1 As shown in the **Figure 1-1** (page 1), the former rail route is located in close proximity to a wide range of environmentally sensitive landscape features and designated sites - most notably the route runs through the Coastal Hazard Zone which is subject to coastal flooding risk. These constraints are considered in more detail in **Chapter 7** of this report.

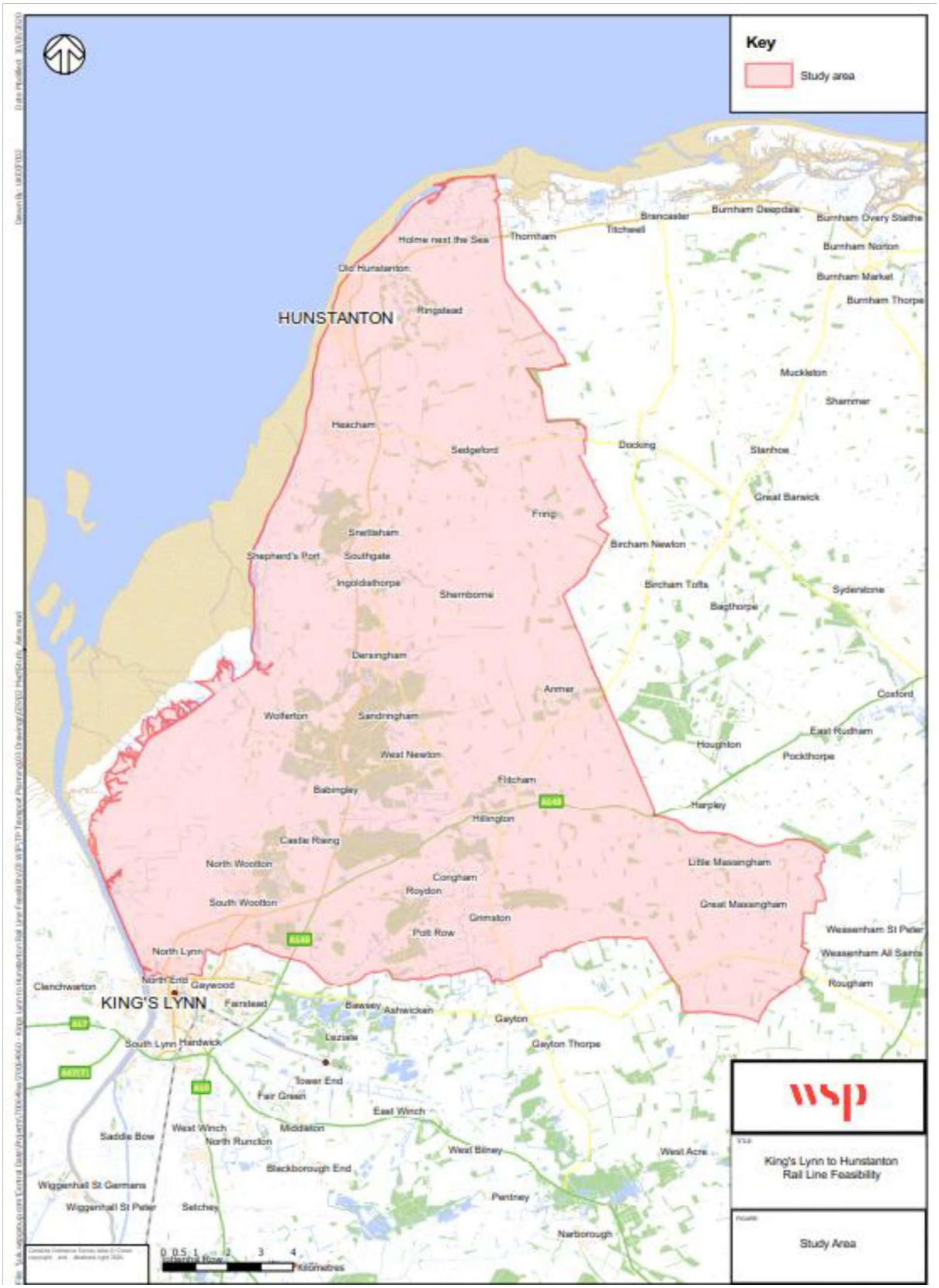
3.4 DEMOGRAPHIC CONTEXT

3.4.1 POPULATION

The 2011 UK Census revealed that 147,451 people resided in King's Lynn & West Norfolk and circa 36,339 of these people lived in the King's Lynn to Hunstanton corridor, shown indicatively in **Figure 3-3.**

3.4.2 Within the corridor study area, key settlements along the former rail-line include North and South Wootton (c6,908 population), Wolferton, Dersingham (c4,640 population), Snettisham (population c4,032 including Ingoldisthorpe, Fring and Sedgeford), Heacham (c4,750 population), and Hunstanton (c5,420 population).

Figure 3-3: King's Lynn to Hunstanton Study Area



3.4.3 Across the district (King's Lynn & West Norfolk) the population has risen by 8.9% since the previous census in 2001; however, in the King's Lynn to Hunstanton corridor, the population has only risen by 5.2%. Analysis of aerial photography (Google Earth) from 2019 suggests that there has been some in-fill development in towns within the corridor.

3.4.4 The population of the built-up area around King's Lynn (which includes the corridor area of North Lynn) is 61,966. South Wootton and North Wootton are also included in this total.

ECONOMIC ACTIVITY

3.4.5 Of the corridor population 43% were economically active in 2011, 20% were in school or further education, 9% unemployed and 28% were retired. Within the King's Lynn and West Norfolk district population about 25% were retired which is significantly higher than the national average (across the England and Wales population only 18% were retired in 2011).

HOUSEHOLD OWNERSHIP

3.4.6 Within the King's Lynn to Hunstanton corridor the household ownership of 73% is slightly higher than the District average of 70%, but substantially higher than the average across England and Wales of 64%. There are also many caravans and second homes in the catchment of the former rail route. However, it is assumed that these are not fully captured in 2011 Census data.

CAR OWNERSHIP

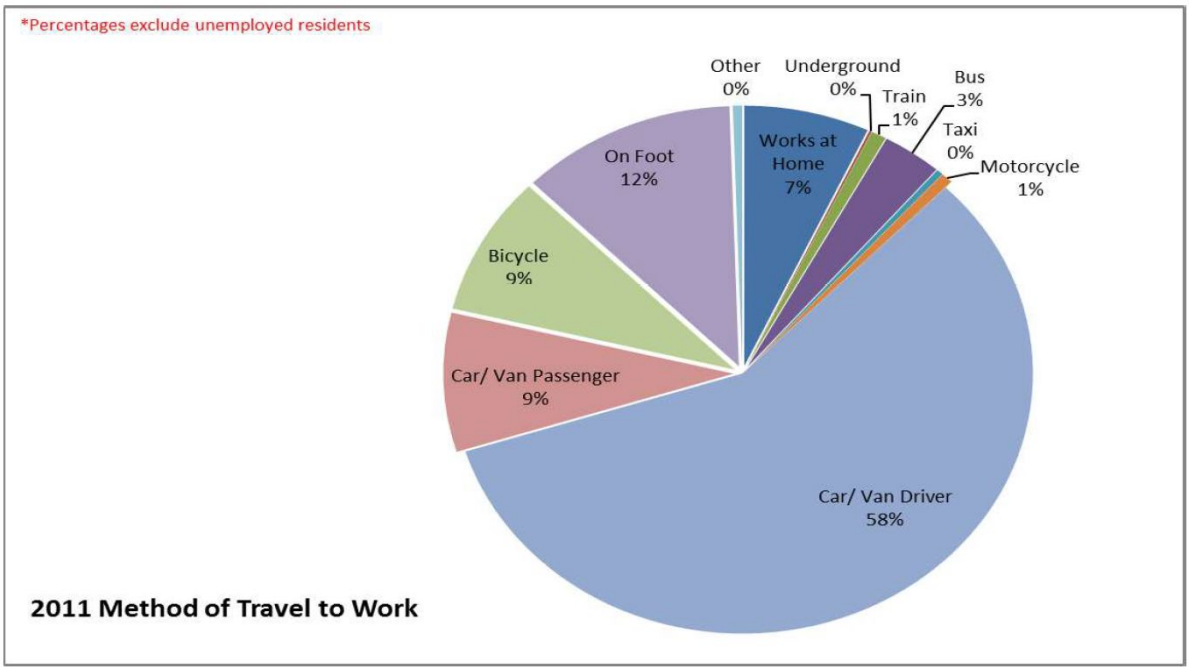
3.4.7 The 2011 census also indicates 83% of households in the King's Lynn to Hunstanton corridor have access to a car / van, with 36% having access to two or more cars / vans. Across the King's Lynn and West Norfolk district, 84% of households have access to a car / van with 39% having access to two or more cars / vans). In comparison, the average car ownership percentage in England and Wales is lower at 74% with 32% of households having access to two or more cars / vans.

METHOD OF TRAVEL TO WORK

3.4.8 The 2011 Census also shows that of those in employment, 72% use a car / van for their journey to work and 65% travel as car drivers. Across the King's Lynn and West Norfolk district, 70% use a car / van to travel to work (64% as drivers). For comparison, the England and Wales average car mode share for commuting is much lower with only 59% of people using the car to travel to work (54% as car drivers).

3.4.9 The 2011 Census also indicates that the use of public transport for commuting within the corridor is limited, with only 1% using the train for their respective journeys to work. Whilst only King's Lynn currently has a station, the mode shares for wards covering the King's Lynn urban area have a public transport commuting mode share of 4% (1% rail and 3% bus) which is below the national average of 12%. A summary of the King's Lynn mode shares is shown in **Figure 3-4.**

Figure 3-4: Census 2011 Commuting Mode Shares: King's Lynn Wards



3.4.10 The wider district of King's Lynn & West Norfolk sees limited use of public transport in general, with only 2% of the population using bus for their journey to work. Across England and Wales, 7% of trips to work are by bus and 5% are by rail, so the local population have a propensity to travel by public transport which is substantially below the UK average.

3.4.11 The use of walking as a means to travel to work within both the corridor and district is slightly below the England and Wales average - 7% walk to work within the corridor, 8% walk to work within the King's Lynn & West Norfolk district, whereas across England and Wales the average is 10%. However, more people in the corridor and the district cycle than the English and Welsh average. Within the corridor 6% of the population cycle to work, 5% of the district population cycle to work, whereas just 3% of the English and Welsh population cycle to work.

3.4.12 Whilst the relatively large retired and apparently affluent population (relatively high home and car ownership) within the district perhaps generates the higher car / van usage recorded by the census, the data may also suggest that opportunities to travel more sustainably are limited within the area. The use of the bike as a means of travel to work however, perhaps shows that the population within the corridor is willing to travel sustainably. Propensity for cycling in the flatter landscape may be higher as it is not fully constrained by shortfalls in the local public transport network.

3.4.13 The data presented above only covers commuting trips included within the 2011 Census. Whilst it is expected that there are other non-commuting trips occurring in the study area, there is limited local data available on this. The UK National Travel Survey (NTS,2018) Table 409 covering trips by mode of travel and journey purpose, is summarised in **Figure 3-5**, with all public transport modes (rail, bus and taxi) combined. This shows a combined public transport mode share of 7.7% for non-commuting trips.

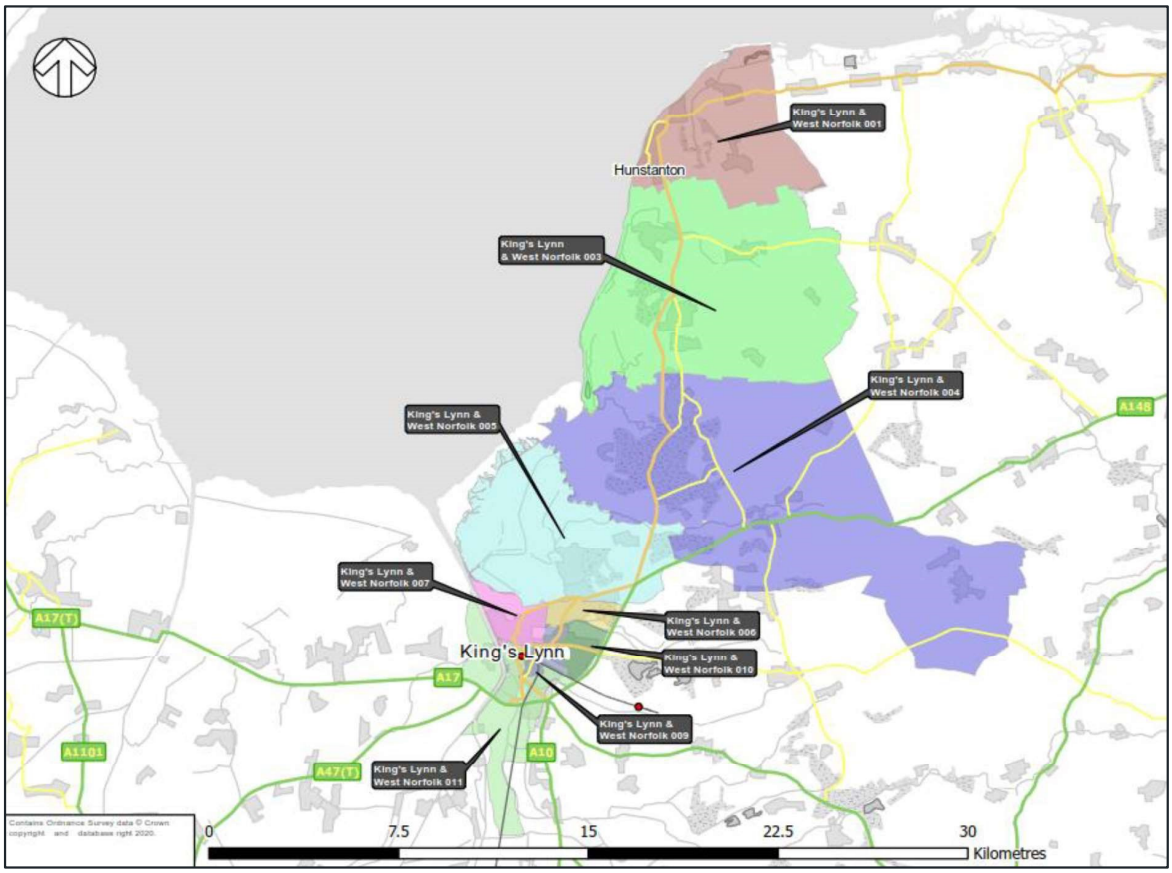
Figure 3-5: NTS 2018 Table 409: Main Mode by Purpose

NTS 2018	Trips per person per year							
Purpose	Walk[1,4]	Bicycle	Car / van driver	Car / van passenger	Motorcycle	Other private transport[2]	All Public transport Bus, Rail, Taxi	All modes
Commuting	19	6	78	12	1	-	28	144
Business	3	-	20	2	-	-	4	30
Education / escort education	53	2	27	29	0	3	12	126
Shopping	50	1	84	36	-	1	16	188
Other escort	11	-	49	25	0	-	3	89
Personal business	21	1	39	22	-	1	8	92
Leisure[5]	44	6	97	82	-	2	24	255
Other including just walk	62	0	-	-	-	0	-	62
All purposes	262	17	395	207	2	7	95	986
Total Non-Commuting & Business Trips	**241**	**11**	**296**	**194**	**1**	**7**	**63**	**812**
%of total Non-commuting and business	29.7%	1.3%	36.5%	23.9%	0.1%	0.8%	**7.7%**	100.0%

3.5 TRAVEL PATTERNS & KEY DESIRE LINES

The web-based online tool DataShine Commute[2], created by University College London (UCL), is a geospatial statistical model used to ascertain the key origins and destinations of journeys to work (by all modes) taken from Middle-Layer Super Output Areas (MSOA) within the study area. **Figure 3-6** shows the MSOA coverage and geographic boundaries.

Figure 3-6: Census 2011 MSOA Boundaries



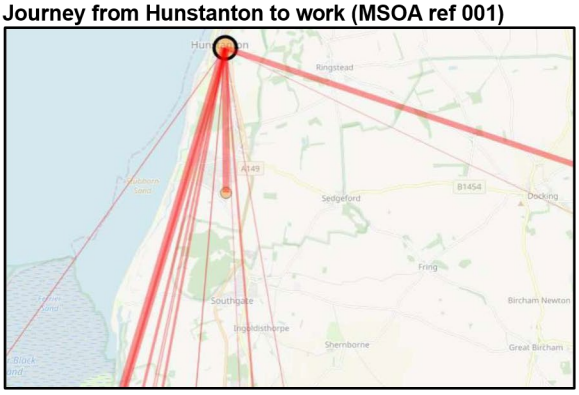
[2] https://commute.datashine.org.uk

3.5.1 **Figure 3-7** demonstrates the key desire lines for journeys to and from work for a series of King's Lynn & West Norfolk MSOAs which are located within the study area and would potentially be a calling point on a reinstated rail service. **Appendix B** provides the full-scale maps covering the study areas.

3.5.2 The top five MSOA origins and destinations for each of the MSOAs analysed and the associated number of trips to those MSOAs are also listed.

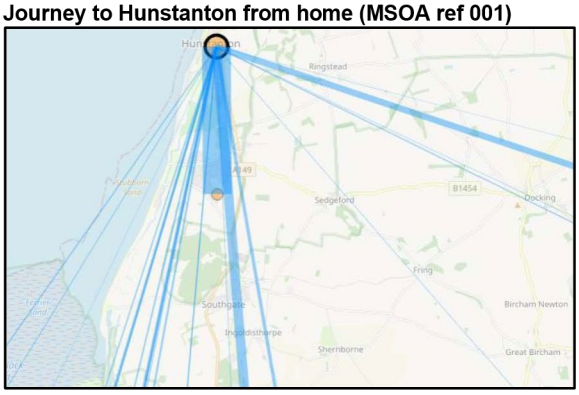
Figure 3-7: King's Lynn & West Norfolk MSOA Origins / destinations

Journey from Hunstanton to work (MSOA ref 001)



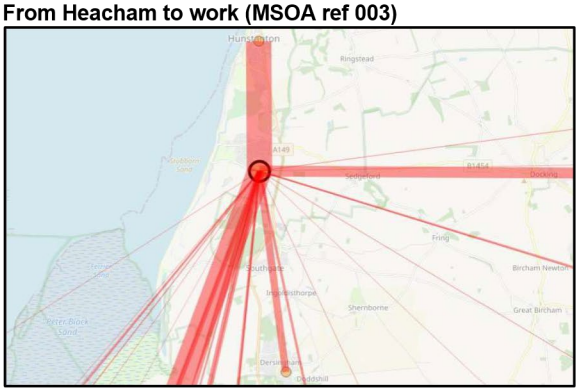
King's Lynn & West Norfolk 001 = 562
King's Lynn & West Norfolk 011 = 142
King's Lynn & West Norfolk 003 = 102
King's Lynn & West Norfolk 002 = 86
King's Lynn & West Norfolk 009 = 43

Journey to Hunstanton from home (MSOA ref 001)



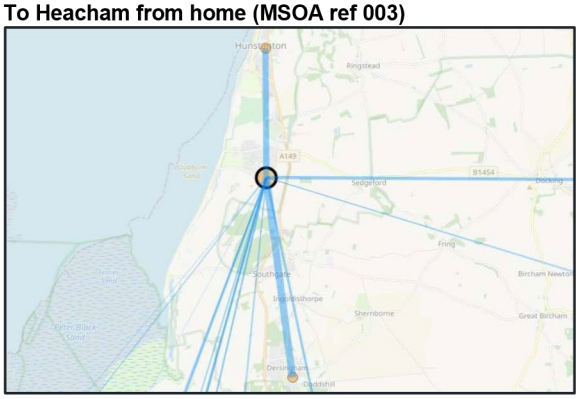
King's Lynn & West Norfolk 001 = 562
King's Lynn & West Norfolk 003 = 424
King's Lynn & West Norfolk 004 = 142
King's Lynn & West Norfolk 002 = 94
King's Lynn & West Norfolk 012 = 48

From Heacham to work (MSOA ref 003)



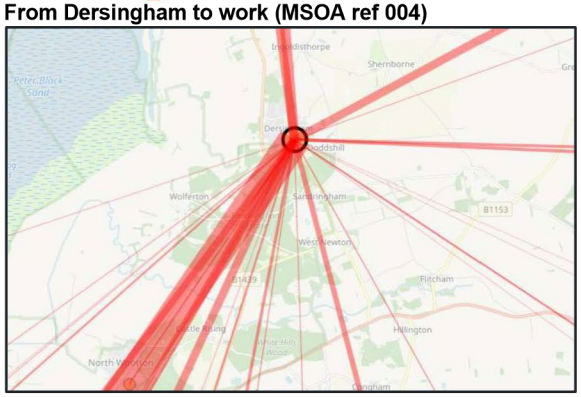
King's Lynn & West Norfolk 003 = 521
King's Lynn & West Norfolk 001 = 424
King's Lynn & West Norfolk 011 = 407
King's Lynn & West Norfolk 002 = 182
King's Lynn & West Norfolk 004 = 122

To Heacham from home (MSOA ref 003)



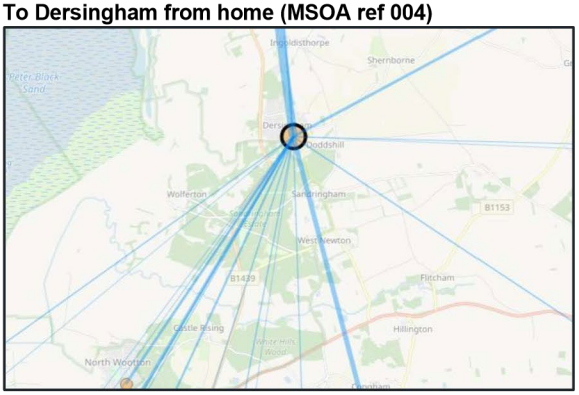
King's Lynn & West Norfolk 003 = 521
King's Lynn & West Norfolk 004 = 123
King's Lynn & West Norfolk 001 = 102
King's Lynn & West Norfolk 002 = 54
King's Lynn & West Norfolk 012 = 40

From Dersingham to work (MSOA ref 004)



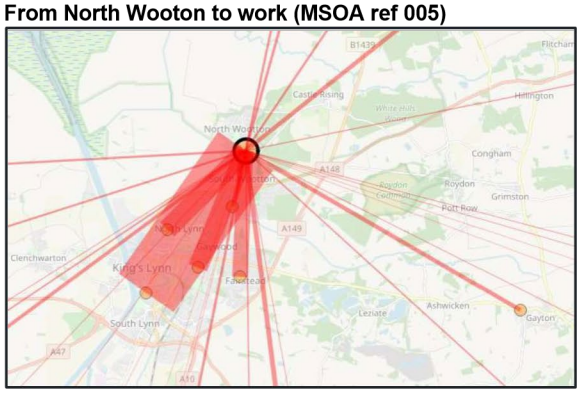
King's Lynn & West Norfolk 011 = 448
King's Lynn & West Norfolk 004 = 361
King's Lynn & West Norfolk 001 = 142
King's Lynn & West Norfolk 003 = 123
King's Lynn & West Norfolk 009 = 121

To Dersingham from home (MSOA ref 004)



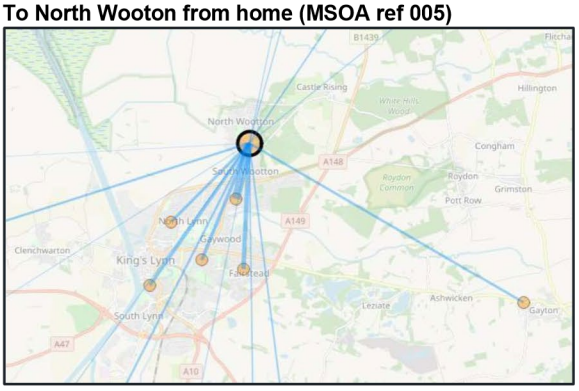
King's Lynn & West Norfolk 004 = 361
King's Lynn & West Norfolk 003 = 122
King's Lynn & West Norfolk 012 = 68
King's Lynn & West Norfolk 002 = 41
King's Lynn & West Norfolk 006 = 41

From North Wooton to work (MSOA ref 005)



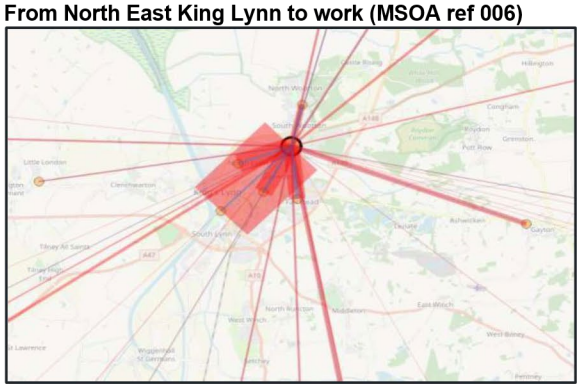
King's Lynn & West Norfolk 011 = 939
King's Lynn & West Norfolk 007 = 279
King's Lynn & West Norfolk 009 = 275
King's Lynn & West Norfolk 010 = 216
King's Lynn & West Norfolk 005 = 203

To North Wooton from home (MSOA ref 005)



King's Lynn & West Norfolk 005 = 203
King's Lynn & West Norfolk 006 = 119
King's Lynn & West Norfolk 010 = 63
King's Lynn & West Norfolk 009 = 48
King's Lynn & West Norfolk 011 = 47

From North East King Lynn to work (MSOA ref 006)

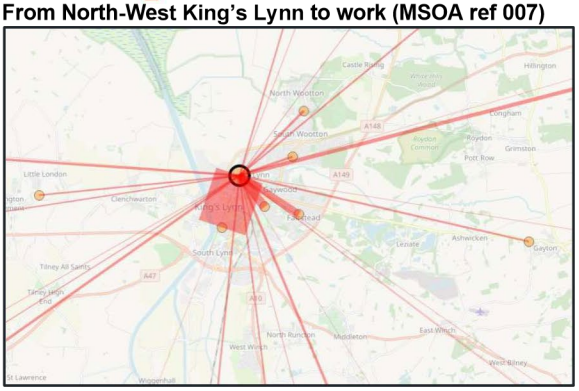


King's Lynn & West Norfolk 011 = 1,270
King's Lynn & West Norfolk 007 = 342
King's Lynn & West Norfolk 009 = 321
King's Lynn & West Norfolk 010 = 280
King's Lynn & West Norfolk 006 = 132

To North East King Lynn from home (MSOA ref 006)

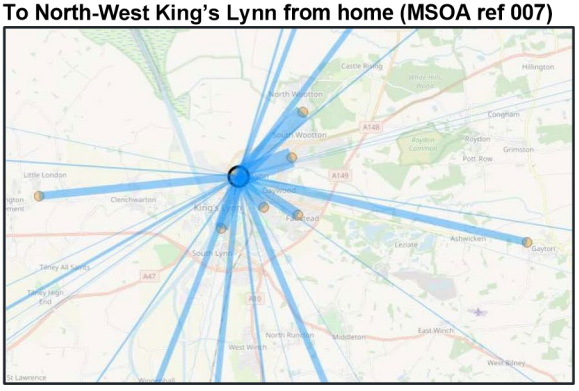
King's Lynn & West Norfolk 006 = 132
King's Lynn & West Norfolk 010 = 55
King's Lynn & West Norfolk 009 = 48
King's Lynn & West Norfolk 007 = 39
King's Lynn & West Norfolk 011 = 35

From North-West King's Lynn to work (MSOA ref 007)



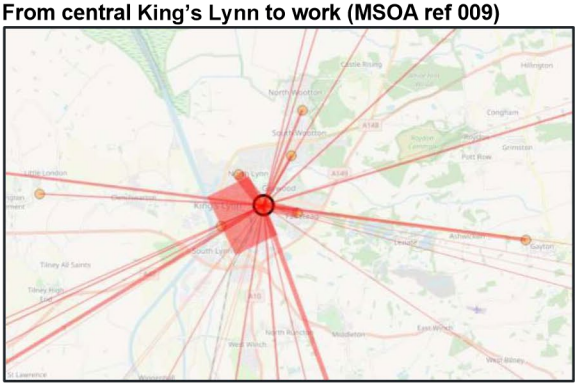
King's Lynn & West Norfolk 011 = 838
King's Lynn & West Norfolk 007 = 227
King's Lynn & West Norfolk 009 = 149
King's Lynn & West Norfolk 010 = 126
North Norfolk 011 = 66

To North-West King's Lynn from home (MSOA ref 007)



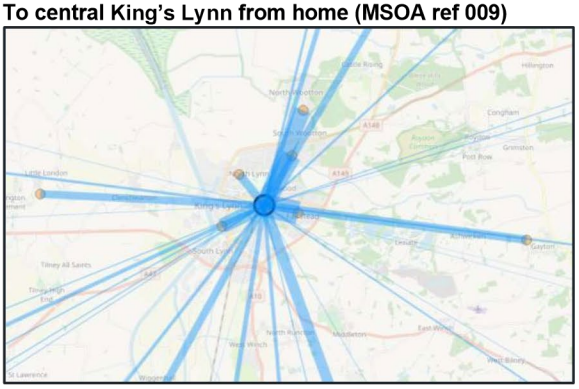
King's Lynn & West Norfolk 006 = 342
King's Lynn & West Norfolk 005 = 279
King's Lynn & West Norfolk 011 = 247
King's Lynn & West Norfolk 007 = 227
King's Lynn & West Norfolk 010 = 192

From central King's Lynn to work (MSOA ref 009)



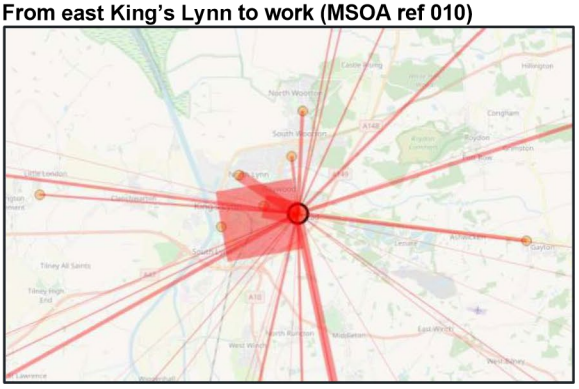
King's Lynn & West Norfolk 011 = 1,119
King's Lynn & West Norfolk 009 = 343
King's Lynn & West Norfolk 007 = 191
King's Lynn & West Norfolk 010 = 173
King's Lynn & West Norfolk 014 = 81

To central King's Lynn from home (MSOA ref 009)



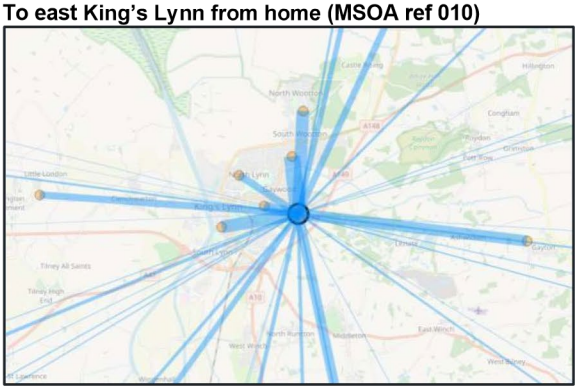
King's Lynn & West Norfolk 010 = 399
King's Lynn & West Norfolk 009 = 343
King's Lynn & West Norfolk 006 = 321
King's Lynn & West Norfolk 005 = 275
King's Lynn & West Norfolk 011 = 258

From east King's Lynn to work (MSOA ref 010)



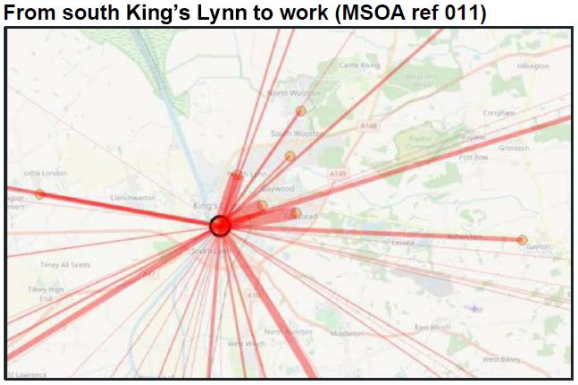
King's Lynn & West Norfolk 011 = 1,222
King's Lynn & West Norfolk 010 = 549
King's Lynn & West Norfolk 009 = 399
King's Lynn & West Norfolk 007 = 192
King's Lynn & West Norfolk 014 = 152

To east King's Lynn from home (MSOA ref 010)



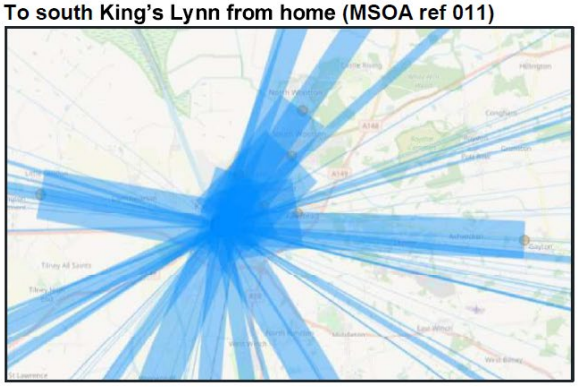
King's Lynn & West Norfolk 010 = 549
King's Lynn & West Norfolk 006 = 280
King's Lynn & West Norfolk 011 = 220
King's Lynn & West Norfolk 005 = 216
King's Lynn & West Norfolk 012 = 194

From south King's Lynn to work (MSOA ref 011)



King's Lynn & West Norfolk 011 = 1,740
King's Lynn & West Norfolk 009 = 258
King's Lynn & West Norfolk 007 = 247
King's Lynn & West Norfolk 010 = 220
King's Lynn & West Norfolk 014 = 139

To south King's Lynn from home (MSOA ref 011)



King's Lynn & West Norfolk 011 = 1,740
King's Lynn & West Norfolk 006 = 1,270
King's Lynn & West Norfolk 010 = 1,222
King's Lynn & West Norfolk 009 = 1,119
King's Lynn & West Norfolk 005 = 939

3.5.3 The diagrams in **Figure 3-7** demonstrate that there are relatively few longer distance trips which travel to rail-based destinations south of King's Lynn such as Cambridge, Ely, Peterborough and London on a daily basis for commuting, especially from the northern part of the catchment. This may be because the existing travel times are prohibitively long. A new rail connection would potentially improve access to Cambridge and improve journey times to this globally important centre of excellence for education and research.

3.5.4 However, it is acknowledged that there are some commuting patterns which have origins and destinations aligned with the former rail route stations. For example, the data indicates that there are about 424 daily commuters travelling from Heacham to Hunstanton and 448 from Dersingham to King's Lynn. There is potential for some of these trips to transfer to rail.

3.5.5 Within the King's Lynn urban area, there are also about 939 daily commuters travelling from North Wootton to King's Lynn town centre and about 1,222 trips from King's Lynn east to the town centre. These trips are located on the route.

3.5.6 Within the study area a total of 4,638 journeys to work have a destination and origin within the same MSOA, so are short distance trips that would be unlikely to transfer to rail. There are also 5,287 commuter journeys that occur between MSOAs, with 1,684 occurring between the MSOAs that make up the built area of King's Lynn. **Table 3-1** provides an origin-destination matrix for journeys to work by all modes from the 2011 census.

Table 3-1: Journey to Work Origin-Destination Matrix

All Modes		Usual Residence (MSOA Centroid)								
		Hunstanton	Heacham	Dersingham	North Wootton	North East King's Lynn	North-West King's Lynn	Central King's Lynn	East King's Lynn	South Kings Lynn
Workplace	Hunstanton	562	424	142	30	44	26	22	28	36
	Heacham	102	521	123	37	26	10	21	27	37
	Dersingham	31	122	361	31	41	11	22	29	13
	North Wootton	11	14	21	203	119	39	48	63	47
	North-East King's Lynn	7	17	13	34	132	39	48	55	35
	North-West King's Lynn	41	80	99	279	342	227	191	192	247
	Central King's Lynn	43	83	121	275	321	149	343	399	258
	East King's Lynn	39	92	115	216	280	126	173	549	220
	South King's Lynn	142	407	448	939	1270	838	1,119	1,222	1,740

Source: WU03EW - Location of usual residence and place of work by method of travel to work (MSOA level) (Census 2011)

3.6 EXISTING ROAD NETWORK CONDITIONS

TRAFFIC FLOWS & SEASONAL VARIATION

3.6.1 In order to understand daily variation of traffic within a typical week, a review of recent traffic survey data has been carried out for the A149 which connects King's Lynn with Hunstanton (running broadly parallel with the rail route considered within this study). Longer term data from A47 permanent monitoring sites has also been used to understand seasonal patterns of trips throughout the year.

3.6.2 The DfT published traffic count monitoring data for site 26716[3] on the A149 located to the south of Heacham indicates recorded Annual Average Daily Traffic (AADT) flows of 16,696 in 2017. Traffic flows recorded on the A149 at the King's Lynn end of the route, were higher with DfT count site 36735[4] recording two-way flows of 26,028 vehicles in 2018.

3.6.3 An Automatic Traffic Counter (ATC) survey was also commissioned by NCC on the A149 Queen Elizabeth Way between the B1145 and Sandy Lane from 21 June to 17 July 2018. The ATC recorded AADT flows (seven-day average) of 11,171 vehicles per day (or 12,588 vehicles for the five weekdays only) travelling northbound on the A149 and an average of 13,939 vehicles per day (14,938 weekday vehicles per day) heading southbound.

[3] https://roadtraffic.dft.gov.uk/manualcountpoints/26716

[4] https://roadtraffic.dft.gov.uk/manualcountpoints/36735

3.6.4 The data showed that in the northbound direction this peaked at 16,505 vehicles on Friday 13 July 2018, whilst the southbound peaked at 17,610 vehicles per day on Monday 25 June 2018. The southbound spike in traffic also appears to be spread over Sunday and Monday. This pattern of higher traffic volumes in the northbound direction on a Friday and in a southbound direction on a Sunday or Monday is repeated on other surveyed weekends, perhaps suggesting a large proportion of tourist or visitor traffic. Comparing the peaks with weekday averages indicates that tourist / visitor traffic may cause an approximate 30% increase in traffic.

3.6.5 To consider seasonality of traffic throughout the year, longer term data was extracted from Highways England 2018 monitoring sites on the A47 circa 600m west of its junction with the A149. As summarised in **Figure 3-8** the data showed that the average daily flow in April, July and August are typically higher than the average, with two way flows up to 10% higher than the weekday average during these school holiday months of the year, and about 35% higher than the average of the lowest recorded months of May and December.

Figure 3-8: A47 Average Daily Traffic (ADT) and Average Weekday Traffic (AWT)

3.6.6 August 2018 data (**Figure 3-9**) showed a similar Friday peak; however, it was less discernible between eastbound and westbound directions and the pattern was also repeated in October 2018 (**Figure 3-10**), a non-peak month.

Figure 3-9: A47 August Daily Flows (By Direction)

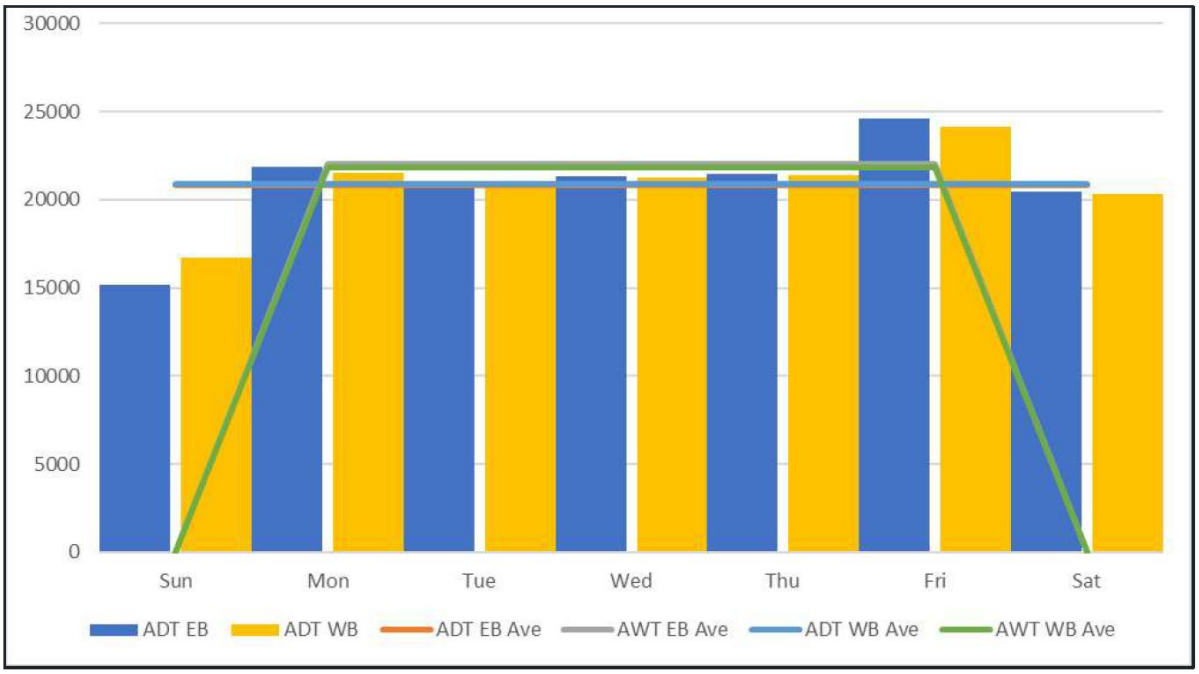


Figure 3-10: A47 October Daily Flows (By Direction)

3.6.7 A review of year-long 2015 ATC data from the A149 corridor at Hunstanton (**Figure 3-11**) revealed a similar seasonal trend where the relatively low AADT of 16,949 vehicles per day could increase by nearly 30% in August. This seasonal / monthly variation can be seen in **Table 3-2.**

Figure 3-11: ATC Location (567720, 340697)

Table 3-2: Seasonal / Monthly Variation A149 at Hunstanton

Month	AADT Factor
January	0.8128
February	0.7416
March	0.8308
April	1.0667
May	1.0771
June	1.1217
July	1.2043
August	1.2934
September	1.1155
October	1.0148
November	0.8668
December	0.8536

3.6.8 Year-long average 2015 ATC data from the A149 closer to King's Lynn (**Figure 3-12**) however, showed a relatively smaller seasonal variation perhaps as the result of larger background traffic flows in this location. The ATC located on the A149 at King's Lynn recorded an AADT of 23,606 vehicles per day and the seasonal / monthly variation of the AADT can be seen in **Table 3-3.**

Figure 3-12: ATC Location (566288, 322136)

Table 3-3: Seasonal / Monthly Variation A149 at King's Lynn

Month	AADT Factor
January	0.8371
February	0.9034
March	0.9689
April	1.0321
May	1.0449
June	1.0709
July	1.1322
August	1.1705
September	1.0574
October	0.9998
November	0.9041
December	0.8793

CONGESTION

3.6.9 An initial review of Google Traffic[5] shows that on a typical neutral weekday (Tuesday-Thursday) traffic is generally free flowing along the A149 between Hunstanton and King's Lynn, even in peak times (AM 08:00-09:00 and PM 17:00-18:00). However, the analysis did show some slow traffic in Heacham and Hunstanton outside these hours on a weekday, and through Dersingham and Snettisham around mid-day on a weekend suggesting that visitor traffic may be a contributory factor to congestion.

3.6.10 Within the King's Lynn urban area, it is evident that the local road network suffers from peak time congestion, with queuing and slow moving traffic on the principal routes within the town centre (A148 and B1144), and on the A149 eastern bypass of King's Lynn between A47 and Queen Elizabeth hospital (A1076 / B1145 junction). In the AM peak hour there is east-west congestion on a typical weekday on the A1076 passing through Fairstead and Gaywood towards the town centre. From the north, Google Traffic indicates instances of slow-moving traffic on the A148 southbound from South Wootton towards the town centre. Congestion is also recorded during the school peak hour (15:00- 16:00), with queuing traffic on approach arms of the A148 / A1076 junction.

3.6.11 Congestion along the A149 north of King's Lynn to coastal resorts is likely to be apparent during the holiday season. A detailed analysis of the extent of this has not been undertaken in this report but could be considered as part of a separate study that could potentially assess in more detail the likely mode-shift from road to rail on seasonal trips although these types of trips are unlikely to offer a reliable baseline of regular patronage needed to support a new railway.

ROAD SAFETY

3.6.12 Personal Injury Accidents (PIAs) on the A149 were obtained for the last five-year period from NCC (as seen in **Appendix C**). Between 01 December 2014 and 30 November 2019 there were 95 PIAs (72 of slight severity, 19 serious and four fatal) reported along the A149 corridor within the study area. The number of slight and serious type accidents increases coinciding with the busier monthly / seasonal variations in traffic flows. Fatal type accidents also increase in August, although the sample size is relatively low (four fatal accidents in five years), with three of these occurring in August. The seasonal distribution by month and severity are summarised in **Table 3-4** and **Table 3-5**.

[5] https://www.google.co.uk/maps/@52.8435794,0.480419,11.5z/data=!5m1!1e1?hl=en

Table 3-4: Road Accident Type by Month

Month	Slight	Serious	Fatal	All
January	3	2	0	5
February	1	1	0	2
March	5	3	0	8
April	10	0	0	10
May	5	2	0	7
June	3	1	0	4
July	10	3	1	14
August	13	3	2	18
September	6	0	0	6
October	6	1	0	7
November	3	2	0	5
December	7	1	1	9
Total	19	19	4	95

Table 3-5: Road Accident Seasonal Distribution

Month	Slight	Serious	Fatal	All
January	4.17%	10.53%	0.00%	5.26%
February	1.39%	5.26%	0.00%	2.11%
March	6.94%	15.79%	0.00%	8.42%
April	13.89%	0.00%	0.00%	10.53%
May	6.94%	10.53%	0.00%	7.37%
June	4.17%	5.26%	0.00%	4.21%
July	13.89%	15.79%	25.00%	14.74%
August	18.06%	15.79%	50.00%	18.95%
September	8.33%	0.00%	0.00%	6.32%
October	8.33%	5.26%	0.00%	7.37%
November	4.17%	10.53%	0.00%	5.26%
December	9.72%	5.26%	25.00%	9.47%
Total	100.00%	100.00%	100.00%	100.00%

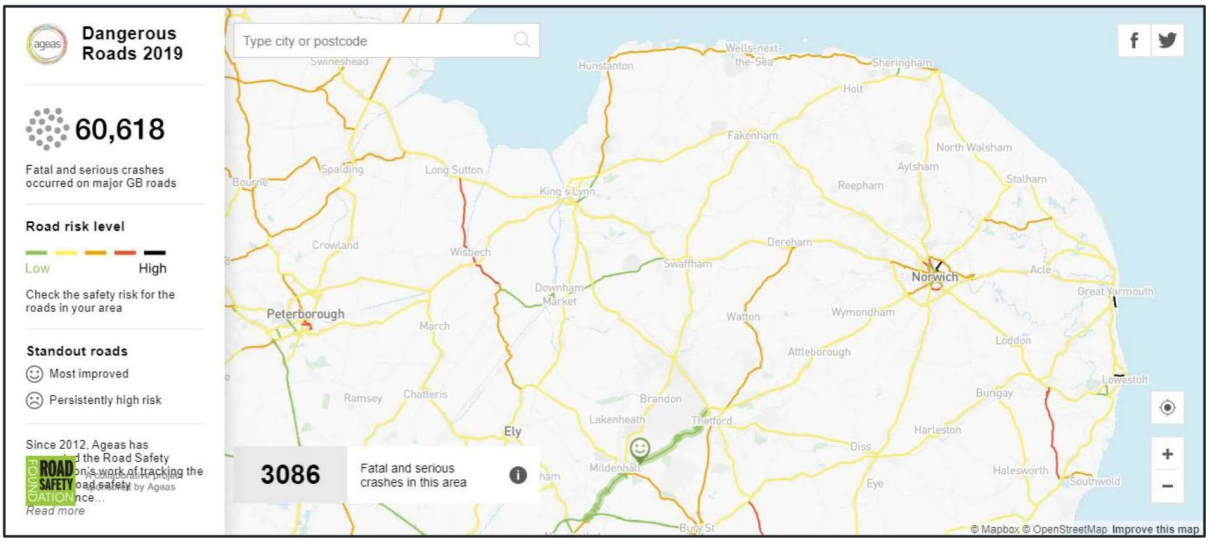
3.6.13 The majority of PIAs were of slight severity, with apparent peaks occurring during the school holiday months of April (Easter), July and August. There were relatively few fatal PIAs, but all of these occurred during school holiday months of the year. PIAs of serious severity seem to be more evenly distributed throughout the year. There does appear to be a higher incidence of PIAs overall during the seasonal peak periods.

3.6.14 A review of the dangerous roads map published by Ageas Insurance Limited[6] (an extract for the local area of Norfolk is shown in **Figure 3-13**), indicates that the A149 around King's Lynn generally has a good safety performance and is below the UK average in terms of accident risk.

[6] https://dangerousroads.ageas.co.uk/

3.6.15 North of King's Lynn, the A149 is in the central category indicating that the risk is average in comparison with the rest of the UK. In comparison with other similar roads across Norfolk, the A149 has a higher risk category than most other similar A-Road routes outside of urban areas.

Figure 3-13: Ageas Insurance Limited Dangerous Roads Map Extract



Source: https://dangerousroads.ageas.co.uk/

3.7 SUMMARY OF TRAVEL PATTERNS

3.7.1 Existing evidence on travel patterns within the corridor has been reviewed and this indicates that the local employed population within the catchment generally has a below average propensity to use public transport and journey distances for local residents tend to be relatively localised. There does not appear to be a high demand for long distance travel (e.g. to workplaces in Cambridge and London) and the A149 is generally uncongested and free flowing on a typical weekday, although it is understood that this is not necessarily the case during holiday periods. **Chapter 4** considers future development proposals and opportunities within the corridor to understand how much demand might grow in the corridor in the future.

3.7.2 It appears that visitor traffic, travelling longer distances, increases pressure on the A149 at weekends and during school holidays with about a 30% uplift in traffic, with increases in delays and journey times. There tends to be higher instances of PIAs on the surrounding highway network during school holiday periods. However, Ageas Insurance Limited data indicates that the A149 appears to have an accident risk that is no higher than other similar roads across the UK, but is above average locally within Norfolk for rural A-Roads away from urban areas.

3.7.3 There is also a high proportion of retired population living locally, who's travel patterns are less strongly related to commuting as well as a transient population of second homeowners and visitors which is most likely not captured within the demographic data available.

3.7.4 Whilst further surveys and studies could be carried out to understand visitor and non-resident travel patterns within the area, these types of trips are unlikely to offer a reliable baseline of regular patronage needed to support a new railway. Hence the emphasis on commuting data in the analysis undertaken.

3.7.5 It is acknowledged that there are shorter distance daily commuting trips within the corridor (e.g. Hunstanton to Heacham and Dersingham to King's Lynn), a proportion of which could potentially be undertaken by rail, if the railway route was re-instated. However, the magnitude of this effect would depend on the service frequency and pricing as well as overall convenience of rail travel for door-to-door journeys in comparison with the private car. From a review of Census data on mode shares, it does not appear that there is a high propensity for local residents to travel by public transport for commuting purposes currently with a bus mode share substantially below the UK national average.

3.7.6 At the King's Lynn end of the route, the historic highway network in the town centre is more constrained and there are more prevalent commuting patterns between potential station option locations (e.g. 939 daily commuting journeys from North Wootton to King's Lynn town centre or 962 daily journeys to and from the east of King's Lynn where the Queen Elizabeth hospital is located). Some of these trips could potentially be undertaken by public transport but again this would require a direct, convenient and cost-effective option to be available. Going forward NCC will continue to monitor issues of congestion on the A149 to understand them in more detail.

4 FUTURE BASELINE

4.1 THE FUTURE SITUATION IN 2036

4.1.1 The baseline for this study considers the future situation to the timeframe of the Local Plan horizon year of 2036. In this time, traffic and travel demand growth along the A149 route is expected to occur as a result of new development in the corridor and in line with national road traffic forecasting.

4.1.2 Trip End Model Presentation Programme (TEMPro) v7.2 forecasting with localised adjustments from National Road Traffic Forecast (NRTF) 2015 for rural principal roads in King's Lynn & West Norfolk has been used to apply an uplift to the 2018 observed flows (16,696 AADT) on the A149 south of Heacham. TEMPro indicates that an AADT growth factor of 1.29 is appropriate for the period from 2018 to 2036 which would give a future baseline flow of approximately 21,537 by 2036 on the A149 (south of Heacham).

4.1.3 It should be noted that TEMPro-based forecasting assumes unconstrained capacity and is based on development assumptions of 23,145 dwellings and 4,469 jobs in the forecast period across the entire district of King's Lynn & West Norfolk. If this level of growth is actually realised and existing travel patterns continue, with the majority of trips undertaken by private car, capacity enhancements of the A149 might be required in order to accommodate the unconstrained growth predicted in TEMPro.

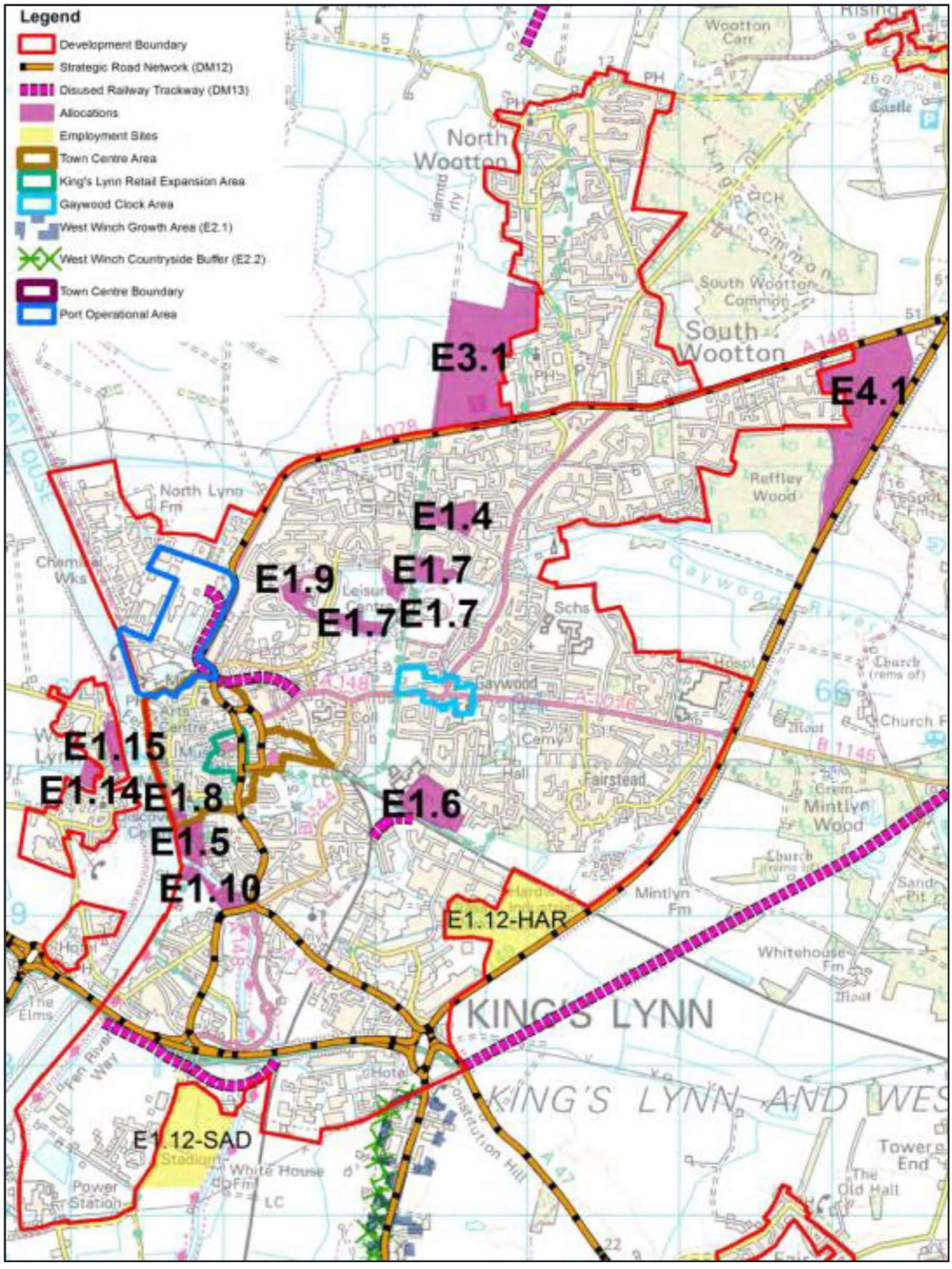
4.2 LOCAL PLAN ALLOCATIONS (PREDICTED GROWTH)

4.2.1 In the first instance the Site Allocations and Development Management Policies (SADMP) Plan, adopted September 2016, has been assessed to understand the extent to which development is proposed. The SADMP which forms part of the KL&WNBC Core Strategy which aims to guide development in the borough of King's Lynn and West Norfolk to 2026.

King's Lynn

4.2.2 Under the general policy 'E' the SADMP allocates the following sites in the area of King's Lynn for development and protects areas, as indicated on **Figure 4-1**.

Figure 4-1: King's Lynn SADMP Map Extract

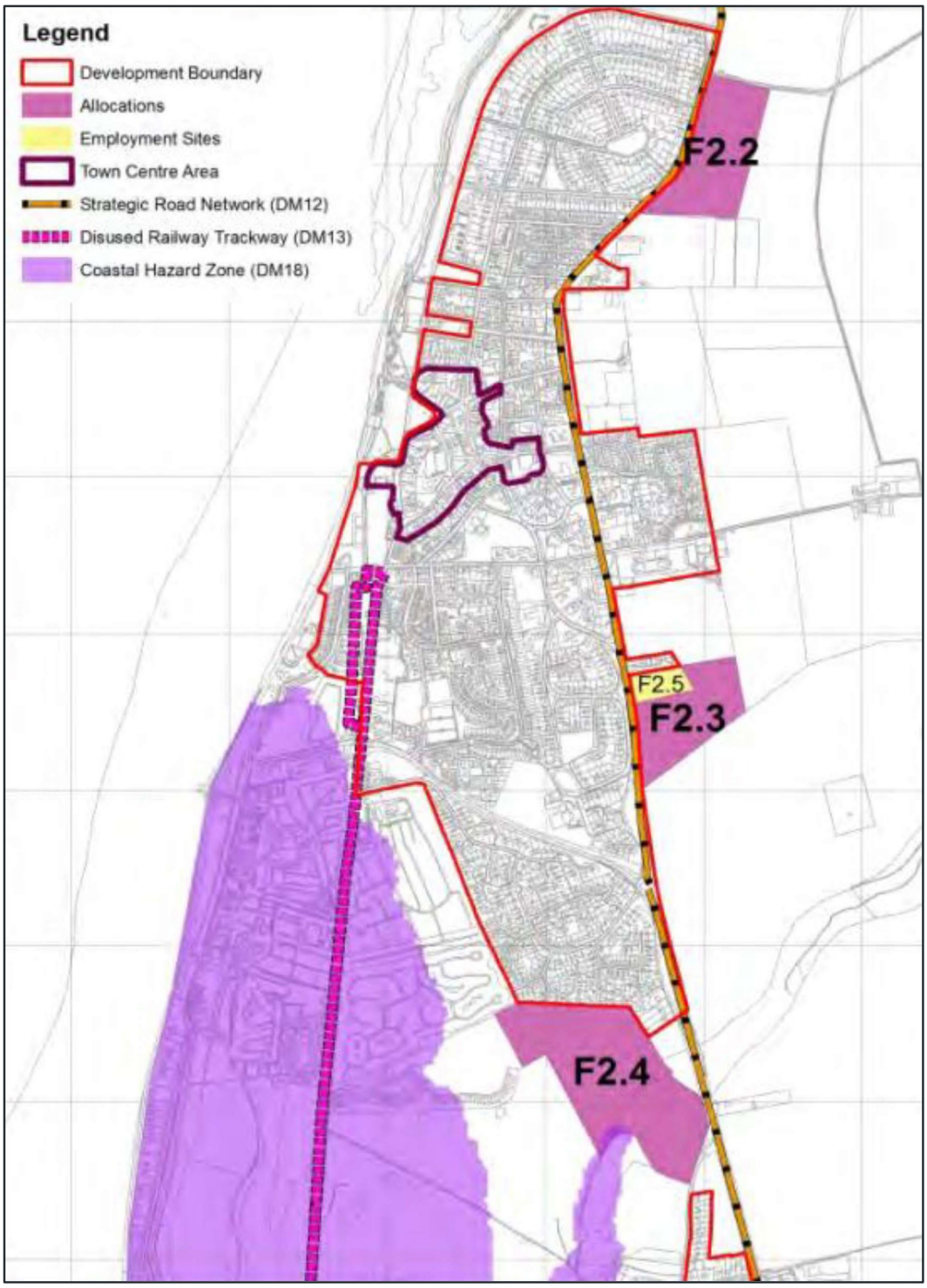


4.2.3 Of particular interest to this study are the sites E1.4, E1.7, E1.9; and E3.1. These are explained in more detail below:

- **E1.4**: The 5.3ha site is allocated for 130 dwellings. As of March 2019, the development of this site is underway and the access (onto Reid Way) has been constructed. A planning application for the 130 homes (15/00828/FM) was approved January 2017.
- **E1.7**: The site is split into three parcels of land and in total consists of 9.1ha and is capable of supporting at least 297 dwellings. An application for 54 homes was approved in November 2016 for the parcel of land to the west of Front Way (16/00097/FM); a further application (16/01327/FM) was permitted for 89 homes on the parcel of land either side of Greenpark Avenue (January 2017); and a further application was approved for 82 homes (16/02227/FM) in August 2017 for the parcel of land to the east of Front Way. In total, 225 dwellings have been approved. As of March 2019, development of the three parcels has commenced.
- **E1.9**: The 3.3ha development site has also been allocated for residential development of at least 100 units; a planning application remains to be submitted for this site.
- **E3.1**: The 40ha site at Hall Lane, South Wootton has been allocated for at least 300 dwellings. Subsequently, an outline planning permission for a significantly larger mixed-use development was approved in April 2019 - up to 450 dwellings, a mixed use local centre comprising Class A uses (including retail facilities and public house) and Class D1 (such as creche / day centre / community areas, sustainable urban drainage infrastructure, access and link road and associated infrastructure). As of March 2019, the development has yet to commence.

4.2.4 Policy F2 of the SADMP manages development within Hunstanton and **Figure 4-2** shows the relevant areas covered. The Hunstanton allocations are focused upon the A149 corridor.

Figure 4-2: Hunstanton SADMP Map Extract



- **F2.2**: The 6.2ha site on land east to Cromer Road is allocated for at least 120 dwellings. Outline planning permission for 120 dwellings (16/00082/OM) was approved September 2016. Aerial photography from September 2019 suggests that the site remains to be developed.
- **F2.3**: The 5ha site (Land South of Hunstanton Commercial Park, Residential) is allocated for housing also, 60 homes with care units, 50 general homes and a further 'affordable' element as per Core Strategy Policy CS09. Outline approval (16/00084/OM) was granted in February 2017 for a care home, up to 60 housing with care units and approximately 60 new dwellings with landscaping and vehicular access. Aerial photography from September 2019 suggests that development has not commenced.
- **F2.4**: The 12.6ha site (Land North of Hunstanton Road) is split between housing and public open space allocation. It is envisaged by KL&WNBC that 6.2ha of the site allocated for residential development could support 163 homes. Planning for this development (Heacham Manor) was originally submitted in 2007 (07/01718/F) and a variation of the approval conditions was accepted in March 2017. Aerial photography from September 2019 suggests that the first phase of the development is under way and the A149 access roundabout.
- **F2.5**: The site (Land South of Hunstanton Commercial Park, Employment Uses) comprises 1ha between the existing commercial park and the approved housing F2.3 and to date no application has been made for the site.

BRANCASTER

4.2.5 In Brancaster, circa 10km (6-miles) east of Hunstanton, Policy G13.1 of the SADMP allocates a relatively small site of 0.5ha for at least five dwellings. The site had a planning application for the construction of 12 residential units (10 open market, two affordable) (17/01517/FM) approved in July 2018. Aerial photography from August 2019 suggests that development of the site has commenced.

BRANCASTER STAITHE

4.2.6 Development in the adjacent Brancaster Staithe, circa 1.8km (8-miles) east of Hunstanton, is controlled under Policy G13.2 of the SADMP. The plan allocates 0.7ha (Land of The Close) for at least 10 dwellings. The development was permitted in November 2017 (16/02140/FM) and aerial photography from May 2019 suggests that construction of the development of 12 homes is underway.

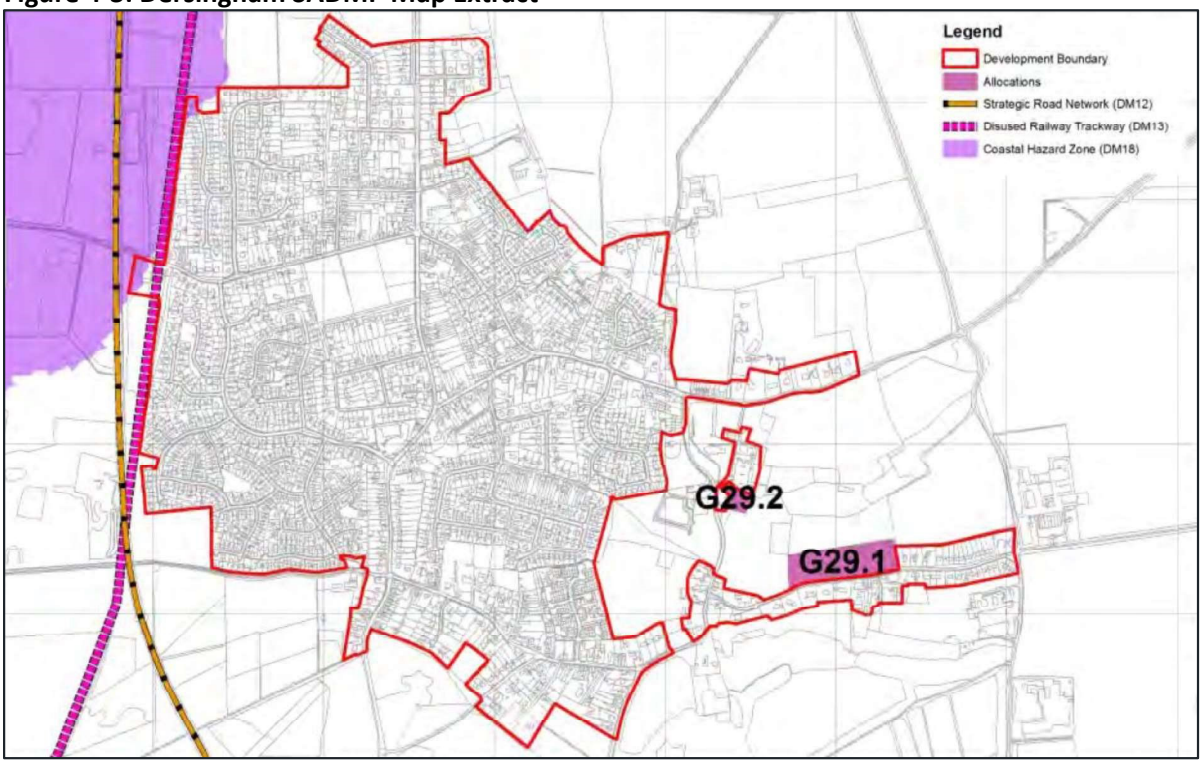
BURNHAM MARKET

4.2.7 Development in the settlement of Burnham market, circa 16km (10-miles) east of Hunstanton, is managed under Policy G17.1. The policy allocates 2.7ha site for 32 dwellings and a public car park of at least 1.2ha (Land at Foundry Field). The application was permitted in August 2014 (13/01810/FM) for a site which comprises 32 new dwellings, a 186-space public car park, retail units (Class A1, A2 or A3), public toilets and public open space. Aerial photography from May 2019 suggest that the development is complete.

DERSINGHAM

4.2.8 Policies G29.1 and G29.2 allocate two residential sites to the east of Dersingham as shown in **Figure 4-3.** Development to the west of the town is restricted by the A149 and Coastal Hazard Zone.

Figure 4-3: Dersingham SADMP Map Extract



4.2.9 The 1.8ha G29.1 site is allocated for a residential development of at least 20 units (Land north of Doddshill Road) and an application for 30 residential units was approve May 2018 (17/01336/OM). Aerial photography from September 2019 suggests that initial site development has begun.

4.2.10 The relatively smaller 0.3ha site G29.2 (Land at Manor Road) is allocated for a residential development of at least 10 units. An application for the 10 homes was permitted in April 2018 (17/01376/FM). Aerial photography from September 2019 suggests that development of this site has yet to commence.

DOCKING

4.2.11 Policy G30.1 allocates a relatively small site in Docking, circa 9km (5.5-miles) east of Heacham, for the development of at least 20 dwellings (Manor Pasture). The planning portal shows that outline planning permission (16/00866/OM) was permitted in February 2017 for 33 homes. Aerial photography from September 2019 suggests that development of this site has yet to commence.

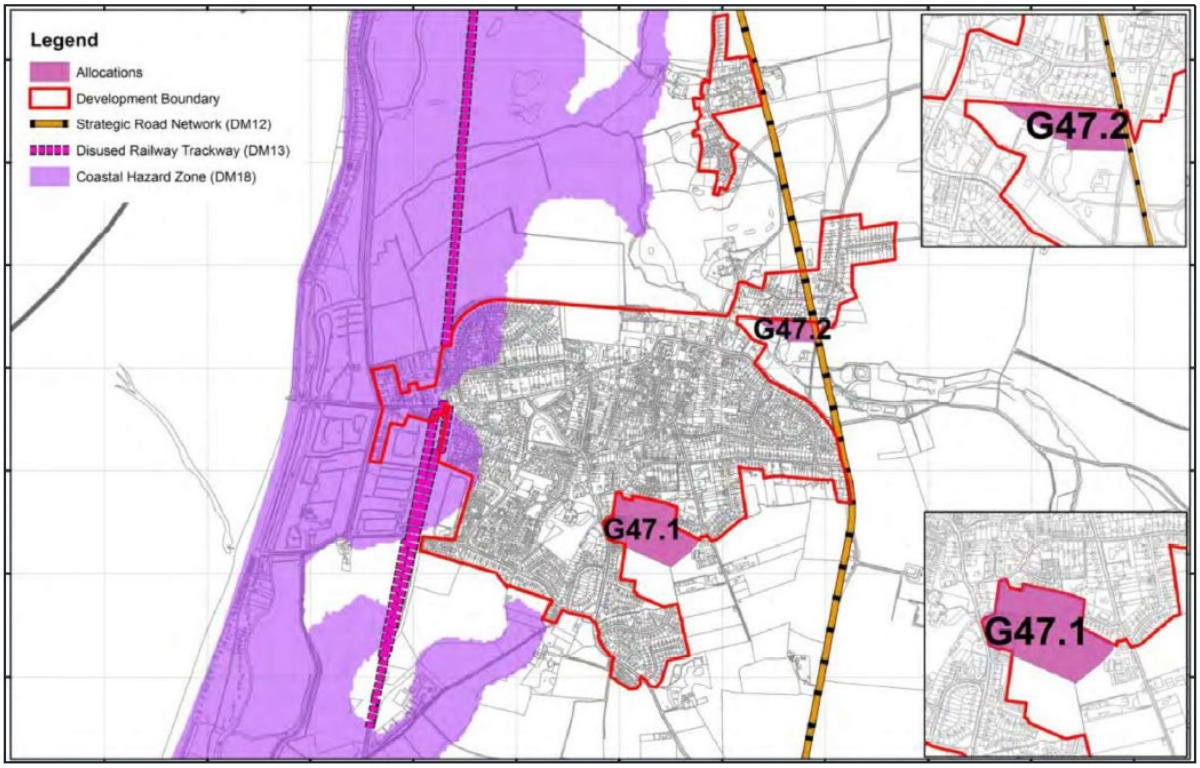
GREAT BIRCHAM

4.2.12 Policy G42.1 allocates a relatively small 0.58ha site in Great Bircham, circa 8.5km (5.25-miles) east of Snettisham, for the development of at least 10 residential units (Land Adjacent to 16 Lynn Road). These 10 units were approved in outline (16/00888/O) August 2017. Aerial photography from September 2019 suggests that development of this site has yet to commence.

HEACHAM

4.2.13 The SADMP allocates two sites in Heacham for development as indicated by Figure 4-4, G47.1 and G47.2. Development of the town is also constrained by the Coastal Hazard Zone and the A149.

Figure 4-4: Heacham SADMP Map Extract



4.2.14 The 6ha allocation G47.1 (Land of Cheyney Hill) has been considered capable of accommodating at least 60 dwellings and the planning portal reveals that the development of this site for 64 dwellings was permitted upon appeal (16/01385/OM) September 2018. Aerial photography from September 2019 suggests that development of this site has yet to commence.

4.2.15 The relatively smaller 1.3ha allocation G47.2 (Land to the South of St Mary's Close) is allocated for the development of at least six dwellings. An outline planning application for eight units (16/00245/O) was permitted January 2017 and aerial photography from September 2019 suggest that this small development is complete.

INGOLDISTHORPE

4.2.16 Development in Ingoldisthorpe, between Snettisham and Dersingham, less than 1.5km (1-mile) north of the latter, is controlled by Policy G52.1. The 0.7ha G52.1 allocation (Land opposite 143-161 Lynn Road) was considered capable of supporting of at least 10 dwellings. The planning portal indicates that permission was permitted April 2016 and September 2019 aerial photography suggests that initial works may have commenced.

SEDGEFORD

4.2.17 Policy G78.1 allocates a 0.6ha site in Sedgeford, circa 3km (2-miles) east of Heacham, (Land off Jarvie Close) for the development of at least 10 houses. The planning portal reveals that the development of this site in outline was permitted January 2017 (16/01414/O). Aerial photography from September 2019 suggests that development of this site has yet to commence.

4.2.18 The SADMP allocates the site G83.1 in Snettisham for development and it is considered that the 1.5ha site is capable of supporting at least 34 dwellings (Land south of Common Road and behind Teal Close). Aerial photography from September 2019 shows that the first phase of this development (accessing Common Road) is complete and the planning portal indicates that an application was granted in October 2016 (15/02006/OM) for nine dwellings (accessing Teal Close).

4.2.19 Within Snettisham, a planning application (20/00226/OM, Land North of Poppyfields Drive) for a further 69 homes has been recently submitted and is yet to be decided.

4.3 LOCAL PLAN REVIEW 2016-2036

4.3.1 KL&WNBC has issued a call for sites in line with government policy to inform their emerging Local Plan. Potential sites within the King's Lynn to Hunstanton corridor that could potentially be served by a new rail service are shown in **Table 4-1**. Sites in the table are residential unless stated otherwise.

Table 4-1: 2016-2036 Call For Sites List

Parish	Site	Area (ha)
Bircham	Land at Docking Road, Great Bircham	3.5
	Land North Of Stanhoe Road, Bircham Tofts	0.8
	Land North Of Stanhoe Road, Great Bircham	1.95
	Whitegates, Lynn Road, Great Bircham	0.92
Brancaster	Land Adjacent to Common Lane, Brancaster Staithe	2.73
Burnham Market	Land at Westgate Old Rectory, Ringstead Road	1.38
	Foundry Field, Mill Farm (Residential Led Mixed Use)	9.83
	Overy Road Nurseries, Overy Road	0.87
	Land To The South Of Sunnymead, Whiteway Rd	1.8
	Land Off Foundry Place	0.95
	Sunnymead, Whiteway Road	1.8
	Land South Of Joan Short's Lane And East Of Creake Road (Residential Led)	2.65
	Land At The Junction Of Whiteway Road, Ringstead Road And Church Walk	1.79
Burnham Overy	Land To The South Of Glebe Lane (Glebe Estate)	0.14
	Land West Of Mill Road	0.28
Burnham Thorpe	Leith House Barns, Wells Road (Commercial Use)	1.04
Dersingham	Land adj to Dersingham Bypass	11.61
	Land at Fernhill	2.04
	Land at Sandringham Sawmill, Admirals Drive (Commercial Use)	2.13

Parish	Site	Area (ha)
Docking	Land At Station Road	1.75
	Land At Monks Close	1
	Sedgeford Road	0.39
	Bayfield Meadow	1.29
	Pound Lane	2
	Land North Of Woodgate Way	1.2
	North Of Stanhoe Road	4.73
	North Of Fakenham Road	4.97
Heacham	Land Off Hunstanton Road	0.25
	East Of School Road / West Of A149 (Mixed Use)	2.45
	West Of School Road / West Of A149 (Mixed Use)	2.95
	School Road	1.86
	Land On The South Side Of The Village Off School Road	3.57
	Land Behind And Adjacent To Mulberry Barn, Hunstanton Road	0.23
	Land North Of Heacham Manor Hotel	1.01
	Land To Rear Of 45 Broadway	1.59
	Land South Of Heacham Manor Hotel (Tourism/ Leisure)	0.4
	Land To The East Of Hunstanton Road And To The West Of The A149	0.95
	Land At Redgate Hill	1.8
	Land To The West Of School Road	2
	Land To The East Of School Road	8
	Land Between School Road And The A149 (Residential Led Mixed Use)	21.99
	Land Off School Road	4.6
	1 Kenwood Road	
	Old Hall Boarding Kennels, 52 Hunstanton Road (Mixed Use)	
	Land Adjacent to Marea Farm	2.9
	Land Off Cheney Crescent	3.41
	Land At Mount Pleasant	0.42
Hunstanton	The Land Is Located On The South West Side Of Redgate Hill	0.64
Ingoldisthorpe	1 Lynn Road	2

Parish	Site	Area (ha)
	Coaly Lane	0.31
	Coaly Lane	1
	Land Adjacent to Grovelands	1.7
	Land East Of Nos 151-161, Lynn Road	0.68
	Land East Of 53-57 Lynn Road/North Of Brickley Lane West	
	Land At Brickley Lane	2.2
North Wootton	Land Adjacent To Nursery Lane	1.2
Snettisham	Saffron Side Garden Land North Of 1 -12 Sedgeford Road	0.5
	Park Farm	2.3
	Land At Poppyfields Drive	4.1
	Land At Beach Road	2.1
	Land To South Of Church Road And adjacent To British Legion Club	0.36
	Land Bounded By A149, Cherry Tree Road And Common Road	8.38
South Wootton	Land Off Nursery Lane	4.05
	Paddock At The Rear Of The Den, 69 Nursery Lane (Residential+Care Home)	0.4
	Land At Gap Farm	12.6
	Land West Of Ryalla Drift Leading Off Nursery Lane	4.49
Thornham	Land Off Ringstead Road	1.78
	Land South East Of Thornham (Residential Led Mixed Use)	10
	Land Off Green Lane, Thornham	7.7
	Station Lane	1.45

4.3.2 If all of the above sites came forward at an approximate average density of 30 dwellings per hectare this would increase the population of the study area by up to 5000 dwellings; however, the review of the plan indicates only an additional 1,700 dwellings are proposed. Given this, and that it is possibly unlikely that all growth would come forward along this corridor, the actual population increase is likely to be significantly lower.

5 PATRONAGE & REVENUE FORECAST METHODOLOGY

5.1 BACKGROUND

5.1.1 A four-staged approach has been utilised within this study to provide a progressive assessment of viability. The four stages are identified below:

- Investigating the potential revenue and patronage that might arise from introducing passenger services on a new / reinstated rail line between King's Lynn and Hunstanton. This is based on high-level demand estimates and benchmarking following standard transport planning practice and guidance;
- An assessment of the broad operational costs;
- A high-level estimate of the capital costs of the line based on capital costs of current and recent rail projects in the UK; and
- Identifying the major constraints that would require a new alignment to be investigated (such as where the existing route is compromised by development).

5.1.2 An initial review of the original route was carried out plus the Hunstanton Rail Group option was also considered. Additional route options were then identified that seek to overcome potential constraints.

5.2 WSP APPROACH

ASSOCIATION OF TRAIN OPERATING COMPANIES (ATOC) GUIDANCE

5.2.1 The ATOC guidance document, Connecting Communities Expanding Access to the Rail Network published in 2009 is now superseded by the more recent document, Connecting Communities with the Railways: The Community Rail Development Strategy published by the DfT (2018).

5.2.2 This document describes a holistic and inclusive approach to connecting communities to the railways. The cornerstones of this approach are:

- Connecting people to places and opportunities
- Integrating communities to create a fairer society and encourage diversity and inclusion
- Supporting local and regional economies and sharing opportunities
- Suggesting innovative ways to improve the way the railway works

5.2.3 These cornerstones will be used to inform the socio-economic benefit assessment of reinstating the rail line as part of this initial outline study.

TRANSPORT ANALYSIS GUIDANCE

5.2.4 The DfT's WebTAG[7] provides guidance on transport modelling and appraisal methods and software tools that are applicable for highways and public transport interventions. WebTAG facilitates the appraisal and development of transport interventions, enabling analysts to build evidence to support business cases and inform investment funding decisions.

5.2.5 The Transport Appraisal Process module of WebTAG sets out a three-staged approach that should be followed for any strategic transport scheme that requires government approval. The three stages in the Transport Appraisal Process are as follows:

[7] https://www.gov.uk/guidance/transport-analysis-guidance-webtag

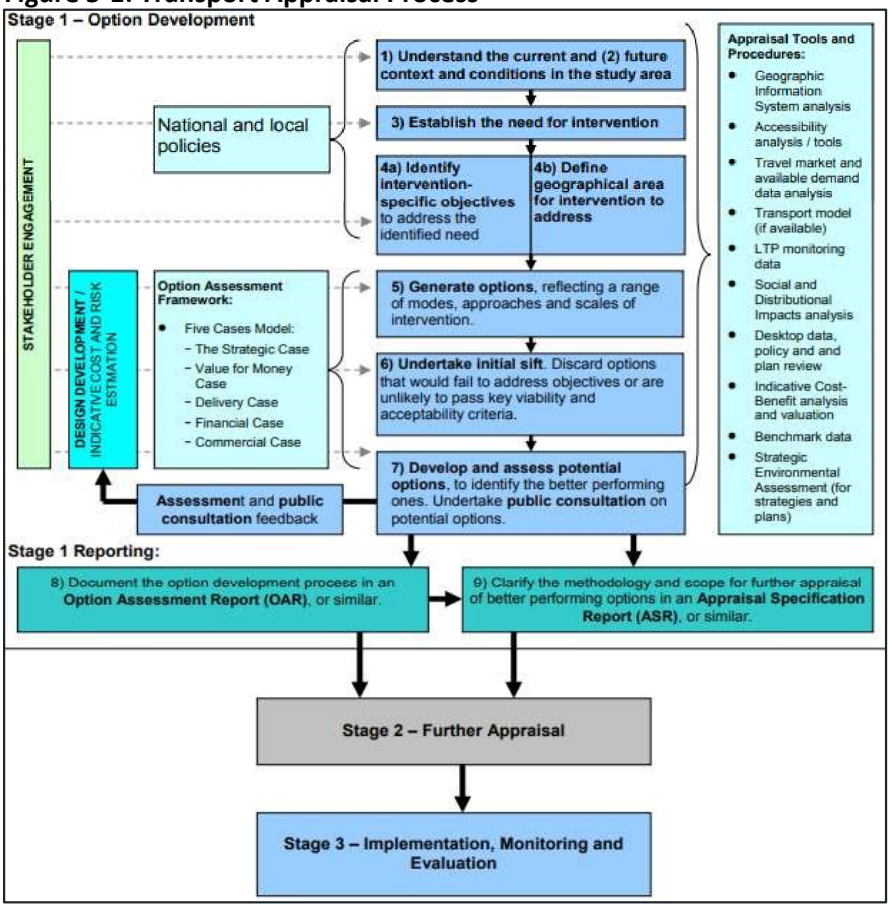
- **Stage 1 - Option Development**: this involves identifying the need for intervention and developing options to address a clear set of locally developed objectives which express desired outcomes. These are then sifted for the better performing options to be taken on to further detailed appraisal.
- **Stage 2 - Further Appraisal**: the better performing options identified from Stage 1 are subject to more detailed appraisal (focussing on performance and impact) in order to obtain sufficient information to enable decision-makers to make an auditable decision on whether to proceed.
- **Stage 3 - Implementation, Monitoring and Evaluation**

5.2.6 This viability study aligns with the DfT's WebTAG methodology and broadly satisfies the requirements for Steps 1, 2 and 4b of Stage 1 of the Transport Appraisal Process Option Development (see **Figure 5-1**), in order to identify the need for intervention and enable:

- the key physical and operational aspects of an intervention to be understood;
- interfaces an intervention might have with its environs to be identified;
- the likely change in transport network and service performance to be estimated; and
- differences between closely competing options to be identified.

5.2.7 Steps 3 and 4a are effectively excluded from this Viability Study and would be covered as part of a future, more-refined study, that might act as a pre-cursor to the production of an Option Assessment Report. This would be required if the King's Lynn to Hunstanton Rail Line project was to progress to SOBC with a view to seeking a funding decision from the DfT.

Figure 5-1: Transport Appraisal Process



5.2.8 Initially population within one mile of the new stations has been extracted from 2017/18 Experian Mosaic Data8. A high-level estimate of likely rail penetration is made based upon benchmarking the potential catchments with other similar stations.

5.2.9 The catchment population is considered with a trip rate informed by 2011 Census Journey To Work (JTW) data, looking at other locations with comparable levels of rail service. An uplift from the JTW demand is made to factor likely demand for non-commuting trips.

Costing

5.2.10 OPEX includes Variable Usage Charges (VUC) from Network Rail (Control Period 6 rates, 2019-2024); and with consideration of typical Network Rail Long Term Charges (LTC rates) for upkeep of small stations. We do note that Greater Anglia (GA) have a lease arrangement which means that LTC rates are not published for GA stations; however, this maintenance charge is still published for most stations off the GA patch. A simple bottom up assessment will be used to derive typical costs for staff and rolling stock maintenance, and finally we will provide a brief narrative on timetabling to provide an indication on the likely frequency of service achievable on this route based upon available capacity and platforming at King's Lynn.

5.2.11 An order of magnitude CAPEX is based on typical cost per linear km and benchmarked against other projects.

Route Planning

5.2.12 To inform the CAPEX assessment, two new indicative route alignments that seek to minimise impact on significant constraints, including residential settlements and public highways, whilst optimising connectivity and accessibility to the passenger catchment, have been considered. We have also considered station siting, and likely number of structures (avoiding level crossings).

5.2.13 It is recognised that the route on the approach to King's Lynn and Hunstanton are particularly constrained, and structures associated with grade separation, such as for road, private access and Public Rights of Way, would add significant cost. Additionally, a high-level review and narrative on the likely rail infrastructure requirements to inform not only the route planning, but also CAPEX has been undertaken.

Constraints

5.2.14 To understand constraints associated with reopening of the line, or route planning for a new alignment, a high-level desk-based review of existing infrastructure and significant constraints has been undertaken using publicly available aerial mapping, photography and designated Environment Constraints. The review seeks to identify key constraints along the route, such as residential and commercial development, particularly at the interface with the public highway network and existing settlements.

[8] https://www.experian.co.uk/business/marketing/segmentation-targeting/mosaic/

6 POTENTIAL ROUTE OPTIONS & CONSTRAINTS

6.1 Overview

6.1.1 In considering the case for re-instating the former King's Lynn to Hunstanton rail line, it is clear that there are potential constraints affecting the feasibility of re-opening the original route exactly in its previous form. These include built development, highway infrastructure and statutory designated environmental constraints which are identified below. The potential safety risk of re-instating level crossings particularly on the busy A149 route is also considered in **Chapter 8.**

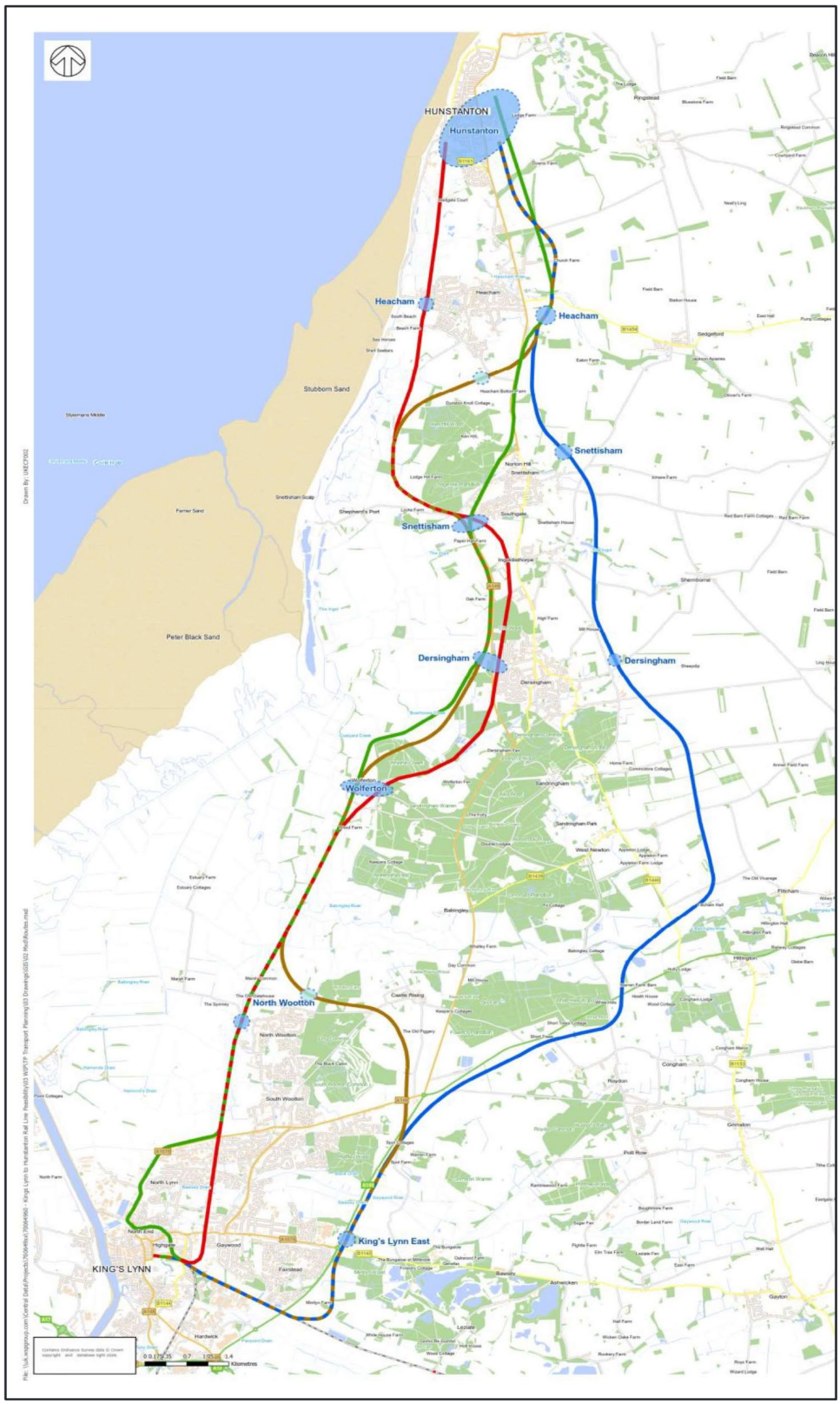
6.1.2 The Hunstanton Rail Group had already developed their own variant of the route which seeks to address some of the above issues and WSP have also identified two further potential options for consideration as part of this study. Therefore, a total of four options have been reviewed within this study. These are shown on **Figure 6-1** and a larger format version is provided in **Appendix D.**

6.1.3 The length of each route in kilometres and miles (as used predominantly by the rail industry) are shown in **Table 6-1.**

Table 6-1: Route Option Mileage

Route	Length (miles)	Length (km)
Red (Original Route)	14.90	23.98
Green (Hunstanton Rail Group Route)	15.57	25.05
Blue	17.81	28.66
Brown	18.37	29.56

Figure 6-1: Potential Route Options Considered



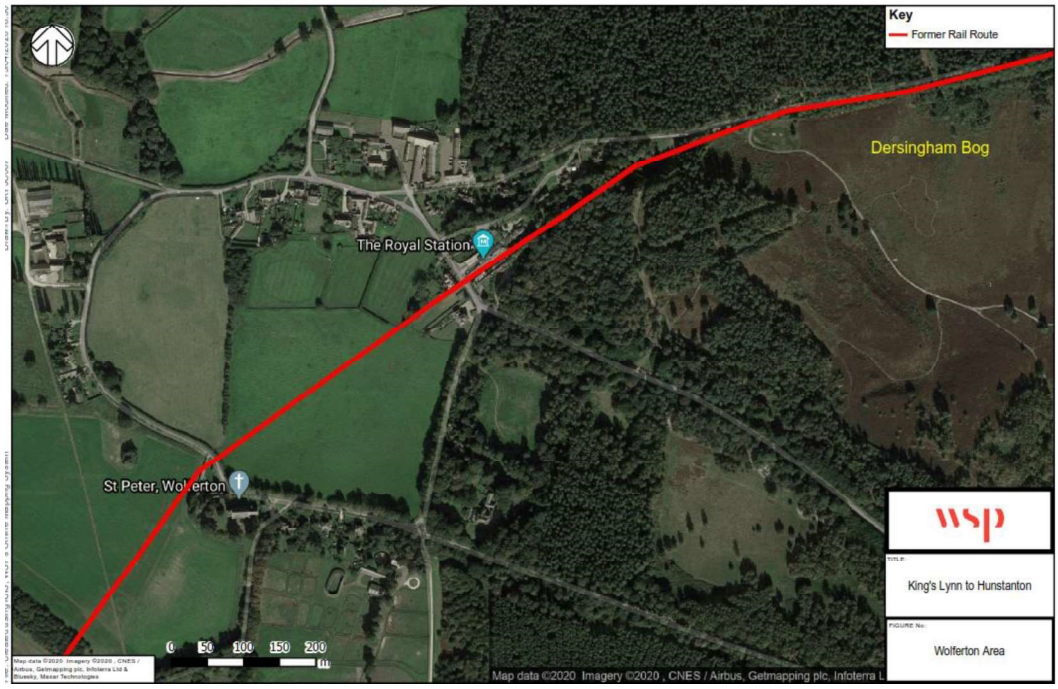
6.2 RED (ORIGINAL ROUTE)

6.2.1 The former King's Lynn to Hunstanton railway closed in 1969, and much of the track infrastructure has since been dismantled and subsumed into the local environment and settlements. As shown on **Figure 6-2**, the route leaves King's Lynn from the existing station turning to head due north, passing to the west of Gaywood and through the Lynn Sport recreation centre before crossing the Edward Benefer Way dual carriageway which forms a northern ring road around King's Lynn.

Figure 6-2: Former Rail Route King's Lynn Area Map

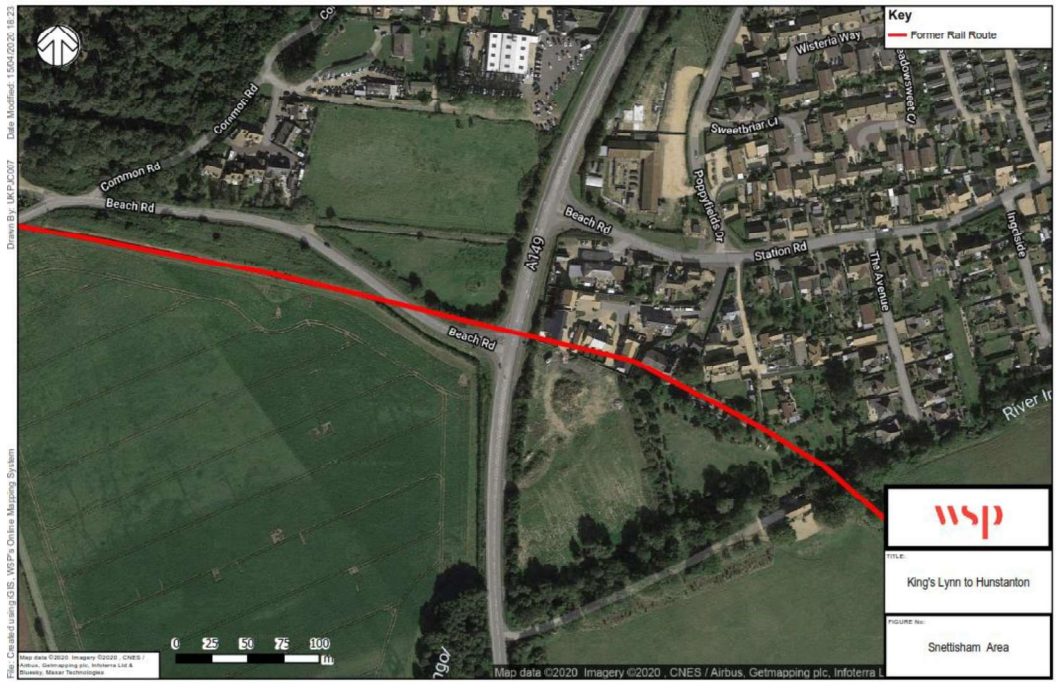
6.2.2 North of King's Lynn, the former route then heads north connecting with North Wootton and onward to Wolferton (about 3km west of the Sandringham Estate visitor centre), as shown in **Figure 6-3**. This area is sparsely populated and environmentally constrained. The former Royal station at Wolferton is now a listed building and occupied residential property and the route also passes close to St Peter's Church. To the north east of Wolferton the route passes through woodland areas and Dersingham Bog which is a Special Area of Conservation (SAC).

Figure 6-3: Former Rail Route Wolferton Area Map



6.2.3 From Wolferton the route heads north east towards Dersingham, crossing A149 to reach the former Dersingham station. Continuing north to Ingoldisthorpe and Snettisham where it diverts to the west, crossing A149 again then routing west of Lodge Plantation and Ken Hill Wood, on approach to Heacham. The crossing of the A149 at Snettisham is shown in **Figure 6-4** and it is evident that a new housing development has been built on part of the former route immediately east of A149 and a new highway junction known as Beach Road now sits on the route to the west.

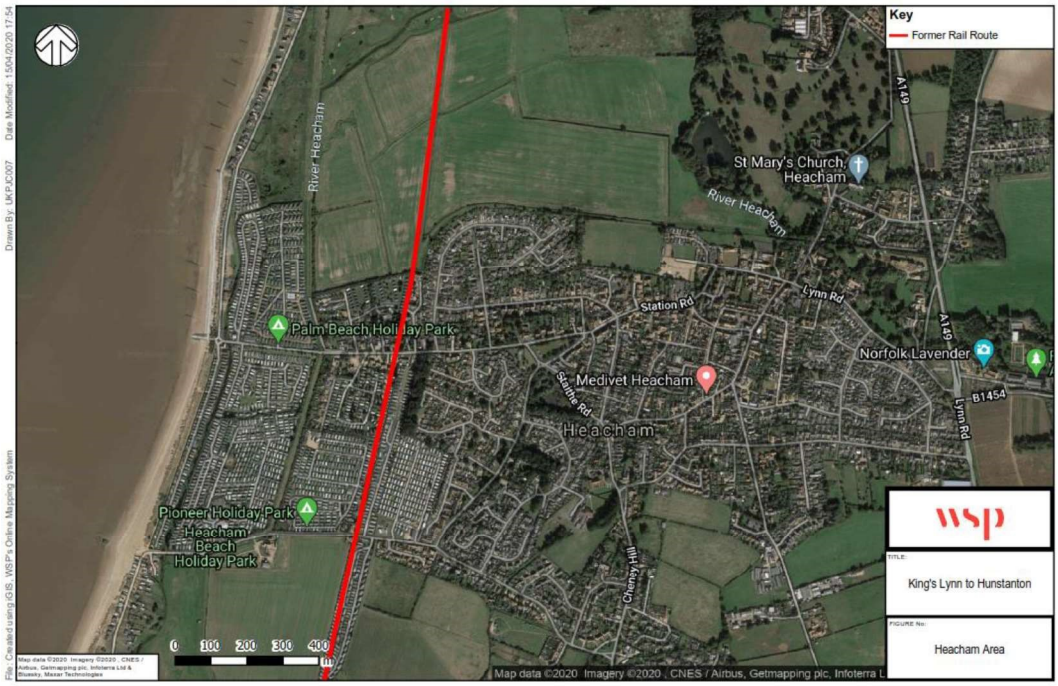
Figure 6-4: Former Rail Route Snettisham Area Map



6.2.4 In order to cross the A149 safely at the south of Snettisham, it would be necessary to make a grade separated crossing, either by elevating the road or the railway rather than re-instate the former level crossing.

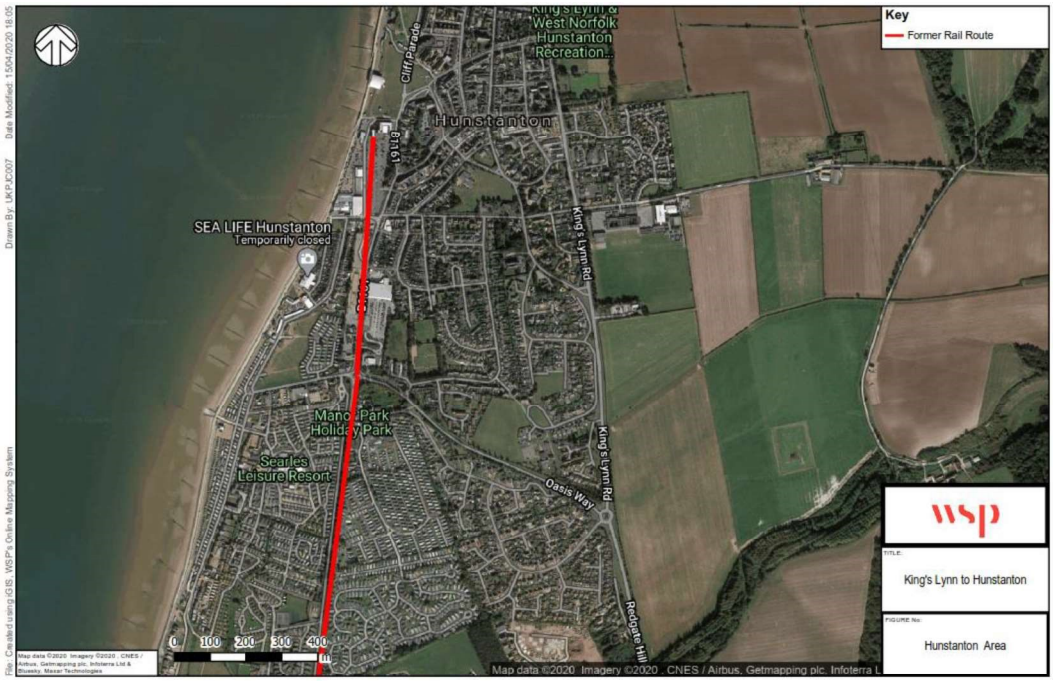
6.2.5 North of Snettisham, the route continues towards Heacham to the west of A149. The former Heacham station is located on the eastern edge of Heacham between the village and river but this is now an extensive caravan site. The extent of the caravan site is shown on the satellite map extract below in **Figure 6-5**. Whilst caravans are temporary structures, the re-opening of the route would have a lasting commercial impact on the holiday parks in Heacham and the presence of the route would potentially cause severance of access from the village to the beach and other caravan sites to the west of the railway. To the north of Heacham the route runs in close proximity to residential properties which would potentially experience noise and vibration impacts with rail services operating.

Figure 6-5: Former Rail Route Heacham Area Map



6.2.6 Further north, as shown in **Figure 6-6**, the final approach to Hunstanton Town centre is similarly constrained by caravan sites which takes access from the B1161 road which has since been constructed on the former railway line route. In central Hunstanton the route passes through existing car parks and a public highway which is the main access to the main supermarket within the town. There would be significant commercial impact on local businesses and loss of car parking. Revised access arrangements would be costly and challenging to reconfigure. Reinstating the route on its former alignment through the centre of town is therefore not considered to be a feasible option.

Figure 6-6: Former Rail Route Hunstanton Area Map



6.2.7 The existing route passes through the settlements of Heacham, Snettisham, Dersingham, and Wootton as well as what was previously known as the Royal Station at Wolferton, which is now a listed building and occupied as a residential property. The remainder of the route lies within open countryside and predominately arable land, but constrained by areas of designated protected habitats, areas at risk of coastal flooding and heritage sites. Since its closure the line has been overbuilt in several locations by:

- Footpath / cycleway around King's Lynn;
- Lynn Sport leisure centre;
- Several roads, including A148 within King's Lynn, A1078 Edward Benefer Way (dual carriageway to the north of King's Lynn) and A149 near Dersingham and Snettisham;
- Several roads over level crossings appear to have been upgraded since opening, e.g. Marsh
- Road at North Wootton was a track, now an unclassified road;
- Extensive Mobile home sites in the Heacham and Hunstanton areas; and
- The Hunstanton Station footprint, now a car park.

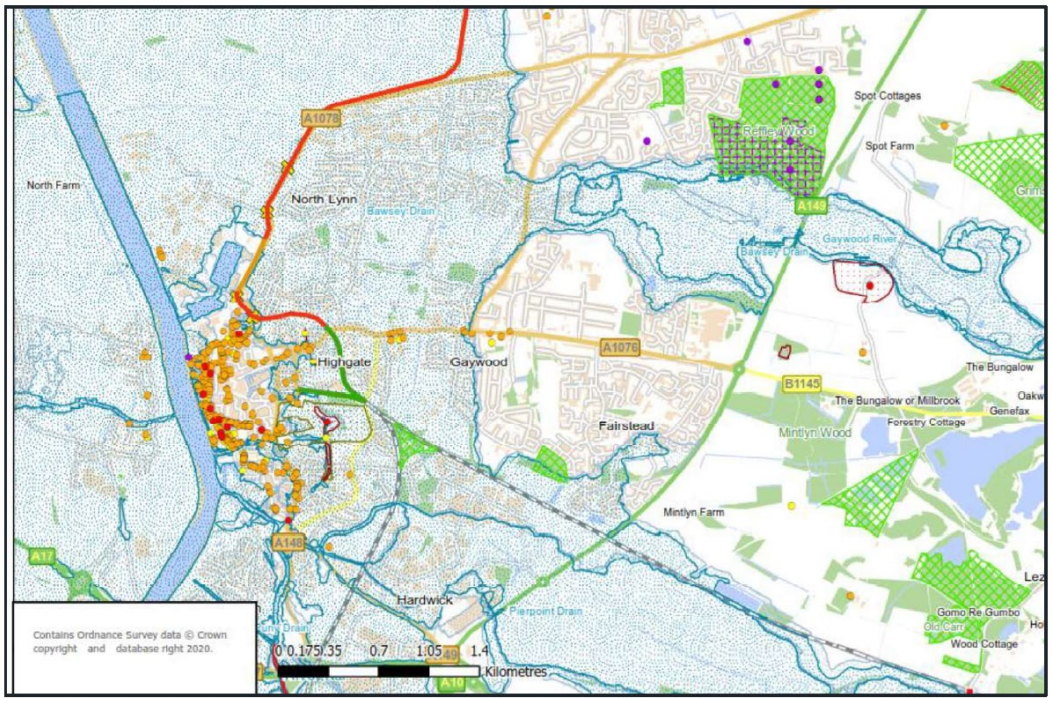
6.2.8 There are also several level crossings on the former rail route which would need to be reinstated which are considered in more detail in **Chapter 8**. Whilst level crossings may have been acceptable in 1969 when the route closed, the Office of Rail and Road (ORR) no longer permit the installation of any new crossings except in exceptional circumstances. Given the magnitude of observed traffic flows on A149, it is expected that grade separation of any road crossings would be required by the ORR and NCC in the interests of public safety. This would substantially increase the cost and land take of the scheme, despite this option offering the most direct route to Hunstanton.

6.3 GREEN (HUNSTANTON RAIL GROUP ROUTE)

6.3.1 The Hunstanton Rail Group have developed their own preferred solution which closely follows the original rail route but avoids some of the above feasibility issues affecting the previous route. A detailed study has been carried out by the Hunstanton Rail Group looking on the ground at physical site constraints and this has been reviewed by WSP. The proposals are enclosed in **Appendix E.**

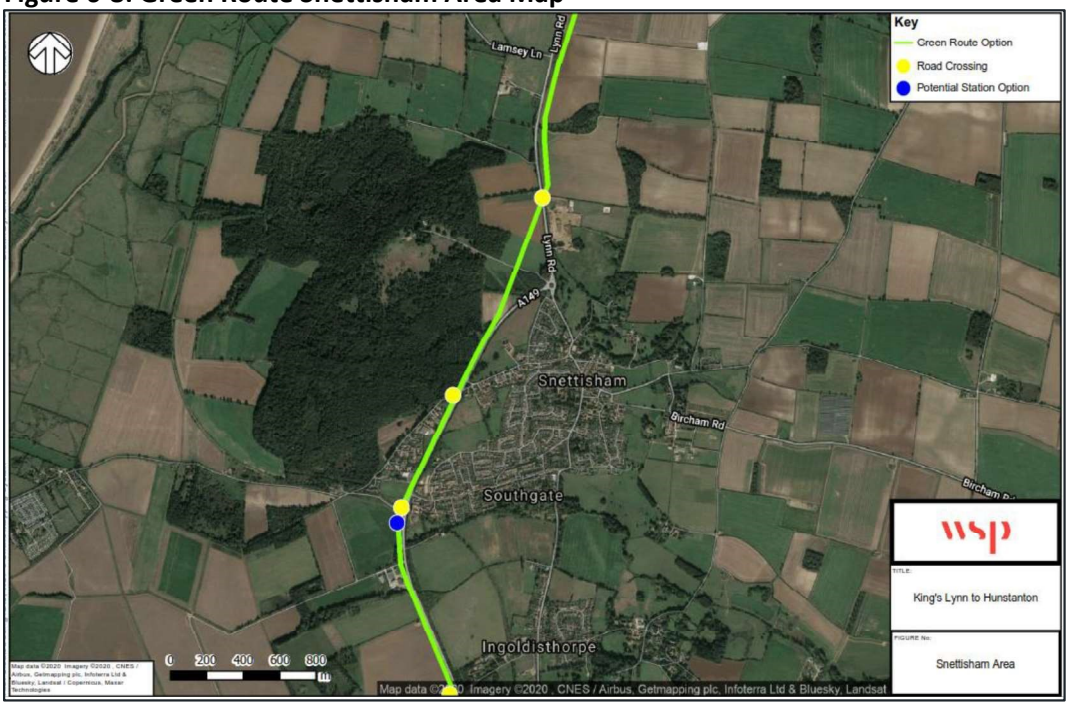
6.3.2 On departing King's Lynn, this route follows a former branch line serving Kings Lynn docks, crossing several public highways at grade, before routing to the north side of Edward Benefer Way (as shown in **Figure 6-7**). Whilst it is a helpful variant which avoids a level crossing on the dual carriageway, this option would either require the introduction of level crossings within central King's Lynn, or closure of some roads to through traffic close to the town centre. This line takes a challenging route through the Operational Port Area, and the introduction of level crossings or road closures may have an adverse impact the commercial operations of the port and local industry, and conflict with local traffic. Conversely, allowing a rail connection to the port could be considered to offer an advantage in terms of future freight movement, although the viability of this requires further study.

Figure 6-7: Green Route King's Lynn Area Map



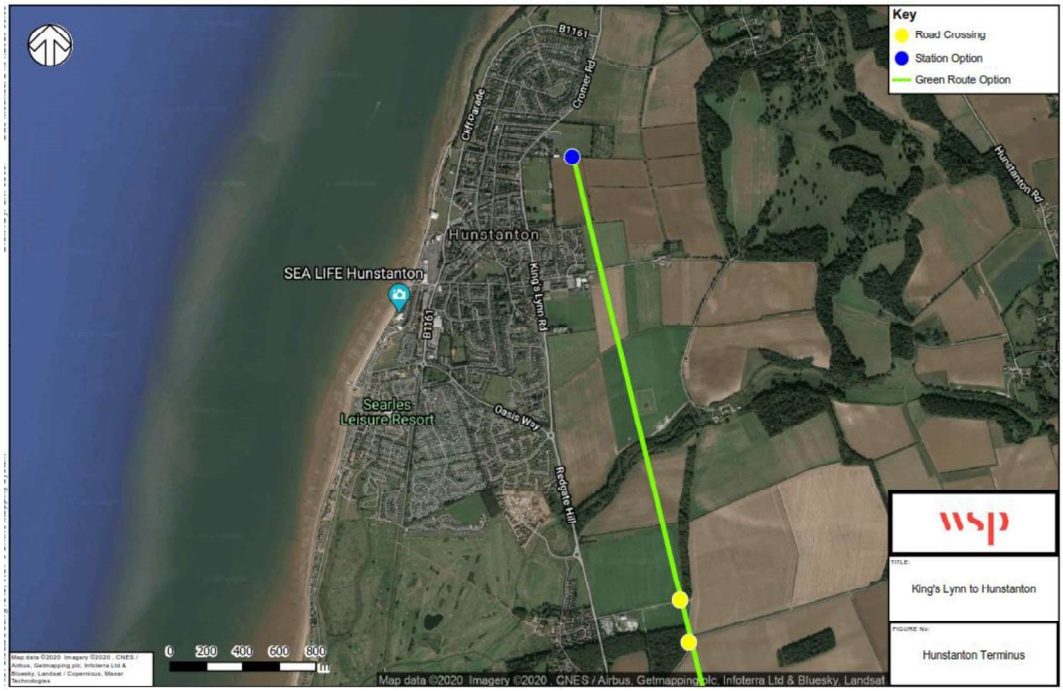
6.3.3 North of King's Lynn, the route broadly follows the former route but remains west of A149 between Dersingham and Snettisham avoiding the need for a crossing. At Wolferton, the route takes an alternative alignment and proposes a new station on the western edge of the village, rather than seeking to bring the former Royal Station back into use. At Snettisham this route option follows the A149 which offers an efficient route minimising distance to Heacham (as shown in **Figure 6-8**). However, it is very close to the highway and existing development on the west side of the village which may impact on residential amenity.

Figure 6-8: Green Route Snettisham Area Map



6.3.4 Routing to the east of A149 before terminating at Hunstanton (as shown in Figure 6-9), reduces the walking catchment of the station in comparison with the original (Red) route but is expected to be more feasible to construct as it is relatively unconstrained and avoids conflict with built development and the Coastal Hazard Zone. This also gives flexibility for future extension along the north Norfolk coast and could create opportunities for development around a new station on the east side of the town.

Figure 6-9: Green Route Hunstanton Area Map



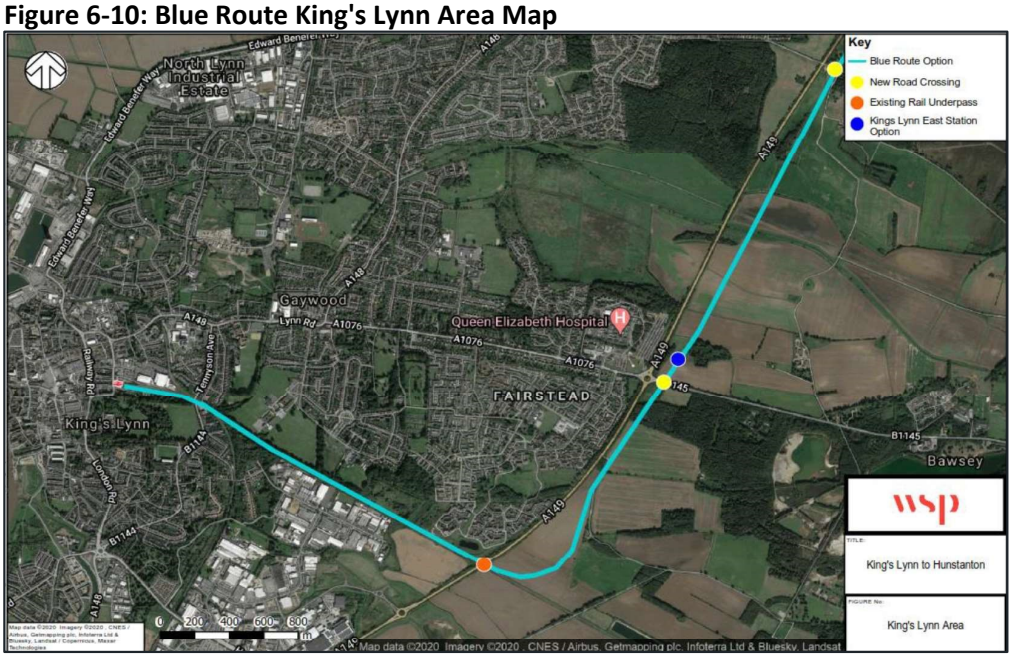
6.4 BLUE (NEW OPTION)

6.4.1 The Blue route option was developed seeking to avoid as many of the constraints identified affecting the Red and Green routes as possible. This route is longer, but makes use of the existing rail infrastructure within the Kings Lynn urban area (former Dereham freight line) before taking a route through less constrained open countryside than the red and green options.

6.4.2 To avoid the Coastal Hazard Zone and other designated constraints and to minimise the need for level crossings, it takes an alternative departure route from King's Lynn to the east. Using an existing rail track known as the Middleton Branch line (which is an existing rail route used for operational freight movements), has the benefit of making use of an existing rail underpass to cross under the A149, avoiding the need for a level crossing.

6.4.3 This route does not serve North Wootton or Wolferton but instead offers the opportunity for a new station on the eastern edge of King's Lynn close to the Queen Elizabeth hospital. The King's Lynn section of the Blue route is shown below in **Figure 6-10**.

Figure 6-10: Blue Route King's Lynn Area Map



6.4.4 Further north, the blue route remains to the east of A149 for the remainder of its length, passing close to settlements on their eastern edge to retain catchment, with new station locations proposed for Dersingham on the edge of the Sandringham Estate, Snettisham on the east of A149, Heacham to the east of the village and terminating east of Hunstanton. Routing to the east of A149 at Hunstanton again offers the opportunity for future extension along the north Norfolk coast.

6.4.5 Locating the stations on the opposite side of A149 from the villages along the route may require improved crossing facilities on A149 for pedestrians and cyclists to access the route. This also reduces the number of properties in the 1km catchment.

6.4.6 However, in the event that grade separation is required, it would be easier and more cost effective with reduced land take for NMU bridges to be installed than for a level crossings or highway bridges to be implemented. The route may also offer increased opportunity for development around the proposed stations.

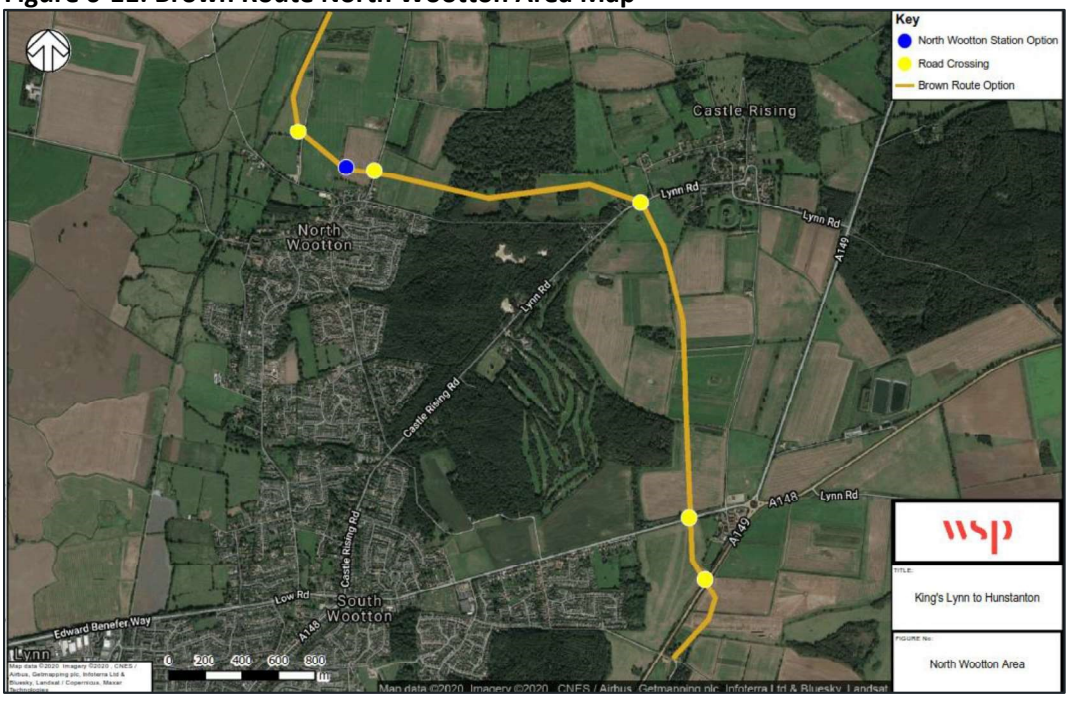
6.4.7 Whilst this route avoids level crossings on A149, there are various minor roads and private farm accesses to be crossed, including B1145, B1454 and A148. New structures are also required at the Gaywood River crossing east of King's Lynn and the Babingley River further north.

6.5 BROWN (NEW OPTION)

6.5.1 The Brown route offers a hybrid of the Blue and Green routes, using the existing rail line east of King's Lynn to cross the A149 initially on departure from King's Lynn, as proposed from the Blue route. Again, there is the opportunity to place a new station at King's Lynn East which would potentially enhance the catchment of the route.

6.5.2 In order to additionally serve the North Wootton catchment, at the north east edge of King's Lynn, it is then necessary to cross two roads in close proximity (A148 and A149) and pass close to the Castle Rising English Heritage site to reconnect with the former rail route. It is expected that grade separated crossings would be required for both A148 and A149 (as shown in **Figure 6-11**).

Figure 6-11: Brown Route North Wootton Area Map



6.5.3 Further north the route follows the same alignment as the Green option until Snettisham. The Brown option then re-joins the Red route alignment heading west around environmental constraints at Ken Hill Wood and Lodge Hill plantation before re-routing back towards the A149, passing to the south of Heacham, where a new station could be located west of A149 (as shown in **Figure 6-12**).

Figure 6-12: Brown Route Snettisham and Heacham Area Map

6.5.4 East of the A149 at Heacham, the Brown route follows the same approach to Hunstanton as the Green route.

6.6 SUMMARY

6.6.1 The four route options all have advantages and disadvantages in terms of their proposed route alignments and station options.

6.6.2 Parts of the Red route (original route) are still evident on the ground and possible to re-instate if environmental constraints and level crossing issues can be acceptably overcome. However, in urban areas, the majority of the Red route is not feasible to re-instate, so alternative alignments are required. Particularly at the King's Lynn and Hunstanton ends of the route.

6.6.3 The Red and Green options have challenges due to built development and level crossing risk in the urban areas which would potentially exacerbate congestion and highway safety issues. The most feasible and readily available option for departure from King's Lynn is via the existing track to the east as shown for the Blue and Brown options. This also creates a potential opportunity for a new station to the east close to the Queen Elizabeth hospital. The Brown route option also serves North Wootton, so would have increased catchment in comparison with all other route options but requires new grade separated crossings of the A149 and A148 in close proximity.

6.6.4 Due to built development constraints in central Hunstanton, the most feasible and simple to implement option for the Hunstanton end of the route is a route to the east of A149 which also offers future connectivity options along the north Norfolk coast.

7 ENVIRONMENTAL CONSTRAINTS

7.1 CONSTRAINTS MAP

7.1.1 A constraints map has been produced for the study and the proposed route options overlaid on statutory designated environmental constraints, some of which are likely to directly affect the feasibility of re-opening the line.

7.2 CONSTRAINTS ANALYSIS METHODOLOGY

7.2.1 At this stage a high-level review of route options in respect of statutory designated environmental constraints has been undertaken using GIS software. A Red / Amber / Green (RAG) colour coding system has been used to show where the route is wholly or partially affected by constraints. This is presented in graphical format on constraints mapping for the original and alternative proposed route options. The colour coding is based on the following criteria:

- Red - significant issue and / or risk which would most likely require a significant piece of infrastructure / significant solution including realignment (where the original alignment cannot be achieved);
- Amber - major issue and / or risk which may require additional consideration including realignment;
- Green - generally no major physical constraints but further review is required. For the purpose of this initial study, environmental constraints have not been fully categorised or separately assessed. Production of an Environmental Constraints Summary table will be carried out during future stages of work.

7.2.2 The results are shown in **Appendix F** and key types of constraint and issues for each route option are highlighted below.

7.3 DESIGNATED ENVIRONMENTAL CONSTRAINTS

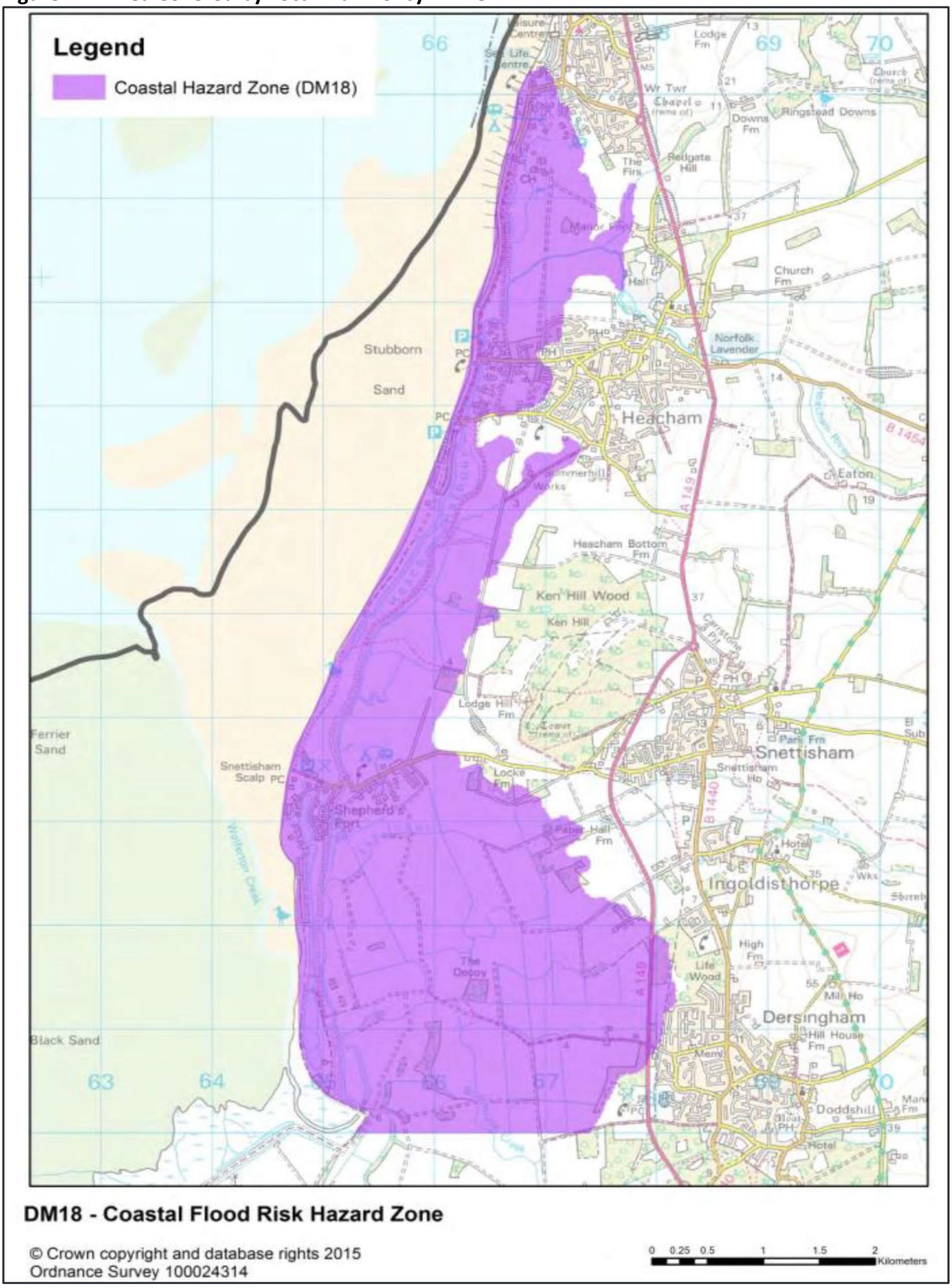
COASTAL FLOOD HAZARD ZONE

7.3.1 The largest and most extensive geographic constraint affecting the feasibility of the potential route options is the Coast Flood Risk Hazard Zone (Policy DM18 of the King's Lynn & West Norfolk Local Plan). The Coastal Hazard Zone Extents are shown in **Figure 7-1.**

7.3.2 The Environment Agency (EA) and the Local Planning Authority have a joint approach agreed via a Coastal Flood Risk Planning Protocol. Within this zone, only essential infrastructure and water compatible new development is permitted. Vulnerable development such as new residential dwellings and holiday caravans are not permitted as the EA do not want to increase the population within the catchment as flooding presents a risk to human life.

7.3.3 Whilst a railway may be considered as essential infrastructure, a sequential approach is advocated for any new development proposals so it needs to be demonstrated that alternatives to development in this zone (i.e. locating the proposals outside of the flood zone) and those which minimise the impact on flood risk have been adequately considered and are not feasible.

Figure 7-1: Area Covered by Local Plan Policy DM18



7.3.4 Locating significant parts of the routes within the flood plain may prevent the railway from maximising its economic potential as additional housing along the route would not be possible as it is vulnerable development. It is especially important that any new rail stations along the route should avoid the flood zone, so that users can access and egress the system without risk.

7.3.5 The Local Plan policy and Planning Protocol document both also highlight that there are seasonal restrictions limiting when dwellings and holiday parks can be occupied to only the period from 1 April to 30 September. Such time limits would restrict the population within the catchment for the new railway at other times of year.

7.3.6 The proposal to place a new railway in a coastal flood zone would also potentially have operational impacts in times of flood and this may also cause damage to the railway infrastructure so increased maintenance may be required. It would therefore be advisable to select a route which avoids or minimises the scheme footprint extents within this zone.

7.3.7 The Red, Green and Brown routes, all take an alignment through the Coastal Hazard Zone, so would be at risk of flood and may receive a policy objection from local authorities. but making use of the former track where possible or keeping as far east as possible may help to minimise the extent to which the risk of tidal flooding is impacted by the proposals.

7.3.8 The Blue option is routed further east and is much less likely to cause impact on tidal flooding.

SPECIAL AREAS OF CONSERVATION, RAMSAR & SITES OF SPECIAL SCIENTIFIC INTEREST (SSSI)

7.3.9 There are three Special Areas of Conservation (SACs) located within the study area at Dersingham Bog on the edge of Wolferton to the west of A149, Roydon Common (east of King's Lynn and A149) and also The Wash. SACs are protected by European legislation and have the highest level of environmental protection under the Habitats Regulation Directive. Development proposals which sever or directly impact a SAC are likely to be met with strong opposition and likely to attract objections from key stakeholders such as Natural England and the Environment Agency. Construction works in close proximity to such designated sites are also likely to be significantly challenged. Mitigation works for managing impacts around SACs are likely to be extensive compensatory measures which can be costly. It may also be difficult to justify any impacts are justifiable unless it can be demonstrated that there are Imperative Reasons of Overriding Public Interest.

7.3.10 The above three sites are also designated as RAMSAR (Wetlands of International Importance) and SSSI (Site of Special Scientific Interest), so are heavily protected by environmental legislation. The Wash SAC is also designated as Special Protection area. An HRA will be required for any options with works in close proximity to these sensitive habitats. Therefore, it is preferable to find a route alignment which avoids impact on these sensitive locations.

7.3.11 The former route (Red) directly affects Dersingham Bog so would be unlikely to be acceptable from an environmental point of view and other options should be selected in preference to this. The Brown route and the Green route take a similar path to the west of Dersingham Bog with the nearest point about 500m to the north and about 1.3km to the east of The Wash SAC. The Blue and Brown routes run close to Roydon Common SAC approximately 800m away at the nearest point.

7.3.12 There are additional SSSI designations in the northern part of the route close to the northern edge of Snettisham, south of Heacham and to the east of Hunstanton. None of the proposed routes directly conflict with these SSSIs but the Green route runs adjacent to the northern edge of the SSSI at Snettisham where it crosses the A149. The Brown route proposed station is closest to the Heacham SSSI and all route options (other than the original red route) are within 1km of the SSSI to the east of Hunstanton.

ANCIENT WOODLANDS

7.3.13 Ancient Woodlands are considered to be irreplaceable habitats, so the scheme should seek to avoid impact on these. There are several areas of ancient woodland within the study areas which need to be avoided. Three such areas are located west of A149 between North Wootton and Wolferton. These are known as Wolferton Wood, Wootton Carr and Castle Rising Wood. To the east of A149, there is also an area of Ancient Woodland at Congham Wood (between Congham and Hillington) and in the north of the route straddling the A149 just north of Church Farm, Heacham.

7.3.14 The original route (Red) has no direct impact on areas of Ancient Woodland with the nearest point of the route 400m from the edge of Wolferton Wood. The Green, Brown and Blue routes all follow the same alignment into Hunstanton on the east side of A149 and all of these skirt along the edge of Long Wood, Heacham. However, there appears to be sufficient scope for increasing separation from this woodland to avoid impact. The Brown route also runs close to Castle Rising Wood. Care would be needed during construction to avoid damage or pollution to this site.

SCHEDULED ANCIENT MONUMENTS

7.3.15 The study area includes heritage assets of national significance known as Scheduled Ancient Monuments which cannot be replaced. These include Castle Rising which is an English Heritage property between North Wootton and Wolferton. Whilst such assets are not physically affected by the majority of options, the impact on the setting of these heritage assets would need to be considered within the design. The Brown route runs closest to this at a distance.

7.4 CONSTRAINTS ANALYSIS RESULTS

7.4.1 In addition to the above designations which the scheme may impact upon, there are other statutory designated ecology and heritage constraints affecting parts of the route such as County Wildlife Sites, Grasslands and Parks, listed buildings and veteran trees also shown on the constraints maps in **Appendix F.**

7.4.2 Using the RAG classifications to provide a broad-brush indication of the extent of impact of each route option the results, presented in **Appendix F**, can be summarised as follows:

- Red Route - predominantly red as much of the alignment sits within the Coastal Hazard Zone and is at risk of tidal flooding.
- Green Route – the southern part of the route is predominantly red from King's Lynn to Snettisham but the northern part is predominantly green.
- Blue Route - predominantly green for the entire alignment, except for two short sections which pass through the flood plain to the east of King's Lynn.

- Brown Route – predominantly green from King's Lynn to North Wootton and also from Snettisham to Hunstanton but predominantly red in the central part of the route from North Wootton to Snettisham. Overall about 50% red and 50% green.

7.4.3 Overall, the blue option was designed to offer a route which minimises environmental impact on designated constraints, so naturally this option is likely to offer a less controversial option.

7.5 BIODIVERSITY NET GAIN

7.5.1 It also needs to be considered that Biodiversity Net Gain (BNG) is an objective and approach to development that leaves biodiversity in a better state than before. It is anticipated that BNG will be made mandatory within the new Environment Bill, with the expectation that developments deliver at least a 10% BNG. This would potentially increase the land take and mitigation requirements of the scheme and would add to the cost of the project.

8. SAFETY & LEVEL CROSSINGS

8.1 OFFICE OF ROAD AND RAIL (ORR) POLICY

8.1.1 The ORR states in its Strategy for Regulation of Health and Safety Risks - 4 that level crossings advocate a risk assessment-based approach to (amongst others):

- Ensure that the closure of level crossings is the first option considered in a risk-control strategy by the duty holder, in line with the principles of prevention.
- Encourage alternatives to crossings to be fully explored and delivered where reasonably practicable. In principle, we do not support the creation of new level crossings where there is a reasonably practicable alternative".
- Drive the consistent application of Network Rail's level crossing strategy 2019-2029, so improvements are targeted in accordance with risk.

8.1.2 Furthermore, the ORR states that Network Rail, operators of heritage and light railways and those who control depots have an explicit legal duty under the Health and Safety at Work etc. Act 1974 (HSWA) to minimise risks arising on their networks, so far as is reasonably practicable.

8.1.3 ORR guidance document RIG 2014-061 states:

- This RIG provides guidance on how ORR applies its "no new level crossings unless there are exceptional circumstances" policy and sets out a process that ORR inspectors should follow if they receive information concerning a proposed new crossing of any type. It covers mainline and heritage networks but does not apply to new crossings on tramways as such intersections are governed by road traffic signals.
- New level crossings introduce particular risks to the railway; ORR, therefore, considers that there should generally be enhanced scrutiny of how proposers are complying with their health and safety duties (for example, around the suitable and sufficient assessment of risk). There may be cases where a proposer will have other steps to take before developing a level crossing, such as the amendment of a safety authorisation involving the necessary scrutiny and decisions from ORR, or safety verification.

8.2 NETWORK RAIL LEVEL CROSSING SAFETY

8.2.1 In 2019 Network Rail published their strategy for 'Enhancing Level Crossing Safety 2019 – 2029' A long-term strategy targeting improved safety on Great Britain's railway, 2019. Level crossings were built when the railway was first constructed in the Victorian times. They are used to connect communities across the UK, from residential and industrial areas, to high streets and farmland and at the time (when trains were relatively slow and noisy) they were the easiest form of accommodating the interruptions in land and public highways that resulted, especially in areas of flat terrain.

8.2.2 They pose a significant risk however, to rail passengers, staff and general members of the public, who can also be delayed if there is a fault or incident at a level crossing. Drivers, cyclists and pedestrians can also find themselves delayed in their journeys by waiting for trains to pass through crossings.

8.2.3 The introduction from Network Rail's Chief Executive Andrew Haines advocates that new level crossings should not be introduced:

"If we were to build the railway from scratch today, we wouldn't include level crossings. They pose a risk to our passengers and members of the public, who can also be delayed if there is a fault or incident at a level crossing. Drivers, cyclists and pedestrians can also find themselves delayed in their journeys by waiting for trains to pass through crossings" … "There are far too many near misses and there are still, sadly, fatalities on level crossings" … "Simply put, the safest level crossing is a closed one" … "We know that closing our level crossings isn't always a realistic option for the communities they serve" … "That's why since 2009, we have invested over £200million in improving safety at thousands of crossings" … and "closed over 1,100 level crossings since 2009".

8.2.4 Whilst over the past five years there has been a sustained reduction in the number of near misses with road vehicles, pedestrian safety, does not follow the general downwards trajectory. Combining the two, the overall picture shows an increase in the number of incorrect usage events during 2018/19. Furthermore, in 2018/19 there were nine collisions with road vehicles, which is slight increase on previous years, and there were two accidental fatalities at level crossings in the past year, all of which were pedestrians, additionally a pedestrian was also struck non-fatally in this period. (Rail Safety and Standards Board (RSSB) Annual Health & Safety Report: A reference guide to trends on GB railways 2018/19, July 2019).

8.2.5 Closing level crossings and not creating new crossings therefore, remains an important part of the Network Rail strategy. The total number of closures since the start of 2014/15 now stands at 372, with the total number of closures achieved since the start of 2009/10 at 1,176. A further 63 remain temporarily closed through Traffic Regulation Orders (TRO's). The combined closures achieved over the past ten years are a significant success and contribute to reduced risk and improved public and passenger safety across the network.

8.3 POTENTIAL LEVEL CROSSINGS ON A149

8.3.1 In order to operate a live railway, a Transport and Works Act Order (TWAO) is needed to gain the powers to dedicate rights for a public transport corridor over level crossings on the route. The ORR and Network Rail would be statutory consultees to such proposals, so in order to avoid objection, the proposed solution would need to acceptable and compliant with their policies.

8.3.2 The former rail route and the Hunstanton Rail Group alternative route options both involve re-opening several out of use level crossings, including two crossings of the A149. Based on the above, Network Rail and ORR policy documents relating to level crossing safety and Network Rail's desire to close as many level crossings as possible across the UK as they pose a risk to the road and railway network, it is anticipated that grade separation would be required.

8.3.3 The Blue and Brown route options have been developed to minimise and avoid the need for level crossings or achieve an alignment that could be grade separated. This, however, adds significant cost and land take to the proposals but would potentially offer a solution that is more acceptable to the ORR.

8.4 EXAMPLE CASE PRECEDENTS

8.4.1 The traffic flows observed on the A149 are in the region of 16,000-26,000 vehicles AADT. Examples of level crossing proposals for A-Road routes are listed below which indicate that grade separation is likely to be required for any crossing of the A149.

OSWESTRY A5 LEVEL CROSSING

8.4.2 Oswestry level crossing is situated to the north east of the town of Oswestry, in the Shropshire district, in the West Midlands. A single rail line, now disused, crosses the A5, with level crossing barriers and most associated infrastructure still in place on the carriageway. The line runs from Gobowen to Llanyblodwel quarry and was in use until 1988. The 2018 AADT on the A1175 was 23,086 and operates at the national speed limit of 60mph.

8.4.3 In February 2017, Cambrian Heritage Railway applied for a TWAO for transfer of Network Rail's rights to itself, which permits them to reopen the route. Objections were received from the ORR and Highways England, under whose jurisdiction the A5 falls, on safety ground to the crossings. The ORR referred to their established policy that there should be no new (or reinstated) level crossings on any railway, unless there are exceptional circumstances. The TWAO[9] was made, but with amendments which included the need to negotiate the A5 by means other than a level crossing (i.e. tunnel or bridge).

KINGS DYKE LEVEL CROSSING A605

8.4.4 Another example includes the Kings Dyke MCB (Manually Controlled Barrier) on the A605 at Whittlesea, Cambridgeshire. The A47 carries circa 12,500 vehicles per day and the level crossing has a Collective Risk of 2 (High) and is now subject to full closure with diversion to a new overbridge. This road carries about 12,500 two-way vehicles per day on a similar category local authority maintained principal A-Road route.

8.4.5 The speed limit is 40mph currently on the A605 which is below the existing limit on A149 and the typical traffic flows are also lower. The A605 is also in a lower risk category on the AGEAS dangerous roads map.

MARCH TO WISBECH LINE RE-OPENING A47 CROSSING

8.4.6 Similarly, the March to Wisbech railway in Cambridgeshire being proposed by the Cambridgeshire and Peterborough Combined Authority (CA) assumes that grade separation is required for the former A47 level crossing. The CA are currently working with Highways England to find an acceptable solution to the A47 crossing. The A47 in this location carries about 18,000 two-way vehicles per day on average, which is similar to the observed traffic flows on the A149 at the Hunstanton end of the route (circa 16,000 AADT).

[9] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/595431/cambrian-railway-decision-letter.pdf

8.5 ROUTE OPTION IMPACTS ON LEVEL CROSSINGS

8.5.1 Using the constraints maps the number of road crossings by category of road crossed has been summarised to understand the extent to which the options present level crossing risk (**Table 8-1**). This indicates how many structures are potentially required since level crossings are expected to be unacceptable. At this stage, the review covers public highways only and excludes private farm accesses and public rights of way crossings.

Table 8-1: Road Crossing Requirements

Option	A Road	B Road	Minor	Total
Red Option	4	1	7	12
Green Option	1	0	13	14
Blue Option	1	3	15	19
Brown Option	3	2	7	12

8.5.2 In terms of total number of crossings, the Blue route has the most, whilst the Red and Brown options have the lowest number of total crossings. For the Blue route the majority of crossings are of minor roads which could potentially be consolidated, diverted or stopped up more easily than A-Roads or B-Roads and most are perpendicular. The Red and Brown options have the highest number of A-Road crossings which are likely to be more challenging to overcome. The Green option offers a good balance with only one A-Road crossing, and potential opportunity for consolidation and diversion or stopping up of minor roads to reduce the risk. However, it crosses the A149 at a very skewed angle north of Snettisham close to a bend which is less ideal from a geometrical point of view.

8.5.3 Grade separation has been assumed for the purposes of producing a robust cost but options for including level crossings on minor roads would require discussion going forward with ORR in the next stage of the project.

9. REVENUE & PASSENGER DEMAND FORECASTING

9.1 OVERVIEW

9.1.1 This section outlines the modelling approach behind the passenger demand forecast for the new line. A trip rate model was developed using observed station usage benchmarking along with recent population data. Freight usage will be considered at a later stage of the project.

9.1.2 The forecast demand for each proposed station is based on applying the same observed number of trips taken (trip rate) per distance catchment away from existing stations which have similar properties (e.g. frequency) to estimate the demand generated at each proposed station.

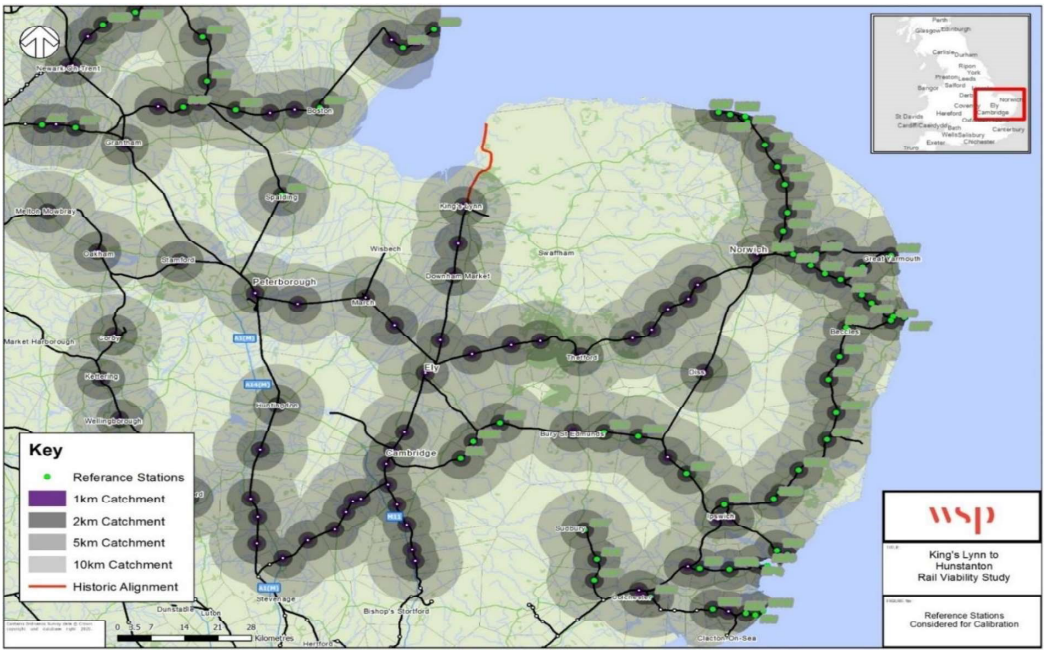
Figure 9-1: Overarching modelling approach flowchart

9.1.3 In order to develop the trip rate model, observed demand data from existing stations were required. A selection procedure was undertaken with the aim to select stations with similar properties such as geography (to proxy demographic travel behaviour) and level of service (to be similar to the level of service at the proposed stations).

9.1.4 An initial selection of all stations in the Norfolk and wider Anglia area (obtained using ArcGIS) was trimmed to those which see between 15 and 30 services per to mirror the expected frequency. These stations form our reference station set for the benchmarking exercise. The ORR 2018/19 Annual Station Usage Statistics were used to obtain an observed total Stations Entry and Exit figures for each reference station for the trip rate model. Experian's Mosaic dataset was used for current (2018/19) population estimates of all households within non-overlapping 1, 2, 5 and 10km straight-line catchments of these stations.

9.1.5 **Figure 9-2** shows all rail stations in the selected geography along with the non-1, 2, 5 and 10km catchment bands. The selected reference stations with similar service characteristics are indicated in green. Each catchment band was assigned an average number of annual trips per year and this was calibrated to the observed annual station usage figures as per the ORR for the reference stations.

Figure 9-2: Stations Used for Benchmarking



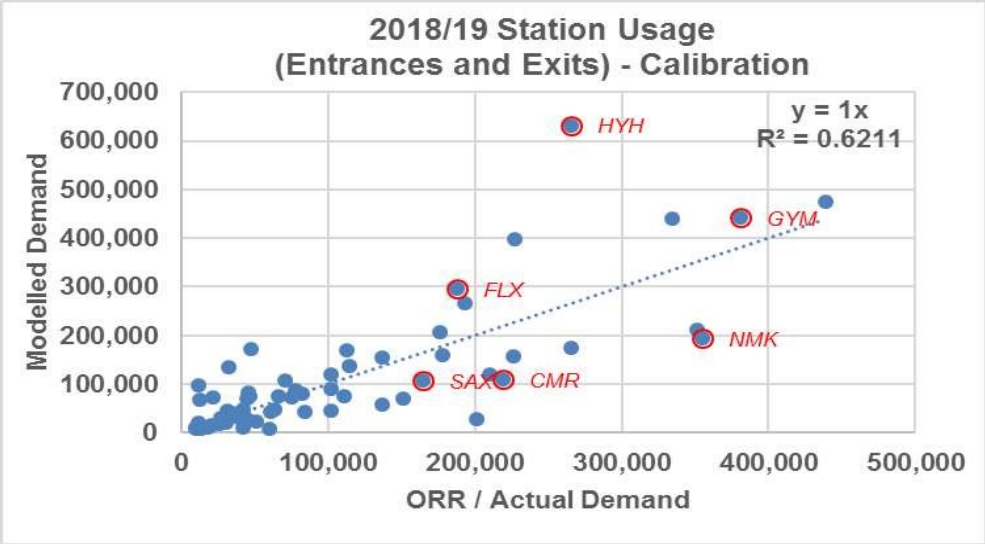
9.1.6 **Table 9-1** shows the calibrated trip rate figures are the trip rate calibration strength can be seen in **Figure 9-3**. The chart shows a blue dot for all of the reference stations that have been considered, and indicates how the trip rate and catchment-based demand estimates (vertical axis) compare to the real-world station demands as reported by ORR (horizonal axis). The dotted line is the best fit line, which has a gradient one, demonstrating that the model behaves well in that there is no systematic bias where low or high levels of demand are under or over reported. The r^2 term is also shown, and reported at 0.632, calibration of the trip rates has been undertaken using this r^2 value. Visually the fit looks fairly good, there is a strong positive correlation indicating that the modelled station demand is a reasonable estimate of the true demand. The graphic also shows a few stations have been highlighted with red circles, identifying stations of particular relevance, or outliers that have been investigated further, including:

- HYH = Hythe;
- GYM = Great Yarmouth;
- FLX = Felixstowe;
- SAX = Saxmundham;
- CMR = Cromer; and
- NMK = Newmarket

Table 9-1: Trips per day per 100 people per distance catchment

Distance Catchment	<1km	1-2km	2-5km	5-10km
Trips per day per 100 people	9.26	1.00	0.80	0.10

Figure 9-3: Trip Rate Calibration



9.2 FORECAST DEMAND

9.2.1 The model with its calibrated trip rates was then used to evaluate the likely demand for the proposed station location. Using a similar approach, the population within the same distance bands around the proposed station is determined and the trip rates applied respectively. This gives us an estimated annual demand for each station.

9.2.2 Implicitly an equivalent level of connectivity is implied for the new stations when compared to the reference data set. This is perhaps generous since the King's Lynn to Hunstanton branch line is most likely to be an isolated shuttle service with interchange required for onward connections to London and Cambridge for example. Census JTW data suggests there would likely be very limited demand for travel beyond King's Lynn.

9.2.3 On review of the initial population-based forecasting, it was noted that the patronage expected at the stations was below expectations based on other characteristically similar stations on other coastal rail routes such as the Bittern line or Suffolk coastal routes.

9.2.4 It was noted from the trip rate calibration, shown in **Figure 9-3**, that there were some stations which were at the outlying edge of the range and these were predominantly those affected by seasonal tourism and visitor traffic, such as Great Yarmouth, Cromer, Newmarket and Felixstowe so it seemed reasonable to make some seasonal adjustments for this effect for the King's Lynn to Hunstanton route. The demand estimates for Hunstanton and Heacham stations have been increased by 30% to account for seasonal tourism.

9.2.5 It was also considered that the population data may not be fully representative as it may not include second homes or longer-term holiday lets which may have led to the initial forecast being underestimated. Manual adjustments to the catchment have therefore been made to include for additional transient population based on a very coarse estimate of the number of caravans in the catchment (circa 1,600 caravans based on a visual inspection of google maps aerial imagery). The assumed average occupancy of 1 person per caravan was used so the population catchment was increased by 1,600 total people. This aspect will be considered in more detail in the next stage.

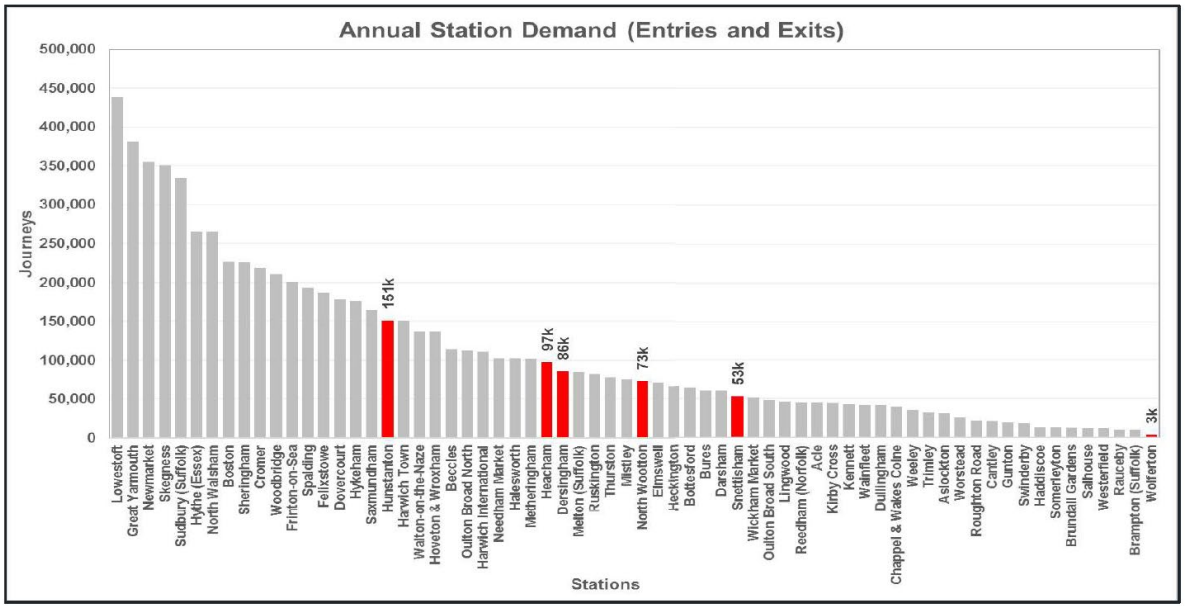
9.2.6 An estimated fare yield has been considered developed from a linear relationship that varies by distance (where yield is equal to £1.40 + 18p per mile [informed from other fares in the region]). For simplicity, the yield has been determined assuming one end of all trips is King's Lynn. Using this yield estimate, a forecast revenue generation can also be calculated for the proposed stations.

9.3 OUTPUT

9.3.1 The model contains a dashboard with an output demand for each of the proposed new stations ranked alongside the refence stations in the Norfolk and north Anglia geography, as shown in **Figure 9-4**. The station locations proposed by the King's Lynn to Hunstanton Railway Campaign group have been evaluated and the model predicts that the total combined revenue from for all six new stations would be in the region of £1,440,000 per year. This revenue is generated from approximately 464,000 annual trips on the line.

9.3.2

Figure 9-4: Model output dashboard rank of annual station demand



9.4 BENCHMARKING

9.4.1 The patronage forecast for the King's Lynn to Hunstanton route has been compared with other rail routes in the East of England that have some similar characteristics in terms of seasonal visitor attractions, proximity to the coast or similar train frequencies. Potential comparator routes include the Bittern line (which provides access to the Norfolk Coast connecting Norwich with Cromer and Sheringham) and Suffolk coastal routes, as well as Lincolnshire coastal routes.

BITTERN LINE

9.4.2 The Bittern line is also located in Norfolk and connects the City of Norwich with the north Norfolk coast via Wroxham and North Walsham. Due to the connectivity to Norwich, it is used by commuters for access to jobs as well as tourists to the coast. The route length is approximately 30 miles from Norwich to Sheringham which is about double the length of the King's Lynn to Hunstanton former route and there are 10 stations on the route.

9.4.3 The Norwich end of the route has a much higher population catchment than that of King's Lynn. Whilst Hunstanton may seem similar in character to Cromer or Sheringham, it has substantially lower resident population than Cromer. However, the principle of the route is similar and train frequency is similar at an hourly frequency. The patronage numbers for 2018 for the route were just below 1mppa (million passengers per annum) as summarised in **Table 9-2**.

Table 9-2: Bittern Line Patronage 2018/19

Station	Location	Local authority	Mileage	Patronage
Norwich	Norwich	City of Norwich	0 3/4	4,250,834
Salhouse	Salhouse	Broadland	6 3/4	11,778
Hoveton / Wroxham	Hoveton / Wroxham	North Norfolk	8 3/4	136,414
Worstead	Worstead / Sloley	North Norfolk	13 1/4	25,650
North Walsham	North Walsham	North Norfolk	16 3/4	265,400
Gunton	Thorpe Market / Lower Street	North Norfolk	19 3/4	19,188
Roughton Road	Cromer / Roughton	North Norfolk	24 3/4	21,766
Cromer	Cromer	North Norfolk	26 3/4	219,244
West Runton	West Runton	North Norfolk	28 3/4	27,212
Sheringham	Sheringham	North Norfolk	30 3/4	225,894

Source: Wikipedia / ORR

EAST SUFFOLK LINE

9.4.4 The East Suffolk line is a 49-mile railway line between Ipswich and Lowestoft in Suffolk, on the east coast of East Anglia. The route carries passenger services operated by Greater Anglia, and nuclear flask trains for the Sizewell nuclear power stations operated by Direct Rail Services. There are 12 stations on the route. The population of Lowestoft and Ipswich at each end of the route far exceeds that of King's Lynn and Hunstanton.

9.4.5 However, the route operates at an hourly service frequency and some of the intermediate stations have similar rural coastal village characteristics to the proposed route between Hunstanton and King's Lynn and the route is also used by tourists. The patronage for Saxmundham station is expected to be similar to that of Hunstanton in the benchmarking graph output from the patronage model.

FELIXSTOWE BRANCH LINE

9.4.6 The Felixstowe branch line is also located in Suffolk, connecting the Great Eastern Main Line to Felixstowe and its port. The line is 15 miles 51 chains in length from Ipswich to Felixstowe, so is more similar in length to the former Hunstanton rail route and has only four stations (other than Ipswich). Passenger service frequency on the line is typically one train per hour in each direction between Ipswich and Felixstowe. The timetabled journey time from one terminus to the other is 26 minutes. This route carries approximately 250,000 passengers per annum (excluding Ipswich), of which about 187,500 used Felixstowe station.

10. RAIL OPERATIONS

10.1 SERVICE ASSUMPTIONS

10.1.1 The assumptions outlined in **Table 10-1** have been made:

Table 10-1: Proposed rail service frequencies

Route	Peak Frequency	Off-peak frequency
King's Lynn to London King's Cross	2 tph	1 tph*
King's Lynn to London Liverpool Street	1 tph	-
King's Lynn to Hunstanton (sensitivity test)	1 tph (2 tph)	1 tph (up to 2 tph)
Middleton Towers freight services	-	Up to 1 train per day

** Network Rail is working with industry partners to provide a two train per hour pattern service between King's Lynn and Cambridge; however, infrastructure constraints at Ely are restricting delivery.*
tph = trains per hour

10.1.2 It is assumed that the Hunstanton line is operated as a self-contained service. This is because:

- The operational cost and disbenefit of operating two adjacent but unconnected stations within King's Lynn would be disproportionate to the benefit of providing a direct London-facing connection.
- Alternatively, all rail services must be displaced to a new station elsewhere in the town. The additional cost and complexity of this has been deemed exceptional and discounted.
- The line to Ely is predominantly single track and is currently limited by the capacity of the section between Downham Market and Littleport as there is no intermediate signalling provided. The impact of this is that a regular train service cannot exceed 2tph, meaning that if a Hunstanton through train were to be introduced it would have to displace an existing service in the peaks. Off-peak, a service to Ely or beyond could be considered.
- All existing services to the south are electrically powered whereas the case for electrification to Hunstanton is likely to be very weak. Given the rolling stock is or will soon be relatively modern (<10 years old) switching to an alternative bi-mode solution is not considered viable;
- Trains to the south are a minimum of four carriages long (81m) whereas the demand to Hunstanton is unlikely to justify trains of this capacity;
- Coupling/uncoupling of carriages at Kings Lynn has not been considered as this would introduce additional operational constraints and requirements for layover and sidings.
- Operationally it ties the services together which is highly undesirable given the amount of single-track railway on both routes and the performance risk this brings.

10.1.3 Using the above logic, it is assumed that all trains must call at the existing King's Lynn station. It is assumed that the King's Lynn to Hunstanton service calls at all intermediate stations.

10.1.4 The connectivity from Hunstanton is assumed to be that it connects with a London service with a reasonable interchange allowance, e.g. if the London service leaves at XX.44 each hour, the Hunstanton service should arrive no later than XX.40 if a cross-platform interchange, and XX.37 if a non-cross-platform interchange is provided. The same principle should be applied in the reverse direction, possibly with a longer allowance as the route from London is more likely to be affected by delays. The two key conclusions from this assumption is that an additional platform will be required at King's Lynn, and that the timings may need to alter during the day to favour the direction of peak interchange.

10.2 OPERATIONS

10.2.1 Journey time on the proposed route would be approximately 25-minutes. This means that a single unit would be capable of operating the 1tph service. If a 2tph service were required, a passing loop would be required. It is likely that the passing loop would be between Wolferton and Dersingham as this is the middle of the route in terms of journey times. Depending on the precise timetable and operational risk levels, this could be limited to be between the stations, or it could be extended to include two platforms at one or both of the stations.

10.2.2 As a variant on this option, a mixed 1tph stopping / 1tph fast service pattern would be possible using the passing loop. Fast services would likely take <20 minutes.

10.3 TRAINS

10.3.1 Currently the services in the area are operated as Great Northern by Govia Thameslink Railway and some peak services as Greater Anglia by Abellio. Great Northern trains are primarily electric class 387 Bombardier Electrostar units that can operate as 4-car (81 metre) or 8-car (162 metre) sets. This length is limited by platform lengths and power capabilities on the route. Greater Anglia trains are currently electric class 379 Bombardier Electrostar units (dimensions as above) although these are to be replaced by electric class 720 Bombardier Aventra units operating as 5-car (122 metre) sets by the end of 2021.

10.3.2 Trains for the Hunstanton branch would need to be self-powered. Passenger capacity requirements are likely to be low for the majority of the year. Greater Anglia have introduced 3 and 4 car class 755 Stadler FLIRT trains elsewhere on the Norfolk and Suffolk routes and these could be used on the route. However, they are all maintained from Norwich Crown Point depot which would mean extended journeys for maintenance at regular intervals.

10.3.3 Alternative novel stock and operators could be considered. It is likely that maintenance would have to be performed locally if this is the case. No site has been assessed for this.

10.4 INFRASTRUCTURE

10.4.1 It is assumed that the railway would be constructed to Network Rail standards and specifications. The railway in flood zone areas would need to be built to a higher specification to avoid washout from flooding - flood plains may need to be crossed on shallow structures rather than embankment.

10.4.2 King's Lynn station area will need to be remodelled in all cases to provide one additional platform face. Various options exist for this, but ideally the existing northernmost platform (2) will become the Hunstanton line platform. It may be possible to fully segregate services in the area for maximum reliability.

10.4.3 All options to remodel King's Lynn station area will require some stabling capacity to be lost. This will need to be re-provided elsewhere in the area. There is currently a siding under construction to the south east of Tennyson Avenue and it appears possible that this site could be enlarged to compensate for any loss and provide additional stabling for Hunstanton services.

10.4.4 The existing signal box has a mechanical interlocking. It is likely that this would need replacing with the introduction of a more complex layout and the Hunstanton branch services.

10.4.5 The following line speeds are indicative of what could be achieved:

- King's Lynn (if remodelled): 20mph inbound, 30mph outbound
- Tight curves: 20mph (mainly on the Green route)
- Medium curves: 40mph (all routes, limited length)
- Flat curves: 60+mph (majority of all routes)
- Upper limit of 90mph if suitable for the alignment, rolling stock and stopping patterns.

10.4.6 Based on the assumption above, all passenger trains will stop at all stations so 75mph would be a typical upper limit.

10.4.7 Level crossings would not be tolerated as a rule, though specific local examples could be justified if exceptional. Grade separated crossings should be achieved at the majority of crossings, preferably by using the topography where possible. Each individual intersection should be assessed for whether the railway or road should "move" to generate the height required - given the tolerance for road gradients it's quite possible that it could be more cost effective to move the roads rather than use extended approaches to make the rail route cross an existing road.

10.4.8 Environmental considerations may force areas of the route to be hidden from view/hearing meaning that the view from the train is likely to be limited.

10.4.9 Rail infrastructure would be typical and align with that present in the local area, e.g. welded rails on concrete sleepers, colour light signalling with computer-based interlockings operated from a remote location.

GREEN (HUNSTANTON RAIL GROUP ROUTE)

10.4.10 It is not clear how the Green option could serve the existing King's Lynn station. It is unlikely to be acceptable to displace existing services onto the Hunstanton line as set out previously, so any services using this route would need to reverse in a facility to the east of King's Lynn junction adding time and operational complexity.

10.4.11 The Green route then follows the route of the old Port branch to leave King's Lynn centre. This would require at least one level crossing across John Kennedy Road. Some local road remodelling would be required to limit the number of sequential level crossings in this area. The curvature and complexity of the alignment is likely to require low permanent speed restrictions to be implemented in the area, increasing journey times.

10.4.12 The route follows the A1078 to the north and east around King's Lynn. There is little to the west and north of this route, although there will be a critical interface with the North Fire Station. It is assumed that the indicated curves along the alignment would be flattened to remove the need for significant speed restrictions, particularly just north of King's Lynn and north of Wolferton. The corridor between Snettisham and Heacham is very tight but an elegant route if it can be made to fit and is environmentally acceptable. The route has few gradients of significance along it. There is a climb from Snettisham to Heacham.

BLUE (NEW ROUTE)

10.4.13 The Blue route takes a significantly inland route. This takes it well away from flood zones and environmental constraints but increases the length and scale of earthworks significantly. There would also likely be a need for viaducts across the river valleys.

10.4.14 Gradients on this alignment would be longer than on any of the others, though it is unlikely that these would be challenging to the trains identified above. The topography could be an advantage when avoiding level crossings. The roads in the area appear to be built at grade so if the rail intersections can be optimised to be in cutting or on embankment at the crossing point minimal interventions would be needed.

BROWN (NEW ROUTE)

10.4.15 The Brown route leaves King's Lynn to the east then follows the A149 to the north. A suitable crossing will be needed as the route approaches Castle Rising where it crosses back over the A148 and A149. The route gains significant additional length as it tries to re-join the historic alignment both north of King's Lynn and south of Heacham. These routes have been chosen to maximise the amount of alignment that is reused. If this condition is relaxed a significant length of route could be avoided. The route has few gradients of significance along it. There is a climb from Snettisham to Heacham.

11. COSTS

11.1 CAPITAL COSTS

11.1.1 This section outlines the capital costs assumed within the analysis of the route options. These have been developed by high-level benchmarking against other schemes to provide indicative values for the options to support the understanding of the viability of progressing further with this study.

11.1.2 It is recommended a full assessment of the costs, following a recognised industry approach (such as the Rail Method of Measurement) is produced once a concept design has been developed before a budget for this scheme is determined. This will enable route specific issues to be costed, such as flood mitigation and utility costs. These values should only be used as a guide for the purpose of understanding the potential viability of the scheme and are not an estimate of the budget required, which could be higher than the values used in this analysis. If the analysis of viability is particularly sensitive to the capital cost, then it is recommended additional work is done to determine a more refined value before concluding on the viability of the project.

11.2 BENCHMARKING METRICS

11.2.1 Benchmarking metrics have been derived from a number of schemes to generate a range for cost per mile. This has included the work from the Campaign for Better Transport, who undertook an extensive benchmarking exercise as reported in their January 2019 report 'The case for Expanding the rail network'. This report sets out an approximate benchmark Cost per Mile of £9.0m-£16.7m (2017 prices). However, there are a number of schemes that forecast values significantly above this range, for example the Lewes to Uckfield Railway Line Reinstatement study, undertaken by Network Rail in 2008 generated a cost per mile of £19m (2008 prices). For the purposes of developing an indicative cost range for the King's Lynn to Hunstanton scheme, cost per mile values of £10m-£20m have been used.

11.3 INDICATIVE CAPITAL COST ESTIMATE

11.3.1 In addition to the per mile cost, allowance needs to be made for works to integrate the new infrastructure with the existing route and provide suitable improvements to the rail systems, track, signalling and station infrastructure. No designs have been undertaken on this and so a notional allowance of £30m-£50m has been considered. It has also been assumed that the wider rail infrastructure facilities needed to accommodate the new route will not incur further costs (e.g. depot space). The indicative capital cost ranges of the routes assessed are summarised in **Table 11-1.**

Table 11-1: Indicative Capital Cost Estimates

Route	Length (miles)	Indicative Cost Ranges
Hunstanton Rail Group Proposal	15.57	£185m-£360m
Blue	17.81	£210m-£405m
Brown	18.37	£215m-£415m

11.3.2 Although there is an apparent reduced cost for the shorter route (due to the reduced length), given the high-level nature of these cost estimates and the significant range associated with developing indicative costs at this stage of development, it is not recommended to assume that this route is the lowest cost option. For the purposes of the analysis into the validation of this route it is suggested a capital cost range of £200m-£400m is used. Appropriate levels of Optimism Bias (64% at SOBC stage) will need to be included in the economic case analysis.

11.4 OPERATING COST

11.4.1 The costs of operating a line include a series of elements, some of which are largely fixed and some of which depend on the distance travelled, the frequency of the train service, and other factors. Under the current industry structure, which may evolve in the coming months, these include:

- Lease payment for the rolling stock, and its maintenance. A longer or more complex train would cost more than a short simple train, in exactly the same way as a hire car.
- Cost of fuel (electricity/diesel)
- Variable usage charge (a cost paid to Network Rail or another infrastructure manager representing the damage caused by the passage of the train)
- Staff costs - driver, guard (if used) and on-station

11.4.2 We assume that the capital cost of construction will be paid by other means; we have not included any cost of borrowing for the capital sum within the track access charges.

11.4.3 In an early feasibility study such as this, the above would be converted into a notional cost per mile of operation, reflecting some elements having a fixed and variable component. **Table 11-2** illustrates a range of the costs of operation, from £1.5m to £2.8m.

Table 11-2: Expected Operational Costs Summary

Route Option	Mileage (variants)	Trains per hour	Number of hours of operation per day	Both ways	Number of days per year1	Expected minimum cost (	Expected maximum cost (@ £15 per mile)
Red	14.90	1	16	2	300	£1,525,760	£2,288,640
Green	15.57	1	16	2	320	£1,594,368	£2,391,552
Blue	17.81	1	16	2	320	£1,823,744	£2,735,616
Brown	18.37	1	16	2	320	£1,881,088	£2,821,632

[1] An annualisation factor of 320 does not imply that there would be no service on a Sunday. It implies that Saturdays and Sundays and various bank holidays may see a reduced level of service. This annualisation factor can easily be amended according to choices made about the service.

11.4.4 Against the expected cost of operation should be placed the expected revenue. The work that has been completed to date suggests that the annual patronage would be in the region of 460,000, and that would imply a revenue of approximately £1.44m per annum. This figure includes a 30% uplift for the expected tourist traffic to Hunstanton and Heacham plus a manual population uplift of 1600 based on the number of caravans within the catchment. Sensitivity testing on upper and lower bound sensitivity testing. A summary of the forecast revenue versus expected operating costs are provided in **Table 11-3.**

Table 11-3: Operating Cost and Revenue Comparison

Route option	Expected minimum cost (£10 per mile)	Expected maximum cost (£15 per mile)	Projected Revenue	Expected % of minimum operating cost	Expected % of maximum operating cost
Red	£1,525,760	£2,288,640	£1,439,536	94%	63%
Green	£1,594,368	£2,391,552	£1,439,536	90%	60%
Blue	£1,823,744	£2,735,616	£1,439,536	79%	53%
Brown	£1,881,088	£2,821,632	£1,439,536	77%	51%

11.4.5 On the basis of the above scenario, the annual revenue falls just below the expected lower bound operating costs (based on £10 per mile). However, if the longest route was adopted, and the higher operating mileage cost of £15 were to be applicable, then the service would only cover about 50% of its costs.

11.5 SERVICE CONSIDERATIONS

11.5.1 We have based our analysis on the operation of a self-contained shuttle between King's Lynn and Hunstanton, operating once per hour in each direction. This would sensibly be timed to make a connection to / from the train to / from Cambridge and London. At present this train operates once per hour, but is expected to go to 2 trains per hour, and up to 8-cars in length, in the coming years, following completion of infrastructure enhancements at Ely. The operating costs outlined above imply a train of 2 or maximum 3 cars on most services.

11.5.2 It has been suggested that an alternative to a self-contained shuttle would be the extension of the trains to / from London. That poses some additional issues, none of which is insuperable, but all of which entail a higher cost. These include:

- The London trains are electric, and the line to Hunstanton would need to be electrified to take advantage of them. An alternative would be the procurement of a replacement fleet of electro-diesel bi-mode trains, which operate in other parts of East Anglia (on the route from Cambridge to Norwich for example), but that would be an additional cost.
- Trains extending to Hunstanton would need to reverse at King's Lynn. This is perfectly possible but will impose a time penalty for the reversal for through passengers.
- Trains south of King's Lynn will soon be 8 (2x4) cars in length. Demand north of King's Lynn does not justify a train longer than 4 cars, and so it is probable that trains would split or join at King's Lynn. As with reversal, this is perfectly possible, but it would impose an operational constraint.

11.5.3 Whilst none of these options should be dismissed from further consideration, we believe that the base option should be of a self-contained shuttle, making, wherever possible, cross-platform connections at King's Lynn with the trains to / from Cambridge and London. This is almost certainly going to be the most cost-effective option to pursue.

12. SUMMARY & CONCLUSIONS

12.1 FEASIBILITY & DELIVERABILITY

12.1.1 Four options have been considered in high-level terms within this study including the former route from King's Lynn to Hunstanton as previously operated until 1969, a review of the former rail route variant option proposed by the Hunstanton Rail Group and two potential new options.

12.1.2 The study concludes that the re-instatement of the original route in its entirely cannot be feasibly re-instated due to built development on the former route at the Hunstanton and King's Lynn ends of the route, heritage constraints at Wolferton (as the former Royal Station is now a listed building and occupied dwelling) and most significantly, the majority of the route falls within the Coastal Hazard zone which is at high risk of flooding from rivers and seas.

12.1.3 It is also unlikely that any new level crossings would be accepted from an operational highway safety and railway safety perspective. Even the re-instatement of former level crossings is likely to be met with a policy objection from the ORR. Therefore, it would be necessary to route the railway to avoid level crossings, minimise the number of minor road crossings and consider a grade separated solution for any crossings of the A149. Traffic data for the A149 shows that this road experiences pressure at weekends and during peak seasonal times of the year, with congestion and delays which would potentially be exacerbated by the new development in the corridor and therefore would be sensitive to the addition of any new level crossings. It also has a higher safety risk than other rural A-roads in Norfolk.

12.1.4 The two new route options, seek to avoid many of the environmental constraints highlighted above and by taking an alternative departure route to the east of King's Lynn using an existing railway which crosses under the A149 at an existing underpass can avoid the need for a level crossing. As a result, these options have longer alignments and more challenging topography so therefore have an increased capital and operational cost. However, these routes are more likely to be feasible to deliver from an environmental point of view and more likely to be approved by the ORR.

12.2 VIABILITY OF OPTIONS

12.2.1 A review of demographic data from Census 2011 and Experian Mosaic data has informed the analysis presented in this report. Patronage forecasts have been benchmarked against other similar stations in the wider UK database of estimated station usage published by the ORR. An uplift of 30% has been added to account for seasonal and weekend visitor traffic based on evidence from the observed traffic data on A149 and A47.

12.2.2 Additional uplifts have also been applied to the proposed stations within the population catchment since the demographic data drawn from is unlikely to include residents at second homes and longer-term holiday makers in caravans. This is based on a visual inspection of the number of caravans in the catchment from Google maps aerial photography (we estimate this to be in the region of 1,600 caravans).

12.2.3 The patronage forecasting for the route indicates that the station would have similar patronage in the current year to other coastal stations which have geographic and demographic similarities as well as similar train frequencies, so we expect that the numbers forecast are realistic.

12.2.4 The capital costs for any of the options are likely to be in excess of £185m in all cases. Hence when considering the cost benefit case against this, with less than 500,000 passengers per annum expected to be using the route, with revenues in the region of £1.44m per annum, the BCR value would be expected to be substantially below 1.0 and within the low category in terms of value for money.

12.2.5 Comparing revenues against the annual operational costs only with annual revenues, for all options, this is likely to remain within the low category below 1.0 but would be close to 1.0 for the most optimistic case. There are other types of benefits and wider economic impacts that have not been considered which may increase the BCR to marginally above 1.0 in the most optimistic case but with the longer route options and operating costs at the higher end of the spectrum the BCR would most likely remain below 1.0.

12.2.6 In order to demonstrate viability, the railway would normally need to have a reliable baseline of commuters, which may come about as a result of mode shift in response to congestion on the surrounding highway network. A review of traffic conditions on the A149 indicates that on a typical weekday the highway generally operates within capacity, even at peak times (08:00-09:00 and 17:00-18:00), so there would be limited incentive for commuters to change modes to rail in this case. However, there is pressure on this road during weekends, Fridays and Mondays due to seasonal traffic. This falls outside of typical commuting times and there is limited evidence on use of rail for non-residential trips locally but the UK national average uptake of all public transport options (bus, rail and taxi) for non-commuting and business trips is around 7.7% (NTS, 2018).

12.2.7 Within King's Lynn town centre congestion is more apparent and the route options do support journeys on key desire lines from the north and east periphery of the King's Lynn urban area, so there would potentially be a localised benefit. However, this is the most challenging section of route to re-instate due to built development constraints and requirements for level crossings.

12.3 SUMMARY OF OPTION PERFORMANCE

12.3.1 Whilst it is not the purpose of this report to recommend a preferred option, there are positives and negatives of all four options considered. Firstly, it is clear that the re-instatement of the original route is unlikely to be feasible in its entirety, hence three alternatives have been considered. The Blue and Brown options make use of existing rail track at the Kings Lynn end and offer the most expedient options for achieving connectivity to the existing station. Whilst the Green option (proposed by Hunstanton Rail Group) offers the shortest distance route, and makes use of the former rail route where it still exists which keeps costs down.

12.3.2 The Green route has less A-Road crossings, but the Snettisham section and A149 crossing is likely to be challenging to deliver. The Brown option has more opportunity for patronage as there is an opportunity for connecting with Kings Lynn east and north but has some environmental challenges, especially through the Coastal Flood Hazard Zone. The Blue route offers the least environmental impact but is also more costly and has more minor road crossings to negotiate and less patronage catchment. However, may offer increased opportunity to support future development.

12.4 CONCLUSIONS AND NEXT STEPS

12.4.1 Based on the operational and capital Cost estimates provided above, it seems unlikely that re-instating the former rail route would demonstrate good value for money as a heavy rail route, and there are feasibility constraints for all options which would increase costs substantially.

12.4.2 However, there is some evidence of congestion and seasonal pressure on the local road network as a result of tourist traffic and comparing existing rural bus service and potential journey times against the route options in this study suggests that a direct fixed track-based solution would offer a quicker and more direct option and with increased growth in the corridor and emerging policy emphasis on climate change going forward, communities will benefit with a range of travel options available.

12.4.3 On review of other established rail routes on the Norfolk and Suffolk east coast, it is also evident that there are other routes which survive today operating a similar service level within similar catchments. There are also several opportunities for additional revenue (eg from tourism and freight) that have not been factored into the above analysis and potential cost savings (such as avoiding grade separation of all road crossings) that could be made which can be investigated further going forward. This may enhance the business case for the proposed route.